6. Documentation

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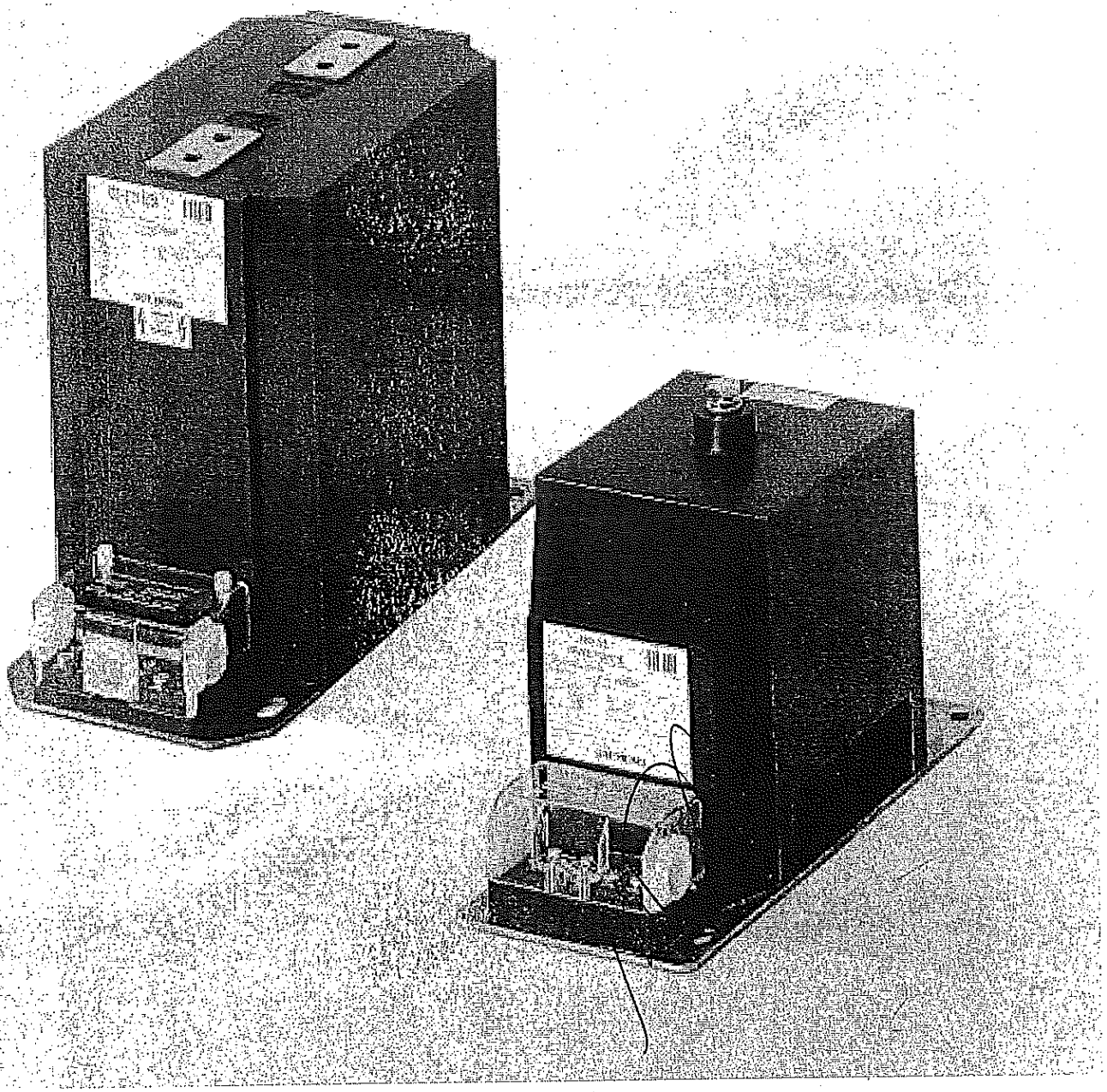
6.2	Panel Arrangement Diagram	Annex 2
6.3	Constructional Data	Annex 3

ВЯРНО С ОРИГИНАЛА



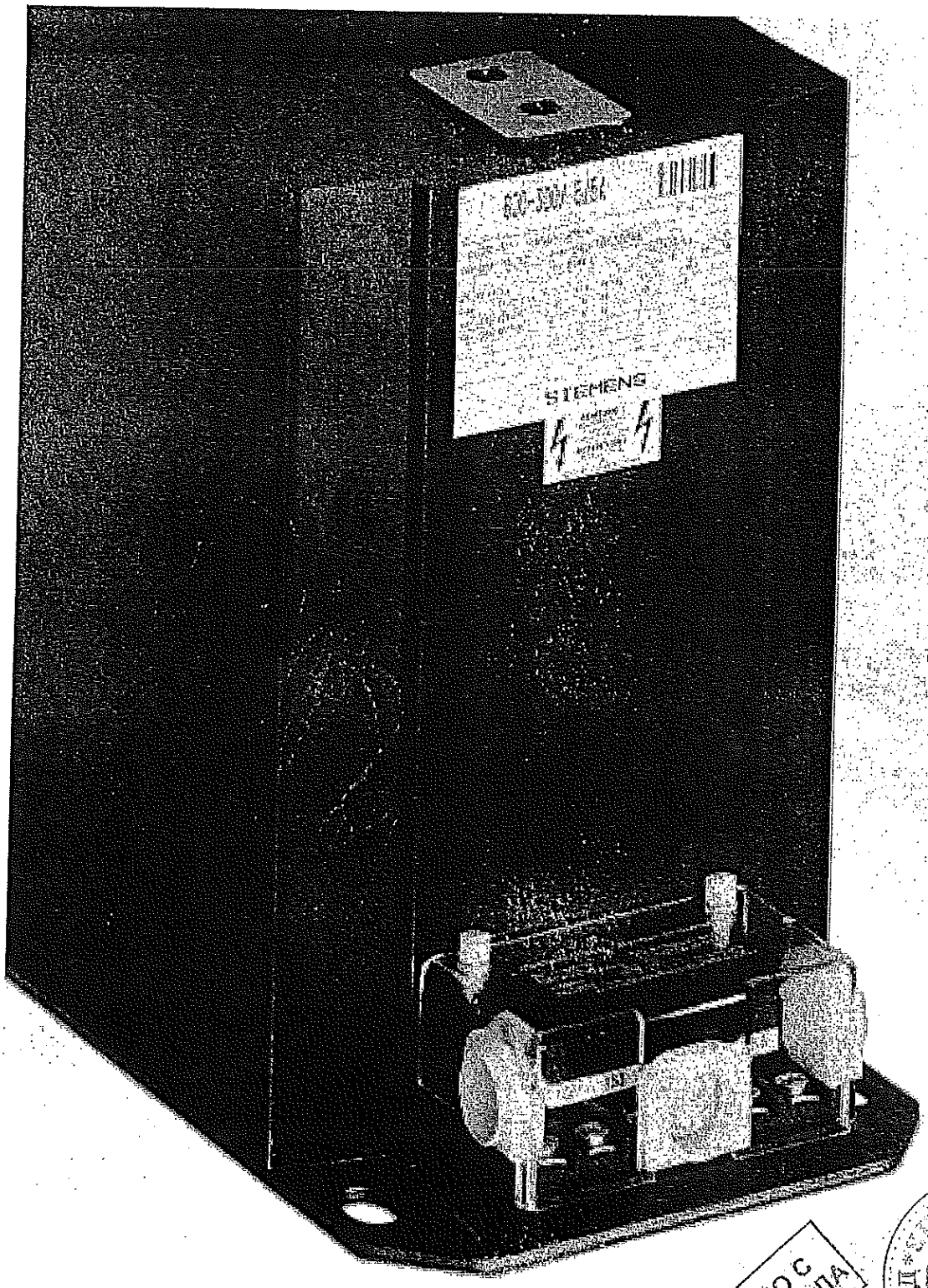
4M Protective and Measuring Transformers

Medium-Voltage Equipment
Selection and Ordering Data

Catalog HG 24 · 2009

Answers for energy.

SIEMENS



4M Protective and Measuring Transformers

Medium-Voltage Equipment
Catalog HG 24 · 2009

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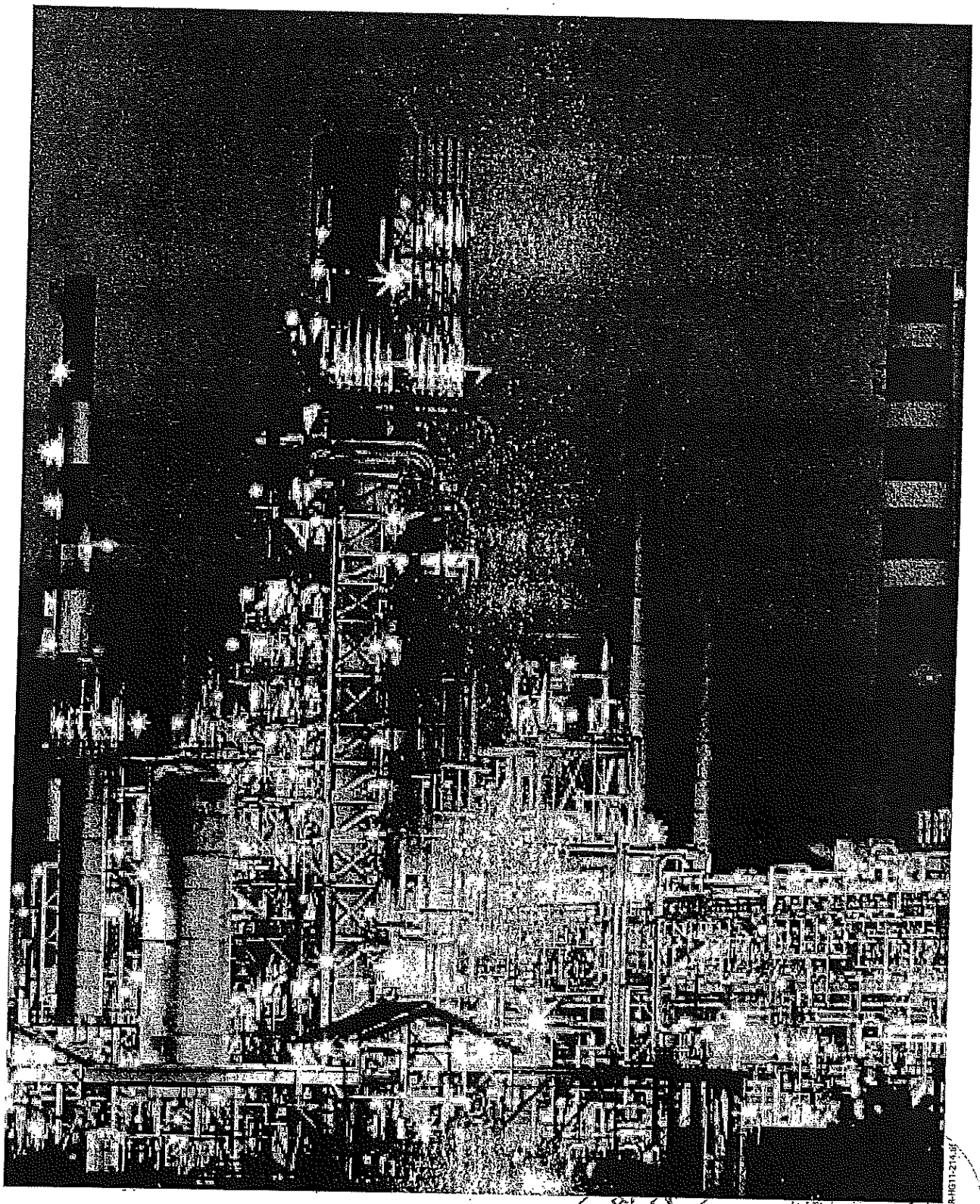


Industrial application: Refinery

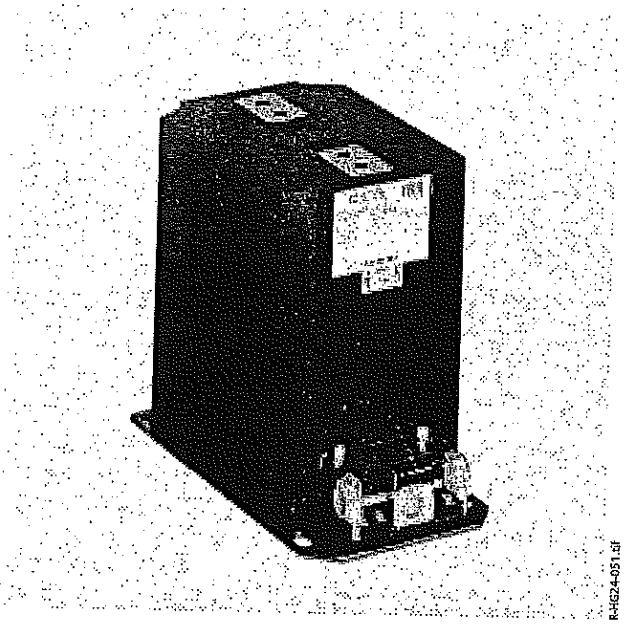
Contents

Protective and Measuring Transformers – The Adaptable

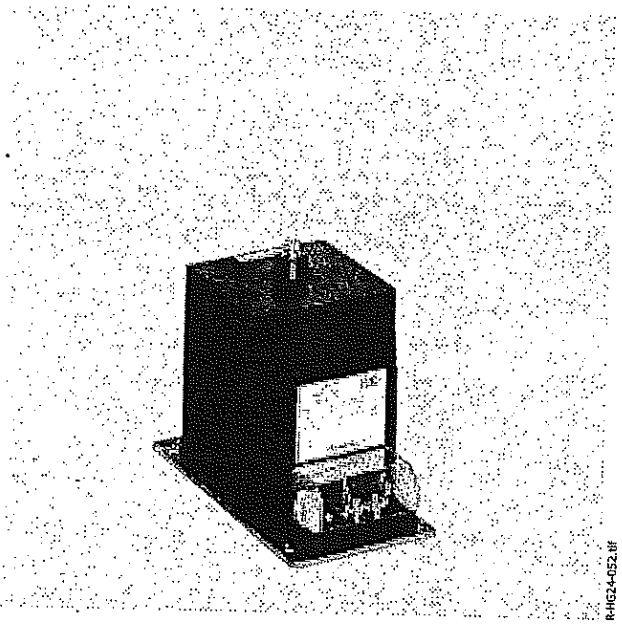
1

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



Voltage transformer



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

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

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

In contrast to current transformers, voltage transformers must 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.

1

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:

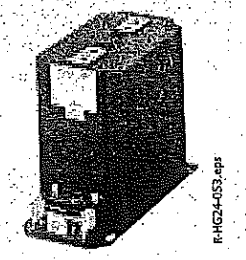
Current transformers

- 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

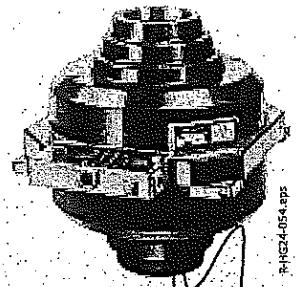
Voltage transformers

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

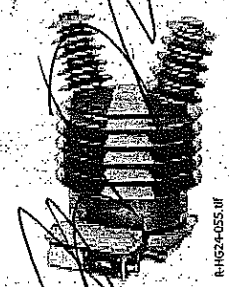
The transformers offered in the selection are only a part of the possible variations. If the transformer required is not shown, please clarify the feasibility with the responsible sales partner or the order processing department in the Switchgear Factory Berlin. The same applies to transformers according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



Example for transformer in block-type design



Example for bushing-type transformer



Example for outdoor transformer

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.

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.

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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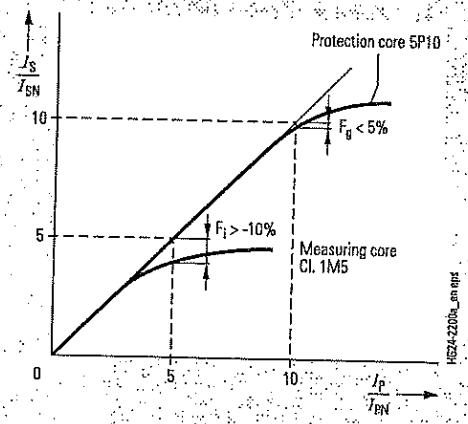
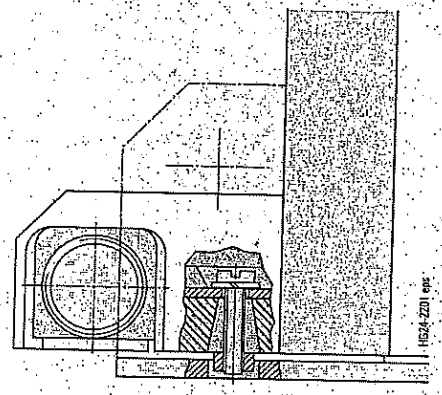


Overcurrent performance of current transformers when loaded with rated burden

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.

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.

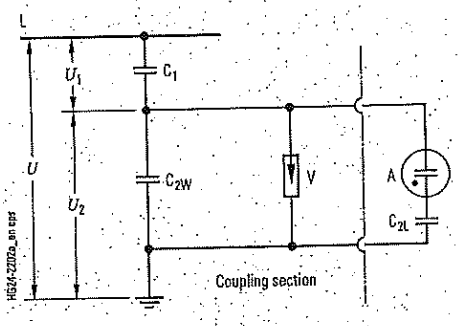
Indication range:
At 0.01 x U_N, no indication,
as of 0.40 x U_N, secure indication.

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

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.

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

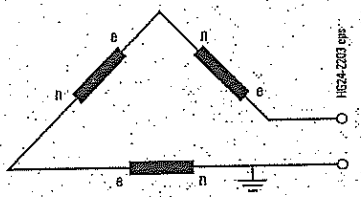
This connection must not be opened during operation.

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

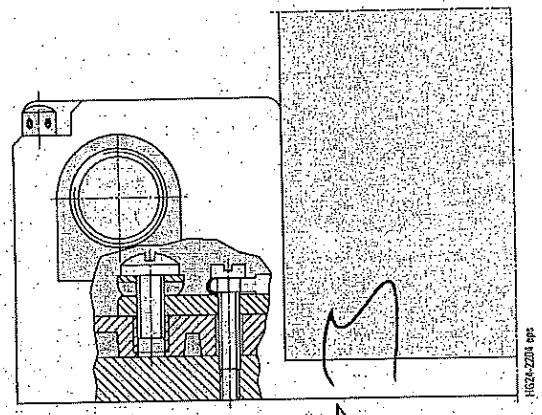
For earthing the secondary windings, a thread is provided under each secondary terminal. The earth connection required is established by fitting a special screw.

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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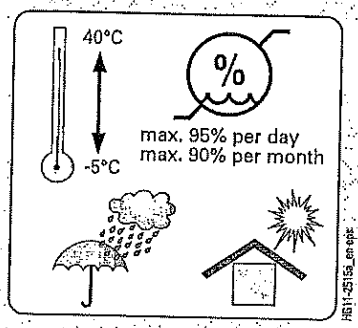
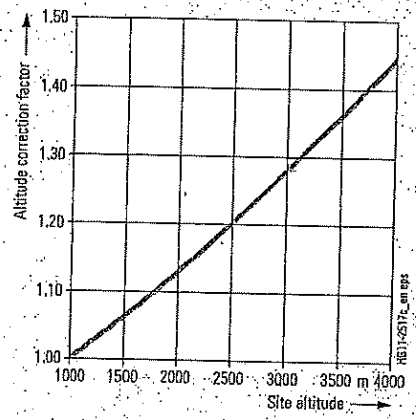




Highest voltage for equipment U_m	Rated short-duration power-frequency withstand voltage	Rated lightning impulse withstand voltage
kV	kV	kV
7.2	20	60
12	28	75
17.5	38	95
24	50	125
36	70	170
52	95	250

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:

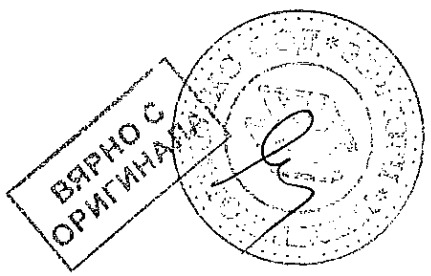
90 kV ≥ 75 kV x 1.2

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.



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.

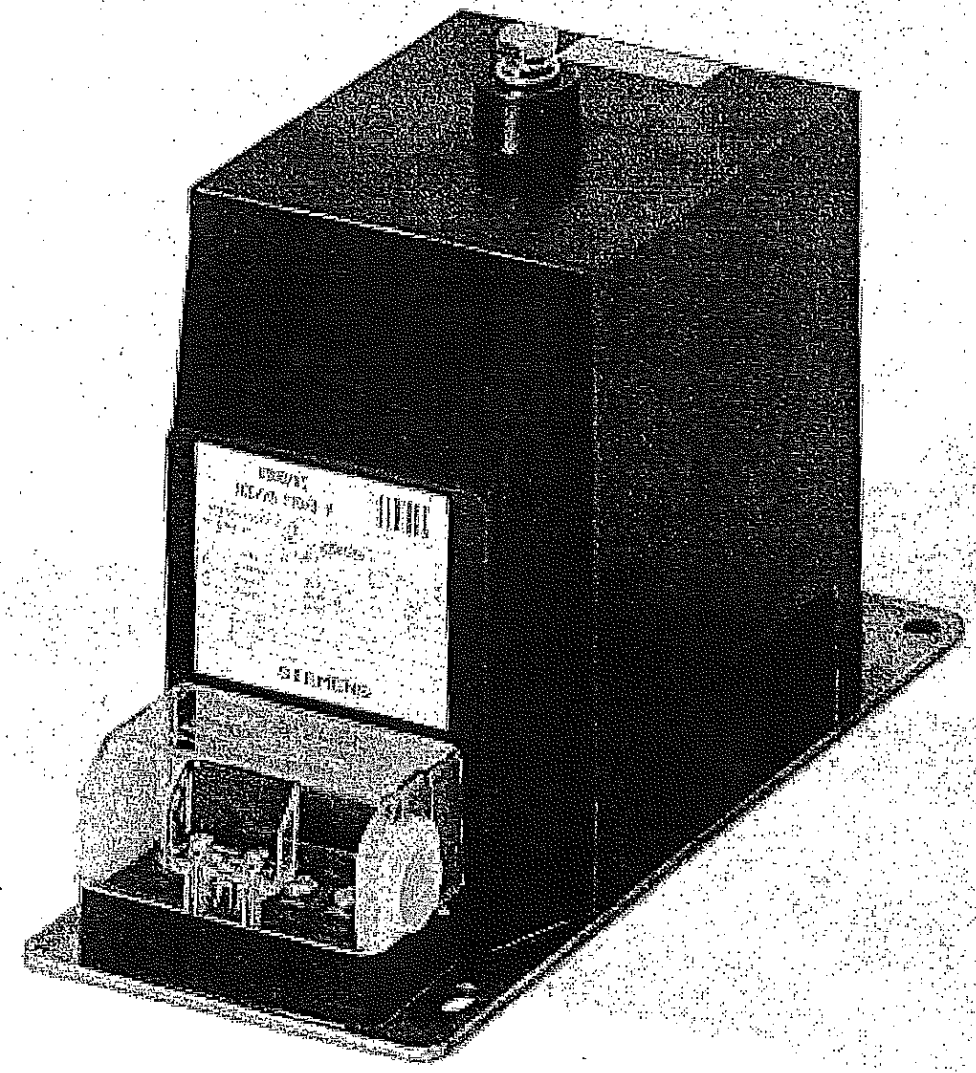
Partial discharges act like HF emitters, producing a mixture of the most different frequencies. The partial discharge measurement enables an assessment about the homogeneity of the insulating material. Partial discharge measurements are performed as a routine test on inductive transformers with solid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

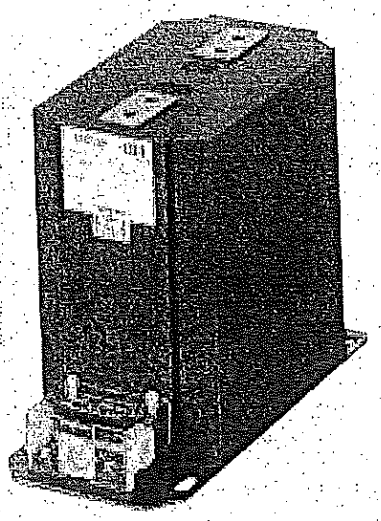
Type of earthing	Type of transformer	Pre-stressing voltage ≥ 10 s	Measuring voltage ≥ 1 min	Permissible partial discharge level Apparent load
Systems with isolated or impedance earthed neutral	Current transformers and earthed voltage transformers	$1.3\ U_m$	$1.1\ U_m$	250 pC
			$1.1\frac{U_m}{\sqrt{3}}$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

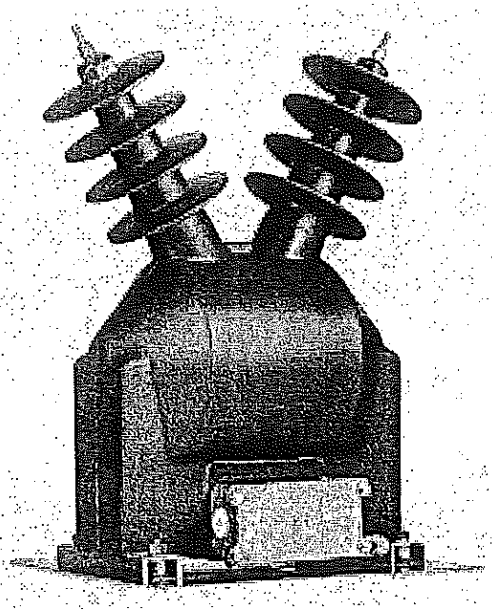
- VDE 0414 "Stipulations for instrument transformers"
- VDE 0111 "Insulation co-ordination for equipment in three-phase systems above 1 kV"
- IEC 60044-1
- IEC 60044-2
- ANSI 1675 (IEEE)
- DIN 42600





R-HG24-053.eps

4MA74 current transformer



R-HG24-058.eps

4MS6 outdoor voltage transformer

Contents

2

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.

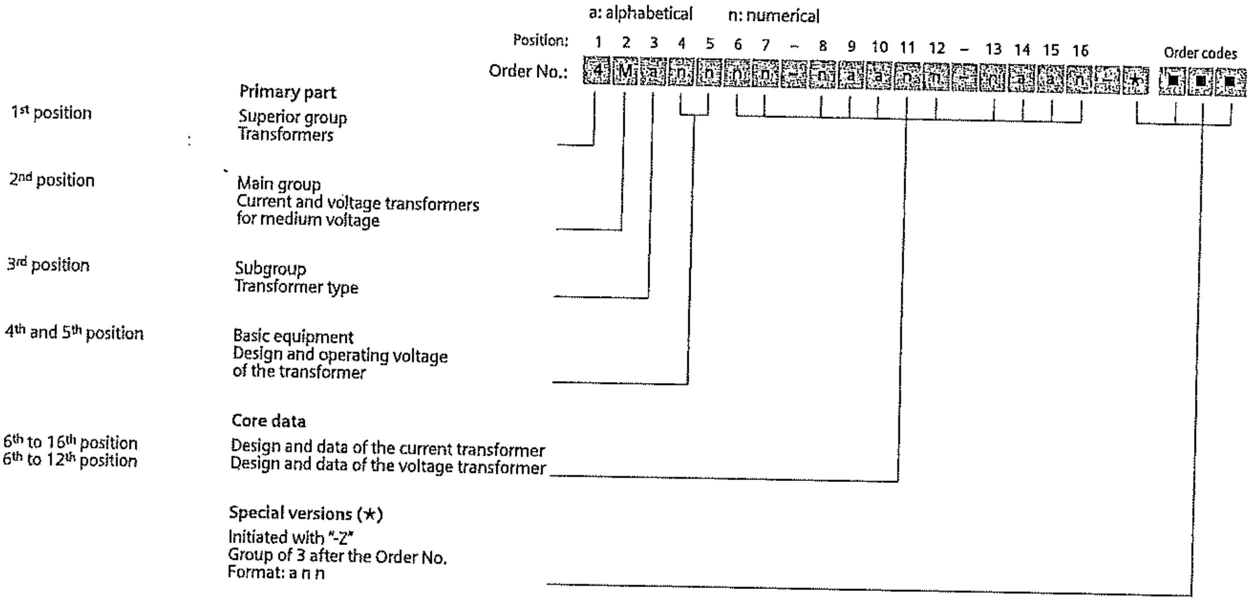
Order codes

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:

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
Illustration / Type of design	Order No.:	4	M	■	■	■	■	■	–	■	■	■	■	■	–	■	■	■	■	■ ■ ■


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

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

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

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	A	7	■	■	■	–	■	■	■	■	■	–	■	■	■	■	★	■ ■ ■
									See page 21	See page 21	See page 22 to page 39						See page 40	See page 40		See page 40

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 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	

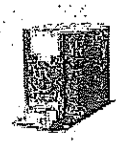
6th/7th position
Rated short-time thermal current

Rated short-time thermal current I_{th} kA	Remark	Position 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:

ВЯРНО С ОРИГИНАЛА



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 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

8th/9th position
Rated primary current

See page 22 to page 39 (positions 10 to 14) · See page 40 (position 15) · See page 40 (position 16) · See page 40 (order codes)

Rated primary current I_{PN} A	Rated primary current with primary multi-ratio I_{PN} A	8 kA	12.5 kA	16 kA	20 kA	25 kA	31.5 kA	40 kA	50 kA	63 kA	8	9
		Rated short-time thermal current I_{th}										
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)

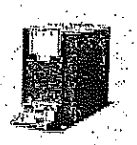
2

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:

стр. 64



8 kA

10th to 14th position

Core versions

At rated primary current I_{PN}	Thermal strength
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}
60 A 75 A	150 x I_{PN}
40 A 50 A	200 x I_{PN}
30 A	300 x I_{PN}
20 A 25 A	400 x I_{PN}

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 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ s. p. 40 s. p. 40 s. p. 40 ■ ■ ■

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}
0.2	FS10	10												■
		15												■
0.5	FS5	10												■
		15												■
		30												■
1	FS5	10												■
		15												■
		30												■
5P	10	5												■
		10												■
		15												■
		30												■
10P	10	5												■
		10												■
		15												■
		30												■
0.5	FS5	5	5P	10	5									■
		10			10									■
		15			15									■
		30			30									■
0.5	FS5	5	10P	10	5									■
		10			10									■
		15			15									■
		30			30									■
1	FS5	5	5P	10	5									■
		10			10									■
		10			15									■
		15			15									■
		15			30									■
		30			30									■
1	FS5	5	10P	10	5									■
		10			10									■
		10			15									■
		15			15									■
		15			30									■
		30			30									■

■ Feasible (other combinations on request)

0: 1

2: 3

4:

C 2 – 0 A
C 3 – 0 A
E 2 – 0 A
E 3 – 0 A
E 4 – 0 A
H 2 – 0 A
H 3 – 0 A
H 4 – 0 A
L 1 – 0 A
L 2 – 0 A
L 3 – 0 A
L 4 – 0 A
Q 1 – 0 A
Q 2 – 0 A
Q 3 – 0 A
Q 4 – 0 A
E 1 – 1 L
E 2 – 2 L
E 3 – 3 L
E 4 – 4 L
E 1 – 1 Q
E 2 – 2 Q
E 3 – 3 Q
E 4 – 4 Q
H 1 – 1 L
H 2 – 2 L
H 2 – 3 L
H 3 – 3 L
H 3 – 4 L
H 4 – 4 L
H 1 – 1 Q
H 2 – 2 Q
H 2 – 3 Q
H 3 – 3 Q
H 3 – 4 Q
H 4 – 4 Q

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 L 4 0 – 0 A

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

стр. 65

8 kA – with primary multi-ratio

10th to 14th position

Core versions

At rated primary current I_{PN}	Thermal strength
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}
2x 60 A 2x 75 A	150 x I_{PN}
2x 40 A 2x 50 A	200 x I_{PN}
2x 30 A	300 x I_{PN}
2x 20 A 2x 25 A	400 x I_{PN}

1st core			2nd core			Thermal strength							
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								■	■	■	■	■
		15								■	■	■	■	■
0.5	FS5	10								■	■	■	■	■
		15								■	■	■	■	■
		30								■	■	■	■	■
1	FS5	10								■	■	■	■	■
		15								■	■	■	■	■
		30								■	■	■	■	■
5P	10	5								■	■	■	■	■
		10								■	■	■	■	■
		15								■	■	■	■	■
		30								■	■	■	■	■
10P	10	5								■	■	■	■	■
		10								■	■	■	■	■
		15								■	■	■	■	■
		30								■	■	■	■	■
0.5	FS5	5	5P	10	5					■	■	■	■	■
		10			10					■	■	■	■	■
		15			15					■	■	■	■	■
		30			30					■	■	□	■	■
0.5	FS5	5	10P	10	5					■	■	■	■	■
		10			10					■	■	■	■	■
		15			15					■	■	■	■	■
		30			30					■	■	□	■	■
1	FS5	5	5P	10	5					■	■	■	■	■
		10			10					■	■	■	■	■
		10			15					■	■	■	■	■
		15			15					■	■	■	■	■
		15			30					■	■	□	■	■
		30			30					■	■	■	■	■
1	FS5	5	10P	10	5					■	■	■	■	■
		10			10					■	■	■	■	■
		10			15					■	■	■	■	■
		15			15					■	■	■	■	■
		15			30					■	■	□	■	■
		30			30					■	■	■	■	■

■ 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

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 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

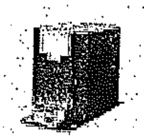
s. p. 40 s. p. 40 s. p. 40

10th position: 0 1 2 3 4

11th position: C 2 – 0 A; C 3 – 0 A; E 2 – 0 A; E 3 – 0 A; E 4 – 0 A; H 2 – 0 A; H 3 – 0 A; H 4 – 0 A; L 1 – 0 A; L 2 – 0 A; L 3 – 0 A; L 4 – 0 A; Q 1 – 0 A; Q 2 – 0 A; Q 3 – 0 A; Q 4 – 0 A; E 1 – 1 L; E 2 – 2 L; E 3 – 3 L; E 4 – 4 L; E 1 – 1 Q; E 2 – 2 Q; E 3 – 3 Q; E 4 – 4 Q; H 1 – 1 L; H 2 – 2 L; H 2 – 3 L; H 3 – 3 L; H 3 – 4 L; H 4 – 4 L; H 1 – 1 Q; H 2 – 2 Q; H 2 3 Q; H 3 – 3 Q; H 3 – 4 Q; H 4 – 4 Q

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

Order codes:



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 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – Z ■ ■ ■

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

At rated primary current I_{PN}	Thermal strength	Code (pos. 10)
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

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}	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} = 12.5 kA, I_{PN} = 100 A)
Thermal strength 150 x I_{PN}
1st core class 10P; instrument security factor 10; rating 5 VA
2nd core without

4 M A 7
2 4 0 – 0 M
1
Q 1 – 0 A

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

ВЯРНО С ОРИГИНАЛА

12.5 kA – with primary multi-ratio

10th to 14th position

Core versions

At rated primary current I_{PN}	Thermal strength
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}
2x 100 A	150 x I_{PN}
2x 75 A	200 x I_{PN}
2x 50 A 2x 60 A	300 x I_{PN}
2x 40 A	400 x I_{PN}
2x 25 A 2x 30 A	500 x I_{PN}
2x 20 A	800 x I_{PN}

1st core			2nd core			Thermal strength							
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								■	■	■	■	■
		15								■	■	■	■	■
0.5	FS5	10					■		■	■	■	■	■	■
		15					■		■	■	■	■	■	■
		30								■	■	■	■	■
1	FS5	10					■		■	■	■	■	■	■
		15					■		■	■	■	■	■	■
		30					■		■	■	■	■	■	■
5P	10	5					■		■	■	■	■	■	■
		10					■		■	■	■	■	■	■
		15								■	■	■	■	■
		30										■	■	■
10P	10	5					■		■	■	■	■	■	■
		10					■		■	■	■	■	■	■
		15							■	■	■	■	■	■
		30										■	■	■
0.5	FS5	5	5P	10	5		■		■	■	■	■	■	■
		10			10						■	■	■	■
		15			15						■	■	■	■
		30			30							■	■	■
0.5	FS5	5	10P	10	5		■		■	■	■	■	■	■
		10			10						■	■	■	■
		15			15						■	■	■	■
		30			30							■	■	■
1	FS5	5	5P	10	5		■		■	■	■	■	■	■
		10			10						■	■	■	■
		10			15						■	■	■	■
		15			15							■	■	■
		15			30							■	■	■
		30			30								■	■
1	FS5	5	10P	10	5		■		■	■	■	■	■	■
		10			10						■	■	■	■
		10			15						■	■	■	■
		15			15							■	■	■
		15			30							■	■	■
		30			30								■	■

■ Feasible (other combinations on request)

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 ■ ■ 0 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ■ ■ ■

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

10	11	12
0		
1		
2		
3		
4		
5		
7		
C	2	– 0 A
C	3	– 0 A
E	2	– 0 A
E	3	– 0 A
E	4	– 0 A
H	2	– 0 A
H	3	– 0 A
H	4	– 0 A
L	1	– 0 A
L	2	– 0 A
L	3	– 0 A
L	4	– 0 A
Q	1	– 0 A
Q	2	– 0 A
Q	3	– 0 A
Q	4	– 0 A
E	1	– 1
E	2	– 2 L
E	3	– 3 L
E	4	– 4 L
E	1	– 1 Q
E	2	– 2 Q
E	3	– 3 Q
E	4	– 4 Q
H	1	– 1 L
H	2	– 2 L
H	2	– 3
H	3	– 3 L
H	3	– 4 L
H	4	– 4 L
H	1	– 1 Q
H	2	– 2 Q
H	2	– 3 Q
H	3	– 3 Q
H	3	– 4 Q
H	4	– 4 Q

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 1 Q ■ ■

Order codes:

Equipment Selection

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

2

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}	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} = 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:

ВЯРНО С ОРИГИНАЛА

стр. 69

16 kA – with primary multi-ratio

10th to 14th position

Core versions

At rated primary current I_{PN}	Thermal strength
2x 200 A 2x 250 A 2x 300 A 2x 400 A 2x 500 A 2x 600 A	100 x I_{PN}
2x 125 A 2x 150 A	150 x I_{PN}
2x 100 A	200 x I_{PN}
2x 60 A 2x 75 A	300 x I_{PN}
2x 40 A 2x 50 A	400 x I_{PN}
2x 30 A	600 x I_{PN}
2x 25 A	800 x I_{PN}
2x 20 A	1000 x I_{PN}

1st core			2nd core			Thermal strength							
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								■	■	■	■	■
		15								■	■	■	■	■
0.5	FS5	10						■	■	■	■	■	■	■
		15						■	■	■	■	■	■	■
		30								■	■	■	■	■
1	FS5	10						■	■	■	■	■	■	■
		15						■	■	■	■	■	■	■
		30								■	■	■	■	■
5P	10	5						■	■	■	■	■	■	■
		10						■	■	■	■	■	■	■
		15								■	■	■	■	■
		30										■	■	■
10P	10	5						■	■	■	■	■	■	■
		10						■	■	■	■	■	■	■
		15							■	■	■	■	■	■
		30										■	■	■
0.5	FS5	5	5P	10	5				■	■	■	■	■	■
		10			10						■	■	■	■
		15			15						■	■	■	■
		30			30								■	■
0.5	FS5	5	10P	10	5				■	■	■	■	■	■
		10			10						■	■	■	■
		15			15						■	■	■	■
		30			30								■	■
1	FS5	5	5P	10	5			■	■	■	■	■	■	■
		10			10					■	■	■	■	■
		10			15						■	■	■	■
		15			15						■	■	■	■
		15			30								■	■
		30			30								■	■
1	FS5	5	10P	10	5			■	■	■	■	■	■	■
		10			10					■	■	■	■	■
		10			15						■	■	■	■
		15			15						■	■	■	■
		15			30								■	■
		30			30								■	■

■ 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

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 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■

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

0 1 2 3 4 6 7 8

C 2 – 0 A
C 3 – 0 A
E 2 – 0 A
E 3 – 0 A
E 4 – 0 A
H 2 – 0 A
H 3 – 0 A
H 4 – 0 A
L 1 – 0 A
L 2 – 0 A
L 3 – 0 A
L 4 – 0 A
Q 1 – 0 A
Q 2 – 0 A
Q 3 – 0 A
Q 4 – 0 A
E 1 – 1
E 2 – 2 L
E 3 – 3
E 4 – 4
E 1 – 1 Q
E 2 – 2 Q
E 3 – 3 Q
E 4 – 4 Q
H 1 – 1 L
H 2 – 2 L
H 2 – 3 L
H 3 – 3 L
H 3 – 4 L
H 4 – 4 L
H 1 – 1 Q
H 2 – 2 Q
H 2 – 3 Q
H 3 – 3 Q
H 3 – 4 Q
H 4 – 4 Q

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

Order codes:

20 kA

10th to 14th position

Core versions

At rated primary current I_{PN}	Thermal strength
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}
150 A	150 x I_{PN}
100 A 125 A	200 x I_{PN}
75 A	300 x I_{PN}
50 A 60 A	400 x I_{PN}
40 A	500 x I_{PN}
30 A	800 x I_{PN}
25 A	1000 x I_{PN}

1st core			2nd core			Thermal strength							
Class	Factor	VA rating	Class	Factor	VA rating	1000 x I_{PN}	800 x I_{PN}	500 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										■	■	■
		15										■	■	■
0.5	FS5	10										■	■	■
		15										■	■	■
		30										■	■	■
1	FS5	10										■	■	■
		15										■	■	■
		30										■	■	■
5P	10	5										■	■	■
		10										■	■	■
		15										■	■	■
		30										■	■	■
10P	10	5										■	■	■
		10										■	■	■
		15										■	■	■
		30										■	■	■
0.5	FS5	5	5P	10	5							■	■	■
		10			10							■	■	■
		15			15							■	■	■
		30			30							■	■	■
0.5	FS5	5	10P	10	5							■	■	■
		10			10							■	■	■
		15			15							■	■	■
		30			30							■	■	■
1	FS5	5	5P	10	5							■	■	■
		10			10							■	■	■
		10			15							■	■	■
		15			15							■	■	■
		15			30							■	■	■
		30			30							■	■	■
1	FS5	5	10P	10	5							■	■	■
		10			10							■	■	■
		10			15							■	■	■
		15			15							■	■	■
		15			30							■	■	■
		30			30							■	■	■

■ 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

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	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	■ ■ ■
																			s. p. 40	
																			s. p. 40	
																			s. p. 40	

10th position	11th position	12th position	13th position	14th position	15th position	16th position
0	1					
2	3					
4	5					
7	8					
C	2	–	0	A		
C	3	–	0	A		
E	2	–	0	A		
E	3	–	0	A		
E	4	–	0	A		
H	2	–	0	A		
H	3	–	0	A		
H	4	–	0	A		
L	1	–	0	A		
L	2	–	0	A		
L	3	–	0	A		
L	4	–	0	A		
Q	1	–	0	A		
Q	2	–	0	A		
Q	3	–	0	A		
Q	4	–	0	A		
E	1	–	1	L		
E	2	–	2	L		
E	3	–	3	L		
E	4	–	4	L		
E	1	–	1	Q		
E	2	–	2	Q		
E	3	–	3	Q		
E	4	–	4	Q		
H	1	–	1	L		
H	2	–	2	L		
H	2	–	3	L		
H	3	–	3	L		
H	3	–	4	L		
H	4	–	4	L		
H	1	–	1	Q		
H	2	–	2	Q		
H	2	–	3	Q		
H	3	–	3	Q		
H	3	–	4	Q		
H	4	–	4	Q		
H	2	–	3	L		

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

Order codes:

2

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 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 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} = 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 [illegible] – 1 Q ■ ■
Order codes:

ВЯРНО С ОРИГИНАЛА

стр. 72

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 10
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

2

1st core			2nd core			Thermal strength									Position 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} = 25 kA, I_{PN} = 100 A) — 4 M A 7 2 5 4 – 0 M
Thermal strength 300 x I_{PN} — 3
1st core class 10P; instrument security factor 10; rating 15 VA — Q 3 – 0 A
2nd core without

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

ВЯРНО С ОРИГИНАЛА

стр. 73

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 code (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:

ВЯРНО С ОРИГИНАЛА

2

стр. 34

31.5 kA

10th to 14th position

Core versions

At rated primary current I_{PN}	Thermal strength	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 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – X	■ ■ ■
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			2nd core			Thermal strength								
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} = 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 4 C 3 – 0 A
Order codes:

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 11
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}	Order No. 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
(U_m = 12 kV, I_{th} = 31.5 kA, I_{PN} = 2x 100 A) — 4 M A 7 / 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

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 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – Z / ■ ■ ■

(15: s. p. 40; 16: s. p. 40; Z: 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

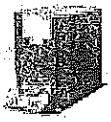
1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Positions 10 11 12 – 13 14
0.2	FS10	10						■		■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	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 (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 — E 1
2nd core class 5P; accuracy limit factor 10; rating 5 VA — – 1 L

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



40 kA – with primary multi-ratio

10th to 14th position
Core versions

At rated primary current I_{PN}	Thermal strength
2x 400 A 2x 500 2x 600 A	100 x I_{PN}
2x 300 A	150 x I_{PN}
2x 200 A 2x 250 A	200 x I_{PN}
2x 150 A	300 x I_{PN}
2x 100 A 2x 125 A	400 x I_{PN}
2x 75 A	600 x I_{PN}
2x 60 A	800 x I_{PN}
2x 50 A	1000 x I_{PN}

1st core			2nd core			Thermal strength						
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						■		■	■	■	■	■
		15								■	■	■	■	■
0.5	FS5	10					■	■		■	■	■	■	■
		15					■	■		■	■	■	■	■
		30						■		■	■	■	■	■
1	FS5	10				■	■	■		■	■	■	■	■
		15				■	■	■		■	■	■	■	■
		30						■		■	■	■	■	■
5P	10	5				■	■	■		■	■	■	■	■
		10						■		■	■	■	■	■
		15								■	■	■	■	■
		30									■	■	■	■
10P	10	5				■	■	■		■	■	■	■	■
		10					■	■		■	■	■	■	■
		15						■		■	■	■	■	■
		30								■	■	■	■	■
0.5	FS5	5	5P	10	5		■	■		■	■	■	■	■
		10			10					■	■	■	■	■
		15			15						■	■	■	■
		30			30							■	■	■
0.5	FS5	5	10P	10	5		■	■		■	■	■	■	■
		10			10					■	■	■	■	■
		15			15						■	■	■	■
		30			30							■	■	■
1	FS5	5	5P	10	5	■	■	■		■	■	■	■	■
		10			10					■	■	■	■	■
		10			15						■	■	■	■
		15			15						■	■	■	■
		15			30							■	■	■
		30			30							■	■	■
1	FS5	5	10P	10	5	■	■	■		■	■	■	■	■
		10			10					■	■	■	■	■
		10			15						■	■	■	■
		15			15						■	■	■	■
		15			30							■	■	■
		30			30							■	■	■

■ 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

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	
											0									
											1									
											2									
											3									
											4									
											6									
											7									
											8									
											C	2		–			0	A		
											C	3		–			0	A		
											E	2		–			0	A		
											E	3		–			0	A		
											E	4		–			0	A		
											H	2		–			0	A		
											H	3		–			0	A		
											H	4		–			0	A		
											L	1		–			0	A		
											L	2		–			0	A		
											L	3		–			0	A		
											L	4		–			0	A		
											Q	1		–			0	A		
											Q	2		–			0	A		
											Q	3		–			0	A		
											Q	4		–			0	A		
											E	1		–			1	L		
											E	2		–			2	L		
											E	3		–			3	L		
											E	4		–			4	L		
											E	1		–			1	Q		
											E	2		–			2	Q		
											E	3		–			3	Q		
											E	4		–			4	Q		
											N	1		–			1	L		
											H	2		–			2	L		
											H	2		–			3	L		
											H	3		–			3	L		
											H	3		–			4	L		
											H	4		–			4	L		
											H	1		–			1	Q		
											H	2		–			2	Q		
											H	2		–			3	Q		
											H	3		–			3	Q		
											H	3		–			4	Q		
											H	4		–			4	Q		
												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:

50 kA

10th to 14th position

Core versions

At rated primary current I_{PN}	Thermal strength
500 A 600 A 750 A 1000 A 1200 A 1250 A 1500 A 2000 A 2500 A	100 x I_{PN}
400 A	150 x I_{PN}
250 A 300 A	200 x I_{PN}
200 A	300 x I_{PN}
125 A 150 A	400 x I_{PN}
100 A	500 x I_{PN}
75 A	800 x I_{PN}
60 A	1000 x I_{PN}

1st core			2nd core			Thermal strength								
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												■
		15												■
0.5	FS5	10							■	■	■	■	■	■
		15							■	■	■	■	■	■
		30							■	■	■	■	■	■
1	FS5	10							■	■	■	■	■	■
		15						■	■	■	■	■	■	■
		30						■	■	■	■	■	■	■
5P	10	5						■	■	■	■	■	■	■
		10						■	■	■	■	■	■	■
		15						■	■	■	■	■	■	■
		30						■	■	■	■	■	■	■
10P	10	5					■	■	■	■	■	■	■	■
		10					■	■	■	■	■	■	■	■
		15					■	■	■	■	■	■	■	■
		30					■	■	■	■	■	■	■	■
0.5	FS5	5	5P	10	5				■	■	■	■	■	■
		10			10				■	■	■	■	■	■
		15			15				■	■	■	■	■	■
		30			30				■	■	■	■	■	■
0.5	FS5	5	10P	10	5			■	■	■	■	■	■	■
		10			10			■	■	■	■	■	■	■
		15			15			■	■	■	■	■	■	■
		30			30			■	■	■	■	■	■	■
1	FS5	5	5P	10	5			■	■	■	■	■	■	■
		10			10			■	■	■	■	■	■	■
		10			15			■	■	■	■	■	■	■
		15			15			■	■	■	■	■	■	■
		15			30			■	■	■	■	■	■	■
		30			30			■	■	■	■	■	■	■
1	FS5	5	10P	10	5			■	■	■	■	■	■	■
		10			10			■	■	■	■	■	■	■
		10			15			■	■	■	■	■	■	■
		15			15			■	■	■	■	■	■	■
		15			30			■	■	■	■	■	■	■
		30			30			■	■	■	■	■	■	■

■ 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)
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

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	–	■	■	■	■	■	–	■	■	■	■	X	■ ■
																	s. p. 40	s. p. 40	s. p. 40	

10th position	11th position	12th position	13th position	14th position	15th position	16th position
	0					
	1					
	2					
	3					
	4					
	5					
	7					
	8					
C	2	–	0	A		
C	3	–	0	A		
E	2	–	0	A		
E	3	–	0	A		
E	4	–	0	A		
H	2	–	0	A		
H	3	–	0	A		
H	4	–	0	A		
L	1	–	0	A		
L	2	–	0	A		
L	3	–	0	A		
L	4	–	0	A		
Q	1	–	0	A		
Q	2	–	0	A		
Q	3	–	0	A		
Q	4	–	0	A		
E	1	–	1	L		
E	2	–	2	L		
E	3	–	3	L		
E	4	–	4	L		
E	1	–	1	Q		
E	2	–	2	Q		
E	3	–	3	Q		
E	4	–	4	Q		
H	1	–	1	L		
H	2	–	2	L		
H	2	–	3	L		
H	3	–	3	L		
H	3	–	4	L		
H	4	–	4	L		
H	1	–	1	Q		
H	2	–	2	Q		
H	2	–	3	Q		
H	3	–	3	Q		
H	3	–	4	Q		
H	4	–	4	Q		

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

50 kA – with primary multi-ratio

10th to 14th position

Core versions

At rated primary current I_{PN}	Thermal strength
2x 500 A 2x 600 A	100 x I_{PN}
2x 400 A	150 x I_{PN}
2x 250 A 2x 300 A	200 x I_{PN}
2x 200 A	300 x I_{PN}
2x 125 A 2x 150 A	400 x I_{PN}
2x 100 A	500 x I_{PN}
2x 75 A	800 x I_{PN}
2x 50 A 2x 60 A	1000 x I_{PN}

1st core			2nd core			Thermal strength							
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							■	■	■	■	■	■
		15							■	■	■	■	■	■
0.5	FS5	10						■	■	■	■	■	■	■
		15						■	■	■	■	■	■	■
		30							■	■	■	■	■	■
1	FS5	10					■	■	■	■	■	■	■	■
		15					■	■	■	■	■	■	■	■
		30							■	■	■	■	■	■
5P	10	5						■	■	■	■	■	■	■
		10							■	■	■	■	■	■
		15								■	■	■	■	■
		30									■	■	■	■
10P	10	5						■	■	■	■	■	■	■
		10							■	■	■	■	■	■
		15								■	■	■	■	■
		30									■	■	■	■
0.5	FS5	5	5P	10	5			■	■	■	■	■	■	■
		10			10				■	■	■	■	■	■
		15			15						■	■	■	■
		30			30									■
0.5	FS5	5	10P	10	5			■	■	■	■	■	■	■
		10			10				■	■	■	■	■	■
		15			15						■	■	■	■
		30			30									■
1	FS5	5	5P	10	5			■	■	■	■	■	■	■
		10			10				■	■	■	■	■	■
		10			15						■	■	■	■
		15			15									■
		15			30									■
		30			30									■
1	FS5	5	10P	10	5			■	■	■	■	■	■	■
		10			10				■	■	■	■	■	■
		10			15						■	■	■	■
		15			15									■
		15			30									■
		30			30									■

■ 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

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	
													0							
													1							
													2							
													3							
													4							
													5							
													7							
													8							
											C	2		–	0	A				
											C	3		–	0	A				
											E	2		–	0	A				
											E	3		–	0	A				
											E	4		–	0	A				
											H	2		–	0	A				
											H	3		–	0	A				
											H	4		–	0	A				
											L	1		–	0	A				
											L	2		–	0	A				
											L	3		–	0	A				
											L	4		–	0	A				
											Q	1		–	0	A				
											Q	2		–	0	A				
											Q	3		–	0	A				
											Q	4		–	0	A				
											E	1		–	1	L				
											E	2		–	2	L				
											E	3		–	3	L				
											E	4		–	4	L				
											E	1		–	1	Q				
											E	2		–	2	Q				
											E	3		–	3	Q				
											E	4		–	4	Q				
											H	1		–	1	L				
											H	2		–	2	L				
											H	2		–	3	L				
											H	3		–	3	L				
											H	3		–	4	L				
											H	4		–	4	L				
											H	1		–	1	Q				
											H	2		–	2	Q				
											H	2		–	3	Q				
											H	3		–	3	Q				
											H	3		–	4	Q				
											H	4		–	4	Q				

Example for Order No.: 4 M A 7 ■ 6 7 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ –

Order codes: 4 M A 7 2 6 7 – 3 M E 1 5 – 1 L ■ ■

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	Code (pos. 12)
750 A 1000 A 1200 A 1250 A 1500 A 2000 A 2500 A	$100 \times I_{PN}$	0
500 A 600 A	$150 \times I_{PN}$	1
400 A	$200 \times I_{PN}$	2
250 A 300 A	$300 \times I_{PN}$	3
200 A	$400 \times I_{PN}$	4
125 A 150 A	$500 \times I_{PN}$	5
100 A	$800 \times I_{PN}$	7
75 A	$1000 \times I_{PN}$	8

2

1st core Class	Factor	VA rating	2nd core Class	Factor	VA rating	Thermal strength $1000 \times I_{PN}$	$800 \times I_{PN}$	$600 \times I_{PN}$	$500 \times I_{PN}$	$400 \times I_{PN}$	$300 \times I_{PN}$	$200 \times I_{PN}$	$150 \times I_{PN}$	$100 \times I_{PN}$	Code
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)
Thermal strength 800 x I_{PN}
1st core class 0.5; instrument security factor FS5; rating 15 VA
2nd core without

4 M A 7
2 7 1 – 0 M
7
E 3 – 0 A

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

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63 kA – with primary multi-ratio

10th to 14th position

Core versions

At rated primary current I_{PN}	Thermal strength
2x 500 A 2x 600 A	150 x I_{PN}
2x 400 A	200 x I_{PN}
2x 250 A 2x 300 A	300 x I_{PN}
2x 200 A	400 x I_{PN}
2x 125 A 2x 150 A	500 x I_{PN}
2x 100 A	800 x I_{PN}
2x 75 A	1000 x I_{PN}

1st core			2nd core			Thermal strength							
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												
		15												
0.5	FS5	10												
		15												
		30												
1	FS5	10												
		15												
		30												
5P	10	5												
		10												
		15												
		30												
10P	10	5												
		10												
		15												
		30												
0.5	FS5	5	5P	10	5									
		10			10									
		15			15									
		30			30									
0.5	FS5	5	10P	10	5									
		10			10									
		15			15									
		30			30									
1	FS5	5	5P	10	5									
		10			10									
		10			15									
		15			15									
		15			30									
		30			30									
1	FS5	5	10P	10	5									
		10			10									
		10			15									
		15			15									
		15			30									
		30			30									

■ 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

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	■	■	1	–	■	■	■	■	■	–	■	■	■	■	–	■	■	■
																	s. p. 40	s. p. 40		s. p. 40		

10	11	12	13	14	15	16
1						
	2					
3						
	4					
5						
	7	1	–			
8						
		C	2	–	0	A
		C	3	–	0	A
		E	2	–	0	A
		E	3	–	0	A
		E	4	–	0	A
		H	2	–	0	A
		H	3	–	0	A
		H	4	–	0	A
		L	1	–	0	A
		L	2	–	0	A
		L	3	–	0	A
		L	4	–	0	A
		Q	1	–	0	A
		Q	2	–	0	A
		Q	3	–	0	A
		Q	4	–	0	A
		E	1	–	1	L
		E	2	–	2	L
		E	3	–	3	L
		E	4	–	4	L
		E	1	–	1	Q
		E	2	–	2	Q
		E	3	–	3	Q
		E	4	–	4	Q
		H	1	–	1	L
		H	2	–	2	L
		H	2	–	3	L
		H	3	–	3	L
		H	3	–	4	L
		H	4	–	4	L
		H	1	–	1	Q
		H	2	–	2	Q
		H	2	–	3	Q
		H	3	–	3	Q
		H	3	–	4	Q
		H	4	–	4	Q
	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:																							

Equipment Selection

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

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 A 7 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ✱ ■ ■ ■

Rated current for 1st core	Rated current for 2nd core	Order No.
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.
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 $I_{PN} = 2\text{x}\ 100$ A	3 M
Thermal strength $800 \times I_{PN}$	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 0 – 1 Q E 1 – Z

Order codes: A 1 0 + C 1 0

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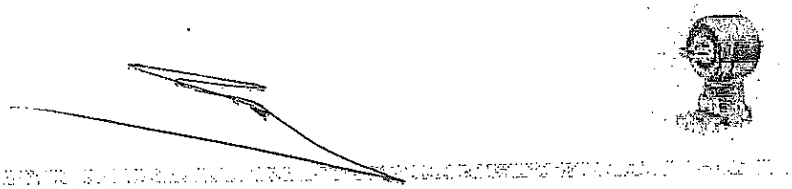


4MB1 indoor support-type current transformer, single-turn design

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 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ ★ ■ ■ ■

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		
12	75	28	4 M B 1 2	See page 42
17.5	95	38	4 M B 1 3	See page 42
24	128	50	4 M B 1 4	See page 42

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

Rated short-time thermal current I_{th} kA			
150	7 8		See page 42
200	8 2		See page 42
250	8 4		See page 42
300	8 5		See page 43
500	8 8		See page 43

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	See page 43
2000		■	■	■	■		1 F	See page 43
2500		■	■	■	■		1 G	See page 43
3000		■	■	■	■		1 H	See page 43
4000		■	■	■	■		1 J	See page 43
5000	Only 4MB13	■	■	■	■		1 K	See page 43
6000	Only 4MB13	■	■	■	■		1 L	See page 43

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, single-turn design
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
Rated short-time thermal current I_{th} = 300 kA
Rated primary current I_{PN} = 3000 A

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

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 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ■ ■

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

See page 43 See page 43 See page 43

0

1st core			2nd core			Rated primary current I_{PN}						
Class	Factor	VA rating	Class	Factor	VA rating	1500 A	2000 A	2500 A	3000 A	4000 A	5000 A	6000 A
0.2	FS10	15				■	■	■	■	■	■	■
		30				■	■	■	■	■	■	■
0.5	FS10	15				■	■	■	■	■	■	■
		30				■	■	■	■	■	■	■
		60				■	■	■	■	■	■	■
1	FS10	15				■	■	■	■	■	■	■
		30				■	■	■	■	■	■	■
		60				■	■	■	■	■	■	■
5P	10	30				■	■	■	■	■	■	■
		60				■	■	■	■	■	■	■
10P	10	30				■	■	■	■	■	■	■
		60				■	■	■	■	■	■	■
0.5	FS10	15	5P	10	15	■	■	■	■	■	■	■
		30			30	■	■	■	■	■	■	■
		30			60	■	■	■	■	■	■	■
1	FS10	15	5P	10	15	■	■	■	■	■	■	■
		30			30	■	■	■	■	■	■	■
		60			60	■	■	■	■	■	■	■
0.5	FS10	15	10P	10	15	■	■	■	■	■	■	■
		30			30	■	■	■	■	■	■	■
		60			60	■	■	■	■	■	■	■
1	FS10	15	10P	10	15	■	■	■	■	■	■	■
		30			30	■	■	■	■	■	■	■
		60			60	■	■	■	■	■	■	■

■ Feasible (other combinations on request)

C 3 – 0 A
C 4 – 0 A
F 3 – 0 A
F 4 – 0 A
F 6 – 0 A
D 3 – 0 A
J 4 – 0 A
J 6 – 0 A
L 4 – 0 A
L 6 – 0 A
Q 4 – 0 A
Q 6 – 0 A
F 3 – 3 L
F 4 – 4 L
F 6 – 6 L
J 3 – 3 L
J 4 – 4 L
J 6 – 6 L
F 3 – 3 Q
F 4 – 4 Q
F 6 – 6 Q
J 3 – 3 Q
J 4 – 4 Q
J 6 – 6 Q

Configuration example

Indoor support-type current transformer, single-turn design
(U_m = 24 kV, I_{th} = 300 kA, I_{PN} = 3000 A)
Thermal strength $100 \times I_{PN}$
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 B 5 – 1 H
4 M B 1 4 B 5 – 1 H F Y 0 Z A 1 ■ ■

Example for Order No.:
Order codes:

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
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
Rated short-time thermal current I_{th} = 300 kA
Rated primary current 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
Rated secondary current 1st core 5 A; 2nd core 5 A
Power frequency 60 Hz; marking according to IEC

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

Order codes:

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

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	Position: 1 2 3 4 5 6 7 – 8 9	10 11 12	13 14 15 16	Order codes	
			Order No.:				
12	75	28	4 M C 2 2	See page 45	See page 45	See page 46	
24	125	50	4 M C 2 4	See page 45	See page 45	See page 46	
36	170	70	4 M C 2 6	See page 45	See page 45	See page 46	

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	6 7 8 9
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
Maximum operating voltage U_m = 36 kV
Rated lightning impulse withstand voltage U_p = 170 kV
Rated short-duration power-frequency withstand voltage U_d = 70 kV
Rated short-time thermal current I_{th} = 50 kA
Rated primary current I_{PN} = 500 A

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

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 See page 46 See page 46

At rated primary current I_{PN}							Thermal strength
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}

1st core			2nd core			Rated primary current I_{PN}			
Class	Factor	VA rating	Class	Factor	VA rating	150 A	200 A	300–600 A	800–1500 A	2000–3000 A
0.2	FS10	10				■	■	■	■	■
		15				■	■	■	■	■
0.5	FS5	15				■	■	■	■	
		30				■	■	■	■	■
0.5	FS10	15								■
1	FS5	15				■	■	■	■	
		30				■	■	■	■	■
1	FS10	15				■	■	■	■	■
10P	10	15				■	■	■	■	■
		30				■	■	■	■	■
		60				■	■	■	■	■
0.2	FS10	10	10P	10	30	■	■	■	■	■
		15			30	■	■	■	■	■
0.5	FS5	15	10P	10	15	■	■	■	■	
		15			30	■	■	■	■	
		30			30	■	■	■	■	■
		30			60		■	■	■	■
0.5	FS10	15	10P	10	15					■
		15			30					■
1	FS5	15	10P	10	15	■	■	■	■	
		15			30	■	■	■	■	
		30			30	■	■	■	■	■
		30			60		■	■	■	■
1	FS10	15	10P	10	15					■
		15			30					■

■ Feasible (other combinations on request)

0

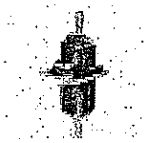
C	2	–	0	A
C	3	–	0	A
E	3	–	0	A
E	4	–	0	A
F	3	–	0	A
H	3	–	0	A
H	4	–	0	A
J	3	–	0	A
Q	3	–	0	A
Q	4	–	0	A
Q	6	–	0	A
C	2	–	4	Q
C	3	–	4	Q
E	3	–	3	Q
E	3	–	4	Q
E	4	–	4	Q
E	4	–	6	Q
F	3	–	3	Q
F	3	–	4	Q
H	3	–	3	Q
H	3	–	4	Q
H	4	–	4	Q
H	4	–	6	Q
J	3	–	3	Q
J	3	–	4	Q

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:



15th position
Rated secondary current

Rated current for 1st core	Rated current for 2nd core	Order codes
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 codes
50 Hz, VDE marking	0
50 Hz, IEC marking	1
50 Hz, VDE marking with approval 1)	Z
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
Other special versions on request	A 1 0

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

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

Configuration example

Indoor bushing-type current transformer, single-turn design — 4 M C 2
Maximum operating voltage U_m = 36 kV — 6
Rated lightning impulse withstand voltage U_p = 170 kV
Rated short-duration power-frequency withstand voltage U_d = 70 kV — 7
Rated short-time thermal current I_{th} = 50 kA — 4
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 9 F 0
Order codes:

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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	■	■	■		■	■	■	■	■		■	■	■	■		■ ■ ■

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		
12	75	28	4 M C 3 2	See page 48
24	125	50	4 M C 3 4	See page 48
36	170	70	4 M C 3 6	See page 48
				See page 48
				See page 49
				See page 49
				See page 49

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		
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
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
Rated short-time thermal current I_{th} = 400 kA
Rated primary current I_{PN} = 4000 A

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

2

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 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ ■ ■ ■ ■

Position 15: See page 49; Position 16: See page 49; Order codes: 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)

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:

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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		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	Y 0 – 0 D
3rd core class 10P; accuracy limit factor 10; rating 30 VA	
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

ВЯРНО С ОРИГИНАЛА

стр. 52

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

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

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

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 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ■ ■ ■

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

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

Order codes:

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	■	■	■	–	■	■	■	■	■	–	■	■	■	■	X	■ ■

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 I_{PN} x 300	I_{PN} x 200	I_{PN} x 100		
0.5	5		■		■	0 0 – 0 A	See page 55
0.6	10		■		■	0 1 – 0 B	See page 55
1	5			■		0 3 – 0 A	See page 55
1.5	15		■		■	0 7 – 0 D	See page 55
2	10			■		1 3 – 0 B	See page 55
2	20		■		■	1 3 – 0 E	See page 55
3	15			■		1 7 – 0 D	See page 55
3	30		■		■	1 7 – 0 G	See page 55
4	20			■		2 2 – 0 E	See page 55
4	40		■		■	2 2 – 0 H	See page 55
5	50			■		2 5 – 0 J	See page 55
6	30		■		■	2 6 – 0 G	See page 55
6	60			■		2 6 – 0 K	See page 55
7.5	75		■		■	3 2 – 0 L	See page 55
8	40			■		3 3 – 0 H	See page 55
10	50		■		■	3 6 – 0 J	See page 55
10	100			■		3 6 – 0 M	See page 55
12	60		■		■	3 8 – 0 K	See page 55
15	75			■		4 3 – 0 L	See page 55
15	150		■		■	4 3 – 0 P	See page 55
20	100			■		4 8 – 0 M	See page 55
20	200		■		■	4 8 – 0 Q	See page 55
25	250			■		5 3 – 0 R	See page 55
30	150		■		■	5 6 – 0 P	See page 55
30	300			■		5 6 – 0 S	See page 55
40	200		■		■	6 3 – 0 Q	See page 55
40	400			■		6 3 – 0 T	See page 55
50	250		■		■	6 7 – 0 R	See page 55
50	500			■		6 7 – 0 U	See page 55
60	300		■		■	7 0 – 0 S	See page 55
60	600			■		7 0 – 0 V	See page 55
80	400		■		■	7 3 – 0 T	See page 55
80	800			■		7 3 – 0 X	See page 55
100	500		■		■	7 5 – 0 U	See page 55
100	1000			■		7 5 – 1 A	See page 55
120	600		■		■	7 6 – 0 V	See page 55
120	1200			■		7 6 – 1 B	See page 55

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

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

10th to 14th position
Core versions

At rated primary current I_{PN}	Thermal strength	Position: 10 11 12	13 14 15 16	Order codes
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	See page 56	
1 2 3 4 5 6 8 10 12 15 20 30 40 50 60 80 100 120	200 x I_{PN}	2	See page 56	
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	See page 56	

1st core			2nd core			3rd core			Rated primary current I_{PN}		
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							■	■	■
		10							■	■	■
		15							■	■	■
		30							■	■	■
0.5	FS5	10							■	■	■
		15							■	■	■
		30							■	■	■
1	FS5	15							■	■	■
		30							■	■	■
5P	10	15							■	■	■
		30							■	■	■
		60							■	■	■
10P	10	15							■	■	■
		30							■	■	■
		60							■	■	■
0.2	FS10	10	5P	10	30				■	■	■
		15			30				■	■	■
		30			60				■	■	■
0.5	FS5	10	5P	10	30				■	■	■
		15			30				■	■	■
		30			30				■	■	■
		30			60				■	■	■
1	FS5	15	5P	10	30				■	■	■
		30			30				■	■	■
		30			60				■	■	■
1	FS5	15	10P	10	30				■	■	■
		30			30				■	■	■
		30			60				■	■	■
0.2	FS10	15	0.5	FS5	15	5P	10	15	■	■	■
		15			30			30	■	■	■
0.5	FS5	15	5P	10	15	5P	10	15	■	■	■
		15			30			30	■	■	■

■ Feasible (other combinations on request)

Order codes
C 1 – 0 A
C 2 – 0 A
C 3 – 0 A
C 4 – 0 A
E 2 – 0 A
E 3 – 0 A
E 4 – 0 A
H 3 – 0 A
H 4 – 0 A
L 3 – 0 A
L 4 – 0 A
L 6 – 0 A
Q 3 – 0 A
Q 4 – 0 A
Q 6 – 0 A
C 2 – 4 L
C 3 – 4 L
C 4 – 6 L
E 2 – 4 L
E 3 – 4 L
E 4 – 4 L
E 4 – 6 L
H 3 – 4 L
H 4 – 4 L
H 4 – 6 L
H 3 – 4 Q
H 4 – 4 Q
H 4 – 6 Q
Y 0 – 0 E
Y 0 – 0 F
Y 0 – 0 G
Y 0 – 0 H

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

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

Equipment Selection

4ME2 outdoor support-type current transformer

15th position
Rated secondary current

Rated current for 1st core	Rated current for 2nd core	Rated current for 3rd core	
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	
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
Size (for specification see the following page)	– Z A 0 0
	– Z A 0 1
	– Z A 0 2
	– 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 — 4

Rated lightning impulse withstand voltage U_p = 125 kV — Z 5

Rated short-duration power-frequency withstand voltage U_d = 50 kV — 1

Rated short-time thermal current I_{th} = 100 kA — A

Rated primary current I_{PN} = 1000 A — 3

Thermal strength 300 x I_{PN} — Q 6

1st core class 10P; instrument security factor 10; rating 60 VA — – 0 A

2nd core without — B

3rd core without — 1

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

Power frequency 50 Hz; marking according to IEC — A 0 1

Size 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

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

стр. 100

4ME3 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 3 ■ ■ ■ – ■ ■ ■ ■ ■ ■ – ■ ■ ■ ■ ■

Operating voltage U_m kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV		
12	75	28	4 M E 3 2	See page 60
24	125	50	4 M E 3 4	See page 60
36	170	70	4 M E 3 6	See page 60
52	250	95	4 M E 3 8	See page 61
				See page 61
				See page 61

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 x I_{PN}	200 x I_{PN}	100 x I_{PN}	
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

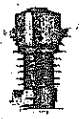
Configuration example

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

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

Order codes:

стр. 101



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 x I_{PN}	200 x I_{PN}	100 x I_{PN}	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 ■ ■ ■ – ■ ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■	
0.5	5		■	■		0 0 – 0 A	See page 60
0.6	10		■	■		0 1 – 0 B	See page 60
1	5		■			0 3 – 0 A	See page 60
1.5	15		■	■		0 7 – 0 D	See page 60
2	10		■			1 3 – 0 B	See page 60
2	20		■	■		1 3 – 0 E	See page 60
3	15		■			1 7 – 0 D	See page 60
3	30		■	■		1 7 – 0 G	See page 60
4	20		■			2 2 – 0 E	See page 61
4	40		■	■		2 2 – 0 H	See page 61
5	50		■	■		2 5 – 0 J	See page 61
6	30		■	■		2 6 – 0 G	See page 61
6	60		■	■		2 6 – 0 K	See page 61
7.5	75		■	■		3 2 – 0 L	See page 61
8	40		■			3 3 – 0 H	See page 61
10	50		■			3 6 – 0 J	See page 61
10	100		■	■		3 6 – 0 M	See page 61
12	60		■			3 8 – 0 K	See page 61
15	75		■			4 3 – 0 L	See page 61
15	150		■	■		4 3 – 0 P	See page 61
20	100		■			4 8 – 0 M	See page 61
20	200		■	■		4 8 – 0 Q	See page 61
25	250		■	■		5 3 – 0 R	See page 61
30	150		■			5 6 – 0 P	See page 61
30	300		■	■		5 6 – 0 S	See page 61
40	200		■			6 3 – 0 Q	See page 61
40	400		■	■		6 3 – 0 T	See page 61
50	250		■			6 7 – 0 R	See page 61
50	500		■	■		6 7 – 0 U	See page 61
60	300		■			7 0 – 0 S	See page 61
60	600		■	■		7 0 – 0 V	See page 61
80	400		■			7 3 – 0 T	See page 61
80	800		■	■		7 3 – 0 X	See page 61
100	500		■			7 5 – 0 U	See page 61
100	1000		■	■		7 5 – 1 A	See page 61
120	600		■			7 6 – 0 V	See page 61
120	1200		■	■		7 6 – 1 B	See page 61
150	1500		■	■		7 8 – 1 D	See page 61
200	2000		■	■		8 2 – 1 F	See page 61
250	2500		■	■		8 4 – 1 G	See page 61
300	3000		■	■		8 5 – 1 H	See page 61

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

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

Equipment Selection

4ME3 outdoor support-type current transformer

10th to 14th position

Core versions

At rated primary current I_{PN}	Thermal strength	Order No.: Position: 10 11 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}	Order codes 13 14 15 16
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:

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

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} = 100 kA
Rated primary current 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
Rated secondary current 1st core 5 A; 2nd core without; 3rd core without
Power frequency 50 Hz; marking according to IEC

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

Order codes:

2

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
Illustration / Type of design	Order No.:	4	M	■	■	■	■	■	–	■	■	■	■	■	–	■	■	■	■	■ ■


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 5 ■ ■ ■ – ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■

Order codes:

ВЯРНО С ОРИГИНАЛА

стр. 105

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 (position 8), See page 65 (position 9), See page 66 (position 10), See page 66 (position 11), See page 67 (position 12), See page 67 (order codes)

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
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
Outdoor design, single-phase
Rated primary voltage U_{prim} = 6.6/√3 kV

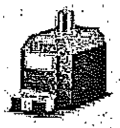
4 M
S 3
2 1 7

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

2

ВЯРНО С ОРИГИНАЛА

стр. 106



24 kV

50/60 Hz

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

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

Positions 8–12: See page 65, See page 65, See page 66, See page 66, See page 67. Order codes: 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
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

2

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	Position 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

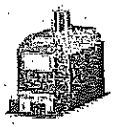
Configuration example
Voltage transformer
Outdoor design, single-phase
Rated primary voltage U_{prim} = 20/√3 kV

4 M
S 3
4 4 2

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

ВЯРНО С ОРИГИНАЛА

стр. 107



52 kV

50/60 Hz

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

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

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	
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

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

8th position
Auxiliary residual voltage winding

Voltage V	4MR1	4MR2	4MR5	4MR6	4MS3	4MS4	4MS5	4MS6	
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	
$100/\sqrt{3}$	■	■	■	■	■	■	■	■	A
100	■	■	■	■	■	■	■	■	B
$110/\sqrt{3}$	■	■	■	■	■	■	■	■	B
110	■	■	■	■	■	■	■	■	C
$120/\sqrt{3}$	■	■	■	■	■	■	■	■	C
120	■	■	■	■	■	■	■	■	

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

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

Order codes:

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

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	Position: 10 11 / Order No.:
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

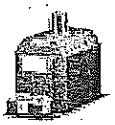
See page 67

See page 67

2

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

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



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	
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

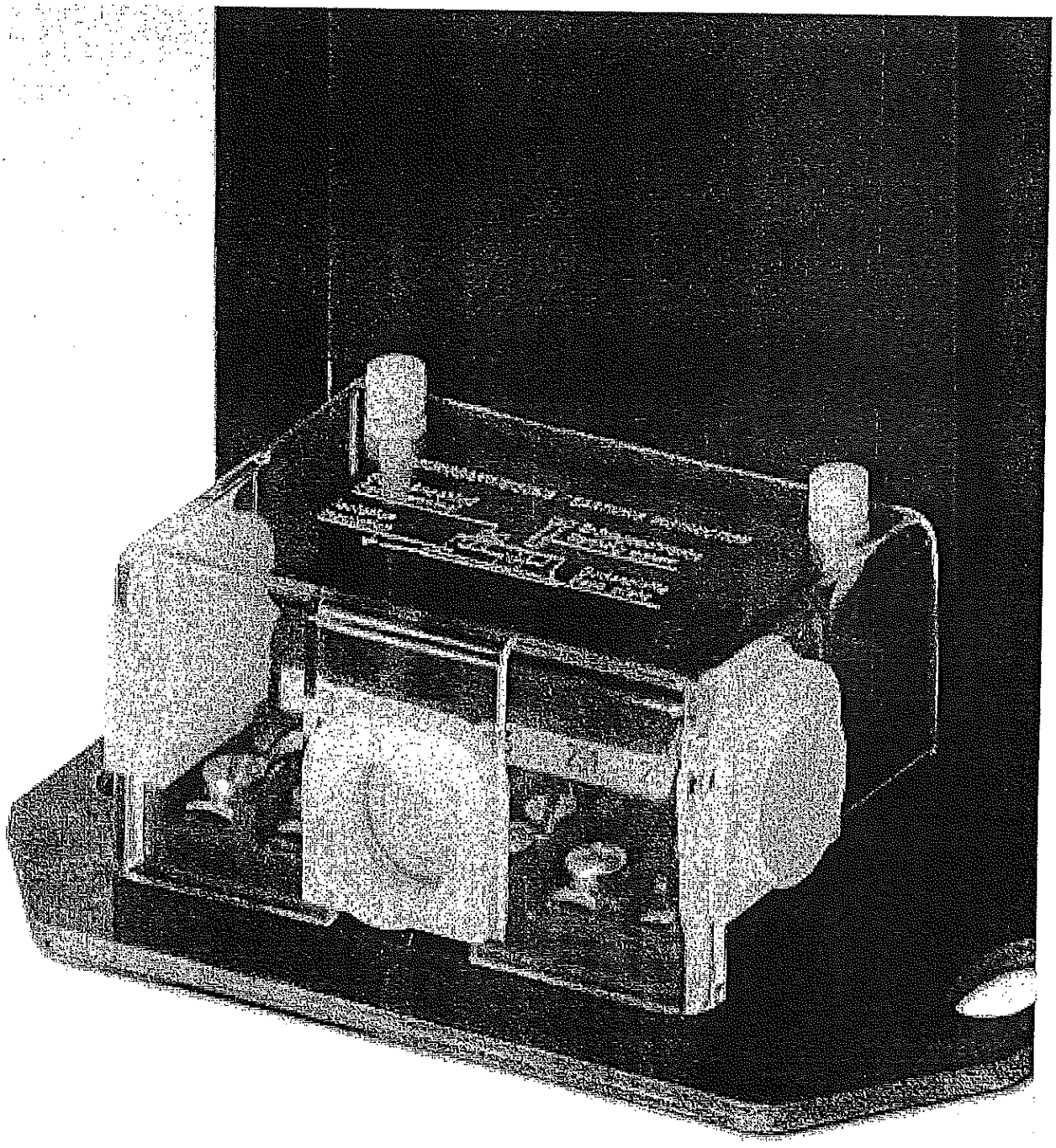
1) Only for class 0.2 and 0.5

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	
With routine test certificate in German/English	■	■	■	■	■	■	■	■	– Z A 1 0

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

Example for Order No.: 4 M S 3 8 4 8 – 0 B S 2 1 – Z
Order codes: A 1 0 — A 1 0



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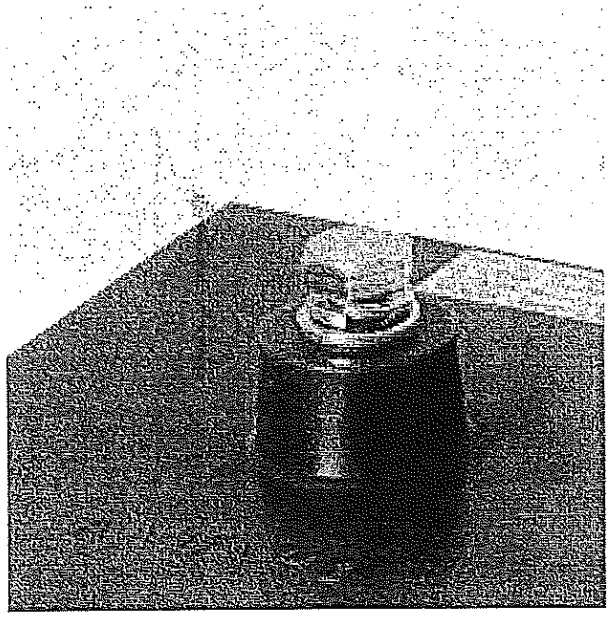

Primary connection terminal of 4MR12 voltage transformer

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Order No.	Operating voltage (maximum value) U_m	Rated short-duration power-frequency withstand voltage U_d	Rated lightning impulse withstand voltage U_p	Rated frequency f_r	Rated primary current I_{PN}	Multi-ratio	Secondary current I_{SN}	Maximum rated continuous thermal current	Rated short-time thermal current (minimum 100 x I_{PN}) I_{th}	Rated dynamic current ($I_{dyn} = 2.5 \times I_{th}$) I_{dyn}	Number of cores	Short-time load (mechanical)	Weight	Catalog dimension drawing
	kV	kV	kV	Hz	A		kA	x I_{PN}	kA	kA	maximum	N	kg	
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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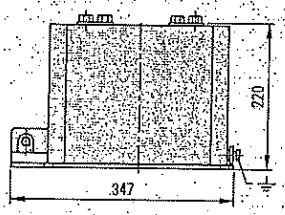
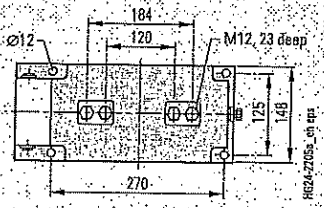
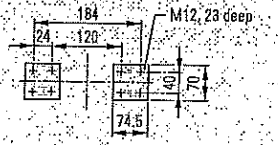
Size specification for 4MC2 transformers

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

Dimension drawings for current transformers

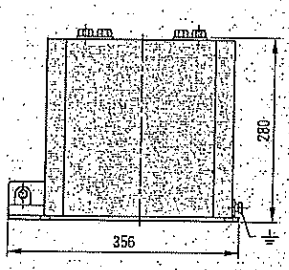


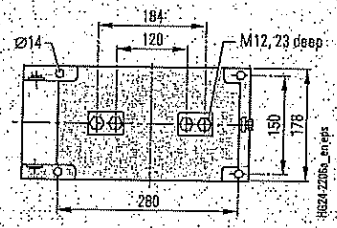


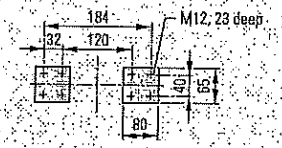


Primary connection ≥ 1500 A

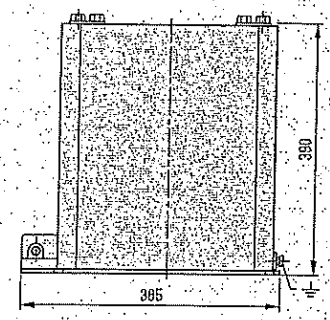
Dimension drawing 1

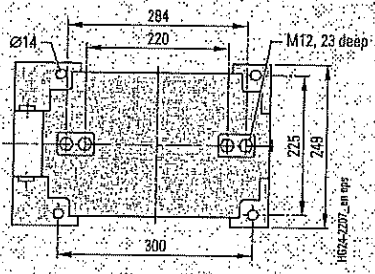


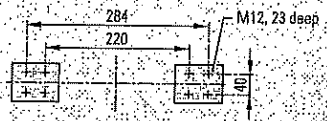




Dimension drawing 2







Dimension drawing 3

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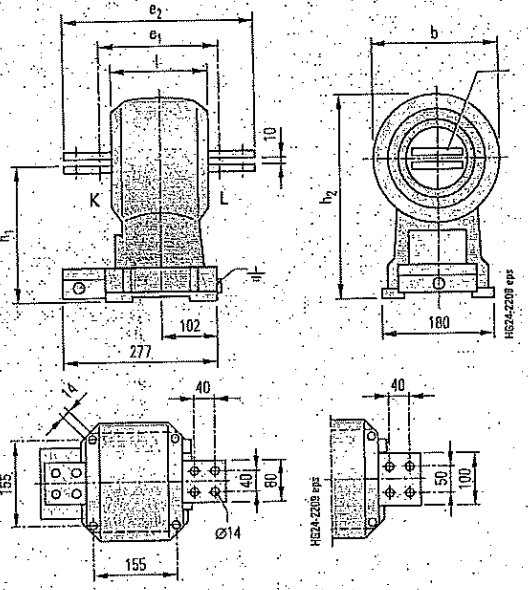
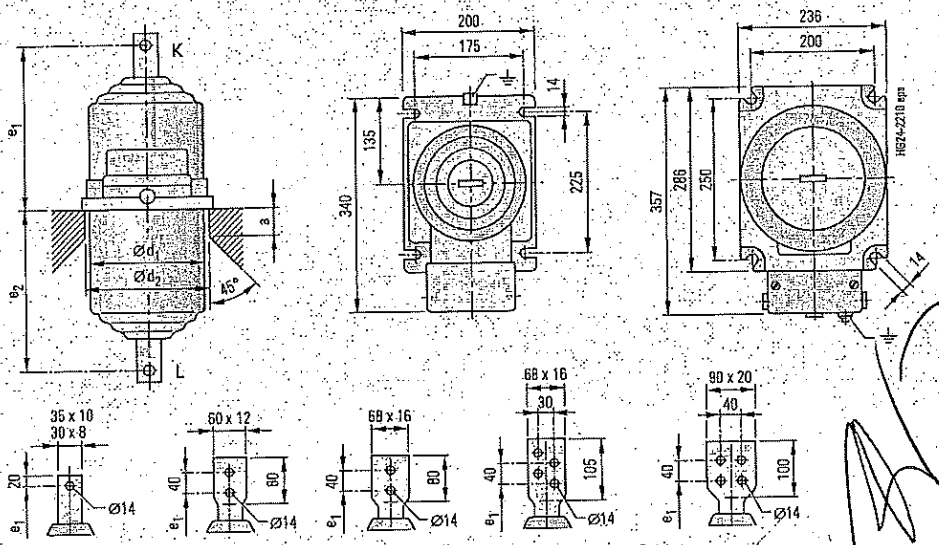


Type	b	e_1	e_2	h_1	h_2	
4MB12, size 1	214	210	350	235	342	176
4MB12, size 2	260	230	350	295	425	196
4MB13	273	–	–	288	425	300
4MB14	260	230	350	295	425	196

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

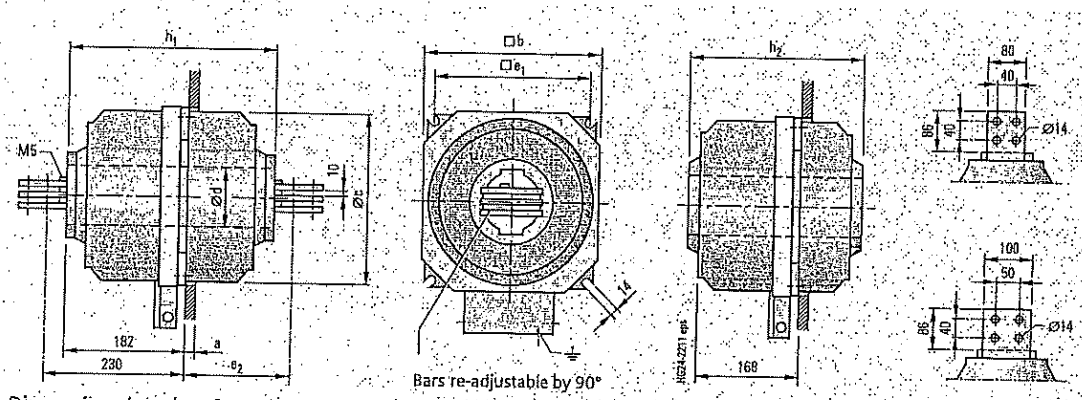
Dimension drawing 4



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



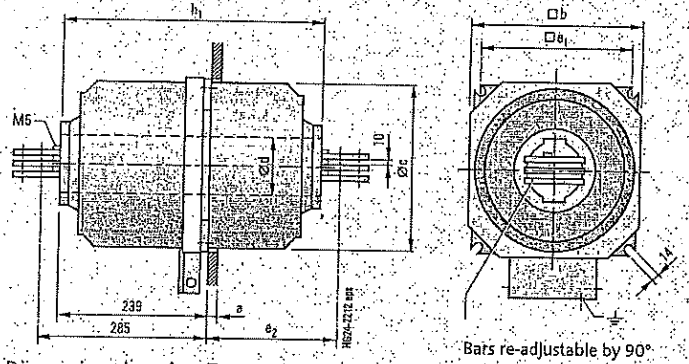
Dimension drawing 6

Size	a_{max}	b	Ø c	Ø d	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

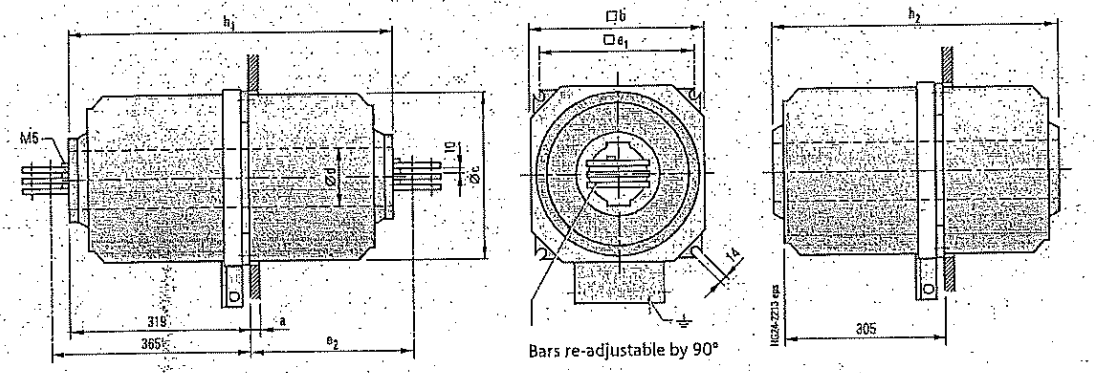
Normal designs

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



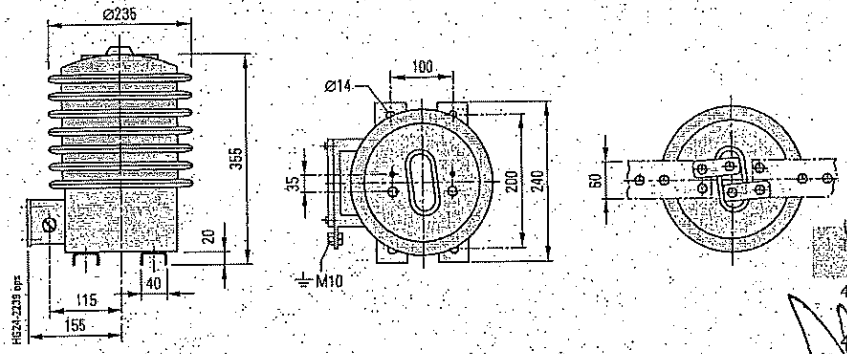
Dimension drawing 7

Size	a_{max}	b	Ø c	Ø d	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	–	–	–



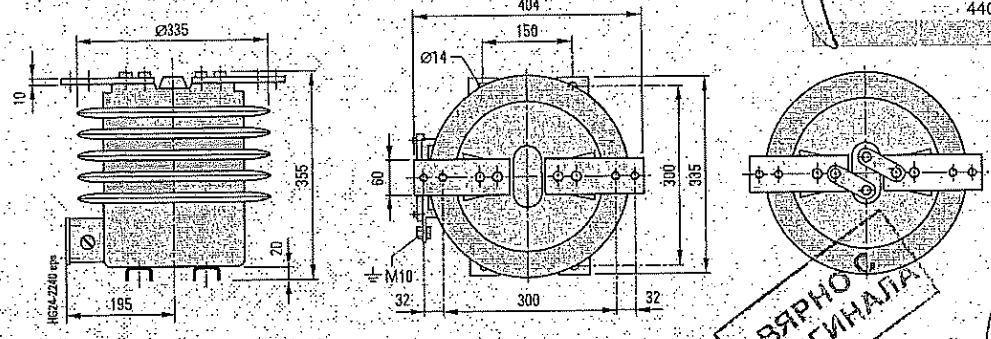
Dimension drawing 8

Size	a_{min}	b	Ø c	Ø d	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	–	–	–

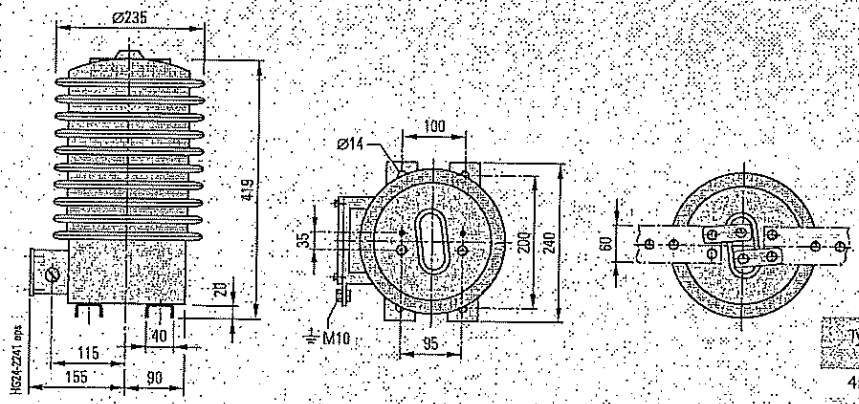


Dimension drawing 9

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

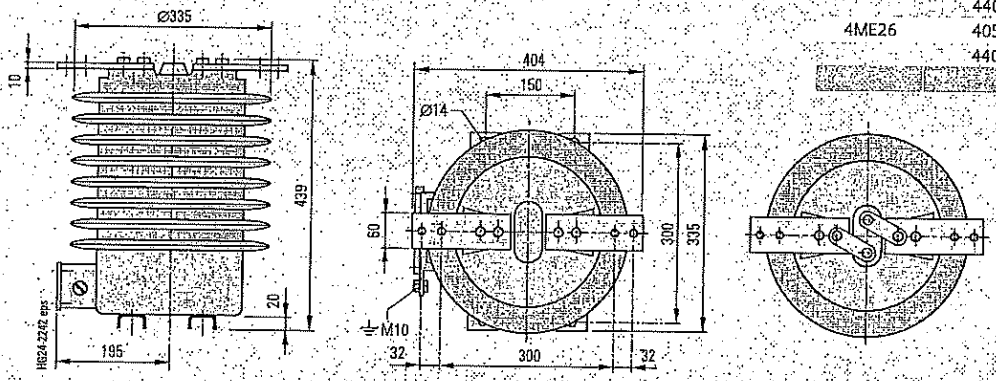


Dimension drawing 10

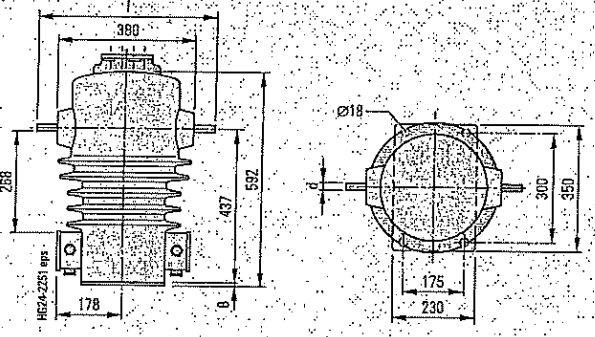


Dimension drawing 11

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

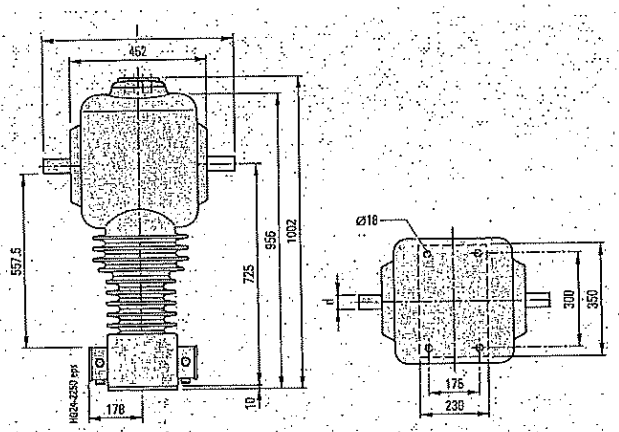


Dimension drawing 12



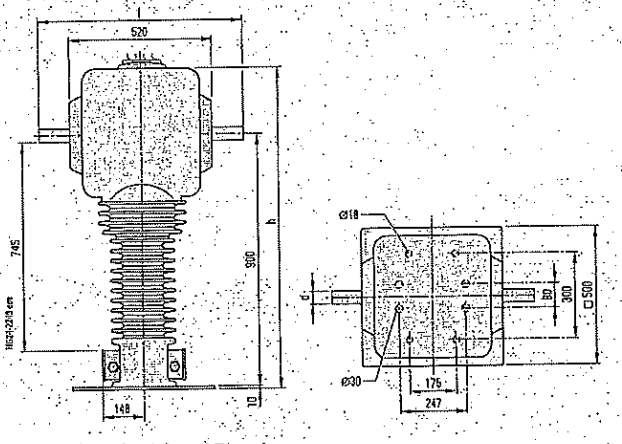
Dimension drawing 13

I_{rr}	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



Dimension drawing 14

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 15

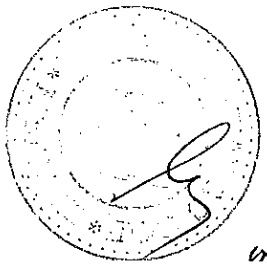
I_{PN}	d	l	h	Arcing distance	Creepage distance
500 A	30	700	1125	745	1823
Up to 1250 A	30	700	1188	745	1823
1250 to 2000 A	42	740	1188	745	1823
2000 to 3000 A	45	760	1188	745	1823
2x 600 A	30	700	1217	745	1823

Terminal designations of current transformers

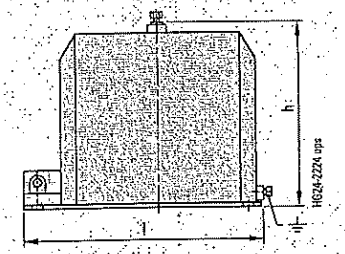
Transformer design	Designation of connection terminals acc. to VDE	acc. to IEC	Example for rated current data
1 primary winding 1 secondary winding	K L k l	P1 P2 S1 S2	100/1 A
2 equivalent primary windings 1 secondary winding	Ka Kb La Lb k l	P1 C1 C2 P2 S1 S2	2 x 100/1 A
with primary multi-ratio			
1 primary winding 1 secondary winding with tappings	K L k l3 l2 l1	P1 P2 S1 S2 S3 S4	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	P1 P2 1S1 1S2 2S1 2S2	100/1/1 A

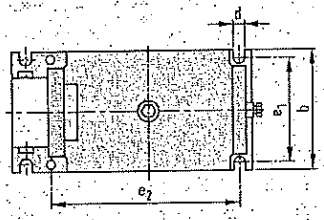
Order No.	Operating voltage (maximum value) U_m kV	Rated short-duration power-frequency withstand voltage U_d kV	Rated lightning impulse withstand voltage U_l kV	Rated frequency Hz	Maximum rated primary voltage U_{PN} kV	Multi-ratio U_{SN} kV	Thermal limiting output S_{th} VA	Rated voltage factor (8h)	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

3



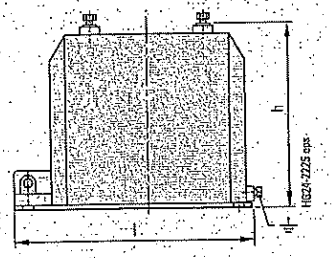
Dimension drawings for voltage transformers

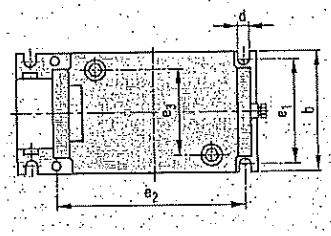




Dimension drawing 16

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

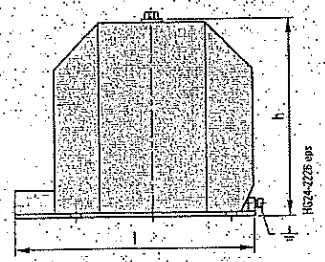


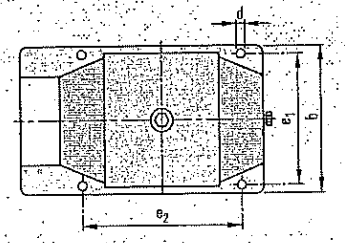


Dimension drawing 17

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

3

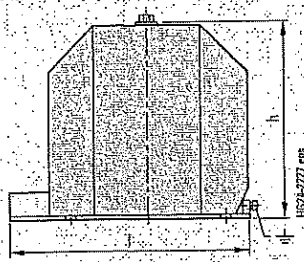


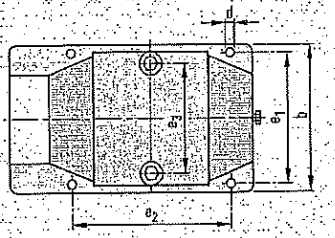


Dimension drawing 18

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

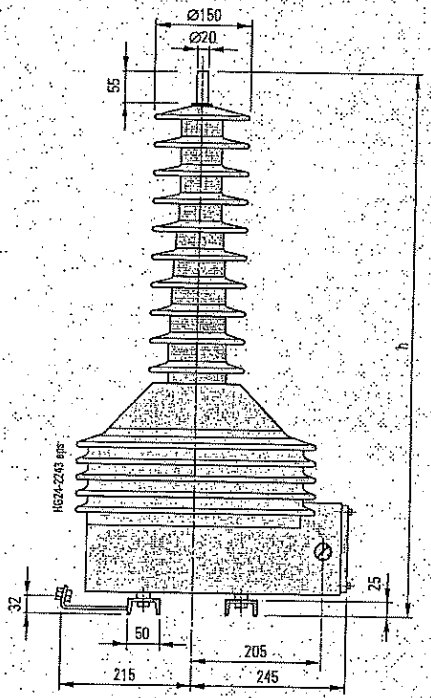




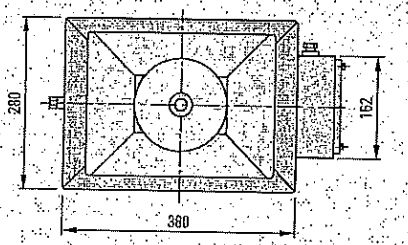
Dimension drawing 19

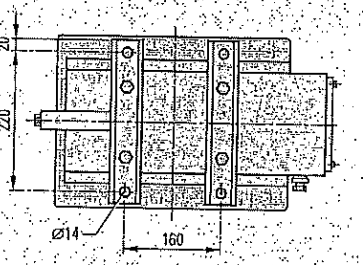
Type	b	h	l	e_1	e_2	e_3	d
4MR62	200	240	342	175	225	150	11
4MR64	225	300	370	200	250	210	14
4MR64 1)	200	260	324	175	225	155	14
4MR66	249	390	395	225	300	320	14

1) Design on request



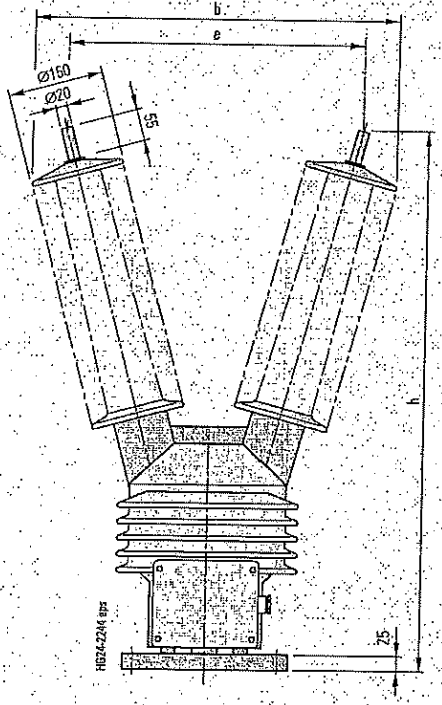
Type	h	Arcing distance	Creepage distance	Number of sheds
4MS32	520	420	790	2
4MS34	655	550	1055	5
4MS36	880	760	1615	10
4MS38	880	760	1615	10



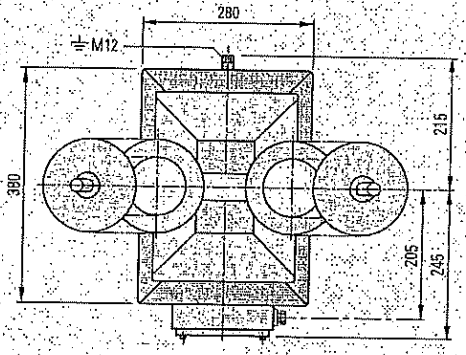


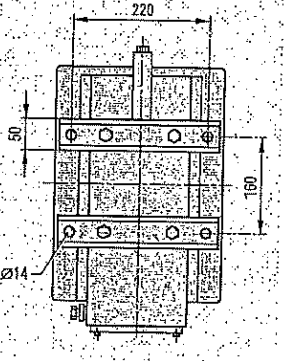
Dimension drawing 20

3

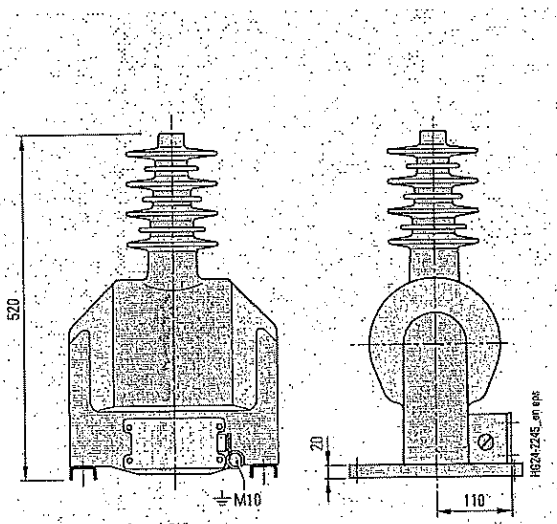


Type	h	b	e	Arcing distance	Creepage distance	Number of sheds
4MS42	515	375	270	420	760	2 x 2
4MS44	645	445	340	550	1035	2 x 5
4MS46	865	560	455	760	1595	2 x 10

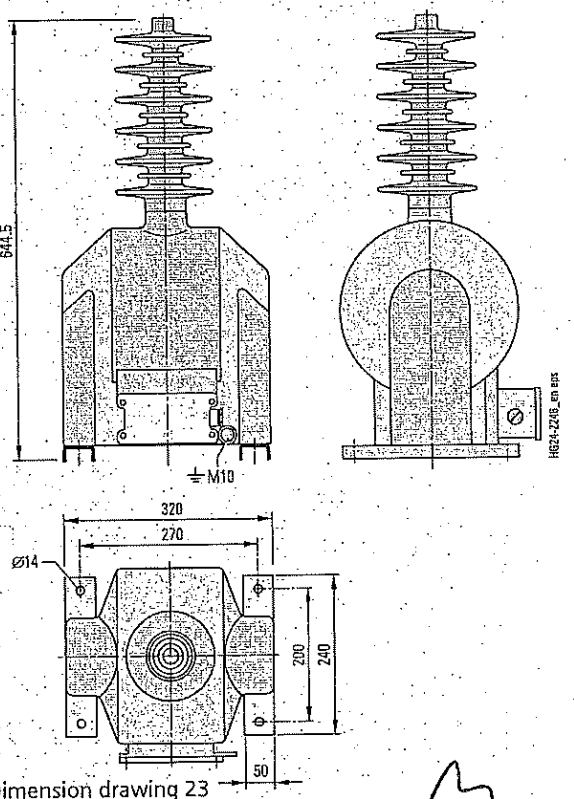




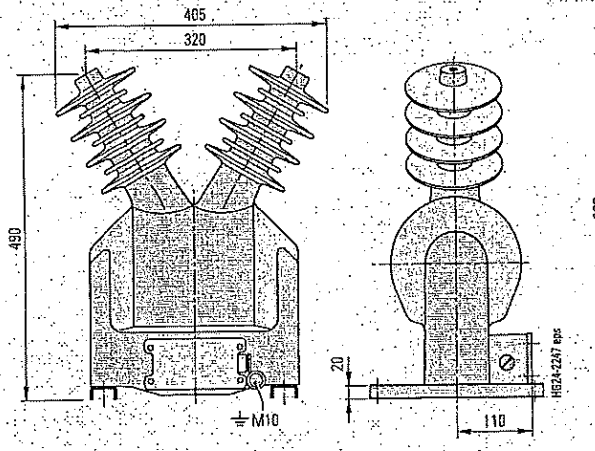
Dimension drawing 21

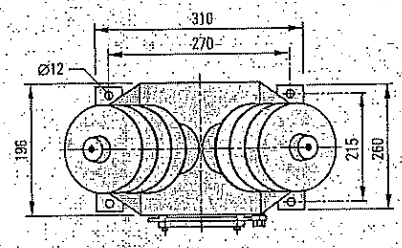


Dimension drawing 22

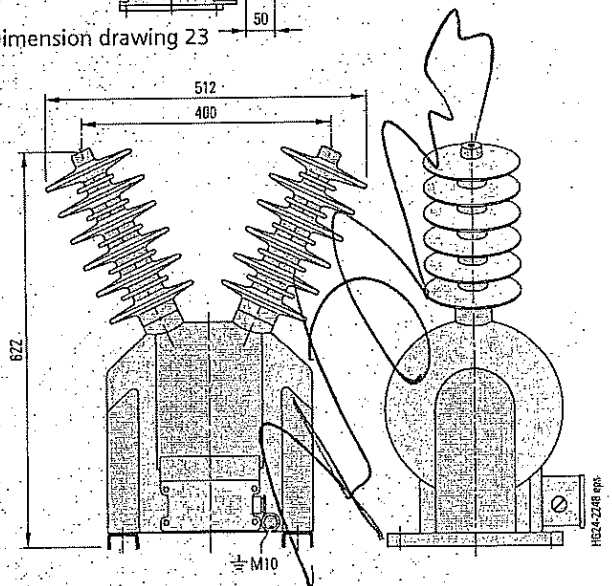


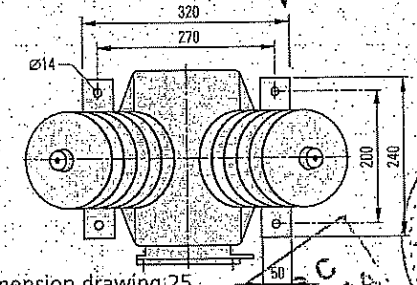
Dimension drawing 23





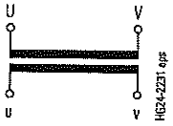
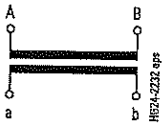
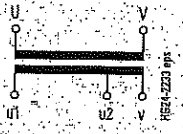
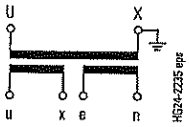
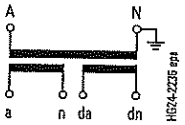
Dimension drawing 24





Dimension drawing 25

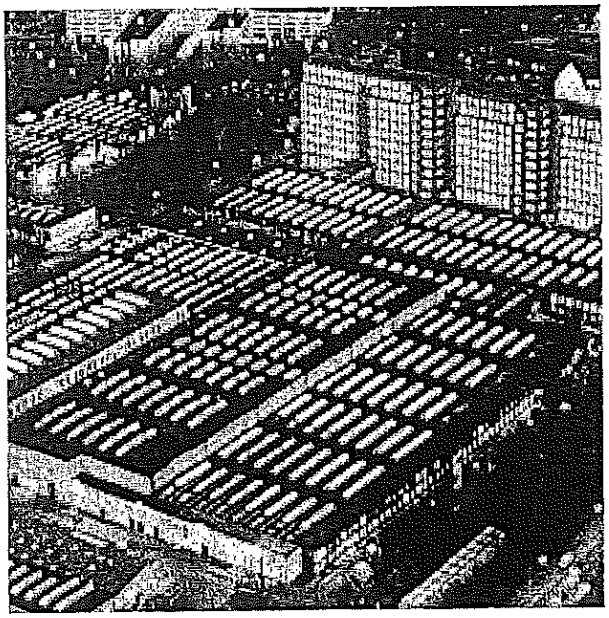
Terminal designations of the voltage transformers

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			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

стр. 125

Brandenburg Gate, Berlin, Germany



Switchgear Factory Berlin, Germany

Contents | Page

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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	☐ ___ /$\sqrt{3}$		
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

ВЯРНО С ОРИГИНАЛА

сма 127

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.

1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16
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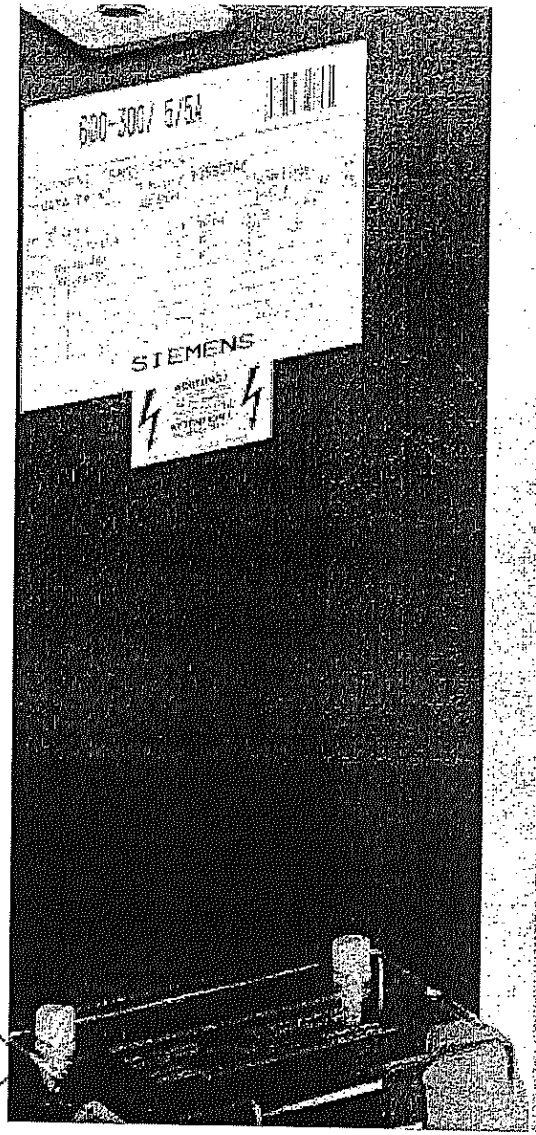
ВЯРНО С ОРИГИНАЛА

стр. 128



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Fax: +49 180 524 24 71
(Charges depending on provider)
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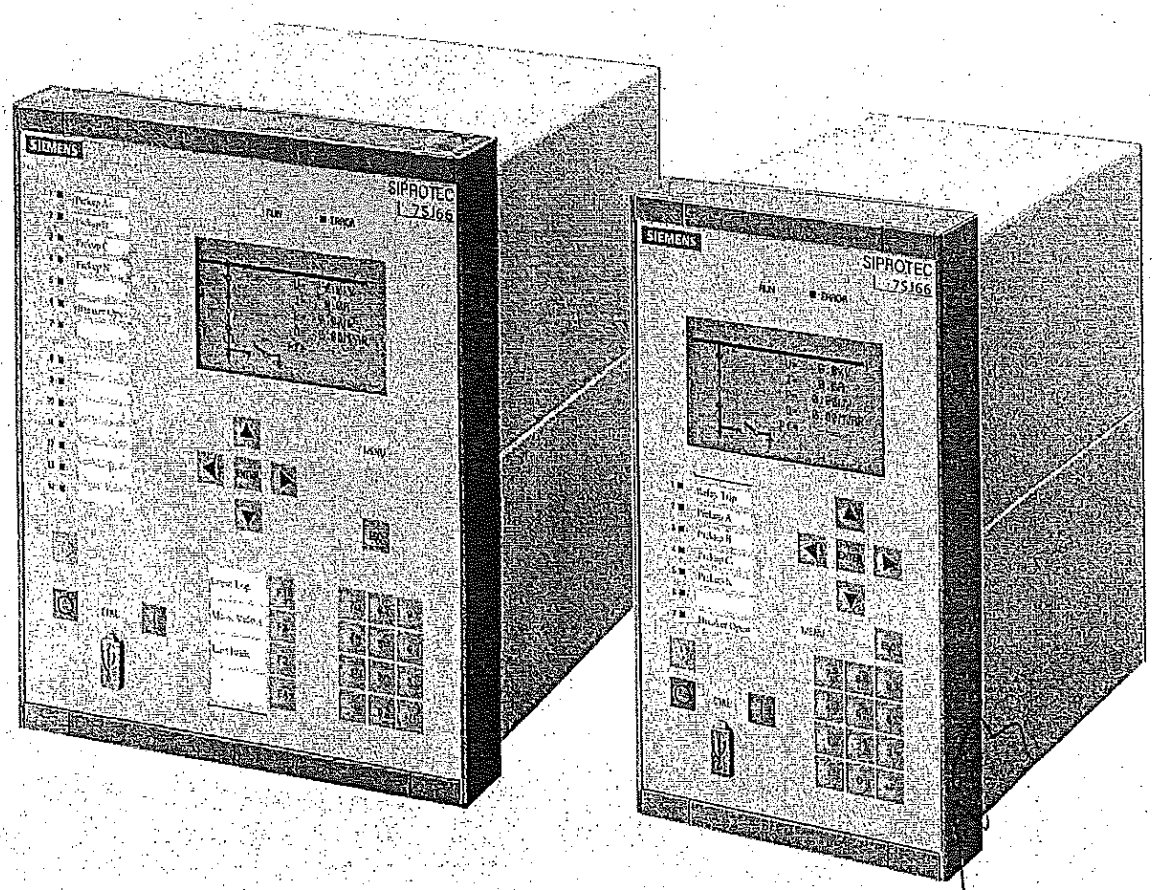

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стр. 130

SIPROTEC 7SJ66

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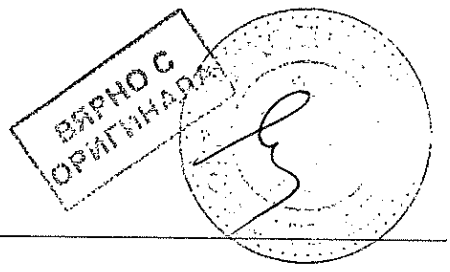

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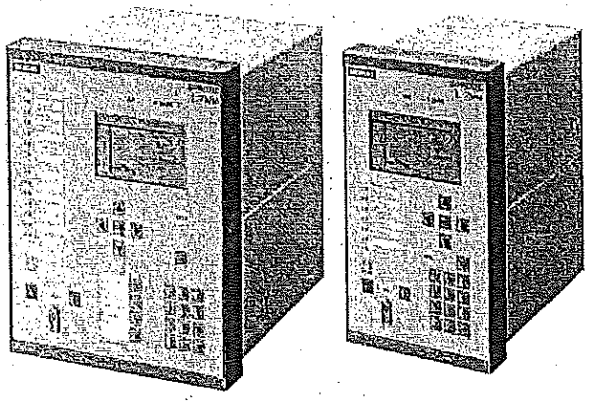

Fig. 1 SIPROTEC 4 7SJ66 multifunction protection relay

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

Application

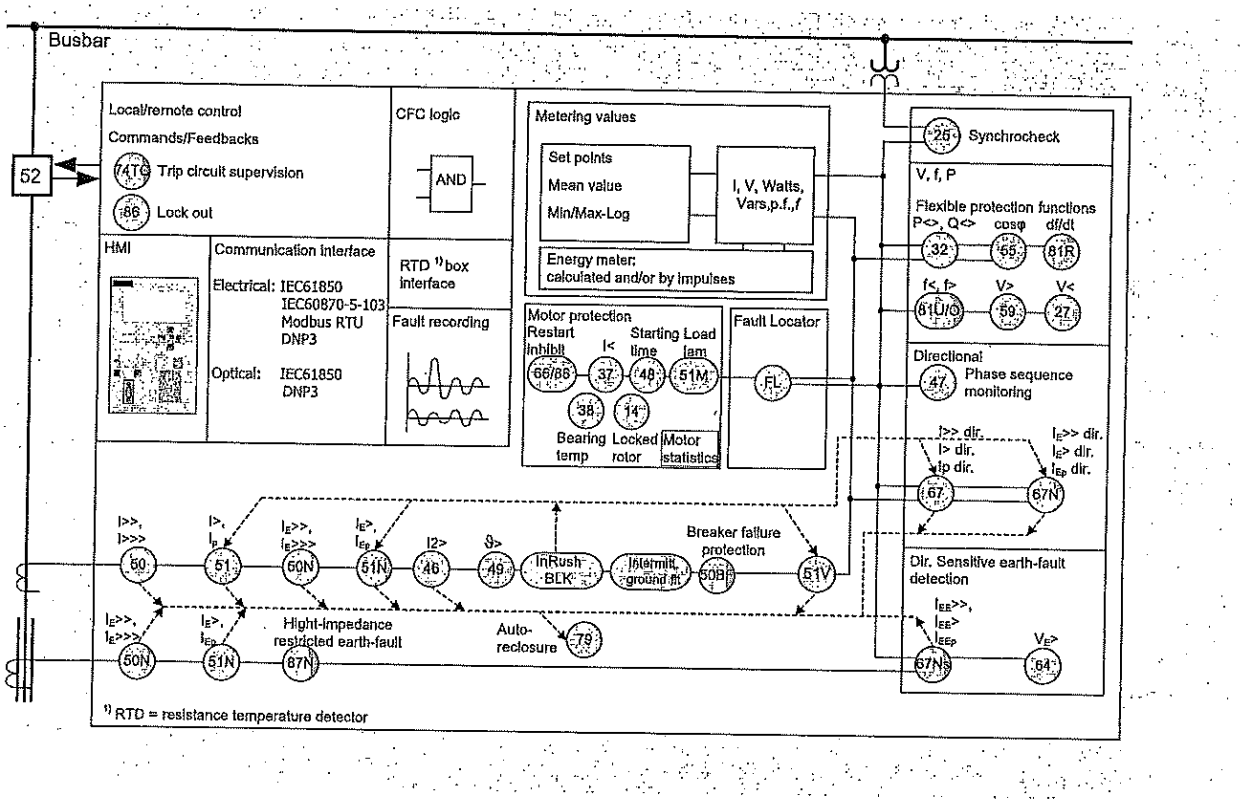

Fig. 2 Function diagram

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 φ	Power factor protection
81O/U	$f>$, $f<$	Overfrequency/underfrequency protection
81R	df/dt	Rate-of-frequency-change protection
21FL		Fault locator

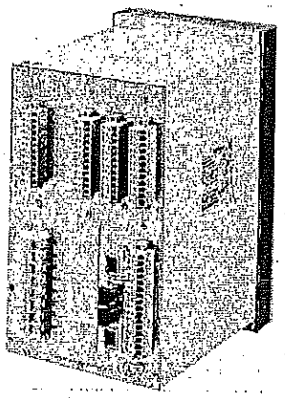

Fig. 3 SIPROTEC 7SJ66 rear view with optical Ethernet system interfaces

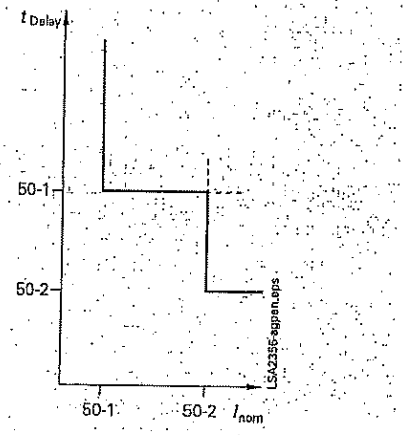

Fig. 4 Definite-time overcurrent protection

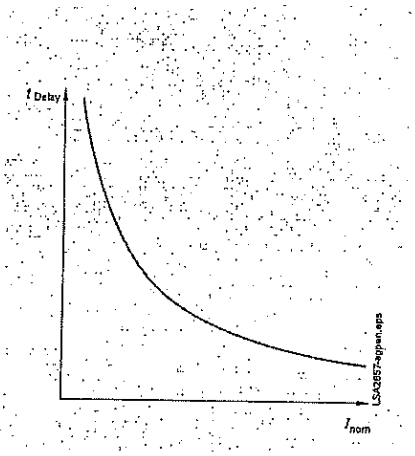

Fig. 5 Inverse-time overcurrent protection

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.

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.

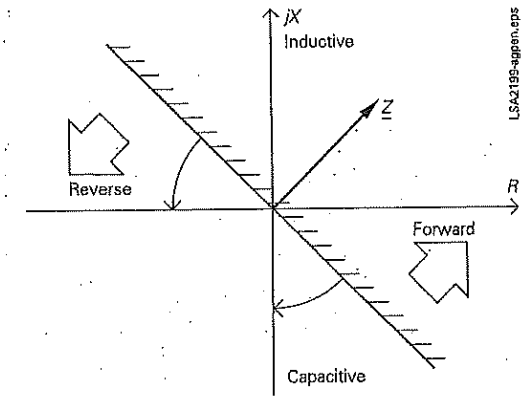

Fig. 6 Directional characteristic of the directional overcurrent protection

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.

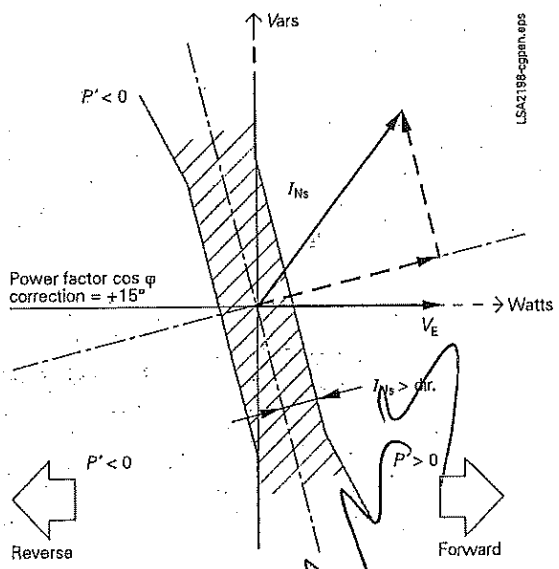

Fig. 7 Directional determination using cosine measurements for compensated networks

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

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

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

Intermittent ground-fault protection

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

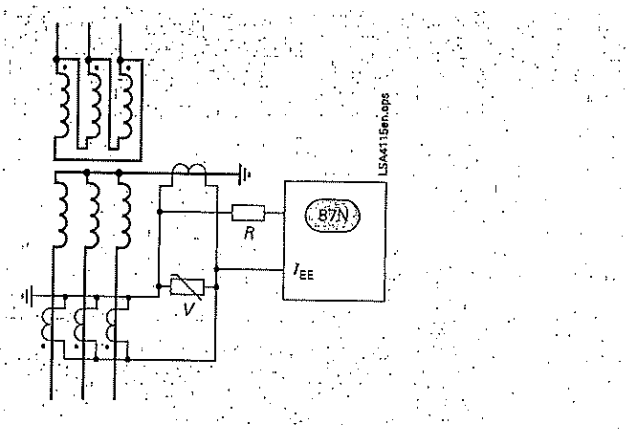

Fig. 8 High-impedance restricted ground-fault protection

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)

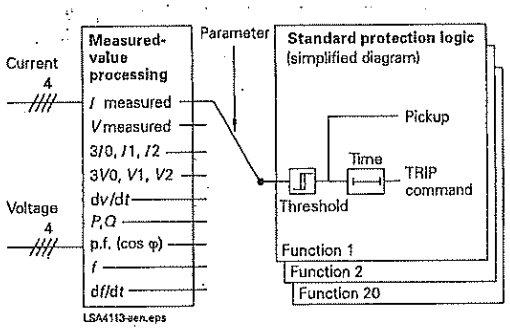

Fig. 9 Flexible protection functions

- 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.

■ Motor protection

Restart inhibit (ANSI 66/86)

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

Emergency start-up

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

Temperature monitoring (ANSI 38)

One temperature monitoring box with a total of 12 measuring sensors can be used for temperature monitoring and detection by the protection relay. The thermal status of motors, generators and transformers can be monitored with this device. Additionally, the temperature of the bearings of rotating machines are monitored for limit value violation. The temperatures are being measured with the help of temperature detectors at various locations of the device to be protected. This data is transmitted to the protection relay via one or two temperature monitoring boxes (see "Accessories", page 5/115).

Starting time supervision (ANSI 48/14)

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

for $I > I_{MOTOR\ START}$

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

I = Actual current flowing

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

t = Tripping time

I_A = Rated motor starting current

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

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

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

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

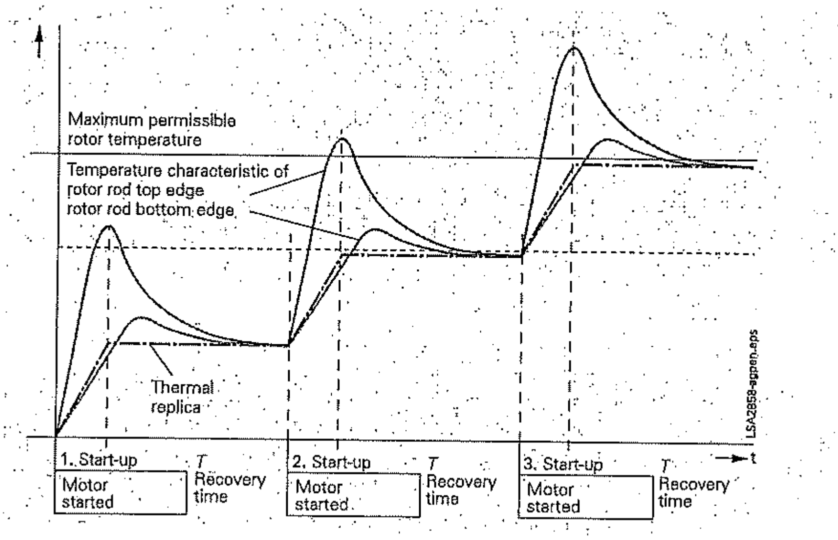

Fig. 10

Load jam protection (ANSI 51M)

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

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

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

The negative-sequence / phase-balance current protection detects a phase failure or load 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

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

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

Fault locator (ANSI 21FL)

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

Circuit-breaker wear monitoring

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

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

- 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.

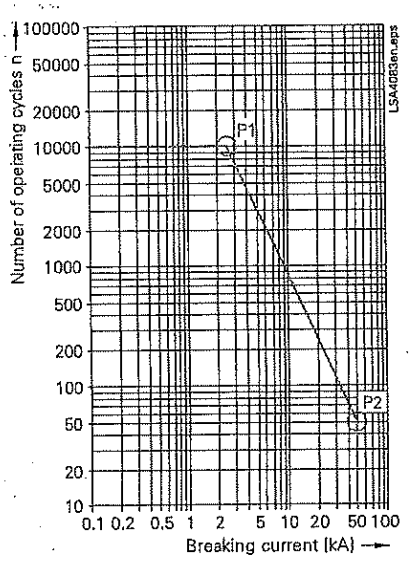

Fig. 11 CB switching cycle diagram

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

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.

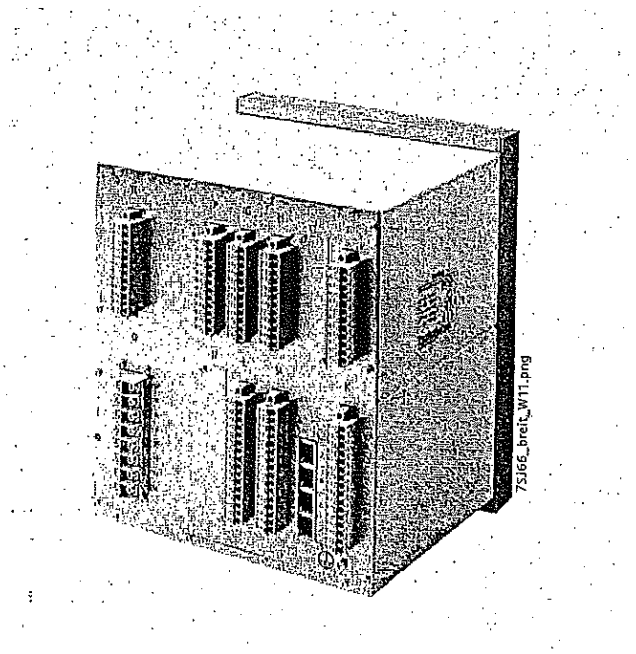

Fig. 12 SIPROTEC 7SJ663 rear view with communication ports

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, VAlP, 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.

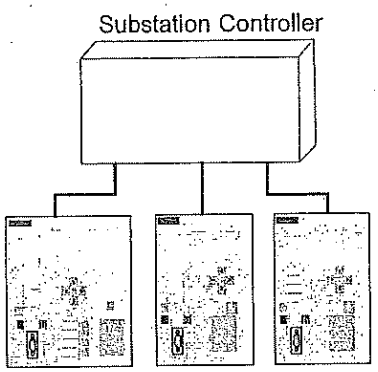


Fig. 13 IEC 60870-5-103: Radial electrical connection

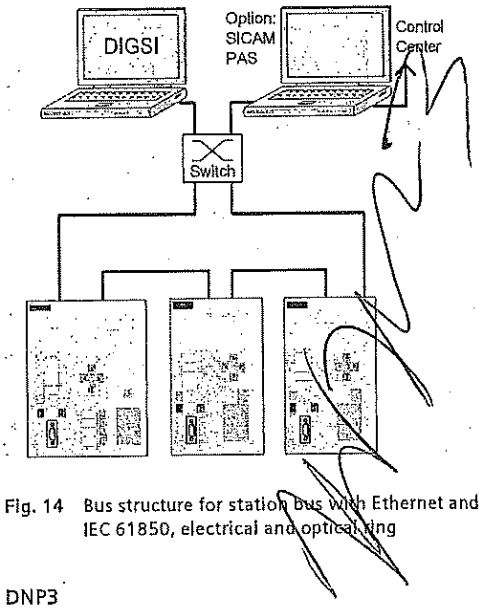


Fig. 14 Bus structure for station bus with Ethernet and IEC 61850, electrical and optical ring

DNP3

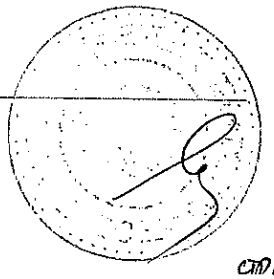
DNP (Distributed Network Protocol, version 3) is a messaging-based communication protocol. SIPROTEC 7SJ66 is fully Level 1 and Level 2-compliant with DNP3, which is supported by a number of protection units manufactures.

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.

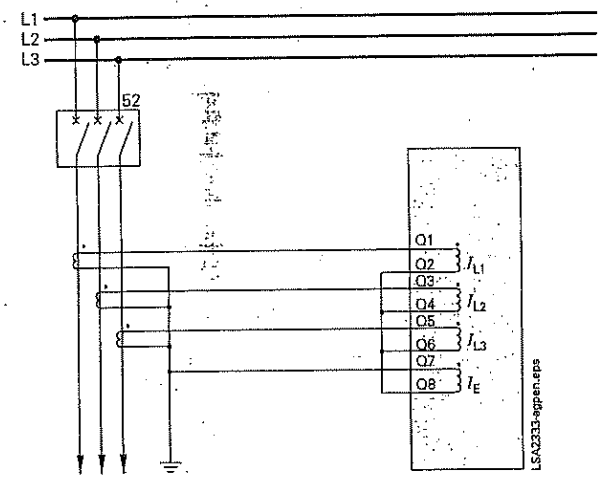

Fig. 15 Residual current circuit without directional element

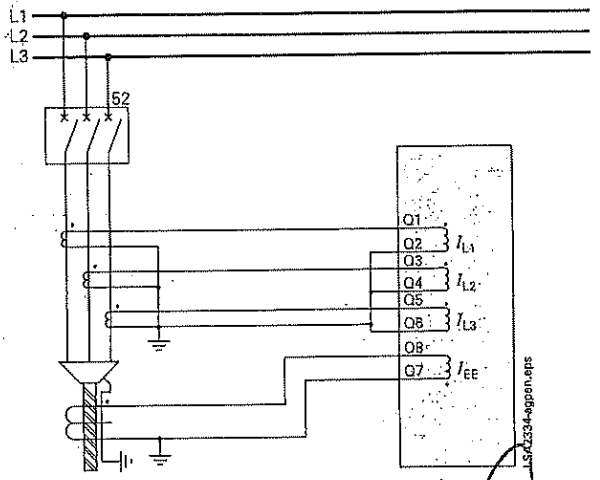

Fig. 16 Sensitive ground-current detection without directional element

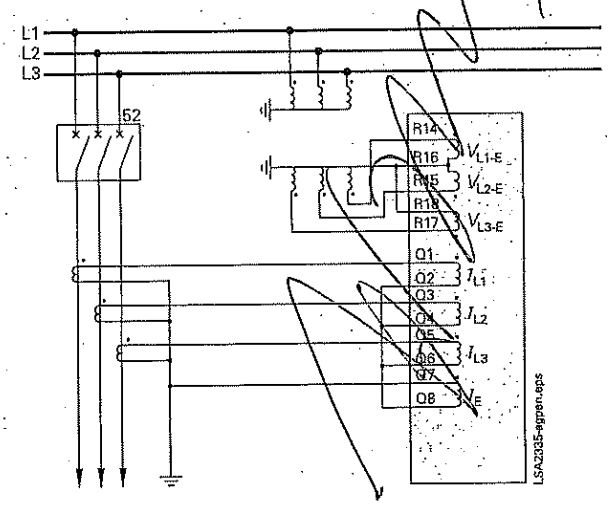

Fig. 17 Residual current circuit with directional element

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.

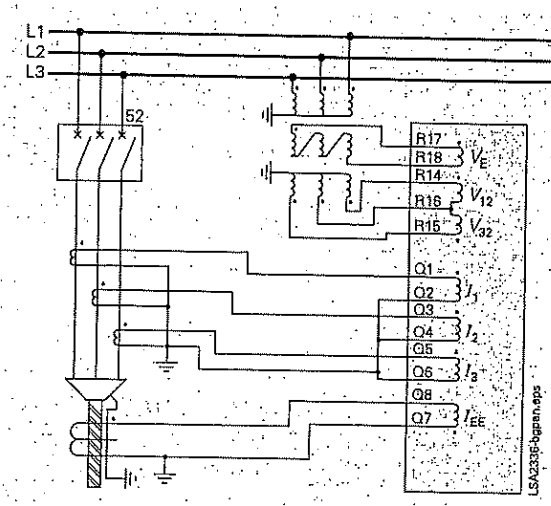

Fig. 18 Sensitive directional ground-fault detection with directional element for phases

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.

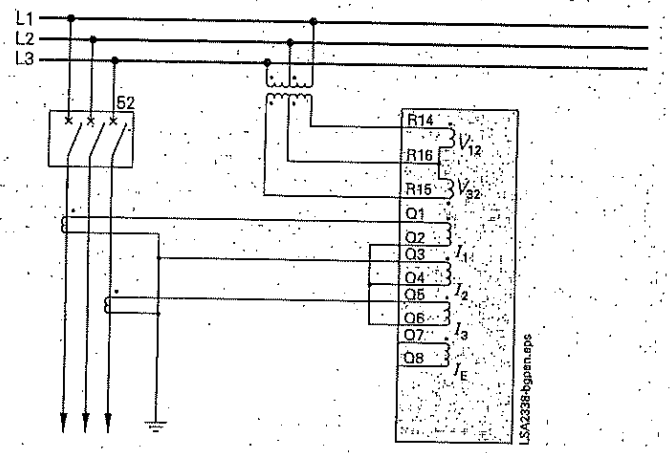

Fig. 19 Isolated-neutral or compensated networks

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.

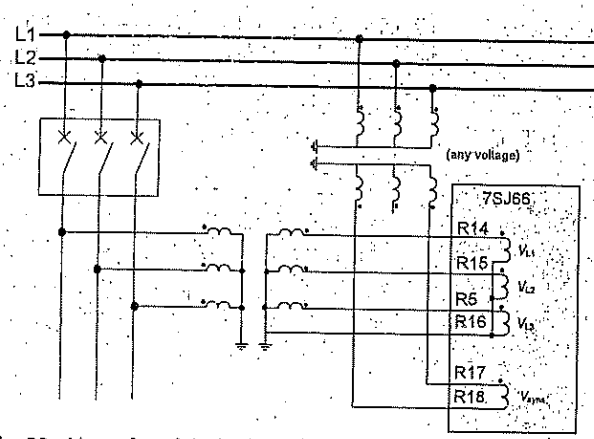

Fig. 20 Measuring of the busbar voltage and the outgoing feeder voltage for the synchro-check

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

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.

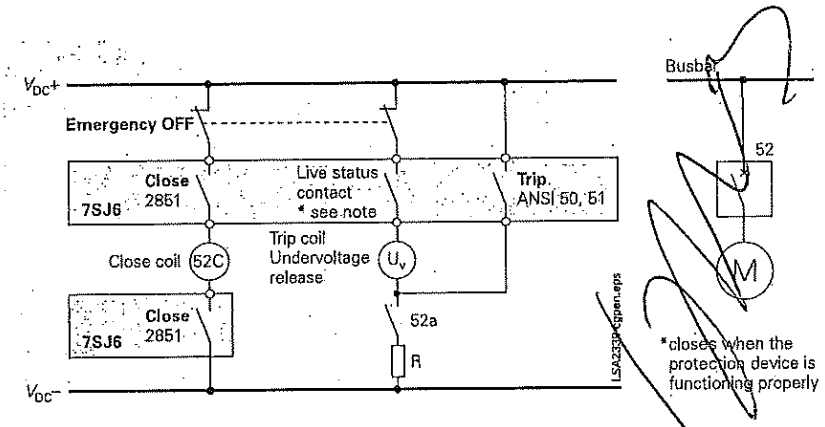

Fig. 21 Undervoltage release with make contact (50, 51)

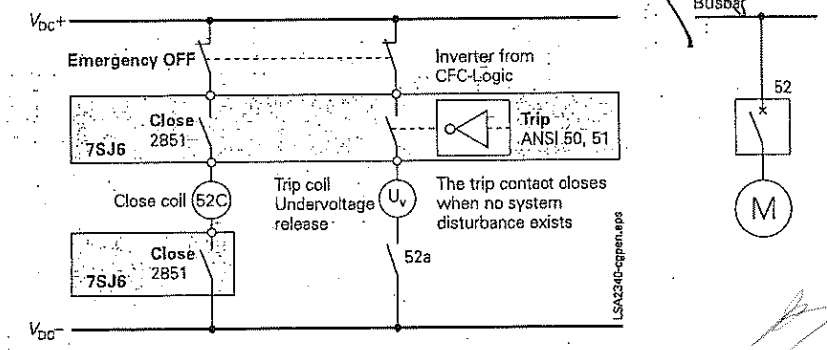

Fig. 22 Undervoltage trip with locking contact (trip signal 50 is inverted)

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.

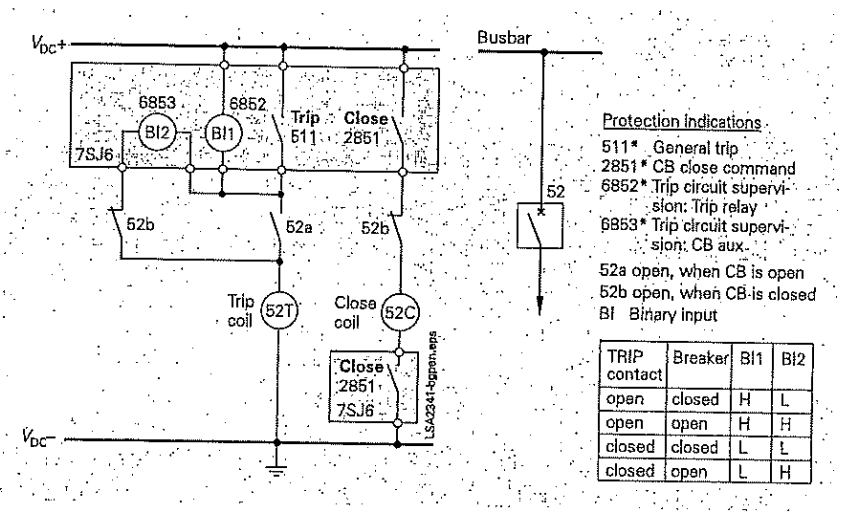

Fig. 23 Trip circuit supervision with 2 binary inputs

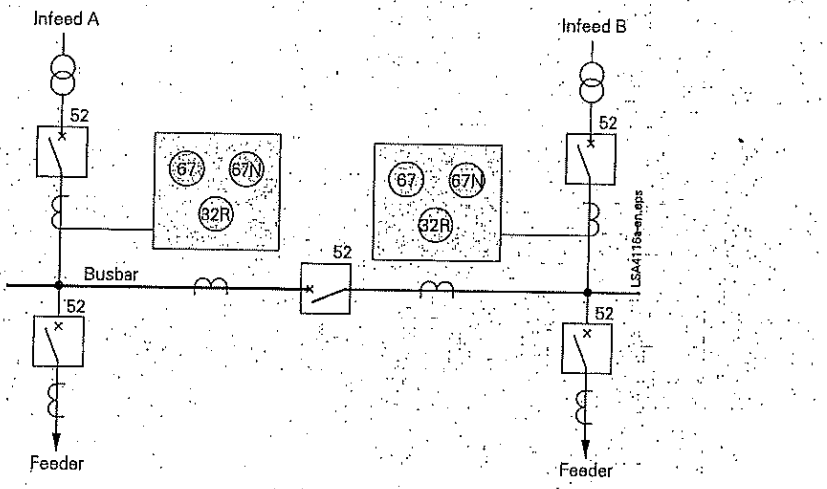

Fig. 24 Reverse-power protection for dual supply

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)							0
No interface							2
DIGSI 4 / Modem / RTD-box, electrical RS485, RJ45-connector							6
Ethernet port (DIGSI port, RTD box connection, not IEC 61850), RJ45-connector							
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
SIPROTEC 7SJ66 multifunction protection relay and bay controller			1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	7SJ66☐☐-☐☐☐☐☐-☐☐☐☐-☐☐☐
Basic version	ANSI No.	Description		
	Control			
	50/51	Overcurrent protection $I>$, $I>>$, $I>>>$, I_p	F	A
	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)	Flexible protection (index quantities derived from		
	32/55/81R	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)	Flexible protection (index quantities derived from		
	32/55/81R	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)	Flexible protection (index quantities derived from		
	32/55/81R	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)	Flexible protection (index quantities derived from		
	32/55/81R	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	ANSI No.	Description	Order No. 12345 6 7 8 9 10 11 12 13 14 15 16 17 18 19 7SJ66□□-□□□□□-□□□□-□□□
SIPROTEC 7SJ66 multifunction protection relay and bay controller			
Basic + Sens.earth-f-det. Dir REF		Basic version (see page before)	F D [2]
	67/67N	Direction determination for overcurrent, phases and ground	
	67Ns	Directional sensitive ground-fault detection	
	67Ns	Directional intermittent ground fault protection	
Basic + Sens.earth-f-det. Dir IEF REF		Basic version (see page before)	P D [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 Intermittent earth-fault	
Basic + Sens.earth-f-det. V,P,f REF		Basic version (see page before)	F F [2]
	67Ns	Directional sensitive ground-fault detection	
	67Ns	Directional intermittent ground fault protection	
	87N	High-impedance restricted ground fault	
	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 + Sens.earth-f-det. REF		Basic version (see page before)	F B [2]
	67Ns	Directional sensitive ground-fault detection	
	67Ns	Directional intermittent ground fault protection	
	87N	High-impedance restricted ground fault	
Basic + Sens.earth-f-det. Motor V,P,f REF		Basic version (see page before)	H F [2]
	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 + Sens.earth-f-det. Motor Dir V,P,f REF		Basic version (see page before)	H 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	

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)

SIPROTEC 7SJ66

Selection and ordering data

Description	ANSI No.	Description	Order No. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 — 7SJ66 □□-□□□□□-□□□□	Order code
SIPROTEC 7SJ66 multifunction protection relay and bay controller				
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)	Flexible protection (index quantities derived from		
	32/55/81R	current and voltages): Voltage, power, p.f., rate-of-frequency-change protection		
Basic + Motor Dir V,P,f		Basic version (see page 20)	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)	Flexible protection (index quantities derived from		
	32/55/81R	current and voltages): Voltage, power, p.f., rate-of-frequency-change protection		
Basic + Motor		Basic version (see page 20)	H A	
	48/14	Starting ime supervision, locked rotor		
	66/86	Restart inhibit		
	51M	Motor load jam protection		
		Motor statistics		
		Measuring/fault recording	13	
		With fault recording	□	
		With fault recording, average values, min/max values	1	
			3	
		Auto reclosing, fault locator, synchro-check	16	
		Without	□	
	79	With 79	0	
	21FL	With fault locator	1	
	79,21FL	With 79 and fault locator	2	
	25	With synchronization	3	
	25, 79, 21FL	With synchronization, 79 and fault locator	4 [3]	
			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

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]

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

SIPROTEC 7SJ66

Connection diagram

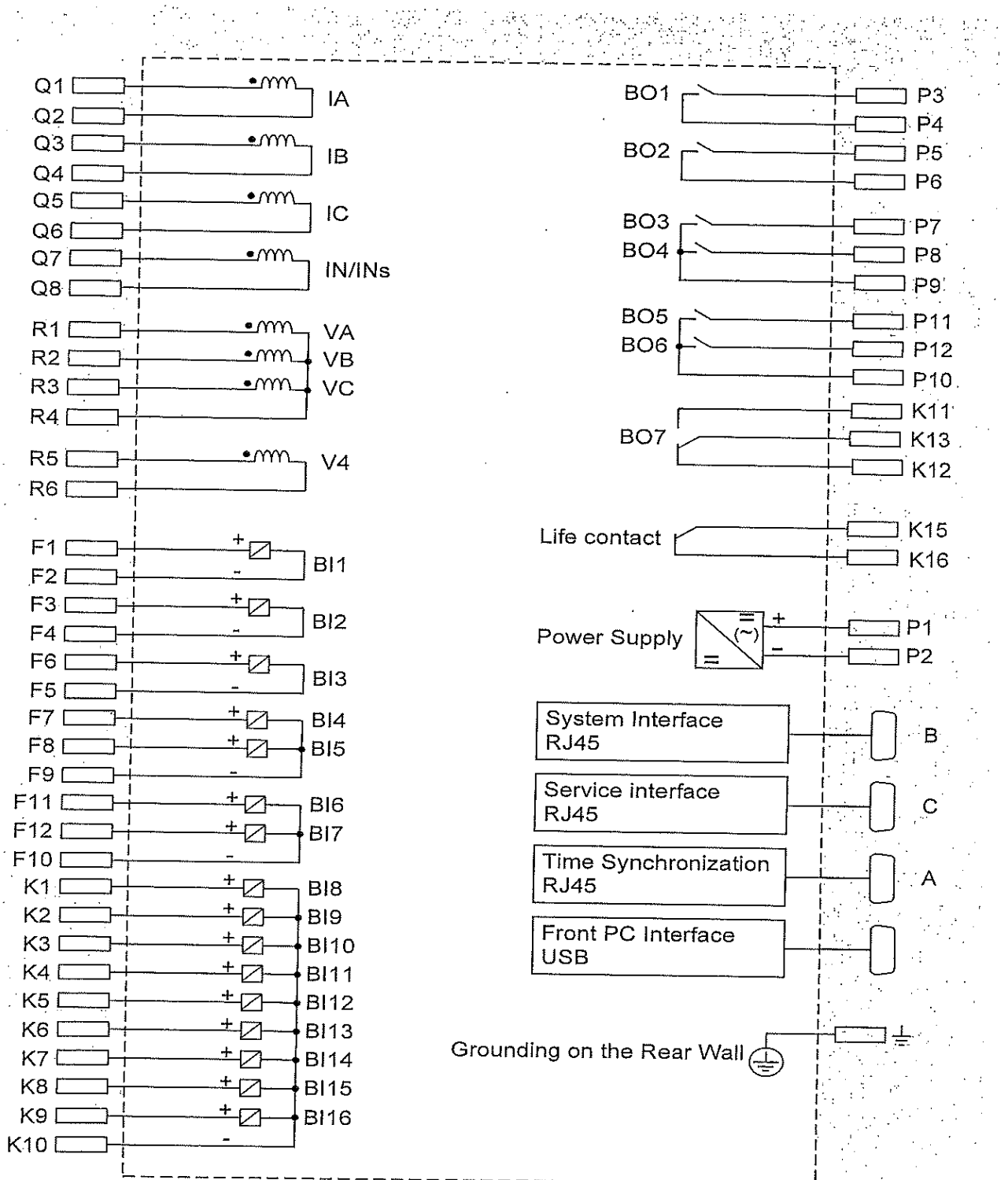


Fig. 25 SIPROTEC 7SJ661 connection diagram

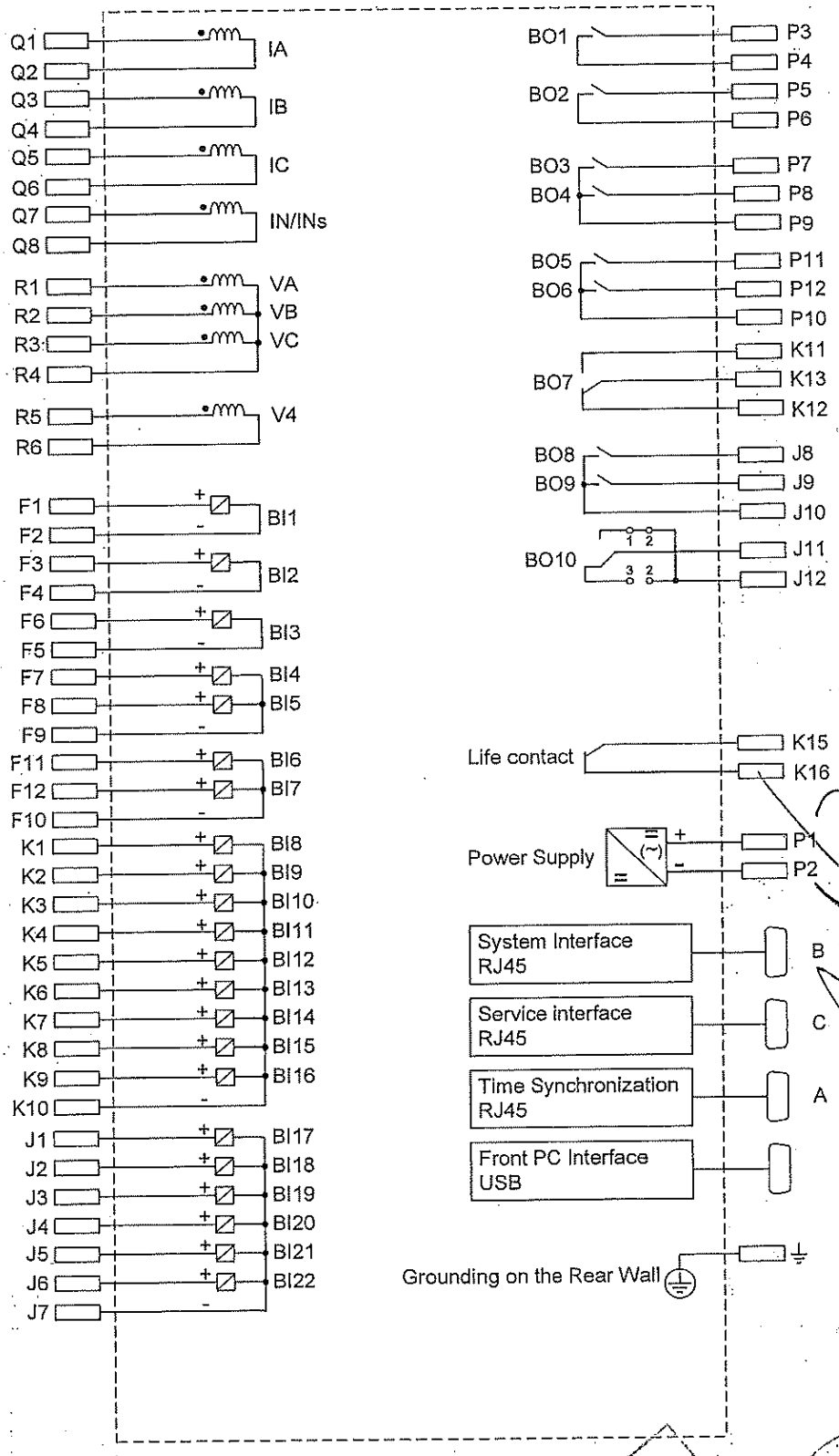


Fig. 26 SIPROTEC 7SJ662 connection diagram

Connection diagram

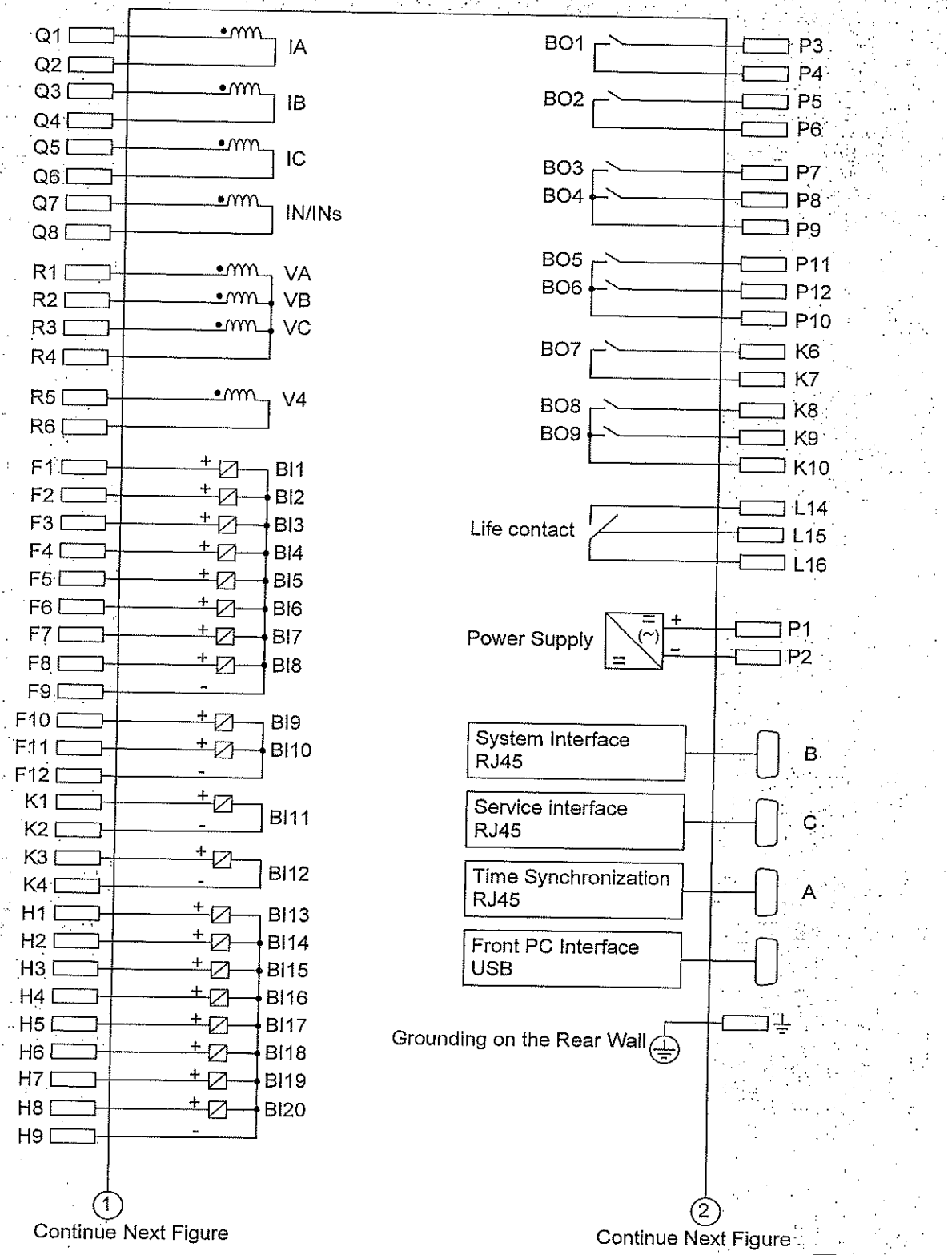


Fig. 27 SIPROTEC 7SJ663 connection diagram

стр. 155

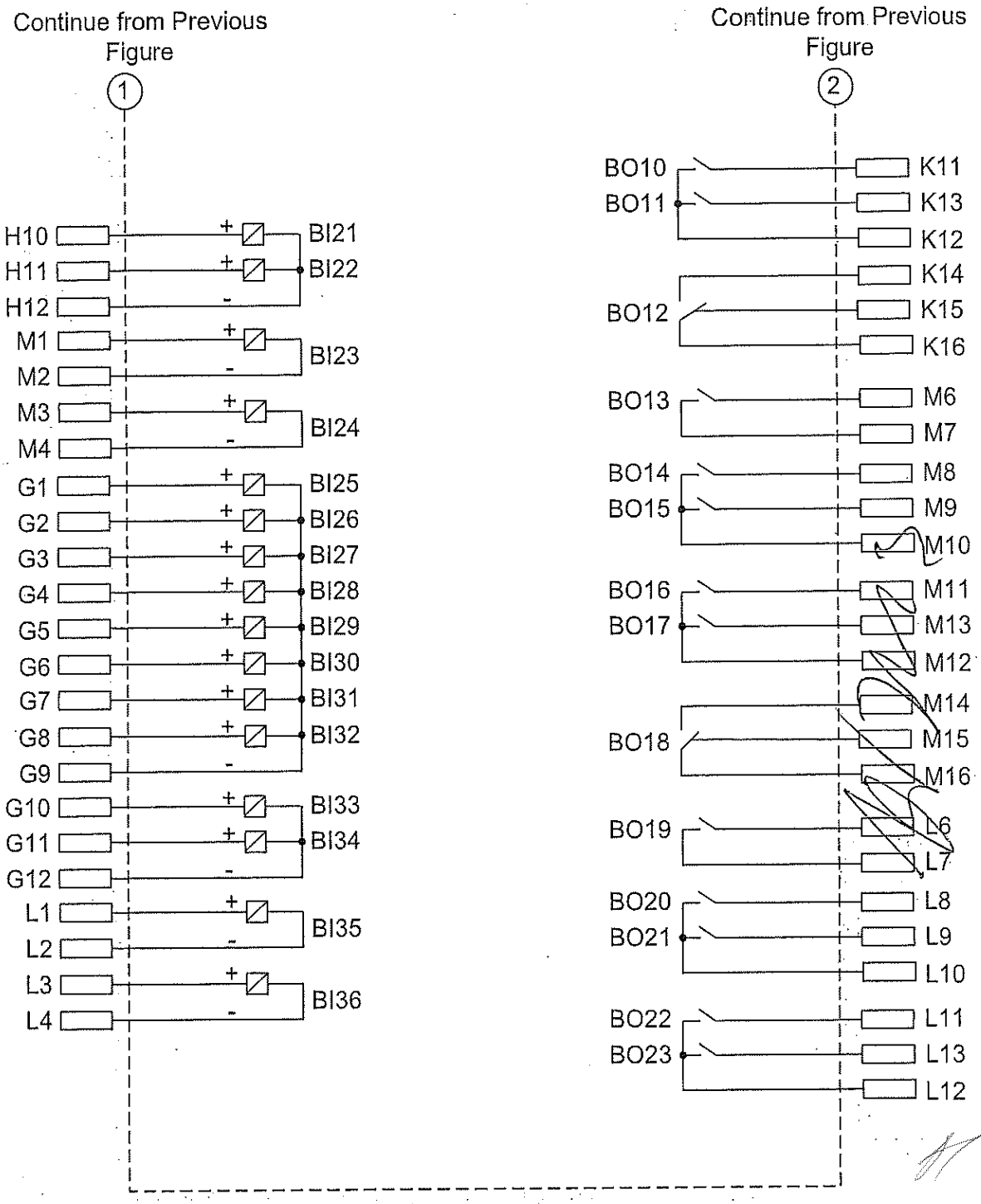
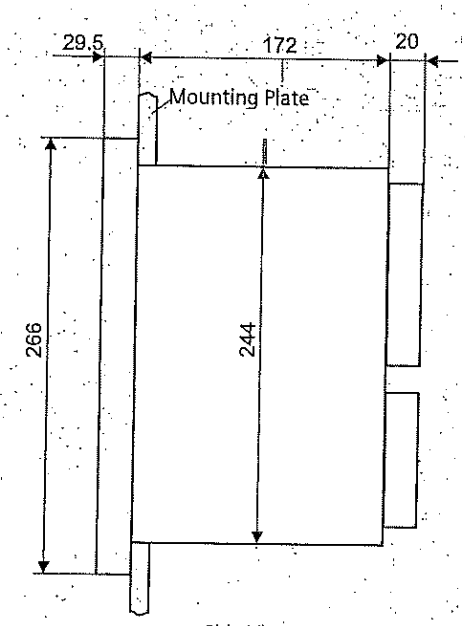
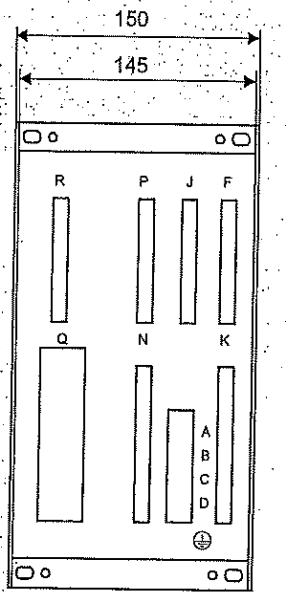


Fig. 28 SIPROTEC 7SJ663 connection diagram

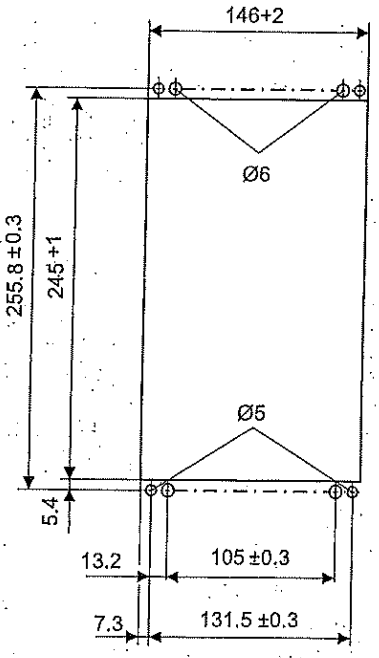
Dimensions



Side View

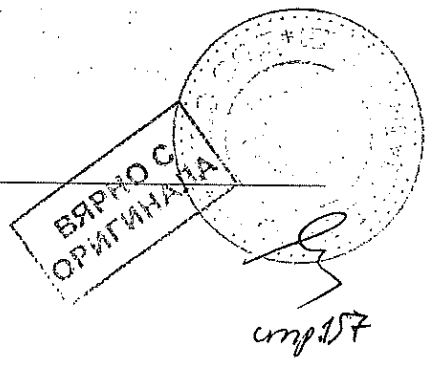


Rear View

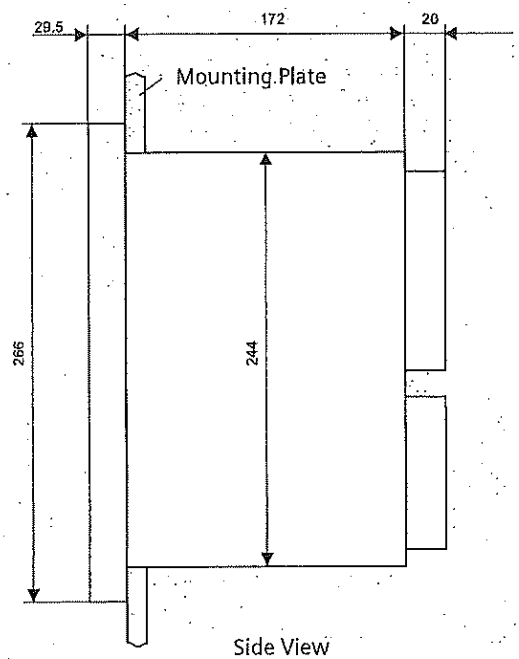


Dimensional Drawing
(Front View)

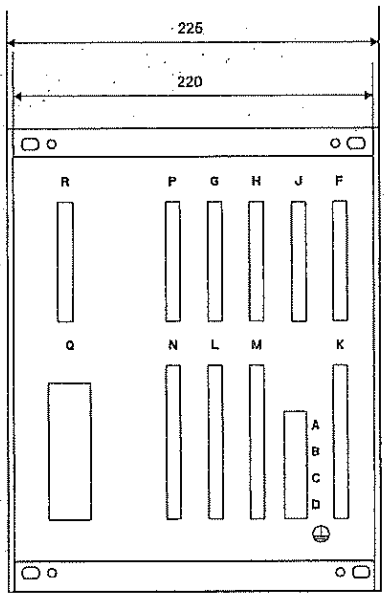
Fig. 29 Dimensional drawing for SIPROTEC 7SJ66 (housing size 1/3)



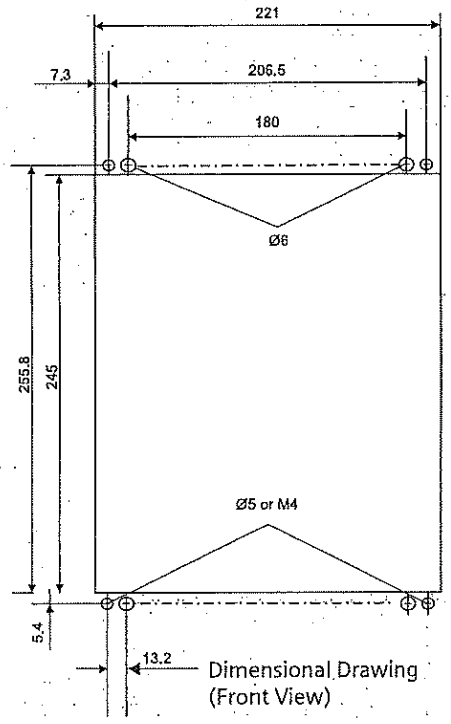
Dimensions in mm



Side View



Rear View



Dimensional Drawing
(Front View)

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

For more information, please contact our
Customer Support Center.
Phone: +49 180 524 70 00
Fax: +49 180 524 24 71
(Charges depending on provider)
E-Mail: support.ic@siemens.com
www.siemens.com/siprotec

ВЯРНО С ОРИГИНАЛА

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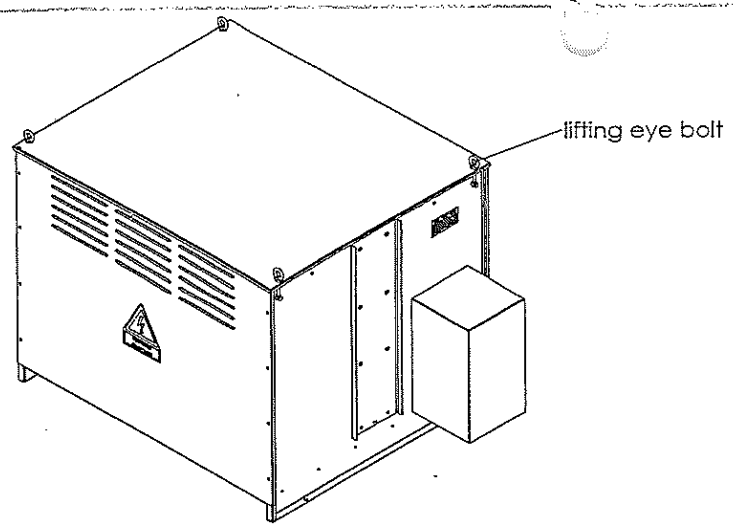
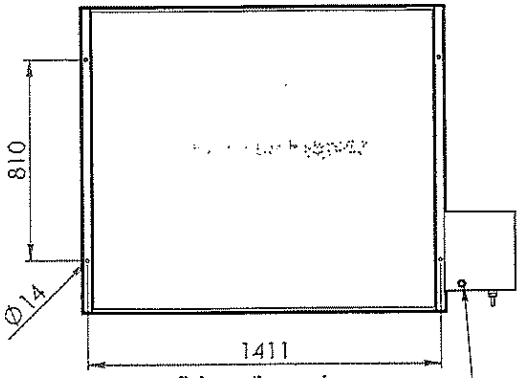
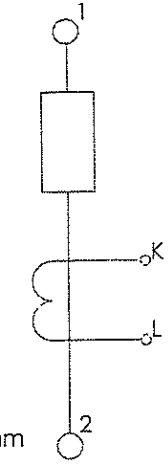
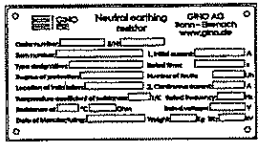


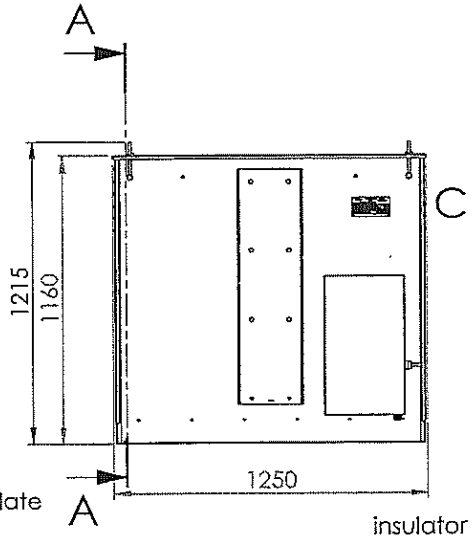


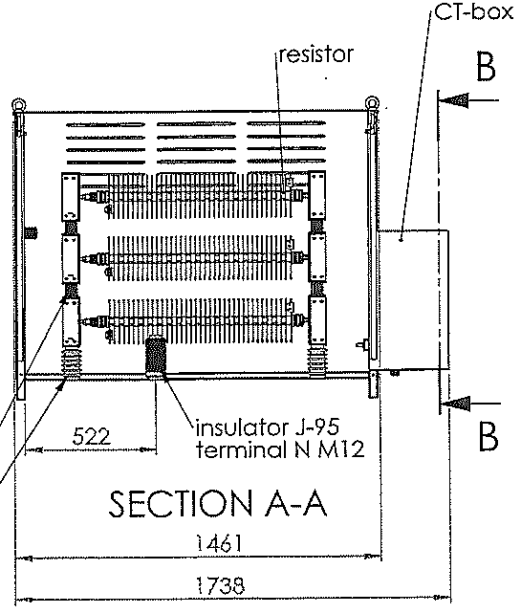


cable gland PG21
clamping range 17-20,5mm

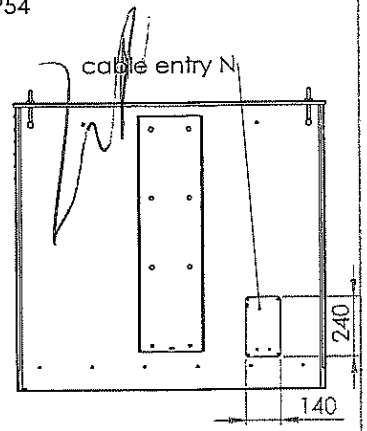


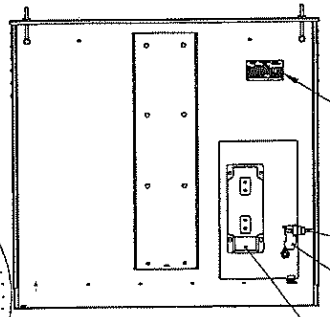
DETAIL C
SCALE 1 : 3





SECTION A-A





SECTION B-B

ВЕРНО
ОРИГИНАЛУ

Approved on _____ by _____

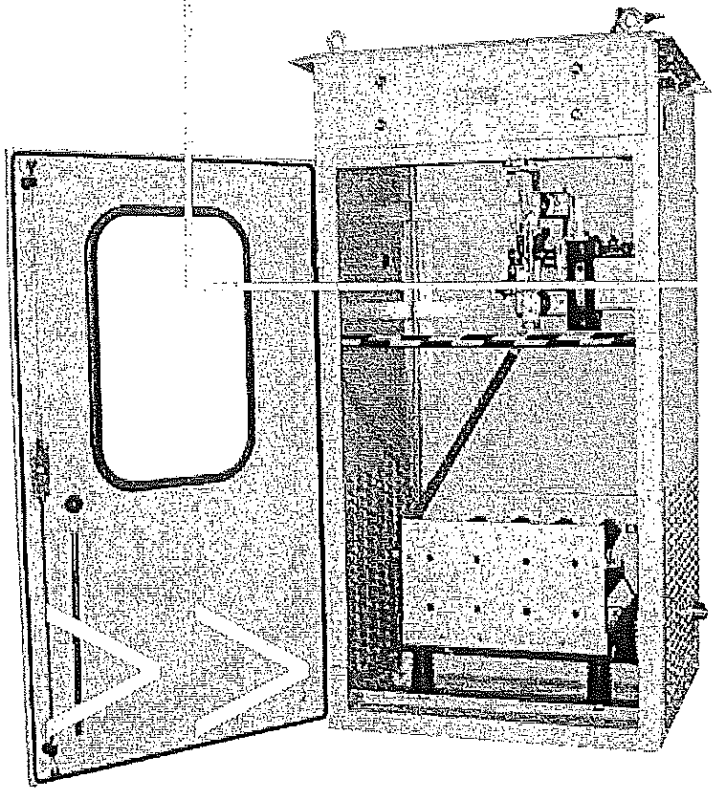
Änderung / Modification	Datum / Date	Name
K01		

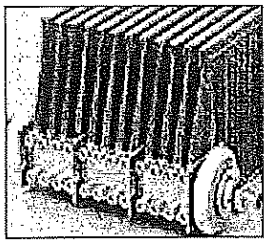
Erstellt / Created: 20.11.2017 Hengstler	Gewicht / weight: approx. 450kg	Material: AISI304 (1.4301)	Status: TO CUSTOMER
GINO ESE GINÖ AG Elektrotechnische Fabrik Friedrich-Wöhler-Straße 65 53117 Bonn www.gino.de	Bezeichnung / Description: BEG EBE054-40R-12U-10-CT		
	Zeichnungsnummer / Drawing Number: Z057279M0		Toleranz / Tolerance
	Artikelnummer / Item Number: 145255	Blattformat / Paper Size: A3	Maßstab / Scale: 1:20

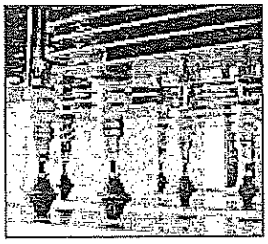
На основание чл.36а ал.3 от ЗОП

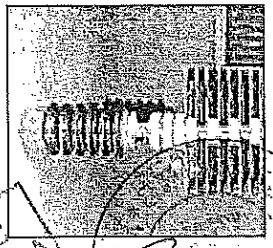
Neutral Earthing Resistors

For permanent or temporary neutral earthing in HV systems









GINO ESE

ВЯРНО С ОРИГИНАЛА

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

Neutral point connection

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

Neutral point connection	$\mathcal{E}=U_{LF}/U_L$
Direct, Z0/Z1 = 0	1,0
Low-resistance Z0/Z1 ~ 1...5	1,1...1,4
High- resistance Z0/Z1 ~ 20...100	1,75...1,8
Compensated -> infinite	1,75...1,85
Isulated Z0/Z1 ~ 100...200	1,75...1,85

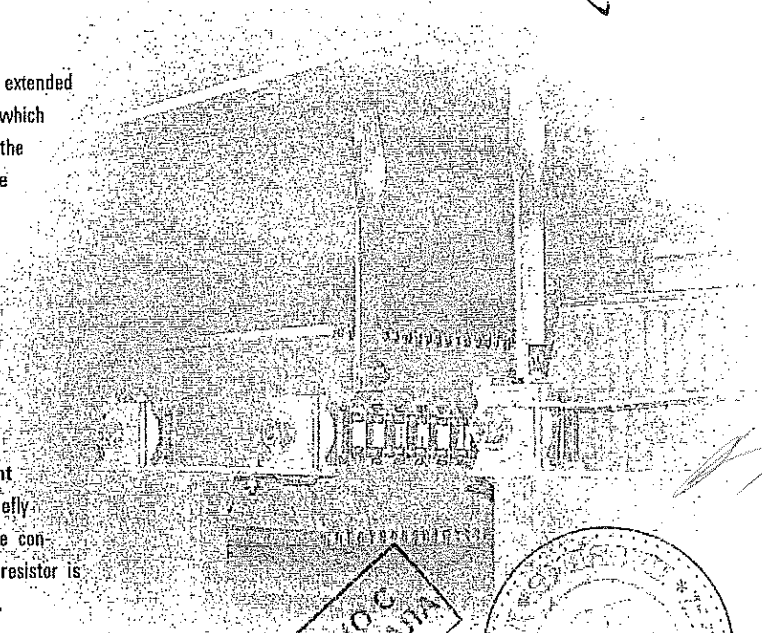
Z0 = neutral point impedance [1]
Z1 = symmetrical supply impedance

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

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

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

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



General

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

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

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

Resistors for indoor applications are manufactured in IP00 and IP20.

Resistor outdoor applications, at least IP23 is required.

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

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

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

GINO Grounding Resistors

GINO grounding resistors consist of the resistor packages with resistor elements made from siliconized cast iron with or without surface protection (e.g. zinc dust primer) or steel sheet grid elements made from various resistor materials. Several resistor packages can be combined to a withdrawable module, insulated from the housing and up to three modules can be arranged in one housing. One or several modules can also be combined for installation in existing switchgears on a base frame to form an IP00 resistor.

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

Grounding resistor design

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

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

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

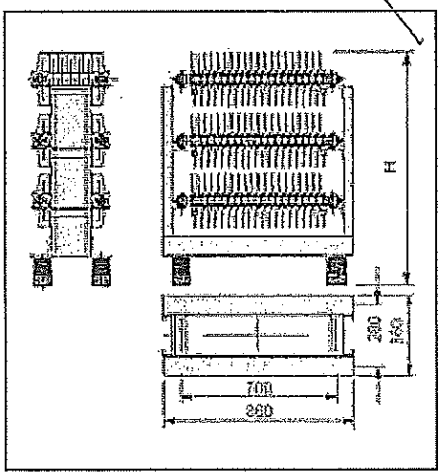
The insulation of the connection for operational earth depends on the conditions of the grounding system. Where a ground fault voltage UE at the connecting point as per VDE00141 exceeds prerequisite 4 (V4) 3000 V, it has proven to be advantageous to also insulate the grounding connection for the system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

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

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

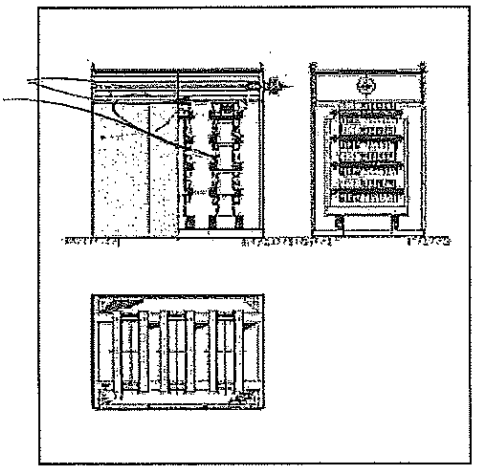
Resistor modules, protection class IP00, installation

Size	No. of banks1)	Dimension H	Weight ca. kg
System voltage 12 kV, maximum 4 kV per bank			
1202	2	850	145
1203	3	1040	210
1204	4	1310	275
1205	5	1500	340
1206	6	1750	400
System voltage 24 kV, maximum 12 kV per module, maximum 4 kV per bank			
2402	2	940	150
2403	3	1130	215
2404	4	1400	280
2405	5	1590	345
2406	6	1840	405
System voltage 36 kV, maximum 12 kV per module, maximum 4 kV per bank			
3602	2	1050	155
3603	3	1240	220
3604	4	1510	285
3605	5	1700	350
3606	6	1950	410



Housed resistors for outdoor installation, protection class IP23

Size	Modules	Max. no. of banks	Dimensions W	D	H	H1	Weight ca. kg
System voltage 12 kV, maximum 4 kV per bank							
12102		2			1500	1250	390
12103		3			1700	1450	470
12104	1	4	800		1950	1750	550
12105		5			2150	1900	630
12106		6			2400	2150	710
12208		8		1200	1950	1750	1000
12210	2	10	1400		2150	1900	1150
12212		12			2400	2150	1300
12312		12			1950	1750	1350
12315	3	15	1800		2150	1950	1570
12318		18			2400	2150	1780
System voltage 24 kV, maximum 12 kV per module, maximum 4 kV per bank							
24104		4			2100	1825	710
24105	1	5	900		2300	2025	800
24106		6			2550	2275	890
24208		8			2100	1825	1090
24210	2	10	1500	1400	2300	2025	1250
24212		12			2550	2275	1400
24312		12			2100	1825	1450
24315	3	15	2000		2300	2025	1680
24318		18			2500	2275	1900
System voltage 36 kV, maximum 12 kV per module, maximum 4 kV per bank							
36104		4			2300	1900	840
36105	1	5	1200		2500	2100	930
36106		6			2750	2350	1020
36208		8			2300	1900	1230
36210	2	10	1800	1700	2500	2100	1400
36212		12			2750	2350	1550
36312		12			2300	1900	1610
36315	3	15	2300		2500	2100	1830
36318		18			2750	2350	2060



Special designs and accessories available

- Galvanized housing, hot-dip galvanized frame, hot-dip galvanized sheet cladding, 2K PUR painting
- Steel grid elements made from chromium nickel steel instead of cast iron
- Higher protection class IP3x, IP4x, IP5x
- Indoor / outdoor bushing HV side
- Currency converter
- Higher clearances and creepage distances with insulators
- Disconnecting switch, 1-pole, different drives
- Low voltage recess or terminal strip

Notes

Information required:

- System voltage
- Ohm value R
- Rated earth fault current [I_d] = A
- Operating time s
- Cont. Current, where applicable [I_d] = A
- Protection class IPxx
- Connection (cable, bushing)

Dimensioning:

- Calculate current-time integral [$I^2 t$] = kA^2s
- Select element type GWE.. on page 1.19
- Calculate the number of elements
  $n_{Elements} = R / R_{Elements}$
- Calculate the number of banks
  $n_{Banks} = n_{Elements} / 48$ round up to full no. of banks, select even number of elements per bank, direct-axis voltage If $\cdot R_{Bank}$ per bank maximum 4 kV, increase number of banks, where required
- Select module or housing size, observe criteria for system voltage If $\cdot R_{Module} \leq 4$ kV
- Additional remarks in special brochure "Neutral point grounding resistors"

Routine tests

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

Special designs and additional equipment items

- Galvanized housing, hot-dip galvanized frame, galvanized cladding, with 2-component PUR paint coat
- Resistors with punched sheet elements made from corrosion and acid-proof chromium nickel steel 18 9, material number 1.4301/AISI304
- Higher protection IP3x, IP4x, IP5x
- Transformers, support-type current transformers or low voltage transformers on the ground connection side (see above remark)
- Special design with higher clearance and creepage distances by using C- supports as per IEC 273
- Disconnector, single-pole, ring-type drive
- Disconnector, single-pole, track-control drive
- Disconnector, single-pole, with motor drive
- Separate low-voltage compartment or terminal box

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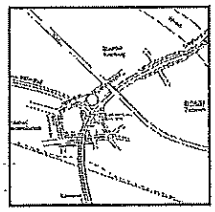

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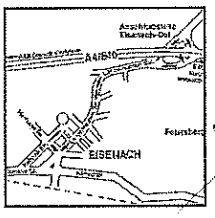

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ВЯРНО С ОРИГИНАЛА

certified according to DIN EN ISO 9001

стр. 166