SIEMENS

小型断路器、剩余电流保护断路器和模数化产品

Miniature Circuit-Breakers, Residual Current Operated Circuit-Breakers and Modular Devices

目录 2001

Catalog 2001

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ELECTRICAL INSTALLATION TECHNOLOGY

电气安装技术

SIEMENS

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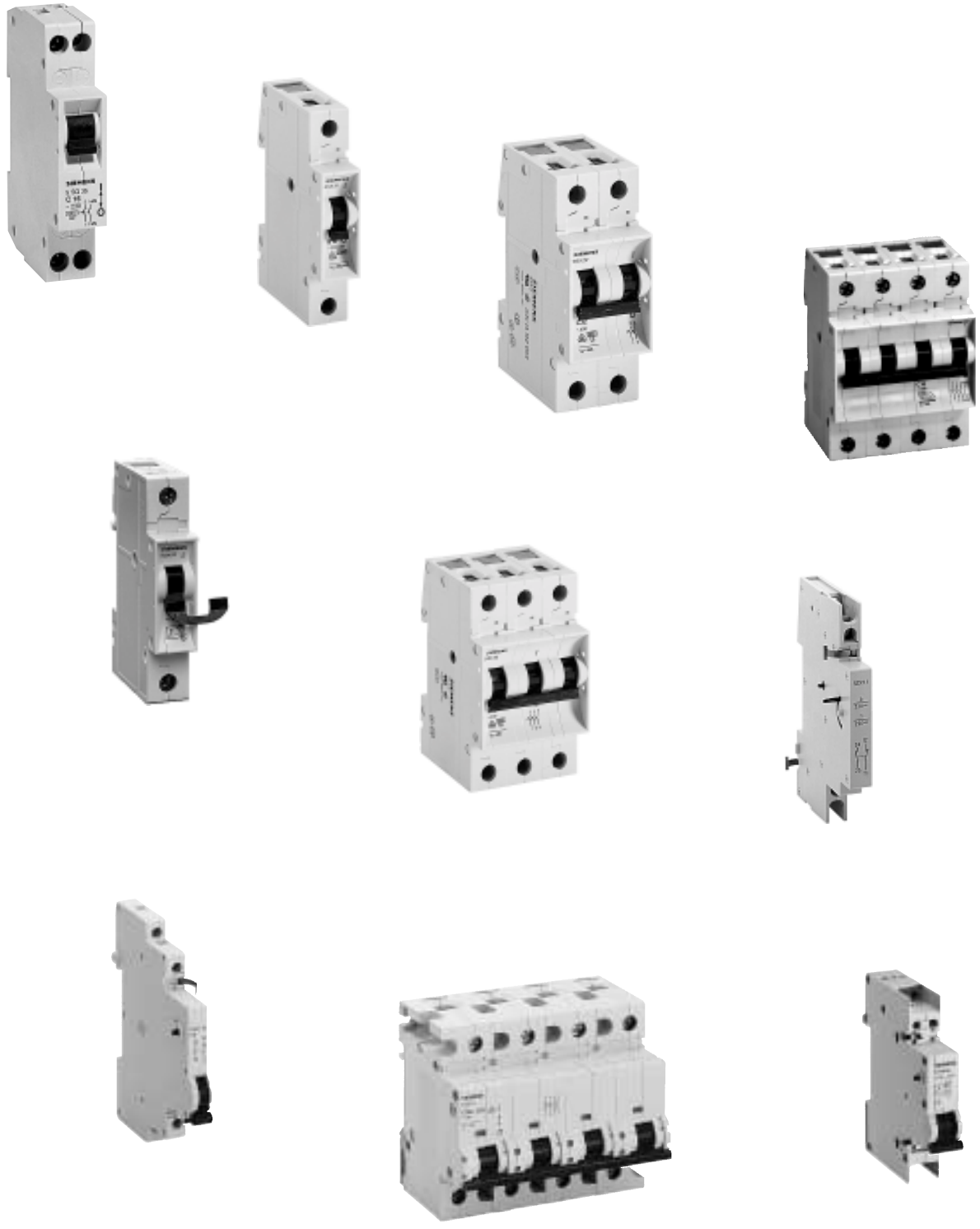
小型断路器、剩余电流保护断路器和模数化产品

Miniature Circuit-Breakers Residual Current Operated Circuit - Breakers and Modular Devices

小型断路器
Miniature Circuit-Breakers



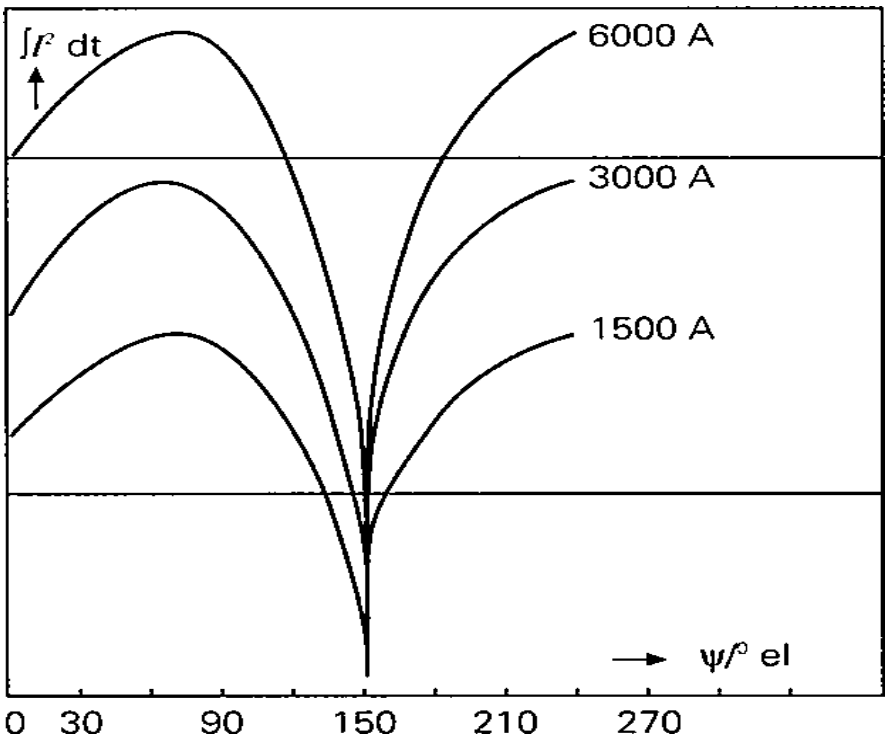
接线举例 Connection examples

导线可将截面至 25mm² 的下进线和 5ST2 144，3 极式汇流连接排与小型断路器的组合型接线端子相连接。
Feeder cables from below with cross sections up to 25mm² and triple-pole 5ST2 144 busbars can be simultaneously connected at the combination terminal of the MCB.

同时可将截面至 35mm² 的下进线和 5ST2 143，2 极式汇流排接在 5ST2 166 接线端子上。
连接线如上进线时可用类似的方法进行。
Feeder cables from below with cross sections up to 35mm² and double-pole 5ST2 143 busbars can be simultaneously connected using the terminal 5ST2 166.
Cables connected from the top use the same principle.

接线举例 Connection examples

导线可将截面至 35mm² 的上进线通过辅助接线端子 5ST2 157 与汇流连接排 5ST2 144 相连接。
Feeder cables from above with cross sections up to 35mm² and at 5ST2 144 busbars through supplementary terminal 5ST2 157.



在小型断路器的组合型接线端子上可同时连接导线截面至 25mm² 的进线和 5ST2 165 汇流连接排，并可在现场加装辅助开关。
Feeder cables with cross sections up to 25mm² and 5ST2 165 busbars can be simultaneously connected at the combination terminal of the MCB using the auxiliary contacts mounted on-site.

产品概述 The range

本章节所描述的模块式断路器简称小型断路器 (MCB)，可用于低压电气系统中作为导线、开关柜、电器设备等的过载及短路保护。

该小型断路器采用最先进的技术设计和生产，能满足电气安装系统中的所有需要。

模块化小型断路器可针对工业、公众、高科技以及家用等各种场合的电气回路提供最优化、最经济的解决方案。

该小型断路器的生产符合最具权威的国际标准 (IEC 898)，产品可分为七大系列，额定电流范围从 0.3 到 125A，额定电压范围从 230V 到 400V。

该小型断路器有以下的共同特点：它们可以用于各种使用环境，从民用住宅一直到工业领域。

该产品的不同系列可根据分断能力来分类，同时小型断路器可有各种附件和辅助设备与之相联。

小型断路器可以用符合 EN 50022 和 DIN 46277 标准的统一 35mm 导轨进行卡式安装。

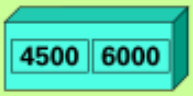
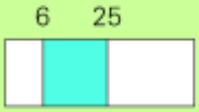
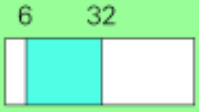
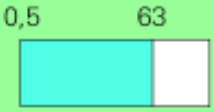
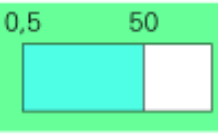
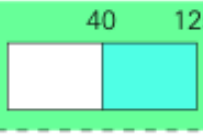
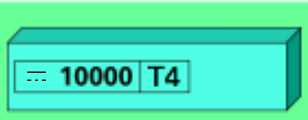
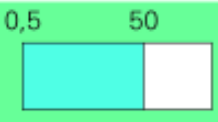
小型断路器的外形尺寸符合统一的 DIN 43880 标准：18mm 宽度为一个模数 (1 极)，前面窗口 (指凸起部分) 高度为 45mm。

The modular circuit-breakers presented in this chapter are Miniature
Circuit Breakers (M.C.B.) which can be used in Low Voltage electrical installations to protect conductors, switchgear, and electrical equipment in general against overloads and short-circuits.
These miniature circuit breakers, which are designed and manufactured with the most advanced techniques, cover all the requirements concerning electrical installations.
Modular miniature circuit breakers represent the optimum technical and economic solution in all sectors: industrial, public and high-tech public, domestic.
These miniature circuit-breakers are produced according to the international standards in force (IEC 898) and are divided into seven series, covering a range between 0.3 A and 125 A under the voltage of 230/400 V.
The miniature circuit breakers have this in common: they can be used in almost all environments, from domestic to industrial.
The various proposed series are distinguished by their rated short-circuit capacity, as well as by the accessories and auxiliary releases associated with them.
They are snap-mounted on symmetric sectioned rails of 35 mm in accordance with standards EN 50022 and DIN 46277.
Miniature circuit breaker sizes comply to the standard DIN 43880: 18 mm module (1 pole), front window height equal to 45mm.

小型断路器由西门子加强系统动力部门设计
The miniature circuit breakers are designed with the Siemens-enhanced systems dynamic program.

小型断路器
Miniature Circuit-Breakers

产品范围 The range

系列 Series	分断能力 [1] Short-Circuit Capacity [1]	I_n (A) 230/400 V~	脱扣特性 Tripping Characteristic	使用场合 Application Sector	页码 Page
5SQ35 [2]				建筑领域 /building 工业领域 /industrial	1/38
5SX1				建筑领域 /building 工业领域 /industrial	1/40
5SX2				建筑领域 /building 工业领域 /industrial	1/42
5SX4				建筑领域 /building 工业领域 /industrial	1/44
5SX7				建筑领域 /building 工业领域 /industrial	1/46
5SX5 [3] 直流部分 Version for DC				工业领域 /industrial	1/48

1) 黑色方框内显示的有关电流值 (A) 符合 IEC 898 标准；红色部分的有关电流值符合 IEC 947- 2 标准。
The value indicated in black in the rectangle corresponds to the rated value in A according to the standard IEC 898; the value indicated in red refers to the standard IEC 947-2.

2) 1P+N 一个模数宽度部分 (1P+N=1 MW=18mm)。
1 P + N version in one Module Width unit (MW = 18mm).

3) 直流部分分断能力符合标准 VDE 0641，第 12 部分。
DC short-circuit capacity according to the standard VDE 0641, Part 12.

应用

*N 系列*小型断路器主要用于保护电缆和导线以防止过载和短路故障的发生。根据标准 DIN VDE 0100 第 430 部分它们还可以保护电器设备以防止过热。根据标准 DIN VDE 0100 第 410 部分，在一定的条件下小型断路器还可以防止由于绝缘故障而产生过高的接触电压所造成的振荡电流。

另外，由于小型断路器电流的固定设置，它还可以在很小的范围内对电动机进行有限的保护。在以下的应用中，将对四种不同的脱扣特性单独进行描述。小型断路器的结构设计和认证是基于 EN 60 898，DIN VDE 0641 第 11 部分和 IEC 898 等标准的。

*N 系列*小型断路器在应用于工业领域和开关柜中时，可以加装一系列的附件，如辅助触头 (AC)故障信号触头 (FC)，分励脱扣器 (ST) 和欠压脱扣器 (UR) 等。

Applications

MCBs of the *N System* primarily protect cables and conductors against overload and short circuit. They also protect electrical equipment against overheating according to DIN VDE 0100 Part 430.

Under certain conditions MCBs protect against shock currents caused by excessive touch voltage due to insulation failure according to DIN VDE 0100 Part 410.

Further, due to the fixed current settings of MCBs, it is also possible to protect motors in a limited form.

For the following applications, there are four different tripping characteristics available which will be individually described.

The standards EN 60 898, DIN VDE 0641 Part 11 and IEC 898 form the basis for the mechanical design and approval of the MCBs.

For applications in industry and in system and plant engineering where MCBs of the *N System* are used, add-on accessories are available, such as auxiliary contacts (AC), fault-signal contacts (FC), shunt trips (ST) and undervoltage releases (UR).

功能设计和操作方式

*N 系列*小型断路器采用一个与过电流 / 时间有关的带延时的热脱扣器 (热双金属片) 对较小的过电流进行保护，对于很高的过载电流和短路电流使用一个瞬时动作的电磁式脱扣器进行保护。

特殊的触头材料的使用保证了它很长的使用寿命并提供了一个很高的安全水平以防止触头的熔焊。

*N 系列*小型断路器由于超快的触头分开速度和灭弧室中的快速灭弧可以保证在故障发生时对流经的电流进行有效的限制作用。因此，总的来说小型断路器允通 I^2t 值要远低于能量限制等级 3 的规定值，根据 DIN VDE 0641 第 11 部分标准仅为 50%。这就保证了与上级的保护设备形成了良好的选择性。

Functional design, mode of operation

MCBs of the *N System* operate using a delayed overcurrent/time-dependent thermal trip (thermal bimetal) for low overcurrents and an instantaneous electromagnetic trip for higher overload and short-circuit currents.

The special contact materials used assure a long service life and offer a high level of safety against contact welding.

MCBs of the *N System* significantly limit the let-through current when a fault occurs due to the ultra-fast contact separation and the quick quenching of the emergency arc in the arc-chamber.

Thus, generally, they fall below the permissible limiting I^2t values of energy limiting class 3, specified in DIN VDE 0641 Part 11 by 50%. This guarantees excellent selectivity with the upstream protective devices.

特点

- 根据 IEC 898 标准，额定分断能力高达 10kA
- 极好的限流作用和选择性
- 脱扣特性为 A, B, C, D
- 采用机械卡装的快速附件安装
- 组合型接线端子可同时连接汇流排和馈线电缆
- 根据 DIN VDE 0660 第 107 部分标准同时具有隔离功能 (5SP4)
- 根据 EN 60 204 同时具有主开关功能 (5SP4)
- 独立的开关位置指示器 (5SP4)
- 根据 DIN VDE 01 006 第 100 部分标准可防止手指和手背触电

Features

- High rated short-circuit capacity up to 10000 A according to IEC 898
- Excellent current limiting and selectivity
- Tripping characteristics A, B, C and D
- Add-on accessories quick mounting using snap-on mechanism
- Combined terminal allows busbar and feeder cable to be simultaneously connected
- Disconnector characteristics according to DIN VDE 0660 Part 107 (5SP4)
- Main switch characteristics according to EN 60 204 (5SP4)
- Separate switch position indicator (5SP4)
- Safe from finger touch and safe from touch by the back of the hand acc. to DIN VDE 01 006 Part 100

- 采用插入导向孔可快速、方便地引入接线端子
- Insertion guide for fast and easy access to the terminal

- 手柄锁定装置可有效防止未经许可的操作
- Handle locking device effectively prevents unauthorised operation of the handle

技术数据 Technical description

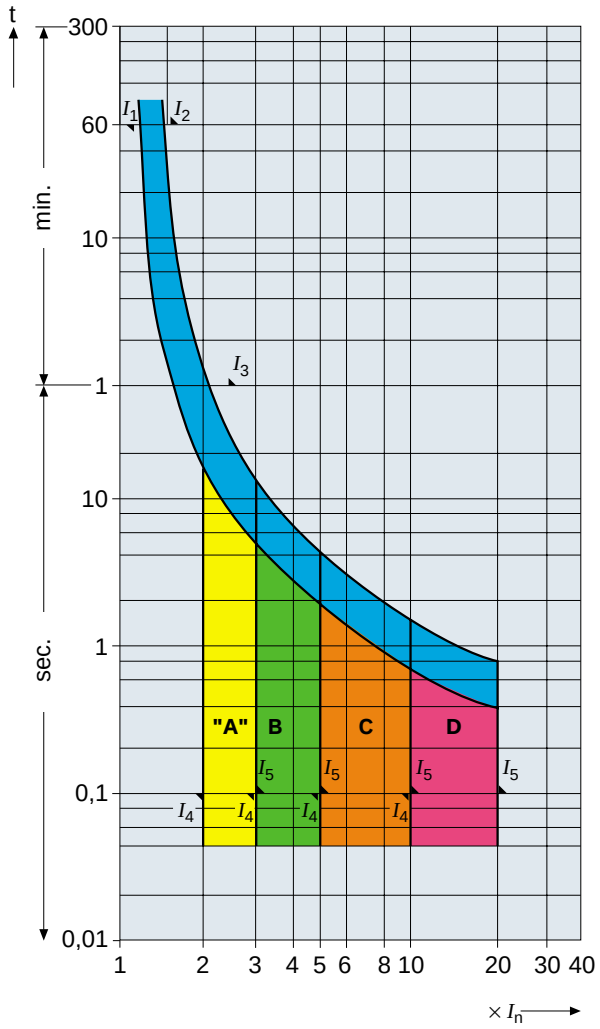
脱扣特性 30°C 室温时的脱扣特性
Tripping characteristics Tripping performance at a 30°C ambient temperature

符合标准 Standards	脱扣特性 Tripping characteristics	热力脱扣测试电流低测试电流 Thermal release Test currents low test current I_1	高测试电流 High test current I_2	脱扣时间 63A ≤ In ≤ 125A Tripping time 63A ≤ In ≤ 125A t		电磁脱扣测试电流保持 Electromagnetic release Test currents hold I_4	最迟脱扣 Trips latest at I_5	脱扣时间 Tripping time t
IEC 898/EN 60898 DIN VDE 0641 第 11部分 IEC 898/EN 60898 DIN VDE 0641 Part 11	A	1.13 x I_n		>1h	>2h	2 x I_n		≥ 0.1s
			1.45 x I_n	<1h	<2h		3 x I_n	< 0.1s
	B	1.13 x I_n		>1h	>2h	3 x I_n		≥ 0.1s
			1.45 x I_n	<1h	<2h		5 x I_n	< 0.1s
	C	1.13 x I_n		>1h	>2h	5 x I_n		≥ 0.1s
			1.45 x I_n	<1h	<2h		10 x I_n	< 0.1s
	D	1.13 x I_n		>1h	>2h	10 x I_n		≥ 0.1s
			1.45 x I_n	<1h	<2h		20 x I_n	< 0.1s

在其它运行温度，每 10 度的温度差，延迟脱扣电流的变化大约为 5%，并且在低于 30°C 时增加，高于 30°C 时减少。
At other operating temperatures, the currents of the delayed tripping change by approximately 5% for each 10K temperature difference, and more specifically they increase for lower and decrease for higher temperatures than 30°C .

对于 DC (直流)，瞬时脱扣极限电流以系数 1.2 增加。
For DC, the limit currents of the instantaneous release increase by a factor 1.2

小型断路器脱扣特性
Miniature circuit-breaker tripping characteristics



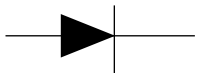
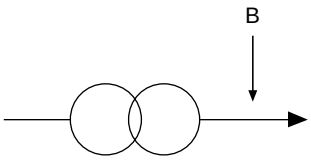
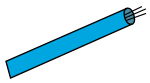
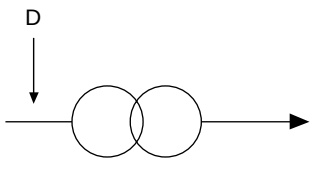
		A	B	C	D
t	I_1 (t ≥1h)	1,13 × I_n	1,13 × I_n	1,13 × I_n	1,13 × I_n
	I_2 (t <1h)	1,45 × I_n	1,45 × I_n	1,45 × I_n	1,45 × I_n
m	I_4 (t ≥ 0,1s)	2 × I_n	3 × I_n	5 × I_n	10 × I_n
	I_5 (t < 0,1s)	3 × I_n	5 × I_n	10 × I_n	20 × I_n

t = 热脱扣
t = thermal tripping
m = 磁脱扣
m = magnetic tripping

交流 — 电流 / 时间特性带 I_4 / I_5 极限值在直流时提高 1.2 倍

技术数据 Technical data

小型断路器脱扣特性的选择
Selection of miniature circuit-breakers vs. tripping characteristics

脱扣特性 Tripping characteristics	小型断路器 Miniature circuit-breakers	小型断路器脱扣特性简述 Description of the tripping characteristics of the miniature circuit-breakers	应用范围 Application type
A	5SX2	特性 A 用于需要快速 (无延时) 脱扣的小型断路器使用场合，亦即用于较低的故障电流值 (通常是额定电流 I_n[1]的 2~3 倍), 以限制 I^2t 值和总的分断时间。该特性允许用一个小型断路器来替代熔断器作为电子元器件的过电流保护。 Characteristic A must be used when instantaneous (non-delayed) tripping of the circuit-breaker is desired,even for low value default currents of 2 to 3 I_n [1], to limit the I^2t and total breaking time. This characteristic allows limited protecting the electronic components against overcurrents by using a circuit-breaker instead of a fuse.	 半导体设备保护 Protection of semiconductor devices
B	5SQ35 5SX2 5SX4 5SX5 5SP4	特性 B 用于需要较快速度脱扣且短路电流不是很大的小型断路器使用场合。相比较特性 A，特性 B 允许通过的峰值电流 < 3 I_n Characteristic B generally allows obtaining instantaneous tripping of the circuit-breaker for not very high short-circuit currents. Contrary to characteristic A, characteristic B allows applying loads with relatively low peak currents < 3 I_n.	 变压器二次线路的保护 Protection of transformer secondary circuits
C	5SQ35 5SX1 5SX2 5SX4 5SX5 5SP4	特性 C 适用于大部分的电气回路，它允许负载通过较高的短时峰值电流而小型断路器不动作，事实上特性 C 允许通过的峰值电流最大可达 5 倍的额定电流值 (5 I_n)。 Characteristic C is the most used because it is suitable for practically all electrical circuits; it allows applying loads having high peak currents without requiring the circuit-breaker to be oversized. In fact, thanks to this characteristic, it is possible to apply loads with peak currents up to 5 I_n.	 一般电气回路的保护 Protection of electrical circuits in general
D	5SX2 5SP4	特性 D 被推荐用于很高的峰值电流 (<10I_n) 的开关设备。例如，它可以用于变压器的一次线路和电磁阀等的保护。 Characteristic D is recommended for switchgear having particularly high peak currents < 10 I_n. It is suitable, for example, for transformer primary circuits and solenoid valves.	 变压器一次线路的保护 Protection of transformer primary circuits

[1] I_n = 小型断路器的额定电流值。
I_n = the circuit breaker's rated current.

小型断路器是限制型断路器，因为它们预测脱扣时间是如此的迅速以致在很大程度上不仅限制了短路峰值电流(图 1.6), 而且限制了通过的能量 I^2t。

额定工作电压(U_e)

断路器的额定工作电压是由告知性能的制造商指配的电压值(尤其是短路性能)。

不同的额定电压和不同的额定短路能力可指配给相同的断路器。

所有小型断路器都是为预见到交流电流和直流电流的功能性而设计的。

在交流电流方面，小型断路器可用于额定电压可达 240/415V 且频率不同于 50/60Hz 的电网中以及用于各配电系统中：TT，TN，IT。

关于交流电流的功能性，所有小型断路器均标有新的正常额定电压值即230/400V, 这是考虑到已公布的新的配电额定电压而作出的，该电压按照欧洲标准被确定为 230/400V。

现有电网的额定电压即 220/380V 和 240/415V 应朝着 230/400V 的额定值发展。

就直流方面的功能性而言，所有小型断路器都可分别用于电压可达120V ⎓的电路中以便用两个保护极实现双极执行以及用于电压可达60V ⎓ IP+N 和 IP 的执行。

针对高压, 5SX5系列提供了在220V ⎓1P和440V ⎓ 2P 条件下使用的可能性。

额定电流 I_n

额定电流是由制造商指配的并由断路器预定在指定参考环境温度时在不间断工作中承载的电流值。

按照 CEI 23-3/4[a] 版本标准，小型断路器的参考环境温度为30°C。如果在安装断路器地点的环境温度高于或低于30°C, 则应在该温度时借助正确校正的系数对断路器的额定电流进行测量。对于小型断路器来说，温度每增加或减少 10°C, 额定铭牌上标注的额定电流值将分别减少或增加 5%。

小型断路器的额定电流覆盖范围在 0.3A 到 125A 之间，具体数值如下：

0.3, 0.5, 1, 1.6, 2, 3, 4, 6, 8, 10, 13, 16, 20, 25, 32, 40, 50, 63, 80, 100, 125A。

针对 5SP4 系列，小型断路器因此能控制的相应最大功率在 cosφ = 1 时为 86.5 kW。

脱扣特性 A, B, C, D

小型断路器具有一系列范围广泛的且正确定义的脱扣特性，以满足设备的任何要求：对变压器上的电子元件进行保护。

这些脱扣特性分别标明了A, B, C, D 四个字母并适用于 30°C 的参考环境温度。

反时限脱扣区即热继电器脱扣区对所有这四个特性都是相同的：常规脱扣电流I_t等于1.45I_n, 而常规非脱扣电流 I_{nf} 为 1.13 I_n。

不过，A, B, C, D 四个不同特性之间的差异在于界定瞬时脱扣(磁性脱扣)区的数值不同。

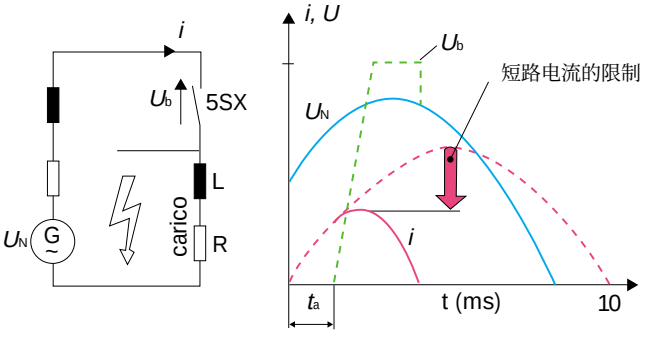
我们可从第 1/7 页注意到，这四个脱扣特性覆盖的瞬时脱扣区域在2I_n和 20I_n之间。

小型断路器瞬时脱扣区 B，C，D

规定的脱扣特性B，C，D 分别具有各自瞬时脱扣区的极限值，如图 1.2 所示。

我们可始终从上图注意到，由于结构公差值最小以及电磁脱扣器的校准更精确，因而使得小型断路器的瞬时脱扣区的极限更具有限制性。

小型断路器由此具有的优点便是更好地承受住了设施的起动电流，尤其是 当决定采用特性C 或 D 时更是如此。



U_n - 电网电压
I_{cc} - 假设的短路电流
U_b - 电弧电压
i - 短路限制电流
t_a - 触点间隙延时

图 1.1　感应电路限制，对于小型断路器来说带有故障电流限制

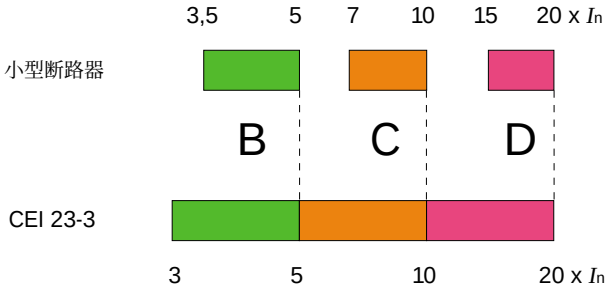


图 1.2　小型断路器的瞬时脱扣区 B，C，D 与 CEI 23-3 标准中规定的进行比较

The miniature circuit breakers N are the circuit breakers of limitative type since they foresee the time of tripping so briefly as to limit considerably not only the peak values of short circuit current (Fig. 1.6), but also the passing specific energy I^2t.

Rated operating voltages (U_e)

The rated operating voltage of a circuit breaker is the value of voltage assigned by the constructor, to whom the performances are reported (in particular the performance in short circuit).
At the same circuit breaker, different rated voltages and different rated short circuit capabilities can be assigned.
All the automatic circuit breakers N are foreseen for the functionality not only in alternating current, but also in direct current.
In alternating current, the circuit breakers N can be used in networks with rated voltages up to 240/415V for frequencies also different from 50/60 Hz and in each distribution system: TT, TN, IT.
In relation to the functionality in alternating current, all the circuit breakers N are marked with the new normal values of rated voltage of 230/400V, considering the published new rated voltage of distribution of electric energy fixed at 230/400V at European level.
The rated voltage of the existing networks at 220/380V and 240/415V should develop toward the rated value of 230/400V.
As far as the functionality in direct current is concerned, all the automatic circuit breakers N can be used in circuits up to 120V DC for the bipolar executions with two protected poles and 60V DC for the executions 1P+N and IP.
For high voltages, the Series 5SX5 offers the possibility of use up to 220V ⎓ 1P, 440V ⎓ 2P.

Rated currents I_n

The rated current is the value of current assigned by the constructor, which the circuit breaker is destined to carry in uninterrupted service at a reference ambient temperature specified.
The reference ambient temperature for the automatic circuit breakers that comply with the Standard CEI 23-3/4ª Edition is 30°C. If the ambient temperature where the circuit breaker is installed is higher or lower than 30°C, the rated current of the circuit breaker should be measured at such temperature by means of proper corrective coefficients. For the circuit breakers N, the values of rated currents indicated in nameplate decrease or increase by 5% respectively for each increase or decrease of temperature by 10°C.
The rated currents of the circuit breakers N cover a field included between 0.3 and 125A, the maximum value laid down in the Standard CEI 23-3/4ª Edition, and to be more precise, the values are:
0.3, 0.5, 1, 1.6, 2, 3, 4, 6, 8, 10, 13, 16, 20, 25, 32, 40, 50, 63, 80, 100, 125A.
The corresponding maximum power that the circuit breakers N can therefore control is 86.5 kW at cos φ = 1 with the Series 5SP4.

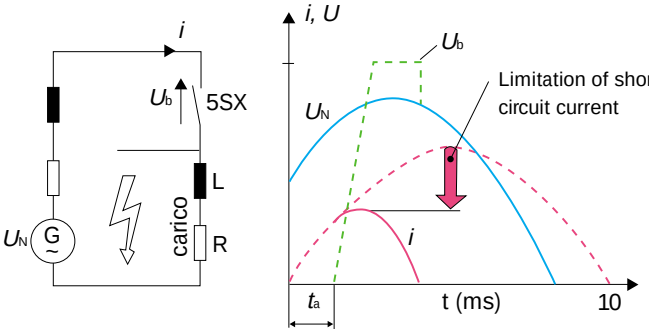
The characteristics of tripping A, B, C, D

The automatic circuit breakers N have a wide range of characteristics of tripping properly defined to satisfy any requirement of unit: protection of electronic units located at transformers.
These characteristics of tripping are marked respectively by the letters A, B, C, D and have the reference ambient temperature 30∞C in accordance with the Standard CEI 23-3/4ª Edition.
The zone of tripping at inverse time, thermal relay tripping, is the same for all the four characteristics: the conventional tripping current I_f is equal to 1.45 I_n, while the conventional non-tripping current I_{nf} is 1.13 I_n.
The difference among the different characteristics A, B, C, D consists however in the different values that delimit the zone of instantaneous tripping (magnetic tripping).
As we may note from page 1/7, the four tripping characteristics cover a field of instantaneous tripping included between 2 I_n and 20 I_n.

The zones B, C, D of instantaneous tripping of the automatic circuit breakers N

The characteristics of tripping B, C, D defined in the Standard CEI 23-3 have the limit values of the respective zones of instantaneous tripping, as indicated in Fig. 1.2.
As we may note always from the above figure, the limits of the zones of instantaneous tripping of the circuit breakers N, thanks to the minimum values of constructive tolerances and to a more precise calibration of the electromagnetic release, turn out to be more restrictive: in particular, the values 3 I_n, 5 I_n and 10 I_n of the Standard CEI 23-3 become 3.5 I_n, 7 I_n and 15 I_n.

The advantage that is offered consequently by the automatic circuit breakers N is to withstand better the starting current of the utilities, in particular when it is decided to use the characteristic C or D.



U_n - Voltage of network
I_{cc} - Presumed short circuit current
U_b - Arc voltage
i - Limited short circuit current
t_a - Delay time of contact gap

Fig. 1.1 Tripping of an inductive circuit with limitation of fault current on the part of a circuit breaker N

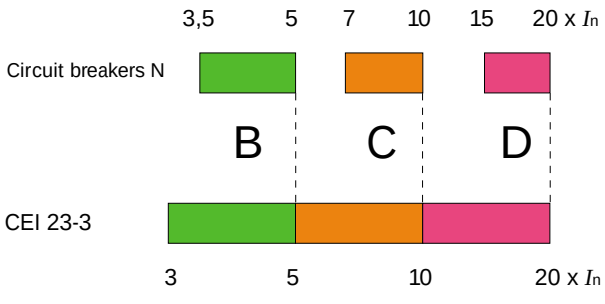


Fig. 1.2 Fields of instantaneous tripping B, C, D of the automatic circuit breakers N in comparison to those defined in the Standard CEI 23-3.

小型断路器的脱扣特性 A，B，C，D 的优点

对于所有脱扣特性来说，为确保防过载而在断路器和电缆之间进行的配合是通过采用以下单独关系式来实现的：

$$I_b \le I_n \le I_z$$

I_b - 工作电流

I_n - 断路器的额定电流

I_z - 导线载流量

A、B、C、D 四区覆盖的广泛瞬时脱扣区域可使小型断路器适用于最多样化的应用类型：对变压器上的电子元件进行保护。

由于在定义 A、B、C、D 这四个特性上实现了均匀性(相同参考环境温度，相同热特性)以及各瞬时脱扣区不存在叠加情况，从而有助于选择最适合所需应用类型的特性。

瞬时脱扣区已按照标准规定在很大程度被涵盖，从而针对高起动电流实现了电荷插入。

额定短路能力和有效最大短路能力

短路能力(关合和脱扣)是假设的交流电流分量值，以其有效值表示，并且该值可由断路器针对其在指定条件下的开断和中断时间进行确定并承载。

不同系列的各种N型断路器的特点是具有三种短路能力：

- 额定短路能力，参见 EN 60898 标准
- 有效最大短路能力，始终参见EN 60898标准。
- 有效最大短路能力，参见EN 60947-2 (IEC 947-2)标准。

各种短路能力将按照在已确定的额定电压时不同极性的执行情况而在以后提及。该额定电压可能为：

1P	230/400V~
2P	230 or 400V~
1P+N	230V~
3P, 3P+N	400V~

在断路器额定铭牌上标注的额定短路能力将由在上述标准中规定的其中一个正常值表示。符合 EN 60898 标准的额定短路能力应标注在额定铭牌上，长方形内为安培单位，并且无测量单位符号。

不过，小型断路器的有效最大短路能力显示假设的短路电流最大值，该电流可由小型断路器有效中断。

我们注意到，该短路能力通常随着断路器本身额定电流的减少而增加。

通过能量值 I^2t

小型断路器的功能通常是防止电导体和电气设备不受热应力和动应力。断路器执行该任务越有效，它就越有能力限制比能 I^2t，即所知的焦耳积分或通过能量。在过电流开始时刻至断路器所有极内全部灭弧时刻之间将对该积分进行鉴定。

$$E_{sp} = \int_{t_o}^{t_f} i^2 dt$$

E_{sp} = specific energy (A^2s)

特别是，与有效电流 I_{cc} 的正弦曲线半波有关的通过能量等于：

$$E_{sp} = \frac{I^2_{cc}}{100}$$

I_{cc} = 100A E_{sp} = 100A^2s

The advantages of characteristics A, B, C, D of the automatic circuit breakers N

For all the characteristics of tripping, the coordination between circuit breaker and cable to ensure the protection against overload is executed by applying the single relation:

$$I_b \le I_n \le I_z$$

I_b – Operating current

I_n – Rated current of the circuit breaker

I_z – Capacity of cable

The ample zone of instantaneous tripping covered by the set of the fields A, B, C, D allows the use of the circuit breakers N for the most diversified applied typologies: the protection of electronic units located at transformers.

The homogeneity with which the four characteristics A, B, C, D have been defined (same reference ambient temperature, same thermal characteristic) and absence of superposition of the individual fields of instantaneous tripping facilitate the selection of characteristic most suitable for the required type of application.

The zones of instantaneous tripping have been largely contained as prescribed in the standard to allow the insertion of charges with the elevated starting currents.

The capability of rated short circuit and of real effective maximum short circuit

The capability of short circuit (closing and tripping) is the value of the presumed alternating current component, expressed in its effective value, which the circuit breaker is in a position to decide and carry for its time of opening and interruption under specified conditions.

Each automatic circuit breaker N of the different series is characterized by having three capabilities of short circuit:

- The rated capability of short circuit, refer to the Standard EN 60898 (CEI 23-3/4 [a] Edition)
- The effective maximum capability of short circuit, refer always to the Standard EN 60898.
- The effective maximum capability of short circuit, refer to the Standard EN 60947-2 (IEC 947-2).

Each capability of short circuit is later referred according to the different polar executions at a well determined rated voltage that can be:

1P	230/400V~
2P	230 or 400V~
1P+N	230V~
3P, 3P+N	400V~

The rated capability of short circuit, which is one that is indicated on the nameplate of the circuit breaker, as prescribed in the Standard CEI 23-3/4[a] Edition, is represented by a normal value among those defined in the above standard. The rated capability of short circuit as per EN 60898 should be indicated in nameplate, in ampere in a rectangular and without the symbol of measurement unit.

The effective maximum capability of short circuit of the automatic circuit breakers N shows however the presumed maximum value of short circuit current, which the automatic circuit breakers are effectively in a position to interrupt. As we may note such capability of short circuit in general increases with the decrease of the rated current of the circuit breaker itself.

Passing specific energy I^2t

The function of an automatic circuit breaker is in general to prevent electric conductors and electric units from thermal and dynamic stresses. More effectively a circuit breaker performs such task, more capably it limits the specific energy I^2t, known as the integral of Joule or passing energy. Such integral is appraised between the moment of beginning of overcurrent and the moment at which there is the complete arc extinction in all the poles of the circuit breaker.

$$E_{sp} = \int_{t_o}^{t_f} i^2 dt$$

E_{sp} = specific energy (A^2s)

In particular, the passing energy related to a sinusoidal semiwave of current of effective value I_{cc} equals to:

$$E_{sp} = \frac{I^2_{cc}}{100}$$

For I_{cc} = 100 A E_{sp} = 100 A^2s

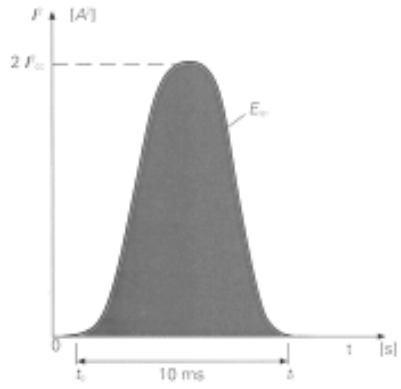


图 1.3 与带有正弦曲线运动的电流半波以及与最大电流$\sqrt{2}\ I_{cc}$的半波相关的通过比能

Fig. 1.3 Passing specific energy related to a semiwave of current with sinusoidal movement and of maximum value $\sqrt{2}\ I_{cc}$.

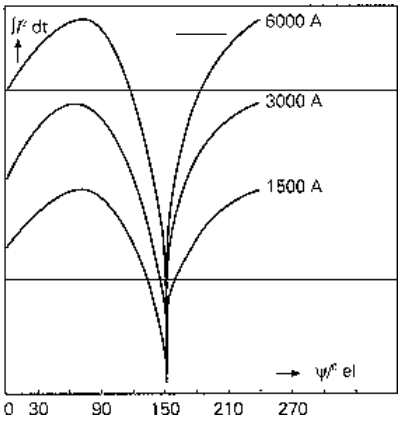


图 1.4 按照与电压波相关的插入角度 Y 通过小型断路器的比能的运动

Fig. 1.4 Movement of the specific energy let through an automatic circuit breaker according to the angle of insertionY related to the voltage wave

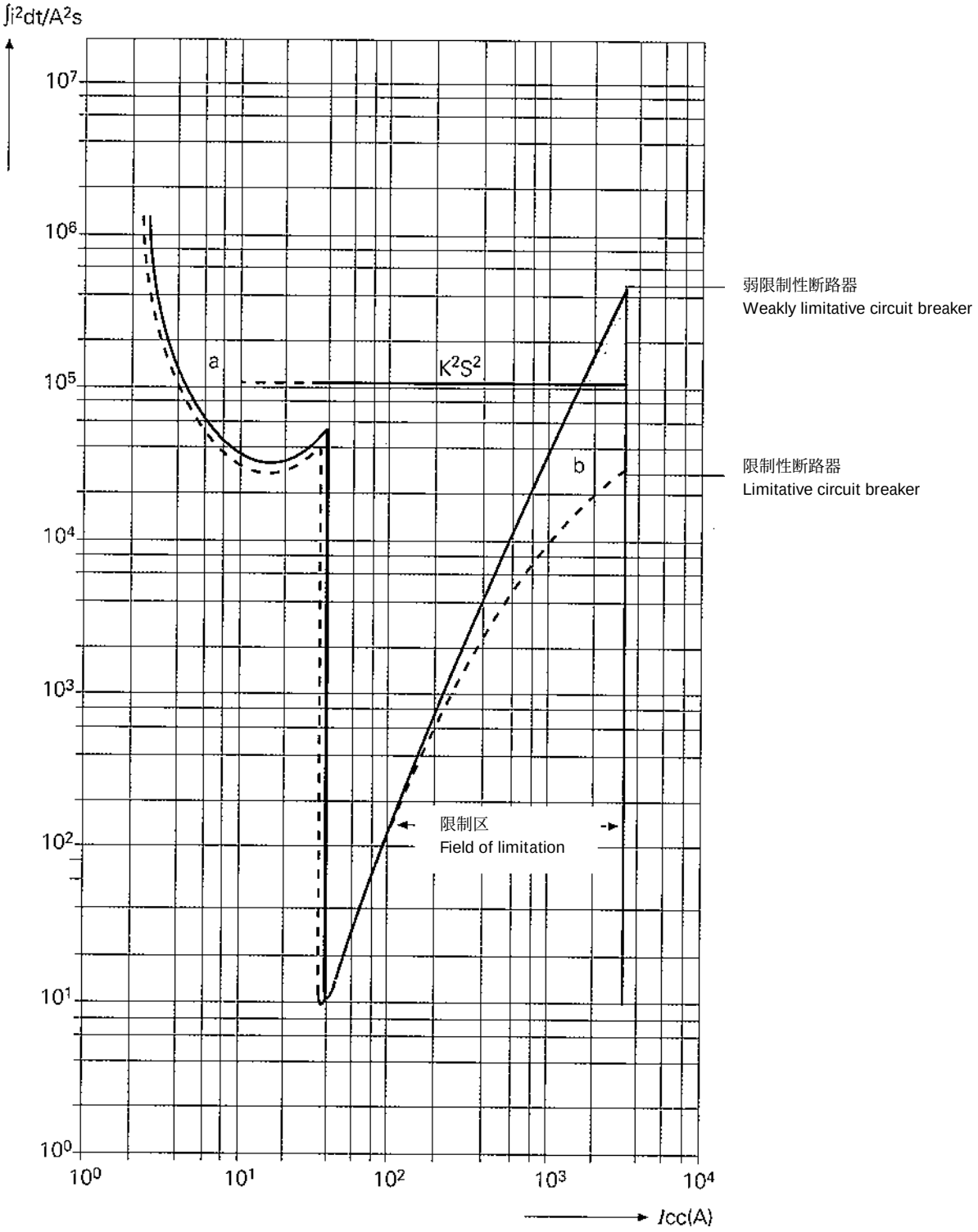


图 1.5 小型断路器的 I^2t 特性
Fig. 1.5 Characteristic I^2t of an miniature circuit breaker

特性 I^2t

曲线或特性 I^2t 显示按照假设短路电流通过小型断路器的最大能量(I^2t)的变化。

每个特性I^2t均是由两个曲线段组成：第一段(a)涉及热脱扣器(双金属)且凹度朝上旋转，而第二段(b)涉及电磁脱扣器且凹度朝下旋转。

该第二曲线段决定断路器短路性能的质量：对于确定的假设电流值来说，通过的 I^2t 值越小，电缆上和其他操作设备上的热效应或动效应就越大。

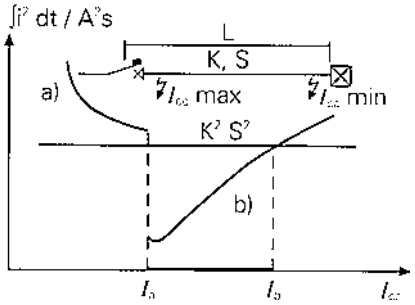


图 1.6　通过小型断路器使导体防短路：S 部分的导体将具有防短路能力，如果下列关系满足的话：$I^2t \le k^2 S^2$.

Fig. 16　Protection of a conductor against the short circuits through an miniature circuit breaker as per the Standard CEI 64-8: the conductor of section S turns out to be protected against the short circuit currents if the following relation is satisfied: $I^2t \le k^2 S^2$.

特性 I^2t 和 EN 60898 标准 - 有限能量等级

符合CEI 23-3/4[a]版本(EN 60898)标准的小型断路器的曲线I^2t应按照该标准中的规定，应清晰地注明在制造商的产品目录中。

另外，如果小型断路器也按照限流进行分类，通过能量 I^2t 始终按照EN 60898标准中规定的数量被涵盖在方框形内的限制等级编号(1，2或3)应与脱扣特性一起被相应注明在额定铭牌上，作为分断能力的一种补充。

例如，符号 6000/3 表示一个额定分断能力为6000A 和保护等级为 3 的断路器，该等级是EN 60898 标准中规定的三种等级中最严格的等级。

因此，这将为设计者和安装者都带来一个很大的好处就是能使其在了解限制等级的同时，还能读到断路器额定铭牌上的这些数据，因为这些数据将最直接地显示断路器在出现有关导体和选择性保护方面的短路时所能提供的性能。

断路器5SX2 6000/3 和5SX4 10000/3 由于将最大值限制到与I^2t的限制等级3有关数值的一半以下，从而为电子设备防过电流提供最大的安全可靠性(图 1.7)。

The characteristics I^2t

The curves or characteristics I^2t show the movement of the passing maximum specific energy (I^2t) let through the automatic circuit breakers according to the presumed short circuit current.

Each single characteristic I^2t is composed of two curvilinear segments: the first segment (a), with concavity turned upward, is related to the thermal release (bimetallic), while the second segment (b), with concavity turned downward, is related to the electromagnetic release.

This second curve segment is one that defines the quality of the performances on short circuit of the circuit breaker: the lower the value of let-through I^2t for a determined value of the presumed current is, the higher the limitation of thermal or dynamic effects on the cables and on the other operating units will be.

The characteristics I^2t and the Standard EN 60898 – classes of limited energy

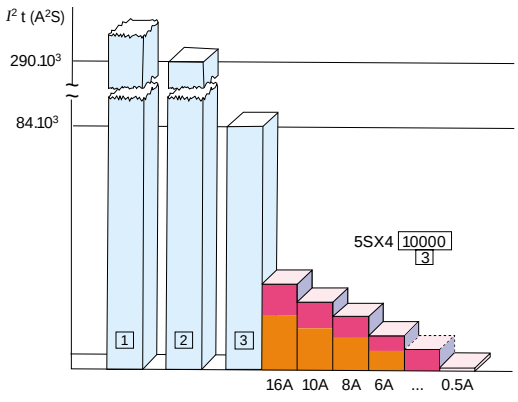
The curves I^2t of the automatic circuit breakers complying with the Standard CEI 23-3/4 [a] Edition (EN 60898) should be clearly reported in the catalogs of the manufacturers, as specified in the standard itself.

In addition, if the circuit breakers are classified also according to the limits, inside which their characteristics I^2t are contained always in conformity with quantity specified in the Standard EN 60898, the number of class of limitation (1, 2 or 3) put in a square should be correspondingly clearly indicated in nameplate, in addition to the capability of tripping.

The symbol 6000/3 defines, for example, a circuit breaker with a rated capability of tripping of 6000 A and with a class of limitation 3, the most severe among the three classes defined in the Standard EN 60898.

Therefore, this brings a great benefit for the designer and installer to read such data on nameplate of the circuit breaker, while understand the class of limitation, since such data have a first and immediate indication on the type of performance that the circuit breaker is in a position to offer in case of short circuit with reference to the protection of conductor and to selectivity.

The circuit breakers 5SX2 6000/3 and 5SX4 10000/3 limiting the maximum values to values even lower than half of values related to the class of limitation 3 of I^2t offer the amplest guarantee of security in the protection of electric units against overcurrent (Fig. 17)

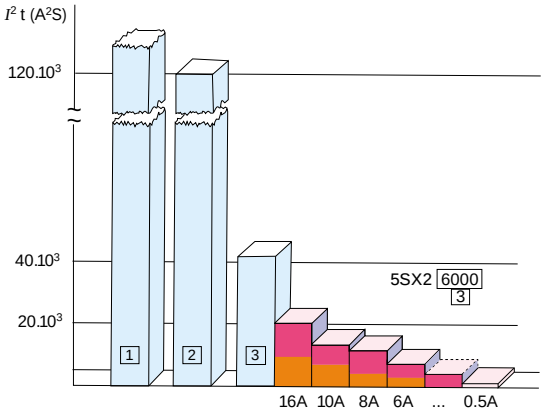


□ 符合 EN 60898 标准的通过能量 I^2t 的限制等级：脱扣特性 C; P. I. n. = 10000A; $I_n \le 16A$; ■1P; 1P+N, 3P, 3P+N; ■2P (230V~)

□ Class of limitation of the passing specific energy I^2t as per EN 60898: characteristic of tripping C; P. I. n. = 10000A; $I_n \le 16A$; ■1P; 1P+N, 3P, 3P+N; ■2P (230V~)

图 1.7a 通过断路器 5SX4 的 I^2t 值

Fig. 17a Values of I^2t let through the circuit breakers 5SX4.



□ 符合 EN 60898 标准的通过能量 I^2t 的限制等级：脱扣特性 C; P. I. n. = 6000A; $I_n \le 16A$; ■1P; 1P+N, 3P, 3P+N; ■ 2P (230V~)

□ Class of limitation of the passing specific energy I^2t as per EN 60898: characteristic of tripping C; P. I. n. = 6000A; $I_n \le 16A$; 1P; ■1P+N, 3P, 3P+N; ■2P (230V~)

图 1.7b 型断路器 5SX2 的 I^2t 值

Fig. 17b Values of I^2t let through the circuit breakers 5SX2.

小型断路器和另一防短路设备(小型断路器或熔断器)之间在短路条件下的配合

选择性和后备保护

“ 配合 ” 一词包含了对脱扣选择性和保护支持(后备)两方面的考虑。为确保实现一确定类型的配合, 有必要考虑两个串联设备的单独特性以及其相关性能。

与小型断路器的动态选择性

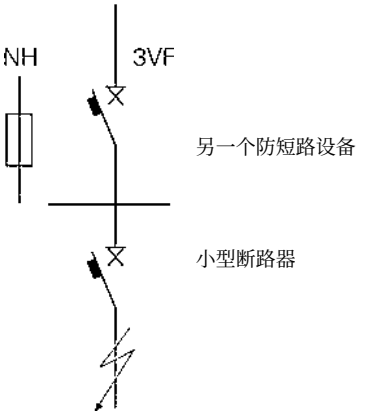


图 1.8　与小型断路器在短路条件下的配合

在防过电流设备之间的脱扣选择性(过电流选择性)

当防过电流设备采用串联布置时并且当实际情况需要这样做时, 它们的功能性特性应按照下述方式选择, 即出现故障时, 只有设备中出现故障的部分将与电源隔离, 也就是说, 选择性应加以确保(CEI 64-8 标准第 536.1 条)。

必须要求选择性的实际情况例如涉及安全工作用的电源电路(CEI 64-8 第563.4 条); 在表演和娱乐等公开场所中的电气设备应具有单独的防过电流能力, 其中这些场所中有公众进入的地方应设有固定插座, 并且电路的保护设备和分区应能够应付紧急情况的发生(CEI 64-8 新标准第 752 节)。

完全选择性

过电流的选择性是在下列情况时被成为“ 完全选择性 ”, 即当有两个防过电流设备串联时, 电荷侧的保护设备(下游)执行保护, 而对于可检验的任何过电流值来说, 不会导致另一个上游设备脱扣。

部分选择性

反之, 过电流选择性在下列情况下被称为“ 部分选择性 ”, 即当电荷侧的保护设备(下游)执行保护能力达到过电流的给定水平时, 不会导致另一上游设备的脱扣。

小型断路器之间的选择性

分类

在检查两个串联的小型断路器之间脱扣选择性方面, 可定义下列四种类型的选择性：

1) *电流测定选择性*, 即用于电流阶跃, 有关瞬时过电流脱扣器调整的备忘录可获得, 如果可调整的话, 或者由 CEI 23-3/4[a] E 版本标准规定的脱扣特性 B, C, D 的类型被更改。
2) *时间测定选择性*, 即用于时间阶跃[1], 有关带有延时的脱扣器的脱扣时间的备忘录可获得, 这与过电流无关。
3) *区域选择性*, 可借助微处理器实现并且当期望保持脱扣快速性时使用。
4) *动态选择性*, 仅能借助电荷侧的限制性断路器获得, 因此可使用小型断路器实现。

小型断路器的动态选择性

我们可从图 1.10 观察到, 动态选择性呈现高值形式, 无需特意使电源侧断路器(上游)的脱扣延时。这将带来的优点就是减少设备在故障时的应力以及节省该设备某些部件的尺寸。

因此, 通过使用电流限制, 或更确切地说是通过采用下游的 N 型断路器, 可确保在高的短路电流时也能实现与上游断路器之间的选择性。

在这种情况下, 实际上, 有选择性保证的短路电流极限值(图1.9)比上游断路器的瞬时脱扣值要大得多。一旦下游的断路器不具有限制性时, 上游断路器的瞬时脱扣值也将与选择性极限值相对应。

在“ 小型断路器的技术数据 ” 部分中, 下游的小型断路器和上游的3VF之间的选择性数值将以表格形式列出。

熔断器和小型断路器之间的选择性

如果电源侧的保护设备是熔断器(图 1.17), 则与电荷侧各小型断路器之间的选择性数值可通过将小型断路器的I^2t曲线叠加到熔断器燃弧曲线并以图形方式获得。

上述曲线的交叉点决定了组合选择性的极限值, 因为针对上游熔断器, 断路器的选择性将按照电流值予以保证, 因此, 通过断路器的 I^2t 值低于熔断器的预燃弧的 I^2t 值。

支持(后备)保护

在选择防短路设备方面, 该设备应响应的两个条件的其中之一便是在其安装点处, 脱扣能力不应低于假设的短路电流。

然而, 一个具有低脱扣能力的保护设备是允许使用的, 条件是应在上游安装一个具有必要脱扣能力的设备。

在这种情况下, 该两个设备的特性应采用下列方式进行配合, 即通过能量将不超过可予以支持的能量, 而不会对下游设备以及由这些设备所保护的导管造成损坏, 也就是说支持(备用)保护应予以保证(CEI 64-8 新标准第 434.3.1 条)。

在“ 小型断路器的技术数据 ” 部分中, 小型断路器和3VF断路器之间的备用数值将以表格形式列出。

1)　不适用于符合 CEI 23-3/4[a] 版本(EN 60898)标准的小型断路器

Coordination under the conditions of short circuit between miniature circuit breakers and another device of protection against the short circuits (miniature circuit breaker or fuse)

Selectivity and back up
The term coordination includes considerations both on the selectivity of tripping and on the protection of support (back-up). To ensure a determined type of coordination, it is necessary to take into account the single characteristic of both units connected in series and also their associated behavior.

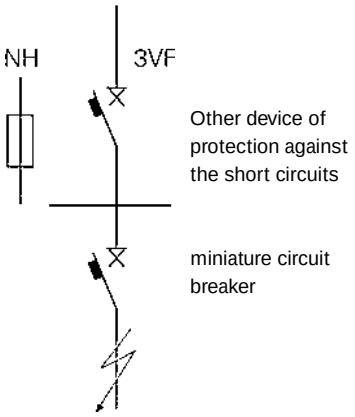


Fig. 18 Coordination under conditions of short circuit with miniature circuit breaker.

Selectivity of tripping among devices of protection against the overcurrents (selectivity of overcurrent)
When the devices of protection of overcurrent are arranged in series and when the necessities of practice require this, their characteristics of functionality should be selected in such a way that, in case of fault, only the part of unit in which the fault is found would be separated from power supply, namely that the selectivity should be guaranteed (Art. 5361, CEI 64-8).
Situations of practice that require obligatorily the selectivity are for example those that concern the power supply circuits for services of security (Art 563.4, CEI 64-8); the electric units at the public places of spectacle and entertainment where it is required the fixed receptacles are located in the places where the public can enter, should possess a single protection against the overcurrents, and in general the devices of protection and the subdivision of circuits should be such as to prevent the occurrence of panic (Section 752, new Standard CEI 64-8).

Total selectivity
The selectivity of overcurrent is called the total when there are two devices of protection of overcurrent in series, the device of protection at charge side (downstream) performs the protection without causing the tripping of the other device located upstream for any value of overcurrent that can be verified.

Partial selectivity
Vice versa, the selectivity of overcurrent is called the partial when the device of protection at charge side (downstream) performs the protection up to a given level of overcurrent, without causing the tripping of the other device upstream.

Selectivity among miniature circuit breakers
Classification
In examining the selectivity of tripping between two miniature circuit breakers connected in series, it is possible to define four types of selectivity:
1) *The amperometric selectivity* or for steps of current, obtainable agenda on adjustment of releases of instantaneous overcurrent, if adjustable, or the changed type of tripping characteristics B, C, D, defined by the Standard CEI 23-3/4ª Edition.
2) *The chronometric selectivity* or for steps of time[1)], obtainable agenda on the times of tripping of releases with delay independent from overcurrent.
3) *The selectivity of zone*, realizable through the use of microprocessors and utilized when it is desired to maintain also the rapidity of tripping.
4) *The dynamic selectivity*, obtainable only through the use of limitative circuit breakers at charge side and therefore realizable with the miniature Circuit Breakers.

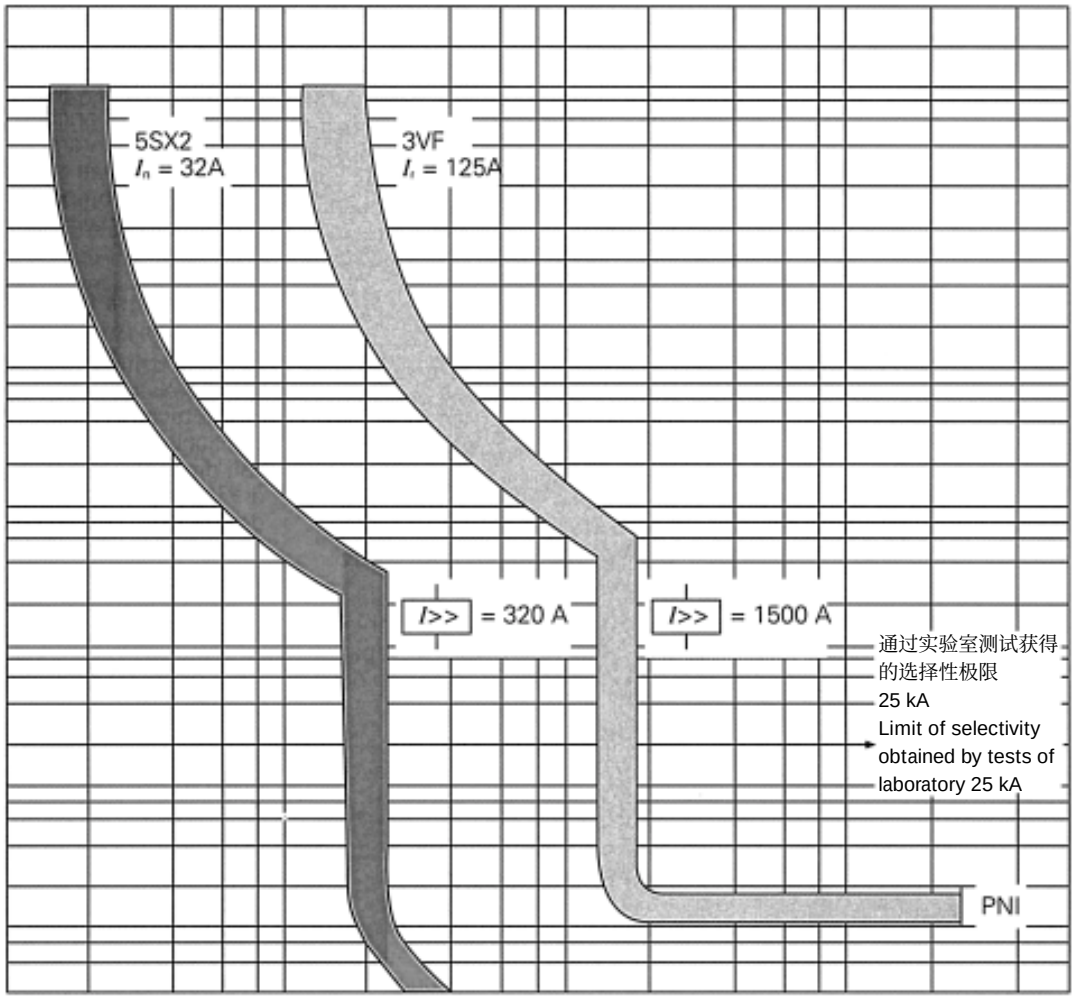
Dynamic selectivity with the miniature circuit breakers
As we may observe from Fig. 110, the dynamic selectivity assumes high values without the necessity of delaying intentionally the tripping of the circuit breaker at power supply side (upstream). This brings about the advantage of the reduction of stresses at unit in case of fault and the saving of dimensions of some of its components.
Therefore, through the use of the limitation of current or to be more precise through the use of the circuit breakers downstream, it is possible to guarantee the selectivity with the circuit breaker upstream also for high short circuit current.
In this case, in fact, the limit value of the short circuit current for which the selectivity is guaranteed (Figure 1.9) is much more higher than the value of instantaneous tripping of the circuit breaker upstream that would correspond also to the limit value of selectivity in the event that the circuit breaker downstream would not be limitative.
In the Part "Technical data of miniature circuit breakers," the values of selectivity between the miniature circuit breakers downstream and 3VF upstream are reported in the tabular form.

Selectivity between fuses and miniature circuit breakers
If the device of protection at power supply side is a fuse (Fig. 117), the values of selectivity with the respective miniature circuit breakers at charge side can be obtained graphically, superposing the curve of I^2t of miniature circuit breaker to that of the pre-arc of the fuse.
The point of intersection of the above curves decides the limit value of selectivity of combination, since the selectivity of a circuit breaker in regard to the fuse upstream is guaranteed up to the value of current.
Therefore, the value of I^2t let through the circuit breaker is lower than the value of I^2t of pre-arc of the fuse.

Protection of support (back-up)
In selecting the device of protection against the short circuits, one of the two conditions, to which the device should respond, is that its capability of tripping should not be lower than the presumed current of short circuit at its point of installation.
Nevertheless, the use of a device of protection with low capability of tripping is admitted if another device having the necessary capability of tripping is installed upstream.
In this case, the characteristics of the two devices should be coordinated in such a way that the let through energy would not exceed the energy that can be supported without damage to the device located downstream and to the conduits protected by these devices, namely that the protection of support (back-up) should be guaranteed (new Standard CEI 64-8 Art. 434.3.1).
In the Part "Technical Data of miniature circuit breakers," the values of back-up between the miniature circuit breakers and the circuit breakers 3VF are reported in the tabular form.

1) Not applicable to the automatic circuit breakers complying with the Standard CEI 23-3/4ª Edition (EN 60898)

小型断路器的动态选择
Dynamic selectivity with the miniature circuit breakers



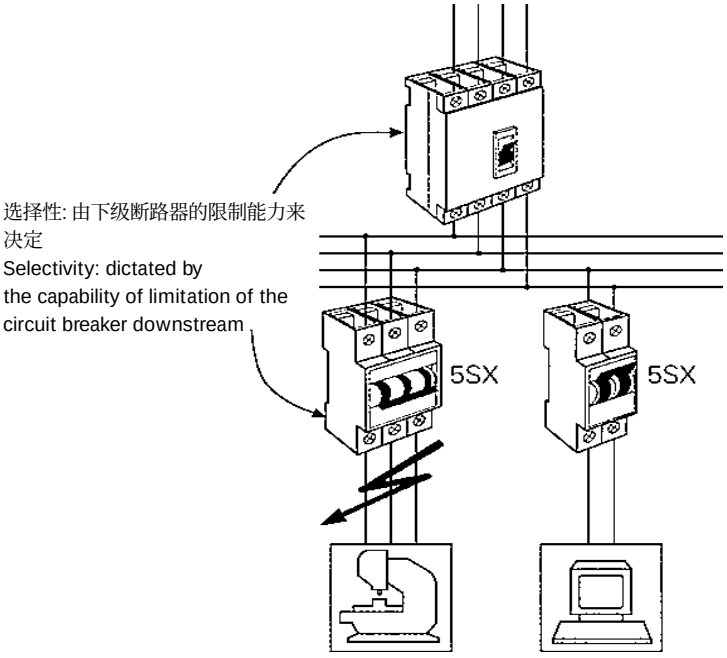


图 1.9
Fig. 1.9

小型断路器之间的选择性
Selectivity among miniature circuit breakers

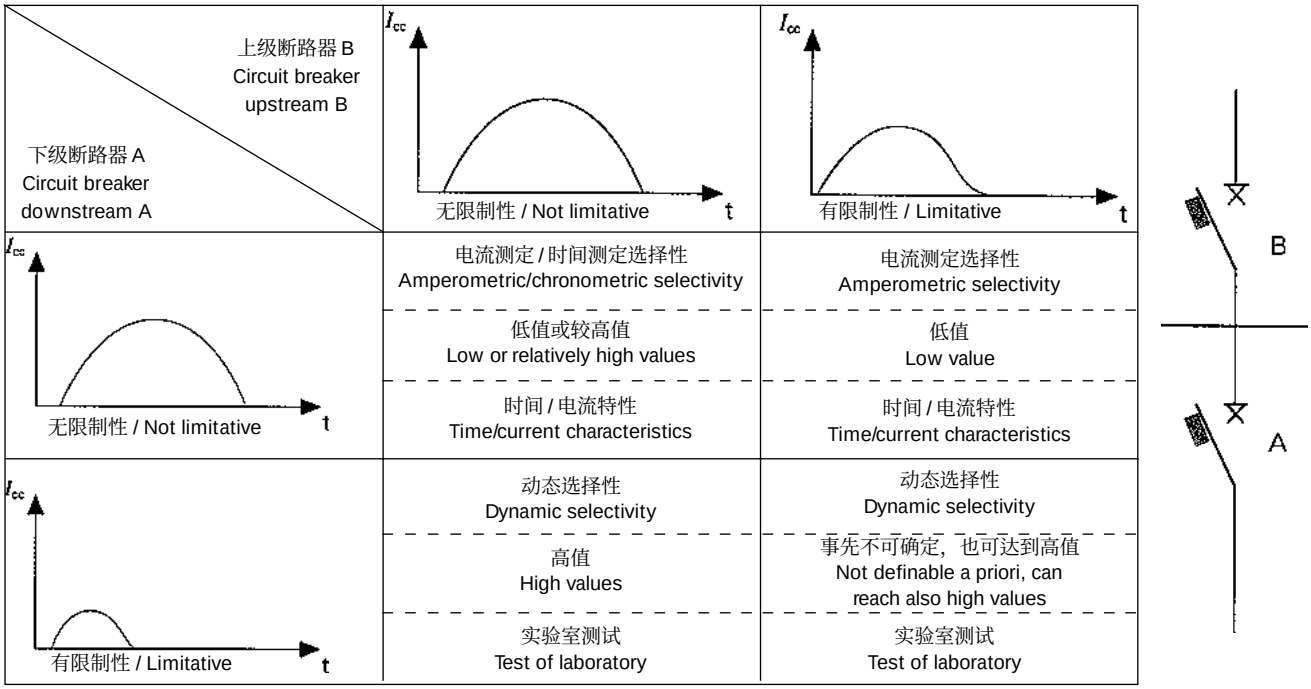


图 1.10
Fig. 1.10

熔断器和小型断路器之间的选择性
Selectivity between fuses and miniature circuit breakers

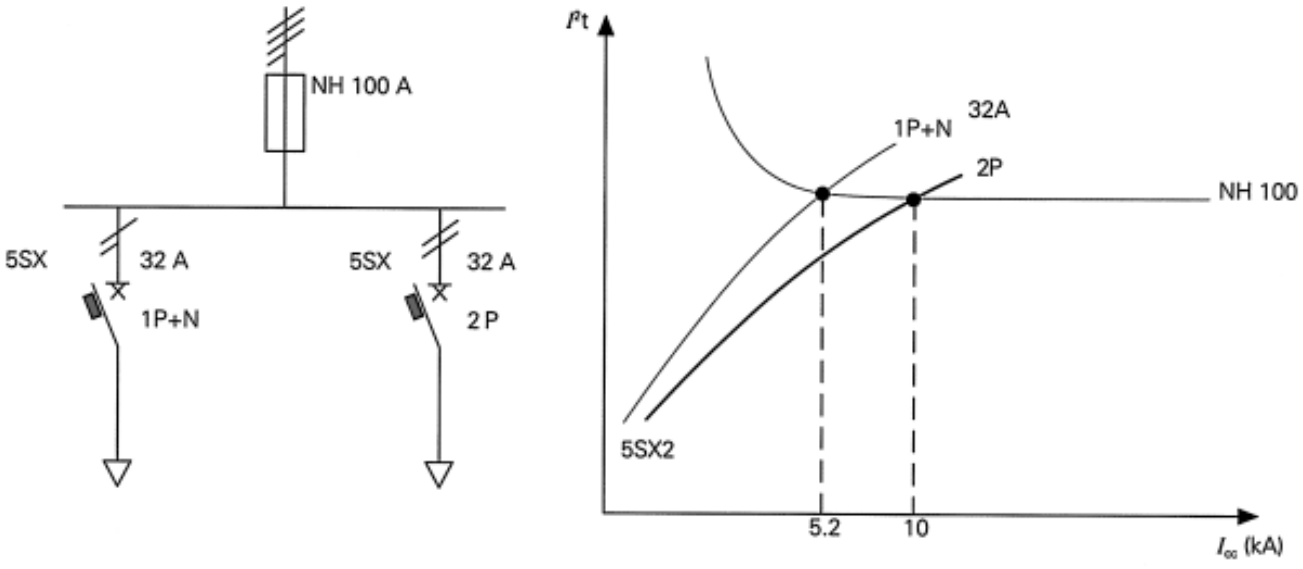
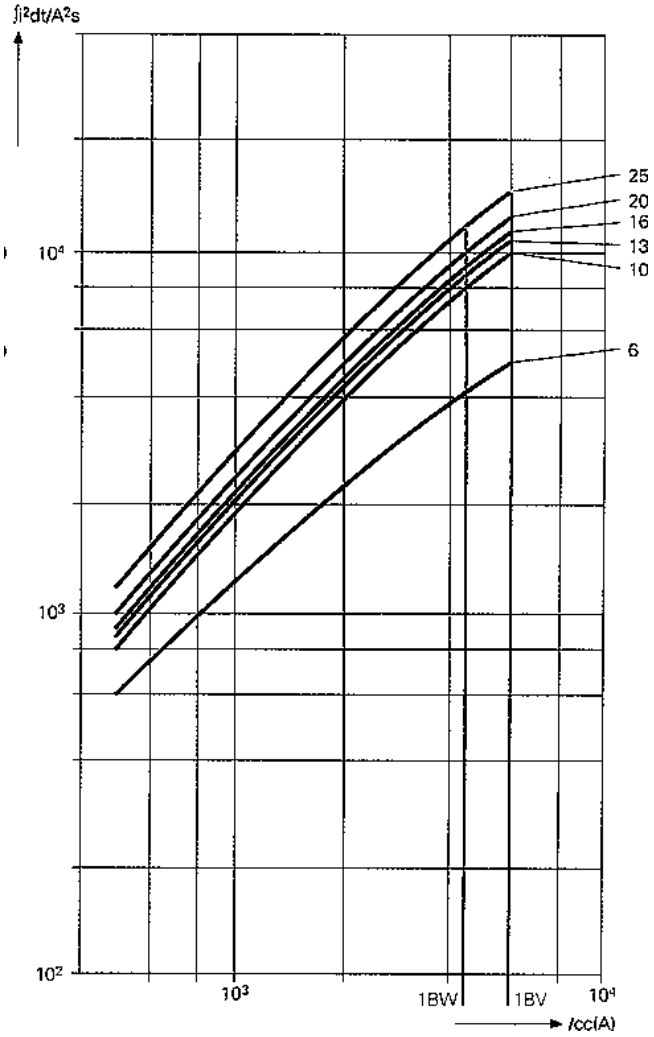


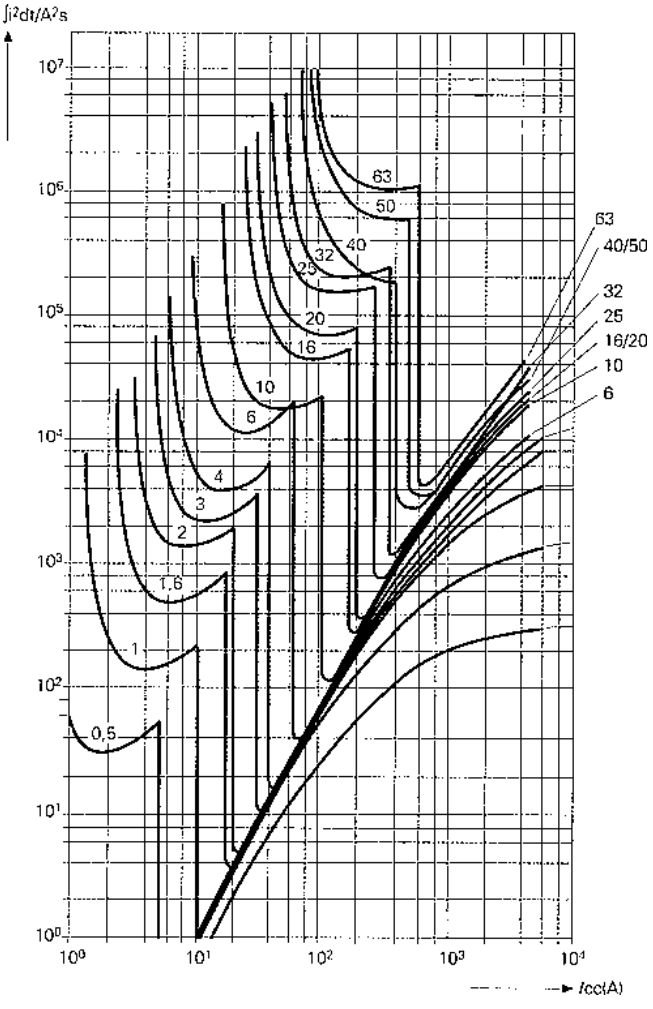
图 1.11
Fig. 1.11

I^2t 曲线 Curve I^2t

小型断路器 5SQ35 - 4500 6000
U_e 230V ~ (1P+N)
脱扣特性：C
Miniature circuit breakers 5SQ35 - 4500 6000
U_e 230V ~ (1P+N)
Tripping Characteristic: C



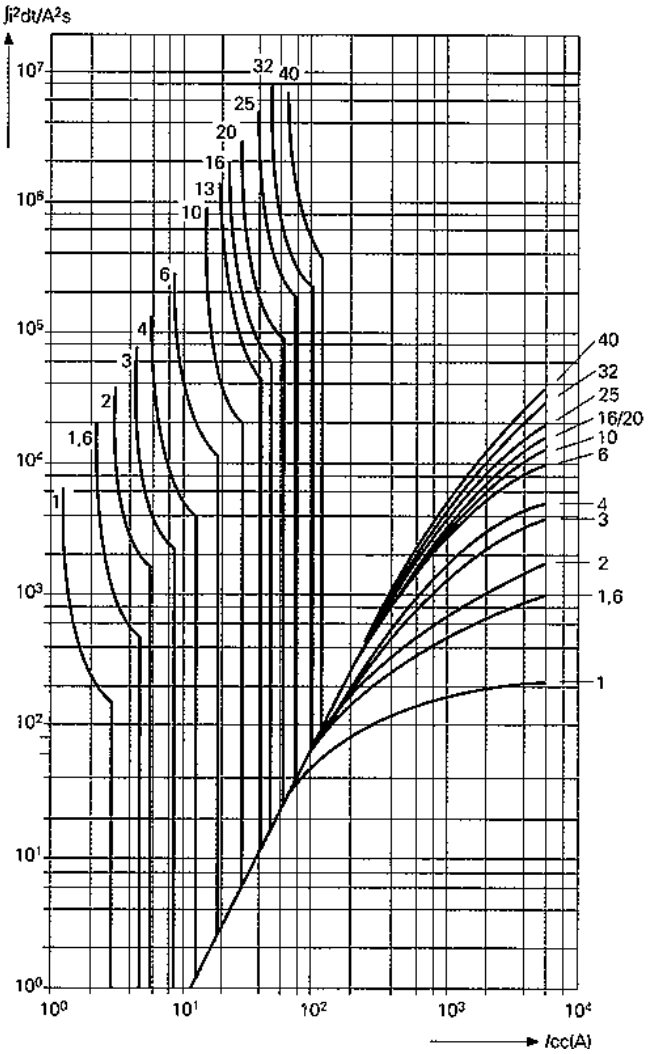
小型断路器 5SX2 - 6000
U_e 230/400V ~ (1P) –230V~(1P+N) –400V~
(2P[1)], 3P, 3P+N) cosφ0.45…1
脱扣特性：C
Miniature circuit breakers 5SX2 - 6000
U_e 230/400V ~ (1P) –230V~(1P+N) –400V~
(2P[1)], 3P, 3P+N) cosφ0.45…1
Tripping Characteristic: C



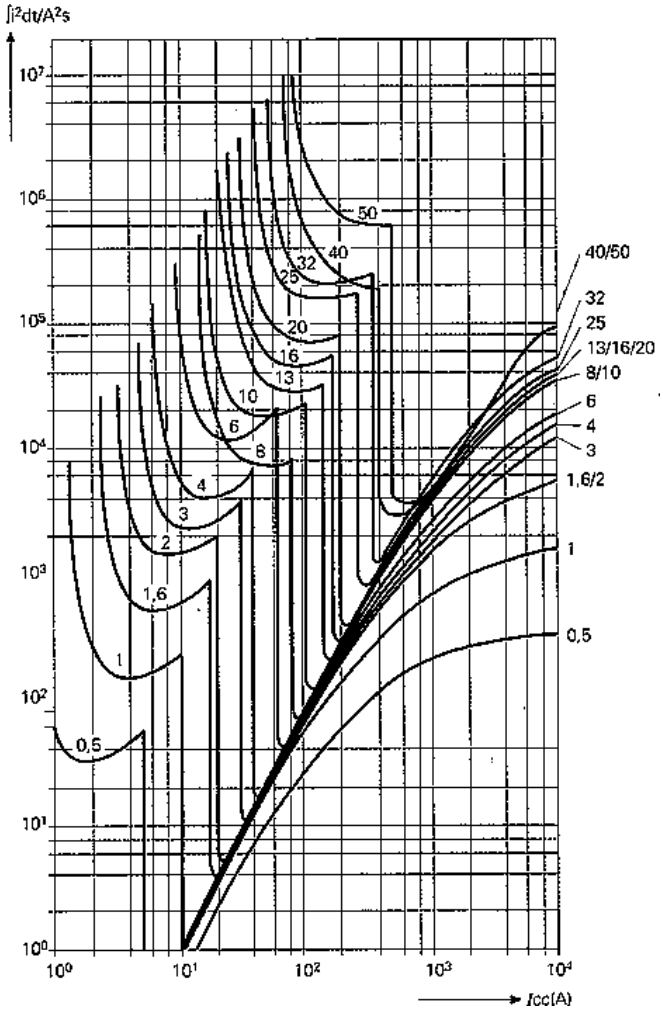
1) 为了在 230V~ 下执行 2P，与电磁脱扣器脱扣相关的传递能量进一步减少 40%。
1) For the execution 2P at 230 V~, the values of passing specific energy related to the tripping of the eletromagnetic release are further reduced by 40%.

I^2t 曲线 Curve I^2t

小型断路器 5SX2 -6000
U_e 230/400V ~ (1P) –400V~
(2P[1)], 3P) cosφ0.6…1
脱扣特性：A
Miniature circuit breakers 5SX2 -6000
U_e 230/400V ~ (1P) –400V~
(2P[1)], 3P) cosφ0.6…1
Tripping Characteristic: A



小型断路器 5SX4 -10000
U_e 230/400V ~ (1P) –230V ~ (1P+N) –400V ~
(2P[1)], 3P, 3P+N) cosφ0.45…1
脱扣特性：C
Miniature circuit breakers 5SX4 -10000
U_e 230/400V ~ (1P) –230V ~ (1P+N) –400V ~
(2P[1)], 3P, 3P+N) cosφ0.45…1
Tripping Characteristic: C

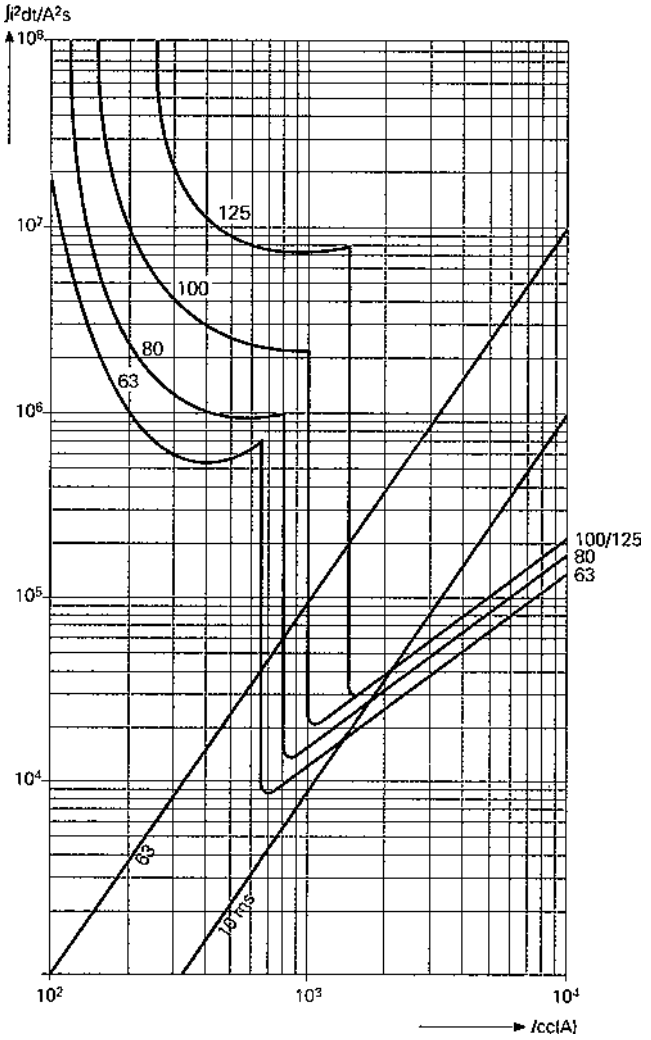


1) 为了在 230V~ 下执行 2P，与电磁脱扣器脱扣相关的传递能量进一步减少 40%。
1) For the execution 2P at 230 V~, the values of passing specific energy related to the tripping of the eletromagnetic release are further reduced by 40%.

I^2t 曲线 Curve I^2t

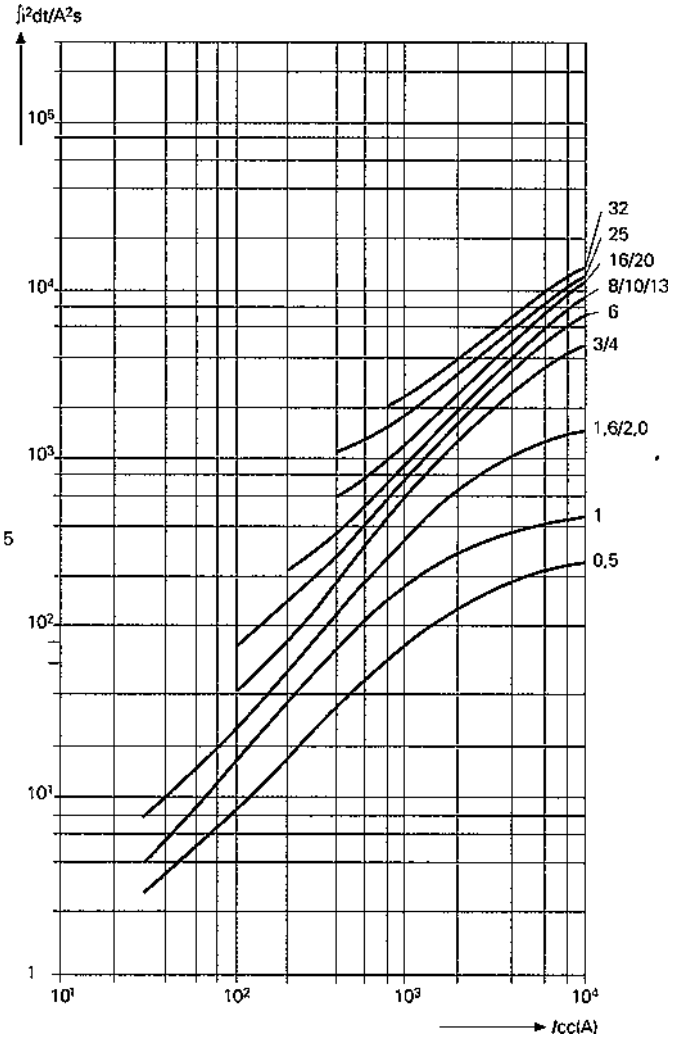
小型断路器 5SP4 - 10000
U_e 230/400V ~ (1P) –400V ~
(2P[1)], 3P, 4P) cosφ0.45…1
脱扣特性：C

Miniature circuit breakers 5SP4 - 10000
U_e 230/400V ~ (1P) –400V ~
(2P[1)], 3P, 4P) cosφ0.45…1
Tripping Characteristic: C



小型断路器 5SX5 - ⎓10000
220V ⎓(1P) - 440V ⎓(2P)τ = 4 ± 0.1ms
脱扣特性：C

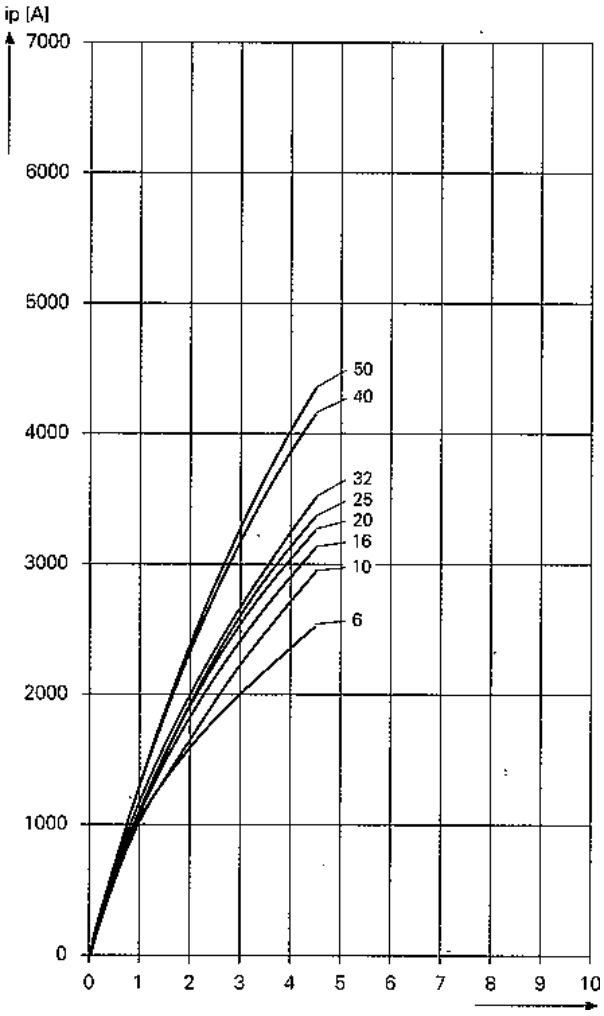
Miniature circuit breakers 5SX5 - ⎓10000
220V ⎓(1P) - 440V ⎓(2P)τ = 4 ± 0.1ms
Tripping Characteristic: C



1) 为了在 230V~ 下执行 2P，与电磁脱扣器脱扣相关的传递能量进一步减少 40%。
1) For the execution 2P at 230V~, the values of passing specific energy related to the tripping of the eletromagnetic release are further reduced by 40%.

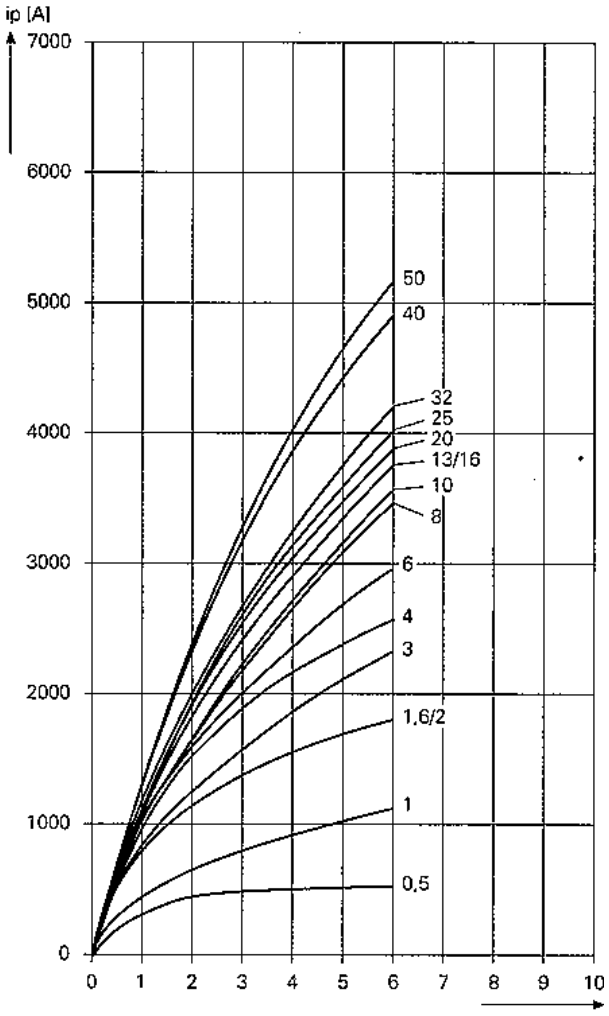
能量限制特性 Characteristics of limitation

小型断路器 5SQ3 - 4500
U_e 230/400V ~ cosφ0.45…1
脱扣特性：C
Miniature circuit breakers 5SQ3 - 4500
U_e 230/400V ~ cosφ0.45…1
Tripping Characteristic: C



预计短路电流 [kA]
Presumed current of short circuit [kA]

小型断路器 5SX2 - 6000
U_e 230/400V ~ cosφ0.45…1
脱扣特性：C
Miniature circuit breakers 5SX2 - 6000
U_e 230/400V ~ cosφ0.45…1
Tripping Characteristic: C

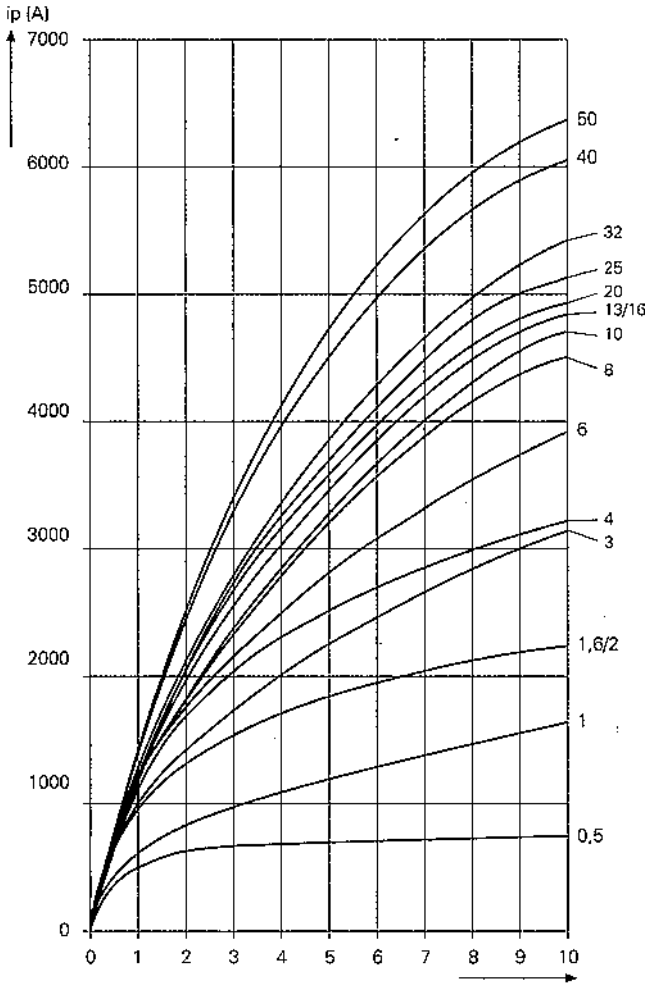


预计短路电流 [kA]
Presumed current of short circuit [kA]

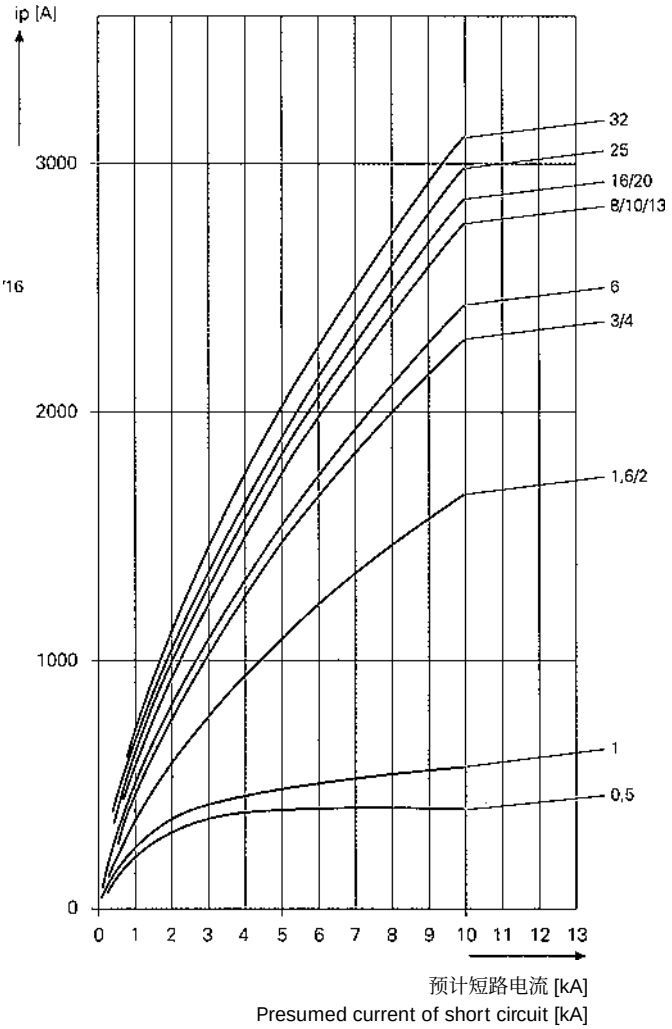
ip - 中断短路峰值电流最大值
ip - Maximum value of peak current of interrupted short circuit

能量限制特性 Characteristics of limitation

小型断路器 5SX4 - 10000
U_e 230/400V ~ cosφ0.45...1
脱扣特性：C
Miniature circuit breakers 5SX4 - 10000
U_e 230/400V ~ cosφ0.45...1
Tripping Characteristic: C



小型断路器 5SX5 - ⎓10000
U_e 220/440V⎓ τ = 4 ± 0.1ms
脱扣特性：C
Miniature circuit breakers 5SX5 - ⎓10000
U_e 220/440V⎓ τ = 4 ± 0.1ms
Tripping Characteristic: C

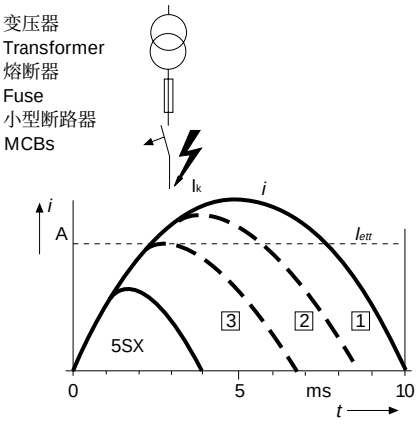


ip - 中断短路峰值电流最大值
ip - Maximum value of peak current of interrupted short circuit

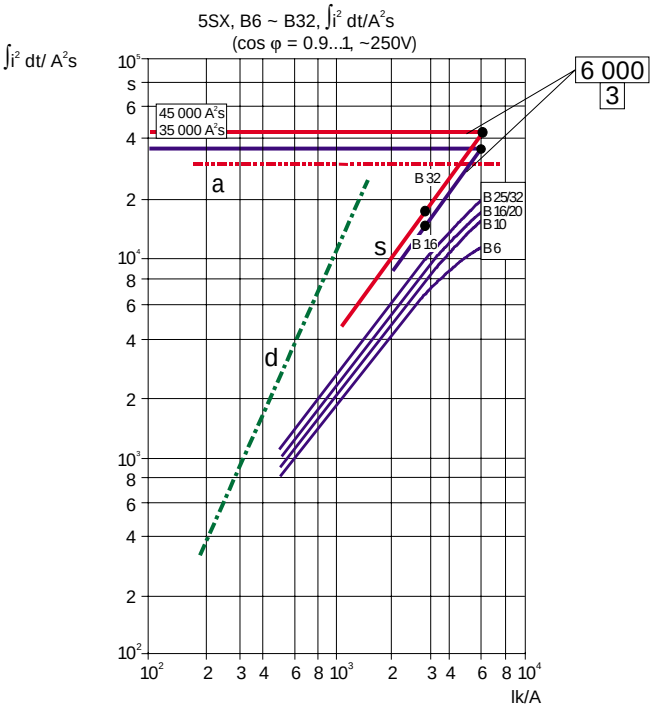
电流和能量限制作用 Current and energy limitation of miniature circuit breakers

根据 DIN VDE 0641 的要求，对小型断路器规定了下述限流等级:
1 用于一般要求 (I^2t 允许相当于一个正弦－整半波)
2 用于中等要求 (I^2t 允许相当于最大为 1/3 正弦－半波)
3 用于高要求 (I^2t 允许相当于最大为 1/10 正弦－半波)

According to DIN VDE 0641, specify the following current limitation grades for miniature circuit breakers:
1 Use for ordinary requirement (I^2t permission equate to one Sin. - Half wave)
2 Use for medium requirement (I^2t permission equate to 1/3 Sin. - Half wave)
3 Use for high requirement (I^2t permission equate to 1/10 Sin. - Half wave)



5SQ、5SX、5SP 系列小型断路器的限流作用与 3 类不同限流等级的比较
5SQ, 5SX , 5SP series MCBs current limitation and comparison with 3 different grades of energy limitation



a: 1.5mm² PVC- 绝缘导线的允许负载
s: 符合 DIN VDE 0641 第 11 部分规定的极限值
d: 未受限制的正弦半波

a: Permission load of 1.5mm² PVC-insulation cable
s: Limited value according to DIN VDE 0641 part 11
d: Sin. - Half wave without limitation

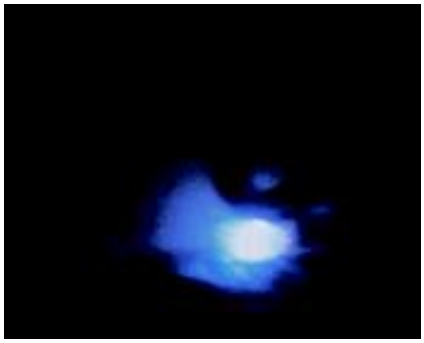
5SQ、5SX、5SP系列小型断路器的限流作用要比限流等级 3 强 50%，它带来的优点是:
- 大大限制了实际通过载流部件的短路电流
- 有效地遏制了电动力给触头系统造成损坏或变形的可能性
- 显著地减少了预期短路电流产生的热量，从而提高了线路的使用寿命

The energy limitation function of 5SQ, 5SX, 5SP series of miniature circuit breakers is 50% higher than that limitation class 3. It brings the benefits as following:
- Greatly limits the actual short-circuit current passing through load parts saving from mechanical and arc damage
- Improves electrical service life of circuit
- Improves selectivity to upstream MCCBs and Fuses for cost effective design and unnecessary clipping

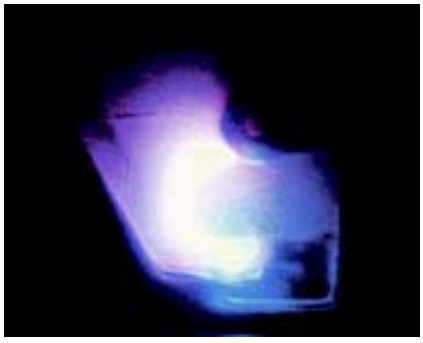
用于 B-特性的能量限制等级，符合标准 EN 60 898, DIN VDE 0641 第 11 部分
Energy limitation class use for B characteristic
EN 60 898, DIN VDE 0641 Part 11

	额定通断能力 Rated breaking capacity A	能量限制等级 /Energy limitation class 1	2	3
			$\int i^2dt_{max.}$ /A²s	
	4.500	未规定极限值 No limitation value	60.000	25.000
In	6.000		100.000	35.000
16A	10.000		240.000	70.000
16A	4.500		80.000	32.000
In	6.000		130.000	45.000
32A	10.000		310.000	90.000

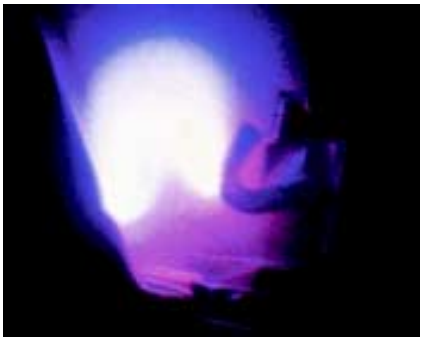
灭弧过程 Arc quench process of miniature circuit breakers



①



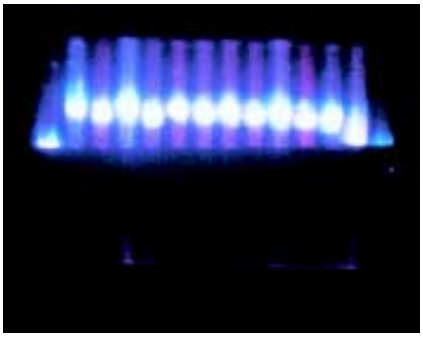
②



③

④

⑤



⑥

5SQ、5SX、5SP 系列小型断路器的触头系统是采用优质的银－石墨或银锡合金等触头材料，通过精心的设计与布置，在进行分断时，出现在断开的动静触头之间的电弧，被强行卷入由铁制栅片构成的灭弧室中，电弧能量急剧衰减，从而使出现的燃弧又迅速熄灭。

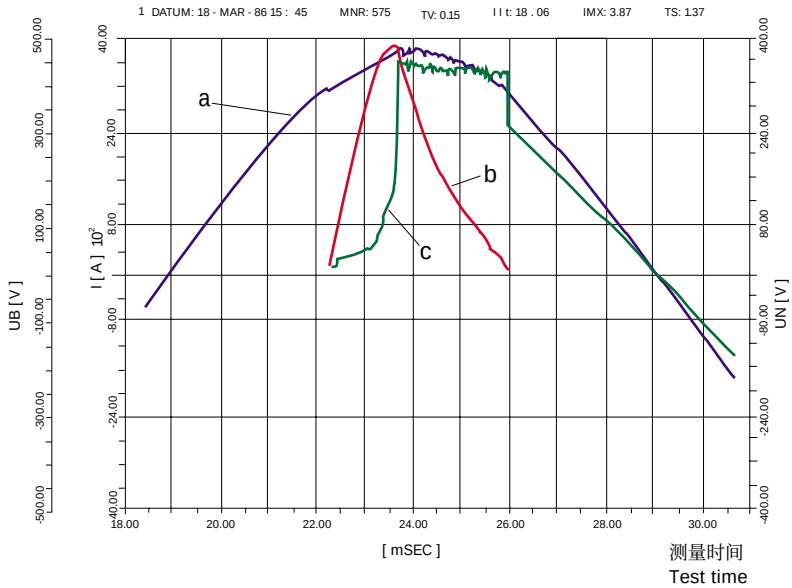
触头上几乎不残留烧损的痕迹。上图是用间隔时间为 0.5ms 高速摄影机摄下的从触头断开至电弧熄灭的过程。

5SQ, 5SX, 5SP series miniature circuit breaker contact system is made of high quality silver carbon or silver tin alloy materials. By elaborately design and arrangement, electrical arc which appears between moving and still contact is drawn into arc quenching room during tripping, the energy of the electrical arc is reduced dramatically, therefore the arc can be quenched rapidly due to very quick separation of the arc from the contacts to contacts.

There is almost nothing of trace of inflating damage left on the contacts which means they have a very long service life. The above drawing is the process of arc quenching from contact clipping to the fully quenched arc photo by 0.5ms high speed camera.

①－⑥ 为电弧熄灭过程

①－⑥ is the process of electrical arc quench

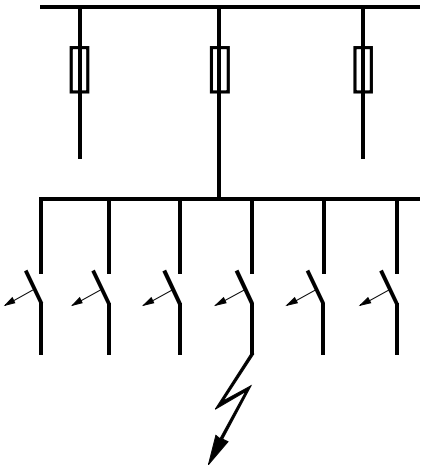


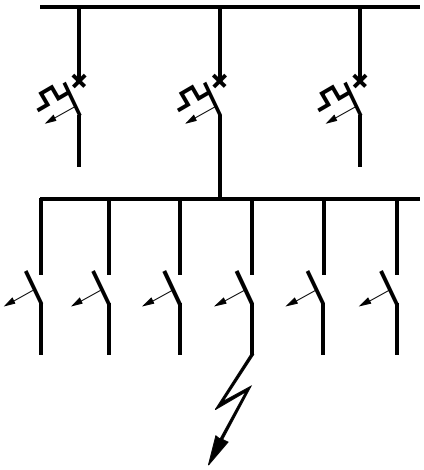
5SQ、5SX、5SP 系列小型断路器在进行高分断能力试验时摄录的示波图。

Oscilloscope graph of 5SQ, 5SX, 5SP MCB that taken when doing high breaking capacity test.

a: 线路电压 (U_N)
Supply voltage
b: 短路电流 (I)
Short-circuit current
c: 电弧电压 (U_B)
Arc voltage

选择性保护 Selectivity protection of miniature circuit breakers





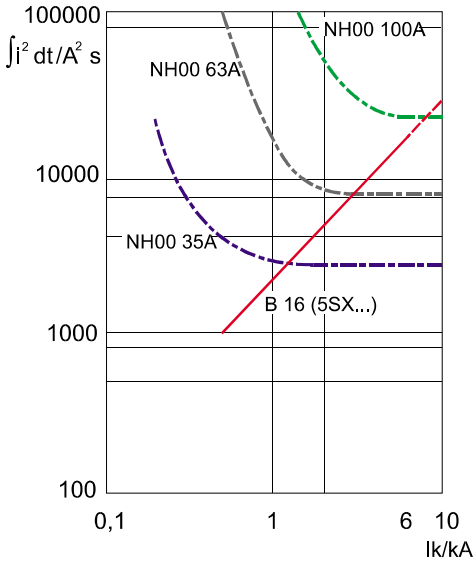
选择性

在不引起上一级保护装置动作的情况下，只断开发生故障的分支回路，则就达到了选择性保护。

Selectivity

When the fault happen, the protective devices only open the branch circuit where the fault happened, but don't open the main circuit, that is meaning selective protection.

小型断路器和熔断器之间的选择性 Selectivity between MCB and fuse



小型断路器允通－∫i²dt 曲线与熔断器熔化－∫i²dt 曲线的交点

The cross point of MCB energy let through - ∫i²dt curve and fuse melt - ∫i²dt curve

选择性极限

Limitation of selectivity

小型断路器和 NH 熔断器之间的选择性

配电网络一般都是辐射式电网结构，每当导线截面减小时就必须配置过流保护装置。因此而获得的按额定电流分级配合的串接线路就能实现“选择性”。选择性是指在发生故障时，只是最靠近故障源的保护装置进行分断，这样就能使并行的电路继续保持能量流。

当小型断路器与前接 NH 熔断器串联时，选择性范围基本上决定于小型断路器的限流能力与脱扣特性以及 NH 熔断器的熔化 I^2t-值。由此可见，不同特性与不同客定通断能力的小型断路器，其选择性范围也是不同的。

下表对短路选择性范围作出了回答，也就是说，在短路电流达到何值之前，在小型断路器和前接的符合 DIN VDE 0636 第 21 部分规定的 NH 熔断器之间仍存在着选择性。表中值的单位为 kA，它包含了极限值，并且是在不同测试条件下得到的。在实际使用中，可得到良好的值，这取决于上极选用的熔断器型号。

Selectivity, miniature circuit-breakers/NH fuses

Generally, distribution networks are configured as radial networks. An overcurrent device must be provided at each reduction of the conductor cross section. This results in a staggered cascade according to the rated current, which should, where possible, provide selectivity. Selectivity means, that in the event of a fault, only the protective device in the vicinity of the fault trips. Parallel current paths can continue to provide the necessary power.

For MCBs with NH fuses connected upstream, the selectivity limit essentially depends on the current limits and tripping characteristics of the MCB as well as the pre-arcing I^2t value of the NH fuse. Therefore MCBs with different characteristics and rated breaking capacities also have different selectivity limits.

The subsequent tables provide information regarding which selectivity is provided between MCBs and upstream NH fuses according to DIN VDE 0636 Part 21. For values, specified in kA, it involves limit values, which were determined under unfavourable test conditions. In practice, better values can be obtained, depending on the type of fuse upstream.

下级 **MCB** **Downstream MCB**		上级 **NH** 熔断器 **Upstream NH fuse**							
	I_n [A]	16A	20A	25A	35A	50A	63A	80A	100A
5SX1, 5SX2	≤ 2	0.4	0.7	2.0	•	•	•	•	•
特性 A	3	0.3	0.6	1.6	2.0	•	•	•	•
Characteristic A	4	0.3	0.6	0.9	1.6	•	•	•	•
	6	0.2	0.4	0.8	1.2	3.0	3.2	•	•
	10		0.4	0.6	1.1	2.2	3.0	•	•
	16			0.5	1.0	2.0	2.6	4.5	•
	20				1.0	2.0	2.4	4.1	•
	25					1.5	2.0	3.7	•
	32					1.2	1.8	3.0	5.0
	40						1.7	2.5	4.0
特性 B	6	0.3	0.4	0.7	1.2	3.0	3.2	•	•
Characteristic B	10		0.4	0.6	1.0	2.2	3.0	5.0	•
	13			0.5	1.0	2.2	3.0	5.0	•
	16				1.0	2.0	2.4	4.0	•
	20					2.0	2.4	4.0	•
	25						2.0	3.5	•
	32						1.7	2.9	•
	40							2.0	4.0
	50								4.0
特性 C	≤ 2	0.3	0.5	1.2	1.7	•	•	•	•
Characteristic C	3	0.3	0.4	0.8	1.4	4.0	5.0	•	•
	4	0.3	0.4	0.6	1.1	3.0	4.0	•	•
	6		0.4	0.6	1.0	2.4	3.2	•	•
	8			0.5	0.9	1.4	2.6	3.1	•
	10			0.5	0.9	1.4	2.1	3.1	•
	13				0.8	1.3	2.0	3.0	•
	16				0.8	1.3	2.0	3.0	•
	20					1.3	2.0	2.7	•
	25						2.0	2.4	5.0
	32							2.2	4.0
	40								3.5
	50								3.0
	63								3.0
特性 D	≤ 2	0.3	0.4	0.7	1.3	3.0	•	•	•
Characteristic D	3	0.3	0.4	0.7	1.2	3.0	•	•	•
	4		0.4	0.6	1.0	2.5	4.0	•	•
	6			0.5	0.9	2.0	3.0	•	•
	8				0.7	1.4	2.0	3.1	•
	10					1.4	2.0	3.1	•
	13						1.7	3.0	•
	16						1.7	3.0	•
	20							2.4	5.0
	25								5.0
	32								4.0
	40								
	50								

• ≥ 根据 IEC 898 标准，5SX1, 5SX2 分断能力为 6 000

• ≥ Rated short-circuit capacity 5SX1, 5SX2 according to IEC 898 6 000

小型断路器和 NH 熔断器的选择性
在发生短路时，5SX1/5SX2/5SX4/5SP4 小型断路器与符合 DIN VDE 0636 标准第 21 部分规定的熔断器，在达到规定值 (kA) 之前，它们相互之间存在的选择性。

Selectivity MCBs/NH fuses
In the event of a short-circuit when using the MCBs 5SX1/5SX2/5SX4/5SP4 and fuses according to DIN VDE 0636 Part 21, selectivity is provided up to the indicated values in kA.

下级 **MCB** **Downstream MCB**		上级熔断器 **Upstream fuse**								
	I_n [A]	16 A	20 A	25 A	35 A	50 A	63 A	80 A	100 A	125 A
5SX4	6	0.3	0.4	0.8	1.4	3.2	4.5	9.0	•	•
特性 B	10		0.4	0.7	1.2	2.5	3.5	5.0	•	•
Characteristic B	13			0.7	1.2	2.5	3.5	5.0	•	•
	16				1.0	2.0	2.8	4.2	9.0	•
	20				1.0	2.0	2.6	4.2	9.0	•
	25					1.7	2.2	3.7	7.0	•
	32					1.7	2.2	3.7	7.0	•
	40						1.6	2.2	4.0	6.0
	50							2.2	4.0	6.0
特性 C	≤ 2	0.3	0.5	1.5	2.0	9.0	•	•	•	•
Characteristic C	3	0.3	0.4	1.1	1.6	5.0	6.0	•	•	•
	4	0.3	0.4	0.9	1.4	3.5	5.0	9.0	•	•
	6		0.4	0.8	1.4	2.7	4.5	6.0	•	•
	8			0.6	1.2	2.2	3.5	5.0	7.0	•
	10			0.5	1.2	2.0	3.0	4.2	7.0	•
	13				1.0	1.6	2.4	3.4	6.0	•
	16				1.0	1.5	2.2	3.0	6.0	•
	20					1.3	2.2	3.0	6.0	•
	25						2.2	2.9	5.0	9.0
	32							2.4	4.0	7.0
	40							2.0	3.5	4.0
	50								3.0	4.0

• ≥ 根据 IEC 898 标准，5SX4 分断能力为 10 000
• ≥ Rated short-circuit capacity 5SX4 according to IEC 898 10 000

下级 **MCB** **Downstream MCB**		上级熔断器 **Upstream fuse**					
	I_n [A]	100 A	125 A	160 A	200 A	224 A	250 A
5SP4	40	4.2	5.7	7.5	•	•	•
特性 B	50	3.8	5.2	7.0	•	•	•
Characteristic B	63	3.4	4.7	6.5	9.5	•	•
特性 C	40	3.7	5.2	7.4	•	•	•
Characteristic C	50	3.3	4.5	6.3	•	•	•
	63	3.0	4.1	5.6	9.1	•	•
	80	2.5	3.5	5.1	7.5	9.2	•
	100		3.3	4.5	6.5	8.0	•
	125			4.5	6.5	8.0	•
Characteristic D	40	3.2	4.5	6.2	9.0	•	•
	50	2.9	4.0	5.7	8.7	•	•
	63	2.6	3.5	5.2	8.1	•	•
	80	2.3	3.3	4.6	6.9	8.1	•
	100		2.8	4.3	6.2	7.5	9.2

• ≥ 根据 IEC 898 标准，5SP4 分断能力分别为 10 000
• ≥ Rated short-circuit capacity 5SP4 according to IEC 898 10 000

技术说明 Technical description

小型断路器和 NEOZED，DIAZED 熔断器的选择性
在发生短路时，5SQ3/5SX2/5SX4 小型断路器与 NEOZED，DIAZED 熔断器，在达到规定值(kA)之前，
它们之间存在的选择性
Selectivity MCBs/NEOZED, DIAZED fuses
In the event of a short-circuit when using the MCBs 5SQ3/5SX2/5SX4 and NEOZED, DIAZED fuses, selectivity is provided up to the indicated values in kA.

下级 / Downstream	上级 / Upstream		NEOZED								DIAZED							
系列 5SQ3 型，5SX2 型，5SX4 型小型断路器 MINIATURE CIRCUIT BREAKERS 5SQ3 - 5SX2 - 5SX4	I_n (A)		16	20	25	35	50	63	80	100	16	20	25	35	50	63	80	100
特性 / Characteristic： C		P_I kA	50	50	50	50	50	50	50	50	∞	∞	70	70	70	70	70	70
			选型数值，以 kA 计 [1] / Values of selectivity in kA [1]															
	6/8		0.38	0.52	0.72	1.35	2.25	3.15	4.1	>6	0.32	0.58	0.92	1.5	2.65	4.3	5.3	>6
	10		-	0.51	1.05	1.35	2.15	3.15	4.1	>6	-	0.55	1.05	1.4	2.5	4	5.1	>6
	16		-	-	0.98	1.3	2.05	2.9	3.8	6	-	-	0.98	1.35	2.3	3.6	4.7	>6
	20		-	-	0.98	1.3	2.05	2.9	3.8	6	-	-	0.98	1.35	2.3	3.6	4.7	>6
	25		-	-	-	1.2	1.85	2.65	3.6	5.5	-	-	-	1.2	2	3	4	6
	32		-	-	-	-	1.82	2.65	3.6	5.5	-	-	-	-	2	3	4	6
	40		-	-	-	-	-	2.5	3.4	5.3	-	-	-	-	-	2.8	3.8	5.8
	50		-	-	-	-	-	2.4	3.2	5.2	-	-	-	-	-	2.6	3.6	5.6
	63	-	-	-	-	-	-	-	2.4	3.4	-	-	-	-	-	-	2.0	3.1

1) 上述选型数值是在 400V ~ 电压时测得的(230V~ 用于 1P+N，230/400V~ 用于 1P)。
对于在 230V ~ 电压下使用的双极断路器，选型由最大值保证。
The values of selectivity cited are attributed to the voltages of 400V ~ for 1P+N and 230/400V ~ for 1P).
For the bipolar circuit breakers employed at the voltages of 230V ~ , the selectivity is guaranteed by the most elevated values.

小型断路器和塑壳断路器的选择性

配电网络中有时经常不使用任何熔断器。这时就必须由一个断路器来作为上级的保护设备。在这种情况下，选择性的极限取决于小型断路器的电流峰值 $\hat{I}$ 和塑壳式断路器的脱扣电流大小。

以下表格中显示的是短路电流的大小 (kA)，根据 IEC 947-2 标准在 230V/400V AC, 50Hz 时小型断路器和上级的塑壳式断路器存在着选择性。

Selectivity MCBs/MCCBs

Distribution networks can also be configured without any fuses. In these cases, a circuit-breaker acts like an upstream protective device. In this case, the selectivity limit is dependent on the magnitude of the peak current $\hat{I}$ of the miniature circuit breaker and the tripping current of the moulded case circuit-breaker.

The following table specifies up to which short-circuit currents in kA, selectivity is provided between the MCBs and upstream MCCBs according to IEC 947-2 at 230/400 V AC, 50Hz.

下级 **MCB** **Downstream MCB**				上级 **MCCBs** **Upstream MCCBs**									
				3VU13				**3VU16**					
I_n [A]	I>> [A]	I_{cn} [kA]		10 120 10	16 190 6	20 240 6	25 300 6	10 120 100	16 192 100	25 300 100	32 384 35	40 480 35	52 600 35
				选择性极限 **[kA] 1)** **Selectivity limits [kA] 1)**									
5SX1, 5SX2, 5SX4	2	6	6		0.2	0.6	1	0.2	0.6	2.1	2.7	6	6
特性 A	10	30	6		0.2	0.3	0.4		0.3	0.6	0.6	0.9	1.2
Characteristic A	16	48	6			0.3	0.4			0.6	0.6	0.9	1.2
	32	96	6									0.8	1
	40	120	6										1
特性 B	6	30	6/10		0.2	0.3	0.4	0.2	0.3	0.7	0.7	1	1.5
Characteristic B	10	50	6/10		0.2	0.3	0.4		0.3	0.6	0.7	1	1.2
	13	65	6/10		0.2	0.2	0.3		0.2	0.6	0.6	0.8	1.2
	16	80	6/10			0.2	0.3			0.6	0.6	0.8	1.2
	20	100	6/10				0.3			0.6	0.6	0.8	1.2
	25	125	6/10								0.5	0.8	1
	32	160	6/10									0.8	1
	40	200	6/10										1
	50	250	6/10										
特性 C	0.5	5	6/10	0.2	0.3	0.4	0.6	0.2	0.4	0.8	1	1.5	4
Characteristic C	1	10	6/10	0.2	0.3	0.4	0.6	0.2	0.4	0.8	1	1.5	4
	1.5	15	6/10	0.2	0.3	0.4	0.6	0.2	0.4	0.8	1	1.5	4
	2	20	6/10	0.2	0.3	0.4	0.6	0.2	0.4	0.8	1	1.5	4
	3	30	6/10		0.2	0.2	0.4	0.2	0.2	0.6	0.7	1	1.4
	4	40	6/10		0.2	0.2	0.4	0.2	0.2	0.6	0.7	1	1.4
	6	60	6/10		0.2	0.2	0.4	0.2	0.2	0.6	0.7	1	1.4
	8	80	6/10		0.2	0.2	0.3		0.2	0.5	0.6	0.8	1.2
	10	100	6/10		0.2	0.2	0.3		0.2	0.5	0.6	0.8	1.2
	13	130	6/10		0.2	0.2	0.3		0.2	0.5	0.6	0.8	1.2
	16	160	6/10			0.2	0.3			0.5	0.6	0.8	1.2
	20	200	6/10				0.3			0.5	0.6	0.8	1.2
	25	250	6/10								0.5	0.7	1
	32	320	6/10									0.7	1
	40	400	6/10										0.8
	50	500	6/10										
特性 D	2	40	6		0.3	0.4	0.6		0.4	0.8	0.8	1.2	2.1
Characteristic D	6	120	6			0.3	0.4		0.3	0.6	0.6	0.8	1.2
	10	200	6			0.2	0.3			0.5	0.5	0.8	1
	16	320	6								0.5	0.6	1
	32	640	6										
	40	800	6										
	50	1 000	6										

1) 在 240/415 V, 50Hz 电网中，选择性极限必须下降 10%。
I>> = 脱扣电流

1) In 240/415 V, 50Hz networks, the selectivity limits must be reduced by 10%.
I>> = Tripping current.

小型断路器和塑壳式断路器的选择性
在短路情况下，小型断路器和塑壳断路器之间存在着选择性。以下数值是根据 IEC 947-2 和 DIN VDE 0660 第 101 部分所可以达到的最大值 (kA)。

Selectivity MCBs/MCCBs
Under short-circuit conditions, selectivity is provided between the MCBs and MCCBs in accordance with IEC 947-2 and DIN VDE 0660 Part 101 up to the specified values in kA.

下级 **MCB** **Downstream MCB**				上级 **MCCBs** **Upstream MCCBs** **3VF1**										
	I_n [A]	I>> [A]	I_{cn} [kA]	10 120 10	16 192 100	25 300 100	32 380 100	35 420 100	40 480 42	50 600 30	56 672 42	63 760 22	65 780 30	80 960 22
				选择性极限 **[kA]** [1] **Selectivity limits [kA]** [1]										
5SX1, 5SX2, 5SX4	2	6	6		0.2	1.1	1.5	2.6	6	6	6	6	6	6
特性 A	10	30	6			0.4	0.6	0.6	1	1.2	1.5	1.5	2.1	2.7
Characteristic A	16	48	6			0.4	0.5	0.6	1	1	1.2	1.2	1.5	2.5
	32	96	6						0.9	1	1.2	1.2	1.5	2.1
	40	120	6							0.8	1	1	1.2	1.5
特性 B	6	30	6/10	0.1	0.2	0.4	0.6	0.7	1.2	1.3	1.5	1.5	2.6	3.8
Characteristic B	10	50	6/10		0.2	0.4	0.6	0.7	1	1.2	1.2	1.2	2	3
	13	65	6/10		0.2	0.4	0.5	0.6	1	1.2	1.2	1.2	1.5	2.5
	16	80	6/10			0.4	0.5	0.6	1	1.2	1.2	1.2	1.5	2.5
	20	100	6/10			0.4	0.5	0.6	1	1.2	1.2	1.2	1.5	2.5
	25	125	6/10				0.4	0.5	0.8	1	1.2	1.2	1.5	2.1
	32	160	6/10						0.8	1	1.2	1.2	1.5	2.1
	40	200	6/10							1	1.2	1.2	1.5	1.9
	50	250	6/10									1	1.2	1.5
特性 C	0.5	5	6/10	0.2	0.3	0.6	0.8	1	3.2	3.5	4.0	4.6	6/10	6/10
Characteristic C	1	10	6/10	0.2	0.3	0.6	0.8	1	3.2	3.5	4.0	4.6	6/10	6/10
	1.5	15	6/10	0.2	0.3	0.6	0.8	1	3.2	3.5	4.0	4.6	6/10	6/10
	2	20	6/10	0.2	0.3	0.6	0.8	1	3.2	3.5	4.0	4.6	6/10	6/10
	3	30	6/10	0.1	0.2	0.4	0.6	0.7	1	1.2	1.5	1.5	2.1	3.4
	4	40	6/10	0.1	0.2	0.4	0.6	0.7	1	1.2	1.5	1.5	2.1	3.4
	6	60	6/10	0.1	0.2	0.4	0.6	0.7	1	1.2	1.5	1.5	2.1	3.4
	8	80	6/10		0.2	0.3	0.5	0.6	1	1	1.2	1.2	1.9	2.5
	10	100	6/10		0.2	0.3	0.5	0.6	1	1	1.2	1.2	1.9	2.5
	13	130	6/10		0.2	0.3	0.5	0.6	1	1	1.2	1.2	1.5	2.2
	16	160	6/10			0.3	0.5	0.6	1	1	1.2	1.2	1.5	2.2
	20	200	6/10			0.3	0.5	0.6	1	1	1.2	1.2	1.5	2.2
	25	250	6/10				0.4	0.5	0.8	0.8	1	1	1.5	1.9
	32	320	6/10						0.8	0.8	1	1	1.5	1.9
	40	400	6/10							0.8	0.8	0.8	1.2	1.5
	50	500	6/10									0.8	1.2	1.5
特性 D	2	40	6		0.3	0.5	0.7	0.8	1.5	1.5	2.0	2.3	3.6	5.3
Characteristic D	6	120	6			0.4	0.5	0.6	1	1.2	1.2	1.2	1.5	2.6
	10	200	6			0.3	0.5	0.5	0.9	1	1.2	1.2	1.5	2.2
	16	320	6				0.4	0.5	0.7	0.8	1	1	1.5	2
	32	640	6									0.8	1.2	1.5
	40	800	6											1.2
	50	1 000	6											

[1] 在 240/415V, 50Hz 电网中，选择性极限必须下降 10%。
I>> = 脱扣电流

[1] In 240/415V, 50Hz networks, the selectivity limits must be reduced by 10%.
I>> = Tripping current.

小型断路器和塑壳式断路器的选择性
在短路情况下，小型断路器和塑壳断路器之间存在着选择性。以下数值是根据 IEC 947-2 和 DIN VDE 0660 第 101 部分所可以达到的最大值 (kA)。

Selectivity MCBs/MCCBs
Under short-circuit conditions, selectivity is provided between the MCBs and MCCBs in accordance with IEC 947-2 and DIN VDE 0660 Part 101 up to the specified values in kA.

下级 **MCB** **Downstream MCB**				上级 **MCCBs** **Upstream MCCBs**												
				3VF3 可调设置 **/adjustable**						**3VF3** 固定设置 **/fixed setting**						
I_n [A]	I>> [A]	I_{cn} [kA]		50	63	80	100	125	160	50	63	80	100	125	160
				500	630	800	1 000	1 250	1 600	400	500	630	800	1 000	1 280
				40/70	40/70	40/70	40/70	40/70	40/70	40/70	40/70	40/70	40/70	40/70	40/70
				100	100	100	100	100	100	100	100	100	100	100	100
				选择性极限 **[kA]** [1] **Selectivity limits [kA]** [1]												
5SX1, 5SX2, 5SX4	2	6	6	6	6	6	6	6	6	6	6	6	6	6	6
特性 A	10	30	6	1.6	4.7	6	6	6	6	2.5	4	4.5	4.5	4.9	6
Characteristic A	16	48	6	1.4	4.7	6	6	6	6	2.3	3.7	4.4	4.4	5	6
	32	96	6	1.2	3.6	4.6	6	6	6	1.8	3	3.5	3.5	3.7	6
	40	120	6	1	2.5	3.1	6	6	6	1.5	2	2.4	2.4	2.7	3.2
特性 B	6	30	6/10	2.1	6/10	6/10	6/10	6/10	6/10	3.2	6/10	6/10	6/10	6/10	6/10
Characteristic B	10	50	6/10	1.8	6/6.6	6/10	6/10	6/10	6/10	2.5	6/6.2	6.2	6/6.2	6/6.5	6/10
	13	65	6/10	1.6	5.1	6/8.2	6/10	6/10	6/10	2.3	4.6	4.6	4.6	5.1	6/8.9
	16	80	6/10	1.6	5.1	6/8.2	6/10	6/10	6/10	2.3	4.6	4.6	4.6	5.1	6/8.9
	20	100	6/10	1.6	5.1	6/8.2	6/10	6/10	6/10	2.3	4.6	4.6	4.6	5.1	6/8.9
	25	125	6/10	1.4	3.5	4.6	5.5	6	6/10	2.1	3.4	3.3	3.4	3.7	5.2
	32	160	6/10	1.4	3.5	4.6	5.5	6	6/10	2.1	3.4	3.3	3.4	3.7	5.2
	40	200	6/10	1.3	2.4	2.8	3.3	4.5	6.7	1.8	2.3	2.4	2.4	2.5	3.6
	50	250	6/10		2.4	2.8	3.3	4.3	5.8		2.3	2.4	2.4	2.7	3.6
特性 C	0.5	5	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
Characteristic C	1	10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	1.5	15	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	2	20	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	3	30	6/10	1.9	6/9.5	6/10	6/10	6/10	6/10	2.5	6/8.2	6/8.2	6/8.2	6/8.6	6/10
	4	40	6/10	1.9	6/9.5	6/10	6/10	6/10	6/10	2.5	6/8.2	6/8.2	6/8.2	6/8.6	6/10
	6	60	6/10	1.9	6/9.5	6/10	6/10	6/10	6/10	2.5	6/8.2	6/8.2	6/8.2	6/8.6	6/10
	8	80	6/10	1.7	4.2	6/7.9	6/10	6/10	6/10	2.3	3.7	3.8	3.8	4.6	6/9.4
	10	100	6/10	1.7	4.2	6/7.9	6/10	6/10	6/10	2.3	3.7	3.8	3.8	4.6	6/9.4
	13	130	6/10	1.5	4.2	5.5	6/10	6/9.7	6/10	2.1	3.7	3.8	3.8	4.4	6/7.5
	16	160	6/10	1.5	4.2	5.5	6/10	6/9.7	6/10	2.1	3.7	3.8	3.8	4.4	6/7.5
	20	200	6/10	1.5	4.2	5.5	6/10	6/9.7	6/10	2.1	3.7	3.8	3.8	4.4	6/7.5
	25	250	6/10	1.1	3.4	4.5	5.4	5.7	6/8.8	1.9	3	2.3	3	3.6	4.9
	32	320	6/10	1.1	3.4	4.5	5.4	5.7	6/8.8	1.9	3	2.3	3	3.6	4.9
	40	400	6/10	0.9	2.2	2.6	2.8	3.1	4.8	1.4	2.1	2.2	2.2	2.3	2.9
	50	500	6/10		2.1	2.5	2.8	3.1	4.8			1.9	2.1	2.2	2.9
特性 D	2	40	6	2.4	6	6	6	6	6	4.2	6	6	6	6	6
Characteristic D	6	120	6	1.4	4.2	4.8	6	6	6	2.3	4.1	4.2	4.2	4.3	6
	10	200	6	1.3	3.9	5.5	6	6	6	1.9	3.7	3.7	3.7	4	6
	16	320	6	1.1	3.5	4.2	4.9	6	6	1.7	3.3	3.3	3.3	3.5	4.7
	32	640	6			3.3	3.9	4.2	6				2.4	2.7	3.7
	40	800	6				3.1	3.3	4.9					1.5	3
	50	1 000	6					2.9	4.8						2.6
5SP4	63	630	10			1.2	1.5	2	3				1	1.2	1.5
特性 C	80	800	10				1.5	1.5	2.5					1.2	1.5
Characteristic C	100	1 000	10					1.5	2						1.5
特性 D	63	1 200	10						2.5						
Characteristic D	80	1 600	10												
	100	2 000	10												

[1] 在 240/415V, 50Hz 电网中，选择性极限必须下降 10%。
选择性极限的最大值是对可调脱扣有效的，I_n = 额定电流。
I>> = 脱扣电流

[1] In 240/415V, 50Hz networks, the selectivity limits must be reduced by 10%.
The selectivity limits are valid for adjustable releases for the maximum value, I_n = rated current.
I>> = tripping current.

小型断路器、塑壳断路器、框架式断路器的选择性
在短路情况下, 小型断路器和塑壳断路器以及框架式断路器之间存在着选择性。以下数值是根据 IEC 947-2 和 DIN VDE 0660 第 101 部分所可以达到的最大值 (kA)。

Selectivity MCBs/MCCBs/ACB
Under short-circuit conditions, selectivity is provided between the MCBs, MCCBs and ACBs in accordance with IEC 947-2 and DIN VDE 0660 Part 101 up to the specified values in kA.

下级 **MCB** **Downstream MCB**				上级 **MCCBs** **Upstream MCCBs**													
				3VF4				**3VF5**				**3VF6**		**3VF7**	**3VF8**	**3WN1**	**3WN6**
	I_n [A]			125	160	200	250	200	250	315	400	315	400-800	400-1 250	800-2 500	315-6 300	315-3 200
		I>> [A]		1 250	1 600	2 000	2 500	2 000	2 500	3 150	4 000	3 200	1 575-6 400	15 000	20 000	3 780-75 600	3 780-48 000
				40/70	40/70	40/70	40/70	45/70	45/70	45/70	45/70	45/70	45/70	50/70		65/80	
			I_{cn} [kA]	100	100	100	100 A	100	100	100	100	100	100	100	70/100	100	65/75
				选择性极限 **[kA]** [1] **Selectivity limits [kA]** [1]													
5SX1, 5SX2, 5SX4	2	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
特性 A	10	30	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Characteristic A	16	48	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	32	96	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	40	120	6	3.9	4.6	6	6	6	6	6	6	6	6	6	6	6	6
特性 B	6	30	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
Characteristic B	10	50	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	13	65	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	16	80	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	20	100	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	25	125	6/10	6/9.6	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	32	160	6/10	6/9.6	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	40	200	6/10	6	6	6	6	6	6	6	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	50	250	6/10	5.1	5.9	6	6	6	6	6	6/10	6/10	6/10	6/10	6/10	6/10	6/10
特性 C	0.5	5	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
Characteristic C	1	10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	1.5	15	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	2	20	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	3	30	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	4	40	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	6	60	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	8	80	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	10	100	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	13	130	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	16	160	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	20	200	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	25	250	6/10	6/8	6/9.1	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	32	320	6/10	6/8	6/9.1	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	40	400	6/10	3.6	4.8	6/6.5	6/6.5	6/6.5	6/6.5	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
	50	500	6/10	3.6	4.8	6/6.2	6/6.2	6/6.2	6/6.3	6/10	6/10	6/10	6/10	6/10	6/10	6/10	6/10
特性 D	2	40	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Characteristic D	6	120	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	10	200	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	16	320	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	32	640	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	40	800	6	4	4.9	6	6	6	6	6	6	6	6	6	6	6	6
	50	1 000	6	4	4.8	6	6	6	6	6	6	6	6	6	6	6	6
5SP4	63	630	10	2.5	3	4	4	4	4	4	6	10	10	10	10	10	10
特性 C	80	800	10	1.5	2	3	3	3	3	3	6	8	10	10	10	10	10
Characteristic C	100	1 000	10	1.5	2	3	3	3	3	3	5	6	10	10	10	10	10
特性 D	63	1 200	10		2	4	4	3	4	4	6	8	10	10	10	10	10
Characteristic D	80	1 600	10			3	3	2.5	3	3	5	6	10	10	10	10	10
	100	2 000	10				2.5		3	3	5	6	10	10	10	10	10

[1] 在 240/415V, 50Hz 电网中，选择性极限必须下降 10%。
选择性极限的最大值是对可调脱扣有效的，I_n = 额定电流。
对于 3VF8，脱扣延时时间应该设置为 100ms 或更高。
I>> = 脱扣电流

[1] In 240/415V, 50Hz networks, the selectivity limits must be reduced by 10%.
The selectivity limits are valid for adjustable releases for the maximum value, I_n = rated current.
For 3VF8, the tripping delay time t_d should be set to 100ms or higher.
I>> = tripping current.

技术说明 Technical description

小型断路器之间的选择性
在没有任何熔断器的配电网络中，小型断路器在他们的闭合极限内本身之间也可以存在着选择性。这取决于下级 MCB 的电流峰值和上级 MCB 的脱扣电流值。
以下表格提供的短路电流值为 kA，在 230V 交流电压时 MCB 之间的选择性。

Selectivity MCBs/MCCBs
In distribution networks without any fuses, MCBs provide selectivity between themselves within close limits. This is dependent on the peak current Î of the downstream MCB and the tripping current of the upstream MCB.
The following table specifies up to which short-circuit current in kA, selectivity is provided between MCBs connected in series at 230 V AC.

下级 **MCB** **Downstream MCB**				上级 **MCBs** **Upstream MCBs**											
				5SX4-7 characteristic C					**5SP4-7 characteristic C**			**5SP4-8 characteristic D**			
	I_n [A]	$I>>$ [A]	I_{cn} [kA]	20	25	32	40	50	63	80	100	63	80	100	
				200	250	320	400	500	630	800	1 000	945	1 200	1 500	
				10	10	10	10	10	10	10	10	10	10	10	
				选择性极限 **[kA]** **Selectivity limits [kA]**											
5SX1, 5SX2, 5SX4	6	30	6/10	0.2	0.2	0.3	0.5	0.5	0.5	0.8	1.5	1.5	3	5	
特性 B	10	50	6/10	0.2	0.2	0.3	0.5	0.5	0.5	0.8	1.2	1.5	3	4	
Characteristic B	13	65	6/10	0.2	0.2	0.3	0.4	0.5	0.5	0.8	1.2	1.5	2	3	
	16	80	6/10	0.2	0.2	0.3	0.4	0.5	0.5	0.8	1.2	1.5	2	3	
	20	100	6/10		0.2	0.3	0.4	0.5	0.5	0.8	1.2	1.5	2	3	
	25	125	6/10				0.4	0.4	0.4	0.6	1.2	1.2	1.5	3	
	32	160	6/10				0.4	0.4	0.4	0.6	1.2	1.2	1.5	3	
	40	200	6/10					0.4	0.4	0.6	1.2	1.2	1.5	2.5	
	50	250	6/10						0.4	0.6	1	1.2	1.5	2.5	
特性 C	0.5	5	6/10	0.2	0.3	0.5	0.8	0.8	0.8	1.2	4	5	6/10	6/10	
Characteristic C	1	10	6/10	0.2	0.3	0.5	0.8	0.8	0.8	1.2	4	5	6/10	6/10	
	1.5	15	6/10	0.2	0.3	0.5	0.8	0.8	0.8	1.2	4	5	6/10	6/10	
	2	20	6/10	0.2	0.3	0.5	0.8	0.8	0.8	1.2	4	5	6/10	6/10	
	3	30	6/10	0.2	0.2	0.3	0.5	0.5	0.5	0.8	1.5	1.5	3	4	
	4	40	6/10	0.2	0.2	0.3	0.5	0.5	0.5	0.8	1.5	1.5	3	4	
	6	60	6/10	0.2	0.2	0.3	0.5	0.5	0.5	0.8	1.5	1.5	3	4	
	8	80	6/10	0.2	0.2	0.3	0.4	0.4	0.4	0.6	1.2	1.5	2.5	3	
	10	100	6/10	0.2	0.2	0.3	0.4	0.4	0.4	0.6	1.2	1.5	2.5	3	
	13	130	6/10	0.2	0.2	0.3	0.4	0.4	0.4	0.6	1.2	1.2	2	3	
	16	160	6/10	0.2	0.2	0.3	0.4	0.4	0.4	0.6	1.2	1.2	2	3	
	20	200	6/10		0.2	0.3	0.4	0.4	0.4	0.6	1.2	1.2	2	3	
	25	250	6/10				0.3	0.4	0.4	0.6	1	1.2	1.5	2.5	
	32	320	6/10				0.3	0.4	0.4	0.6	1	1.2	1.5	2.5	
	40	400	6/10								0.8	1	1.5	2	
	50	500	6/10								0.8	1	1.5	2	
	63	630	6/10								0.8		1.2	1.5	

NH 熔断器对小型断路器的后备保护
如果小型断路器安装位置上出现的最大短路电流值是个未知数，或者超过了规定的额定通断能力，为了防止小型断路器遭受过度的负载与应力，就必须前接其它保护装置作为后备－保护。一般都为此而应用 NH 熔断器。
下表对后备保护范围作了回答，也就是说，在短路电流 (kA) 达到何值之前，使用符合 DIN VDE 0636 第 21 部分规定的NH 熔断器才能保证实现后备－保护。

Back-up protection, MCBs/NH fuses
If the magnitude of the maximum short-circuit current, flowing at the MCB location, is unknown, or if the specified rated breaking capacity is exceeded, an additional protective device must be connected in series as back-up protection. This prevents excessive stressing of the MCB. Generally, a NH fuse is used.
The following table specifies up to which short-circuit currents in kA, back-up protection is guaranteed when using NH fuses according to DIN VDE 0636 Part 21.

下级 **MCB** **Downstream MCB**	I_n [A]	上级熔断器 **Upstream fuse** 50A	63A	80A	100A	125A	160A
5SX1, 5SX2, 5SX4 	C 0.5 - 6	50kA 之前不需要后备－保护 /No back-up protection required up to 50kA					
	B 6	50	50	50	50	50	35
	C 8	50	50	50	50	50	35
	B/C 10	50	50	50	50	50	35
	B/C 13	50	50	50	35	35	30
	B/C 16	50	50	50	35	30	30
	B/C 20	50	50	50	35	25	25
	B/C 25	50	50	50	35	30	25
	B/C 32	50	50	50	35	30	25
	B/C 40	50	50	50	50	25	15
	B/C 50	50	50	50	50	25	15
	C 63	50	50	35	25	25	15
	试验回路数据: Test circuit data:			试验循环: Test cycle:			
	Up = 250 V cos φ = 0.27 to 0.49			0 (60 °C) - t - 0 (60°), t = 3 min (在电角度 60° 时 2 次分断 /2 trips at 60° electrical)			

塑壳断路器对小型断路器的后备保护
如果小型断路器是用在无熔断器的配电设备中，则应装上符合 EN 60 947-2 和 DIN VDE 0660 第 101 部分标准的塑壳断路器作为后备保护。
以下表格给出了在使用塑壳断路器作为后备保护后可以达到的最大短路电流值 (kA)。

Back-up protection, MCBs/MCCBs
If MCBs are used in fuseless distribution boards, MCCBs should be provided as back-up protection in accordance with EN 60 947-2 and DIN VDE 0660 Part 101.
The following table shows short-circuit currents in kA up to which back-up protection is guaranteed using MCCBs.

下级 **MCB** **Downstream MCB**	I_n [A]	$I>>$ [A] I_{cn} [kA]	上级 **MCCBs** **Upstream MCCBs** **3VU13** 10	16	20	25	**3VU16** 10	16	25	32	40	52	63
			120	192	240	300	120	190	300	380	480	600	600
			10	6	6	6	100	100	100	35	35	35	35
			后备保护最大至 **[kA]** **Back-up protection up to [kA]**										
 5SX1, 5SX2, 5SX4	≤ 4	6/10	10	6	6	6	30	17.5	15	12.5	12	12	12
特性 A	6	6/10	10	6	6	6	30	17.5	15	12.5	12	12	12
Characteristic A	8	6/10	10	6	6	6	30	17.5	15	12.5	12	12	12
特性 B	10	6/10		6	6	6		17.5	15	12.5	12	12	12
Characteristic B	13	6/10		6	6	6		17.5	15	12.5	12	12	12
特性 C	16	6/10			6	6			15	12.5	12	12	12
Characteristic C	20	6/10				6			15	12.5	12	12	12
特性 D	25	6/10								12.5	12	12	12
Characteristic D	32	6/10									12	12	12
	40	6/10										12	12
	50	6/10											12

技术说明 Technical description

NEOZED，DIAZED 熔断器对小型断路器的后备保护
当短路电流发生时，上级的熔断器对下级的小型断路器提供后备保护的电流值(kA)
Back-up protection, MCBs/NEOZED, DIAZED fuses
When a short-circuit develops, back-up protection is provided between the downstream MCB and the upstream NEOZED and DIAZED fuses up to the values specified in kA

下级 / Downstream	上级 / Upstream		NEOZED				DIAZED					
5SX2 型，5SX4 型，5SQ3 型断路器 MINIATURE CIRCUIT BREAKERS 5SX2 - 5SX4 - 5SQ3	I_n (A)		50	63	80	100	50	63	80	100	160	200
特性 / Characteristic：A, B, C, D		P_I [1]	50	50	50	50	70	70	70	70	50	50
	备用值，以 kA 计 / Values of backup in kA											
230/400V ~	0.5 ÷ 2		∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
	3		50	50	35	35	70	50	35	35	16	16
	4		50	50	35	35	70	50	35	35	16	16
	6		50	50	35	35	70	50	35	35	16	16
	10		50	50	35	35	70	50	35	35	16	16
	13		50	50	35	35	70	50	35	35	16	16
	16		50	50	35	35	70	50	35	35	16	16
	20		50	50	35	35	70	50	35	35	16	16
	25		50	50	35	35	70	50	35	35	16	16
	32		50	50	35	35	70	50	35	35	16	16
	40		-	50	35	35	-	50	35	35	16	16
	50		-	-	35	35	-	-	35	35	16	16

1) P_I - 熔断器盒的额定分断能力，以 kA 计。
P_I - Rated breaking capability in kA of fuse block.

塑壳断路器对小型断路器的后备保护
当短路电流发生时，上级的塑壳断路器对下级的小型断路器提供后备保护的电流值 (kA)。

Back-up protection, MCBs/MCCBs
When a short-circuit develops, back-up protection is provided between the downstream MCB and the upstream MCCBs up to the values specified in kA.

下级 **MCB** **Downstream MCB**			上级 **MCCBs** **Upstream MCCBs** **3VF1**										
	I_n [A]		10	16	25	32	35	40	50	56	63	65	80
		I>> [A]	120	192	300	380	420	480	600	672	760	780	960
		I_{cn} [kA]	100	100	100	100	100	42	30	42	22	30	22
			选择性极限 **[kA]** **Back-up protection up to [kA]**										
5SX1, 5SX2, 5SX4	≤ 4	6/10	35	35	35	35	35	35	30	35	22	30	22
特性 A	6	6/10	20	20	20	20	20	15	15	15	15	15	15
Characteristic A	8	6/10	20	20	20	20	20	15	15	15	15	15	15
特性 B	10	6/10		20	20	20	20	15	15	15	15	15	15
Characteristic B	13	6/10		20	20	20	20	15	15	15	15	15	15
特性 C	16	6/10			20	20	20	15	15	15	15	15	15
Characteristic C	20	6/10			20	20	20	15	15	15	15	15	15
特性 D	25	6/10				15	20	15	15	15	15	15	15
Characteristic D	32	6/10						15	15	15	15	15	15
	40	6/10							12	12	12	12	12
	50	6/10									10	10	10

下级 **MCB** **Downstream MCB**			上级 **MCCBs** **Upstream MCCBs** **3VF3** 可调设置 **/ adjustable**						**3VF3** 固定设置 **/ fixed setting**					
	I_n [A]		50	63	80	100	125	160	50	63	80	100	125	160
		I>> [A]	500	630	800	1 000	1 250	1 600	400	500	630	800	1 000	1 280
			40/70	40/70	40/70	40/70	40/70	40/70	40/70	40/70	40/70	40/70	40/70	40/70
		I_{cn} [kA]	100	100	100	100	100	100	100	100	100	100	100	100
			后备保护最大至 **[kA]** **Back-up protection up to [kA]**											
5SX1, 5SX2, 5SX4	0.5 - 2	6/10	50	50	50	50	50	50	50	50	50	50	50	50
特性 A	3	6/10	35	35	35	35	35	35	35	35	35	35	35	35
Characteristic A	4	6/10	35	35	35	35	35	35	35	35	35	35	35	35
特性 B	6	6/10	15	15	15	15	15	15	15	15	15	15	15	15
Characteristic B	8	6/10	15	15	15	15	15	15	15	15	15	15	15	15
特性 C	10	6/10	15	15	15	15	15	15	15	15	15	15	15	15
Characteristic C	13	6/10	15	15	15	15	15	15	15	15	15	15	15	15
特性 D	16	6/10	15	15	15	15	15	15	15	15	15	15	15	15
Characteristic D	20	6/10	15	15	15	15	15	15	15	15	15	15	15	15
	25	6/10	15	15	15	15	15	15	15	15	15	15	15	15
	32	6/10	15	15	15	15	15	15	15	15	15	15	15	15
	40	6/10	10	10	10	10	10	10	10	10	10	10	10	10
	50	6/10		10	10	10	10	10		10	10	10	10	

下级 **MCB** **Downstream MCB**			上级 **MCCBs** **Upstream MCCBs**											
			3VF4				**3VF5**				**3VF6**	**3VF7**	**3VF8**	**3WN1/ 3WS1**
	In [A]		125	160	200	250	200	250	315	400	315 - 630	400 - 1 250	1600 - 2 000	315 - 6 300
		I>> [A]	1 250	1 600	2 000	2 500	2 000	2 500	3 150	4 000	3 200 - 6 300	15 000	20 000	3 780 - 75 600
			40/70	40/70	40/70	40/70	45/70	45/70	45/70	45/70	45/70/	50/70/		
		Icn [kA]	100	100	100	100	100	100	100	100	100	100	70/100	65 - 100
			后备保护最大至 **[kA]** **Back-up protection up to [kA]**											
5SX1, 5SX2, 5SX4	0.5 - 2	6/10	50	50	50	50	50	50	50	50	50	50	50	50
特性 A	3	6/10	35	35	35	35	35	35	35	35	35	35	35	35
Characteristic A	4	6/10	35	35	35	35	35	35	35	35	35	35	35	35
特性 B	6	6/10	15	15	15	15	15	15	15	15	15	15	15	15
Characteristic B	8	6/10	15	15	15	15	15	15	15	15	15	15	15	15
特性 C	10	6/10	15	15	15	15	15	15	15	15	15	15	15	15
Characteristic C	13	6/10	15	15	15	15	15	15	15	15	15	15	15	15
特性 D	16	6/10	15	15	15	15	15	15	15	15	15	15	15	15
Characteristic D	20	6/10	15	15	15	15	15	15	15	15	15	15	15	15
	25	6/10	15	15	15	15	15	15	15	15	15	15	15	15
	32	6/10	15	15	15	15	15	15	15	15	15	15	15	15
	40	6/10	8	8	8	8	8	8	8	8	8	8	8	8
	50	6/10	8	8	8	8	8	8	8	8	8	8	8	8

产品数据 Product data sheet

5SQ35 系列 | 4500 | 6000 |
Series 5SQ35 | 3 | 3 |

应用范围: 家用, 公众场合, 工业领域
Application sectors: domestic, public, industrial

小型断路器分断能力 4500A 或 6000A，符合 IEC 898 标准.
- 额定电流范围: 6 to 25A, AC 230V
- 脱扣特性: B, C
- 额定分断能力: 4500A 或 6000A，符合 IEC 898 标准
- 能量限制等级(I^2t): 3
- 相线＋中性线 (一个模数)，额定分断能力 6000A(- 0kV) 和 4500A(-0kW)
- 符合下列标准: IEC 898, EN 60898,VDE 0641，第 11 部分
- 标志：CE

Circuit-breaker having a short-circuit capacity of 4500A or 6000A according to standard IEC 898.
- Current range: 6 to 25A AC 230V~
- Tripping characteristic: B, C
- Rated short-circuit capacity according to IEC 898: 4500A or 6000A
- Strong limitation of I^2t energy: limitation class 3
- Neutral phase version, in a Module Width unit, with a short-circuit capacity of 6000A (0kV) and 4500A (0kW)
- Totally compliant to the standards: IEC 898-EN 60898 - VDE 0641 Part 11
- Marking CE

相线＋中性线 (一个模数) 产品可对相线和中性线进行有效的保护；额定分断能力为 6000A (- 0kV) 和 4500A (- 0kW)。

Neutral phase version incorporates in the same Module Width unit the protected pole and the neutral pole; the short-circuit capacity is 6000A for the -0kV versions and 4500A for the -0kW versions.

主要认证说明 Approvals and main certifications	B, C
VDE	6 - 25 A

5SQ3		1P+N
	U_e(V) ~	230
	I_n(A) ⎓	55
B	6 ▬ 16	●
C	6 ▬ 25	●

短路分断能力 (最大值) Short-circuit capacity (max. values)		
I_n(A)	IEC 898 I_{cs} (kA)	IEC 947-2 I_{cu} (kA)
1P+N (230 V~)		
6 ...20 (0kV)	6	6
6 ...25 (0kW)	4.5	4.5

有关 5SQ35 小型断路器产品的详细技术数据请参阅:
小型断路器技术数据第 38 页。
For more details on the technical data of 5SQ35 circuit-breakers, please consult the section:
Technical data of the miniature circuit-breakers page 38.
小型断路器外形尺寸见第 39 页。
Dimension data of the miniature circuit-breakers see page 39.

选型和技术数据 Selection and ordering data

5SQ35 系列 4500 6000
Series 5SQ35 3 3
脱扣特性 C, B
Tripping characteristics C, B

5SQ35 系列
- 额定分断能力 4500A/6000A，符合标准 IEC 898, EN 60898
- 额定电压 AC 230V
- 能量限制等级: 3
- 用于直流: 最大至 DC ⎓55V
- 接线端子防护等级: IP 2X - IP XXB
- 包装: 12 只

5SQ35 Series
- rated short-circuit capacity of 4500 A/6000A according to IEC 898, EN 60898
- Ue AC 230V
- Energy limitation class: 3
- DC usable: up to DC⎓55V
- protected terminals IP 2X - IP XXB
- packaging: 12 parts

原理图和接线端子 Schematic diagram and connecting terminals	额定电流 Rated current I_n (A)	订货号 Order No. 特性 C Characteristic C	特性 B Characteristic B
1 极 + N (1 模数) [1] 1 pole + N (1 MW) [1] 4,500A	6 10 13 16 20 25	5SQ3 570 - 0KW06 5SQ3 570 - 0KW10 5SQ3 570 - 0KW13 5SQ3 570 - 0KW16 5SQ3 570 - 0KW20 5SQ3 570 - 0KW25	
1 极 + N (1 模数) [1] 1 pole + N (1 MW) [1] 6,000A	6 10 13 16 20	5SQ3 570 - 0KV06 5SQ3 570 - 0KV10 5SQ3 570 - 0KV13 5SQ3 570 - 0KV16 5SQ3 570 - 0KV20	5SQ3 560 - 0KV06 5SQ3 560 - 0KV10 5SQ3 560 - 0KV13 5SQ3 560 - 0KV16

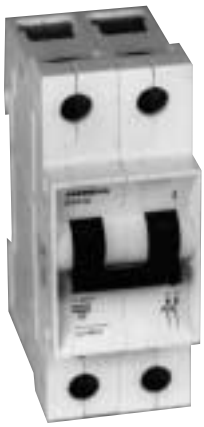
5SQ35 小型断路器: 1P + N, 1 模数 (MW)
5SQ35 circuit-breaker 1P + N: 1 MW

[1] 1 模数 (MW) = 一个模数单元 = 18mm
1 MW = one Module Width unit = 18mm

产品数据 Product data sheet

5SX1 系列 6000
Series 5SX1 3

应用范围: 家用，公众场合，工业领域
Application sectors: domestic, public, industrial



小型断路器有着很好的特点－即在短路情况下有极高的分断能力和能量限制等级
- 额定电流范围: 6 到 32A, AC 230/400 V
- 脱扣特性: C
- 额定分断能力符合 IEC 898 标准: 6000A
- 很强的能量限制等级 (I^2t): 3
- 用于直流最大至: DC ⎓120V 2P; ⎓60V 1P
- 符合以下标准: IEC 898, GB 10963

Circuit-breaker featuring excellent performances in the event of short-circuiting: high breaking capacity and important I^2t energy limitation.
- Complete current range: 6 to 32A AC 230/400V
- Characteristic: C
- Rated short-circuit capacity according to IEC 898: 6000A
- Strong energy limitation of I^2t: limitation class 3
- DC usable up to DC ⎓ 120V 2P, ⎓ 60V 1P
- Compliant to the standards: IEC 898, GB 10963

小型断路器 5SX1 系列, 按功能特点和产品优点分类形成一个非常完整的系列, 所有系列都得到认可并具有最出众的特点, 那就是小型断路器的分断能力可达 6000A。

在公众场合以及工业领域, 5SX1 系列小型断路器可对电器设备进行最好的保护并且满足很高的选择性要求。

The circuit-breakers of the 5SX1 series, which are distinguished by optimum functional characteristics and benefit from a comprehensive series of approvals, are certainly among the most high-performance devices in their class, that is, circuit-breakers with a short-circuit capacity of 6000 A.
In the public and industrial sectors, the circuit-breakers 5SX1 allow obtaining maximum protection and guaranteeing high selectivity.

主要认证说明 Approvals and main certifications	C
VDE	6 - 32 A
GB	6 - 32 A

短路分断能力 (最大值) Short-circuit capacity (max. values)		
I_n(A)	IEC 898 I_{cs} (kA)	IEC 947-2 I_{cu} (kA)
1P (230 V~), 2P, 3P (400 V~)		
6 ...32	6	6

有关 5SX1 小型断路器产品的详细技术数据请参阅：
小型断路器技术数据第 38 页。
For more details on the technical data of 5SX1 circuit-breakers, please consult the section:
Technical data of the miniature circuit-breakers page 38.
小型断路器外形尺寸见第 39 页。
Dimension data of the miniature circuit-breakers see page 39.

选型和技术数据 Selection and ordering data

5SX1 系列 6000
Series 5SX1 3
脱扣特性 C
Tripping characteristics C

5SX1 系列
- 额定分断能力 6000A
  符合标准 IEC 898
- 额定电压 AC 230/400V
- 能量限制等级 3
- 用于直流: 至 DC ⎓120V (2P);
  DC⎓60V (1P)
- 接线端子防护等级: IP 2X-IP XX B
- 包装件 (每个单元的数量)
  12 (1P)
  6 (2P)
  4 (3P)

5SX1 Series
- rated short-circuit capacity 6000A
  according to IEC 898,
- Ue AC 230/400V
- Energy limitation class 3
- DC usable:
  up to DC⎓120V (2P)
  up to DC⎓60V (1P)
- protected terminals IP 2X -
  IP XXB
- packaging (number of parts per
  unit)
  12 (1P)
  6 (2P)
  4 (3P)

	原理图和接线端子 Schematic diagram and connecting terminals	额定电流 Rated current I_n (A)	订货号 Order No. 特性 C Characteristic C
	1 极 1 pole 	6 10 16 20 25 32	5SX1 106 - 7CC 5SX1 110 - 7CC 5SX1 116 - 7CC 5SX1 120 - 7CC 5SX1 125 - 7CC 5SX1 132 - 7CC
	2 极 2 pole 	6 10 16 20 25 32	5SX1 206 - 7CC 5SX1 210 - 7CC 5SX1 216 - 7CC 5SX1 220 - 7CC 5SX1 225 - 7CC 5SX1 232 - 7CC
	3 极 3 pole 	6 10 16 20 25 32	5SX1 306 - 7CC 5SX1 310 - 7CC 5SX1 316 - 7CC 5SX1 320 - 7CC 5SX1 325 - 7CC 5SX1 332 - 7CC

[1] 1 模数 (MW)= 一个模数单元 =18mm
1 MW = one Module Width unit = 18mm

产品数据 Product data sheet

5SX2 系列 6000 3
Series 5SX2
应用范围: 公众场合，工业领域
Application sectors: public, industrial

小型断路器 5SX2 系列, 按功能特点和产品优点分类形成一个非常完整的系列, 所有系列都得到认可并具有最出众的特点, 那就是小型断路器的分断能力可达 6000A。

在公众场合以及工业领域, 5SX2 系列小型断路器可对电器设备进行最好的保护并且满足很高的选择性要求。

5SX2 系列小型断路器 1 极、2 极、3 极和脱扣特性 B、C、D 同时还符合 UL 和 CSA 标准认可，亦即在系统电压为 AC120/240V 和 AC277/480V 时照样能有效工作。这样, 所有这些组装成一体的小型断路器均能满足那些对断路器要求较高的国家的标准

The circuit-breakers of the 5SX2 series, which are distinguished by optimum functional characteristics and benefit from a comprehensive series of approvals, are certainly among the most high-performance devices in their class, that is, circuit-breakers with a short-circuit capacity of 6000 A.
In the public and industrial sectors, the circuit-breakers 5SX2 allow obtaining maximum protection and guaranteeing high selectivity
The 5SX2 circuit-breakers in the one-, two-, and three-pole versions, characteristics B, C, and D, have also obtained UL and CSA certifications[2] for systems operating under a rated voltage of AC 120/240V and AC 277/480V; therefore, these circuit-breakers can be integrated in finished products for export to countries where approvals are expressly required.

有关 5SX2 小型断路器产品的详细技术数据请参阅：
小型断路器技术数据第 38 页。
For more details on the technical data of 5SX2 circuit-breakers, please consult the section:
Technical data of the miniature circuit-breakers page 38.
小型断路器外形尺寸见第 39 页。
Dimension data of the miniature circuit-breakers see page 39.

10kA, IEC 947-2
小型断路器有着很好的特点－即在短路情况下有极高的分断能力和能量限制等级
- 完整的额定电流范围: 0.3 到 63A, AC 230/400V
- 完整的脱扣特性范围: A, B, C, D
- 额定分断能力符合 IEC 898 标准: 6000A
- 很强的能量限制等级(I^2t): 3
- 用于直流最大至: DC ⎓120V 2P; ⎓ 60V 1P, 1P + N
- 多种附件可供选择
- 符合以下标准: IEC 898 - EN 60 898, VDE 0641, 第 11 部分, VDE 0660 T101, UL 1077, GB10963[3]

Circuit-breaker featuring excellent performances in the event of short-circuiting: high short-circuit capacity and important I^2t limitation.
- Complete current range: 0.3 to 63A AC 230/400V
- Complete characteristic range: A, B, C, D
- Rated short-circuit capacity according to IEC 898: 6000A
- Strong energy limitation of I^2t: limitation class 3
- DC usable up to DC ⎓ 120V 2P, ⎓ 60V 1P, 1P + N
- Wide range of accessories and auxiliary components
- Compliant to the standards: IEC 898 - EN 60 898, VDE 0641 Part 11, VDE 0660 T101, UL 1077, GB10963[3]

主要认证说明 [1] [2] Approvals and main certifications [1] [2]	C	B	D
IMQ	0.5 - 50A		
VDE	0.5 - 50A	6 - 50A	0.5 - 50A
CSA	0.5 - 50A	6 - 50A	0.5 - 32A
UL	0.5 - 50A	6 - 50A	0.5 - 32A
GERMANISCHER LLOYD	0.5 - 32A	6 - 32A	

5SX2		1P	1P+N	2P	3P	3P+N
	U_e(V) ~	230	230	400	400	400
	I_n(A) ⎓	60	60	120		
A	1 40	●		●	●	
B	6 50	●	●	●	●	
C	0.3 63	●	● 6 - 50A	● 0.5 - 63A	● 0.5 - 63A	● 10 - 50A
D	0.5 50	●		●	●	

短路分断能力 (最大值) Short-circuit capacity (max. values)		
I_n(A)	IEC 898 I_{cs} (kA)	IEC 947-2 I_{cu} (kA)
1P (230 V~), 2P, 3P, 3P+N (400V~)		
0.3..32	6	10
40..63	6	6
1P+N, 2P, 3P, 3P+N (230V~)		
0.3..32	6	15
40..63	6	10

[1] 5SX2 系列小型断路器 A 特性同样符合 VDE 标准。
Characteristic A also according to the VDE standard.
[2] 适合于后缀无 CC 的小型断路器。
Only the versions without CC at the end of the Order No.
[3] 适合于 5SX2，C, D 特性 /1~32A。
Suit for 5SX2 C, D characteristic / 1~32A.

选型和技术数据 Selection and ordering data

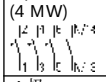
5SX2 系列 6000
Series 5SX2 3
10kA, IEC 947-2
脱扣特性 C, A, B, D
Tripping characteristics C, A, B, D

5SX2 系列
- 额定分断能力 6000A 符合标准 IEC 898,
- 额定电压 AC 230/400V
- 能量限制等级 3
- 用于直流: 至 DC⎓120V (2P); DC 60V (1P, 1P+N)
- 接线端子防护等级: IP 2X-IP XX B
- 辅助触头和故障信号触头可装在断路器右侧。
  - 最多装载 2 个辅助触头 (AC)
  - 或 1 个故障信号 (FC)
  - 或最多 1 个辅助触头 (AC，装在内侧) 和 1 个故障信号触头 (FC，装在外侧)
- 分励脱扣 (ST) 装在断路器左侧
- 包装件 (每个单元的数量)
  12 (1P)
  6 (1P+N, 2P)
  4 (3P)
  3 (3P+N,4P)

5SX2 Series
- rated short-circuit capacity 6000 A according to IEC 898,
- Ue AC 230/400 V
- Energy limitation class 3
- DC usable:
  up to DC ⎓ 120V (2P)
  up to DC ⎓ 60V (1P, 1P+N)
- protected terminals IP 2X - IP XXB
- auxiliary contact and fault signal contact mountable on the right-hand side:
  - 2 auxiliary contact (AC) max. or
  - 1 fault signal contact (FC) or
  - max. 1 AC (internal) + 1 FC (external)
- shunt trip mountable on the left-hand side
- packaging (number of parts per unit)
  12 (1P)
  6 (1P+N, 2P)
  4 (3P)
  3 (3P+N,4P)

[1] 1 模数 (MW)=
一个模数单元 =18mm
1 MW = one Module Width unit = 18mm

[2] 额定分断能力: 4500A
Rated breaking capacity: 4500A

原理图和接线端子 Schematic diagram and connecting terminals	额定电流 Rated current I_n (A)	订货号 Order No. 特性 C Characteristic C	特性 A Characteristic A	特性 B Characteristic B	特性 D Characteristic D
1 极 (1 模数) [1] 1 pole (1 MW) [1] 	0.3	5SX2 114 - 7			
	0.5	5SX2 105 - 7			5SX2 105 - 8
	1	5SX2 101 - 7CC	5SX2 101 - 5		5SX2 101 - 8CC
	1.6	5SX2 115 - 7CC	5SX2 115 - 5		5SX2 115 - 8CC
	2	5SX2 102 - 7CC	5SX2 102 - 5		5SX2 102 - 8CC
	3	5SX2 103 - 7CC	5SX2 103 - 5		5SX2 103 - 8CC
	4	5SX2 104 - 7CC	5SX2 104 - 5		5SX2 104 - 8CC
	6	5SX2 106 - 7CC	5SX2 106 - 5	5SX2 106 - 6	5SX2 106 - 8CC
	8	5SX2 108 - 7CC			5SX2 108 - 8CC
	10	5SX2 110 - 7CC	5SX2 110 - 5	5SX2 110 - 6	5SX2 110 - 8CC
	13	5SX2 113 - 7CC		5SX2 113 - 6	5SX2 113 - 8CC
	16	5SX2 116 - 7CC	5SX2 116 - 5	5SX2 116 - 6	5SX2 116 - 8CC
	20	5SX2 120 - 7CC	5SX2 120 - 5	5SX2 120 - 6	5SX2 120 - 8CC
	25	5SX2 125 - 7CC	5SX2 125 - 5	5SX2 125 - 6	5SX2 125 - 8CC
	32	5SX2 132 - 7CC	5SX2 132 - 5	5SX2 132 - 6	5SX2 132 - 8CC
	40	5SX2 140 - 7CC	5SX2 140 - 5	5SX2 140 - 6	5SX2 140 - 8CC[2]
	50	5SX2 150 - 7CC		5SX2 150 - 6	5SX2 150 - 8CC[2]
	63	5SX2 163 - 7CC			
1 极 + N (2 模数) 1 pole + N (2 MW) 	6	5SX2 506 - 7CC		5SX2 506 - 6	
	10	5SX2 510 - 7CC		5SX2 510 - 6	
	13	5SX2 513 - 7CC		5SX2 513 - 6	
	16	5SX2 516 - 7CC		5SX2 516 - 6	
	20	5SX2 520 - 7CC		5SX2 520 - 6	
	25	5SX2 525 - 7CC		5SX2 525 - 6	
	32	5SX2 532 - 7CC		5SX2 532 - 6	
	40	5SX2 540 - 7CC		5SX2 540 - 6	
	50	5SX2 550 - 7CC		5SX2 550 - 6	
2 极 (2 模数) 2 pole (2 MW) 	0.5	5SX2 205 - 7			5SX2 205 - 8
	1	5SX2 201 - 7CC	5SX2 201 - 5		5SX2 201 - 8CC
	1.6	5SX2 215 - 7CC	5SX2 215 - 5		5SX2 215 - 8CC
	2	5SX2 202 - 7CC	5SX2 202 - 5		5SX2 202 - 8CC
	3	5SX2 203 - 7CC	5SX2 203 - 5		5SX2 203 - 8CC
	4	5SX2 204 - 7CC	5SX2 204 - 5		5SX2 204 - 8CC
	6	5SX2 206 - 7CC	5SX2 206 - 5	5SX2 206 - 6	5SX2 206 - 8CC
	8	5SX2 208 - 7CC			5SX2 208 - 8CC
	10	5SX2 210 - 7CC	5SX2 210 - 5	5SX2 210 - 6	5SX2 210 - 8CC
	13	5SX2 213 - 7CC		5SX2 213 - 6	5SX2 213 - 8CC
	16	5SX2 216 - 7CC	5SX2 216 - 5	5SX2 216 - 6	5SX2 216 - 8CC
	20	5SX2 220 - 7CC	5SX2 220 - 5	5SX2 220 - 6	5SX2 220 - 8CC
	25	5SX2 225 - 7CC	5SX2 225 - 5	5SX2 225 - 6	5SX2 225 - 8CC
	32	5SX2 232 - 7CC	5SX2 232 - 5	5SX2 232 - 6	5SX2 232 - 8CC
	40	5SX2 240 - 7CC	5SX2 240 - 5	5SX2 240 - 6	5SX2 240 - 8CC[2]
	50	5SX2 250 - 7CC		5SX2 250 - 6	5SX2 250 - 8CC[2]
	63	5SX2 263 - 7CC			
3 极 (3 模数) 3 pole (3 MW) 	0.5	5SX2 305 - 7			5SX2 305 - 8
	1	5SX2 301 - 7CC	5SX2 301 - 5		5SX2 301 - 8CC
	1.6	5SX2 315 - 7CC	5SX2 315 - 5		5SX2 315 - 8CC
	2	5SX2 302 - 7CC	5SX2 302 - 5		5SX2 302 - 8CC
	3	5SX2 303 - 7CC	5SX2 303 - 5		5SX2 303 - 8CC
	4	5SX2 304 - 7CC	5SX2 304 - 5		5SX2 304 - 8CC
	6	5SX2 306 - 7CC	5SX2 306 - 5	5SX2 306 - 6	5SX2 306 - 8CC
	8	5SX2 308 - 7CC			5SX2 308 - 8CC
	10	5SX2 310 - 7CC	5SX2 310 - 5	5SX2 310 - 6	5SX2 310 - 8CC
	13	5SX2 313 - 7CC		5SX2 313 - 6	5SX2 313 - 8CC
	16	5SX2 316 - 7CC	5SX2 316 - 5	5SX2 316 - 6	5SX2 316 - 8CC
	20	5SX2 320 - 7CC	5SX2 320 - 5	5SX2 320 - 6	5SX2 320 - 8CC
	25	5SX2 325 - 7CC	5SX2 325 - 5	5SX2 325 - 6	5SX2 325 - 8CC
	32	5SX2 332 - 7CC	5SX2 332 - 5	5SX2 332 - 6	5SX2 332 - 8CC
	40	5SX2 340 - 7CC	5SX2 340 - 5	5SX2 340 - 6	5SX2 340 - 8CC[2]
	50	5SX2 350 - 7CC		5SX2 350 - 6	5SX2 350 - 8CC[2]
	63	5SX2 363 - 7CC			
3 极 + N (4 模数) 3 pole + N (4 MW) 	10	5SX2 610 - 7CC			
	16	5SX2 616 - 7CC			
	20	5SX2 620 - 7CC			
	25	5SX2 625 - 7CC			
	32	5SX2 632 - 7CC			
	40	5SX2 640 - 7CC			
	50	5SX2 650 - 7CC			
4 极 (4 模数) 4 pole (4 MW) 	6	5SX2 406 - 7			
	10	5SX2 410 - 7			
	16	5SX2 416 - 7			
	20	5SX2 420 - 7			
	25	5SX2 425 - 7			
	32	5SX2 432 - 7			
	40	5SX2 440 - 7			
	50	5SX2 450 - 7			
辅助触头 /Auxiliary contacts (1/2 模数)/(1/2 MW)		1NO+1NC 2NO 2NC		5SX9 100 5SX9 101 5SX9 102	
故障信号触头 Fault signal contacts (1/2 模数)/(1/2 MW)		1NO+1NC 2NO 2NC		5SX9 200 5SX9 201 5SX9 202	
		说明 对故障信号触头，在主触头第一次手动被合上时状态会被改变。如对于 NO 触头来说，此时已闭合。 For fault signal contacts, it will change station when MCB be closed at first time. For example, the NO contact will be closed at this time.			
分励脱扣 /Shunt trip (1 模数)/(1 MW) U_c= AC 110~415V 				5SX9 300	

产品数据 Product data sheet

5SX4 系列 10000 3
Series 5SX4
应用范围: 公众场合，工业领域
Application sectors: public, industrial

5SX4 系列小型断路器可以用于那些需要较高保护要求和选择性要求的场合，如某些公众场所和工业领域。由于小型断路器有很高的短路分断能力，所以它可以对那些有非常高短路电流的危险场所和电气安装设备进行有效的保护。

The 5SX4 circuit-breakers can be used in the public and industry sectors when it is necessary to obtain maximum protection and guarantee high selectivity. Thanks to their high short-circuit capacity, they effectively protect electrical installations with a high risk of encountering short-circuit currents.

25 kA IEC 947-2

小型断路器除了具有与 5SX2 系列相同的特点之外，还可以提供更高的短路分断能力
- 额定电流范围: 0.5 到 50A, AC 230/400V
- 脱扣特性范围: B, C
- 额定分断能力符合 IEC 898 标准: 10 000A
- 很强的能量限制等级(I^2t): 3
- 用于直流最大至: DC ⎓ 120V 2P, ⎓ 60V 1P, 1P + N
- 多种附件可供选择
- 符合以下标准: IEC 898 - EN 60 898, VDE 0641，第 11 部分
- 标记：CE

Circuit-breaker assuring the same performances as those of the 5SX2 circuit-breaker, but offering still higher breaking capacity.
- Complete current range: 0.5 to 50A AC 230/400V~
- Characteristics: B, C
- Rated short-circuit capacity according to IEC 898: 10 000A
- Strong energy limitation of I^2t: limitation class 3
- DC usable up to DC⎓ 120V 2P, ⎓ 60V 1P, 1P + N
- Wide range of accessories and auxiliary components
- Compliant to the standards: IEC 898 - EN 60898, VDE 0641 T 11
- Marking CE

主要认证说明 Approvals and main certifications	C	B
IMQ	0.5 - 50A	
VDE	0.5 - 50A	6 - 50A
GERMANISCHER LLOYD	0.5 - 32A	6 - 32A

5SX4		1P	1P+N	2P	3P	3P+N
	U_e(V) ~	230	230	400	400	400
	I_n(A) ⎓	60	60	120		
B	6 50	●		●	●	
C	0.5 50	●	● 6 - 50A	●	●	● 10 - 50A

短路分断能力 (最大值) Short-circuit capacity (max. values)		
I_n(A)	IEC 898 I_{cs} (kA)	IEC 947-2 I_{cu} (kA)
1P (230 V~), 2P, 3P, 3P+N (400 V~)		
0.5..6	10	50
10..50	10	25
1P+N, 2P, 3P, 3P+N (230 V~)		
0.5..6	10	50
10..50	10	25

有关 5SX4 小型断路器产品的详细技术数据请参阅：
小型断路器技术数据第 38 页。
For more details on the technical data of 5SX4 circuit-breakers, please consult the section:
Technical data of the miniature circuit-breakers page 38.
小型断路器外形尺寸见第 39 页。
Dimension data of the miniature circuit-breakers see page 39.

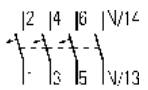
选型和技术数据 Selection and ordering data

5SX4 系列 10000
Series 5SX4 3
25 kA EN 60947 - 2
脱扣特性 C, B
Tripping characteristics C, B

5SX4 系列
- 额定分断能力 10000A 符合标准 IEC 898,
- 额定电压 AC 230/400V
- 能量限制等级 3
- 用于直流: 至 DC 120V (2P); DC 60V (1P, 1P+N)
- 接线端子防护等级: IP 2X-IP XX B
- 辅助触头 (AC) 和故障信号触头 (FC) 可装在断路器右侧。
  - 最多装载 2 个辅助触头 (AC)
  - 或 1 个故障信号触头 (FC)
  - 或最多 1 个辅助触头 (AC, 装在内侧) 和 1 个故障信号触头 (FC, 装在外侧)
- 分励脱扣 (ST) 装在断路器左侧
- 包装件 (每个单元的数量)
  12 (1P)
  6 (1P+N, 2P)
  4 (3P)
  3 (3P+N,4P)

5SX4 Series
- rated short-circuit capacity 10000A according to IEC 898,
- Ue AC 230/400V
- Energy limitation class 3
- DC usable:
  up to DC 120V (2P)
  up to DC 60V (1P, 1P+N)
- protected terminals IP 2X - IP XXB
- auxiliary contact (AC) and fault signal contact (FC) mountable on the right-hand side:
  - 2 auxiliary contact (AC) max. or
  - 1 fault signal contact (FC) or
  - max. 1 AC (internal) + 1 FC (external)
- shunt trip mountable on the left-hand side
- packaging (number of parts per unit)
  12 (1P)
  6 (1P+N, 2P)
  4 (3P)
  3 (3P+N,4P)

[1] 1 模数 (MW)=
一个模数单元 =18mm
1 MW = one Module Width unit = 18mm

	原理图和接线端子 Schematic diagram and connecting terminals	额定电流 Rated current I_n (A)	订货号 Order No. 特性 C Characteristic C	特性 B Characteristic B
	1 极 (1 模数) [1] 1 pole (1 MW) [1] 	0.5 1 1.6 2 3 4 6 8 10 13 16 20 25 32 40 50	5SX4 105 - 7 5SX4 101 - 7 5SX4 115 - 7 5SX4 102 - 7 5SX4 103 - 7 5SX4 104 - 7 5SX4 106 - 7 5SX4 108 - 7 5SX4 110 - 7 5SX4 113 - 7 5SX4 116 - 7 5SX4 120 - 7 5SX4 125 - 7 5SX4 132 - 7 5SX4 140 - 7 5SX4 150 - 7	5SX4 106 - 6 5SX4 110 - 6 5SX4 113 - 6 5SX4 116 - 6 5SX4 106 - 6 5SX4 120 - 6 5SX4 132 - 6 5SX4 140 - 6 5SX4 150 - 6
	1 极 + N (2 模数) 1 pole + N (2 MW) 	6 10 13 16 20 25 32 40 50	5SX4 506 - 7 5SX4 510 - 7 5SX4 513 - 7 5SX4 516 - 7 5SX4 520 - 7 5SX4 525 - 7 5SX4 532 - 7 5SX4 540 - 7 5SX4 550 - 7	5SX4 506 - 6 5SX4 510 - 6 5SX4 513 - 6 5SX4 516 - 6 5SX4 520 - 6 5SX4 525 - 6 5SX4 532 - 6
	2 极 (2 模数) 2 pole (2 MW) 	0.5 1 1.6 2 3 4 6 8 10 13 16 20 25 32 40 50	5SX4 205 - 7 5SX4 201 - 7 5SX4 215 - 7 5SX4 202 - 7 5SX4 203 - 7 5SX4 204 - 7 5SX4 206 - 7 5SX4 208 - 7 5SX4 210 - 7 5SX4 213 - 7 5SX4 216 - 7 5SX4 220 - 7 5SX4 225 - 7 5SX4 232 - 7 5SX4 240 - 7 5SX4 250 - 7	5SX4 206 - 6 5SX4 210 - 6 5SX4 213 - 6 5SX4 216 - 6 5SX4 206 - 6 5SX4 220 - 6 5SX4 232 - 6 5SX4 240 - 6 5SX4 250 - 6
	3 极 (3 模数) 3 pole (3 MW) 	0.5 1 1.6 2 3 4 6 8 10 13 16 20 25 32 40 50	5SX4 305 - 7 5SX4 301 - 7 5SX4 315 - 7 5SX4 302 - 7 5SX4 303 - 7 5SX4 304 - 7 5SX4 306 - 7 5SX4 308 - 7 5SX4 310 - 7 5SX4 313 - 7 5SX4 316 - 7 5SX4 320 - 7 5SX4 325 - 7 5SX4 332 - 7 5SX4 340 - 7 5SX4 350 - 7	5SX4 306 - 6 5SX4 310 - 6 5SX4 313 - 6 5SX4 316 - 6 5SX4 306 - 6 5SX4 320 - 6 5SX4 332 - 6 5SX4 340 - 6 5SX4 350 - 6
	3 极 + N (4 模数) 3 pole + N (4 MW) 	6 10 13 16 20 25 32 40 50	5SX4 606 - 7 5SX4 610 - 7 5SX4 613 - 7 5SX4 616 - 7 5SX4 620 - 7 5SX4 625 - 7 5SX4 632 - 7 5SX4 640 - 7 5SX4 650 - 7	5SX4 610 - 6 5SX4 613 - 6 5SX4 616 - 6 5SX4 620 - 6 5SX4 625 - 6 5SX4 632 - 6
	辅助触头 Auxiliary contacts (1/2 模数)/(1/2 MW)	1NO+1NC 2NO 2NC	5SX9 100 5SX9 101 5SX9 102	
	故障信号触头 Fault signal contacts (1/2 模数)/(1/2 MW)	1NO+1NC 2NO 2NC	5SX9 200 5SX9 201 5SX9 202	说明 对故障信号触头，在主触头第一次手动被合上时状态会被改变。如对于 NO 触头来说，此时已闭合。 For fault signal contacts, it will change station when MCB be closed at first time. For example, the NO contact will be closed at this time.
	分励脱扣 /Shunt trip (1 模数)/(1 MW) U_e=AC 110...415V		5SX9 300	

产品数据 Product data sheet

5SP4 系列 10000
Series 5SP4
应用范围: 公众场合，工业领域
Application sectors: public, industrial

5SP4 系列小型断路器可广泛应用于公众场合和工业领域, 并具有以下一些显著的优点:

外形尺寸减小: 相比较而言，5SP4 (例如: 125A, 4 极) 系列小型断路器的外形尺寸要远比常规使用的塑壳式断路器 (MCCB) 小得多。

无需专业人员使用: 完全符合 IEC898 标准，也就是说可以为非专业和无经验人员使用。

降低成本: 相比较而言，5SP4 系列小型断路器要比塑壳式断路器价格便宜得多。

The 5SP4 circuit-breakers, which are perfectly adapted for utilization in public or industrial environments, offer major advantages such as:
Reduced size: for comparable performances, an 5SP4, 125 A, 4-pole circuit-breaker is significantly smaller than a conventional molded case circuit-breaker (MCCB);
Usability by non-specialists: the circuit-breaker, totally compliant to the standard IEC 898, can be manipulated by inexperienced personnel;
Reduced cost: for comparable performances, the 5SP4 circuit-breaker is significantly cheaper than a molded case circuit-breaker.

有关 5SP4 小型断路器产品的详细技术数据请参阅:
小型断路器技术数据第 38 页。
For more details on the technical data of 5SP4 circuit-breakers, please consult the section:
Technical data of the Miniature Circuit-breakers page 38.
小型断路器外形尺寸见第 39 页
Dimension data of the miniature circuit-breakers see page 39.

15kA IEC 947-2
小型断路器额定电流至 125A，分断能力根据 IEC 947-2 标准可达 15kA。通常用于较大的负载以及在配电柜中作为主回路的开关设备。

- 额定电流: 40A, 50A, 63A, 80A, 100A, 125A AC 230/400V
- 脱扣特性: B, C, D
- 额定分断能力符合标准 IEC 898, 10000A (IEC 947-2, 15kA)
- 用于直流最大至: DC⎓120V 2P; ⎓60V 1P
- 外形尺寸: H × W × D=90 × 27 × 70mm (1 极)
- 接线端子防护等级为 IP 2X-IP XX B，最大连接导线截面可至 50mm²；由平头一字槽和十字槽螺丝组成。
- 可以用符合 EN 50022 标准的 35mm 导轨进行卡式安装，也可以用 3.5mm 的螺丝进行固定安装
- 小型断路器的主触头位置可以通过一个可视的小窗口来进行判别, 触头分开位置显示绿色，而触头在闭合位置显示红色
- 指示标签
- 多种附件可供选择
- 符合以下标准: IEC 898, EN 60898, EN 60204-1/10.92, VDE 0641 第 11 部分 /08.92
- 标记: CE

Miniature Circuit-breaker up to 125A characterized by a breaking capacity of 15kA according to IEC 947-2, accepting high loads; usable as general circuit-breakers, in electrical panels.

- Rated currents: 40A, 50A, 63A, 80A, 100A, 125A AC 230/400V
- Tripping characteristics: B, C, D
- Rated short-circuit capacity according to IEC 898: 10000A, 15 kA (IEC 947-2)
- DC usable up to DC⎓120V 2P, ⎓60V 1P
- Modular dimensions H × W × D : 90 × 27 × 70mm (1 pole)
- Terminals IP 2X - IP XXB for conductors up to 50mm²; combined slotted and pozidrive head screws
- Snap-mounted on symmetric sectioned rails of 35 mm EN 50022 or by screws (dia. 3.5mm)
- Position of circuit-breaker's main contacts highlighted by a window, green if contacts open, red if contacts closed
- Label support
- Wide range of accessories and auxiliary components
- Compliant to the standards: IEC 898, EN 60898, EN 60204-1/10.92 VDE 0641 T11/08.92
- Marking CE

主要认证说明 Approvals and main certifications	C	
VDE	63 - 100A	1P, 2P, 3P, 4P

5SP4		1P	2P	3P	4P
	U_e(V) ~	230	400	400	400
	I_n(A) ⎓	60	120		
B	40 125	●	●	●	●
C	40 125	●	●	●	●
D	40 100	●	●	●	●

短路分断能力 (最大值) Short-circuit capacity (max. values)		
I_n(A)	IEC 898 I_{cs} (kA)	IEC 947-2 I_{cu} (kA)
1P (230 V~), 2P, 3P, 4P (400 V~)		
40....125	10	15
2P, 3P, 4P (230 V~)		
40....125	10	22

选型和技术数据 Selection and ordering data

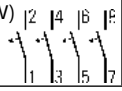
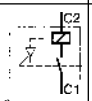
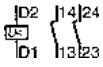
5SP4 系列 10000
Series 5SP4
15kA EN 60947 - 2
脱扣特性 C, B, D
Tripping characteristics C, B, D

5SP4 系列
- 额定分断能力 10000A 符合标准 IEC 898,
- 额定电压 AC 230/400V
- 用于直流: 至 DC ⎓120V (2P); DC ⎓60V (1P)
- 接线端子防护等级: IP 2X-IP XX B
- 辅助触头 (AC)
- 故障信号触头 (FC)
- 分励脱扣 (ST)
- 欠压脱扣 (UR)
- 包装件 (每个单元的数量)
  6 (1P)
  3 (2P)
  2 (3P)
  1 (4P)

5SP4 Series
- rated short-circuit capacity 10000A according to IEC 898,
- Ue: AC 230/400V
- DC usable:
  up to DC ⎓120V (2P)
  up to DC ⎓60V (1P)
- protected terminals IP 2X - IP XXB
- auxiliary contact (AC)
- fault signal contact (FC)
- shunt trip (ST)
- undervoltage release (UR)
- packaging (number of parts per unit)
  6 (1P)
  3 (2P)
  2 (3P)
  1 (4P)

有关附加的漏电模块 5SM2
详见漏电保护断路器产品样本
Additional RCCB modules 5SM2:
see RCDs product catalogue

[1] 1 模数(MW) =
一个模数单元 = 18mm
1 MW = one Module Width unit = 18mm

	原理图和接线端子 Schematic diagram and connecting terminals	额定电流 Rated current I_n (A)	订货号 Order No. 特性 C Characteristic C	特性 B Characteristic B	特性 D Characteristic D
	1 极 (1.5 模数) [1] 1 pole (1.5 MW) [1] 	40 50 63 80 100 125	5SP4 140 - 7 5SP4 150 - 7 5SP4 163 - 7 5SP4 180 - 7 5SP4 191 - 7 5SP4 192 - 7	5SP4 140 - 6 5SP4 150 - 6 5SP4 163 - 6 5SP4 180 - 6 5SP4 191 - 6 5SP4 192 - 6	5SP4 140 - 8 5SP4 150 - 8 5SP4 163 - 8 5SP4 180 - 8 5SP4 191 - 8
	2 极 (3 模数) 2 pole (3 MW) 	40 50 63 80 100 125	5SP4 240 - 7 5SP4 250 - 7 5SP4 263 - 7 5SP4 280 - 7 5SP4 291 - 7 5SP4 292 - 7	5SP4 240 - 6 5SP4 250 - 6 5SP4 263 - 6 5SP4 280 - 6 5SP4 291 - 6 5SP4 292 - 6	5SP4 240 - 8 5SP4 250 - 8 5SP4 263 - 8 5SP4 280 - 8 5SP4 291 - 8
	3 极 (4.5 模数) 3 pole (4.5 MW) 	40 50 63 80 100 125	5SP4 340 - 7 5SP4 350 - 7 5SP4 363 - 7 5SP4 380 - 7 5SP4 391 - 7 5SP4 392 - 7	5SP4 340 - 6 5SP4 350 - 6 5SP4 363 - 6 5SP4 380 - 6 5SP4 391 - 6 5SP4 392 - 6	5SP4 340 - 8 5SP4 350 - 8 5SP4 363 - 8 5SP4 380 - 8 5SP4 391 - 8
	4 极 (6 模数) 4 pole (6 MW) 	40 50 63 80 100 125	5SP4 440 - 7 5SP4 450 - 7 5SP4 463 - 7 5SP4 480 - 7 5SP4 491 - 7 5SP4 492 - 7	5SP4 440 - 6 5SP4 450 - 6 5SP4 463 - 6 5SP4 480 - 6 5SP4 491 - 6 5SP4 492 - 6	5SP4 440 - 8 5SP4 450 - 8 5SP4 463 - 8 5SP4 480 - 8 5SP4 491 - 8
	辅助触头 /Auxiliary contact (AC) (1/2 模数) (1/2 MW)		1NO+1NC 2NO 2NC	5ST3 010 5ST3 011 5ST3 012	
	故障信号触头 Fault signal contact (FC) (1/2 模数) (1/2 MW)		1NO+1NC 2NO 2NC 说明 对故障信号触头，在主触头第一次手动被合上时状态会被改变。如对于 NO 触头来说，此时已闭合。 For fault signal contacts, it will change station when MCB be closed at first time. For example, the NO contact will be closed at this time.	5ST3 020 5ST3 021 5ST3 022	
	分励脱扣 /Shunt trip  (1 模数) (1 MW) (~110 ... 415V, ⎓ 110V) (⎓ 24 ... 48)		5ST3 030 5ST3 031		
	欠压脱扣 Undervoltage release (1 模数)/(1 MW) (~230V)  (⎓ 110V) (⎓ 24V)		5ST3 040 5ST3 041 5ST3 042		
	(~230V)  (⎓ 110V) (⎓ 24V)		5ST3 043 5ST3 044 5ST3 045		

产品数据 Product data sheet

5SX5 系列 ⎓ 10000 T4 | 4500 | 3
Series 5SX5
应用范围: 工业领域
Application sectors: industrial

常用的交流型小型断路器可以用于直流电网中，最大至 DC 120V (2 极) 或 DC 60V (1 极)。

而 5SX5 系列小型断路器与之相比有所不同。它是专门为用于直流电网中而设计的, 所以它可以用于最大至DC ⎓ 440V (2 极) 或 DC ⎓ 220V (1 极) 的电力系统中。

这些高的额定电压值是通过一种特殊的制造方法, 即在小型断路器的灭弧室区域中加装了附加的永久磁铁而得到的。

在直流回路中, 这种设备产生很强的电磁力迫使产生的电弧迅速进入灭弧室，从而使之尽可能快地熄灭。

当 5SX5 系列小型断路器用于直流回路时，由于加装了永久磁铁，所以在接线时务必分清上下端子的极性。

The 5SX5 circuit-breakers differ from AC circuit-breakers usable in DC applications up to DC ⎓ 120V (two-pole version) or DC ⎓ 60V (one-pole version) in that they have been expressly designed for DC utilization under a voltage range of up to DC ⎓ 440V (2P) or DC ⎓ 220V (1P). These rated voltage values have been obtained by means of a special manufacturing method which consists of equipping the arc-suppressing chamber with a nearby permanent magnet.
In DC this device creates a high magnetic force which allows rapidly generating the arc inside the arc-suppressing chamber and then suppressing it as quickly as possible.
When the 5SX5 circuit-breakers are used in DC, the polarities indicated at the terminals should be respected because the permanent magnet is present.

有关 5SX5 小型断路器产品的详细技术数据请参阅:
小型断路器技术数据第 38 页。
For more details on the technical data of 5SX5 circuit-breakers, please consult the section:
Technical data of the Miniature Circuit-breakers page 38.
小型断路器外形尺寸见第 39 页。
Dimension data of the miniature circuit-breakers see page 39.

[1] 时间常数 = 4ms
Time constant t = 4ms

小型断路器是专门为用于直流电压回路而设计的，额定工作电压至 DC ⎓ 440V 2P 和 DC ⎓ 220V 1P。
- 完整的额定电流范围: 0.5 to 50A
- 脱扣特性: B, C
- 直流额定分断能力: 10000A[1]
- 与 5SX2/4 系列相同的外形尺寸，1P = 1 模数(18mm)
  2P = 2 模数 (36mm)
- 用于交流: AC 230/400V；额定分断能力: 4500A
- 能量限制等级: 3
- 多种附件可供选择
- 符合以下标准: IEC 898, EN 60898, VDE 0641 第 12 部分
- 标记: CE

Circuit-breaker specially designed for DC utilization under voltages of up to DC ⎓ 440V 2P and DC ⎓ 220V 1P.
- Complete current range: 0.5 to 50A
- Tripping characteristics: B, C
- Rated DC breaking capacity: 10000A[1] (DIN VDE 0641 T12)
- Sizes identical to those of the 5SX2/4 series
  1P = 1 MW (18mm) 2P = 2 MWs (36mm)
- AC usable: AC 230/400V; rated short-circuit capacity: 4500A
- Energy limitation class : 3
- Wide range of accessories and auxiliary releases
- Compliant to the standards: IEC 898 - EN 60898, VDE 0641 T12
- Marking CE

5SX5		1P	2P
	U_e(V) ~	230	400
	I_n(A) ⎓	220	440
B	6 — 32	●	●
C	0.5 — 50	●	●

短路分断能力 (最大值) Short-circuit capacity (max. values) kA[1]		
I_n(A)	1P	2P
0.5 ... 32	10 (220 ⎓)	10 (440 ⎓)
40 ... 50	10 (110 ⎓)	10 (220 ⎓)

选型和技术数据 Selection and ordering data

5SX5 系列 ⎓ 10000 T4 | 4500
Series 5SX5 | 3
脱扣特性 C, B
Tripping characteristics C, B

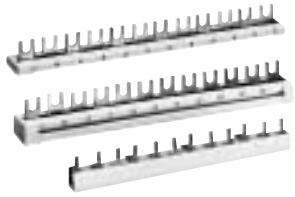
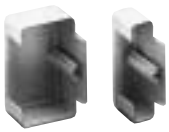
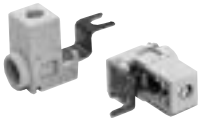
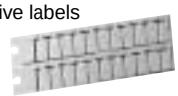
5SX5 系列
- 额定电压
  DC ⎓ 440V (2P);
  DC ⎓ 220V (1P);
- 额定分断能力 10000A
- 接线端子防护等级: IP 2X-IP XX B
- 辅助触头模块和故障信号触头可装在断路器右侧。
- 最多装载 2 个辅助触头 (AC)
- 或 1 个故障信号触头 (FC)
- 或最多 1 个辅助触头 (AC，装在内侧) 和 1 个故障信号触头 (FC，装在外侧)
- 分励脱扣 (ST) 装在断路器左侧
- 包装件 (每个单元的数量)
  12 (1P)
  6 (2P)

5SX5 Series
- Ue
  DC ⎓ 440V (2P);
  DC ⎓ 220V (1P);
- rated short-circuit capacity in DC 10000A
- protected terminals IP 2X - IP XXB
- auxiliary contact blocks and fault signal contacts blocks mountable on the right-hand side:
- 2 auxiliary contact blocks max. (AC) or
- 1 fault signal contact block (FC) or
- max. 1 AC (internal) + 1 FC (external)
- shunt trip mountable on the left-hand side
- packaging (number of parts per unit)
  12 (1P)
  6 (2P)

	原理图和接线端子 Schematic diagram and connecting terminals	额定电流 Rated current I_n (A)	订货号 Order No. 特性 C Characteristic C	特性 B Characteristic B
	1 极 (1 模数) [1] 1 pole (1 MW) [1] 	0.5 1 1.6 2 3 4 6 8 10 13 16 20 25 32 40 50	5SX5 105 - 7 5SX5 101 - 7 5SX5 115 - 7 5SX5 102 - 7 5SX5 103 - 7 5SX5 104 - 7 5SX5 106 - 7 5SX5 108 - 7 5SX5 110 - 7 5SX5 113 - 7 5SX5 116 - 7 5SX5 120 - 7 5SX5 125 - 7 5SX5 132 - 7 5SX5 140 - 7 5SX5 150 - 7	5SX5 106 - 6 5SX5 110 - 6 5SX5 113 - 6 5SX5 116 - 6 5SX5 120 - 6 5SX5 125 - 6 5SX5 132 - 6
	2 极 (2 模数) 2 pole (2 MW) 	0.5 1 1.6 2 3 4 6 8 10 13 16 20 25 32 40 50	5SX5 205 - 7 5SX5 201 - 7 5SX5 215 - 7 5SX5 202 - 7 5SX5 203 - 7 5SX5 204 - 7 5SX5 206 - 7 5SX5 208 - 7 5SX5 210 - 7 5SX5 213 - 7 5SX5 216 - 7 5SX5 220 - 7 5SX5 225 - 7 5SX5 232 - 7 5SX5 240 - 7 5SX5 250 - 7	5SX5 206 - 6 5SX5 210 - 6 5SX5 213 - 6 5SX5 216 - 6 5SX5 220 - 6 5SX5 225 - 6 5SX5 232 - 6
	辅助触头 Auxiliary contacts (1/2 模数)(1/2 MW)	1NO+1NC 2NO 2NC	5SX9 100 5SX9 101 5SX9 102	
	故障信号触头 Fault signal contacts (1/2 模数)/(1/2 MW)	1NO+1NC 2NO 2NC	5SX9 200 5SX9 201 5SX9 202	说明 对故障信号触头，在主触头第一次手动被合上时状态会被改变。如对于 NO 触头来说，此时已闭合。 For fault signal contacts, it will change station when MCB be closed at first time. For example, the NO contact will be closed at this time.
	分励脱扣 Shunt trip (1 模数)/(1 MW)		5SX9 300	

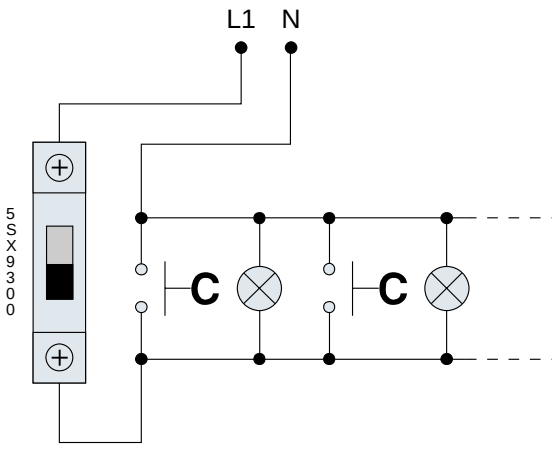
[1] 1 模数(MW)=
一个模数单元 =18mm
1 MW = one Module Width unit
= 18mm

附件 Auxiliary releases

	说明 Versions	应用 Utilization	订货号 Order No.	包装件 (一个单元数量) Packaging (no. of parts)
汇流铜排 /Copper busbars • Umax = AC 450V • 抗过电压能力>3kV • 抗短路电流能力 25A • Umax = AC 450V • resistance to overvoltages>3kV • resistance to short-circuits 25kA 铜排特性 /Bar characteristics 截面 section (mm^2) / 端部进线 lateral feed / 中间进线 transverse feed 16 / 65A / 120A 	长度 210mm (带端盖) Length 210mm (with end caps) 单相 /one phase 16mm^2 单相 + 中性线 /one phase + N 16mm^2 三相 /three phases 16mm^2 三相 + 中性线 /three phases + N 16mm^2	用于 12 模数的宽度 (1 模数 =18mm) for 12 Module Width units 用于小型断路器 for miniature circuit-breakers:	 5ST2 142 5ST2 143 5ST2 144 5ST2 145	 25 10 10 10
	1000mm (不带端盖) 1000mm (without end caps) 单相 /one phase 16mm^2 单相 + 中性线 /one phase + N 16mm^2 三相 /three phases 16mm^2 三相 + 中性线 /three phases + N 16mm^2	用于 56 模数的宽度 (1 模数 =18mm) for 56 Module Width units (1 MW = 18mm) 用于小型断路器 for miniature circuit-breakers:	 5ST2 151 5ST2 152 5ST2 153 5ST2 154	 10 5 10 5
	1000mm (不带端盖) 1000mm (without end caps) 单相 /one phase 16mm^2 单相 + 中性线 /one phase + N 16mm^2 三相 /three phases 16mm^2	用于 56 模数的宽度 for 56 Module Width units 带辅助触头用于 37 模数的宽度 (1 模数 =27mm) with auxiliary contacts 37 Modular Width units (1 MW = 27mm)	 5ST2 163 5ST2 164 5ST2 165	 10 5 10
汇流排端盖 Busbar end caps 	5ST2 (单相，单相 + 中性线) 5ST2 (one phase, one phase + N) 5ST2 (三相，三相 + 中性线) 5ST2 (three phase, three phase + N)	为保证防护等级达到 IP 2X， 汇流排两端必须用端盖封闭 to assure a protection IP 2X, the busbars are closed laterally with covers	5ST2 155 5ST2 156	10 10
汇流排附加接线端子 5ST2 Additional terminals to feed busbars 5ST2 	单相，单相 + 中性线 one phase, one phase + N 三相，三相 + 中性线 three phase, three phase + N	用于小型断路器或导线以及 与汇流排的进线连接 最大至 35mm^2 for bars placed on upper terminals of the circuit-breakers or for cables up to 35mm^2	5ST2 166 5ST2 167	10 10
手柄锁定机构，用于 5SX1, 5SX2, 5SX4, 5SX5 小型断路器 Handle locking device circuit-breakers 5SX1, 5SX2, 5SX4, 5SX5 	 红色 /red 透明 /transparent	防止误操作 /to prevent undesired: 合闸 /switching on 隔离 /disconnector	 5ST2 168 5ST2 170	 1 1
粘贴标签 Adhesive labels 	白色 /white		5ST2 173	44
隔块 /Spacer 	1/2 模数 (一个单元) 1/2 MW unit(s)	用于分隔设备 (模拟极) to separate the devices (dummy pole)	5ST2 122	10

附件 Auxiliary releases

辅助触头和故障信号触头的使用特点 Utilization characteristics of the auxiliary contacts and the fault signal contacts							
电流形式 Current type	使用范围 Utilization category	U_e (V)/I_e (A)					
AC	AC - 15	24/6	110/6	230/6 240/4	400/3 415/3	50/60Hz	
DC	DC - 14	24/3	60/3	110/3	220/1		
U_e - 额定工作电压 /rated operating voltage I_e - 额定工作电流 /rated operating current							
辅助触头和故障信号触头可通过后备的熔断器进行保护 - NEOZED/DIAZED 熔断器最大 6A - gl/gG - 小型断路器最大 6A Auxiliary contact and fault signal protection devices - fuses NEOZED/DIAZED 6A max. - gl/gG - Miniature Circuit-breakers 6A max.							



Emergency stop control with Shunt trip

小型断路器 5SX2, 5SX4, 5SX5 和 5SP4 系列可以安装如下所述的附件。所有这些附件都可以满足电气安装系统的需要, 并可以直接被使用者安装。

- 辅助触头 (AC)
- 故障信号触头 (FC)
- 分励脱扣 (ST)
- 欠压脱扣 (UR; 5SP4)

辅助触头 (AC)

每个模块都由两个独立的触头 (分开的电气回路) 组成: 其中一个是常开而另一个是常闭。触头的机械锁定位置不会改变, 除非由于人为的动作或由于过载和短路才会改变。接线端子防护等级为 IP2X, 允许连接的导线截面最大至 2.5mm² 并可以用扁平或十字螺丝进行固定

故障信号触头 (FC)

故障信号触头模块具有和辅助触头模块相同的结构和外形。它同时还可以远距离指示由于过载或短路而引起的设备脱扣。触头在人为的动作之下仍保持原有的位置。

分励脱扣 (ST)

分励脱扣线圈允许小型断路器远距离脱扣。线圈和小型断路器一起动作不仅仅因为控制杆的作用, 而且同时因为内部机构的动作。

欠压脱扣 (UR)

欠压脱扣线圈的动作是由于断电或是电压在额定电压值的 35% 至 70% 之间 (根据标准 7.2.1.3 EN 60947-1)。

在上述条件下, 欠压脱扣线圈可以防止小型断路器的合闸。

紧停控制

分励脱扣和欠压脱扣中的任何一个都允许用于紧停控制, 并符合 IEC64-8 第 537.4.3 的标准。

对于分励脱扣, 可以在紧停安钮处并联一个指示灯用以永久地显示控制回路的状态。

如果整个损耗不超过 100mA 时将指示灯连接至分励脱扣 5SX9300 也是可能的。

门联锁旋转操作机构

5SP4 系列小型断路器可以配备一个门联锁旋转操作机构。在小型断路器为闭合位置时, 操作机构可以防止柜门打开, 而在柜门为打开位置时, 操作机构可以防止小型断路器合上(此操作需用特殊工具)。

The Miniature Circuit-breakers of the series 5SX2, 5SX4, 5SX5 and 5SP4 can be equipped with the auxiliary releases indicated below, which meet most of the requirements concerning electrical installations and can be mounted directly by the installer:

- auxiliary contacts (AC)
- fault signal contacts (FC)
- shunt trip (ST)
- undervoltage release (UR; 5SP4)

Auxiliary contacts (AC)

Each block consists of two electrically independent contacts (separated electrical circuits): one of these contacts is normally open and the other normally closed. The mechanically stable position of the contacts does not change unless the circuit-breaker is manually actuated or is tripped due to an overload or a short-circuit. The terminals are characterized by a degree of protection IP 2X; they allow connecting conductors with a max. cross-section of 2.5mm² and are delivered with combined slotted and pozidrive head srews.

Fault signal contacts (FC)

The fault signal contact block has a structure and dimensions identical to those of the auxiliary contact block. The fault signal contact block remotely indicates the tripping of the device due to an overload or a short-circuit. The block's contact remain in position when the circuit-breaker's handle is manually actuated.

Shunt trip (ST)

The shunt trip coil allows the circuit-breaker to be remotely tripped. The coil and circuit-breaker are coupled together not only by using the control handle, but also with the internal trigger.

Undervoltage release (UR)

The undervoltage coil causes the circuit-breaker to trip during a voltage break or a progressive drop in value of the rated voltage rating between 35% and 70% (art. 7.2.1.3 IEC 947-1).
Under the conditions described above, the undervoltage release prevents the circuit-breaker from closing.

Emergency Stop control

The Shunt trip and the undervoltage release allow either to actuate an emergency stop as specified in standard IEC 64-8 art. 537.4.3.
For the shunt trip, it is sufficient to connect an indicator light in parallel with the emergency stop pushbutton which permanently indicates the control circuit state.
It is possible to connect the indicator lights to the shunt trip 5SX9300 if their total consumption does not exceed 100mA.

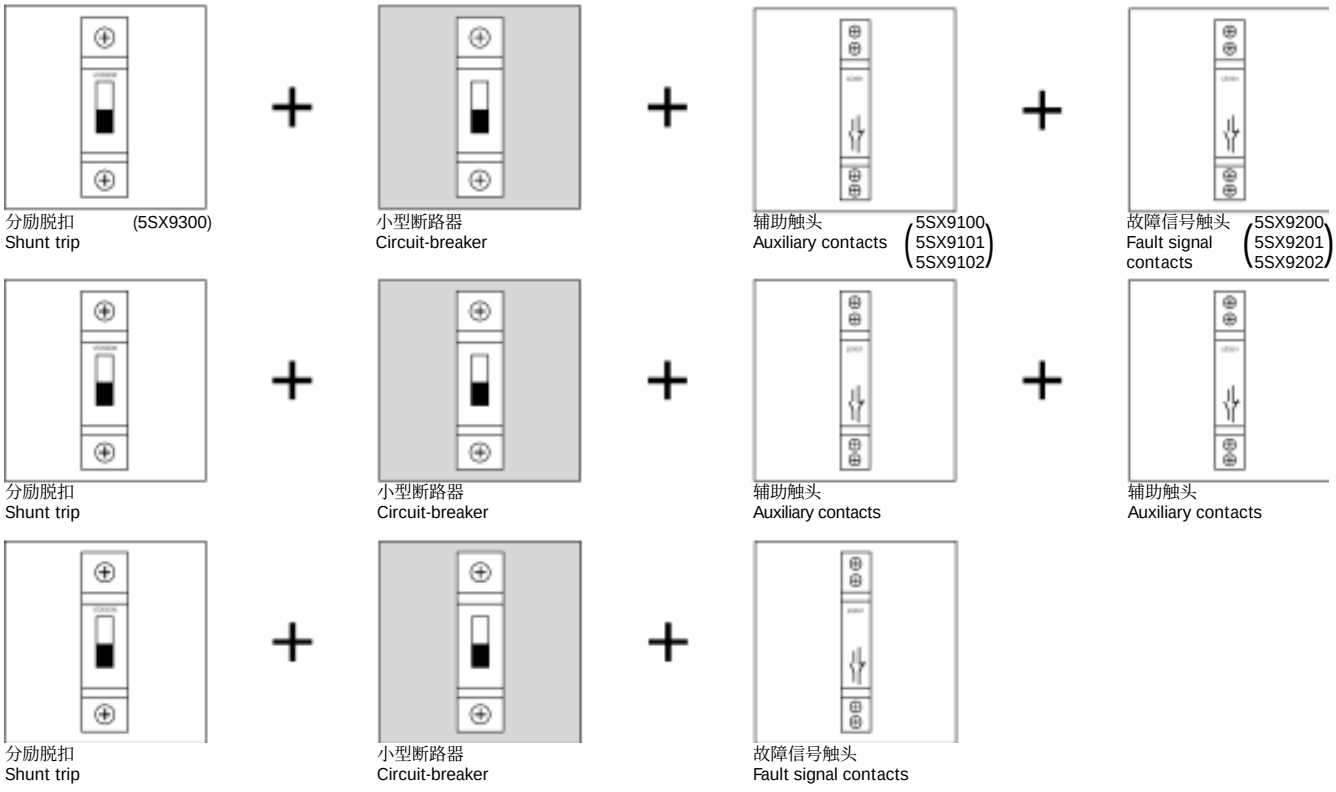
Door coupling rotary operating mechanism

The Miniature Circuit-breakers of the 5SP4 series can be equipped with a door coupling rotary operating mechanism. The mechanism prevents the switchboard from opening when the circuit-breaker is closed and prevents the circuit-breaker from closing (this operation requires a special tool) when the switchboard door is open.

附件 Auxiliary releases

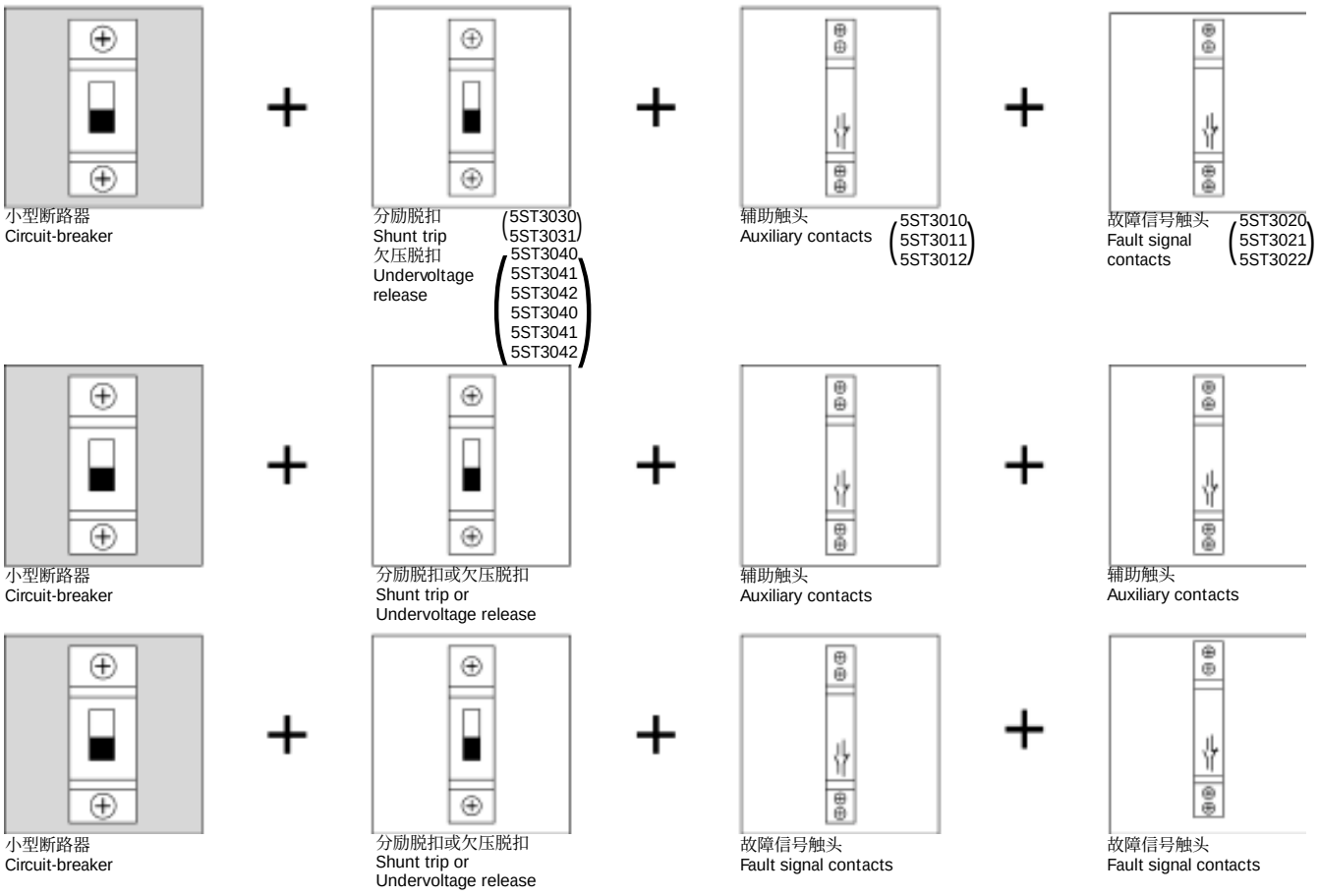
5SX2, 5SX4, 5SX5 系列小型断路器可连接的最多数量的附件

Maximum number of configurations allowed between the 5SX2, 5SX4, 5SX5 Miniature Circuit-breakers and their auxiliary releases.



5SP4 系列小型断路器可连接的最多数量的附件

Maximum number of configurations allowed between the 5SP4 Miniature Circuit-breakers and their auxiliary releases.



技术数据总表 General technical data

系列 Series	5SQ35 4500 3 / 6000 3	5SX1 6000 3	5SX2 6000 3	5SX4 10000 3	5SP4 10000	5SX5 ⎓ 10000 T4 4500 3
额定电流 /Rated currents	6 ... 25A	6 ... 32A	0.3 ... 63A	0.5 ... 50A	40 ... 125A	0.5 ... 50A
额定电压 (交流) Rated AC voltage U_e	230V~ 1P 230 V~ 1P+N 400V~ 2P, 3P, 3P+N, 4P 50/60Hz					直流部分 DC version DC⎓220V 1P DC⎓440V2P
额定短路分断能力 I_{cn} 符合标准 IEC 898 Rated short-circuit capacity in short-circuit I_{cn} according to IEC 898	4 500A 6 000A	6 000A	6 000A	10 000A	10 000A	4 500A AC 10 000A DC
能量限制等级 /Energy limitation class	3					
脱扣特性 /Tripping characteristics	B, C	C	A, B, C, D	B, C	B, C, D	B, C
最大额定工作电压 Maximum AC operating voltage	250/440V~					
最小额定工作电压 Minimum operating voltage	交流或直流 24V AC/DC 24V					
直流工作电压 DC operating voltage	1P, 1P+N 至 DC 60V 2P 至 DC 120V up to DC 60V 1P, 1P+N up to DC 120V 2P					1P 至 DC 220V 2P 至 DC 440V up to DC 220V up to DC 440V
热脱扣的标准环境温度[1] Calibration ambient temperature of the thermal trip trigger [1]	30ºC					
工作温度范围 Operating temperature range	-25ºC 至 +45ºC (短时为 ＋55ºC)，最大相对湿度 95% -25ºC to +45ºC (+55ºC if not permanent), maximum relative humidity 95%					
环境气候条件 /Resistance to climate	根据 IEC 68-2-30 标准为 6 个周期 according to IEC 68-2-30, 6 cycles					
储存温度 /Storage temperature range	-40ºC to 至 +75ºC/ -40ºC to +75ºC					
安装位置 /Operating position	任意 /as desired					
进线方向 /Supply connection	上部或下部端子 top or bottom					取决于极性 respect polarities
接线端子 Terminals	防护等级为 IP 2X -IPXXB, 导线截面为 0.75mm² 至 25mm² (5SX2, 4, 5 及 5SQ35 上端子为 16mm²) protected IP 2X -IPXXB, for conductors of 0.75mm² to 25mm² (16mm² for upper terminal, series)				防护等级为 IP 2X 导线截面至 50mm² protected IP 2X for conductors up to 50mm²	与 5SX2 同 like 5SX2
外壳 /Enclosure	材料绝缘性能符合 DIN 7708 标准，手柄可在 “ 通 ” 与 “ 断 ” 位置锁定 in insulating material according to DIN 7708, toggle handle sealable in “ON” and “OFF” positions					
抗震强度 Resistance to vibration	在每个方向为 6g (g = 9.81m/s²)　60m/s² 在 10..150Hz 时，根据 IEC 68-2-6 6 g in each direction (g = 9.81m/s²)　60m/s² at 10..150Hz to IEC 68-2-6					
使用寿命 /Service life	在额定负载时，20 000 次 /20 000 operations at nominal load					
易燃性 /Flammability	符合标准 DIN VDE 0304 第 3 部分 II b 级 /category II b to DIN VDE 0304 Part 3					
附件[2] Auxiliary components	辅助触头, 故障信号触头, 分励脱扣，欠压脱扣 (5SP4) auxiliary contacts, fault signal contacts, shunt trip, undervoltage release (5SP4)					

[1]) 当环境温度大于或小于校正 (参考) 温度值时，必须根据相应的环境温度调整小型断路器的额定电流值。当环境温度每大于或低于校正值的 10ºC 时，小型断路器的额定电流值须减小或增加 5%。另外，当配电箱中装有 2 个或 2 个以上的小型断路器或回路数并且是并排安装和同时满负载运行时，必须考虑小型断路器的降容使用。有关这方面的信息请与当地办事处联系。

[2]) 5SQ35，5SX1 系列不能加附件。

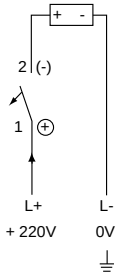
[1]) For ambient temperatures greater/less than the calibration (reference) temperature, the current values indicated on the plate decrease/increase approximately 5% for each variation of 10ºC with respect to the calibration temperature. In a switchboard when two or several series of circuit-breakers are juxtapositioned and simultaneously used under full load, the load on these circuit-breakers may have to be reduced; please consult the manufacturer for information about such circumstances.

[2]) No accessory function for 5SQ35, 5SX1.

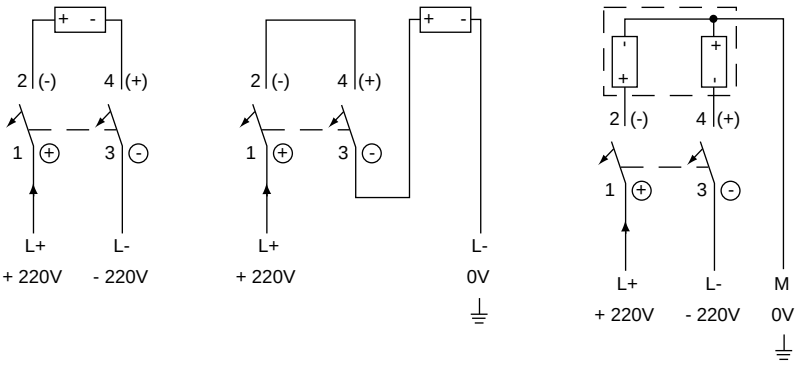
直流应用 DC application

在至 60V 或 120V 的直流电网中，N- 系统的各种小型断路器都能单极或 2 极地应用。
较高的电压需用 5SX5。
5SX5 小型断路器与标准产品的差别是在灭弧室区域中加装了附加的永久磁铁，迫使电弧迅速熄灭。
由于这个原因，开关都标注极性，在接线时务必注意开关的极性。
All〉N〈-type MCBs can be used for DC supplies up to 60V 1 pole and 120V 2 pole.
For higher voltages model 5SX5 is required.
The differences of the 5SX5 to the standard program are in the arc-chamber area that has additional permanent magnets to support the positive quenching of the arc.
For this reason the polarity marked on the MCB terminals must be adhered to when connecting the cables.

5SX5, 1P 直至最大 DC 220V 蓄电池电压
5SX5, 1P to max. DC 220 V battery voltage

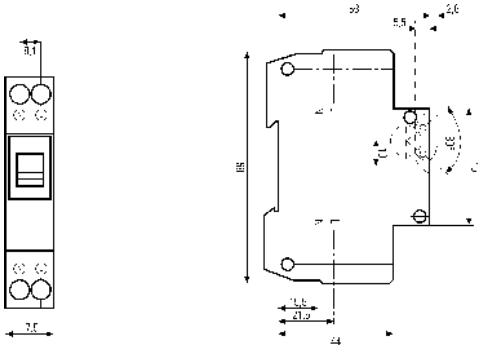


5SX5, 2P 直至最大 DC 440V 蓄电池电压
5SX5, 2P to max. DC 440V battery voltage

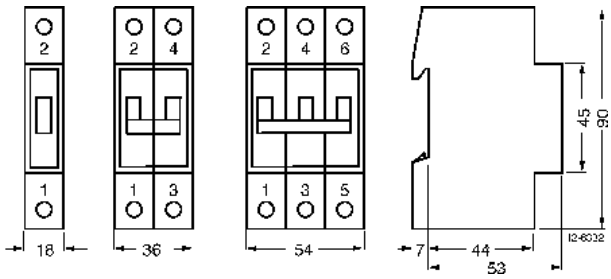


外形尺寸 Dimension drawings

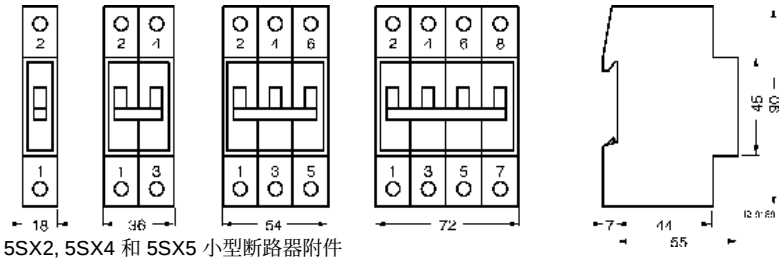
5SQ35 小型断路器
5SQ35 Miniature Circuit-Breakers



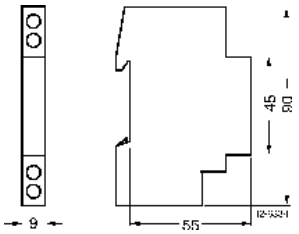
5SX1 小型断路器
5SX1 Miniature Circuit-Breakers



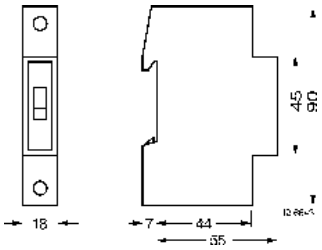
5SX2, 5SX4 和 5SX5 小型断路器
5SX2, 5SX4, and 5SX5 Miniature Circuit-Breakers
外形尺寸 (mm)/Dimensions in mm



5SX2, 5SX4 和 5SX5 小型断路器附件
Accessories for 5SX2, 5SX4, and 5SX5

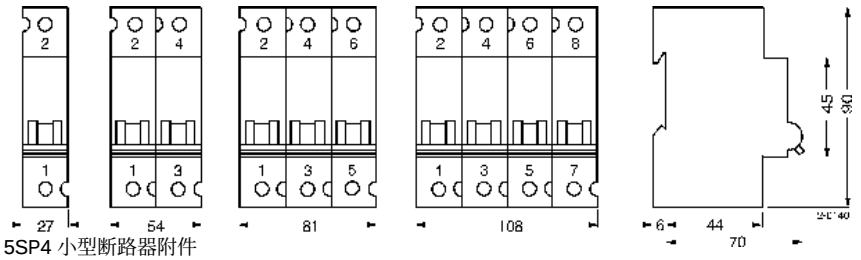


5SX9 10., 5SX9 20.

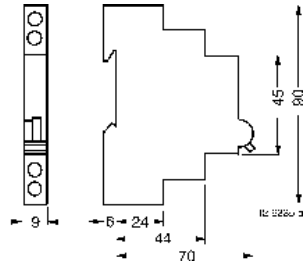


5SX9 300

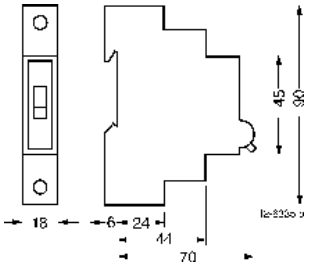
5SP4 小型断路器
5SP4 Miniature Circuit-Breakers
外形尺寸 (mm)/Dimensions in mm



5SP4 小型断路器附件
Accessories for 5SP4



5ST3...



5ST3...

有关电磁式 (FI) 剩余电流保护断路器产品技术的文章

为什么必须采用脱扣与电网电压无关的电磁式 (FI-) 剩余电流保护断路器？

Why residual current-operated circuit-breakers functioning independent of the supply?

Reinhard Solleder 著文
By Reinhard Solleder

脱扣与电压无关的剩余电流保护断路器作为间接接触保护措施并在额定剩余电流至 30mA 时也可作为直接接触的补充保护以及防火措施，多年的实践证明是最耐受考验的保护措施，因此日益要求在安装规范中给予明文规定。本文的论述表明，应用脱扣与电网电压有关的电子式脱扣的开关电器 (例如 LS/DI- 断路器) 目前还不能保证达到相同高度的保护水平。因此，必须在电器标准中对电子元件的可靠性作出具体规定。

Residual current-operated circuit-breakers functioning independent of the supply voltage have for many years proved to be a most reliable measure of protection against indirect contact, and as far as the tripping threshold is not higher than 30mA, also as additional protection in case of direct contact with live parts and as protection against fire hazards. They are therefore increasingly specified in standards for the electrical installation of buildings. The following article shows that the application of residual-current circuit-breakers (r.c.b.'s) that use electronic components for the tripping function and whose performance depends on the supply voltage (voltage dependent r.c.b.'s) at present does not ensure the same high degree of protection. Requirements and tests for the reliability of the electronic components and circuits therefore have to be incorporated in the specifications for residual-current circuit-breakers.

电磁式 (FI-) 剩余电流保护断路器

Electromechanical (FI) RCCBs

采用与电网电压无关的脱扣原理的电磁式 (FI-) 剩余电流保护断路器多年的使用实践表明它能承受各种考验，它对防止人身事故和火灾危险所作出的有益贡献，深得专家们的高度评价 [见文献 1-5]，愈来愈多的人们提出要求，应将必须使用这类 FI- 剩余电流保护断路器，即其脱扣与电网电压无关的 FI- 剩余电流保护断路器纳入到安装规范的规定中。标准制订机构的安全意识，反映在标准中，例如 DIN VDE0660、CEE27 或其它国家标准中规定的更高要求，对此起了主要的作用，当然，生产制造厂方面在进一步发展 FI- 剩余电流保护断路器过程中，在技术与质量方面也作了积极的贡献。从技术观点看，对 FI- 剩余电流保护断路器的主要要求或改进有：

－发展新一代产品，它既能在交流漏电电流时，也能在脉动直流漏电电流时脱扣；
－具有冲击电流强度；
－进一步提高通断能力、短路强度，并对可靠性提出了更高的要求 (例如在潮湿气候中的特性)；
－能可靠地使用在周围温度最低至 -25°C 的场合。

就目前情况来说，FI- 剩余电流保护断路器在设计人员和用户的心目中不仅要保持已经获得的崇高形象，并且还得进一步扩大这种良好的形象，在这种背景下，目前或在可见的将来提出这样一个问题是否深有意义，或者从安全角度看是完全必要的，即：

－在 " 微电子 " 年代里，是否应将微电子装入到 FI- 漏电保护器，下文试图回答这一问题。

The use of residual current-operated circuit-breakers functioning independent of the supply voltage (voltage independent r.c.b.'s) is becoming increasingly common as a result of years of practical experience, and on account of the evidence proved by exports [1 to 5] of their high efficiency concerning prevention of accidents and fire. They are increasingly frequently specified in standards for the electrical installation of buildings.

Conaclousness of their responsibility for safety in the part of the standards authorities have been a contributary factor, as expressed in stringent requirements in DIN VDE 0664, CEE 27 and other national standards.

Improvements in technology and in the quality of voltage independent r.c.b. 's have also played a port, Essential requirements for and improvements of voltage independent r.c.b.'s from the technical point of view are for instance:

- development or the new generation of devices which trip both at AC residual currents and at pulsating DC residual currents
- improvements with regard to surge-current resistivity
- Increased performance with regard to breaking capacity and short circuit current withstandability, and more stringent requirements regarding reliability (e.g. behaviour in humid climate conditions)
- Improvements concerning the application at ambient temperatures down to -25°C

It is therefore important not only to maintain the excellent reputation of voltage independent r.c.b.'s, but to improve it further. In this respect we are faced with the question of whether it is now or whether it will be in the foreseeable future - in the age of micro-electronics - appropriate or whether it can be permitted at all from the safety point of view to integrate micro-electronics in voltage independent r.c.b.'s. The following article tries to find an answer to these questions.

作用原理

Principles of operation

首先根据接线原理图来说明脱扣与电网电压无关的 FI- 剩余电流保护断路器 (图 1) 和脱扣与电网电压有关的剩余电流保护断路器 (图 2) 的工作原理。后一种断路器被称为 DI- 剩余电流保护断路器 (差动电流－断路器)。在德国，这类电器只有与小型断路器组合而成的 2 极式结构出售在市场上。

The block diagram in Fig. 1 illustrates the functions of a voltage independent r.c.b.'s and that in Fig. 2 shows the functions of a voltage dependent r.c.b.'s. In the Federal Republic of Germany voltage dependent r.c.b.'s are only available as double pole devices in combination with circuit-breakers for overcurrent protection.

脱扣与电网电压无关的 FI- 剩余电流保护断路器

Voltage independent RCCBs

在 FI- 剩余电流保护断路器上，即可采用" 闭锁磁铁式脱扣器 " 作为脱扣器 A，也可采用 " 保持电磁铁式脱扣器 " 作为脱扣器 A，一般都优先采用后一种。它在断路器脱扣回路与供电电网之间不存在电的连接。交流漏电电流和脉动直流漏电电流脱扣用的 FI- 断路器的结构与作用原理图示于图 3，具体说明见文献 6 和文献 7。

FI- 剩余电流保护断路器的主要特征是，脱扣器 A 所需的脱扣能量直接来自于零序电流互感器 S。它不需要辅助能量。

In voltage independent r.c.b.'s the release A may be either a magnetloally locked relay or a polarized tripping relay, preference being given to the latter. There is no galvanic connection between the trip circuit of the circuit-breaker and the power supply. Construction and function of voltage independent r.c.b.'s tripping at AC residual currents as well as at pulsating DC residual currents are described in [6 and 7] and are illustrated in Fig. 3.

A significant feature of voltage independent r. c.b.'s is that the energy for the release A is provided directly by the core balance current transformer S. An auxiliary power supply is therefore not required.

脱扣与电网电压有关的 DI- 剩余电流保护断路器
Voltage dependent r.c.b.'s

DI- 剩余电流保护断路器的结构是与 FI- 剩余电流保护断路器相类似。然而，突出的差异在于工作原理，当供电线路中出现漏电电流时，由零序电流互感器 S 发出的信号须借助与辅助能量有关的电子单元 V 放大后输送给脱扣器 A，然后由它进行分断。电子式放大器所需要的辅助能量主要取决于供电电网，因此蓄电池由于其工作可靠性与寿命太低而不适宜作为辅助能源，所以在开关的脱扣回路与供电网之间一般都存在着电连接 (图 3)。在 DI- 剩余电流保护断路器上，主要是应用“ 分断脱扣器 ”作为脱扣器 A 与电子式放大器相连接。

Voltage dependent r.c.b.'s have a design similar to that of voltage independent r.c.b.'s. The significant difference in the function is, however, that in the event of residual current in the electrical installation, the signal given by the current transformer S is amplified by an electronic unit V, which for its part depends on auxiliary energy, and is then fed to the release A, which initiates the breaking operation. The auxiliary energy required for the electronic amplifier is preferably taken from the mains supply system, as accumulators on acoount of their inadequate reliabilly and short service life are not suitable. Therefore there is usually a galvanic connection between the tripping circuit of the circuit-breaker and the mains power supply (Fig. 3). In connection with the electronic amplifier V, usually simple current operated relay are used in voltage dependent r.c.b.'s.

对采用分断的保护措施的
保护价值起决定性作用的因素
Determining parameters for the level of protection in an installation using disconnection from the supply by protective devices as measure for protection

采用分断的保护措施，例如在 TN 或 TT- 电网中应用 FI- 剩余电流保护断路器，其保护价值主要决定于 (图 4)：

－在故障情况下承担分断任务的断路器本身的可靠性和失效率 [文献 8、9]。
－断路器与供电电网共同作用时，即保护措施的可靠性和换效率 [见文献 8、9]。

在试图回答问题“ 为什么必须采用脱扣与电网电压无关的 FI- 剩余电流保护断路器？ ”时，必须着重研究这两个要素。

关于 FI- 剩余电流保护断路器或 DI- 剩余电流保护断路器在交流或脉动直流敏感型脱扣方面的其它论述，均可见之于在 DIN VE0664 第 1 部分中已规定的脱扣条件 [文献 10]。

The level of protection of a measure for the protection against indirect contact by disconnection from the supply - e.g. residual-current protection in TN- or TT-systems - is determined mainly by (Fig. 4):

- the reliability resp. the failure rate of the circuit-breaker itself, which has to disconnect the circuit in the event of a dangerous situation [8, 9]
- the reliability resp. the failure rate of the circuit-breaker in cooperation with the mains power supply, i.e. of the protective measure [8. 9] with respect to the influence from the mains.

When answering the question “Why residual-current circuit-breakers functioning independent of the supply ?”, both aspects therefore have to be taken into account. For the following consideration it is assumed that both voltage independent and voltage dependent r.c.b.'s function at AC and pulsating DC rasidual currents. The tripping conditions are stated in DIN VDE 0664, Part 1 [10].

断路器的可靠性或失效率
Reliability resp. failure rate of the circuit-breaker

关于两种开关电器

－脱扣与电网电压无关的 FI- 剩余电流保护断路器和
－脱扣与电网电压有关的 DI- 剩余电流保护断路器

在可靠性方面的理论比较可根据图 3 所示的工作原理，得出以下的结论；

－检测部分，即零序电流互感器 S，对两种开关电器来说，其结构是相同的，因此，它们的失效率大致上是相同的；
－在 DI- 剩余电流保护断路器上，脱扣的能量取自于供电电网。所以，不论是脱扣器 A，还是操作机构 M 可设计得比 FI- 剩余电流保护断路器上用的脱扣器与操作机构更坚固可靠，其结果是使 DI- 剩余电流保护断路器上操作机构和脱扣器发生干扰的可能性就比较小。
－然而，这两种开关电器在可靠性方面的最大区别于功能单元“ 鉴别 ”。

因此，为了比较可靠性，下文将着重论述功能单元“ 鉴别 ”。

For a theoretical comparison of the reliability of the two devices, whose principles are shown in Fig. 3.

- voltage independent r.c.b.'s and
- voltage dependent r.c.b.'s

the following can be stated:

- The part for the detection of the residual current, i.e the core balance current transformer S, is of the same design for both types of devices and therefore has roughly the same failure rate.
- The voltage dependent r.c.b. takes the tripping energy from the mains supply. Both the release A and the mechanism M may therefore be of sturdier construction than it is the case with the voltage independent r.c.b. This may result in a lower susceptability to failures of the mechanism and of the release of the voltage dependent r.c.b.
- The most significant difference in the reliability of the two types of circuit-breakers in question is embodied in the part for the evaluation of the residual current.

The following considerations therefore are deliberately based on the evaluation unit for a comparison of reliability.

举例说明可靠性计算的原理与概念
Principles and terms for a reliability calculation including an example

根据 [文献 11] 的介绍，元件与电子可靠性一般应用的可靠性计算的特性参数是失效率 λ。零件的失效率的数值是表示：在规定的周围条件与工作条件下工作时，在一定间隔时间内平均出现的失效次数。

失效率 λ 的单位为 h^{-1} 并用fit (单位时间的失效次数) 来表示，也就是说：

1 fit = 在 10^9 元件小时中失效 1 次。

失效率 λ，例如电子元件的失效率 λ 主要是决定于工作条件，即实际使用的场合中的具体情况 [文献 11 至 13]。此时，关系到：

－ 工作电流；
－ 工作温度；
－ 以及功率比所谓操劳因数起着十分重要的作用。因此在进行失效率计算时必须从下述引用的标准中考虑取用有关的因数：
－ π_U 实际电压与额定电压之电压比；
－ π_T 与工作条件有关的平均周围温度 (SN29500 中规定的系数 T)；
－ π_P 实际功率与额定功率之功率比

由图 5 可看出对电子元件失效率具有重要影响的各种因素 [见文献 12]。

在失效率分析时并不考虑提前失效，这种提前失效需预先将它排除。

下面是为便于对功能单元“ 鉴别 ”的失效率进行计算而使用的西门子－标准 SN29500 “ 元件的失效率 ” ［文献 11]。这份不断进行当前化的标准，不仅在西门子股份公司内部是作为可靠性预报的统一基础，也是被世界范围内公开招标的大项目承包人及其它大用户所认可。这份标准提供的失效率除根据使用和试验经验外，也考虑了外来的资料来源，例如 MIL 手册 MIL HDBK-217 (军用标准化手册：电子设备可靠性预报）并结合规定的条件而得到的。标准中所列的数值符合元件制造厂当前能实现的技术水平，只要它们应用合适的质量保证措施。在考虑上述各方面因素的前提下，提出的失效率为：

$$\lambda = \lambda_B \pi_U \pi_T \pi_P \quad (1)$$

式中：λ_B 为基准条件时的失效率，而 λ 为工作条件时的失效率。

The most commonly applied parameter in a reliability calculation for components and complete devices according to [11] is the failure rated λ.This value indicates the mean failure frequency to be expected over a period of time under given ambient and functional conditions.

The failure rate λ has the unit h^{-1} and is expressed in fit (failures in time), i.e.

1 fit = 1 failure in 10^9 component operating hours.

The failure rate λ of an electronic component is essentially influenced by the operating cinditions, i.e, by the environmental conditions in practical service [11 to 13]. The so-called stress factors taking into regard the influence of

- the operating voltage
- the operating temperature
- where applicable, the power ratio play an important part and must be taken into account

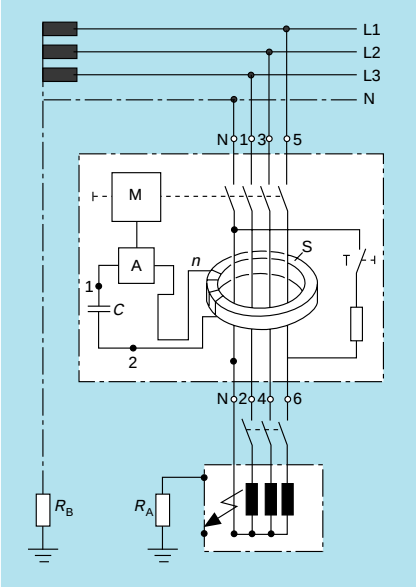
有关电磁式 (FI) 剩余电流保护断路器产品技术的文章

when calculating the failure rate.
These factors can be taken from the standard specified below.
- π_U ratio of actual to rated voltage
- π_T mean ambient temperature referred to operating conditions (index T to SN 29 500 [11]).
- π_P ratio of actual to rated power

The most important factors influencing the failure rate of electronic components (In manufacturing and application) are shown in Fig. 6 [12].
The failure rate analysis does not take premature failures into account. These have to be eliminated in advance, for example, by means of a burn-in test.
The following calculation of a failure rate for the evalution unit is based on Siemens Standard SN 29 500 "Failure Rate of Components" [11]. This standard is continuously updated and serves not only within Siemens AG as a basis for reliability predictions, but is recognized by public contractors and other customers all over the world. The failure rates given in this standard were worked out from both practical and test experience, taking into account other sources such as the MIL-HDBK-217 Handbook (Military Standardization Handbook: "Reability Prediction of Electronic Equipment") and adapted to specified conditions (reference conditions), The values indicated in this standard reflect the state of art attained by manufacturers where adequate quality assurance measures are taken.
Taking the factors mentioned into account the failure rate is given in the equation:

$\lambda = \lambda_B \pi_U \pi_T \pi_P$

λ_B denotes the failure rate under reference conditions and



λ the failure rate under operating conditions.
图 1 脱扣与电网电压无关的剩余电流保护断路器 (FI-) 例如接在 TT- 系统中的接线原理图

A	脱扣器
M	断路器的操作机构
S	零序电流互感器
C	带有焊接连接端 1 和 2 的电容器
T	试验装置
n	副边绕组
R_B	接地电阻，工作接地
R_A	接地电阻，用电设备

Fig. 1, Block-diagram of voltage independent r.c. b.'s e.g. in TT system

A	Release
M	Mechanism
S	Core balance current transformer
C	Capacitor with soidering joints 1 and 2
T	Tast device
n	Secondary winding
R_s	Earthing resistance (system earth)
R_A	Earthing resistance (load)

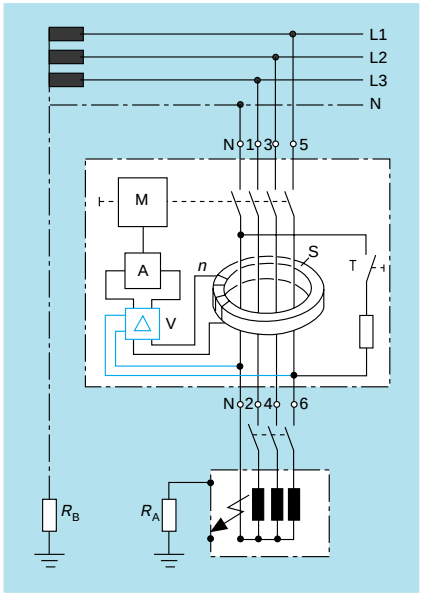


图 2 脱扣与电网电压有关的剩余电流保护断路器 (DI-) 例如接在 TT- 系统中接线原理图

A	脱扣器
M	断路器的操作机构
S	零序电流互感器
V	电子式放大器
T	试验装置
n	副边绕组
R_B	接地电阻，工作接地
R_A	接地电阻，用电设备

Fig. 2, Block-diagram of voltage dependent r.c.b.'s e.g. in TT system

A	Release
M	Mechanism
S	Core balance current transformer
V	Electronic ampilifier
n	Secondary winding
R_s	Earthing resistance (system earth)
R_A	Earthing resistance (load)

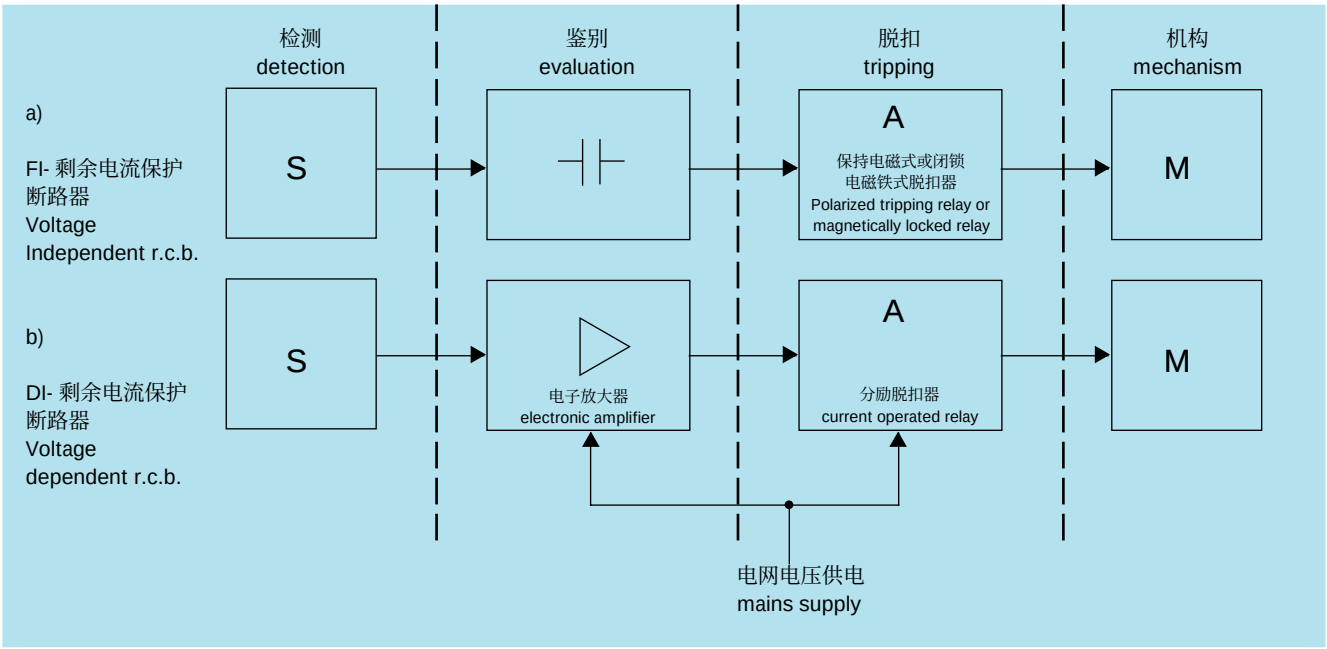


图 3 FI- 剩余电流保护断路器和 DI- 剩余电流保护断路器的工作原理 (两种断路器均为交流和脉动直流敏感型)
S 零序电流互感器　　A 脱扣器　　M 操作机构
Fig. 3. Functional units of voltage independent r.c.b.'s and of voltage dependent r.c.b.'s (both of them AC- and pulsating DC-sensitive)
S Core balence current transformer　　A Release　　M Mechanism

模拟集成电路的失效率计算
Calculating the failure rate of an analogous integrated circuit

以集成电路 (IS) 为例，很明显，为基准条件时失效率 λ 与工作条件时的不一样。

根据 SN- 标准 29500，具有 MSI (中等集成规模的) 集成电路的基准失效率：

λ_B =150 fit [集成电路 (IS) 的额定电压 U_n=11V]

此时，基准条件是等效阻塞层温度：T_{vj1}=55°C

在这一举例中，将下述条件作为工作条件 (使用情况)：

－周围情况：

T_u=40°C 或 85°C；

－工作电压：U=8V 或 11V；

－工作电流：I=3mA。

在工作条件时的等效阻塞层温度可按公式 (2) 计算：

$T_{vj2}=T_u+PR_{th}$

取：

$P=UI$=8V x 3mA=24mW,

R_{th}=150K/W 热阻的基准值外壳 / 周围，摘自 SN- 标准 29500

$T_{vj2}=T_u$+24mW x 150K/W

$T_{vj2}=T_u$+3.6K

根据集成电路的 D“ 工作电压 ”与“ 额定电态 ” 之比较：

U/U_n=8V/11V=0.72。

从 SN- 标准 29500 中获得与电压比相关的操劳系数：

π_U=1.1。

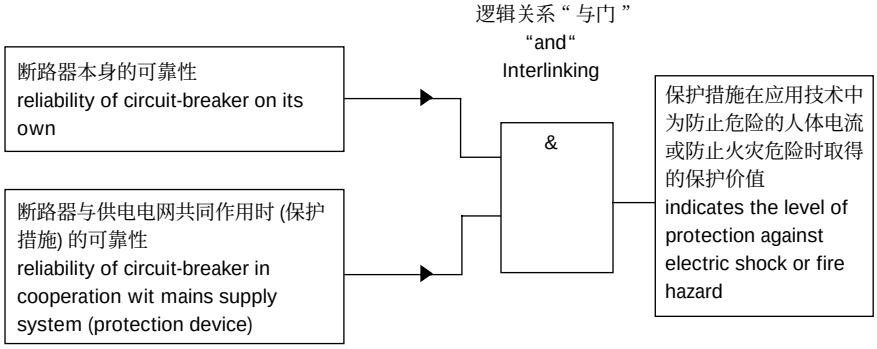


图 4 采用分断的保护措施，对其保护价值起着决定性作用的要素
Fig. 4 Parameters for the degree of protection by a protective measure with disconnection from the supply.

由于等效阻塞层温度

$T_{vj2}=T_u$+3.6K

T_U=40°C

T_{vj2}=40°C +3.6K=43.6°C

由 SN- 标准 29500 得知，与工作温度相关的操劳系数：

π_T=0.7,

在 T_u=85°C 时，算出的等效阻塞层温度：

T_{vj2}=85°C+3.6K=88.6°C

从 SN- 标准 29500 获得的与工作温度相关的操劳系数：

π_T=4。

基准条件时的失效率 λ_B 可按公式 (1) 换算成工作条件时的失效率 λ：

$\lambda=\lambda_B\pi_U\pi_T$

此时根据文献 [11]

在 V_U=40°C 时，得到的：

λ=150 fit x 1.1 x 0.7=115.5 fit。

而在 T_u=85°C 时，得到的：

λ=150 fit x 1.1 x 4=600 fit。

从这一典型的举例可看出，集成电路，单从在周围温度 T_u=40°C 升高到 T_u=85°C 时就提高了 6 倍。如果集成电路仍在额定电压条件下工作，而周围温度考虑到操劳系数 π_U=4, 则得出的失效率：

λ=150 fit x 3 x 4=1800 fit。

从这一简单的计算实例可充分显示出，在开关电器中应用大量的电子元件以前，除考虑到在它们发生故障时会危害人的健康与生命之外，必须进行可靠性计算的重要性，因此，在这类保护开关电器的标准中必须无条件地对电子电路失效率的极限值作出具体规定。

An integrated circuit (IC) provides a useful example for demonstrating the respective failure rates λ under reference conditions and under operating conditions.

According to the Siemens Standard SN 29 500 the reference failure rate for a medium-scale

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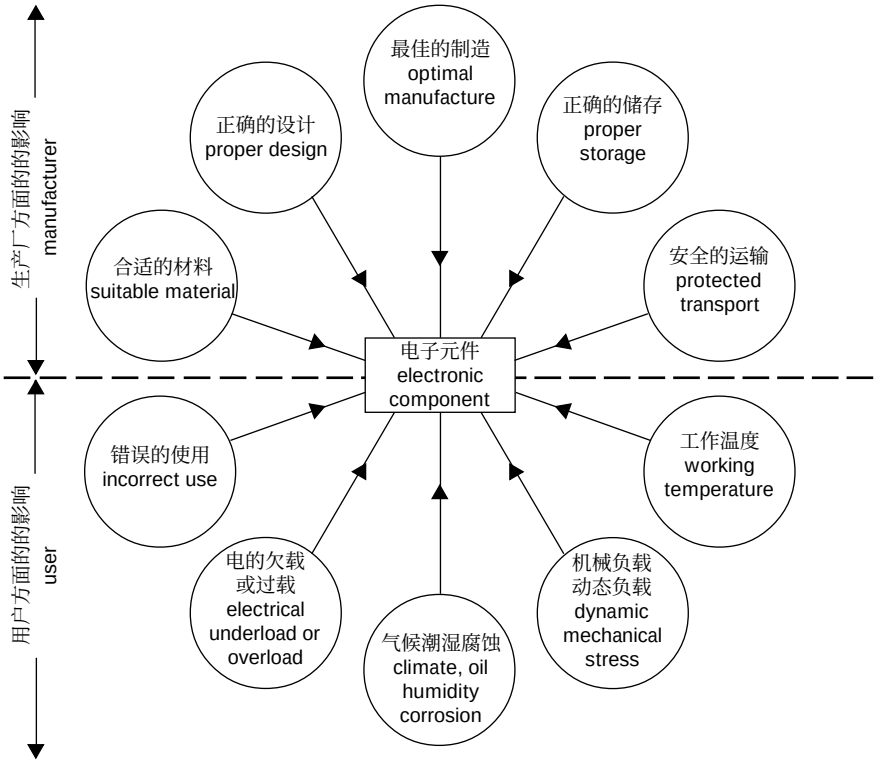


integrated circuit (MSI) is λ =150 fit
(rated voltage of the integrated circuit (IC) U_n=11V).
The reference condition is the equivalent junction temperature
T_{vj1}=55°C
Operating conditions (in service) in this example are assumed to be the following:
- Ambient temperature
  T_u=40°C resp. 85°C
- Operating voltage *U*=8V resp. 11V
- Operating current
  I=3 mA

The equivalent junction temperature T_{vj2} under operating conditions is worked out by means of equation (2):

$T_{vj2}=T_u+P.\ R_{th}$ (2)

with
P=U. I=8V • 3mA=24mW,
R_{th}=150K/W, guide value for thermal resistance for transition from casing to ambient air from Standard SN 29 500.
$T_{vj2}=T_u$+24mW • 150K/W.
$T_{vj2}=T_u$+3.6K.
From the ratio of operating to rated voltage of the integrated circuit (IC)
U/U_n=8V/11V=0.72
the stress factor for voltage ratio π_u can be worked out with the aid of Standard SN 29 500, its value being π_u=1.1
From an equivalent junction temperature given with
$T_{vj2}=T_u$+3.6K, the ambient air temperature being
T_u=40°C
T_{vj2}=40°C+3.6K=43.6°C
by reference to standard SN 29 500, the stress factor for operating temperature dependence can be determined as
π_T=0.7.
For T_u=85°C, and given an equivalent junction temperature
T_{vj2}=85°C+3.6K=88.6°C
the stress factor for operating temperature dependence can be worked out with the aid of Standard SN 29 500 as π_T=4.
The failure rate λ_B under reference condition can be converted to λ under operating conditions by means of equation (1):
$\lambda = \lambda_B \pi_u \pi_T$.
Here, π_p needs not to be taken into account according to [11].
For T_u=40°C
λ =150 fit x 1.1 x 0.7=115.5 fit
and for T_u=85°C
λ =150 fit x 1.1 x 4=660 fit
As the example shows, the failure rate λ of the integrated circuit increases by a factor of roughly 6 solely due to the increase in ambient temperature from T_u=40°C to T_u=85°C
If the integrated circuit is then operated under rated voltage conditions, the failure rate at an ambient temperature of T_u=85°C and taking into account a stress factor π_u=3 is
λ =150 fit x 3 x 4=1800 fit
This simple calculation example shows how important it is to carry out reliablility calculation before equipping a protective device with a large number of electronic components, the failure of which will endanger health and lifes of persons. Limits for the failure rate of electronic circuits must therefore be specified in the standards for protective devices.

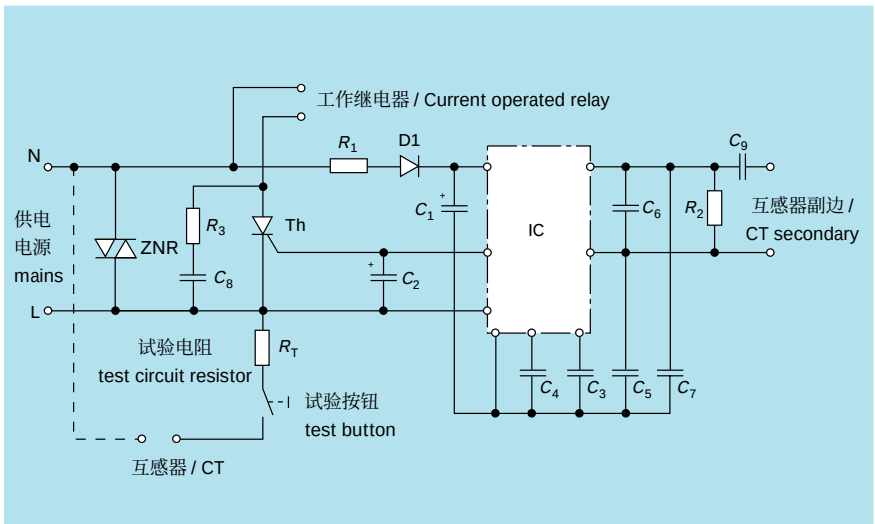


图 6 DI-断路器上脱扣回路的接线原理图
Fig. 6 Circuit-diagram of tripping circuit for voltage dependent r.c.b.'s

FI- 剩余电流保护断路器和 DI- 剩余电流保护断路器中功能单元 “ 鉴别 ” 的失效率
Failure rate of the evaluation unit of voltage independent and voltage dependent r. c. b.

应用文献 11, 根据上述集成电路的举例, 可对 FI- 剩余电流保护断路器和 DI- 剩余电流保护断路器中功能单元 “ 鉴别 ” 的失效率 λ 进行计算并进行相互比较。此时, 只将在失效率时会引起开关电器失灵的电子元件与连接位置纳入计算的范围。关于为了满足文献 [10] 中要求达到的 250A 冲击电流强度而需加装的元件 (在 FI- 剩余电流保护断路器上只需为此加装一个压敏电阻), 对两类开关电器来说, 均不纳入考虑的范围。

交流和脉冲电流敏感型的 FI- 剩余电流保护断路器上的功能单元 “ 鉴别 ” 只是由一个具有 2 个焊接连接端头的优质电容器组成 (图 1), 而发挥同样功能这一部分, DI- 剩余电流保护断路器却是有多几倍的电子元件与连接点组成。图 6 给出了这类开关装有 14 个元件的电路图。

借助 SN- 标准 29500 计算了这一功能单元在温度 85°C 的失效率 λ, 其结果为 :

— FI- 剩余电流保护断路器 λ=5 fit

— DI- 剩余电流保护断路器 λ=1611.7 fit,

如果采用优质的 MKT- 多层电容器取代陶瓷电容器,

λ=827.7 fit

如同 DI- 剩余电流保护断路器失效率 λ 计算结果所表明的那样, 如用优质的 MKT- 电容器取代 C_4 C_5 C_6 和 C_7 陶瓷电容器 (图 6), λ 将大大减小。众所周知, “ 无源元件 ”以及“ 分立的半导体 ” 其失效率也有很大的区别。

如将开关的实际使用寿命折算为 20 年, 则:

— FI- 剩余电流保护断路器上的失效百分率为 0.09%;

— DI- 剩余电流保护断路器上的失效百分率为 28.3%, 或者 14.5% (采用 MKT- 电容器)。

在 85°C 比较有利情况下得出的失效比例 :

$$\frac{\text{DI- 剩余电流保护断路器}}{\text{FI- 剩余电流保护断路器}} = \frac{14.5\%}{0.09\%} = 161$$

即使考虑到不同的脱扣器与操作机构, 但失效比例大致上是位于这一数值。进行试验的结果表明, 开关电器中可能出现的温度可达 85°C — 这决定于装入的具体情况及负载的大小 (例如装在配电柜中)。

需要补充说明的是这项可靠性比较关系到具体的实例, 选用的电子元件是“ 用电设计质量 ”还是 “ MIL- 标准规定的元件 ”, 它也与元件的费用以及前面提到操劳系数有关, 所以实际出现的失效率或失效百分率有可能与所举的实例有差异。

With the aid of (11) the failure rates λ of the evaluation unit (Fig. 3) of voltage independent r.c.b:'s and of voltage dependent r.c.b:'s were calculated on the basis of existing circuits and a comparison was made. Only those electronic components and joints which could lead to non-operation of the circuit-breaker if they themselves were to become defective, were taken into the calculations. The addititonal components required in order to reach the surge current resistivity of 250A specified in [10] (with the voltage independont r.c.b. solely one varistor) were not taken into consideration with both versions.

Whereas with the AC- and pulsating DC-sensitive versions of the voltage independent r.c.b. the evaluation unit consists solely of a high quality capacitor with two soldering joints (Fig. 1), the corresponding component of a voltage dependent r.c.b. contains considerably more electronic components and joints in order to ensure a similar performance, Fig 6. illustrates the circuit of such a circuit -breaker with 14 electronic components.

Calculation of the failure rate λ (Table 1) with the aid of Siemens Standard SN 29 500 produces at a temperature of 85ºC the following results for this unit:

- voltage independent r.c.b. : λ=5 fit

- voltage dependent r.c.b. : λ=1611.7 fit, resp. =827.7 fit if the ceramic capacitors are replaced by high quality capacitors with metallized polyethyleneterephthalate foil.

As the calculation of th failure rate λ for the voltage dependent r.c.b. shows, λ decreases significantly if the ceramic capacitors C_4, C_5, C_6 and C_7 (Fig. 6) are replaced by high quality capacitors with metallized poly-ethyleneterephthalated foil. It is well known that “passive components” and “discrete semiconductors” show considerable differences in their failure rates. In terms of use of the circuit-breaker for 20 years in practical installations failure percentages are as follows:

- for voltage independent r.c.b. : 0.09%

- for voltage depedent r.c.b. : 28.3%, resp. 14. 5%

(where metallized polyethyleneteraphthalate foil capacitors are used).

In the more favourable case with π_u=85°C, this leads to the following failure ratio:

$$\frac{\text{Voltage dependent r.c.b.}}{\text{Voltage independent r.c.b.}} = \frac{14.5\%}{0.09\%} = 161$$

Even taking into account the difference in the releases and mechanical parts, this failure ratio will be of a similar order.

Tests have shown that a temperature of 85°C in switching devices, depending on the installation conditions and the stress level, e.g. in distribution boards, can ocour. It should be mentioned that this reliability comparison represents a concrete example. Depending on the electronic components selected, that is whether they are of consumer quality or according to MIL - standard, and also depending on the number of components used and the stress factors mentioned before, other failure rates or failure ratios may be obtained.

有关电磁式 (FI) 剩余电流保护断路器产品技术的文章

FI- 剩余电流保护断路器 Voltage independent r.c.b.			DI- 剩余电流保护断路器 Voltage dependent r.c.b.			
数量元件名称 Number of components designation	λ_B 每个元件 per component	λ 在 T_u=85°C 时 at T_u=85°C	数量元件名称 Number of components designation	λ_B 每个元件 per component	λ 在 T_u=85°C 时 at T_u=85°C	$\lambda^{1)}$ 在 T_u=85°C 时 at T_u=85°C
1 MKT- 多层电容器 Capacitor with metallized polyethyleneterephthalate foil	2	4	1 集成电路 IC Integrated circuit IC	150	660	660
2 焊接位置 1 和 2 各 0.5 fit Soldering joints 1 and 2 with 0.5 fit	1	1	1 压敏电阻 Voristor ZNR	10	10	10
			1 可控硅 T_h/Thyristor T_h	25	15	15
	每个元件 per component	在 T_u=85°C 时 at T_u=85°C		每个元件 per component	在 T_u=85°C 时 at T_u=85°C	在 T_u=85°C 时 at T_u=85°C
			1 硅二极管 D_1 Silicon diode D_1	25	15	15
			3 钽电容器 $C_1C_2C_3$ Tantalum capacitors C_1, C_2, C_3	5	85	85
			4 陶瓷电容器 C_4, C_5, C_6, C_7 Caramic capacitors C_4, C_5, C_6, C_7	5	85	85
			1 MKT- 多层电容器 Capacitor with metallized polyethyteneterephthalate foil Cs	2	4	4
			1 电阻 R_1 1W Resistor R_2 1W	6	14	14
			1 电阻 R_2 1/4W Resistor R_2 1/4W	0.5	1.5	1.5
			44 焊接位置 手工焊／自动焊 Soldering joints manually/automized	0.5/0.1	7.2	7.2
	∑ 失效率 λ ∑ Failure rate λ	5 fit		∑ 失效率 λ ∑ Failure rate λ	1611.7 fit	827.7 fit
20 年内失效率 Failures in 20 years	%	0.09	20 年内失效率 Failures in 20 years	%	28.3	14.5

1) 用 MKT- 多层电容器取代陶瓷电容器 C_4 至 C_7。
表 1 图 1 所示的FI- 剩余电流保护断路器和图 6 所示的 DI- 剩余电流保护断路器上的功能“ 单元 ”比较，它们的结构类型均为交流和脉冲电流敏感型，失效率计算。
1) Ceramic capacitors C_4 to C_7 replaced by capacitors with polyerthyteneterephthalate foil.
Table 1. Comparison of evaluation units of voltage independent r.c.b. in Fig. 1 and voltage dependent r.c.b. in Fig. 6, each AC - and pulsating DC - sensitive. Calculation of failure rate.

a) N- 断裂　　b) N- 断裂　　c) N- 断裂

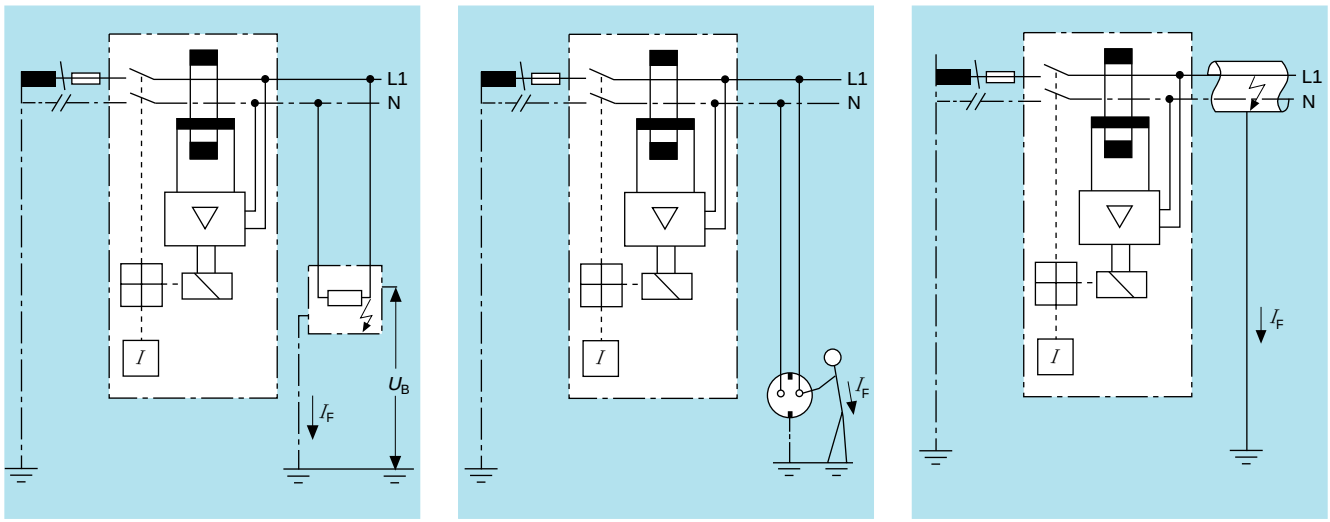


图 7 在供电电网中，中性线 N 的断裂将使 DI- 漏电保护器不起作用 /Fig. 7 Interruption of the neutal conductor N in mains supply system. The voltage dependent r.c.b. is ineffective:

a) 当设备发生故障时，“ 正常的 ” 相线将产生危险的对地接触电压。
If on a defective appliance dangerous touch voltage exists between the “healthy” phase and earth.

b) 当直接接触 “ 正常的 ” 相线时 (即使是高灵敏的 DI- 剩余电流保护断路器也不起保护作用)
If a “healthy” phase is touched (even highly sensitive voltage dependent r.c.b.‘s cannot provide protection).

c) 当漏电电流流经设备的绝缘和导线中故障位置时会引起发生火灾的危险。
If fault current flows through a defective point in the insulation of an appliance or cable, which can possibly cause fire.

保护开关与供电电网中的保护措施
共同工作时的可靠性

Reliability of the protective device in cooperation with the protection measure in the mains power supply

采用分断的保护措施，其保护价值，－如图 4 作为 “ 与门 ” 逻辑关系－是既决定于保护开关本身的可靠性，也决定于保护开关在与供电电网联合工作时的可靠性。

下述的举例是从保护作用来看，反映出脱扣与电网电压有关的－ DI- 剩余电流保护断路器的不可靠性的特性。而在应用脱扣与电网电压无关的－ FI- 剩余电流保护断路器时就不会出现这类问题。

－举例 1:

由于中性线 N (例如在架空线电网中) 或相线 L (例如由于过电流保护装置的分断) 的故障而在供电电网中发生事故。

当电网局部故障时，DI- 剩余电流保护断路器因其 “ 鉴别 ” 功能单元缺少供电电压而不起作用。尽管如此，通过尚有的电网部分有可能产生危险的状态 (图 7a 至 c)。

在多极式 DI- 剩余电流保护断路器上，例如 3 极式带有中性线的 DI- 剩余电流保护断路器装在具有 $L_1/L_2/L_3/N$ 的供电电网 (图 2) 中时，出现这种危险状况的概率还是相当大的，因为 DI- 剩余电流保护断路器的电子式放大器的供电大多是取自于 1 根相线，例如 L_1 和中性线 N 之间。当相线 L_1 或／和中性线 N 发生故障时，DI- 剩余电流保护断路器又不起作用。然而，来自相线 L_2 或 L_3 的危险却又不能被分断。

提高对电子式放大器的供电可靠性，在这种情况下，使供电取用所有 3 根相线 L_1、L_2、L_3 和中性线 N 之间是可行的，但这又意味着必须为电子元件投入更多的费用，以便进一步提高 DI- 剩余电流保护断路器失效率。

－举例 2：

DI- 剩余电流保护断路器在大多数情况下，其电子放大器的动作范围是在 85% 至 110% 的额定电压 U_n，在这个范围内，当发生故障时能保证脱扣。例如符合 VDE0641 第 4 部分规定的 LS/DI-组合式断路器 [文献 18] 只是在电网电压额定值情况下才试验它的 DI- 脱扣。而在发生故障的电网中，当相线 L_1 对中性线 N 的电压例如小于 $0.85U_n$，但又超过最大的允许接触电压 50V 时，这在故障情况下是危害人的生命安全，而 DI- 剩余电流保护断路器却不能实现分断。这类电网故障出现在供电公司管辖的供电区域，而且是可以被一一列举的。例如，当这类电网故障发生在早上时，要消除这类故障将历时 1 小时。这个举例表明，这将是十分危险的，如果在浴室中应用的是 DI- 剩余电流保护断路器或 LS/DI-剩余电流保护断路器。

－举例 3：

在 TN-系统中，当短路发生在相线 L1 和保护导线 PE 之间时，正如文献 [14] 介绍的那样，DI- 剩余电流保护断路器的工作不能被保证，因为电子式放大器的工作电压降低而发生问题。

－举例 4：

DI- 剩余电流保护断路器上的放大器中含有对过电压敏感的电子元件，虽也采取了临时性措施，但当出现雷击过电压或操作过电压时将遭致损坏，致使 DI- 剩余电流保护断路器的脱扣不起作用。在大多数电网中不具备或不足以防止过电压的保护措施。单靠电器中的过电压保护在任何情况下，都是不足以应付的。近年来人们对过电压造成的事故特别担心，这也就是为什么在电子设备中愈来愈多地应用过电压敏感型元件的实际原因，文献 [15] 对此作了特别的论述。

－举例 5 ：

众所周知，电子对防止干扰影响十分困难，例如防止高频振荡过程－电磁兼容性 (EMN)。对于 DI- 剩余电流保护断路器来说，这类影响的结果将提高脱扣电流－即影响保护水平，或者使 DI- 剩余电流保护断路器发生误脱扣－即影响运行安全性。

The efficiency of a protective measure with disconnection from the supply is determined both by the reliability of the circuit-breaker on its own and by the reliability of its function in cooperation with the mains power supply. Fig. 4 show this as “AND” Interlinking.

The following examples demonstrate the unreliable performance of voltage dependent r. c.b.‘s, with respect to protection, where voltage independent r.c.b.‘s are used, such problems do not occur.

- Example 1: Interruption of the neutral N in the mains (e.g. in an overhead line system) or of phase L (e.g. as a result of the operation of the overcurrent protective device).

With a partial mains failure, the supply voltage for the evaluation unit of the voltage dependent r.c.c.b. is lost. The voltage dependent r.c.b. is therefore ineffective. Nevertheless, the remaining part of the system can lead to a dangarous situation (Fig. 7a to 7c).

With multi-pole voltage dependent r.c.b.‘s

e.g. triple pole with neutral in a supply system with L1/L2/L3/N (Fig. 2), the probability that such a danger will occur is even higher, as the supply for the electronic amplifier of the voltage dependent r.c.b. is usually taken from only one phase L1 and/or the neutral N fails, the voltage dependent r.c.b. is again ineffective, Phases L2 or L3 can, however, constitute a source of danger, which is not eliminated.
The supply security for the electronic amplifier could be increased in this case by taking the power supply from all three phases L1, L2 and L3 and the neutral N. This, however, calls for more electronic components, which would lead to a further increase in the failure rate of the voltage dependent r.c.b.
- Example 2: voltage dependent r.c.b.'s usually have a function range for the electronic amplifier of 85% to 110% of the rated voltage U_n in which tripping is ensured in the event of a fault. For example, the residual-current tripping of voltage dependent r.c.b.'s with overload protection according to Draft VDE 0641 part 4 (18) is verified at the rated supply voltage level only. In a faulty mains supply system in which the voltage e. g. of phase L1 to the neutral N is less than 0.85 U_n, but in excess of the maximum permissible touch voltage 50V, therefore constituting a danger to persons in the event of a fault, the voltage dependent r.c.b.'s cannot operate. Such system faults have occurred in areas of several electricity supply companies and have been recorded. In one particular case, such a failure occurred in the early morning and was not cleared for abort 1 hour. This example shows the particular danger in bathrooms, for example, if voltage dependent r.c.b.'s with or without overload protection are used.
- Example 3: if a short-circuit between phase L1 and the PE in a TN system occurs, operation of the voltage dependent r.c.b.'s is not ensured as shown in (14), as the operating voltage for the electronic amplifier is reduced.
- Example 4: The amplifier of a voltage dependent r.c.b. contains electronic components which are sensitive to overvoltages, and which can be destroyed in the event of a lightning or switching surge voltage, despite all precautionary measures. Operation of the voltage dependent r.c.b.'s is in such a case ineffective. In many systems there exist no, or at least no sufficient, protective measures against surge voltage. Overvoltage protection incorporated merely in the equipment itself is not adequate in every case. Article (15) describes, how in recent years damage by overvoltage surges has increased alarmingly, due also to the increased use of electronic equipment with components sensitive to overvoltages.
- Examples 5: it is well known that it is extremely difficult to protect electronic equipment against interferences such as high frequency oscillations; electromagnetic compatibility (EMC) is becoming more and more important. With voltage dependent r.c.b.'s such interferences can lead either to an increaes in the tripping threshold - i. e. reduction of the level of protection - or to nuisance tripping - i. e. reduction in service reliability.

结论
Conclusions

本文的论述清楚地表明, 脱扣与电网电压有关的 DI- 剩余电流保护断路器，不论从电器本身的可靠性，还是从电器与供电电网联合工作时，即保护措施的可靠性来看，它都不能与符合 DIN VDE0664 第 1 部分［文献 10］规定的脱扣与电网电压无关的FI-剩余电流保护断路器或符合 DIN VDE0664 第 2 部分［文献 16］规定的FI/LS组合式断路器相提并论。

为了使装有 DI- 脱扣的与电网电压有关的开关，例如 LS/DI- 断路器至少能应用于特殊的场合，则这必须对其电子元件最大允许的失效率规定一个极限值。

经受实验考验并搏得专家载文证实［文献1至5］的脱扣与电网电压无关的 FI- 漏电保护器，它在 TN- 和 TT- 系统中，在保护人身安全与防止火灾危险方面所具有的保护价值，是不允许通过使用脱扣与电网电压有关的 DI- 漏电保护器而予以更迭。联邦德国的标准制订机构迄今为止一直以正确的态度来处理这种关系。所以在安装规范 DIN VDE0100 第 410/83 年 11 月版的备注中，正确的明文规定，带 DI- 脱扣的小型断路器，按照 DIN VDE0641 第 4 部分(草案)［文献 18］的规定并不能用作剩余电流保护装置，并对应用技术作了补充说明［文献19］, 根据DIN VDE0100第410部分第 5 . 5 节的规定，只有应用符合 D I N VDE0664 规定漏电电流的 (FI-) 剩余电流保护断路器才能发现直接接触时的补充保护。但这段时期，专业界的舆论对 DIN VDE0100 第 410A1 新草案发表不少见解。在这份新草案中，就补充保护来看，认为LS/DI-组合式断路器与剩余电流保护装置应该是等同的。然而对这份草案提出的异议尚须继续讨论。根据 DIN VDE0100 第 710 部分 /84 年 5 月版的规定，在装有浴缸或淋浴设备的房间中，鉴于上述风险，同样只允许使用 DIN VDE0664 规定的脱扣与电网电压无关的 FI- 剩余电流保护断路器。国家级和国际级标准制订机构出于谋求更高安全性的着想，都遵循这一方面而开展工作。如果从今天的安全技术目光来看，脱扣与电网电压无关的 FI- 剩余电流保护断路器可以认为是最佳的，那么，出于责任性也必须去保持这已经实现的保护水平并不允许去损坏这经受实践考验的保护措施的良好信誉。联邦德国劳动保护和事故研究所在其研究报告中［文献21］, 借助质量缺陷树枝分析法，从数学上对这种 FI- 剩余电流保护断路器的保护措施进行了验证。采用 DI- 剩余电流保护断路器或 LS-/DI- 断路器，如果事前对可靠性极限不作具体规定，则将大大降低安全水平。从而使人的生命与财产将受到高风险的危害。但这并不是说，在保护技术领域中泛泛地去拒绝使用电子技术。然而，只有当制造与试验规范能保证相应的安全水平时，在这方面的使用才总是可能的，甚至也有可能更大规模的开拓保护范围。

The report clearly shows that a voltage dependent r. c. b. cannot stand comparison either with the voltage independent r.c. b. to DIN VDE 0664 Part 1 (10), or with a voltage independent r. c. b. with overcurrent protection to DIN VDE 0664 Part 2 (16). This applies as regards both individual reliability and cooperation of the circuit-breaker with the power supply system, i. e. the protection measure.
In order to be able to use voltage dependent r. c. b. 's or voltage dependent r. c. b. 's with overcurrent protection at least for special applications, it is necessary to specify limits for the maximum permissible failure rate for the electronic equipment.
The efficiency of voltage independent r. c. b. 's as regards prevention of accidents and fires in TN and TT systems, for which there is much evidence (1 to 5) and proof in years of practical use, must not be jeopardized by the use of voltage dependent r.c.b.'s. Standards authorities in the Federal Republic of Germany have so far correctly supported this view. Consequently, it was expressly mentioned in a note in DIN VDE 0100 Part 410/11.83(17) that, for example, voltage dependent r.c.b.'s with overcurrent protection to DIN VDE 0641 Part 4 (draft) (18) cannot be considered to be residual-current protective devices to DIN VDE 0664, it has also been clearly stipulated (19) that additional protection in case of direct contact with live parts, according to DIN VDE 0100 Part 410, Section 5.5, can only be achieved by means of a voltage independent r.c.b. to DIN VDE 0564.
In the meantime a new draft of DIN VDE 0100 Part 410 A1 hes been submitted to the experts for comments in which voltage dependent r.c. b.'s with overcurrent protection are placed on the same level with voltage independent r.c.b. 's as regards this additional protection. Objections to this draft have, howerver, yet to be discussed.
In rooms containing a bathtub or shower, according to VDE 0100 part 701/05.84 (20) only voltage independent r. c.b.'s to DIN VDE 0664 are permitted, likewise on account of the risks mentioned. In the interest of a high degree of safety, both national and international standards authorities will move in this direction. If today voltage independent r.c.b.'s

are considered the best option in protective measures, this is a result of endeavours to maintain the high protection level afforded by, and to popularize, this type of protective device. The Federal Institution for Work Safety and Accident Prevention has mathematically illustrated in their research report (21) the efficiency of voltage independent r.c.b.'s by means of fault-tree analysis. The use of voltage dependent r.c.b.'s with or without overcurrent protection without prior determination of reliability limit values, would reduce the safety level considerably. This would constitute a high rick for both persons and materials. This, however, does not imply that the use of electronic components in the field of protective devices generally may not be acceptable. It is possible to use electronic components, if and where standards for the design of the devices and test specifications can ensure the corre-sponding level of sefety and reliability.

Moreover, in many cases an extension of the range of protection can be established by use of electronics.

参考文献

References

[1] Kahnau, H.W.: Schutzmaßnahmen. VDE-Fachber. 33. Berlin & Offenbach: vde-verlag, 1982, pp. 84-96

[2] Biegelmeier, G.; Rabitsch, G.; Koerper-stroeme und Baruehrungsspannungen in der Badewanne. Elektrtech. u. Masch.-bau 103 (1986) Vol. 2, pp. 50-59

[3] Seip, G.; Installationstechnik im In-und Ausland, VDE-Fachber. 33. Berlin & Offenbach: vde-verlag, 1982, pp. 72-83

[4] Feitknecht, J.: Fehlerstrom-Schutzschalter - Konstruktive Losungen, Entwicklungstendenzen und Grundsatze fuer lhre Anwendung, etz Elektrotech. Z. 105 (1984) Vol. 13, pp. 666-671

[5] Hofmann,W.; Respondek, p.: Entwicklung, Einfuehrung und Anwendung empfindlicher Fl- Schutzschalter. Der Elektromeister 60 (1985) Vol. 18, pp. 1275-1278

[6] Roesch, H.: Aufbau und Wirkungsweise eines Fehlerstromschutzschalters, Anforderungen an seine magnetischen Bauteile. J. of Magn. and Magnetic Mater. (1978) Vol. 9, pp. 150-156

[7] Roesch, H.: Fehlerstromschutzschalter fur Aufloesung bei Wechselstromen und pulsierenden Gleichfehlerstroemen. Siemens Energietech. 3 (1981) H. 6, S. 208-221

[8] Scherbaum, R.: Beurteilung von Fehler-stromschutzschaltern. inTheorie und Praxis. etz-b Elektrotech. Z.28 (1976) Vol. 6/7, pp. 168-170

[9] Winkler, A.: Zur Zuverlaessigkeit von Fehlersrtomschutzschaltern. Der Elektromeister 57 (1982) S. -H. 30 Jahre Fehlerstromschutzschalter, S. 23-27

[10] DIN VDE 0664 Teil 1/10. 85: Fehlerstrom-Schutzeinrichtungen. Fehlerstrom-Schutzeschalter fuer Wechselspannyung bis 500 V und bis 63 A. Berlin & Offenbach: Vdeverlag.

[11] Siemens-Norm SN 29 500: Ausfallraten Bauelemente. Erwartngswerte. Allgemeines. Munchen: Siemens AG

[12] Schaefer, E.: Zuverlaessigkeit, Verfuegbadeit rnd Sicherheit in der Elektronik. Wuerzburg: Vogel

[13] Bajenescu, T. I.: Ausfallanalyse elektronischer Komponenten. Elektrotech. u. Masch.-bau 101 (1984) H. 10, S. 455-463

[14] TC 64 (Sec) 400: Collation of Comments on Doc. 64 (Sec) 378. Genf: Int. Elektrotech. Komm. (IEC)

[15] Hasse, P.: Runtsch, E.: Personen-und Sachschutz in Niederspannungsanlagen. etz Elektotech. Z. 105 (1984) Vol. 6/7, pp. 312-315

[16] DIN VDE 0664 Teil 2/10. 83: Fehlerstrom-Schutzinrichtungen. Fehlerstrom-Schutzeschalter mit Ueberstromausloeer (FI/LS-Schalter) bis 415 V Wechselspannung und bis 63 A Nennstrom. Berlin & Offenbach: vdeverlag

[17] DIN VDE 0100 Teil 410/11. 83: Errichten von Starkstromanlagen mit Nennspannungen bis 1000 V; Schutzmaßnahmen: Schutz gegen gefaehrliche Koerperstrome. Berlin & Offenbach: vde-verlag

[18] DIN VDE 0641 Teil 4/09. 83 (Entwurf): Leitungsschutzschutzschalter bis 63 A Nennstrom und bis 415 V Wechselspannung mit Differenzstromausloeser (LS/DI-Schalter). Berlin & Offenbach: vde-verlag

[19] Kanhnau, H. W.: Fehlerstromschutzschalter-ein wirksamer Schutz fuer Personen und Sachen. Der Elektromeister 59 (1984) Vol. 3, pp. 171-181

[20] DIN VDE 0100 Teil 701/05. 84: Errichten von Srarkstromanlagen mit Netzspannungen bis 1000V. Raeume mit Badewanne oder Dusche. Berlin & Offenbach: vde-verlag

[21] Edwin. K. W.; Jakli, G.; Thielen, H.: Zuverlaessigkeituntersuchungen an Schutzmaßnahmen in Niederspannungsverbraucheranlagen. Forschungsber. 221 Dortmund: Bundesanst. fuer Arbeitsschutz und Unfallforschung (1979), pp. 118-121

应用 Application

根据 DIN VED 0100 第 410 部分的规定, 防止危险的人体电流
Protection against dangerous shock currents according to DIN VED 0100 Part 410

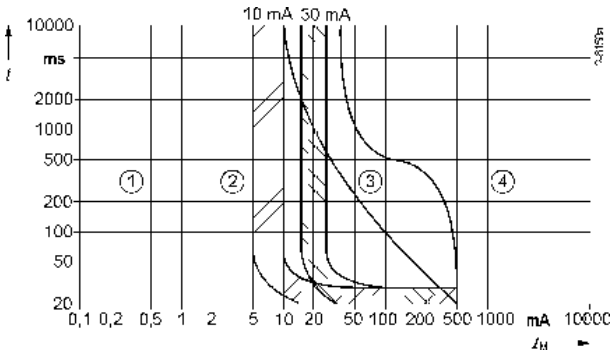
- 间接接触保护 (间接的人体保护)－由于电气设备的机壳连接而出现不允许的较高的接触电压时，通过分断实现保护。
  Protection from indirect contact (indirect personnel-protection). Protection is provided by disconnection of dangerous high touch voltage caused by a short circuit to exposed conductive parts of equipment.
- 应用 $I_{\Delta n}$≤30mA 剩余电流保护断路器也可作直接接触保护 (直接的人身保护)－在直接接触带电部件时通过分断实现补充保护。
  By installing RCCBs with $I_{\Delta n}$≤30mA protection from direct contact (direct personnel-protection) is also provided. Additional protection measure by disconnection in the event of contact with normally live parts.

根据 DIN VED 0100 第 720 部分的规定
Fire protection according to DIN VED 0100 Part 720

防止火灾应用 $I_{\Delta n}$≤30mA 的剩余电流保护断路器就能防止因绝缘故障而引发的电器火灾。
By installing RCCBs with $I_{\Delta n}$≤30mA protection against the outbreaks of electrically ignited burning due to insulation failure is provided.

保护作用 Provided protection

额定漏电电流 $I_{\Delta n}$≤30mA 的电器是提供间接接触保护，而使用 $I_{\Delta n}$≤30mA 的电器也能在不当心接触带电部件时实现进一步的补充保护。
Whilst RCCBs for rated fault current $I_{\Delta n}$≤30mA offer protection against indirect contact, by installing RCCBs with $I_{\Delta n}$≤30mA a high level of protection is achieved by additionally providing protection from unintentional direct contact with live parts.



IEC 479 规定的电流区域
Regions of effects of AC currents of IEC 479

区域 ① /Region ①
一般感觉不到电流的作用
Usually no reaction effect.

区域② /Region ②
一般还不会出现对生理有害的作用
Usually no pathophysiologically dangerous effect.

区域③ /Region ③
一般还不会引起心室颤动的危险
Usually no danger of fibrillation.

区域④ /Region ④
会出现心室颤动
Fibrillation danger.

I_m：人体电流； t：作用时间；
I_m: Body current; t: Operation duration.

上图给示了电流流径人体时在不同电流值区域中引起的人体生理反应。区域 4 中电流／时间值是危险的, 因为它能引起心室颤动而导致当事人的死亡。同样，也给示了额定漏电电流为 10 和 30mA 的剩余电流保护断路器的脱扣范围。脱扣时间的平均值介乎于 10 和 30ms 之间，所以远远低于 DIN VED 0664 或 EN 61 008 或 IEC 61008 规定的允许脱扣时间最大值 0.2s (200ms) 或 0.3s (300ms)。

额定漏电电流 10 或 30mA 的剩余电流保护断路器，也可为不当心直接接触带电部件而使电流流径人体时提供可靠的保护。这种保护作用是没有任何其它可比拟的在间接接触时的保护措施能实现的。

The above diagram shows the physiological reactions of the human body, summarised in regions of effects of currents. Consequently the current/time values in the area 4 are dangerous, because they can cause fibrillation of the heart, which can lead to the death of the person concerned. The tripping ranges of RCCBs with rated fault currents of 10 and 30mA are also plotted. The tripping is on average between 10 and 30ms. This lies within the tripping time of max. 0.2s (200ms) or 0.3s (300ms) according to DIN VDE 0664 and EN 61 008 or IEC 61008. Therefore RCCBs with rated fault current 10 or 30mA also offer reliable protection, even if a current flows through a person due to unintentional direct contact with live parts. This level of protection cannot be obtained by any other comparable measure for protection from indirect contact.

保护作用 Provided protection

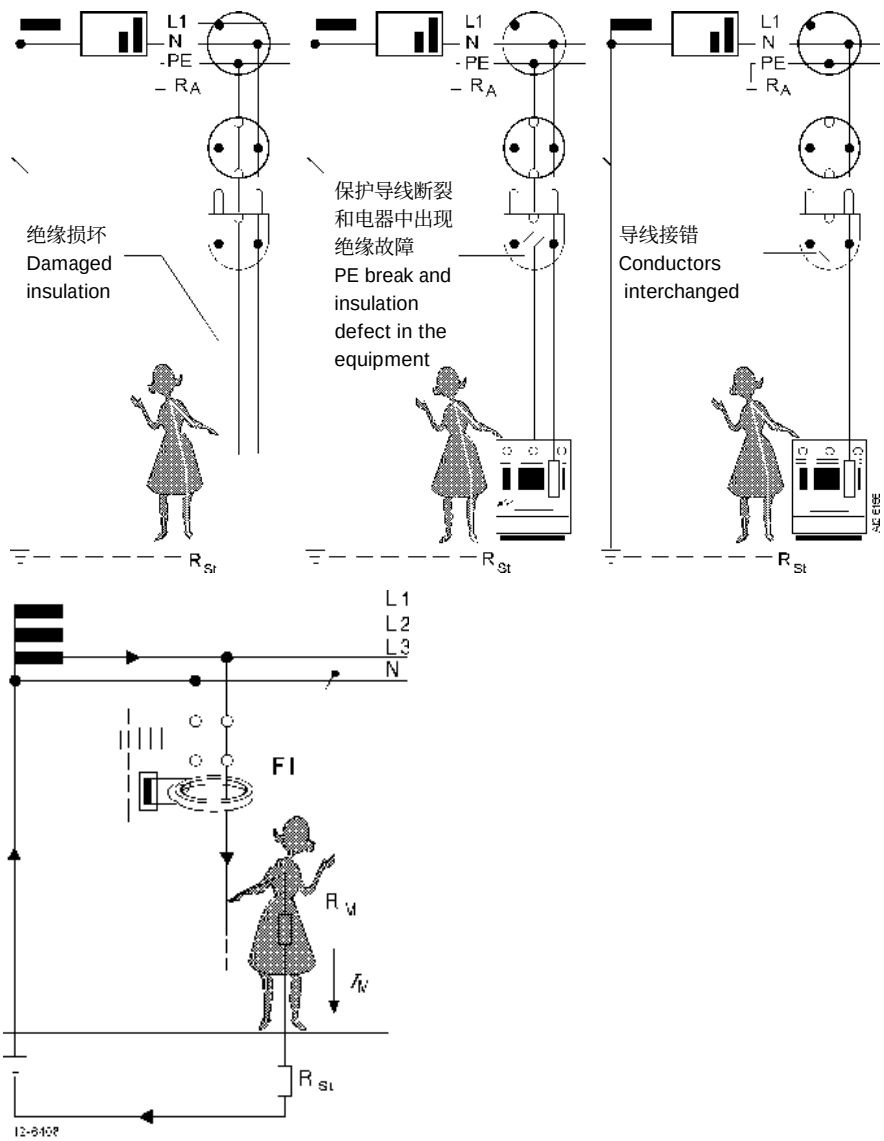
危险的人体电流
Dangerous shock currents

在应用剩余电流保护断路器时，在任何情况下都必须将相应的接地保护导线接在被保护的系统部件和电气设备上。于是，只有在出现两个故障时或在不当心接触带电部件时才会发生电流流径人体。
Wherever RCCBs are used, a corresponding protective earth conductor must also be provided and connected to all equipments etc. Therefore current flow through a human body can only occur if two faults appear, or if the person makes unintentional contact with live parts.

不当心直接接触带电部件的举例
Examples of unintentional direct contact

当直接接触带电部件时，流径人体的电流值是决定于两个电阻值，即人体的体内电阻 R_m 和站立点的接触电阻 R_{st}。对于事故预防研究来说，应着眼于最不利的情况，即把站立点的接触电阻视作为零。
If a person directly touches live parts, two resistances determine the level of the flowing current: the internal resistance of the person R_m and the standard earth leakage resistance R_{st}. For purposes of accident prevention the worst case must be assumed, which means that the local earth leakage resistance is almost zero.

人体电阻与电流途径有关。当电流途径例如为手／手或手／脚时测得的人体电阻约为 1000Ω。当故障电压为 AC 230V 时，对于电流途径手／手来说，其电流值为 230mA。
The resistance of the human body is dependent on the current path. Previous measurements show, for example, with a current path by hand to hand or hand to foot, approximately 1000Ω.
With a fault voltage of 230V AC, the resulting current is 230mA from hand to hand.



直接接触带电部件时提供补充保护的工作原理示意图
Schematic drawing: additional protection from directly touching live parts

火灾防护
Fire protection

根据 DIN VED 0100 第 720 部分的要求，凡是“含火灾危险的工作场所”都应采用措施，防止由绝缘故障引起的火灾。
DIN VDE 0100 Part 720 demands for “Locations exposed to fire” measures to prevent fires, which emerge due to insulation failures. A distinction is drawn between:

- 短路火灾防护／Short-circuit fire protection
- 接地火灾防护／Earth-fault fire protection
- 安全间距 (只适用于电缆与导线的敷设)
  Safe clearance (only for cable and wire laying).

短路火灾防护是通过过电流保护装置、接地火灾防护是通过剩余电流保护断路器来保证。此时，要求使用额定漏电电流最大值为 0.5A 的剩余电流保护断路器。额定上限值不应利用。额定漏电电流最大值为 0.3A 的剩余电流保护断路器具有最佳的保护作用。

应用剩余电流保护断路器作火灾的补充防护不仅仅局限于含有火灾危险的工作场所，而且可普遍推广。
The short-circuit fire protection is ensured by overcurrent protection devices, and earth-fault fire protection by RCCBs. It is stipulated that only RCCBs with a rated fault current up to max. 0.5A are used. The upper limit, however, should not be applied to ensure optimal protection RCCBs of max. 0.3A should be used.
The additional protection against fires provided by RCCBs should not be used on locations exposed to fire, it should be used generally.

结构和作用原理 Construction and operation

剩余电流保护断路器的结构基本上是由 3 个功能组件组成：

The construction of a RCCB depends essentially on 3 functional groups:

1. 检测漏电电流的零序电流互感器／Summation current transformer for fault current detection
2. 将电气测量值转换成机械脱扣的脱扣器 Release for conversion of the electrical measured value into a mechanical release
3. 带触头的锁扣机构／ Contact latching mechanism with the contacts.

零序电流互感器围抱着所有要求承载电流的导线，有时也包括中性线。

在无故障的供电系统中，对于零序电流互感器来说，通电导线的磁化作用相互抵销，因为根据克希荷夫定律，所有电流的总和等于零。此时无剩余磁场使副边绕组可感应电应。

当由于绝缘故障而流过漏电电流时，就打破平衡，互感器的铁心中存在着剩余磁场，使副边绕组产生电压，通过脱扣器和锁扣机构而断开含有绝缘故障的回路。这种脱扣原理在工作时与电网电压或辅助能量无关。这也是符合 DIN VED 0664 规定的剩余电流保护断路器能提供较高保护水平的先决条件。

只有这样才能保证，即使在电网故障时，例如一根相线的断电或中性线断裂时仍能保持漏电保护器的全部保护作用。

The summation current transformer includes all necessary current carrying conductors, i.e. also including the neutral conductor.

Under normal conditions for the summation current transformer the magnetising effects of current carrying conductors, in accordance with Kirchhoff 's law, cancel each other out. There is no residual magnetic field remaining, which could induce a voltage in the secondary winding.

However if a defect in insulation causes a fault current, the balance becomes disturbed, and a residual magnetic field remains in the transformer core. This produces a voltage in the secondary winding, which via the release and the contact latching mechanism disconnects the circuit with the insulation defect.

This tripping principle works independently from the supply voltage or an auxiliary supply. This high level of protection is a requirement for RCCBs that comply with DIN VDE 0664. This is the only way to ensure that the full protective function of the RCCB is maintained, even in the event of a supply fault, e.g. if a phase conductor fails or the neutral conductor is interrupted.

2

四极剩余电流保护断路器在三相三线系统中的应用 Utilization of four-pole Residual Current operated Circuit-Breakers (RCCBs) in three-conductor, three-phase networks

根据标准 IEC 61008-1，必须让用户知道定期检查该剩余电流保护断路器的必要性。按下标有字母 T 的测试按钮，就能检查出该剩余电流保护断路器在使用寿命内是否正常工作，参见面板上的安装指导及说明。

当四极剩余电流保护断路器被用于三相三线系统中时，接线必须是 1, 3, 5, 对 2, 4, 6。为确保测试键动作正确，3 号端子必须连至中性线上。

According to the standard IEC 61008-1, the user must be informed of the necessity to penriodically actuate the device by pressing the test pushbutton designated by the letter T to check that the device is operating correctly during its life-time. See mounting instructions and indications on the plate.

When four-pole Residial Current operated Circuit-Breakers (RCCBs) are used in three-conductor, three-phase networks, the connection must be made to the terminals 1, 3, 5 and 2, 4, 6. To make sure that the test pushbutton operates corretly, terminal 3 has to be shunted to the neutral.

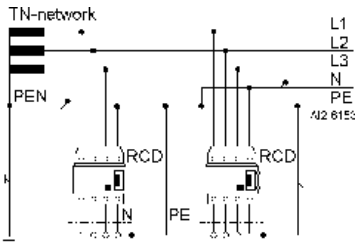
使用 Uses

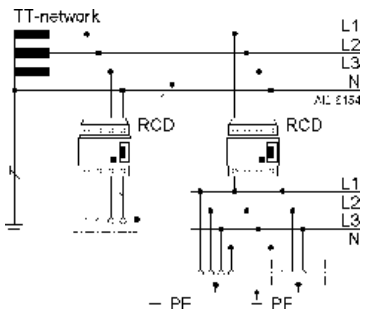
剩余电流保护断路器可安装在所有的 3 种电网系统中 (根据 DIN VED 0100 第 410 部分的规定)，安装在 IT 系统中时，必须满足的条件是电网具有足够的对地电容，以便在故障情况下，流过的漏电电流至少应等于漏电动作电流值。

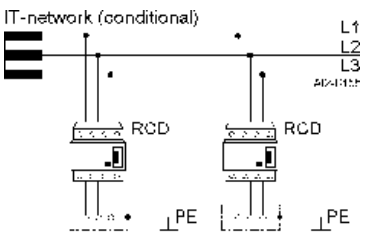
此时，IT 电网还可以另装绝缘监控保护电器。这两种保护措施相互之间不应有干扰与影响。

RCCBs may be used in all three distribution networks (DIN VED 0100 Part 410), and in an IT network provided that the capacitance of the network against earth is sufficient to allow a fault current to flow which has about the same magnitude of the rated fault current for the protecting RCCB.

Also the IT-network can still be monitored using an insulation monitor. Both protective systems do not interfere with each other.







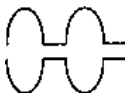
剩余电流保护断路器技术说明
Technical Description Residual Current operated Circuit Breakers (RCCBs)

电流类别 Types of current

由于家用电器和工业设备中装有电子元件，对于带有保护导线的电器 (保护等级 1) 来说，在发生绝缘故障时，流过剩余电流保护断路器的漏电电流已不呈正弦形。剩余电流保护断路器的标准对电网频率周期内趋零与接近零的漏电电流提出了补充要求与试验规程。

凡是既能用在正弦交流型漏电电流时，又能用在脉动直流型漏电电流时脱扣的剩余电流保护断路器可佩带标记。

The use of electronic components in household appliances and in industrial plants for equipment with protective earth conductor (Protection class I) has the effect that when an insulation failure occurs the fault currents flowing through RCCB are not sinusoidal. The standards for RCCBs contain additional requirements and test specifications for fault currents, which within a period of the supply frequency reach zero or approach zero. RCCBs, which trip on both sinusoidally AC fault currents as well as at pulsating DC fault currents are marked with the symbol  .

	电流类别 Type of current		脱扣电流 Tripping current
1	交流型漏电电流 AC fault currents		0.5…1 $I_{\Delta n}$
2	脉动直流型漏电电流半波 (正半波和负半波) Pulsating DC fault currents Half-wave current (pos. and neg. half-wave)		0.35…1.4 $I_{\Delta n}$
	截相半波电流： Phased half-wave currents: 相位截止角 Phase angle 90° el / 135° el		0.25…1.4 $I_{\Delta n}$ 0.11…1.4 $I_{\Delta n}$
3	半波电流叠加 6mA 平滑直流 Half-wave current with superimposed smooth DC current of 6 mA		最大 1.4 $I_{\Delta n}$ + 6 mA max. 1.4 $I_{\Delta n}$ + 6 mA

根据 DIN VDE 0664 第 1 部分规定的剩余电流保护断路器的脱扣电流
To DIN VDE 0664 Part 1 specified tripping currents for RCCB devices

直流型漏电电流 DC fault current

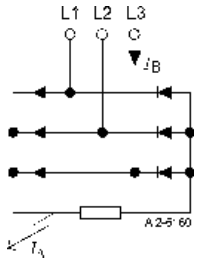
在工业用电设备中，越来越多地应用这类电路，即在发生故障时出现的是平滑直流或略带余波的平滑直流。在装有三相交流整流器电路和用电设备上出现的这类现象清楚地示于图中，这类用电设备例如变频器、医疗电器 (如 X-射线设备和 CT-设备) 以及不间断供电设备。

Various types of circuits are used for electrical equipment in industry, which during a fault can produce a smooth DC fault current or such with slight residual ripple, e.g. frequency converters, ray generators or UPS systems. This is explained using a three-phase rectifier circuit as an example.

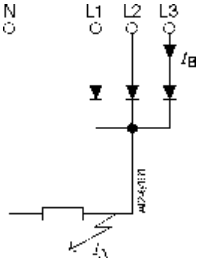
全电流敏感型剩余电流保护断路器 AC/DC sensitive fault current protective devices

标有故障位置的接线原理图
Principle circuit diagram

三相交流－桥式电路－6 次脉动
Three-phase bridge connection-six pulse

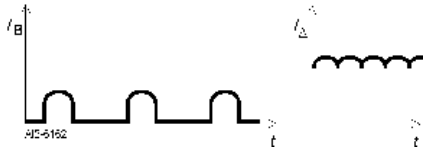


三相交流星型电路
Three-phase star connection



负载电流
Load current

剩余电流
Residual current



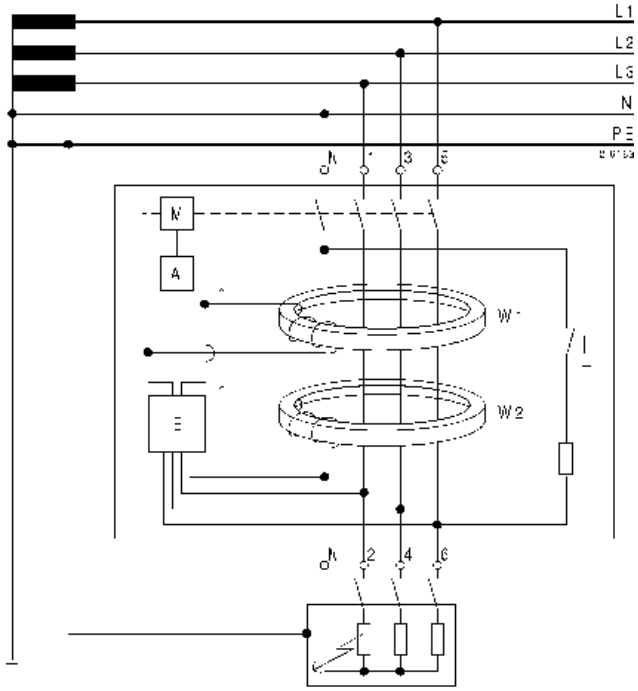
脉动敏感型剩余电流保护断路器并不能检测与断开这种直流型漏电电流，此外，这类漏电电流给它的脱扣功能将带来负面的影响。因此，对于故障时会产生这类漏电电流的用电设备，在其供电网络上是不允许接上脉动电流敏感型保护装置。可以采用例如保护隔离的保护措施，但这必须应用又重又贵的变压器才能实现。应用新的全电流敏感型剩余电流保护断路器是一种技术上可靠、经济上合理的解决方案。这类剩余电流保护断路器已归属于 prEN 50 178 (取代 DIN VDE 0160)“带电子器件的电力设备”的标准中。

Pulsating currents-sensitive RCCBs do not detect such DC fault currents and cannot switch off; besides their tripping function is negatively influenced. Therefore electrical equipment which during faults produces such fault currents, must not be protected by pulsating current sensitive RCCBs connected on the electric supply network. Alternative protection methods can for example be safety separation, which itself however can only be achieved with heavy and expensive transformers. With the new DC sensitive RCCB a technically flawless and economical solution is now available. This residual current circuit-breaker has been listed in the prEN 50 178 standard (replacement for DIN VDE 0160) “Equipment for strong current plants with electronical operating equipment.”

结构和工作原理 Construction and operation

脉动电流敏感型保护装置带有与电网无关的脱扣结构，并加在一个能检测平滑直流型漏电电流的补充单元，这样，就构成了全电流敏感型保护装置的基础，其结构原理示于下图：

The basis for the AC/DC-sensitive device comprises a pulsating current-sensitive protective switching unit with a release that operates independently of the supply, together with an additional unit for the registration of smooth DC fault currents.
The following diagram shows the fundamental construction:



A 脱扣器
Release
M 保护装置的操作机构
Mechanics of the protective device
E 在平滑直流型漏电电流时脱扣用的电子单元
Electronics for tripping smooth DC fault currents
T 试验按钮
Test button
n 副边绕组
Secondary winding
W1 检测正弦交流型漏电电流用的零序互感器
Summation transformer for detection of sinusoidally fault currents
W2 检测平滑直流型漏电电流用的零序电流互感器
Summation transformer for detection of smooth DC fault currents

零序电流互感器 W1与往常一样是检测供电系统中的交流和脉动电流型漏电电流。零序电流互感器 W2 是检测平滑的直流型漏电电流，在发生故障时，它发出分断主令通过电子单元 E 而作用于脱扣器 A。

The summation current transformer W1 constantly monitors the electrical installation for alternating and pulsating formed fault currents. The summation current transformer W2 detects the smooth DC fault currents and gives a switch-off signal via the electronic unit E to the release A.

考虑到供电的可靠性，电子单元是由全部 3 根相线和中性线供电的，此外，设计时已考虑到，即使在电压下降到 70% (例如相线与中性线之间)时，电子单元仍能确保可靠地脱扣。因此，只要出现平滑直流型漏电电流时，即使供电网络中发生故障，例如 N- 导线断裂，同样也能进行脱扣，甚至在最极端的情况下，二根相线与中性线都有故障，而仍在供电的相线也因接地而引起火灾危险时，开关的脉动电流敏感型部分，由于它带有与电压无关的脱扣装置，所以在任何时候都能可靠地担负起分断任务。

For the purpose of a highly secure supply, the power supply for the electronic unit comes from all three phase conductors and the neutral conductor. Besides, it is designed such that the electronics still operate at a voltage reduction of 70% (e.g. between phase conductor and neutral conductor). Consequently the tripping due to smooth DC fault current is provided for whenever such forms of fault current appear, also during disturbances of the electric supply network, e. g. when the neutral conductor is interrupted. Even in the extremely improbable case that two phase conductors and the neutral conductor are lost and the remaining intact phase conductor is a fire hazard due to an earth fault, protection is then provided by the pulsating current sensitive switching part which, due to its supply-independent release, reliably switches the RCCB off.

在设计和安装供电系统时，必须注意，装有全电流敏感型剩余电流保护断路器的固有回路必须与故障时会产生平滑直流型漏电电流的用电设备相匹配。

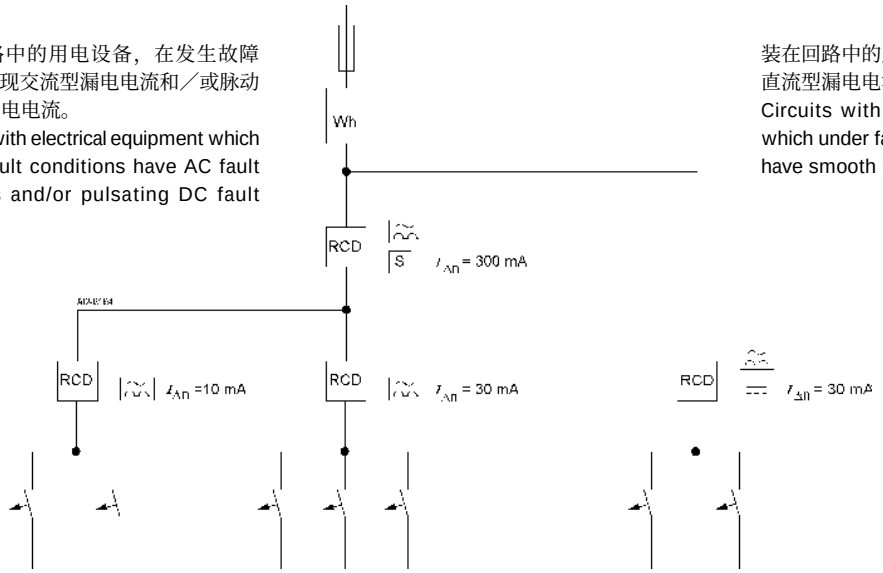
在分支回路中不允许将这类用电设备装在脉动电流敏感型的剩余电流保护断路器的后面，因为这种用电设备在故障时会成为产生平滑直流型漏电电流的根源，从而会影响脉动电流敏感型剩余电流保护断路器的脱扣功能。

At the project planning and design stage consideration should be given to electrical equipment, which under fault conditions can produce smooth DC fault currents; it will be arranged in its own circuit and be protected with a DC sensitive RCCB.

The branching of circuits with such electrical equipment to circuits with pulsating current sensitive RCCBs is not permissible. The smooth DC fault current from such equipment will damage the tripping unit of the pulsating current sensitive RCCB.

装在回路中的用电设备，在发生故障时，会出现交流型漏电电流和／或脉动直流型漏电电流。

Circuits with electrical equipment which under fault conditions have AC fault currents and/or pulsating DC fault currents



装在回路中的用电设备还会出现平滑直流型漏电电流。

Circuits with electrical equipment which under fault conditions can also have smooth DC fault currents

DIN VDE 0664 规定的脱扣条件同样也适用于全电流敏感型的剩余电流保护断路器。

对于平滑直流型漏电电流的脱扣，根据 IEC 479 规定的承受电流的曲线，它们将被扩大到必须在 0.50 至 2 x $I_{\Delta n}$ 的脱扣电流范围内实现分断。

全电流敏感型剩余电流保护断路器可佩带标记 ⏦ ⎓。对于这种新的保护装置，VDE 试验站已颁发注册号 -5342 的监督保护标记。

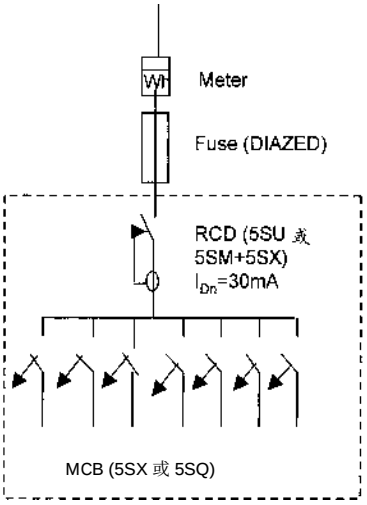
The tripping requirements according to DIN VED 0664 apply also for the DC sensitive RCCB.

Tripping due to smooth DC fault currents complies with the current compatibility curves according to IEC 479, which expands the required resultant disconnection at a tripping current from 0.50 to 2 x $I_{\Delta n}$.

AC/DC sensitive RCCBs are marked with the symbols ⏦ ⎓. This new protective device was also issued with a VDE monitoring mark with the VDE Register No. 5342.

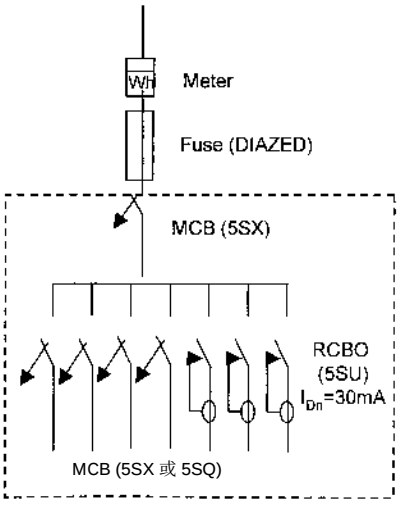
用于国内常见住宅的三种配电线路图

Three usual drawing way of resident electrical distrdution in china



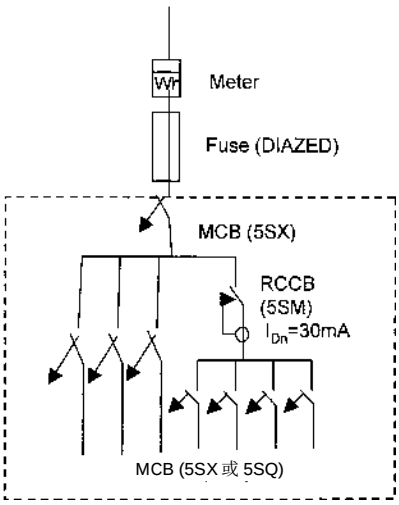
全部回路的漏电保护

Total lines protection of residual current



某些回路 (插座) 的漏电保护

Some of lines (socket) protection of residual current



某些回路 (插座) 的漏电保护

Some of lines (socket) protection of residual current

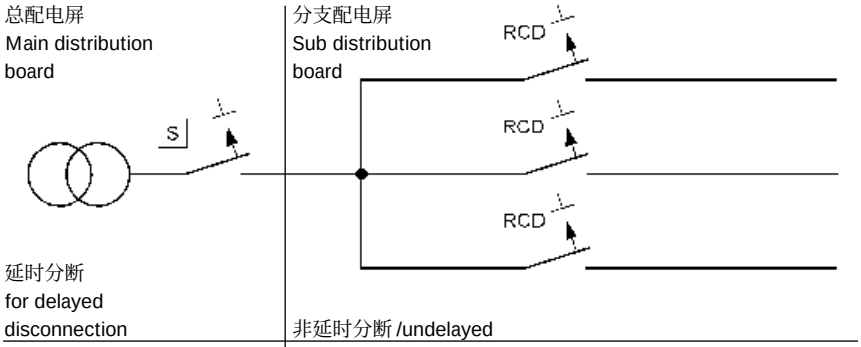
选择性分断 Selective disconnection

剩余电流保护断路器一般都是非延时分断，这就是说，串接的这种剩余电流保护断路器在故障情况下不可能实现选择性分断的目的。为了使串接的剩余电流保护断路器能实现选择性，被串接的电器不仅是脱扣时间，而且额定漏电电流也必须做到分级配合。此外，这种选择性剩余电流保护断路器具有的冲击强度高达 3kA。选择性剩余电流保护断路器可佩带标记 S。

下表示出了与无延时的电器串接时，为实现选择性分断，剩余电流保护断路器之间的分级配合可能性。

Residual current circuit-breakers normally have an instantaneous release. This means that a series circuit of such a residual current circuit-breakers will not operate when a fault occurs. To obtain a series switching of selective RCCBs the series connected devices must be staggered in the release time as well as the rated fault current. The selective RCCBs have an increased peak current of 3 kA. Selective RCCBs are marked as follows: S

The table below details possible combination of RCCBs for selective disconnection without time delay.



延时分断 for delayed disconnection			非延时分断 /undelayed		
$I_{\Delta n}$	0.3	A	0.01 (10 mA)	0.03 (30 mA)	
I_n	63	A	16	25; 40; 63	
$I_{\Delta n}$	0.5	A	0.01 (10 mA)	0.03 (30 mA)	0.3
I_n	125; 160	A	16	25; 40; 63; 125	25; 40; 63; 125
$I_{\Delta n}$	1.0	A	0.01 (10 mA)	0.03 (30 mA)	0.3; 0.5
I_n	125; 160; 224	A	16	25; 40; 63; 125	25; 40; 63; 125; 160

AI2-6168

短延时分断 Short-time delayed disconnection

有些用电设备在接通时会短时出现较高的泄漏电流 (例如在相线与 PE-导线之间的抑制干扰的电容器上流过的暂态剩余电流)，当泄漏电流超过剩余电流保护断路器的额定漏电电流 $I_{\Delta n}$ 时，它有可能使非延时式的剩余电流保护断路器发生不必要的脱扣。

在这种使用场合，要消除这种干扰源是不可能的，或者只是局部可能的，为此就需应用短延时式剩余电流保护断路器，这种电器的最小脱扣时间为 10ms，即在漏电电流脉冲 10ms 时间内它不允许脱扣，此时履行了 DIN VDE 0664 第 1 部分规定的脱扣条件，电器具有超出 DIN VDE 0664 要求的冲击电流强度 3kA。

短延时剩余电流保护断路器可佩带标记 K。

Electrical loads which cause leakage currents when they are switched on (e.g. via a supressor capacitor between the external conductor and PE flowing transient fault currents) may cause unwanted tripping of the instantaneous fault current device , if the leakage current of the rated fault current in of the protective device is exceeded.

In such cases when it is not possible to remove the fault source short-time delayed fault-current protective devices may be used. This devices have a minimal releasing time from 10ms. i.e. they must not operate with a fault impulse of 10ms. the releasing conditions of DIN VDE 0664 Part 1 must be met. The devices exceed the requirements of DIN VDE 0664, because they have a impulse withstand strength of 3kA.

Short-time delayed protective devices are marked as follows: K.

剩余电流保护断路器技术说明
Technical Description Residual Current operated Circuit Breakers (RCCBs)

通断能力　短路强度　Switching capacity short-circuit capacity

根据安装规范 DIN VDE 0100 第410 部分规定 (防止危险的人体电流)，剩余电流保护断路器可安装在全部 3 种电网系统中 (TN、TT 和 IT 电网中)。

使用在 TN 系统中，如果中性线用作保护导线，在发生故障时就会出现短路状的漏电电流，因此，剩余电流保护断路器连同前接的熔断器必须具有相应的短路强度，为此规定了试验规程。组合后的短路强度必须标注在电器上。

西门子剩余电流保护断路器连同相应的前接熔断器具有的短路强度达 10 000A。这是 VDE-规范中最高一级的短路强度。

通断能力或剩余电流保护断路器用的最大短路－前接熔断器的数据列于下表：

In accordance with the established standard DIN VDE 0100 Part 410 (protection against dangerous shock currents), RCCBs may be used in all three distribution networks (TN-, TT- and IT- networks). Subsequently in TN networks where the neutral conductor is used as the protective conductor (PE), short-circuit type fault currents can be produced in the event of a fault. Therefore RCCBs must have a back-up fuse, which in combination with the RCCB has a corresponding short-circuit capacity. Tests have been specified for this purpose. The short-circuit capacity of the combination must be marked on the RCCB. Siemens RCCBs, when in combination with a corresponding back-up fuse, have a short-circuit capacity of 10 000A. That is the highest possible level of short-circuit capacity according to the VDE standard.

Data regarding the breaking capacity and the maximum short-circuit back-up fuses for RCCBs is shown in the following table.

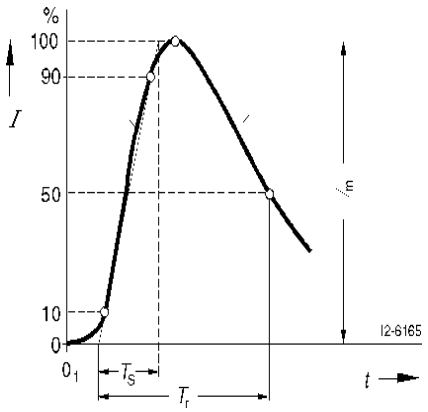
剩余电流保护断路器 的额定电流 Rated current of the RCCB	额定电压时的 通断能力 Breaking capacity at rated voltage	剩余电流保护断路器用的最大短路－前接熔断器 NH、DIAZED、NEOZED，工作等级为 gL/gG Maximum short-circuit back-up fuses NH, DIZED, NEOZED Operating class gL/gG for the RCCB	
		AC 125V 至 400V AC 125V to 400V	AC 500V AC 500V
A	A	A	A
16 to 40	800	63	-
63	800	100	-
80	800	100	-
25	800	100	35
40	800	100	50
63	800	100	-

冲击电流　Impulse current withstand

在雷击时，以行波形式出现的大气过电压从架空线电网进入供电系统的安装线路并使剩余电流保护断路器脱扣。为了避免这种不必要的分断，剩余电流保护断路器必须通过规定的试验来验证其冲击电流强度。试验是采用 8/20 µs 标准化波形及 Î=250A 冲击试验电流。

During thunderstorms, travelling surges in the atmosphere can in the form of overvoltages via overhead lines penetrate the installation and trip the RCCB. To avoid this unwanted tripping, RCCBs must pass specified tests to verify their impulse current withstand capability.

Testing is performed with an impulse current Î = 250A of the standardised impulse wave 8/20 µs.



DIN VDE 0432 第 2 部分规定的冲击电流的特性参数

Characteristics of a surge current to DIN VDE 0432 Part 2

T_s　波前时间／front time in µs

T_r　波尾时间／virtual time to half wave in µs

O_1　额定波起端／virtual origin

I_m　峰值／peak value

冲击电流波 8/20 µs (波前时间 8 µs；波尾时间 20 µs)

Impulse current overvoltage 8/20 µs (front time 8 µs; virtual time to half wave 20 µs)

➤如需要有关剩余电流保护断路器的其它资料可见出版物“应用剩余电流保护断路器更安全”，索取号为 E20001-P311-A17-V1。
Further information regarding RCCBs is contained in the publication “Greater Safety through Earth Fault Protection by Residual Current Operated Circuit-Breakers,” Order No. E20001-P311-A17-V1.

选型表 Tables of selectivity

在熔断器和剩余电流保护断路器之间的选型数值
下部：5SU..4 型，5SU..6 型，5SU..7 型断路器
上部：Neozed 型，Diazed 型，NH 型熔断器
Values of selectivity between fuses and residual current operated circuit breakers in series
Downward: Circuit breakers 5SU..4, 5SU..6, 5SU..7
Upward: Fuses Neozed, Diazed, NH

下部 / DOWNWARD	上部 UPWARD		NEOZED								DIAZED								NH								
N 系列 5SU..4 型，5SU..6 型，5SU..7 型剩余电流保护断路器 RESIDUAL CURRENT OPERATED CIRCUIT BREAKERS 5SU			16	20	25	35	50	63	80	100	16	20	25	35	50	63	80	100	16	20	25	35	40	50	63	80	100
特性 / Characteristic：C		P_I (kA)	50	50	50	50	50	50	50	50	∞	∞	70	70	70	70	70	70	120	120	120	120	120	120	120	120	120
备用值，以 kA 计 / Values of backup in kA																											
	6		0.38	0.52	0.72	1.35	2.25	3.15	4.1	>6	0.32	0.58	0.92	1.5	2.65	4.3	5.3	>6	0.21	0.4	0.65	1.3	2.35	2.35	3.2	4.3	>6
	10		-	0.51	1.05	1.35	2.15	3.15	4.1	>6	-	0.55	1.05	1.4	2.5	4	5.1	>6	-	0.39	0.75	1.2	2.35	2.35	3.2	4.1	>6
	16		-	-	0.98	1.3	2.05	2.9	3.8	6	-	-	0.98	1.35	2.3	3.6	4.7	>6	-	-	0.7	1.15	2.2	2.2	3	3.8	5.9
	20		-	-	0.98	1.3	2.05	2.9	3.8	6	-	-	0.98	1.35	2.3	3.6	4.7	>6	-	-	0.7	1.15	2.2	2.2	3	3.8	5.9
	25		-	-	-	1.2	1.85	2.65	3.6	5.5	-	-	-	1.2	2	3	4	6	-	-	-	1	1.9	1.9	2.6	3.2	5.2
	32		-	-	-	-	1.82	2.65	3.6	5.5	-	-	-	-	2	3	4	6	-	-	-	-	1.9	1.9	2.6	3.2	5.2

在熔断器和剩余电流保护断路器之间的备用数值
下部：5SU..6 型，5SU..7 型断路器
上部：Neozed 型，Diazed 型，NH 型熔断器
Values of back-up between fuses and thermomagnetic differential circuit breakers in series
Downward: Circuit breakers 5SU..6, 5SU..7
Upward: Fuses Neozed, Diazed, NH

下部 / DOWNWARD	上部 / UPWARD		NEOZED				DIAZED						NH						
N 系列 5SU 型热磁差动断路器 THERMOMAGNETIC DIFFERENTIAL CIRCUIT BREAKERS N SERIES 5SU	I_n (A)		50	63	80	100	50	63	80	100	160	200	40	50	63	80	100	160	200
特性 / Characteristic：C		PI [1]	50	50	50	50	70	70	70	70	70	70	120	120	120	120	120	120	120
备用值，以 kA 计 / Values of backup in kA																			
	6		50	50	35	35	70	50	35	35	16	16	100	100	50	35	35	16	16
	10		50	50	35	35	70	50	35	35	16	16	100	100	50	35	35	16	16
	16		50	50	35	35	70	50	35	35	16	16	100	100	50	35	35	16	16
	20		50	50	35	35	70	50	35	35	16	16	100	100	50	35	35	16	16
	25		50	50	35	35	70	50	35	35	16	16	100	100	50	35	35	16	16
	32		50	50	35	35	70	50	35	35	16	16	100	100	50	35	35	16	16

1) 上述选型数值是在 400V ~ 电压 (3P+N)下 测得的(230V~ 用于 1P+N，230/400V~ 用于 1P)。
对于在 230V ~ 电压下使用的双极断路器，选型由最大值保证。
The values of selectivity cited are attributed to the voltages of 400V ~ (3P+N).
For the bipolar circuit breakers employed at the voltages of 230V ~ , the selectivity is guaranteed by the most elevated values.

剩余电流保护断路器(RCCBs)
Residual Current operated Circuit-Breakers (RCCBs)

产品概述 The range

5SM 系列剩余电流保护断路器是根据最新的 IEC 61008-1 标准设计的，同时它还符合 EN 50022 有关模数化开关的标准，即开关都可以卡装在“ 帽形 ”对称结构的标准导轨上。5SM 系列剩余电流保护断路器的外形完全符合 DIN 43880 标准：一个模数为 18 mm (1 极)，前面窗口(指凸起部分)高度为45 mm。

5SM系列剩余电流保护断路器在检测到对地的故障电流 (漏电电流) 后，与漏电脱扣电流值进行比较，当故障电流值大于漏电脱扣电流值时开关会将回路分断。

剩余电流保护断路器与接地系统一起可以对于人体的间接接触带电体进行保护。

剩余电流保护断路器在额定漏电电流(感应值)小于或等于30mA时，也可以作为直接接触带电体的一种附加保护。

除了有直接或间接接触带电体保护的功能，剩余电流保护断路器也可以在绝缘遭到破坏时对可能引起的火灾危险进行保护。

西门子产品范围 (21页) 能完全满足下列三类产品的电气安装设备的需要:

- AC型: 用于交流故障电流的剩余电流保护断路器；
- A 型: 用于交流和直流脉动分量故障电流的剩余电流保护断路器；
- B 型: 用于交流和直流脉动分量故障电流以及直流平滑故障电流的剩余电流保护断路器

The Residual Current operated Circuit-Breakers (RCCBs) of the 5SM series produced according to the new standard IEC 61008-1 are modular switches which are snap mounted on symmetric “hat” profiles in accordance with EN 50022. Their sizes comply to the standard DIN 43880: a module of 18 mm (1 pole), front window height equal to 45 mm.

The 5SM RCCB detect the fault current (residual differential current) connected to earth, compare the fault current value with the tripping differential value (sensitivity threshold), and open the protected circuit when the fault current value is greater than the threshold value.

These devices together with the earthing system are therefore used to protect people in case of indirect contacts.

The RCCB which are characterized by a rated residual differential current (sensitivity) less than or equal to 30 mA can be used as an additional protection in case of direct contacts.

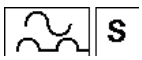
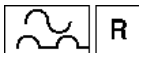
In addition to the function of protection against direct or indirect contacts, the Residual Current operated Circuit-Breakers (RCCBs) incorporate a protective function against the danger of fire in the event of insulation breakdown.

The Siemens supplies range (page 21) studied to meet all the requirements concerning electrical installations consists of three main product families:

- AC type: Residual Current operated Circuit-Breakers (RCCBs) for AC fault currents;
- A type : Residual Current operated Circuit-Breakers (RCCBs) for AC and pulsating DC fault currents;
- B type : Residual Current operated Circuit-Breakers (RCCBs) for AC, pulsating DC and smooth DC fault currents.

5SM 系列剩余电流保护断路器：一个优化的选择方案
The 5SM Residual Current operated Circuit-Breakers (RCCBs): an optimum solution

产品概述 The range

型号 Type	额定电流 I_n (A) Rated current I_n(A) AC 230/400 V	额定漏电电流 $I_{\Delta n}$(mA) Rated fault Currents $I_{\Delta n}$ (mA)	附注 Remarks	页码 Page
剩余电流保护断路器(RCCBs)-5SM 系列 Modular Residual Current operated Circuit-Breakers (RCCBs) - 5SM				
AC 	16 ■ 80	10, 30, 100, 300, 500,	用于交流故障电流 for AC fault currents	2/22
A 	16 ■ 80		用于交流和脉动直流故障电流 for AC, pulsating DC fault currents	2/24
剩余电流保护断路器(RCCBs) - 5SM/5SZ 系列的特殊用途 Modular Residual Current operated Circuit-Breakers (RCCBs) - 5SM/5SZ for special applications				
A 选择性  selective	■ 40 ■ 63	300 , 1000	选择型 selective type	2/26
B 	■ 25 ■ 40 ■ 63	30 , 300	用于交流和脉动直流故障电流 for AC, pulsating and smooth DC fault currents	2/28
A 	■ 25 ■ 40 ■ 63	30 ,100	时间动作型(短延时), 用于非瞬时动作的加强保护 Timed opening (short time delay), for enhanced protection against unwanted tripping actions.	2/29

2

剩余电流保护断路器(RCCBs)
Residual Current operated Circuit-Breakers (RCCBs)

产品数据 Product data sheet

5SM 系列 AC 型
5SM Series TYPE AC
应用范围：家用，公众场合，工业领域
Application fields: domestic, public, industrial

5SM 系列 AC 型剩余电流保护断路器(RCCBs)适用于家用、公众场合和工业领域中的 TT，TN 和 IT 配电系统并符合有关的保护规定。额定漏电电流为30mA的剩余电流保护断路器同时可作为直接接触带电体的附加保护。

The 5SM Residual Current operated Circuit-Breakers (RCCBs) of the AC type adapted to domestic, public, and industrial fields are used in the distribution systems TT, TN and IT, in accordance with the rules and regulations in force. The RCCB characterized by a rated residual differential current of 30 mA also assure an additional protection in case of direct contacts.

用于交流故障电流的交流型剩余电流保护断路器(RCCBs)
- 额定漏电电流 $I_{\Delta n}$:10 mA, 30 mA, 100mA, 300 mA, 500 mA
- 额定工作电流 I_n: 16, 25, 40, 63, 80A
- 额定工作电压 U_n: AC 125 V - 230 V (2P), AC 230 V - 400 V (4P)
- 额定通断能力 I_m: 800A, 通过附加的后备熔断器短路分断能力可达 10kA
- 用于对脉冲波动电流的抑制作用 - 避雷或开关电器设备 - 符合标准 IEC 61008-1
- 附件式辅助触头: 允许负载: 6 A(AC 230 V)或 1 A(DC 220 V)
- 符合以下标准：IEC 61008-1, EN 61008-1
- 标记 CE

AC type Residual Current operated Circuit-Breakers (RCCBs) for AC currents
- Rated residual fault currents $I_{\Delta n}$: 10 mA, 30 mA, 100 mA, 300 mA, 500 mA
- Rated currents I_n :16, 25, 40, 63, 80A
- Rated voltage U_n : AC 125 V - 230 V (2P), AC 230 V - 400 V (4P)
- Rated differential breaking capacity I_m: 800A, short circuit capacity together with appropriate back up fuse: 10kA
- Resistance to surge current pulses - lightning or switchgear manipulation - according to IEC 61008-1
- Attachable auxiliary contacts: permissible load: 6 A (AC 230 V) or 1 A (DC 220 V)
- Compliance with the standards: IEC 61008-1, EN 61008-1
- Marking CE

主要认证说明 Approvals and main certifications	部分 / Versions
IMQ	所有系列 /All [1]

[1]) 2P 63 A, 80 A 的认证在进行中
Certification in progress for 2P 63 A, 80 A

有关 5SM 系列剩余电流保护断路器产品的详细技术数据请参阅：剩余电流保护断路器(RCCBs)技术数据第 30 页。
For more details on the technical data of 5SM RCCBs, please consult the section:
Technical data of the Residual Current operated Circuit-Breakers (RCCBs) on page 30.
剩余电流保护断路器(RCCBs)外形尺寸见第 31 页。
Dimension data of the Residual Current operated Circuit-Breaker (RCCBs) see page 31.

选型和技术数据 Selection and ordering data

5SM 系列　　AC 型
5SM Series　　TYPE AC

5SM 系列
- 额定电压(U_n)=AC 125 至 230 V (2P)
  AC 230 至 400 V (3P+N)
- 用于电网电压至:
  AC 240 V (2P)
  AC 415 V (4P)
- 形式：交流型
- 附件式辅助触头
- 接线端子防护等级
  IP 2X - IP XXB
- 可以用符合EN 50022标准的“ 帽 ”形导轨进行卡式安装
- 包装件
  (每个单元的数量): 1

5SM Series
- U_n = AC 125 to 230 V (2P)
  AC 230 to 400 V (3P+N)
- Usable with line voltages up to:
  AC 240 V (2P)
  AC 415 V (4P)
- Type : AC
- Attachable auxiliary contacts
- Protected terminals
  IP 2X - IP XXB
- Snap on mounted to symmetric “hat” profiles rails according to EN 50022
- Packaging
  (number of parts): 1

	说明 Version	额定漏电电流 Rated fault current $I_{\Delta n}$	额定工作电流 Rated current I_n (A)	订货号 Order No.
	2 极 (2 模数) [1] [2] 2 pole (2 MW) [1] [2]	10 mA 30 mA 30 mA 30 mA 30 mA 100 mA 100 mA 100 mA 100 mA 300 mA 300 mA 300 mA 300 mA	16 25 40 63 80 25 40 63 80 25 40 63 80	5SM1 111 - 0 5SM1 312 - 0 5SM1 314 - 0 5SM1 316 - 0 5SM1 317 - 0 5SM1 412 - 0 5SM1 414 - 0 5SM1 416 - 0 5SM1 417 - 0 5SM1 612 - 0 5SM1 614 - 0 5SM1 616 - 0 5SM1 617 - 0
	4 极 (4 模数) 4 pole (4 MW)	30 mA 30 mA 30 mA 30 mA 100 mA 100 mA 300 mA 300 mA 300 mA 300 mA 500 mA 500 mA 500 mA 500 mA	25 40 63 125 40 63 25 40 63 125 25 40 63 125	5SM1 342 - 0 5SM1 344 - 0 5SM1 346 - 0 5SZ3 470 5SM1 444 - 0 5SM1 446 - 0 5SM1 642 - 0 5SM1 644 - 0 5SM1 646 - 0 5SZ6 470 5SM1 742 - 0 5SM1 744 - 0 5SM1 746 - 0 5SZ7 470
	辅助触头 Auxiliary contacts (1/2 模数)(1/2 MW)	6A, AC 230V 1A, DC 220V	1NO+1NC 2NO 2NC	5SW3 000 5SW3 001 5SW3 002
	锁定设备, 可铅封和可锁定 Locking device sealable and lockable			5SW3 003

[1] 1 模数 = 一个模数宽度单元 =18 mm
1 MW = one Module Width unit = 18 mm
[2] 63A, 80A=2.5 模数
63 A, 80 A = 2.5 MW

剩余电流保护断路器(RCCBs)
Residual Current operated Circuit-Breakers (RCCBs)

产品数据 **Product data sheet**

5SM 系列 A 型
5SM Series TYPE A

应用范围：家用，公众场合，工业领域
Application fields: domestic, public, industrial

5SM 系列 A 型剩余电流保护断路器(RCCBs)适用于家用、公众场合和工业领域中的 TT, TN，和 IT配电系统并符合有关的保护规定。在发生间接接触带电体时通过自动断开电源来达到保护作用。当用户对电气回路要求较高时，根据 IEC 64-8 第 532.2.1.4 部分和 IEC 64-50 第 3.2.6 部分推荐使用 A 型剩余电流保护断路器(RCCBs)。

The 5SM Residual Current operated Circuit-Breakers (RCCBs) of the A type adapted to domestic, public, and industrial fields are used in the distribution systems TT, TN, and IT, in accordance with the rules and regulations in force. To protect in case of indirect contacts by an automatic shutdown of the power supply, the standard IEC 64-8 art. 532.2.1.4 and IEC 64-50 art. 3.2.6 recommend using A type Residual Current operated Circuit-Breakers (RCCBs) when class1 users integrating electronic circuits are present.

用于交流和直流脉动故障电流的剩余电流保护断路器(RCCBs)，保证操作者在使用电器设备时的安全

- 额定漏电电流 $I_{\Delta n}$: 10 mA, 30 mA, 100mA, 300 mA, 500 mA
- 额定工作电流 I_n: 16, 25,40, 63, 80A
- 额定工作电压 U_n: AC 125 V - 230 V (2P), AC 230 V - 400 V (4P)
- 额定通断能力 I_m: 800A, 通过附加的后备熔断器短路分断能力可达 10kA
- 用于对脉冲波动电流的抑制作用 - 避雷或开关电器设备 - 符合标准 IEC 61008-1, 时间为 8/20 µs，大于 1000A 的脉冲电流(VDE 0432 T2)
- 附件式辅助触头: 允许负载: 6 A(AC 230 V)或 1 A(DC 220 V)
- 符合以下标准: IEC 61008-1, EN 61008-1, VDE 0664 T1, CEI 23-18
- 标记 CE

A type Residual Current operated Circuit-Breakers (RCCBs) for AC and DC fault currents, guaranteeing the proper operation of installations, particularly for electronic devices

- Rated residual fault currents $I_{\Delta n}$: 10 mA, 30 mA, 100mA, 300 mA, 500 mA
- Rated currents I_n : 16, 25, 40, 63, 80A
- Rated voltage U_n : AC 125 V - 230 V (2P), AC 230 V - 400 V (4P)
- Rated differential breaking capacity I_m: 800A, short circuit capacity together with appropriate back up fuse: 10kA
- Resistance to surge current pulses - lightning or switchgear manipulation - according to IEC 61008-1, 8/20µs current pulse > 1000 A (VDE 0432 T2).
- Attachable auxiliary contacts: Permissible load: 6 A (AC 230 V) or 1 A (DC 220 V)
- Compliance with the standards: IEC 61008-1, EN 61008-1, VDE 0664 T1, CEI 23-18
- Marking CE

主要认证说明 Approvals and main certifications	部分 / Versions
IMQ	所有系列 /All [1]
VDF	所有系列 /All[1]

[1]) 2P 63 A, 80 A 的认证在进行中
Certification in progress for 2P 63 A, 80 A

根据 IEC 64-8 标准，一级电器设备的使用需要用到 A 型剩余电流保护断路器(RCCBs) Class 1 user equipment requiring the utilization of A type Residual Current operated Circuit-Breakers (RCCBs) in accordance with the standard IEC 64-8	
使用设备	Users
• 微型计算机	• microcomputers
• 电子打字机	• electronic typewriters
• 收银机	• cash registers
• 医疗设备	• medical equipment
• 电子秤	• electronic scales
• 光碟机	• disk units
• 工业计算器	• industrial calculators
• 游戏机	• video games
• 电唱机	• juke boxes
• 电话交换机	• telephone exchanges
• 程序控制器	• programmable controllers
• 转换器	• inverters
• 自动设备控制回路	• control circuits for robotic equipment
• 拱形天线设备等	• parabolic antenna rotors etc.

有关 5SM 系列剩余电流保护断路器产品的详细技术数据请参阅：
剩余电流保护断路器(RCCBs)技术数据第 30 页。
For more details on the technical data of 5SM RCCBs, please consult the section:
Technical data of the Residual Current operated Circuit-Breakers (RCCBs) on page 30.
剩余电流保护断路器(RCCBs)外形尺寸见第 31 页。
Dimension data of the Residual Current operated Circuit-Breaker (RCCBs) see page 31.

选型和技术数据 Selection and ordering data

5SM 系列　　A 型
5SM Series　　TYPE A

5SM 系列
- 额定电压(U_n)=AC 125 至 230 V (2P)
  AC 230 至 400 V (3P+N)
- 用于电网电压至:
  AC 240 V (2P)
  AC 415 V (4P)
- 形式：A 型
- 附件式辅助触头
- 接线端子防护等级
  IP 2X - IP XXB
- 可以用符合EN 50022标准的“ 帽 ”形导轨进行卡式安装
- 包装件
  (每个单元的数量): 1

5SM Series
- U_n = AC 125 to 230 V (2P)
  AC 230 to 400 V (3P+N)
- Usable with line voltages up to:
  AC 240 V (2P)
  AC 415 V (4P)
- Type : A
- Attachable auxiliary contacts
- Protected terminals
  IP 2X - IP XXB
- Snap on mounted to symmetric “hat” profiles rails according to EN 50022
- Packaging
  (number of parts): 1

	说明 Version	额定漏电电流 Rated fault current $I_{\Delta n}$	额定工作电流 Rated current I_n (A)	订货号 Order No.
	2 极 (2 模数) [1] [2] 2 pole (2 MW) [1] [2]	10 mA	16	5SM1 111 - 6
		30 mA	25	5SM1 312 - 6
		30 mA	40	5SM1 314 - 6
		30 mA	63	5SM1 316 - 6
		30 mA	80	5SM1 317 - 6
		100 mA	25	5SM1 412 - 6
		100 mA	40	5SM1 414 - 6
		100 mA	63	5SM1 416 - 6
		100 mA	80	5SM1 417 - 6
		300 mA	25	5SM1 612 - 6
		300 mA	40	5SM1 614 - 6
		300 mA	63	5SM1 616 - 6
		300 mA	80	5SM1 617 - 6
	4 极 (4 模数) 4 pole (4 MW)	30 mA	25	5SM1 342 - 6
		30 mA	40	5SM1 344 - 6
		30 mA	63	5SM1 346 - 6
		100 mA	40	5SM1 444 - 6
		100 mA	63	5SM1 446 - 6
		300 mA	25	5SM1 642 - 6
		300 mA	40	5SM1 644 - 6
		300 mA	63	5SM1 646 - 6
		500 mA	25	5SM1 742 - 6
		500 mA	40	5SM1 744 - 6
		500 mA	63	5SM1 746 - 6
	辅助触头 Auxiliary contacts (1/2 模数)(1/2 MW)	6A, AC 230V 1A, DC 220V	1NO+1NC 2NO 2NC	5SW3 000 5SW3 001 5SW3 002
	锁定设备, 可铅封和可锁定 Locking device sealable and lockable			5SW3 003

[1] 1 模数 = 一个模数宽度单元 =18 mm
1 MW = one Module Width unit = 18 mm
[2] 63A, 80A=2.5 模数
63 A, 80 A = 2.5 MW

剩余电流保护断路器(RCCBs)
Residual Current operated Circuit-Breakers (RCCBs)

产品数据 **Product data sheet**

5SM 系列　A 型，选择型
5SM Series　TYPE A SELECTIVE
应用范围：家用，公众场合，工业领域
Application fields: domestic, public, industrial

5SM 系列剩余电流保护断路器 S 型 (选择型)，根据规定可以用于所有的 TN 和 TT 电网系统的使用场合(家用，公众场合和工业领域)。S 型的剩余电流保护断路器可以和下一级的漏电电流小于或等于30mA的剩余电流保护断路器 (RCCB 或 RCBO) 形成上下两级的选择性脱扣。

为了得到选择性保护，在漏电保护器的上级适合于连接一个带漏电模块的 3VF 塑壳断路器，该模块的漏电电流>1A，延时时间>0.25S。选择型的剩余电流保护断路器都是A型，所以它还可以分断脉动直流型的漏电故障电流。

The 5SM RCCB of the S type (Selective) are used in all the fields (domestic,public, and industrial) in the distribution systems TN and TT, in accordance with the regulation in force. The RCCB of the S type, together with standard RCCB and RCBO circuit-breakers connected downstream and having a residual fault current $I_{\Delta n} \leq$ 30 mA, offer a vertical two-tier tripping selectivity.
To benefit from selectivity, including RCCBs connected upstream, it is suitable to use 3VF circuit-having a residual fault current $I_{\Delta n}$ > 1 A, and a delay > 0.25 s.
The 5SM selective RCCB are A types; as a result, they also open when fault currents of the pulsating DC current type are present.

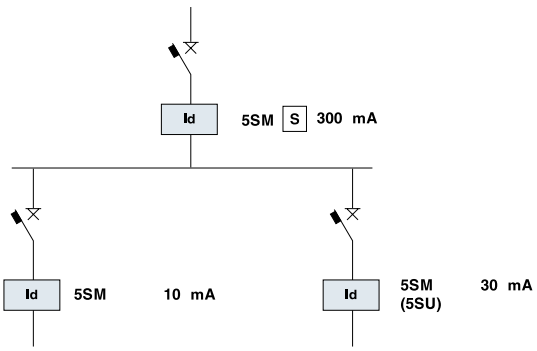
选择型剩余电流保护断路器(RCCBs)与其它类型的5SM 系列剩余电流保护断路器(RCCBs)和集漏电与过电流保护于一体的5SU 系列带过电流保护的剩余电流保护断路器(RCBOs)一起使用，可以保证脱扣的选择性

- 额定漏电电流 $I_{\Delta n}$: 100mA, 300 mA, 1 A
- 额定电压 U_n: AC 125 V - 230 V (2 极), AC 230 V - 400 V (4 极)
- 额定电流 I_n: 40, 63 A
- 额定通断能力 I_m: 800 A，通过附加的后备熔断器短路分断能力可达 10kA
- 用于对脉冲波动电流的抑制作用 - 避雷或开关电器设备 - 符合标准 IEC 61008-1, 8/20µs 大于 5000A 的脉冲电流 (VDE 0432 T2)
- 附件式辅助触头允许负载: 6 A (AC 230 V)或 1 A (DC 220 V)
- 符合以下标准：IEC 61008-1, EN 61008-1, VDE 0664 T1, CEI 23-18
- 标记 CE

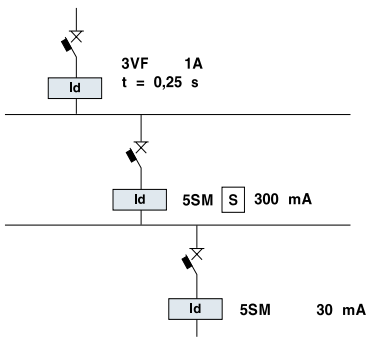
Residual Current operated Circuit-Breakers (RCCBs) assuring a tripping selectivity when associated with other 5SM RCCBs and 5SU Residual Current Circuit-Breakers with integral Overcurrent protection (RCBOs)

- Rated fault currents $I_{\Delta n}$: 300 mA, 1 A
- Rated voltage U_n : AC 125 V - 230 V (2P), AC 230 V - 400 V (4P)
- Rated current I_n : 40, 63 A
- Rated differential breaking capacity I_m: 800 A, short circuit capacity together with appropriate back up fuse: 10kA
- High resistance to surge current pulses - lightning or switchgear manipulation - according to IEC 61008-1, > 5000 A (VDE 0432 T2, 8/20µs current pulse)
- Attachable auxiliary contacts: Permissible load: 6 A (AC 230 V) or 1 A (DC 220 V)
- Compliance with the standards: IEC 61008-1, EN 61008-1, VDE 0664T1, CEI 23-18
- Marking CE

主要认证说明 Approvals and main certifications
VDE



两级选择性保护回路的实例
Example of a two-tier selectivity circuit



三级选择性保护回路的实例
Example of a three-tier selectivity circuit

有关 5SM 系列剩余电流保护断路器产品的详细技术数据请参阅：
剩余电流保护断路器(RCCBs)技术数据第 30 页。
For more details on the technical data of 5SM RCCBs, please consult the section:
Technical data of the Residual Current operated Circuit-Breakers (RCCBs) on page 30.
剩余电流保护断路器(RCCBs)外形尺寸见第 31 页。
Dimension data of the Residual Current operated Circuit-Breaker (RCCBs) see page 31.

选型和技术数据 Selection and ordering data

5SM 系列　　A 型，选择型
5SM Series　　TYPE A SELECTIVE

S

5SM 系列
- 额定电压(U_n)=AC 125 至 230 V (2P)
  AC 230 至 400 V (3P+N)
- 用于电网电压至:
  AC 240 V (2P)
  AC 415 V (4P)
- 额定频率：50/60 Hz
- 形式：A 型
- 附件式辅助触头
- 接线端子防护等级
  IP 2X - IP XXB
- 可以用符合EN 50022标准的“ 帽 ”形导轨进行卡式安装
- 包装件
  (每个单元的数量): 1

5SM Series
- U_n = AC 125 to 230 V (2P)
  AC 230 to 400 V (3P+N)
- Usable with line voltages up to:
  AC 240 V (2P)
  AC 415 V (4P)
- Rated frequency: 50/60 Hz
- Type : A
- Attachable auxiliary contacts
- Protected terminals
  IP 2X - IP XXB
- Snap on mounted to symmetric “hat” profiles rails according to EN 50022
- Packaging
  (number of parts): 1

	说明 Version	额定漏电电流 Rated fault current $I_{\Delta n}$ (A)	额定工作电流 Rated current I_n (A)	订货号 Order No.
	2 极 (2.5 模数) [1] 2 pole (2.5 MW) [1]	300 mA	63	5SM1 616 - 8
	4 极 (4 模数) 4 pole (4 MW)	100 mA 300 mA 300 mA 1A	40 40 63 63	5SM1 444 - 8 5SM1 644 - 8 5SM1 646 - 8 5SM1 846 - 8
	辅助触头 Auxiliary contacts (1/2 模数)(1/2 MW)	6A, AC 230V 1A, DC 220V	1NO+1NC 2NO 2NC	5SW3 000 5SW3 001 5SW3 002
	锁定设备， 可铅封和可锁定 Locking device sealable and lockable			5SW3 003

[1] 1 模数 = 一个模数宽度单元 =18 mm
1 MW = one Module Width unit = 18 mm

剩余电流保护断路器(RCCBs)
Residual Current operated Circuit-Breakers (RCCBs)

产品数据 Product data sheet

5SZ 系列 B 型
5SZ Series TYPE B
应用范围: 家用, 公众场合, 工业领域
Application fields: domestic, public, industrial

用于交流、直流脉动和平滑故障电流。
5SZ Series TYPE B for AC, pulsating, and smooth DC fault currents

剩余电流保护断路器(RCCBs)具有特殊的结构特点, 是专门用于保护直接和间接接触带电体的漏电故障保护 (漏电电流 $I_{\Delta n}$ 30 mA), 包括出现的直流故障电流

- 额定漏电电流 $I_{\Delta n}$: 30 mA, 300 mA
- 额定工作电压 U_n: AC 230 V - 400 V
- 额定工作电流 I_n: 25, 40, 63A
- 额定分断能力 I_m: 800 A, 通过附加的后备熔断器短路分断能力可达 10kA
- 用于交流, 直流脉动和平滑故障电流
- 用于对脉冲波动电流的抑制作用 - 避雷或开关电器设备 - 符合标准 IEC 61008-1, 8/20µs, 大于 1000A 的脉冲电流(VDE 0432 T2)
- 符合以下标准: IEC 60755, 数据摘自 VDE 5342
- 标记 CE

Modular Residual Current operated Circuit-Breakers (RCCBs) presenting special construction characteristics for assuring protection in case of direct or indirect contacts (version $I_{\Delta n}$ 30 mA), including the presence of DC fault currents

- Rated residual fault currents $I_{\Delta n}$: 30 mA, 300 mA
- Rated voltage U_n : AC 230 V - 400 V
- Rated current I_n : 25, 40, 63 A
- Rated differential breaking capacity I_m: 800 A, short circuit capacity together with appropriate back up fuse: 10kA
- For AC, pulsating and smooth DC fault currents
- High resistance to surge current pulses - lightning or switchgear manipulation - according to IEC 61008-1, >1000A (VDE 0432 T2, 8/20µs current pulse)
- Compliance with the standards: IEC 60755, record number of VDE 5342
- Marking CE

选型和技术数据 Selection and 0rdering data

5SZ 系列 B 型
5SZ Series TYPE B
用于交流、直流脉动和平滑故障电流。
5SZ Series TYPE B for AC, pulsating, and smooth DC fault currents

5SZ 系列
- 额定电压(U_n)=AC 230 至 400 V
- 用于交流, 直流脉动和平滑故障电流
- 用于电网电压至: AC 415 V (4 极)
- 形式：B 型
- 可以用符合EN 50022标准的“ 帽 ”形导轨进行卡式安装
- 接线端子防护等级 IP 2X - IP XXB
- 包装件 (每个单元的数量): 1

5SZ Series
- U_n= AC 230 to 400 V
- For AC, pulsating and smooth, DC fault currents
- Usable with line voltages up to AC 415 V (4P)
- Type : B
- Snap on mounted to symmetric “hat” profiles according to EN 50022
- Protected terminals IP 2X - IP XXB
- Packaging (number of parts): 1

说明 Version	额定漏电电流 Rated fault current $I_{\Delta n}$	额定工作电流 Rated current I_n (A)	订货号 Order No.
4 极 (8 模数) [1] 4 pole (8 MW) [1]	5SZ 系列 B 型，用于交流、直流脉动和平滑故障电流 5SZ Series Type B for AC, pulsating and smooth DC fault currents		
	30 mA	25	5SZ3 426 - 0KG00
	30 mA	40	5SZ3 446 - 0KG00
	30 mA	63	5SZ3 466 - 0KG00
	300 mA	25	5SZ6 426 - 0KG00
	300 mA	40	5SZ6 446 - 0KG00
	300 mA	63	5SZ6 466 - 0KG00

[1]) 1 模数 = 一个模数宽度单元 =18 mm
1 MW = one Modular Width unit = 18 mm

有关 5SZ 系列剩余电流保护断路器产品的详细技术数据请参阅：剩余电流保护断路器(RCCBs)技术数据第 30 页。
For more details on the technical data of 5SZ RCCBs, please consult the section:
Technical data of the Residual Current operated Circuit-Breakers (RCCBs) on page 30.
剩余电流保护断路器(RCCBs)外形尺寸见第 31 页。
Dimension data of the Residual Current operated Circuit-Breaker (RCCBs) see page 31.

产品数据 Product data sheet

5SM 系列　A 型,带短延时
5SM Series　TYPE A with short time delay
应用范围: 家用, 公众场合, 工业领域
Application fields: domestic, public, industrial

这种延时型的剩余电流保护断路器 (延时断开), 对雷电或开关电器设备具有很好的过电压抑制作用, 同时对于一个漏电电流为 30 mA 的剩余电流保护断路器, 它有防止直接接触的保护特性, 最大延时根据 IEC 1008-1 标准能满足 30 mA 的故障电流。

This delaying RCCB (delayed breaking) extremely with stands surge current pulses resulting from lightning or switchgear manipulations, and still maintains protective characteristics in case of direct contacts on a RCCB $I_{\Delta n}$ 30 mA: well within limits of permissible opening delays according to IEC 1008-1 for a 30 mA fault current.

剩余电流保护断路器(RCCBs)用于漏电电流 30 mA, 并可以抑制照明设备产生的短时过电压
- 额定漏电电流 $I_{\Delta n}$: 30 mA, 100 mA
- 额定工作电流 I_n: 25, 40, 63A
- 额定工作电压 U_n: AC 230 V - 400 V
- 额定通断能力 I_m: 800 A, 通过附加的后备熔断器短路分断能力可达 10kA
- 相对于标准的 5SM 剩余电流保护断路器延时时间: 10ms
- 用于对脉冲波动电流的抑制作用 - 避雷或开关电器设备 - 符合标准 IEC 61008-1, 8/20µs, 大于 3000A 的脉冲电流(VDE 0432 T2)。
- 符合以下标准: IEC 61008-1, EN 61008-1, VDE 0664 T1, IEC 23-18
- 标记 CE

Modular Residual Current operated Circuit-Breakers (RCCBs) with $I_{\Delta n}$ 30 mA offering high resistance to transients overvoltage due to lightning or switchgear manipulations
- Rated residual fault currents $I_{\Delta n}$: 30 mA, 100 mA
- Rated current I_n : 25, 40 ,63 A
- Rated voltage U_n : AC 230 V - 400 V
- Rated differential breaking capacity I_m: 800 A, short circuit capacity together with appropriate back up fuse: 10kA
- Delay as compared to standard 5SM RCCB: 10 ms
- High resistance to surge current pulses - lightning or switchgear manipulation (IEC 61008-1), > 3000 A (VDE 0432 T2, 8/20µs current pulse)
- Compliance with the standards: IEC 61008-1, EN 61008-1, VDE 0664 T1, IEC 23-18
- Marking CE

主要认证说明 Approvals and main certifications
VDE

选型和技术数据 Selection and ordering data

5SM 系列　A 型,带短延时
5SM Series
TYPE A with short time delay

- 额定电压(U_n)=AC 230 至 400 V
- 延时时间: 10 ms
- 形式：交流型
- 附件式辅助触头
- 可以用符合EN 50022标准的“ 帽 ”形导轨进行卡式安装
- 接线端子防护等级 IP 2X-IP XXB
- 包装件 (每个单元的数量): 1

- U_n = AC 230 to 400 V
- Delay as compared to a standard 5SM RCCB: 10 ms
- Type A
- Attachable auxiliary contacts
- Snap on mountable to symmetric “hat” profiles according to EN 50022
- Protected terminals IP 2X - IP XXB
- Packaging (number of parts): 1

说明 Version	额定漏电电流 Rated fault current $I_{\Delta n}$ (A)	额定工作电流 Rated current I_n (A)	订货号 Order No.
4 极 (4 模数)[1] 4 pole (4 MW)[1]	5SM 系列 A 型，带短延时 5SM Series Type A, with short time delay		
	30 mA 30 mA 100 mA	25 40 63	5SM1 342 - 6KK01 5SM1 344 - 6KK01 5SM1 446 - 6KK01
辅助触头 Auxiliary contacts (1/2 模数)(1/2 MW)	 6A, AC 230V 1A, DC 220V	1NO+1NC 2NO 2NC	5SW3 000 5SW3 001 5SW3 002
锁定设备, 可铅封和可锁定 Locking device sealable and lockable			5SW3 003

[1]) 1 模数 = 一个模数宽度单元 =18 mm
1 MW = one Module Width unit = 18 mm

有关 5SM 系列剩余电流保护断路器产品的详细技术数据请参阅：剩余电流保护断路器(RCCBs)技术数据第 30 页。
For more details on the technical data of 5SM RCCBs, please consult the section:
Technical data of the Residual Current operated Circuit-Breakers (RCCBs) on page 30.
剩余电流保护断路器(RCCBs)外形尺寸见第 31 页。
Dimension data of the Residual Current operated Circuit-Breaker (RCCBs) see page 31.

技术数据总表 General technical data

系列 Series	5SM	5SM	5SM 选择型 Selective	5SZ 用于交流,直流,脉动和平滑故障电流 for AC, pulsating and smooth DC with short fault currents	5SM 带短延时 time delay
额定工作电压 /Rated voltages U_n [1] (V)	AC 125 - 230 V (2P) AC 230 - 400 V (4P)			AC 230 - 400 V	
额定工作电流 /Rated currents I_n (A)	16, 25, 40, 63, 80 A	16, 25, 40, 63, 80 A	40, 63 A	25, 40, 63 A	25, 40, 63 A
额定漏电电流 $I_{\Delta n}$ Rated residual fault currents $I_{\Delta n}$	10 mA, 30 mA, 100mA, 300 mA, 500 mA		100mA, 300 mA, 1 A	30 mA, 300 mA	30 mA, 100 mA
漏电电流类别 /Type of residual current	AC	A	A	B	A
额定工作频率 /Rated frequency	50 Hz				
额定通断能力 I_m Rated differential breaking capacity I_m	800A				
用于测试功能的最小工作电压 (V) Minimum line voltage for test function operation	100				
用于防止雷电或开关电器设备瞬时脱扣的 8/20µs 的脉冲电流 (VDE 0432 T2) (A 和 B 型) Resistance to unwanted trippings by lightning or switchgear manipulations, 8/20µs current pulse (VDE 0432 T2) (Types A and B)	IEC 61008-1	>1000A	>5000A	>1000A	>3000A
工作温度范围 Operating temperature range	-25ºC 至 +45ºC, 最大相对湿度 95% [2] -25ºC to +45ºC, max. relative humidity 95% [2]				
储存温度 /Storage temperature range	-40ºC ~ +70ºC				
安装位置 /Mounting position	任意 /as desired				
进线方向 /Supply connection	上部或下部端子 /top or bottom				
接线端子 /Terminals	防护等级为 IP 2X -IPXXB, 用于导线截面最大至 25 mm² (5SM) protected IP 2X - IPXXB, for conductors having max. cross-section of 25 mm² (5SM)				
外壳 /Enclosure	材料绝缘性能符合 DIN 7708 标准 /in insulating material according to DIN 7708				
在额定电压和额定电流下工作时的电气和机械寿命 Number of electrical manipulation cycles with U_n and I_n	>10000				
防火等级 Fire resistance	符合标准 IEC 61008-1: 白炽灯灯丝测试符合标准 IEC 60695-2-1 according to IEC 61008-1: incandescent filament test according to IEC 60695-2-1				
机械抗振强度 /Mechanical shock resistance	符合标准 IEC 61008-1/according to IEC 61008-1				
符合下列标准 Compliance with the standards	IEC 61008-1, EN 61008-1, VDE 0664, CEI 23-18				
主要认证说明 Approvals and main certifications	IMQ 和 / 或 VDE IMQ and/or VDE				

[1] 用于最大电网电压至 AC 240 V (2P), AC 415 V (4P)/Usable in network with line voltages of AC 240 V (2P), AC 415 V (4P)
[2] 用于 AC 型最小为 -5ºC/ -5ºC for AC type breakers

四极剩余电流保护断路器在三相三线系统中的应用

根据标准IEC 61008-1, 必须让用户知道定期检查该剩余电流保护断路器的必要性。按下标有字母 T 的测试按钮，就能检查出该剩余电流保护断路器在使用寿命内是否正常工作。参见面板上的安装指导及说明。

当四极剩余电流保护断路器被用于三相三线系统中时, 接线必须是1, 3, 5 对 2, 4, 6。为确保测试键动作正确，3 号端子必须连至中性线上。

Utilization of four-pole Residual Current operated Circuit-Breakers (RCCBs) in three-conductor, three-phase networks

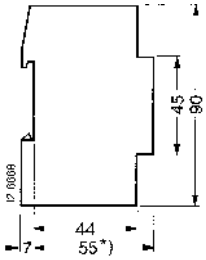
According to the standard IEC 61008-1, the user must be informed of the necessity to periodically actuate the device by pressing the test pushbutton designated by the letter T to verify that the device is operating correctly during its life-time. See mounting instructions and indications on the front.

When four-pole Residual Current operated Circuit-Breakers (RCCBs) are used in three-conductor, three-phase networks, the connection must be made to the terminals 1, 3, 5, and 2, 4, 6. To make sure that the test function can work properly, terminal 3 has to be shunted to the neutral.

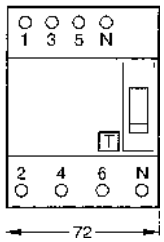
外形尺寸 Dimension drawings

5SM/5SZ 剩余电流保护断路器(RCCBs)
5SM/5SZ Residual Current operated Circuit-Breakers (RCCBs)

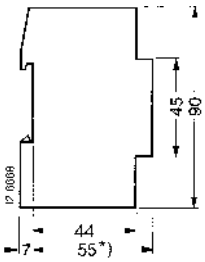
2 极 16 至 40 A
2 poles 16 to 40 A

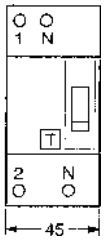


5SM

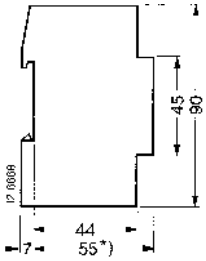


4 极, 5SM
4 poles, 5SM





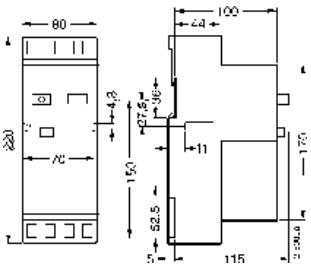
2 极 63 和 80 A
2 poles 63 and 80 A



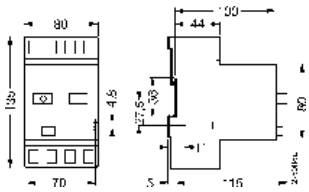
5SM

*) 带锁定设备 5SW3003: 70 mm
with locking device 5SW3003 : 70 mm

5SZ 剩余电流保护断路器 (RCCBs)
5SZ Residual Current operated Circuit-Breakers (RCCBs)
125A

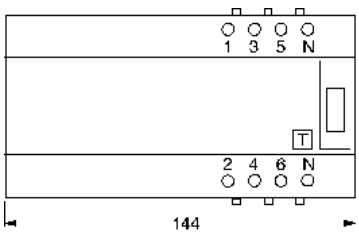


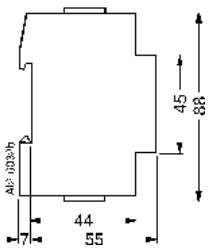
5SZ3 470



5SZ6 470
5SZ7 470

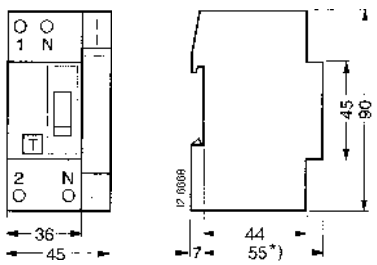
5SZ 剩余电流保护断路器 (RCCBs)
5SZ Residual Current operated Circuit-Breakers (RCCBs)



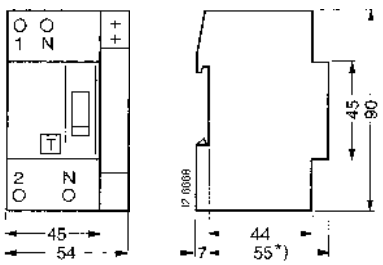


5SZ3 426-0KG00 5SZ3 446-0KG00 5SZ3 466-0KG00
5SZ3 426-0KG00 5SZ3 446-0KG00 5SZ3 466-0KG00

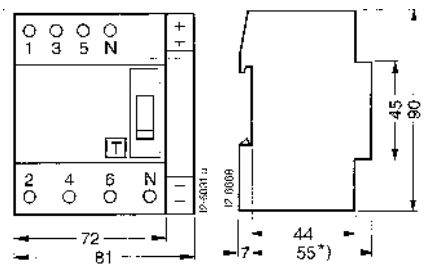
5SM 剩余电流保护断路器(RCCBs)带辅助触头
5SM Modular Residual Current operated Circuit-Breakers (RCCBs) with auxiliary contacts



2 极 16 至 40 A (2.5 模数)
2 poles 16 to 40 A (2.5 MWs)



2 极 63 至 80 A (3 模数)
2 poles 63 to 80 A (3 MWs)



4 极 (4.5 模数)
4 poles (4.5 MWs)

带过电流保护的剩余电流保护断路器(RCBOs)
Residual Current operated Circuit-Breakers with integral Overcurrent Protection (RCBOs)

产品概述 The range

RCBO

5SU系列带过电流动作的剩余电流保护断路器的设计和生产，是符合大多数国家和地区的标准以及符合国际标准 IEC 61009-1 和 IEC 23-18。它的外形尺寸设计又完全符合 DIN 43880 标准。

这些断路器是用于电器设备的过电流保护以及间接接触带电体的保护。

断路器特别用于漏电电流小于或等于 30 mA 时，作为直接接触带电体的一种附加保护。

5SU 剩余电流保护断路器(RCBO)有 A 型和 AC 型两种。

产品范围详见 33 页。

根据IEC 1009-1标准规定，5SU剩余电流保护断路器 (RCBO) 不需要特殊的操作步骤，所以在使用上可以被非专业人士使用。

The RCBO

5SU series are equipped with overcurrent triggers integrated and manufactured according to the most recent national and international regulations: standards IEC 61009-1 and IEC 23-18. Their sizes are in compliance with the regulations of the standard DIN 43880.

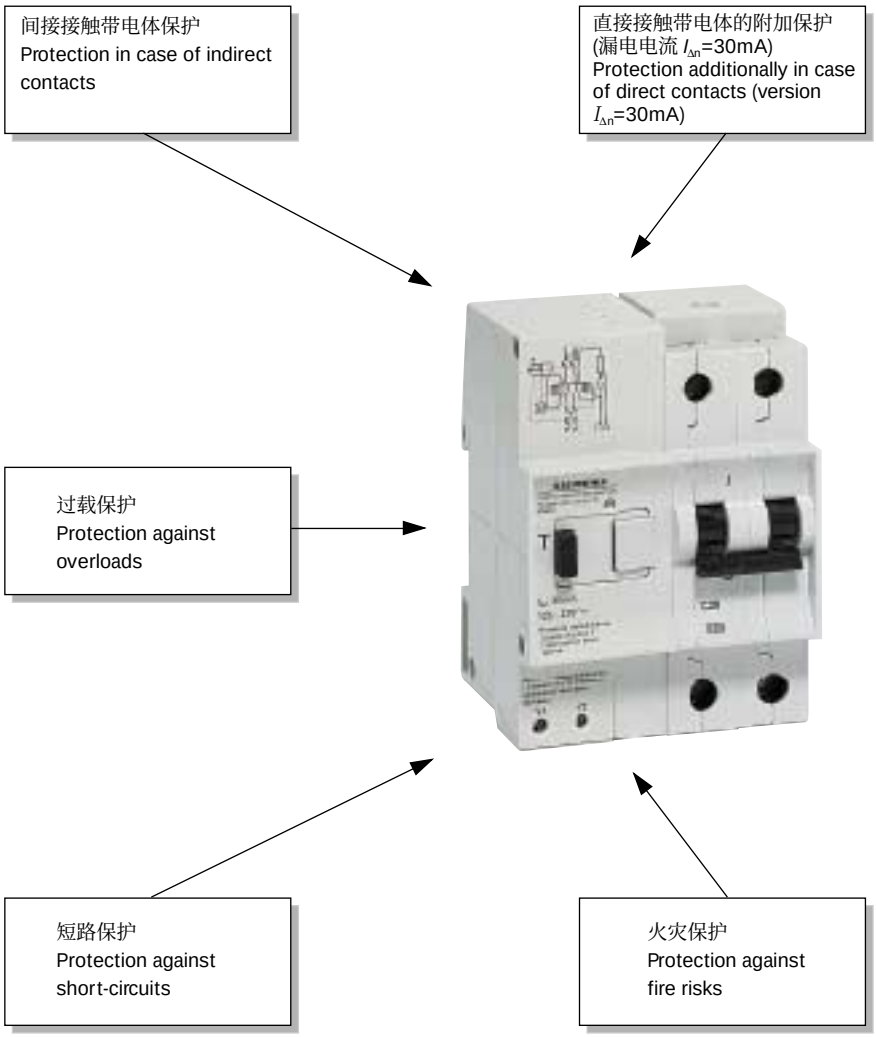
These circuit-breakers are used to protect electrical installations against overcurrents and assure the protection of live in case of indirect contacts.

The circuit-breakers characterized by a residual fault current rated less than or equal to 30 mA offer an additional protection in case of direct contacts.

In addition, these devices assure protection against the risks of fire in the event of an earthing fault if such faults persist without tripping the protection device against overcurrents.

The 5SU RCBO circuit-breakers are available in types A and AC.

The product range is presented in condensed form in the table on page 33.



5SU 系列带过电流保护的剩余电流保护断路器的优点
Advantages of the 5SU Residual Current operated Circuit-Breakers with integral Overcurrent Protection

- 完整的过电流和接地故障保护(间接和直接接触带电体以及火灾事故的保护)
- 极好的电流和能量限制作用 I^2t: 限制等级 3
- 导线极好的短路保护作用
- 很高的选择性
- 手柄锁定装置可防止不必要的误动作
- 对雷电和开关电器设备产生的脉冲波动电流有极好的抑制作用

- Integrated protection against overcurrents and earthing faults (protection in case of indirect contacts, direct contacts, and fire risks)
- Excellent current and I^2t energy limiting grade: limitation class 3
- Better protection of conductors against short-circuits
- High selectivity
- Toggle handle protected against unwanted manipulations
- Excellent resistance to surye current pulses - lightning or switchgear manipulation

产品范围 The range

系列 series	极数 No. of poles	额定分断能力[1] Rated short-circuit Capacity [1]	型号[2] Type [2]	脱扣特性 Tripping Characteristic	应用范围 Application Fields	页码 Page
5SU.747	1P+N 2 模数 2 module 单元 /units	4500	~ / ~	C	家用 /domestic 公众场合 /public	2/34
5SU.76.	1P+N 2 模数 2 module 单元 /units	6000 10 kA [3]	~ / ~	B C	公众场合 /public 工业领域 /industrial	2/36
5SU.66.	3P+N					2/36
5SU.26.	2P	10000 25 kA	~ / ~	C	公众场合 /public 工业领域 /industrial	2/38
5SU.67.	3P+N					2/38
5SU.27.	2P	20000 25 kA	~ / ~	C	公众场合 /public 工业领域 /industrial	2/40

[1] 黑色方框内显示值为相应的额定分断能力值，以 A 为单位，符合标准 IEC 61009-1；红色显示值符合标准 IEC 947-2。
与不同的电流值对应的有效分断能力参见 43 页的表格。
The value indicated in black in the rectangle corresponds to the rated short-circuit capacity in A according to IEC 61009-1; the value indicated in red returns to the standard IEC 947-2.
The max. effective short-circuit capacity values for the various currents are specified in the table on page 43.

[2] ~ AC 型用于交流故障电流。
~ A用于交流和直流脉动故障电流。
~ AC type for AC fault current.
~ A type for AC fault currents and pulsating DC fault currents.

[3] 对于 3P+N，分断能力符合标准 IEC 947-2。
Short-circuit capacity according to IEC 947-2 for the version 3P+N.

带过电流保护的剩余电流保护断路器(RCBOs)
Residual Current operated Circuit-Breakers with integral Overcurrent Protection (RCBOs)

产品数据 Product data sheet

5SU 系列 4500
5SU Series 3
应用范围：家用，公众场合
Application sectors: domestic, public

一体化相线+中性线带过电流保护的剩余电流保护断路器，给用户电器设备最大的保护而外形只有原来的一半
- 额定漏电电流: 30 mA, 300 mA
- 额定工作电流: 6 to 40 A AC 230 V (1P+N)
- 脱扣特性: C
- 按照 IEC 61009-1 标准，额定分断能力 I_{cn} 为: 4500 A
- 极好的电流和能量限制作用 I^2t: 限制等级 3
- 宽度: 36 mm
- 类型: AC 和 A
- 用于对脉冲波动电流的抑制作用 - 避雷或开关电器设备 - 符合标准 IEC 61009-1，时间为 8/20µs，大小为 250A 的脉冲电流(VDE 0432 T2)
- 符合以下标准: IEC 61009-1, EN 61009-1, IEC 23-18
- 标记：CE

Single-block phase neutral RCBO circuit-breakers in two Module Width units; maximum protection to users and electrical installations in half-sized enclosures
- Rated residual fault currents: 30 mA, 300 mA
- Rated currents: 6 to 40 A AC 230 V (1P+N)
- Tripping characteristic: C
- Rated short-circuit capacity I_{cn} according to IEC 61009-1: 4500 A
- Excellent current and energy limiting I^2t: limitation class 3
- Width: 36 mm
- Types: AC A
- Resistance to surge current pulses - lightning or switchgear manipulation - IEC 61009-1, 8/20µs and 250 A current pulse (VDE 0432 T2)
- Compliance with the standards: IEC 61009-1, EN 61009-1, IEC 23-18
- Marking CE

主要认证说明 Approvals and main certifications	C
IMQ	6 to 40 A

5SU			
		1P+N	1P+N
U_n(V)	~	125 to 230	125 to 230
I_n(A)	I_{cn}	4500	4500
6 — 40		●	●

5SU.747 系列带过电流保护的剩余电流保护断路器 (RCBO) 可以用于住宅和公众场合，最适合作为人体间接接触带电体的保护，以及作为电器设备的过载和短路保护。

带过电流保护的剩余电流保护断路器实际上是一种接地故障和过电流故障保护的组合体，用它可以来检测电器设备中的故障电流(电磁式保护)。

使用故障电流为 30 mA 的剩余电流保护断路器同时可以作为直接接触带电体的附加保护。

5SU.747系列带过电流保护的剩余电流保护断路器有两种型号: 一种是只能检测交流故障电流 (AC 型)，另一种是还能检测直流脉动故障电流 (A 型)。

A 型剩余电流保护断路器可以被应用于所有等级1电器设备的场合，如医疗设备，控制系统，视盘游戏机，计算机，办公自动化设备以及一般的电子系统等 (见 24 页)。

The 5SU.74 Residual Current Operated Circuit-Breaker with integral Overcurrent Protection (RCBO) can be used in the domestic and public field for optimum protection of life against the risks of indirect contacts and electrical installations against short-circuits or overload.
The Residual Current Operated Circuit-Breakers with integral Overcurrent Protection combine in fact a protection against earthing faults (differential protection) and a protection against overcurrents detected in the installations (magnetothermic protection).
Versions using a rated residual fault current of 30 mA also assure an additional protection in case of direct contacts.
The 5SU.74 Residual Current Operated Circuit-Breakers with integral Overcurrent Protection are available in two versions: one only sensitive to AC sinusoidal fault currents (AC type) and the other also sensitive to pulsating DC fault currents (A type).
The utilization of A type RCBO circuit-breakers is recommended in all fields where Class 1 devices are involved, such as: medical equipment, control systems, video games for cafes and arcades, computers, office automation and electronic systems in general (see page 24).

有关 5SU 系列剩余电流保护断路器产品的详细技术数据请参阅：
一体化带过电流保护的剩余电流保护断路器 5SU(RCBOs)系列技术数据第 44 页。
For more details on the technical data of 5SU RCBO circuit-breakers, please consult the section:
Technical data of the single-block Residual Current operated Circuit-Breakers with integral Overcurrent Protection (RCBOs) on page 44.
带过电流保护的剩余电流保护断路器(RCBOs)外形尺寸见第 45 页。
Dimension data of the Residual Current operated Circuit-Breakers with integral overcurrent Protection (RCBOs) see page 45.

选型和技术数据 Selection and ordering data

5SU 系列 4500
5SU Series 3
脱扣特性 C
Tripping characteristic C

5SU 系列
- 额定分断能力 I_{cn}: 4500 A, 符合 IEC 61009-1 标准
- 额定工作电压 U_n = AC 125 至 230 V
- 形式: AC, A
- 接线端子防护等级 IP 2X - IP XXB
- 可以用符合 EN 50022 标准的 "帽" 形导轨进行卡式安装
- 包装件, (每个单元的数量): 1

5SU Series
- Rated shout-circuit capacity I_{cn}: 4500 A according to IEC 61009-1
- U_n = AC 125 to 230 V
- Types: AC, A
- Protected terminals IP 2X - IP XXB
- Snap on mountable to symmetric "hat" profiles according to EN 50022
- Packaging (number of parts): 1

	说明 Version	额定漏电电流 Rated fault current $I_{\Delta n}$ (A)	额定工作电流 Rated current I_n (A)	订货号 /Order No. 特性 C/ Characteristic C	
				AC 型 /Type AC	A 型 /Type A
	1 极 +N (2 模数) [1] 1 pole+N (2 MW) [1]	30 mA	6	5SU3 747-0KW06	5SU3 747-0KV06
		30 mA	10	5SU3 747-0KW10	5SU3 747-0KV10
		30 mA	16	5SU3 747-0KW16	5SU3 747-0KV16
		30 mA	20	5SU3 747-0KW20	5SU3 747-0KV20
		30 mA	25	5SU3 747-0KW25	5SU3 747-0KV25
		30 mA	32	5SU3 747-0KW32	5SU3 747-0KV32
		30 mA	40	5SU3 747-0KW40	
	1 极 +N (2 模数) [1] 1 pole+N (2 MW) [1]	300 mA	6	5SU6 747-0KW06	5SU6 747-0KV06
		300 mA	10	5SU6 747-0KW10	5SU6 747-0KV10
		300 mA	16	5SU6 747-0KW16	5SU6 747-0KV16
		300 mA	20	5SU6 747-0KW20	5SU6 747-0KV20
		300 mA	25	5SU6 747-0KW25	5SU6 747-0KV25
		300 mA	32	5SU6 747-0KW32	5SU6 747-0KV32
		300 mA	40	5SU6 747-0KW40	

[1] 1 模数 = 一个模数宽度单元 =18 mm
1 MW = 1 Module Width unit = 18 mm

带过电流保护的剩余电流保护断路器(RCBOs)
Residual Current operated Circuit-Breakers with integral Overcurrent Protection (RCBOs)

产品数据 **Product data sheet**

5SU 系列 6000
5SU Series 3
应用范围: 公众场合，工业领域
Application fields: public, industrial

5SU.76.和5SU.66.系列带过电流保护的剩余电流保护断路器(RCBO)可以用于公众场合和工业领域,最适合作为人体间接接触带电体的保护，以及作为电器设备的过载和短路保护。

带过电流保护的剩余电流保护断路器实际上是一种接地故障和过电流故障保护的组合体，用它可以来检测电器设备中的故障电流(电磁式保护)。

使用故障电流为 30 mA 的剩余电流保护断路器同时可以作为直接接触带电体的附加保护。

5SU.74 系列带过电流保护的剩余电流保护断路器有两种型号: 一种是只能检测交流故障电流 (AC 型)，另一种是还能检测直流脉动故障电流 (A 型)。

A型剩余电流保护断路器可以被应用于所有等级1电器设备的场合，如医疗设备，控制系统，视盘游戏机，计算机，办公自动化设备以及一般的电子系统等。(见 24 页)

The 5SU.76. and 5SU.66. Residual Current Operated Circuit-Breaker with integral Overcurrent Protection (RCBO) can be used in the public and industrial fields for optimum protection of life against the risks of indirect contacts and of electrical installations against short-circuits or overload.

The Residual Current operated Circuit-Breakers with integral Overcurrent Protection (RCBO) combine in fact a protection against earthing faults (differential protection) and a protection against overcurrents detected in the installations (magnetothermic protection).

Versions which are characterized by a rated residual fault current of 30 mA also assure an additional protection against direct contacts.

The 5SU Residual Current operated Circuit-Breakers with integral Overcurrent Protection are available in two versions: one only sensitive to AC sinusoidal fault currents (AC type) and the other also sensitive to pulsating DC fault currents (A type).

The utilization of A type RCBO circuit-breakers is recommended in all fields where Class 1 devices are involved, such as: medical equipment, control systems, video games for cafes and arcades, computers, office automation and electronic systems in general (see page 24).

有关 5SU 系列剩余电流保护断路器产品的详细技术数据请参阅：
一体化带过电流保护的剩余电流保护断路器5SU(RCBOs)系列技术数据第 44 页。
For more details on the technical data of 5SU RCBOs circuit-breakers, please consult the section:
Technical data of the single-block Residual Current operated Circuit-Breakers with integral Overcurrent Protection (RCBOs) on page 44.
带过电流保护的剩余电流保护断路器(RCBOs)外形尺寸见第 45 页。
Dimension data of the Residual Current operated Circuit-Breakers with integral over current Protection (RCBOs) see page 45.

[1]) 3P+N 部分 /Version 3P+N

10 kA IEC 947-2[1])

剩余电流保护断路器(RCBOs)具有很高的分断能力; 两极部分为两个模数宽度单元; 四极部分有三个保护极; 同时剩余电流保护断路器具有很强的电流和能量限制作用

- 额定漏电电流: 30 mA, 300 mA
- 额定工作电流: 6 to 40 A AC 125 至 230 V (1P+N)
  6 至 32 A AC 230 至 400V (3P+N)
- 脱扣特性: B, C
- 按照 IEC 61009-1 标准，额定分断能力 I_{cn} 为: 6000 A
- 很强的电流和能量限制作用 I^2t: 限制等级 3
- 宽度: 36 mm (1P+N)
- 类型: AC 和 A
- 用于对脉冲波动电流的抑制作用 - 避雷或开关电器设备 - 符合标准 IEC 61009-1, 时间为8/20µs, 大小为250A(1P+N)和>1000A (3P+N)的脉冲电流(VDE 0432 T2)
- 符合以下标准: IEC 61009-1, EN 61009-1, IEC 23-18
- 标记：CE

RCBO circuit-breakers with high breaking capacity; phaseneutral version in two Module Width units; four-pole version with three protected poles; excellent current and energy limiting.

- Rated residual fault currents: 30 mA, 300 mA
- Rated currents: 6 to 40 A AC 125 to 230 V (1P+N)
  6 to 32 A, AC 230 to 400 V (3P+N)
- Tripping characteristics: B,C
- Rated breaking capacity I_{cn} according to IEC 61009-1: 6000 A
- Excellent current and energy limiting I^2t: limination class 3
- Width: 36 mm (1P+N)
- Types: AC A
- High resistance to surge current pulses - lightning or switchgear manipulation - (IEC 61009-1), (VDE 0432 T2), 8/20µs current pulse, 250 A (1P+N), > 1000 A (3P+N)
- Compliance with the standards: IEC 61009-1, EN 61009-1, IEC 23-18
- Marking CE

主要认证说明 Approvals and main certifications	C	C
IMQ	6 to 40 A (1P+N)	6 to 25 (3P+N)

	U_e(V) ~	125 to 230	125 to 230	230 to 400	230 to 400
	I_n(A) / I_{cn}	6000	6000	6000	6000
B	6 ... 40	●			
C	6 ... 40	●	●		
C	6 ... 32			●	●

有效分断能力(最大值) Effective short-circuit capacity (max. values)		
	3 极 +N 交流 400 V 3 poles+N AC 400 V	
	IEC 61009-1	IEC 947-2
I_{cs} (kA)	I_{cs} (kA)	I_{cu} (kA)
6 ... 32	6	10

选型和技术数据 Selection and ordering data

5SU 系列 6000
5SU Series 3
脱扣特性 C
Tripping characteristics C

5SU 系列
- 额定分断能力 I_{cn}: 6000 A, 符合 IEC 61009-1 标准
- 额定工作电压 U_n = AC 125 至 230 V(1 极 +N); AC 230 至 400V(3 极 +N)
- 形式: AC, A
- 说明 相线 + 中性线两个模数宽度单元
- 接线端子防护等级 IP 2X - IP XXB
- 可以用符合EN 50022标准的“ 帽 ”形导轨进行卡式安装
- 包装件, (每个单元的数量): 1

5SU Series
- Rated short-circuit capacity I_{cn}: 6000 A according to IEC 61009-1
- U_n = AC 125 to 230 V(1P+N); AC 230 to 400 V (3P+N)
- Types: AC, A
- Version phase plus neutral in two Modular Width units
- Protected terminals IP 2X - IP XXB
- Snap on mountable to symmetric “hat’ profiles according to EN 50022
- Packaging (number of parts): 1

10 kA IEC 947-2 [2]

	说明 Version	额定漏电电流 Rated fault current $I_{\Delta n}$ (A)	额定工作电流 Rated current I_n (A)	订货号 /Order No. 特性 C Characteristic C AC 型 /Type AC	特性 C Characteristic C A 型 /Type A	特性 B characteristic B AC 型 /Type AC
	1 极 +N	30 mA	6	5SU3 767-0KW06	5SU3 767-0KV06	5SU3 766-0KW06
	(2 模数) [1]	30 mA	10	5SU3 767-0KW10	5SU3 767-0KV10	5SU3 766-0KW10
	1 pole+N	30 mA	13	5SU3 767-0KW13	5SU3 767-0KV13	5SU3 766-0KW13
	(2 MW) [1]	30 mA	16	5SU3 767-0KW16	5SU3 767-0KV16	5SU3 766-0KW16
		30 mA	20	5SU3 767-0KW20	5SU3 767-0KV20	5SU3 766-0KW20
		30 mA	25	5SU3 767-0KW25	5SU3 767-0KV25	5SU3 766-0KW25
		30 mA	32	5SU3 767-0KW32	5SU3 767-0KV32	5SU3 766-0KW32
		30 mA	40	5SU3 767-0KW40		5SU3 766-0KW40
	1 极 +N	300 mA	6	5SU6 767-0KW06	5SU6 767-0KV06	
	(2 模数)	300 mA	10	5SU6 767-0KW10	5SU6 767-0KV10	
	1 pole+N	300 mA	16	5SU6 767-0KW16	5SU6 767-0KV16	
	(2 MW)	300 mA	20	5SU6 767-0KW20	5SU6 767-0KV20	
		300 mA	25	5SU6 767-0KW25	5SU6 767-0KV25	
		300 mA	32	5SU6 767-0KW32	5SU6 767-0KV32	
		300 mA	40	5SU6 767-0KW40		
	3 极 +N	30 mA	6	5SU3 667-1BK06	5SU3 667-1BS06	
	(6 模数)	30 mA	10	5SU3 667-1BK10	5SU3 667-0KS10	
	3 pole+N	30 mA	16	5SU3 667-1BK16	5SU3 667-0KS16	
	(6 MW)	30 mA	20	5SU3 667-1BK20	5SU3 667-0KS20	
		30 mA	25	5SU3 667-1BK25	5SU3 667-0KS25	
		30 mA	32	5SU3 667-1BK32	5SU3 667-0KS32	
	3 极 +N	300 mA	6	5SU6 667-1BK06	5SU6 667-1BS06	
	(6 模数)	300 mA	10	5SU6 667-1BK10	5SU6 667-0KS10	
	3 pole+N	300 mA	16	5SU6 667-1BK16	5SU6 667-0KS16	
	(6 MW)	300 mA	20	5SU6 667-1BK20	5SU6 667-0KS20	
		300 mA	25	5SU6 667-1BK25	5SU6 667-0KS25	
		300 mA	32	5SU6 667-1BK32	5SU6 667-0KS32	

[1] 1 模数 = 一个模数宽度单元 = 18 mm
1 MW = 1 Module Width unit = 18 mm
[2] 3P+N 部分
Version 3P+N

带过电流保护的剩余电流保护断路器(RCBOs)
Residual Current operated Circuit-Breakers with integral Overcurrent Protection (RCBOs)

产品数据 Product data sheet

5SU 系列 10000
5SU Series 3
应用范围: 公众场合, 工业领域
Application fields: public, industrial

5SU.26和5SU.67系列带过电流保护的剩余电流保护断路器(RCBO) 可以用于公众场合和工业领域, 最适合作为人体间接接触带电体的保护, 以及作为电器设备的过载和短路保护。

带过电流保护的剩余电流保护断路器实际上是一种接地故障和过电流故障保护的组合体, 用它可以来检测电器设备中的故障电流 (电磁式保护)。

使用故障电流为 30 mA 的剩余电流保护断路器同时可以作为直接接触带电体的附加保护。

5SU系列带过电流保护的剩余电流保护断路器有两种型号:一种是只能检测交流故障电流 (AC 型), 另一种是还能检测直流脉动故障电流 (A 型)。

A 型剩余电流保护断路器可以被应用于所有有关重要设施的场合,如医疗设备, 控制系统, 视盘游戏机, 计算机, 办公自动化设备以及一般的电子系统等。AC 型和用于直流脉动故障电流的A型剩余电流保护断路器可承受暂态过电压, 包括出现 8/20µs 的周期性波形。

The 5SU.26 and 5SU.67 Residual Current operated Circuit-Breaker with integral Overcurrent Protection (RCBO) can be used in the public and industrial fields for optimum protection of live against the risks of indirect contacts and of electrical installations against short-circuits or overloads.
The Residual Current operated Circuit-Breakers with integral Overcurrent Protection combine in fact a protection against earthing faults (differential protection) and a protection against overcurrents detected in the installations (magnetothermic protection).
Versions which are characterized by a rated residual fault current of 30 mA also assure an additional protection against direct contacts.
The 5SU Residual Current operated Circuit-Breakers with integral Overcurrent Protection are available in two versions: one only sensitive to AC sinusoidal fault currents (AC type) and the other also sensitive to pulsating DC fault currents (A type).
The utilization of A type RCBO circuit-breakers is recommended in all sectors where Class 1 devices are involved, such as: medical equipment, control systems, video games for cafes and arcades, computers, office automation and electronic systems in general.The version for AC and pulsating DC fault currents (A type) is resistant to surge current pulses
(8/20µs pulse).

25kA IEC 947-2 [1]

剩余电流保护断路器具有很高的分断能力; 同时它具很高的选择性保护功能, 即使有很大的短路电流出现
- 额定漏电电流: 30 mA, 300 mA
- 额定工作电流: 6 to 32 A AC 125 至 230 V(2 极)
  AC 230 至 400V(3 极 +N)
- 脱扣特性: C
- 按照 IEC 60898 和 IEC 61009-1 标准, 额定分断能力 I_{cn} 为: 10000 A
- 非常重要的能量限制作用: I^2t: 限制等级 3
- 类型: AC 和 A
- 用于对波动的过电压的抑制作用 - 避雷或开关电器设备 - 符合标准 IEC 61009-1, A 型剩余电流保护断路器还能抑制时间为 8/20µs, 大小为 >1000A 的波
  纹电流(VDE 0432 T2)
- 符合以下标准: IEC 61009-1, EN 61009-1, IEC 23-18
- 标记 : CE

Residual Current operated Circuit-Breakers with integral Overcurrent Protection with high breaking capacity, guaranteeing max. protection and selectivity, in particular, when large short-circuit currents are present
- Rated residual fault currents: 30 mA, 300 mA
- Rated currents: 6 to 32 A AC 125 to 230 V (2P)
  AC 230 to 400 V (3P+N)
- Tripping characteristics: C
- Rated short-circuit capacity I_{cn} according to IEC 60898, IEC 61009-1: 10000 A
- Excellent current and energy limiting I^2t: limination class 3
- Types: AC A
- Resistance to surge current pulses - lightning or switchgear manipulation - (IEC 61009-1); > 1000A (VDE 0432 T2, 8/20µs current pulse for A Type)
- Compliance with the standards: IEC 61009-1,EN 61009-1, IEC 23-18
- Marking CE

主要认证说明 Approvals and main certifications	C
IMQ	6 to 25A

5SU	~ 2P	~ 2P	~ 3P+N	~ 3P+N
U_e(V) ~	125 to 230	125 to 230	230 to 400	230 to 400
I_n(A) I_{cn}	10000	10000	10000	10000
6 ... 32	●	●	●	●

有效分断能力(最大值)
Effective short-circuit capacity (max. values)

	2 极交流 230 V 2 poles AC 230 V		3 极 +N 交流 400 V 3 poles+N AC 400 V	
	IEC 61009-1	IEC 947-2	IEC 61009-1	IEC 947-2
I_{cs} (kA)	I_{cs} (kA)	I_{cu} (kA)	I_{cs} (kA)	I_{cu} (kA)
6 ... 32	10	25	10	25

有关 5SU 系列剩余电流保护断路器产品的详细技术数据请参阅：一体化带过电流保护的剩余电流保护断路器 5SU(RCBOs)系列技术数据见第 44 页。
For more details on the technical data of 5SU RCBO circuit-breakers, please consult the section: Technical data of the single-block Residual Current operated Circuit-Breakers with integral Overcurrent Protection (RCBOs) on page 44.
带过电流保护的剩余电流保护断路器(RCBOs)外形尺寸见第 45 页
Dimension data of the Residual Current operated Circuit-Breakers with integral over current Protection (RCBOs) see page 45.
[1] 3P+N 部分 / Version 3P+N

选型和技术数据 Selection and ordering data

5SU 系列 10000
5SU Series 3
脱扣特性 C
Tripping characteristic C

5SU 系列
- 额定分断能力 I_{cn}: 10000 A, 符合 IEC 61009-1 标准
- 额定工作电压 U_n = AC 125 至 230 V (2 极) AC 230 至 400V(3 极 +N)
- 形式: AC, A
- 接线端子防护等级 IP 2X - IP XXB
- 可以用符合 EN 50022 标准的 35mm 导轨进行卡式安装
- 包装件, (每个单元的数量): 1

5SU Series
- Rated short-circuit capacity I_{cn}: 10000 A according to IEC 61009-1
- U_n = AC 125 to 230 V (2P) AC 230 to 400 V (3P+N)
- Types: AC, A
- Protected terminals IP 2X - IP XXB
- Snap on mountable to symmetric "hat" profiles according to EN 50022
- Packaging (number of parts): 1

25 kA IEC 947-2[2])

	说明 Version	额定漏电电流 Rated fault current $I_{\Delta n}$ (A)	额定工作电流 Rated current I_n (A)	订货号 /Order No. 特性 C Characteristic C	
				AC 型 /Type AC	A 型 /Type A
	2 极 (4 模数) [1]) 2 pole (4 MW) [1])	30 mA	6	5SU3 267-1BK06	5SU3 267-1BS06
		30 mA	10	5SU3 267-1BK10	5SU3 267-1BS10
		30 mA	16	5SU3 267-1BK16	5SU3 267-1BS16
		30 mA	20	5SU3 267-1BK20	5SU3 267-1BS20
		30 mA	25	5SU3 267-1BK25	5SU3 267-1BS25
		30 mA	32	5SU3 267-1BK32	5SU3 267-1BS32
	2 极 (4 模数) 2 pole (4 MW)	300 mA	6	5SU6 267-1BK06	5SU6 267-1BS06
		300 mA	10	5SU6 267-1BK10	5SU6 267-1BS10
		300 mA	16	5SU6 267-1BK16	5SU6 267-1BS16
		300 mA	20	5SU6 267-1BK20	5SU6 267-1BS20
		300 mA	25	5SU6 267-1BK25	5SU6 267-1BS25
		300 mA	32	5SU6 267-1BK32	5SU6 267-1BS32
	3 极 +N (6 模数) 3 pole+N (6 MW)	30 mA	6	5SU3 677-1BK06	5SU3 677-1BS06
		30 mA	10	5SU3 677-1BK10	5SU3 677-1BS10
		30 mA	16	5SU3 677-1BK16	5SU3 677-1BS16
		30 mA	20	5SU3 677-1BK20	5SU3 677-1BS20
		30 mA	25	5SU3 677-1BK25	5SU3 677-1BS25
		30 mA	32	5SU3 677-1BK32	5SU3 677-1BS32
	3 极 +N (6 模数) 3 pole+N (6 MW)	300 mA	6	5SU6 677-1BK06	5SU6 677-1BS06
		300 mA	10	5SU6 677-1BK10	5SU6 677-1BS10
		300 mA	16	5SU6 677-1BK16	5SU6 677-1BS16
		300 mA	20	5SU6 677-1BK20	5SU6 677-1BS20
		300 mA	25	5SU6 677-1BK25	5SU6 677-1BS25
		300 mA	32	5SU6 677-1BK32	5SU6 677-1BS32

[1]) 1 模数 = 一个模数宽度单元 =18 mm
1 MW = 1 Module Width unit = 18 mm
[2]) 3P+N 部分 / Version 3P+N

带过电流保护的剩余电流保护断路器(RCBOs)
Residual Current operated Circuit-Breakers with integral Overcurrent Protection (RCBOs)

产品数据 Product data sheet

5SU 系列 20000
5SU Series
应用范围: 公众场合，工业领域
Application fields: public, industrial

5SU.27系列带过电流保护的剩余电流保护断路器(RCBO)可以用于公众场合和工业领域, 最适合作为人体间接接触带电体的保护, 以及作为电器设备的过载和短路保护。

带过电流保护的剩余电流保护断路器实际上是一种接地故障和过电流故障保护的组合体，用它可以来检测电器设备中的故障电流(电磁式保护)。

使用故障电流为 30 mA 的剩余电流保护断路器同时可以作为直接接触带电体的附加保护。

5SU系列带过电流保护的剩余电流保护断路器有两种型号: 一种是只能检测交流故障电流 (AC 型)，另一种是还能检测直流脉动故障电流 (A 型)。

A 型剩余电流保护断路器可以被应用于所有有关重要设施的场合,如医疗设备，控制系统，视盘游戏机，计算机，办公自动化设备以及一般的电子系统等。

AC 型和用于直流脉动故障电流的A型剩余电流保护断路器可承受暂态过电压，包括出现 8/20µs 的周期性波形。

The 5SU.27 Residual Current operated Circuit-Breaker with integral Overcurrent Protection (RCBO) can be used in the public and industrial fields for optimum protection of live people against the risks of indirect contacts and of electrical installations against short-circuits or overloads.
The Residual Current operated Circuit-Breakers with integral Overcurrent Protection combine in fact a protection against earthing faults (differential protection) and a protection against overcurrents detected in the installations (magnetothermic protection).
Versions which are characterized by a rated residual fault current of 30 mA also assure an additional protection against direct contacts.
The 5SU Residual Current operated Circuit-Breakers with integral Overcurrent Protection are available in two versions: one only sensitive to AC sinusoidal fault currents (AC type) and the other also sensitive to pulsating DC fault currents (A type).
The utilization of A type RCBO circuit-breakers is recommended in all sectors where Class 1 devices are involved, such as: medical equipment, control systems, video games for cafes and arcades, computers, office automation and electronic systems in general.
The version for AC and pulsating DC fault currents (A type) is resistant to surge current pulses (8/20µs pulse)

25 kA IEC 947-2

剩余电流保护断路器具有很高的分断能力; 同时它具很高的选择性保护功能, 即使有很大的短路电流出现

- 额定漏电电流: 30 mA, 300 mA
- 额定工作电流: 6 to 32 A AC 125 至 230 V(2 极)
- 脱扣特性: C
- 按照 IEC 61009-1 标准, 额定分断能力 I_{cn} 为: 20000 A
- 类型: AC 和 A
- 用于对波动的过电压的抑制作用 - 避雷或开关电器设备 - 符合标准 IEC 61009-1，A 型剩余电流保护断路器还能抑制时间为 8/20µs，大小为 >1000A 的波纹电流(VDE 0432 T2)
- 符合以下标准: IEC 61009-1, EN 61009-1, IEC 23-18
- 标记 : CE

Residual Current operated Circuit-Breakers with integral Overcurrent Protection with high short-circuit capacity, guaranteeing max. protection and selectivity, including when large short-circuit currents are present

- Rated residual fault currents: 30 mA, 300 mA
- Rated currents: 6 to 32 A AC 125 to 230 V (2P)
- Tripping characteristic: C
- Rated short-circuit capacity I_{cn} according to IEC 61009-1: 20000 A
- Types: AC A
- Resistance to surge current pulses due to lightning or switchgear manipulation according to IEC 61009-1; > 1000A (VDE 0432 T2, 8/20µs current pulse, A Type)
- Compliance with the standards: IEC 61009-1, EN 61009-1, IEC 23-18
- Marking CE

主要认证说明 Approvals and main certifications	C
IMQ	6 to 25A

5SU			
		2P	2P
U_e(V)	~	125 to 230	125 to 230
I_n(A)	I_{cn}	20000	20000
6 — 32		●	●

有效分断能力(最大值) Effective short-circuit capacity (max. values)		
	2 极交流 230 V 2 poles AC 230 V	
	IEC 61009-1	IEC 947-2
I_{cs} (kA)	I_{cs} (kA)	I_{cu} (kA)
6 ... 32	20	25

有关 5SU 系列剩余电流保护断路器产品的详细技术数据请参阅：一体化带过电流保护的剩余电流保护断路器 5SU(RCBOs)系列技术数据见第 44 页。
For more details on the technical data of 5SU RCBO circuit-breakers, please consult the section:
Technical data of the single-block Residual Current operated Circuit-Breakers with integral Overcurrent Protection (RCBOs) on page 44.
带过电流保护的剩余电流保护断路器(RCBOs)外形尺寸见第 45 页
Dimension data of the Residual Current operated Circuit-Breakers with integral over current Protection (RCBOs) on page 45.

选型和技术数据 Selection and ordering data

5SU 系列 20000
5SU Series
脱扣特性 C
Tripping characteristic C

5SU 系列
- 额定分断能力 I_{cn}: 20000 A, 符合 IEC 61009-1 标准
- 额定工作电压 U_n = AC 125 至 230 V (2 极)
- 形式: AC, A
- 接线端子防护等级 IP 2X - IP XXB
- 可以用符合EN 50022标准的“ 帽 ” 形导轨进行卡式安装
- 包装件, (每个单元的数量): 1

5SU Series
- Rated breaking capacity I_{cn}: 20000 A according to IEC 61009-1
- U_n = AC 125 to 230 V (2P)
- Types: AC, A
- Protected terminals IP 2X - IP XXB
- Snap on mountable to symmetric “hat” profiles according to EN 50022
- Packaging (number of parts): 1

25 kA IEC 947-2

	说明 Version	额定漏电电流 Rated fault current $I_{\Delta n}$ (A)	额定工作电流 Rated current I_n (A)	订货号 /Order No. 特性 C Characteristic C	
				AC 型 /Type AC	A 型 /Type A
	2 极 (4 模数) [1] 2 pole (4 MW) [1]	30 mA 30 mA 30 mA 30 mA 30 mA 30 mA	6 10 16 20 25 32	5SU3 277-1BK06 5SU3 277-1BK10 5SU3 277-1BK16 5SU3 277-1BK20 5SU3 277-1BK25 5SU3 277-1BK32	5SU3 277-1BS06 5SU3 277-1BS10 5SU3 277-1BS16 5SU3 277-1BS20 5SU3 277-1BS25 5SU3 277-1BS32
	2 极 (4 模数) 2 pole (4 MW)	300 mA 300 mA 300 mA 300 mA 300 mA 300 mA	6 10 16 20 25 32	5SU6 277-1BK06 5SU6 277-1BK10 5SU6 277-1BK16 5SU6 277-1BK20 5SU6 277-1BK25 5SU6 277-1BK32	5SU6 277-1BS06 5SU6 277-1BS10 5SU6 277-1BS16 5SU6 277-1BS20 5SU6 277-1BS25 5SU6 277-1BS32

[1] 1 模数 = 一个模数宽度单元 =18 mm
1 MW = 1 Module Width unit = 18 mm

剩余电流保护断路器模块(RCCB modules)
Residual Current operated Circuit-Breakers Modules (RCCB modules)

产品数据 Product data sheet

5SM2 RCCB 模块
5SM2 RCCB modules
应用范围: 公众场合，工业领域
Application fields: public, industrial

5SM2剩余电流保护断路器模块(RCCB)与5SX6和5SX7小型断路器一起工作可构成额定工作电流至100A, 额定漏电电流为30mA, 300mA 和1A的剩余电流保护断路器。

5SM2剩余电流保护断路器模块(RCCB)有A型和AC型两种; 在任何情况下都可以将其设置成标准保护或选择性保护。

分断能力视小型断路器来定；有关有效分断能力 (最大值) 的详细资料请参阅 5SX6 和 5SX7 小型断路器产品数据。

5SM2 剩余电流保护断路器模块(RCCB)可以与 B, C 或 D 型 5SX6 和 5SX7 小型断路器一起使用。

The 5SX6 and 5SX7 circuit-breakers, together with the 5SM2 RCCB modules, provide RCBO circuit-breakers for rated currents up to 100 A and rated residual fault currents of 30 mA, 300 mA, and 1 A.
The 5SM2 RCCB modules are available in the A and AC types; in both cases, it is possible to choose a standard protection or a selective protection.
The short-circuit capacity is assured by the circuit-breaker; for more details about the effective short-circuit capacity (max. values), please refer to the product data sheets of the 5SX6 and 5SX7 circuit-breakers.
The 5SM2 RCCB modules can be coupled to 5SX6 and 5SX7 circuit-breakers with tripping characteristics B, C or D.

与 5SX6 和 5SX7 小型断路器一起使用的附件式剩余电流保护断路器(RCCB)模块，可提供热磁式的断路保护并且具有很高的分断能力。
- 额定工作电压: AC 125 至 230 V(2 极), AC 230 至 400 V(4 极)
- 额定工作电流 I_n: 80/100 A
- 额定漏电电流 $I_{\Delta n}$: 30 mA, 300 mA, 1 A
- 形式: A, AC, A 选择型(AC ⌈∿⌉, A ⌈⩙⌉)
- 用于抑制波动的过电压符合标准 IEC 61009-1
- 断路器用于 B, C 或 D 特性
- 模块宽度单元: 3.5 模数(2 极), 5 模数(4 极)
- 符合以下标准: IEC 61009-1 附录 G
- 标记 CE

RCCB modules fittable to 5SX6 and 5SX7 circuit-breakers, resulting in RCBOs with a very high breaking capacity.
- Rated voltages: AC 125 to 230 V (2P), AC 230 to 400 V (4P)
- I_n: 80/100 A
- $I_{\Delta n}$: 30 mA, 300 mA, 1 A
- Types: A, AC, A selective (AC ⌈∿⌉ , A ⌈⩙⌉)
- Resistance to surge current pulses according to IEC 61009-1
- Combination with MCBs of characteristics B,C or D
- Module Width units: 3.5 MWs (2P), 5 MWs (4P)
- Compliance with the standards: IEC 61009-1 Appendix G
- Marking CE

选型和技术数据 Selection and Ordering Data

- 额定工作电压
  U_n = AC 125 至 230 V(2 极)
  AC 230 至 400V(4 极)
- 额定漏电电流
  $I_{\Delta n}$: 30mA, 300mA, 1A
- 形式: AC, A, 选择型
- 对脉冲波动电流的抑制作用, 符合 IEC 61009-1 标准
- 与 B 或 C 特性的断路器组合
- 符合以下标准:
  IEC 61009-1 附录 G

- Rated voltage:
  AC 125 to 230 V (2P)
  AC 230 to 400 V (4P)
- $I_{\Delta n}$: 30 mA, 300 mA, 1 A
- Types: AC, A, A selective
- Resistance to surge current pulses according to IEC 61009-1
- Combination with MCBs of characteristics B or C.
- Compliance with the standards: IEC 61009-1 Appendix G

说明 Version	额定漏电电流 Rated fault current $I_{\Delta n}$ (A)	额定工作电流 Rated current I_n (A)	订货号 / Order No.	
			AC 型 /Type AC	A 型 /Type A
2 极 (3.5 模数) [1] 2 pole (3.5 MW) [1]	30 mA 300 mA 300 mA selectiv	80/100	5SM2 327-0 5SM2 627-0 -	5SM2 327-6 5SM2 627-6 5SM2 627-8
4 极 (5 模数) 4 pole (5 MW)	30 mA 300 mA 300 mA selectiv 1 A selectiv	80/100	5SM2 347-0 5SM2 647-0 - -	5SM2 347-6 5SM2 647-6 5SM2 647-8 5SM2 847-8

[1]) 1 模数 = 一个模数宽度单元 =18 mm
1 MW = 1 Module Width unit = 18 mm

带过电流保护的剩余电流保护断路器(RCBOs)外形尺寸见第 45 页。
Dimension data of the Residual Current operated Circuit-Breakers with integral over current Protection (RCBOs) see page 45.

最大有效分断能力
Maximum effective short-circuit capacity

I_n(A)	IEC 61009 I_{cs} (kA)				IEC 947-2 I_{cu} (kA)	
3P +N (~400 V)						
			5SU.66.	5SU.67.	5SU.66.	5SU.67.
6 to 32	-	-	6	10	10	25
1P+N, 2P (~230 V)						
	5SU.747	5SU.76.	5SU.26.	5SU.27.	5SU.26.	5SU.27.
6 to 32	4.5	6	10	20	25	25
40	4.5	6	-	-	-	-

带过电流保护的四极剩余电流保护断路器在三相三线系统中的应用
Utilization of four-pole Residual Current operated Circuit-Breakers with integral Overcurrent Protection in three-conductor, three-phase networks

当带过电流保护的四极剩余电流保护断路器被用于三相三线系统中时，接线必须是 1, 3, 5 对 2, 4, 6。为确保测试键动作正确，3 号端子必须连至同一侧的中性线上。根据标准IEC 61009-1，必须让用户知道定期检查该剩余电流保护断路器的必要性。按下标有字母T的测试按钮，就能检查出该剩余电流保护断路器在使用寿命内是否正常工作。

When four-pole Residual Current operated Circuit-Breakers with integral Overcurrent Protection are used in three-conductor, three-phase networks, the connection must be made to the terminals 1, 3, 5 and 2, 4, 6. To make sure that the test function can work properly, terminal 3 has to be shunted to the same side neutral. According to the standard IEC 61009-1, the user must be informed of the necessity to periodically actuate the device by pressing the test pushbutton designated by the letter T to verify that the device is operating correctly during its life-time.

带过电流保护的剩余电流保护断路器(RCBOs)
Residual Current operated Circuit-Breakers with integral Overcurrent Protection (RCBOs)

技术数据总表 General technical data

系列 Series	5SU.747-0KW	5SU.747-0KV	5SU.76.-0KW	5SU.76.-0KV	5SU.66.-1BK	5SU.66.-1BS	5SU.26.-1BK 5SU.67.-1BK	5SU.26.-1BS 5SU.67.-1BS	5SU.27.-1BK	5SU.27.-1BS
	4500 3 2 模数宽度 2 Module Width units		6000 3 2 模数宽度 2 Module Width units		6000 3		10000 3		20000	
额定工作电压 /Rated voltages U_n (V)	AC 125 to 230 (1P+N, 2P); AC 230 to 400 (3P+N)									
额定工作电流 /Rated currents I_n (A)	6, 10, 16, 20, 25, 32, 40		6, 10, 16, 20, 25, 32, 40		6, 10, 16, 20, 25, 32					
额定漏电电流 $I_{\Delta n}$ Rated fault currents $I_{\Delta n}$	30 mA, 300 mA									
形式 /Type	AC	A	AC	A	AC	A	AC	A	AC	A
额定频率 /Rated frequency	50 Hz									
额定短路分断能力 I_{cn}, 符合标准 IEC 1009-1 Rated short-circuit breaking capacity I_{cn} according to IEC 1009-1	4500 A		6000 A				10000 A		20000 A	
额定通断能力 I_m Rated differential breaking capacity I_m	500 A		500 A		4500 A					
能量限制等级 Limitation class	3		3		3		3		没有标明 [1] not defined [1]	
脱扣特性 /Tripping characteristics	C		B, C		C					
对于避雷或开关电器的瞬时脱扣所产生的 8/20µs 脉冲电流的抑制作用 (VDE 0432 T2) (A 型) Resistance to unwanted trippings by lightning or switchgear manipulation, 8/20 µs current-pulse (VDE 0432 T2) (A type)	250 A		250 A		符合 IEC 61009-1 according to IEC 61009-1	>1000 A	符合 IEC 61009-1 according to IEC 61009-1	>1000 A	符合 IEC 61009-1 according to IEC 61009-1	>1000 A
用于测试功能的最小工作电压(V) Minimum line voltage for test function operation (V)	125		125		100					
对于热脱扣的参照环境温度 [4] Reference ambient temperature for the thermal trigger [4]	30ºC									
工作温度范围 Operating temperature range	-25ºC to +45ºC 最大相对湿度 95% [2] -25ºC to +45ºC max. relative humidity 95% [2]									
储存温度范围 /Storage temperature range	-20 to +60ºC		-20 to +60ºC		-40 to +70ºC					
安装位置 /Mounting position	任意 /as desired									
进线方向 /Supply connection	上部或下部 /top or bottom									
接线端子 Terminals	防护等级 IP 2X - IPXXB 用于进线容量至 10 mm^2 protected IP 2X - IPXXB for conductors up to 10 mm^2									
外壳 /Enclosure	使用绝缘材料符合标准 DIN 7708/in insulating material according to DIN 7708									
在额定工作电压 U_n 和额定工作电流 I_n 下的开关电气寿命 Number of electrical or mechanical manipulation cycles under U_n and I_n	平均 20000 次 /20000 on the average (最小 10000 次)/(10000 minimum)									
防火等级 /Fire resistance	符合标准 IEC 61009-1: 白炽灯灯丝测试符合标准 IEC 60695-2-1 according to IEC 61009-1; incandescent filament test according to IEC 60659-2-1									
机械抗振强度 Mechanical shock and vibration resistance	符合标准 IEC 61009-1 according to IEC 61009-1									
符合下列标准 Compliance with the standards	IEC 61009-1, IEC 23-18									
主要认证说明 Approvals and main certifications	IMQ		IMQ		IMQ [3]					

[1] 标准IEC 61009-1没有包含有关短路分断能力I_{cn}=20000A的能量限制等级。
The standard IEC 61009-1 does not cover a limitation class for circuit-breakers with an I_{cn} = 20000 A.

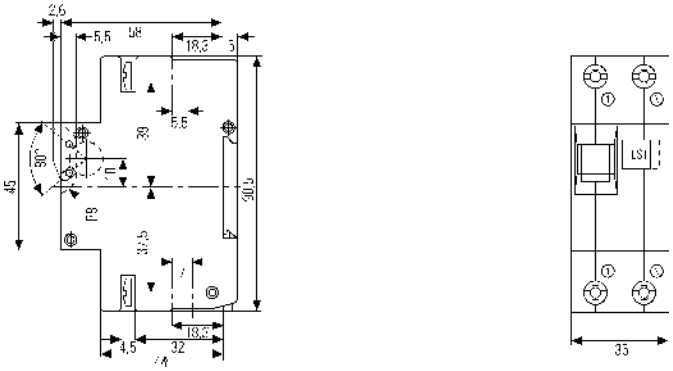
[2] 用于 AC 型最小为 -5ºC, 用于 A 型, 1P+N 最大为 +40ºC
-5ºC for AC type circuit-breakers; +40ºC for versions 1P+N

[3] 用于所有 6 到 25 A 开关
For all versions from 6 to 25 A

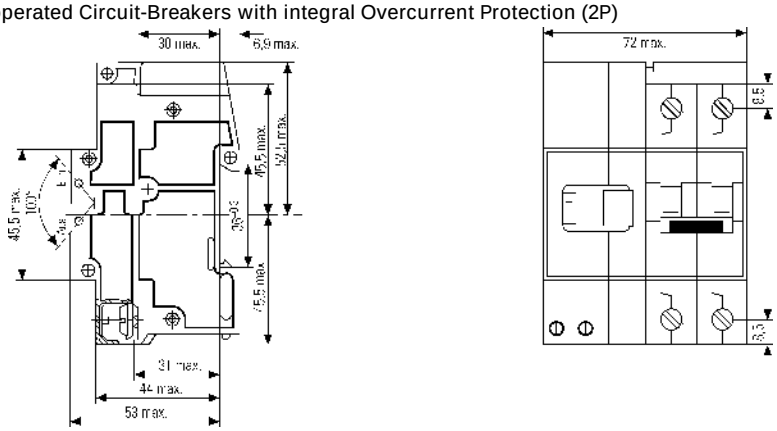
[4] 当周围环境温度大于/小于标定(参考)温度时, 每和标定温度相差10ºC时, 标示在面板上的电流值将减少 / 增加约 5%。在一个配电柜中, 一系列的剩余电流保护断路器并排放置时且同时满负荷工作时, 这些剩余电流保护断路器的负载能力将会下降。在这种情况下, 请向制造商咨询。
For ambient temperatures greater/less than the calibration (reference) temperature, the rated current values indicated on the front decrease/increase approximately 5% for each 10ºC variation of ambient temperatare away from reference temperature. In a switchboard when one several series of circuit-breakers are juxtapositioned and simultaneously used under full load, the load on these circuit-breakers may have to be reduced; please consult the manufacturer for information about such circumstances.

外形尺寸 Dimension drawings

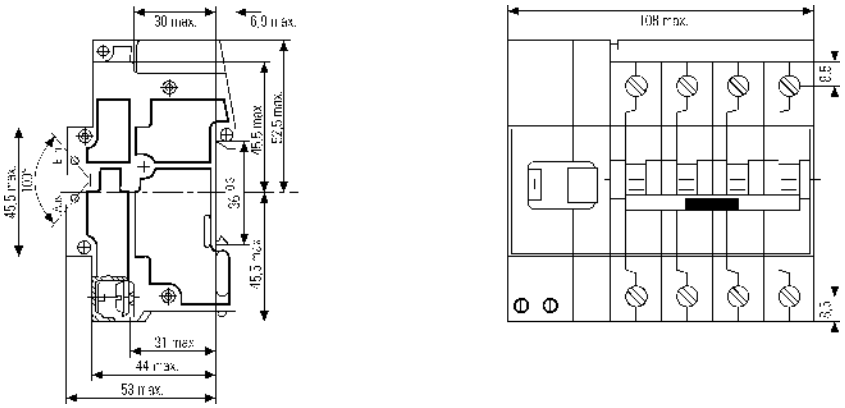
5SU 系列带过电流保护的剩余电流保护断路器(1P+N)
5SU Residual Current operated Circuit-Breakers with integral Overcurrent Protection (1P+N)



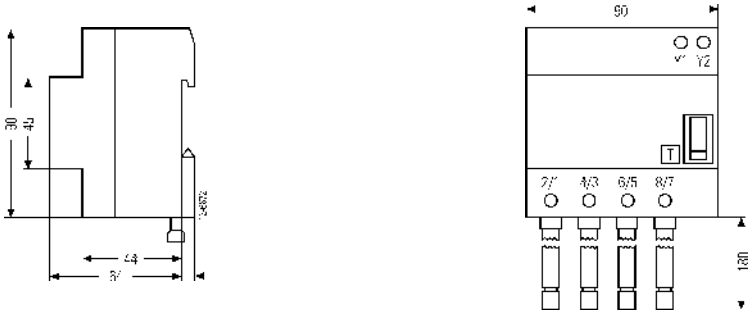
5SU 系列带过电流保护的剩余电流保护断路器(2P)
5SU Residual Current operated Circuit-Breakers with integral Overcurrent Protection (2P)

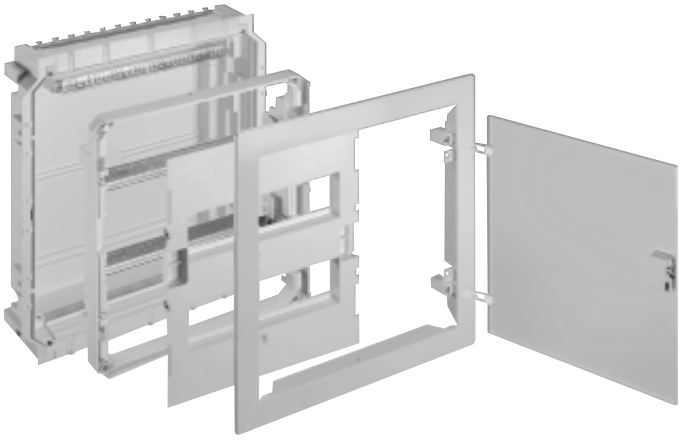


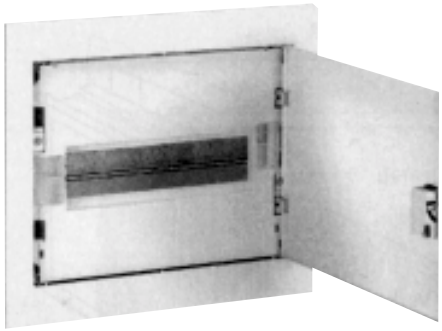
5SU 系列带过电流保护的剩余电流保护断路器(3P+N)
5SU Residual Current operated Circuit-Breakers with integral Overcurrent Protection (3P+N)



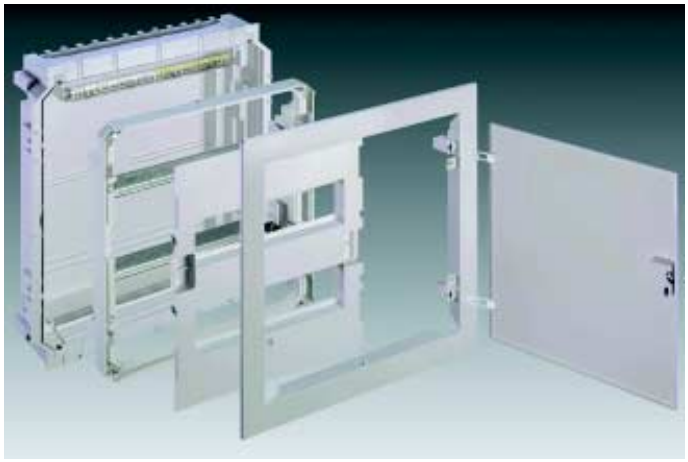
5SM2 系列断路器用剩余电流保护断路器模块(4P)
5SM2 Residual Current operated Circuit-Breaker module (4P)







小配电箱(用户单元) / Small Distribution Boards (Consumer Units)



SIMBOX 63 小配电箱主要用于楼宇电气系统中的就地配电。

由于它们的完美设计和很小的外形尺寸, 配电箱可以很容易地安装在靠近各自的负载中心和主要负载的地方。

SIMBOX63小配电箱有不同的尺寸和不同的安装方式。

它们完全符合标准IEC 439-3, EN60439-3, VDE 0603 和 DIN 43871。

它们能满足1 至4 根的 DIN EN 50022导轨的安装, 这些导轨适合于标准的导轨式安装元件如 MCBs，RCDs 和模数化产品等的安装。

每根DIN 安装导轨可以装载12 个模数(一个模数宽度 = 18mm)， 而在 3 排和 4 排的配电箱中，可以扩展 2 个额外的模数。

该标准箱可以用于室内导轨式安装且安装深度为 55mm 至 70mm 的元件的安装。

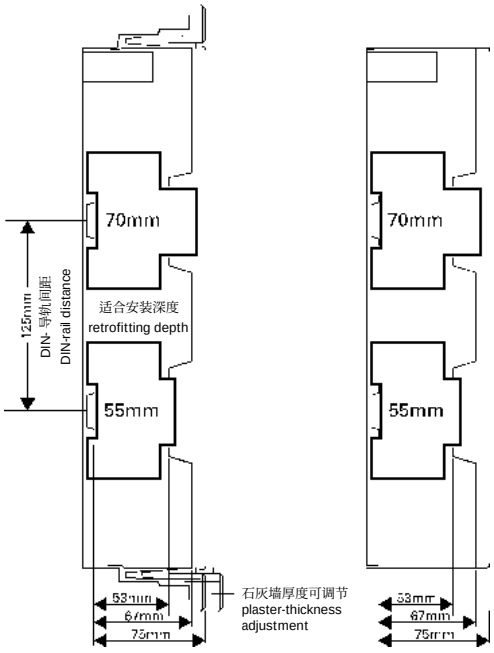
安装形式
- 实心墙暗装
- 空心墙暗装
- 明装

新型 SIMBOX 63 配电箱有以下改进的特点：
- 灵活的组合形式的凸起结构使得在墙体里用泥灰封埋时更坚固。
- 更大的端子和接线区域。
- N, PE 端子已预先安装在箱体内，并采用夹持式方式适合于 1,5-10mm² 和1,5-25 mm²。
- 在 DIN 导轨后面有更大的接线区域。
- 两面皱起的设计结构和适于墙面安装的塑料壳体, 以及镀锌粉末的金属部分。
- 新型的金属锁定夹片使门在关闭时更加可靠。
- 凹陷的结构使得锁在安装时更加容易和紧固。

The SIMBOX 63 Small Distribution Boards are intended for the local distribution of electric power in buildings.
Due to their good design and small size, they can be easily mounted close to the respective load centres / main loads.
The SIMBOX 63 Small Distribution Boards are available in different sizes and for different mounting-types.
They comply with IEC 439-3, EN60439-3,VDE 0603 and DIN 43871
They are fitted with 1 up to 4 standard DIN EN 50022 mounting rails for accomodation of standard snap-on components such as MCBs, RCDs, Modular Devices etc.
Each DIN mounting rail can take up to 12 MW (Modular Width unit = 18mm), 2 extra MW can be cut out in 3- and 4-tier boards.
The 'standard' boxes are ideal to house all snap-on components with retrofitting depths from 55mm up to 70mm.
If, however, a very neat slim board is required e. g. for surface-mounting there are 'low profile' boards available which can house only 55mm components.

Mounting type include
- flush-mounting in solid walls
- flush-mounting in hollow walls
- surface-mounting.

The *NEW* SIMBOX 63 features the following improvements:
- flexible comb-type flange to provide an effective seal while plastering etc.
- bigger terminal and cable compartment
- N, PE-terminals with advanced box-type clamps sized 1,5-10mm² and 1,5-25mm²
- more cabling space behind the DIN-rails available
- rugged design with double-walled plastic boxes and galvanized powder-coated metal parts
- new mechanical locking grip assure secure closing of door
- easy recessed mounting of a security lock possible

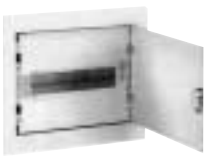


通用型配电箱(左侧为暗装，右侧为明装)用于所有不同型式设备(安装高度至 70mm)。
Example of an universal Distribution Board (left:flush mount, right:surface mount) for all retrofitting devices (all heights up to 70mm).

完美的设计使得箱体和设备易于安装, 并能满足所有安装高度设备的需要。
Good design for easy mounting of board and devices and good appearance for all heights of mounted devices.

小配电箱 SIMBOX 63
Small Distribution Boards SIMBOX 63

SIMBOX 63 - 小配电箱 - 用于实心墙暗装　SIMBOX 63-Small Distribution Boards for flush mounting in soild walls



- 用于元件安装深度至 70mm
- 符合标准 IEC 439-3，EN60439-3，VDE 0603 和 DIN 43871
- 防护等级 IP30
- 绝缘等级 2, 全绝缘保护 (塑料箱体)
  绝缘等级 1 (金属箱体)
- 安装导轨间距 125mm，安装导轨尺寸为 35 × 7.5mm，符合标准 DIN EN50022
- 采用新型的组合形式的凸起结构和N/PE 端子预先安装方式
- 颜色: RAL 9010 纯白
- 可以将元件分开供货

- For mounting of components depth up to 70mm
- According to IEC 439-3, EN60439-3, VDE 0603 and DIN 43871
- Degree of protection IP30
- Protection class 2, isolation protection (with plastic wall box)
  Protection class 1 (with metal wall box)
- Mounting rail centres125mm, mounting rail 35 x 7.5mm according to DIN EN50022
- With new comb-type flange and new advanced N/PE-terminals
- Colour: RAL 9010 pure white
- Can be supplied in separate components

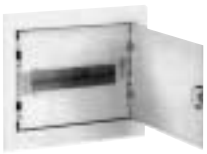
形式 Type	外形尺寸 External Dimensions H × W	壁龛尺寸 Recess Dimensions H × W × D	模数 (18mm) MW (18mm)	订货号 Order No.	重量 weight kg
标准配电箱，用于实心墙暗装 / Standard Distribution Boards, flush mounting for solid walls - 全套供货 / completely assembled					
1-排 / 1-tier	311 × 361	290 × 333 × 92	1 × 12	8GB5 651	2.370
2-排 / 2-tier	436 × 361	415 × 333 × 92	2 × 12	8GB5 652	3.190
3-排 / 3-tier	581 × 361	560 × 333 × 92	3 × 12 [1]	8GB5 653	4.110
4-排 / 4-tier	706 × 361	685 × 333 × 92	4 × 12 [1]	8GB5 654	4.920
标准配电箱，用于实心墙明装 / Standard Distribution Boards, flush mounting for solid walls - 散件供货(组合形式) / as separate components for later assembly (Kit-form)					
塑料箱体 / Plastic wall box 包括 N/PE-端子，组合式凸起结构，硬盖板 / including N/PE-terminals, comb-type flange, cardboard cover plate					
1-排 / 1-tier	303 × 347	290 × 333 × 92		8GB4 521	0.790
2-排 / 2-tier	428 × 347	415 × 333 × 92		8GB4 522	0.995
3-排 / 3-tier	573 × 347	560 × 333 × 92		8GB4 523	1.325
4-排 / 4-tier	698 × 347	685 × 333 × 92		8GB4 524	1.490
金属箱体 / Metal wall box 包括 N/PE-端子，预留 28/40mm 敲落孔 /including N/PE-terminals, 28/40mm knock-out hole					
1-排	266 × 335	246 × 315 × 95		8GB4 521-0CC [2] 8GB4 521-1CC [3]	
2-排	388 × 335	368 × 315 × 95		8GB4 522-0CC [2] 8GB4 522-1CC [3]	
元件组装架 / Component carrier assembly 包括安装导轨，盖板，门和框架 / including mounting rails, cover, door with frame					
1-排 / 1-tier	311 × 361		1 × 12	8GB5 6552CA	1.650
2-排 / 2-tier	436 × 361		2 × 12	8GB5 6562CA	2.345
3-排 / 3-tier	581 × 361		3 × 12 [1]	8GB5 6572CA	2.900
4-排 / 4-tier	706 × 361		4 × 12 [1]	8GB5 6582CA	3.550
较小深度的配电箱，暗装 / Low-profile Distribution Boards, flush mounting 用于元件安装深度至 55mm/for mounting of components with retrofitting depth up to 55 mm 请垂询 / available upon request					

尺寸图见第 3/9 页。／ For dimension drawings, see page 3/9.

1) 对于 3 排和 4 排箱体, 上下两排可以敲落成 13 模数
   For 3-and 4-tier boards the upper and lower row can be extended to 13MW by cutting out pre-moulded sections of the cover
2) 彩锌箱体
   Color-galvanized wall box
3) 白锌箱体
   Galvanized wall box

SIMBOX 63- 小配电箱
用于空心墙暗装(如: 木板墙)

SIMBOX 63-Small Distribution Boards
for flush mounting in hollow walls (e. g.: studded walls)



- 用于元件安装深度至 70mm
- 符合标准 IEC 439-3, EN60439-3, VDE 0603 和 DIN 43871
- 防火空心墙壳体
- 防护等级 IP30
- 绝缘等级 2，全绝缘保护
- 安装导轨间距125mm，安装导轨尺寸为 35 x 7.5mm，符合标准 DIN EN50022
- 采用新型的组合形式的凸起结构和N/PE 端子预先安装方式(带特殊的夹持式端子)
- 颜色: RAL 9010 纯白

- For mounting of components depth up to 70mm
- According to IEC 439-3, EN60439-3, VDE 0603 and DIN 43871
- Flame retardant hollow-wall case
- Degree of protection IP30
- Protection class 2, isolation protection
- Mounting rail centres 125mm, mounting rail 35 x 7.5mm according to DIN EN50022
- With new comb-type flange and new advanced N/PE-terminals (with special box-type clamps)
- Colour: RAL 9010 pure white

形式 Type	外形尺寸 External Dimensions H × W	壁龛尺寸 Recess Dimensions H × W × D	模数 (18mm) MW (18mm)	订货号 Order No.	重量 weight kg
标准配电箱，用于空心墙暗装 / Standard Distribution Boards, flush mounting for hollow walls - 全套供货 /completely assembled					
1-排 / 1-tier	311 × 361	290 × 333 × 92	1 × 12	8GB5 671	2.320
2-排 / 2-tier	436 × 361	415 × 333 × 92	2 × 12	8GB5 672	3.110
3-排 / 3-tier	581 × 361	560 × 333 × 92	3 × 12 [1)]	8GB5 673	3.970
4-排 / 4-tier	706 × 361	685 × 333 × 92	4 × 12 [1)]	8GB5 674	4.750
标准配电箱，用于空心墙暗装 / Standard Distribution Boards, flush mounting for hollow walls - 散件供货(组合形式) / as separate components for later assembly(Kit-form)					
空心墙壳体, 防火 / Hollow-wall case, flame retardant 包括 N/PE- 端子, 组合式凸起结构, 硬盖板 / including N/PE-terminals, comb-type flange, cardboard cover plate					
1-排 / 1-tier	303 × 347	290 × 333 × 92		8GB4 531	0.720
2-排 / 2-tier	428 × 347	415 × 333 × 92		8GB4 532	0.890
3-排 / 3-tier	573 × 347	560 × 333 × 92		8GB4 533	1.180
4-排 / 4-tier	698 × 347	685 × 333 × 92		8GB4 534	1.310
元件组装架 / Component carrier assembly 包括安装导轨, 盖板, 门和框架 / including mounting rails, cover, door with frame					
1-排 / 1-tier	311 × 361		1 × 12	8GB5 675	1.575
2-排 / 2-tier	436 × 361		2 × 12	8GB5 676	2.166
3-排 / 3-tier	581 × 361		3 × 12 [1)]	8GB5 677	2.735
4-排 / 4-tier	706 × 361		4 × 12 [1)]	8GB5 678	3.380
较小深度的配电箱，嵌壁安装 / Low-profile Distribution Boards, flush mounting 用于元件安装深度至 55mm/for mounting of components with retrofitting depth up to 55 mm 请垂询 / available upon request					

尺寸图见第 3/9 页。／For dimension drawings, see page 3/9.

1) 对于 3 排和 4 排箱体, 上下两排可以敲落成 13 模数
For 3-and 4-tier boards the upper and lower row can be extended to 13MW by cutting out pre-moulded sections of the cover

小配电箱 SIMBOX 63
Small Distribution Boards SIMBOX 63

SIMBOX 63- 小配电箱, 用于明装, 金属门带透明窗	SIMBOX 63-Small Distribution Boards, for surface mounting, metal door with transparent windows

- 用于元件安装深度至 70mm
- 符合标准 IEC 439-3，EN60439-3，VDE 0603 和 DIN 43871
- 防护等级 IP30
- 绝缘等级 2，全绝缘保护
- 安装导轨间距 125mm, 安装导轨尺寸为 35 x 7.5mm, 符合标准 DIN EN50022
- 采用新型的组合形式的凸起结构和N/PE 端子预先安装方式(带特殊的夹持式端子)
- 颜色: RAL 9010 纯白

- For mounting of components depth up to 70mm
- According to IEC 439-3, EN60439-3, VDE 0603 and DIN 43871
- Degree of protection IP30
- Protection class 2, isolation protection
- Mounting rail centres125mm, mounting rail 35 x 7.5mm according to DIN EN50022
- With new comb-type flange and new advanced N/PE-terminals (with special box-type clamps)
- Colour: RAL 9010 pure white

形式 Type	外形尺寸 External Dimensions H × W	壁龛尺寸 Recess Dimensions H × W × D	模数 (18mm) MW (18mm)	订货号 Order No.	重量 weight kg
标准配电箱，明装 / Standard Distribution Boards, surface mounting 带透明窗的金属门 / metal door with transparent windows					
1-排 / 1-tier	272 × 342 × 85		1 × 12	8GB5 751	1.650
2-排 / 2-tier	397 × 342 × 85		2 × 12	8GB5 752	2.000
3-排 / 3-tier	542 × 342 × 85		3 × 12 [1)]	8GB5 753	2.950
4-排 / 4-tier	667 × 342 × 85		4 × 12 [1)]	8GB5 754	3.350
较小深度的配电箱，明装 / Low-profile Distribution Boards, surface mounting 用于元件安装深度至 55mm/for mounting of components with retrofitting depth up to 55 mm 请垂询 / available upon request					

尺寸图见第 3/10 页。／For dimension drawings, see page 3/10.

1) 对于 3 排和 4 排箱体, 上下两排可以敲落成 13 模数
For 3-and 4-tier boards the upper and lower row can be extended to 13MW by cutting out pre-moulded sections of the cover

用于 SIMBOX 63- 小配电箱的附件 暗装(实心和空心墙)和明装(金属门), 如前所述	Accessories for SIMBOX 63-Small Distribution Boards flush mount (solid and hollow walls) and surface mount (metal door), as described before		
	形式 Type	订货号 Order No.	重量 weight kg
	遮片, 用于 14 模数宽度, 带切割纹路 Blanking Strip for 14 modular width, with pre-cut segmentspure		
	纯白色 /white 灰色 /grey	8GB4 683 8GB4 671	0.030
	附加 N/PE- 端子板 , 用于 2 至 4- 排配电箱 当使用两个漏电保护器 (RCDs) 时, 需将中性线分开 带 30 × 4 mm² 和 6 × 16mm² 接线端子 Additional N/PE-terminal strip for 2 to 4-row distribution boards for dividing the neutral conductors when using 2 RCDs with 30 × 4mm² and 6 × 16mm² terminals		
		8GB6 224	0.185
	带钥匙的门锁组合件 (最多可以用 19 把不同的锁, 请垂询) Door locking kit with key (max. 19 different keys available on asking)		
		8GB4 577	0.018
	备用钥匙 (在订货时请说明钥匙数量) Spare key (please specify key-no. when ordering)		
		8GB4 580	0.006
	配电箱用隔墙板 / Dividers for distribution boards		
	3- 排 垂直 /3-tier vertical 4- 排 垂直 /4-tier vertical 3- 和 4- 排水平 /3-and-4tier horizontall	8GB4 381 8GB4 382 8GB4 383	0.044 0.056 0.032
	连接件(仅用于暗装式实心墙和空心墙箱体) 用于引入导线和埋墙箱体的机械连接 Sleeve (only for flush-mounting solid and hollow-wall boxes) for cable routing and mechanical joining of wall boxes		
		8GB4 584	0.014
	埋墙锚栓(用于暗装式实心墙箱体) 一对一每个暗装式箱体需两对 Wall-anchor (only for flush-mounting solid wall boxes) one pair - for fixing 2 pairs are erquired per wall box		
		8GB4 100	0.015
	RCD- 接线端子 3 × 1.5...10 mm² / 1 × 1.5...25 mm² RCD-terminal 3 × 1.5...10 mm² / 1 × 1.5...25 mm²		
		8GB4 576	0.026

3

小配电箱 SIMBOX 63
Small Distribution Boards SIMBOX 63

SIMBOX 63- 小配电箱，用于明装，罩式结构　SIMBOX 63-Small Distribution Boards, for surface mounting, hood-type






- 用于元件安装深度至 70mm
- 符合标准 IEC 439-3，EN60439-3，VDE 0603 和 DIN 43871
- 防护等级 IP30
- 绝缘等级 2，全绝缘保护
- 安装导轨间距 125mm，安装导轨尺寸为 35 x 7.5mm，符合标准 DIN EN50022
- 采用新型的组合形式的凸起结构和N/PE 端子预先安装方式(带特殊的夹持式端子)
- 颜色: RAL 9010 纯白

- For mounting of components depth up to 70mm
- According to IEC 439-3, EN60439-3, VDE 0603 and DIN 43871
- Degree of protection IP30
- Protection class 2, isolation protection
- Mounting rail centres125mm, mounting rail 35 x 7.5mm according to DIN EN50022
- With new comb-type flange and new advanced N/PE-terminals (with special box-type clamps)
- Colour: RAL 9010 pure white

形式 Type	外形尺寸 External Dimensions H × W × D	模数 (18mm) MW (18mm)	订货号 Order No.	重量 weight kg
标准罩式配电箱，明装 /Standard hood-type Distribution Boards, surface mounting - 无门 /without door				
1-排 /1-tier	221 × 275 × 74	1 × 12 [1]	8GB5 775	0.750
2-排 /2-tier	346 × 275 × 74	2 × 12 [1]	8GB5 776	1.070
3-排 /3-tier	491 × 275 × 74	3 × 12 [1]	8GB5 777	1.450
4-排 /4-tier	616 × 275 × 74	4 × 12 [1]	8GB5 778	1.850
标准罩式配电箱，明装 /Standard hood-type Distribution Boards, surface mounting - 带门 RAL9010 纯白色 /with door in RAL9010 pure white				
1-排 /1-tier	221 × 275 × 100	1 × 12 [1]	8GB5 761	0.770
2-排 /2-tier	346 × 275 × 100	2 × 12 [1]	8GB5 762	1.100
3-排 /3-tier	491 × 275 × 100	3 × 12 [1]	8GB5 763	1.495
标准罩式配电箱，明装 /Standard hood-type Distribution Boards, surface mounting - 带门透明深色(烟 - 黄宝石色)/with door in transparent darkened (smoke-topaz)				
1-排 /1-tier	221 × 275 × 100	1 × 12 [1]	8GB5 765	0.770
2-排 /2-tier	346 × 275 × 100	2 × 12 [1]	8GB5 766	1.100
3-排 /3-tier	491 × 275 × 100	3 × 12 [1]	8GB5 767	1.495
门的组件 /Ratrofit Door-kits - 用于标准罩式配电箱，明装 /for Standard hood-type Distribution Boards, surface mounting				
门的组件用于 RAL 9010 纯白色，包括螺丝和铰链 /Door-kit in RAL 9010 pure white, hinges and screws included				
1-排 /1-tier		1 × 12	8GB4 401	0.210
2-排 /2-tier		2 × 12	8GB4 402	0.310
3-排 /3-tier		3 × 12	8GB4 403	0.450
门的组件用于透明门(烟 - 黄宝石色)，包括螺丝和铰链 Door-kit in transparent darkened (smoke-topaz), hinges and screws included				
1-排 /1-tier		1 × 12	8GB4 405	0.210
2-排 /2-tier		2 × 12	8GB4 406	0.310
3-排 /3-tier		3 × 12	8GB4 407	0.450
用于每排的透明窗 /Transparent door for each row				
1 排，12 模数，可卡装，纯白色框 /1 row, 12MW, latching, frame pure white			8GB4 388	0.160
1 排，12 模数，可密封，纯白色框 /1 row, 12MW, sealable, frame pure white			8GB4 387	0.165

尺寸图见第 3/10 页。／ For dimension drawings, see page 3/10.

[1] 所有每一排可以敲落成 13 模数
All rows can be extended to 13MW by cutting out pre-moulded sections of the cover

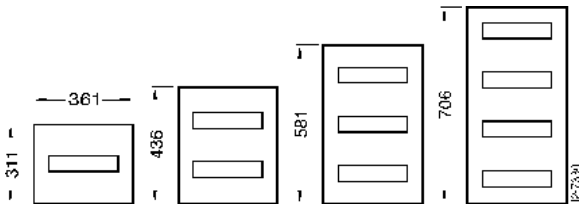
用于 SIMBOX 63- 标准配电箱的附件 罩式明装，如前所述	Accessories for SIMBOX 63-Standard Distribution Boards surface mount hood-type, as described before		
	形式 Type	订货号 Order No.	重量 weight kg
	遮片, 用于 14 模数宽度, 带切割纹路 Blanking Strip for 14 modular width, with pre-cut segmentspure		
	纯白色 /white 灰色 /grey	8GB4 683 8GB4 671	0.030
	附加 N/PE- 端子板 , 用于 2 至 4- 排配电箱 当使用两个漏电保护器 (RCDs) 时, 需将中性线分开 带 30 × 4 mm² 和 6 × 16mm² 接线端子 Additional N/PE-terminal strip for 2 to 4-row distribution boards for dividing the neutral conductors when using 2 RCDs with 30 × 4mm² and 6 × 16mm² terminals		
		8GB6 224	0.185
	带钥匙的门锁组合件 Door locking kit with key		
	纯白色 /white	8GB4 378	0.015
	备用钥匙 Spare key		
		8GB4 038	0.010
	配电箱用隔墙板 / Dividers for distribution boards		
	3- 排 垂直 /3-tier vertical 4- 排 垂直 /4-tier vertical 3- 和 4- 排水平 /3-and-4tier horizontall	8GB4 381 8GB4 382 8GB4 383	0.044 0.056 0.032
	RCD- 接线端子 3 × 1.5...10 mm² / 1 × 1.5...25 mm² RCD-terminal 3 × 1.5...10 mm² / 1 × 1.5...25 mm²		
		8GB4 576	0.026

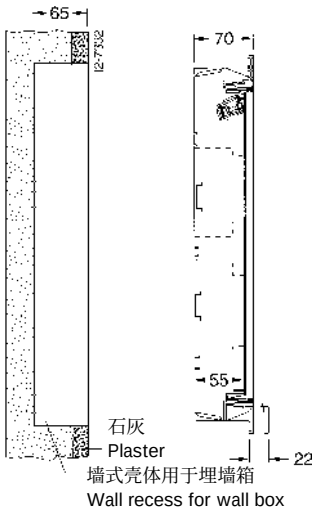
3

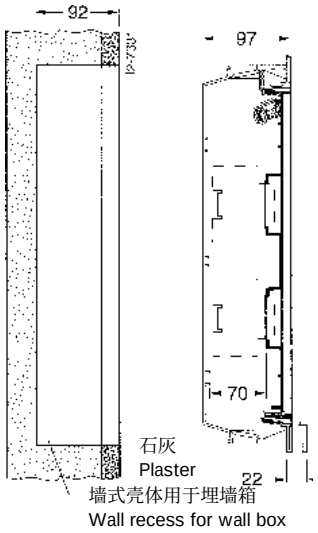
外形尺寸 Dimension drawings

暗装
Flush mounting

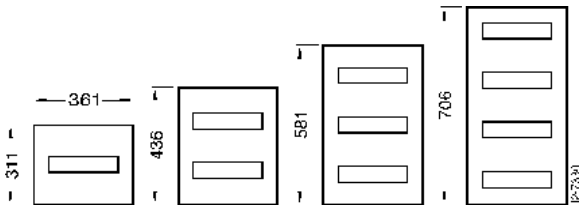
实心墙暗装
Flush mounting in solid walls

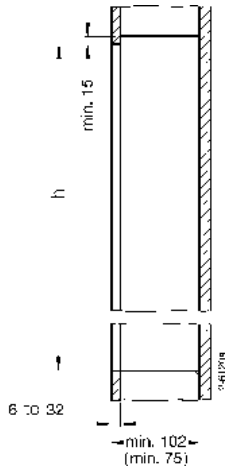




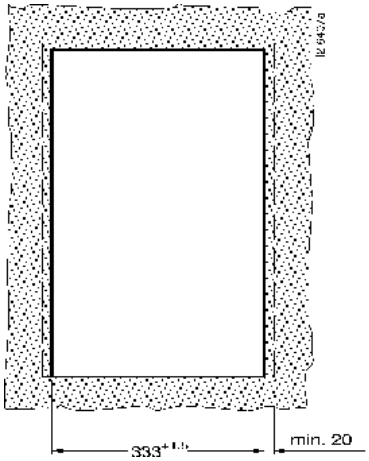


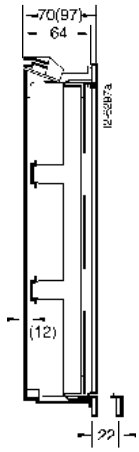
空心墙暗装
Flush mounting in hollow walls





用于标准箱最小 102
(用于薄箱最小 75)
min. 102 for standard board
(min. 75 for low-profile board)





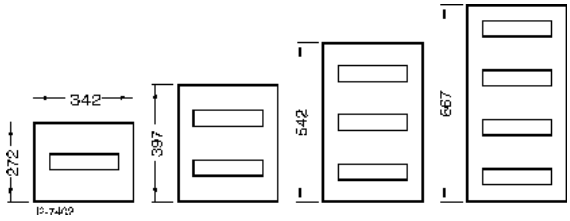
墙面厚度水平
Wall thickness leveling

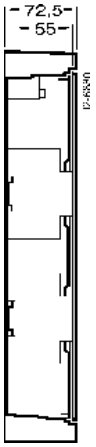
h= 290+1.5 1- 排 /row
415+1.5 2- 排 /row
560+1.5 3- 排 /row
685+1.5 4- 排 /row

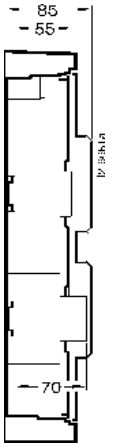
外形尺寸 Dimension drawings

明装
Surface mounting

明装，金属门
Surface mounting, metal door



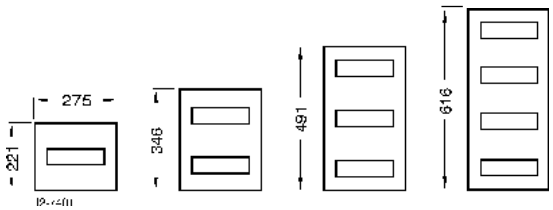


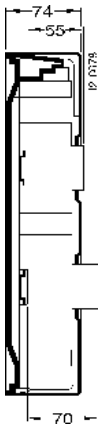


带窗式门
With windows in door

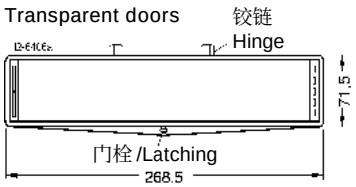
明装，罩式带或不带门
Surface mounting, hood-type with and without door

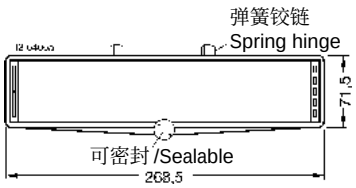
无门
Without door



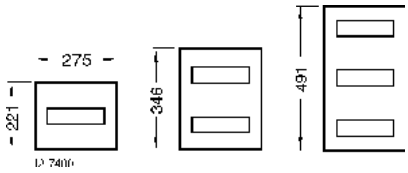


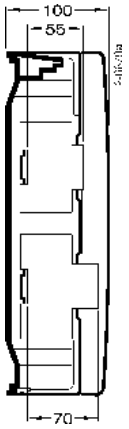
透明门
Transparent doors



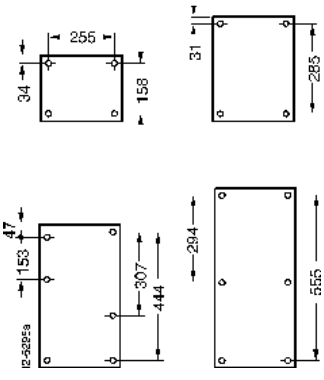


带门
With door





固定孔
Fixing holes

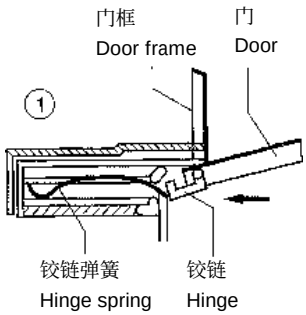


3

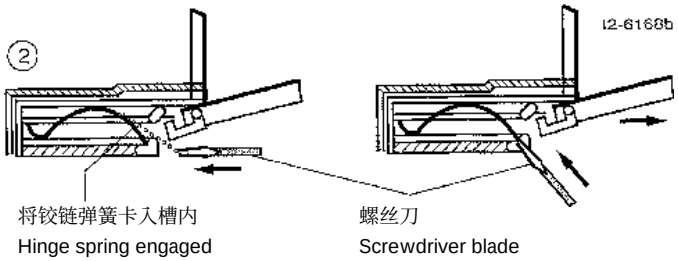
安装说明 Mounting reference

普通铰链的安装与拆卸

Install and remove the hinge



安装
Install
① 将铰链插入槽中。
Put the hinge in the pocket

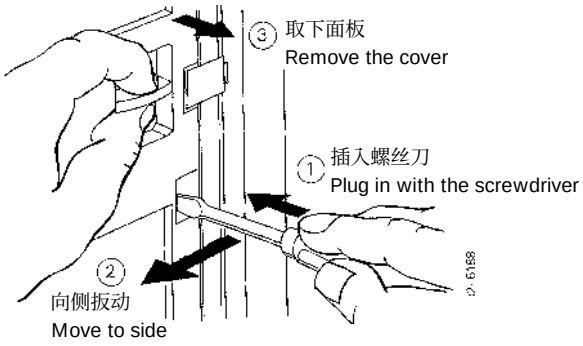


② 用螺丝刀将铰链弹簧卡入槽内
Press the hinge spring engaged with screwdriver

拆卸
Remove
用螺丝刀斜着压住铰链弹簧直至松开，然后取下铰链。
Press the hinge spring to looseness with screwdriver then take away the hinge

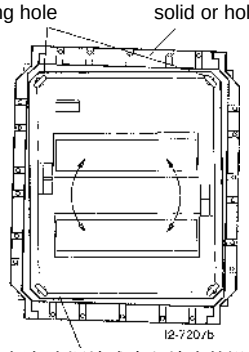
打开接触保护面板

Remove the protection cover



可调固定长孔
Adjusting with long hole

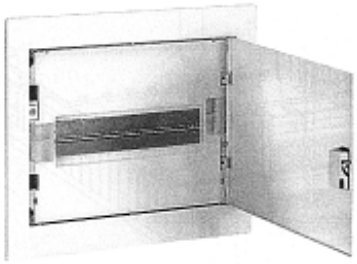
斜装在水泥墙或空心墙上
Box mounted in obligue in solid or hollow wall



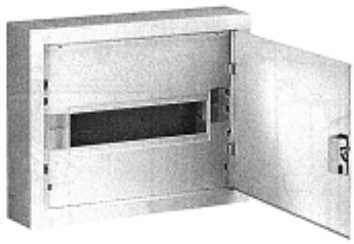
门框与水泥墙或空心墙中的设备支架对齐
Adjusting device base with stretcher in solid or hollow wall

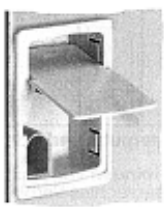
安装门锁

Install the lock



门锁
Lock



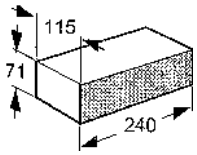


门的正面
Front side of door

安装说明 Mounting reference

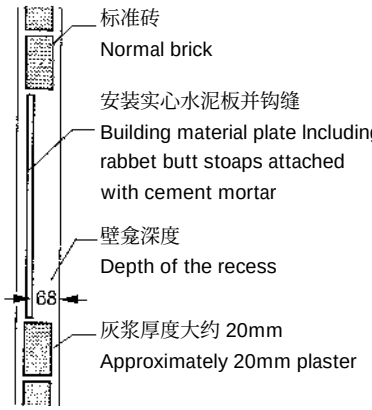
水泥墙埋设图
Flush mounting

安装用于安装深度 55mm 设备的暗装式 SIMBOX 63 小型配电箱
Install Flush-mounting SIMBOX63 for Snap-on components with depth 55mm

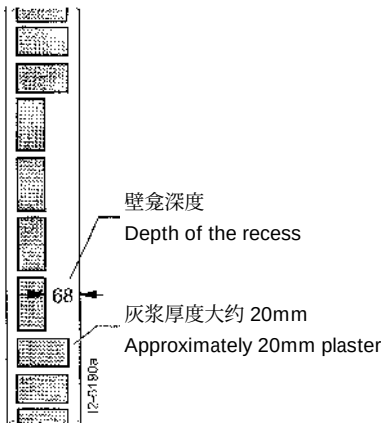


砖块符合标准 DIN 105NF (标准型号)
With brick according to DIN 105 NF (Normalformat)

方案 1
Suggestion 1

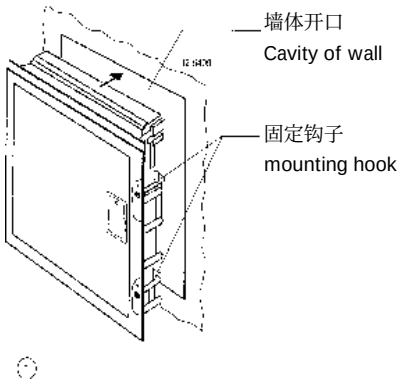


方案 2
Suggestion 2

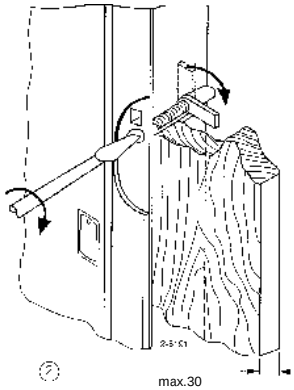


空心墙图
Hollow wall

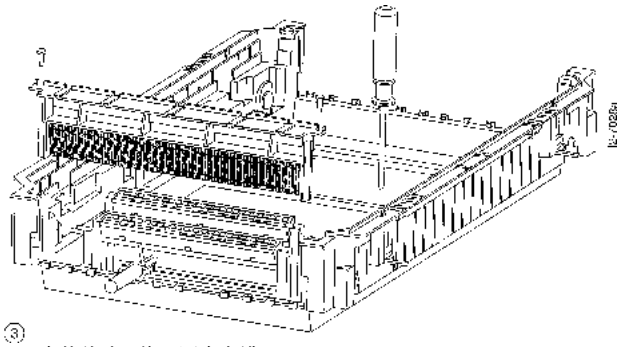
空心墙嵌壁安装
Install flush mounting in hollow walls



① 配电箱空心墙嵌壁安装
Put the small distribution board in the wall



⑦ 每个箱体上都有 4 个固定装置，使用螺丝刀将之旋转 90°，拧紧螺钉。
Mounting instruments 4x per cabinet Turn it to 90° then tighten the screws with screwdriver



③ 安装移动凸缘，固定电缆
Install stiding-flange to fix the wires

3

安装说明 Mounting reference

水泥和空心墙图
Flush-mounting and hollow wall type

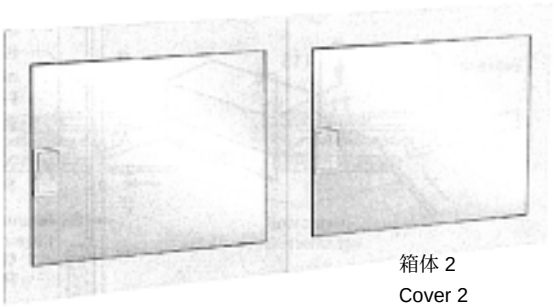
配电箱连接
Connection of junction bards
水泥墙或空心墙间两个配电箱的水平连接
Horizontal connection of two junction boards which built in solid wallsor hollow walls

切开两个嵌壁安装配电箱体带有标记的开口，并去毛刺
Cut and deburr on mark between two junction boxes

两个配电箱的嵌壁箱体相互连通，压入联接套管
Connection two distribution boards and press the sleeve

箱体 1
Cover 1

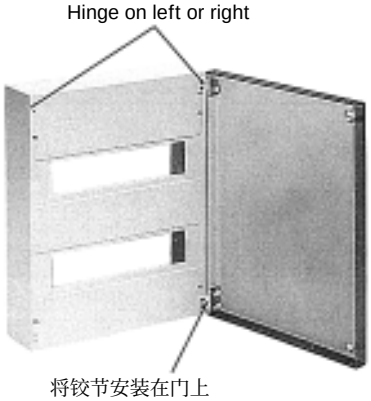
用于水泥墙或空心墙的并列水平安装
For connection of the junction boards horizontal in solid and hollow walls



箱体 2
Cover 2

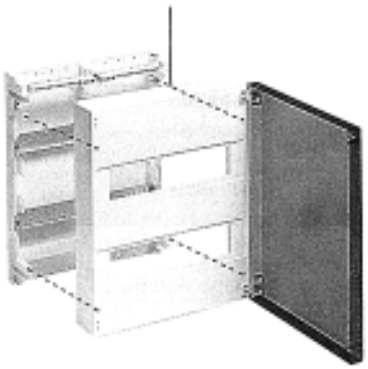
门的安装
Door retrofitting

铰链向左或向右旋转
Hinge on left or right



将铰节安装在门上
Fix hinge in door pocket

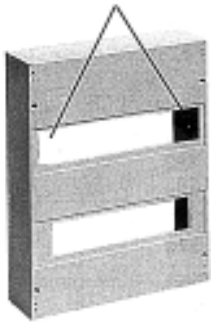
使用快装螺钉将面板固定在后墙面上
Fix the front part on the back wall with rapid fixing screws



安装说明 Mounting reference

防尘门的安装
Engagement of transparence plastic door

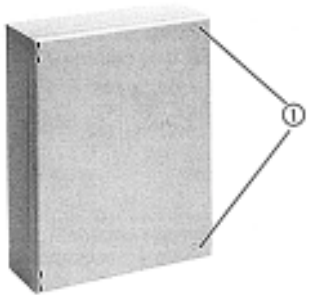
每排 12 模数的槽孔可扩展成 13 模数
Cut out the motch with 12 pitch writ letf and 13 pitch unitright



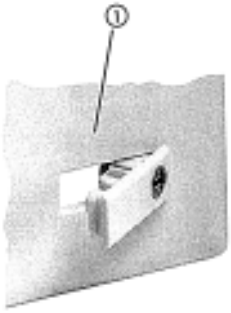
挂上防尘门并用力卡入
Mount the transparence plastic door

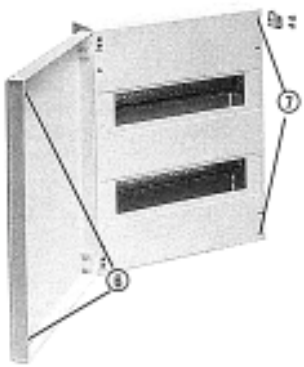
安装配电箱门锁
Mounting the lock on the board

- 在门 ① 的上部或下部打开一个安装门锁的孔
  Open a hole for lock in the door ① at top or bottom
- 从门锁 8GB4 378 上旋出螺钉②，并取下弧形铁皮⑤。
  Screw out the bolt ② from 8GB4 378 and remove mounting plate ⑤
- 取下锁件 ③
  Take away the lock ③
- 将塑料件 ④ 放入门 ① 上的孔中，并固定。
  Mount the plastic-part ④ into the hole of door ①
- 重新安装锁件 ③
  Install the lock ③ again
- 安装弧形铁皮 ⑤ 并用螺钉 ② 固定。
  Install the mounting plate ⑤ and tighten the screw ②
- 在门上切开相应门锁高度的锁定榫头 ⑥。
  Cut off corresponding arresting peg ⑥ in door
- 将锁板 ⑦ 对着锁件拧紧在箱体上。
  Tighten the lock plate ⑦ on the boards



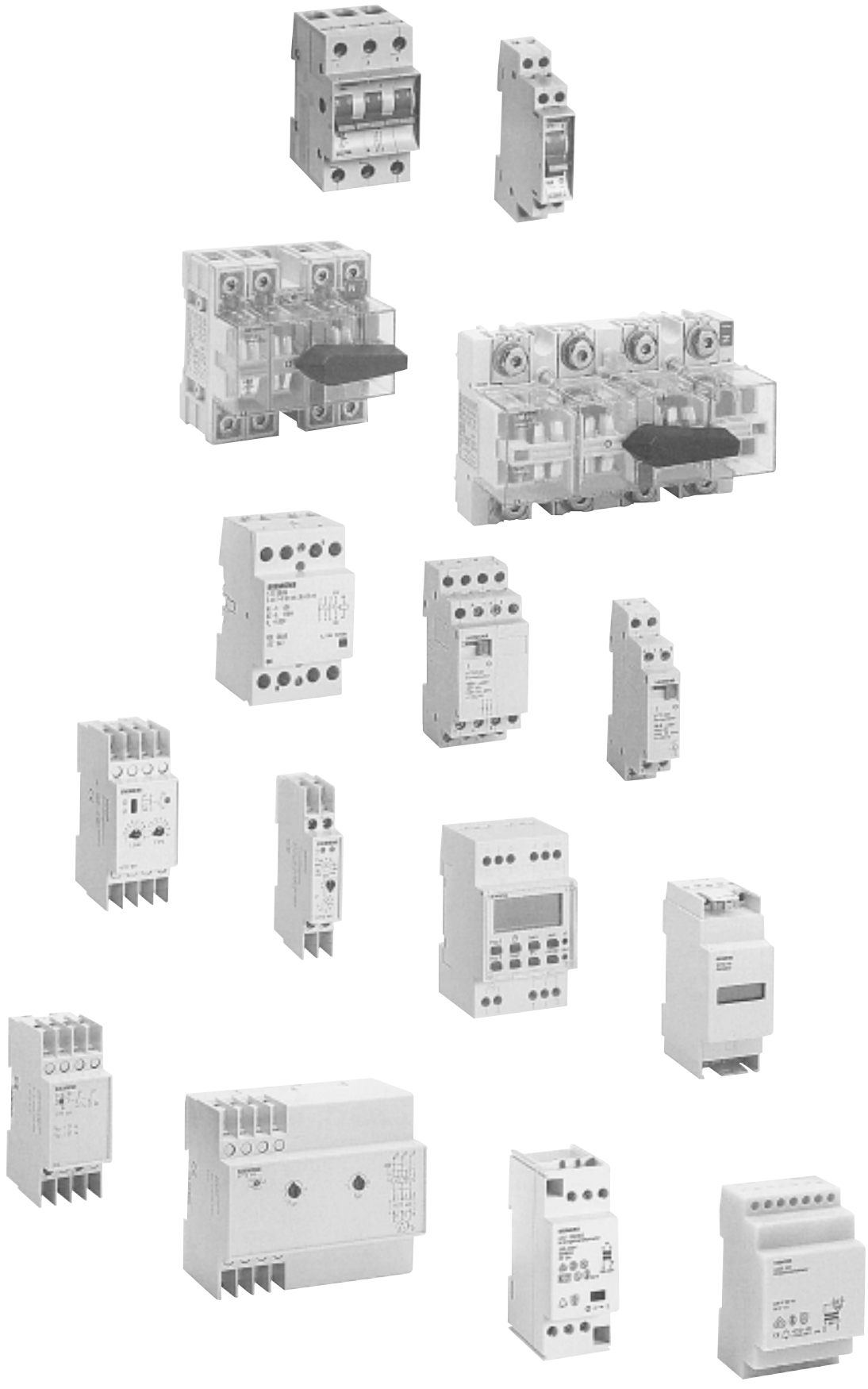
门的正面
Front side of door





门锁 8GB4 378
Lock 8GB4 378

3



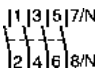
选型和技术数据 Selection and ordering data

隔离开关

- 16...100A, 230 和 400V, 50/60Hz
- 符合标准 DIN VDE 0632, 第 101 部分(至 63A)
- 符合标准 DIN VDE 0660, 第 107 部分(80/100A)
- 可铅封, 35mm DIN 导轨安装(DIN 50 022)
- 可锁定的结构, >N< 型 (55mm 深度)

Switch Disconnectors

- 16...100A, 230 and 400V, 50/60Hz
- According to DIN VDE 0632, Part 101 (up to 63A)
- According to DIN VDE 0660, Part 107 (80/100A)
- Sealable, snapping on 35mm DIN mounting rails (DIN 50 022)
- Lockable model, > N < type (55mm depth)

触头 Contacts	额定电压 U_e~ Rated Voltage U_e~ (V)	额定电流 Rated Current (A)	导线截面至 Conductor size up to mm²	模数 MW	订货号 Order No.
1 常开 / 1NO 	230	16	6	1	5TE7 111
		40	50	1	5TE7 411
		63	50	1	5TE7 511
		80	50	1	5TE7 611
		100	50	1	5TE7 711
2 常开 / 2NO 	400	16	6	1	5TE7 112
		40	50	2	5TE7 412
		63	50	2	5TE7 512
		80	50	2	5TE7 612
		100	50	2	5TE7 712
3 常开 / 3NO 	400	16	6	2	5TE7 113
		25	6	2	5TE7 313
		40	50	3	5TE7 413
		63	50	3	5TE7 513
		80	50	3	5TE7 613
		100	50	3	5TE7 713
		125	50	3	5TE7 813
4 常开 / 4NO 	400	25	6	2	5TE7 314
		40	50	4	5TE7 414
		63	50	4	5TE7 514
		80	50	4	5TE7 614
		100	50	4	5TE7 714

分合开关 /On/off switches

手柄可用挂锁锁定 /Handle lockable by means of padlock
(锁直径 ø max. 3.5mm)/(lock has ø max. 3.5mm)

3 常开 / 3NO 	400	63	50	3	5TE7 513-2
4 常开 / 4NO 	400	63	50	4	5TE7 514-2

分合开关 /On/off switches
带指示灯 /With pilot light

1 常开 / 1NO 	230	16	6	1	5TE7 101

转换开关 /Changeover switches

1 转换 / 1 changeover 	230	16	6	1	5TE7 161
2 转换 / 2 changeover 	400	16	6	2	5TE7 162

带中间位置的转换开关 /Changeover switches with intermediate position

1 转换 / 1 changeover 	230	16	6	1	5TE7 141
2 转换 / 2 changeover 	400	16	6	2	5TE7 142

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选型和技术数据 / Selection and ordering data

隔离开关

- IEC 947-3, EN 60 947-3, NEMA 认证
- 92mm 设备安装深度
- 可锁定 - 用于符合 DIN 50 022 标准的 35mm DIN 导轨卡轨式安装，也可用于螺丝固定。

Disconnectors

- IEC 947-3, EN 60 947-3, NEMA certified
- 92mm device mounting depth
- Lockable - snapping on 35mm DIN mounting rails in accordance with DIN 50 022. Screw mounting also possible.

正面旋转式操作(带透明罩壳的黑色旋钮)
FRONT ROTARY DRIVE (black knob with transparent masking frame)

触头 Contacts	额定电压 U_e~ Rated Voltage U_e~ (V)	额定电流 Rated Current (A)	模数 MW	订货号 Order No.
2 常开 /2NO	690	100	5	5TE1 210
		125	5	5TE1 220
		160	8	5TE1 230
		200	8	5TE1 240
3 常开 /3NO	690	100	5	5TE1 310
		125	5	5TE1 320
		160	8	5TE1 330
		200	8	5TE1 340
4 常开 /4NO	690	100	5	5TE1 410
		125	5	5TE1 420
		160	8	5TE1 430
		200	8	5TE1 440
3 常开 +N 线	690	100	5	5TE1 610
3NO+N through-type		125	5	5TE1 620
		160	8	5TE1 630
		200	8	5TE1 640

紧停－正面旋转式操作(带黄色罩壳的红色旋钮, 符合 VDE 0113 标准)
EMERGENCY-STOP FRONT ROTARY DRIVE (red knob with yellow masking frame, according VDE 0113)

3 常开 /3NO	690	100	5	5TE1 315
		125	5	5TE1 325
		160	8	5TE1 335
		200	8	5TE1 345
4 常开 /4NO	690	100	5	5TE1 415
		125	5	5TE1 425
		160	8	5TE1 435
		200	8	5TE1 445

附件见 1/60 页。
Accessories see page 1/60.

选型和技术数据 Selection and ordering data

5TE1(隔离开关)的附件 Accessories for 5TE1 (disconnectors)

- 辅助开关，可两边同时安装(最多两个) • Auxiliary current switch, retrofittable on both sides (2 pieces max.)

触头 Contacts	额定电压 U_e~ Rated Voltage U_e~ (V)	额定电流 Rated Current (A)	模数 MW	订货号 Order No.
1 转换 1 changeover 	230	6	1	5TE9 005
2 转换 2 changeover 	230	6	1	5TE9 006

- 可封闭的端子盖 (1 片)
  Sealable terminal cover (1 piece)
  用于 100A 和 125A 隔离开关 for 100A and 125A disconnector — 5TE9 000
  用于 160A 和 200A 隔离开关 for 160A and 200A disconnector — 5TE9 001

- 端子连接器
  Terminal connectors
  用于 160A 和 200A 隔离开关 for 160A and 200A disconnectors
  一套 3 个端子连接器 1set of 3 terminal connectors — 5TE9 003
  一套 4 个端子连接器 1set of 4 terminal connectors — 5TE9 004

- 手柄挂锁设备
  Handle padlock device
  可用最多 3 个 ø 8 mm 挂锁锁定 lockable with max. 3 padlocks ø 8 — 5TE9 014

- 扁平铜排连接件(4 极, 100A 和 125A)
  Connections kit for flat bars (4 pole, 100A and 125A)
  扁排，最大 15mm 宽度 flat bar, 15mm wide max. — 5TE9 015

- 旋转手柄, 适用于门和罩壳
  Rotary drive, for fitting in doors and covers
  黑色旋钮 Black knob
  200 mm 杆长 200 mm sheft length — 5TE9 010
  400 mm 杆长 400 mm shaft length — 5TE9 011
  红色旋钮 Red knob
  200 mm 杆长 200 mm shaft length — 5TE9 012
  400 mm 杆长 400 mm shaft length — 5TE9 013

4

选型和技术数据 / Selection and ordering data

按钮 / Pushbuttons
• 符合 DIN VDE 0632 / According to DIN VDE 0632

	额定电压 U_e~ Rated Voltage U_e~ (V)	额定电流 Rated Current (A)	导线截面至 Conductor cross section up to (mm^2)	模数 MW	订货号 Order No.
按钮 Pushbuttons					
1 常开 +1 常闭 1 NO + 1NC 	230	6	6	1	5TE4 700
带灯按钮 Pushbutton with indicator lights					
1 常开 /1 NO 	230	6	6	1	5TE4 701
1 常闭 /1 NC 	230	6	6	1	5TE4 702
指示灯 Indicator lights					
透明氖泡灯, E 10 座，无罩，无二极管 With clear neon lamp base E 10, without cap, without diodes	230	0,6	6	1	5TE5 700

罩 /Caps	
透明 /Clear	5TG8 036
红 /Red	5TG8 034
绿 /Green	5TG8 035

氖泡灯－备件 Spare neon lamps	
透明，也可用于红色罩 Clear, also for red cap	5TG8 004
绿色 /Green	5TG8 006
白炽灯 Incandescent lamp	
1.2W, 24V,50/60Hz, E10 座，透明，包括灯的装卸工具 1.2W, 24V,50/60Hz, base E10, clear incl. replacement tool	5TG8 037

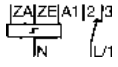
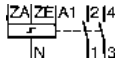
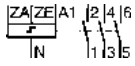
选型和技术数据 Selection and ordering data

远动开关
(脉冲开关)

- 16A, 8, 12, 24, 110, 230V 和 400V, 50/60Hz
- 符合标准 DIN VDE 0637
- 导线截面至 6 mm²
- 在 230V 时按钮式氖泡灯的最大负载: 10mA
- 带保护设备，用于 100% ED 的故障操作按钮
- 带手动操作和开关位置指示

	单极	多极和 5TT5 511
• 白炽灯负载	2400 W	1200 W/ 极
• 卤素灯变压器	1200 W	800 W/ 极
• 荧光灯 58W		
无补偿	25 单元	25 单元 / 极
并联补偿	35 单元	28 单元 / 极
双回路	2 × 20 单元	2 × 16 单元 / 极
西门子电子整流器		
单灯	30 单元	24 单元 / 极
双灯	2 × 15 单元	2 × 12 单元 / 极

应用
用于按钮通断照明设备

触头	额定电压 U_e~ (V)	额定电流 (A)	额定控制电压 U_c (V)	模数	订货号
1 常开 远动开关					
	230	16	~8	1	5TT5 511
			~12		5TT5 501
			⎓ 24,~24		5TT5 521
			⎓ 110,~110		5TT5 541
			⎓ 230,~230		5TT5 531
2 常开 远动开关					
	400	16	~8	1	5TT5 512
			~12		5TT5 502
			⎓ 24,~24		5TT5 522
			⎓ 110,~110		5TT5 542
			⎓ 230,~230		5TT5 532
3 常开 远动开关					
	400	16	~12	2	5TT5 503
			⎓ 24,~24		5TT5 523
			⎓ 110,~110		5TT5 543
			⎓ 230,~230		5TT5 533
1 转换 远动开关					
	230	16	~8	1	5TT5 516
			~12		5TT5 506
			⎓ 24,~24		5TT5 526
			⎓ 110,~110		5TT5 546
			⎓ 230,~230		5TT5 536
带通断中间位置的转换开关					
1 转换 	230	16	~230	1	5TT5 535
2 常开 	230	16	~230	1	5TT5 534
3 常开 	400	16	~230	2	5TT5 537

4

选型和技术数据 Selection and ordering data

Remote Switches

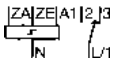
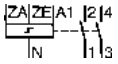
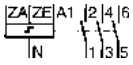
(Pulse switch)

- 16A, 8, 12, 24, 110, 230V and 400V, 50/60Hz
- According to DIN VDE 0637
- Conductor cross section up to 6 mm^2
- Maximum neon lamp load of pushbuttons at 230V: 10mA
- With protective device for pushbutton operation failure with100% ED
- With hand operation and switch position indication

	single -pole	multi-pole and 5TT5 511
• Incandescent lamp load:	2400 W	1200 W/pole
• Transformer for Halogen lamps	1200 W	800 W/pole
• Fluorescent lamps 58W:		
Uncompensated	25 units	25 units/pole
Parallel compensated	35 units	28 units/pole
DUO circuit	2 × 20 units	2 × 16 units/pole
ECG Siemens		
1-lamp	30 units	24 units/pole
2-lamp	2 × 15 units	2 × 12 units/pole

Application

For switching lighting loads using pushbuttons

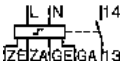
Contacts	Rated Voltage U_e~ (V)	Rated Current (A)	Rated Control Voltage U_c (V)	MW	Order No.
1NO remote switches					
	230	16	~8	1	5TT5 511
			~12		5TT5 501
			⎓ 24,~24		5TT5 521
			⎓ 110,~110		5TT5 541
			⎓ 230,~230		5TT5 531
2NO remote switches					
	400	16	~8	1	5TT5 512
			~12		5TT5 502
			⎓ 24,~24		5TT5 522
			⎓ 110,~110		5TT5 542
			⎓ 230,~230		5TT5 532
3NO remote switches					
	400	16	~12	2	5TT5 503
			⎓ 24,~24		5TT5 523
			⎓ 110,~110		5TT5 543
			⎓ 230,~230		5TT5 533
1CO remote switches					
	230	16	~8	1	5TT5 516
			~12		5TT5 506
			⎓ 24,~24		5TT5 526
			⎓ 110,~110		5TT5 546
			⎓ 230,~230		5TT5 536
Changeover switches with central ON/OFF switching					
1 CO 	230	16	~230	1	5TT5 535
2NO 	230	16	~230	1	5TT5 534
3NO 	400	16	~230	2	5TT5 537

选型和技术数据 Selection and ordering data

固态远动开关
带集中和分组开关
- 16A, 24V, 230V, 50Hz
- 符合标准 DIN VDE 0632
- 用于集中、分组和接通位置开关
- 带操作显示
- 导线截面至 2 x 2.5 mm²
- 线圈额定电压 6.4/6.6 VA 在 24 / 230 V U_e
- 白炽灯负载: 1500W/ 极
- 荧光灯 58 W
  - 带补偿 20 单元 / 极
  - 双回路 2 x 20 单元 / 极

Solid-state remote switches
With central and group switching
- 16A, 24V, 230V, 50Hz
- According to DIN VDE 0632
- For central group and on-site switching
- With operation display
- for conductor sizes up to 2 x 2.5 mm²
- Coil voltage rating 6.4/6.6 VA at 24 / 230 V U_e
- Incandescent lamp load: 1500 W/pole
- Fluorescent lamps 58 W:
  - Compensated 20 units/pole
  - DUO circuit 2 x 20 units/pole

应用 /Application:
根据供电系统的组成情况，可以选用全部的远动开关集中通断。另外也可以单独选用全部的远动开关进行分组通断。
通常负载也可以由房间里的开关进行通断。
Depending on the plant construction all central ON/OFF switches can be used. Additionally all the devices can be used separately and switched ON/OFF in groups. The load is switched conventionally via this room switch.

	额定电压 U_e~ Rated Voltage U_e~ (V)	额定电流 Rated Current (A)	额定控制电压 U_c Rated Control Voltage U_c (V)	模数 MW	订货号 Order No.
1 常开 /1NO	230	16	~24	2	5TE5 150
	230	16	~230	2	5TE5 151
2 常开 /2NO	230	16	~24	2	5TE5 152
	230	16	~230	2	5TE5 153

4

选型和技术数据 / Selection and ordering data

模数化接触器

应用: 家用和三类用途

- 20A, 230V, 50/60Hz; 24, 230V,50/60Hz
- 24, 40 或 63A, 400V, 50/60Hz; 24, 115, 230V, 50/60 Hz 或 24, 110, 220 V DC
- 符合标准 IEC 947, DIN VDE 0660
- 用于 DC/AC 操作
- 具有发光二极管工作显示

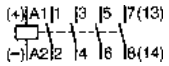
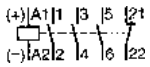
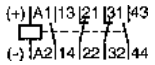
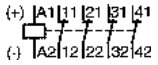
		20A	24A
• 导体截面至	mm^2	4	4
• 线圈额定功率损耗	VA	2.2	4
• 使用类别: AC-1:	A	20	24
AC-3:	kW	1.3	4
• 白炽灯负载:	W/ 极	1000	1500
• 荧光灯负载 58 W:			
无补偿	单元 / 极	10	15
并联补偿	单元 / 极	4	5
双回路	单元 / 极	2 x10	2 x15

Modular contactors

Application: domestic and tertiary uses

- 20A, 230V, 50/60Hz; 24, 230V,50/60Hz
- 24, 40 or 63A, 400V, 50/60Hz; 24, 115, 230V, 50/60 Hz or 24, 110, 220 V DC
- According to IEC 947, DIN VDE 0660
- for DC/AC operation
- for operation display with LED

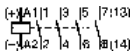
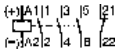
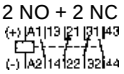
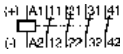
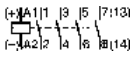
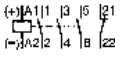
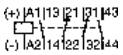
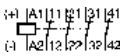
		20A	24A
• Conductor cross section up to	mm^2	4	4
• Rated power consumption of the coil:	VA	2.2	4
• User categories: AC-1:	A	20	24
AC-3:	kW	1.3	4
• Incandescent lamp load:	W/pole	1000	1500
• Fluorescent lamp load 58 W:			
Uncompensated	units/pole	10	15
Parallel compensated	units/pole	4	5
DUO circuit	units/pole	2 x10	2 x15

触头 Contacts	额定电压 U_e~ Rated Voltage U_e~ (V)	额定电流 Rated Current (A)	额定控制电压 U_c Rated ControlVoltage U_c (V)	模数 MW	订货号 Order No.
1 常开 /1NO	230	25	~230	1	5TT3864
			~24		5TT3874
1 常闭 /1NC	230	25	~230	1	5TT3865
			~24		5TT3875
2 常开 /2NO	400	20	~230	1	5TT3 861
			~24		5TT3 871
1 常开 + 常闭 1NO + 1NC	400	20	~230 ~24	1	5TT3 862 5TT3 872
					
2 常闭 /2NC	400	20	~230	1	5TT3 863
			~24		5TT3 873
4 常开 /4 NO	400	24	~230, ⎓220	2	5TT3 801
			~24, ⎓24		5TT3 811
			~115, ⎓110		5TT3 831
3 常开 + 1 常闭 3 NO + 1 NC	400	24	~230, ⎓220 ~24, ⎓24	2	5TT3 802 5TT3 812
					
2 常开 + 2 常闭 2 NO + 2 NC	400	24	~230, ⎓220 ~24, ⎓24	2	5TT3 803 5TT3 813
					
4 常闭 /4 NC	400	24	~230, ⎓220	2	5TT3 804
			~24, ⎓24		5TT3 814

选型和技术数据 Selection and ordering data

模数化接触器(续)/Modular contactors (continuation)

			40 A 常开 NO	40 A 常闭 NC	63 A 常开 NO	63 A 常闭 NC
• 导线截面至		mm²	16	16	16	16
•Conductor cross section up to						
• 线圈额定功率损耗:		VA	5	5	5	5
•Rated power consumption of the coil:						
• 使用类别:	AC-1:	A	40	40	63	63
•User categories:	AC-3:	KW	11	-	15	-
• 白炽灯负载:		W/ 极	3000	-	5000	-
•Incandescent lamp load:		W/pole				
• 荧光灯负载 58 W:						
•Fluorescent lamp load 58 W:						
无补偿		单元 / 极	40	-	40	-
Uncompensated		units/pole				
并联补偿		单元 / 极	25	-	43	-
Parallel compensated		units/pole				
双回路		单元 / 极	2 × 40	-	2 × 60	-
DUO circuit		units/pole				

	触头 Contacts	额定电压 U_e~ Rated Voltage U_e~ (V)	额定电流 Rated Current (A)	额定控制电压 U_c Rated Control Voltage U_c (V)	模数 MW	订货号 Order No.
	4 常开 /4 NO	400	40	~230, ⎓220	3	5TT3 806
				~24, ⎓24		5TT3 816
	3 常开 + 1 常闭	400	40	~230, ⎓220	3	5TT3 821
	3 NO + 1 NC			~24, ⎓24		5TT3 841
						
	2 常开 + 2 常闭	400	40	~230, ⎓220	3	5TT3 822
	2 NO + 2 NC			~24, ⎓24		5TT3 842
						
	4 常闭 /4 NC	400	40	~230, ⎓220	3	5TT3 823
				~24, ⎓24		5TT3 843
	4 常开 /4NO	400	63	~230, ⎓220	3	5TT3 807
				~24, ⎓24		5TT3 817
	3 常开 + 1 常闭	400	63	~230, ⎓220	3	5TT3 824
	3 NO + 1 NC			~24, ⎓24		5TT3 844
						
	2 常开 + 2 常闭	400	63	~230, ⎓220	3	5TT3 825
	2 NO + 2 NC			~24, ⎓24		5TT3 845
						
	4 常闭 /4 NC	400	63	~230, ⎓220	3	5TT3 826
				~24, ⎓24		5TT3 846

4

选型和技术数据 / Selection and ordering data

5TT 38.. 24 to 63 A 的附件
Accessories for 5TT 38.. 24 to 63 A

辅助开关 /Auxiliary current switch

安装在左侧 (每个接触器一个)/Retrofittable on the left side (1 piece per contactor)

触头 Contacts	额定电压 U_e~ Rated Voltage U_e~ (V)	额定电流 Rated Current (A)	额定控制电压 U_c Rated Control Voltage U_c (V)	模数 MW	订货号 Order No.
2 常开 /2NO	230	6		0,5	5TT3 891
1 常开 + 1 常闭 /1NO + 1 NC	230	6		0,5	5TT3 892
可封闭的端子盖 (2 片)/Sealable terminal cover (two pieces)					
用于接触器 5TT3 8, For contactors 5TT3 8,		24			5TT3 895
用于接触器 5TT3 8, For contactors 5TT3 8,		40, 63			5TT3 896

模数化接触器 /Modular contactors

应用: 工业领域

- 20A, 24V, 230 and 400V, 50/60Hz
- 符合标准 IEC 947, DIN VDE 0660
- 可铅封
- 线圈额定功率损耗: 3.5VA
- 导线截面至 4 mm²
- 使用类别: AC-1: 20 A, AC-3: 4 kW
- 白炽灯负载: 1600 W 极
- 荧光灯 58W:
  - 无补偿: 24 单元
  - 并联补偿: 10 单元
  - 双回路: 2 × 28 单元
  - 西门子电子整流器
  - 单灯: 30 单元
  - 双灯: 2 × 12 单元

Application: industrial use

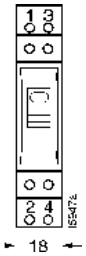
- 20A, 24V, 230 and 400V, 50/60Hz
- According to IEC 947, DIN VDE 0660
- Sealed
- Rated power consumption of the coil: 3.5VA
- Conductor cross section up to 4 mm²
- User categories: AC-1: 20 A, AC-3: 4 kW
- Incandescent lamp load: 1600 W/pole
- Fluorescent lamps 58 W:
  - Uncompensated: 24 units
  - Parallel compensated: 10 units
  - DUO circuit: 2 × 28 units
  - ECG Siemens
  - 1-lamp: 30 units
  - 2-lamp: 2 × 12 units

4 常开	400	20	⎓24	3	5TT3 986
4 NO			~24		5TT3 985
			~110		5TT3 984
			~230		5TT3 983
3 常开 + 1 常闭	400	20	⎓24	3	5TT3 991
3 NO + 1 NC			~24		5TT3 990
			~110		5TT3 988
			~230		5TT3 987

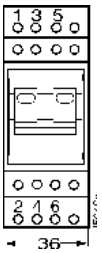
外形尺寸 Dimension drawings

隔离开关
Switch disconnectors

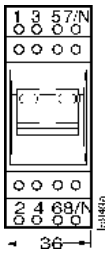
5TE7 111



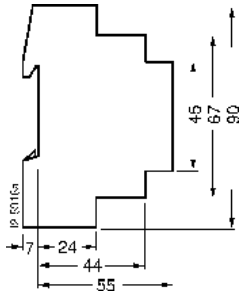
5TE7 112

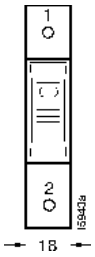


5TE7 113
5TE7 313

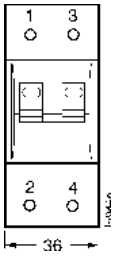


5TE7 314

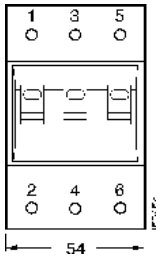




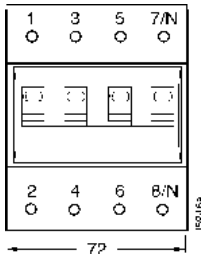
5TE7 411
5TE7 511
5TE7 611
5TE7 711



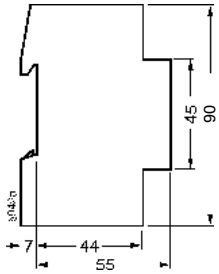
5TE7 412
5TE7 512
5TE7 612
5TE7 712

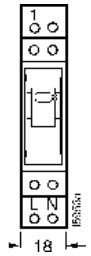


5TE7 413
5TE7 513 (-2)
5TE7 613
5TE7 713
5TE7813

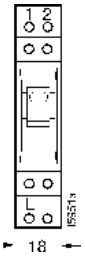


5TE7 414
5TE7 514 (-2)
5TE7 614
5TE7 714

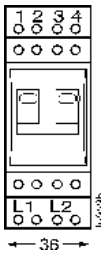




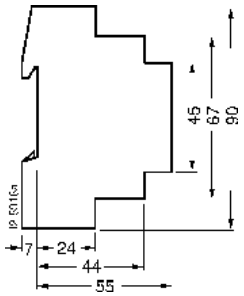
5TE7 101



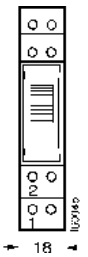
5TE7 141
5TE7 161



5TE7 142
5TE7 162

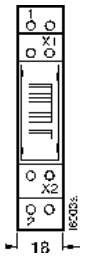


按钮
Pushbuttons

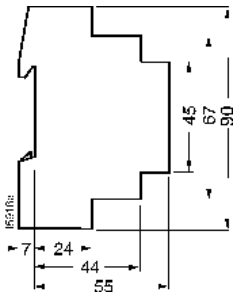


5TE4 700

5TE4 701



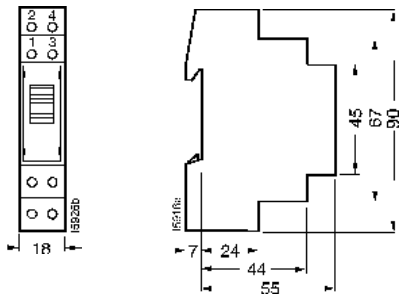
5TE4 702



4

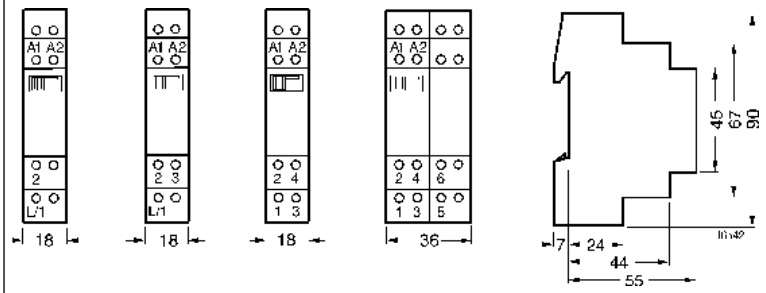
外形尺寸 Dimension drawings

指示灯
Indicator light

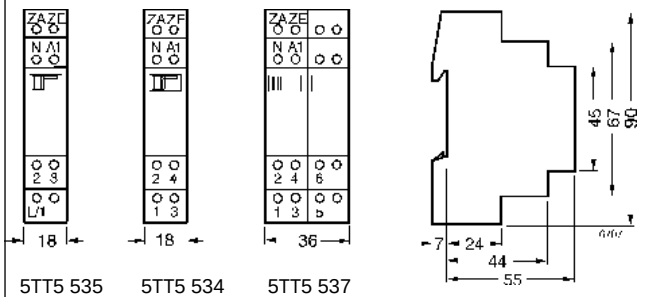


5TE5 700

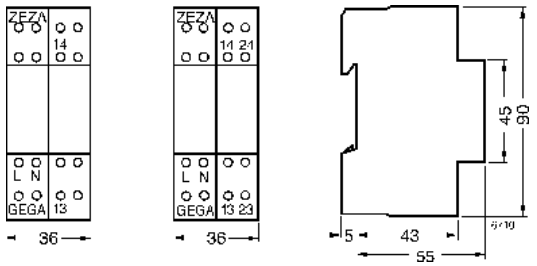
远动开关
Remote switches



5TT5 501	5TT5 506	5TT5 502	5TT5 503
5TT5 511	5TT5 516	5TT5 512	5TT5 523
5TT5 521	5TT5 526	5TT5 522	5TT5 533
5TT5 531	5TT5 536	5TT5 532	5TT5 543
5TT5 541	5TT5 546	5TT5 542	



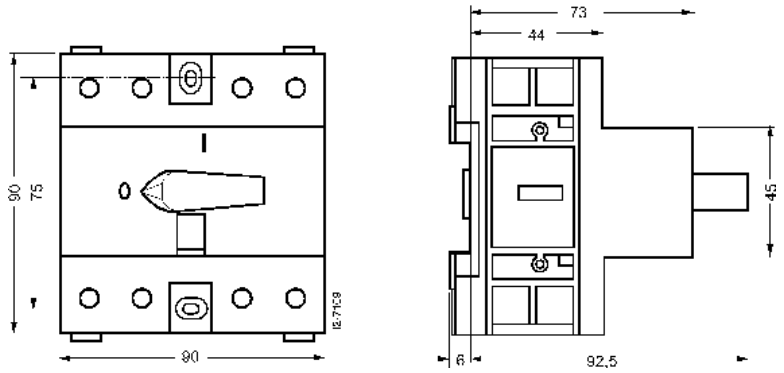
5TT5 535 5TT5 534 5TT5 537



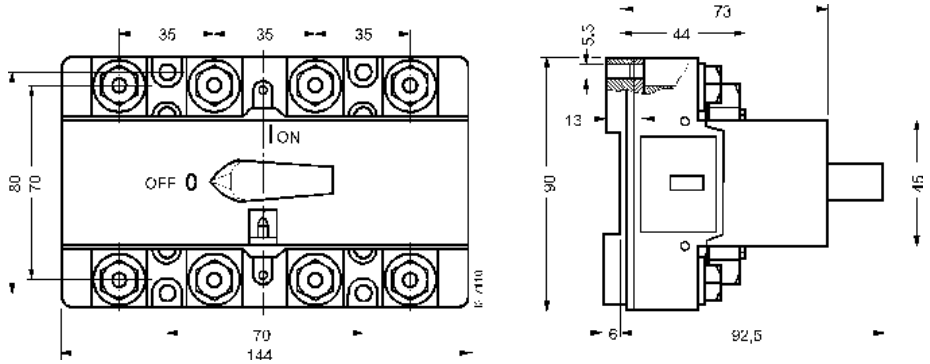
5TT5 150	5TT5 152
5TT5 151	5TT5 153

外形尺寸 Dimension drawings

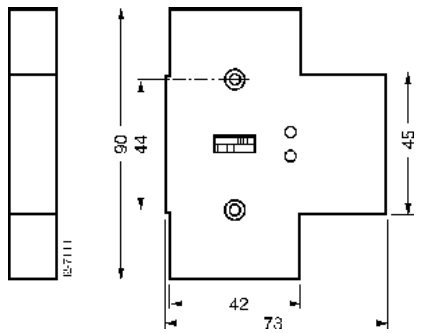
隔离开关 5TE1 100 和 125 A
Disconnectors 5TE1 100 and 125 A



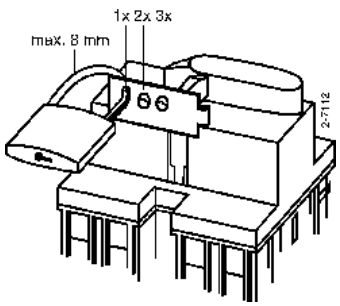
隔离开关 5TE1 160 和 200 A
Disconnectors 5TE1 160 and 200 A



辅助开关 5TE9
Auxiliary current switch 5TE9
5TE9 005, 5TE9 006



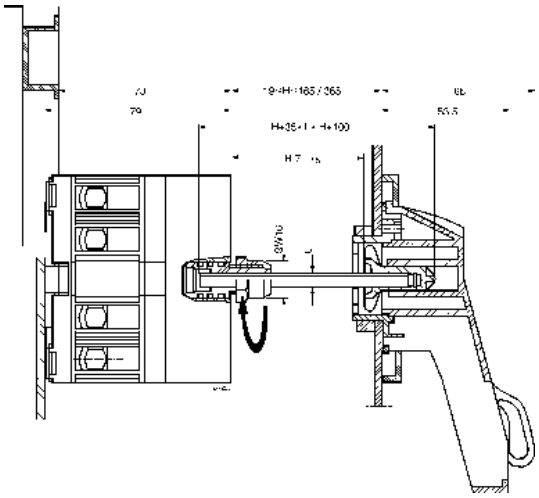
手柄锁定装置 5TE9 014
Handle padlock device 5TE9 014

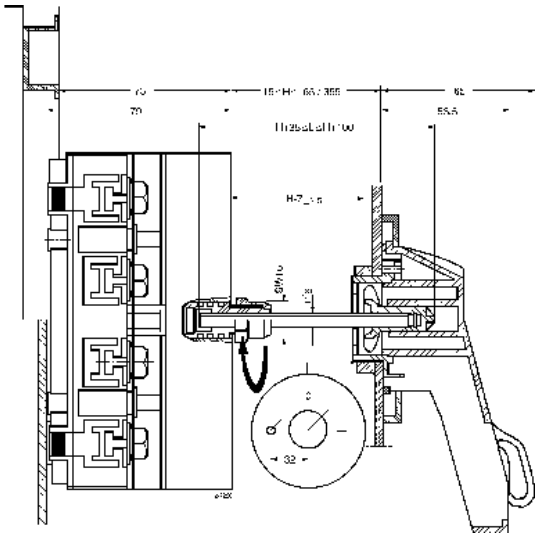


4

外形尺寸 Dimension drawings

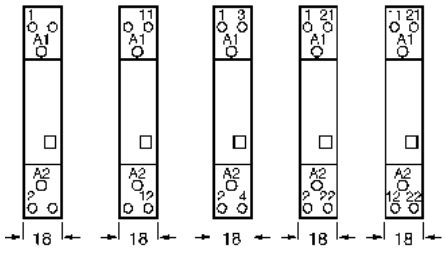
用于门和罩壳的旋转手柄
适用于 100A 和 125A 隔离开关
Rotary drive, for fitting in doors and covers
For disconnectors 100 A and 125 A
5TE9 010, 5TE9 011
5TE9 012, 5TE9 013





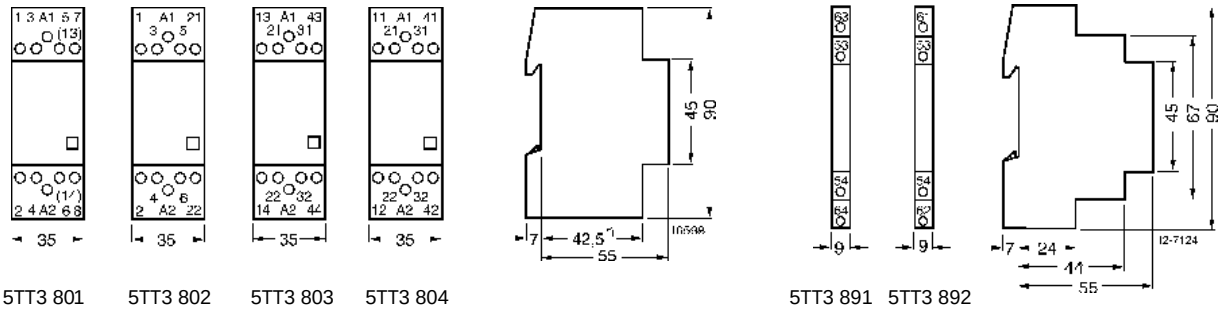
外形尺寸 Dimension drawings

模数化接触器
Modular Contactor



5TT3 864 5TT3 865
5TT3 874 5TT3 875

5TT3 861 5TT3 862 5TT3 863
5TT3 871 5TT3 872 5TT3 873



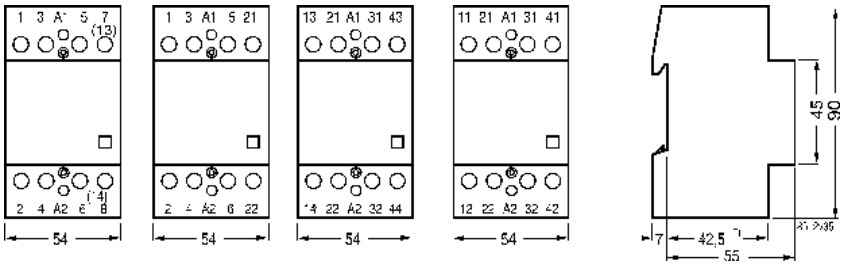
5TT3 801
5TT3 811
5TT3 831

5TT3 802
5TT3 812

5TT3 803
5TT3 813

5TT3 804
5TT3 814

5TT3 891 5TT3 892

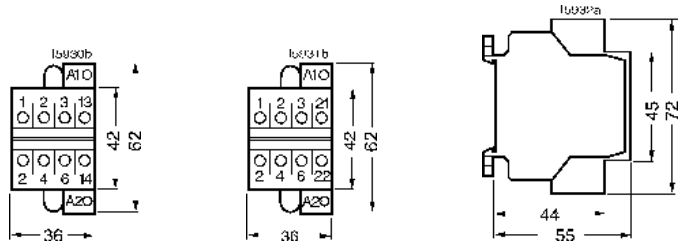


5TT3 806
5TT3 816
5TT3 807
5TT3 817

5TT3 821
5TT3 841
5TT3 824
5TT3 844

5TT3 822
5TT3 842
5TT3 825
5TT3 845

5TT3 823
5TT3 843
5TT3 826
5TT3 846



5TT3 983
5TT3 984
5TT3 985
5TT3 986

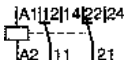
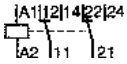
5TT3 987
5TT3 988
5TT3 990
5TT3 991

4

选型和技术数据 Selection and ordering data

控制继电器
- 16A, 8, 12, 24, 110, 230V,50Hz
- 符合标准 DIN VDE 0435
- 安全隔离符合 DIN VDE 0106 第 101 部分标准
- 带操作显示
- 导线截面至 2 x 2.5 mm²
- 线圈额定功率 1.8/2.1 VA
- 白炽灯负载: 1500W/ 极
- 荧光灯 58W:
  - 无补偿 20 单元 / 极
  - 双回路 2 × 20 单元 / 极

应用
用在控制系统中通断较小的负载或通断白炽灯和日光灯。

触头	额定电压 U_e~ (V)	额定电流 (A)	额定控制电压 U_c (V)	模数	订货号
1 常开 	230	16	~8	1	5TT3 041
			~12		5TT3 042
			~24		5TT3 043
			~110		5TT3 044
			~230		5TT3 045
2 常开 	230	16	~8	1	5TT3 051
			~12		5TT3 052
			~24		5TT3 053
			~110		5TT3 054
			~230		5TT3 055
1 转换 	230	16	~8	1	5TT3 061
			~12		5TT3 062
			~24		5TT3 063
			~110		5TT3 064
			~230		5TT3 065
2 转换 	400	16	~8	1	5TT3 071
			~12		5TT3 072
			~24		5TT3 073
			~110		5TT3 074
			~230		5TT3 075
2 转换 	230	16	⎓12	1	5TT3 078
			⎓24		5TT3 076
			⎓110		5TT3 077

可铅封
在持续工作制时，电器之间需保持 7.5mm 的距离。

1 转换 	230	16	~230	1	5TT3 080

控制继电器
用于电容性负载
- 16A, 230V,50Hz
- 符合标准 DIN VDE 0435
- 安全隔离符合 DIN VDE 0106 第 101 部分标准
- 带操作显示
- 导线截面至 2 x 2.5 mm²
- 线圈额定功率 1.8W
- 白炽灯负载 1500W/ 极
- 荧光灯 58W:
  - 并联补偿 13 单元
  - 无补偿 20 单元
  - 双回路 2 × 20 单元
- 金属－卤化物灯
  - 400W, 230V AC 2 单元
  - 1000W, 230V AC 1 单元

应用
专门用于通断电容性照明负载，如日光灯或高压和卤化物金属－蒸汽灯

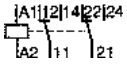
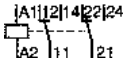
1 常开 	230	16	~230	1	5TT3 081

Switching Relays

- 16A, 8, 12, 24, 110, 230V,50Hz
- According to DIN VDE 0435
- Safe isolation according to DIN VDE 0106 Part 101
- With operation display
- Conductor cross section up to 2 x 2.5 mm²
- Coil rating 1.8/2.1 VA
- Incandescent lamp load: 1500W/pole
- Fluorescent lamps 58W:
  Uncompensated 20 units/pole
  DUO circuit 2 x 20 units/pole

Application

For switching of small loads in control systems or switching of incandescent/fluorescent lamps.

Contacts	Rated Voltage U_e~ (V)	Rated Current (A)	Rated Control Voltage U_c (V)	MW	Order No.
1NO 	230	16	~8	1	5TT3 041
			~12		5TT3 042
			~24		5TT3 043
			~110		5TT3 044
			~230		5TT3 045
2NO 	230	16	~8	1	5TT3 051
			~12		5TT3 052
			~24		5TT3 053
			~110		5TT3 054
			~230		5TT3 055
1CO 	230	16	~8	1	5TT3 061
			~12		5TT3 062
			~24		5TT3 063
			~110		5TT3 064
			~230		5TT3 065
2CO 	400	16	~8	1	5TT3 071
			~12		5TT3 072
			~24		5TT3 073
			~110		5TT3 074
			~230		5TT3 075
2CO 	230	16	⎓12	1	5TT3 078
			⎓24		5TT3 076
			⎓110		5TT3 077

Sealable version

When the device is continuously switched a clearance of 7.5 mm between the devices must be adhered to.

1CO 	230	16	~230	1	5TT3 080

Switching relays

For capacative loads

- 16A, 230V,50Hz
- According to DIN VDE 0435
- Safe isolation according to DIN VDE 0106 Part 101
- With operation display
- Conductor cross section up to 2 x 2.5 mm²
- Coil rating 1.8 W
- Incandescent lamp load: 1500 W/pole
- Fluorescent lamps 58W:
  Parallel compensation 13 units
  Uncompensated 20 units
  DUO circuit 2 x 20 units
- Halogen metal-vapour lamp
  400W, 230V AC 2 units
  1000W, 230V AC 1 units

Application

Special switching of capacative lighting, with incandescent lamps with high pressure and halogen metal-vapour lamps

1 NO 	230	16	~230	1	5TT3 081

4

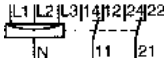
选型和技术数据 / Selection and ordering data

欠电压/过电压继电器

- 4A, 230V, 50/60 Hz; 230/400V, 50/60Hz
- 符合标准 IEC 255, DIN VDE 0435
- 导线截面至 2 x 2,5 mm²
- 保护范围:
  - 过电压
  - 欠电压
  - 断相
  - 相间不平衡对称度 6 to 8%
- 三相对中性线的检测
- 发光二极管监控
- 可调延时 0,1 - 20s
- 可调节: 过电压 U_{ab} = 0,9-1,3Uc
  欠电压 U_{ab} = 0,7-1,1Uc
  滞后: U_{an} = 4%

Undervoltage/overvoltage Relay

- 4A, 230V, 50/60 Hz; 230/400V, 50/60Hz
- According IEC 255, DIN VDE 0435
- Conductor cross section up to 2 x 2,5 mm²
- Recognition:
  - Overvoltage
  - Undervoltage
  - Phase failure
  - Asymmetrical 6 to 8% of the phase symmetrie
- Monitoring 3 phases with respect to N
- LED diagnostics
- Adjustable time delay 0,1 - 20s
- Adjustable : Overvoltage U_{ab} = 0,9-1,3Uc
  Undervlotage U_{ab} = 0,7-1,1Uc
  Hysterese: U_{an} = 4%



额定电压 U_e~ Rated Voltage U_e~ (V)	额定电流 Rated Current (A)	额定控制电压 U_c (V) Rated Control Voltage U_c (V)	模数 MW	订货号 Order No.
230	4	~230/400	2	5TT3 408

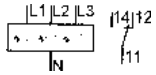
相和相序监视器

- 4A, 230V, 50/60Hz; 230/400V, 50/60Hz
- 符合 IEC 255, DIN VDE 0435
- 1 转换
- 用于每相监视的发光二极管(相监视器部分)
  和用于相序监视的发光二极管(相序监视器部分)

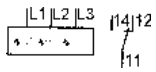
Phase monitor and phase sequence monitor

- 4A, 230V, 50/60Hz; 230/400V, 50/60Hz
- According IEC 255, DIN VDE 0435
- 1 Changeover
- LED for each phase (phase monitor version)
  And LED for phase sequence (phase sequence monitor version)

相监视器: (任何相序) 相故障 Phase monitor: (any phase sequence) Phase failure	230	4	~230/400	1	5TT3 421



相序监视器: 三相电网中的相序判别 Phase sequence monitor: Identify the phase sequence in three phase networks	230	4	~230/400	1	5TT3 423



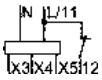
选型和技术数据 / Selection and ordering data

电流监视器

- 5A,230V, 50/60Hz; 230V, 50/60Hz
- 符合标准 IEC 255, DIN VDE 0435
- 判别:
  - 短路
  - 过载
  - 欠载
- 3 种测量范围至 400VA

Current Monitor

- 5A,230V, 50/60Hz; 230V, 50/60Hz
- According IEC 255, DIN VDE 0435
- Identifying:
  - short-circuit
  - overload
  - underload
- 3 measuring ranges up to 400VA



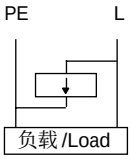
额定电压 U_e~ Rated Voltage U_e~ (V)	额定电流 Rated Current (A)	额定控制电压 U_c Rated Control Voltage U_c (V)	模数 MW	订货号 Order No.
230	5	~230	2	5TT6 110

过电压保护器

- 230 / 400V 电网。U_{emax}: 275V AC / 350 V DC
- 符合标准 DIN VDE 0675
- 使用等级 C (IEC 664)
- 冲击电流 (8 / 20 µs): 15kA
- 红色故障信号指示

Overvoltage Protection

- 230 / 400V Networks. U_{emax}: 275V AC / 350 V DC
- according DIN VDE 0675
- user class C (IEC 664)
- Inrushcurrent (8 / 20 µs): 15kA
- Signals failure with red indicator



单极
one pole

模数 MW	订货号 Order No.
1	5SD7 052

选型和技术数据 / Selection and ordering data

数字式时间开关
- 符合标准 IEC 255 和 EN 60703
- 安装导轨 35mm
- 自动 夏令 / 冬令 时间开关
- 手动 / 自动 开关
- 50 小时运行模式
- 触点 : 10 A 和 16 A, 4 A 和 2.5 A P.f. = 0.6
- 白炽灯负载 : 400W
- 温度范围 : -10,...+55ºC
- 最小通断间歇时间: 1 分钟
- 误差范围 : ± 2.5 和± 1.0 s/ 全日制

Digital time switches
- According to IEC 255 and EN 60703
- Rail mounting 35mm
- Automatic summer/winter time switching
- Manual / automatic switching
- 50 hours running reserve
- contact : 10 A and 16 A, 4 A and 2.5 A P.f. = 0.6
- incandescent load : 400W
- Temperature range : -10,...+55ºC
- Minimum switching interval: 1 minute
- Time error : ± 2.5 and ± 1.0 s/day type

触头 Contacts	额定电压 U_e~ Rated Voltage U_e~ (V)	额定电流 Rated Current (A)	额定控制电压 U_c Rated Control Voltage U_c (V)	模数 MW	订货号 Order No.
日程序 /Daily program 6 × 通 - 断 /6 × ON-OFF 1 转换 /1 CO	250	16	~230	2	7LF4 110
周程序 /Weekly program 14 × 通 - 断 /14 × ON-OFF 1 转换 /1 CO	250	16	~230 ~24 ~12	2	7LF4 111 7LF4 112 7LF4 113
周循环和脉冲程序 /Weekly with cycle and pulse program 1 转换 /1 CO	250	16	~230	2	7LF4 114

周程序 /Weekly program 2 × 21 通 - 断 /2 × 21 on-off 2 转换 /2 CO	250	16	~230	2	7LF4 120
周循环和脉冲程序 /Weekly with cycle and pulse program 2 × 21 通 - 断 /2 × 21 on-off 2 转换 /2 CO	250	16	~230	2	7LF4 121

选型和技术数据 Selection and ordering data

7LF4 1 型数字时间开关
年度计划／每周计划
对于 DCF77 无线电控制信号，须有
- 70 小时备用电源
- 105 个开关点
- 1.0 秒／天运行精度
- 单日开关循环、随机和脉冲程序

7LF4 1 digital time switches
Yearly/weekly program
For DCF 77 radio-controlled signal
- 70 h power reserve
- 105 switching points
- 1.0 s/day typical running accuracy
- With cycle, random and pulse program with single date switching

	额定电压 U_e ~ Rated voltage U_e ~ (V)	额定电流 I_e Rated current I_e A	额定控制电压 U_e ~ Rated control voltage U_e ~ (V)	模数 MW	订货号 Order No.
1 个通道，105 个开关点 1 channel, 105 switching points	250	10	230	3	7LF4 150
2 个通道，2X53 个开关点 1 channels, 2X53 switching points	250	10	230	3	7LF4 151
3 个通道，3X35 个开关点 3 channels, 3X35 switching points	250	10	230 24 12	3	7LF4 152 7LF4 153 7LF4 154

4

选型和技术数据 / Selection and ordering data

感光电子开关

- 220 to 240V, 50Hz
- 触点:μ-触头 10A, 16A, 2.5A P.f. = 0.6
- 白炽灯负载: 1000W
- 温度范围:
  感光器 -30 至 + 70ºC
  设备 -20 至 + 55ºC
- 防护等级: 感光器 IP 65
- 设置范围: 2 至 300 lux, 200 至 20 000 lux
- 滞后: 整定值的 1.3 倍
  50 s 通 /50 s 断，无延时
- 导线截面至: 4 mm²
- 感光器: 导线长度最大为 100 m
  导线截面最大为 2 × 0.75 mm²

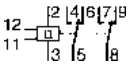
Photo Electric Switches

- 220 to 240V, 50Hz
- Contact: μ-contact 10A, 16A 2.5A P.f. = 0.6
- Incandescent lamp load: 1000W
- Temperature range:
  Light sensor -30 to + 70ºC
  Device -20 to + 55ºC
- Degree of protection: Light sensor IP 65
- Setting ranges: 2 to 300 lux, 200 to 20 000 lux
- Hysterisis: Factor 1.3 from set value
  50 s ON/50 s OFF, undelayed
- Conductor cross section up to 4 mm²
- Light sensor: max. cable length 100 m
  max. cable cross section 2 × 0.75. mm²

应用 /Applications

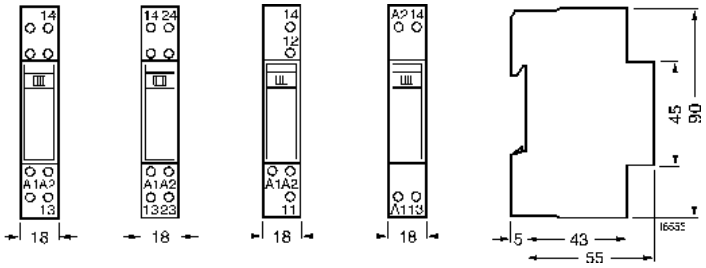
用于自动通断橱窗或走道的照明设备，它们是装在日光充分时不需要照明的场合

For automatic switching of lighting systems for e.g. shop window displays or footpaths where lighting is not necessary when there is sufficient daylight.

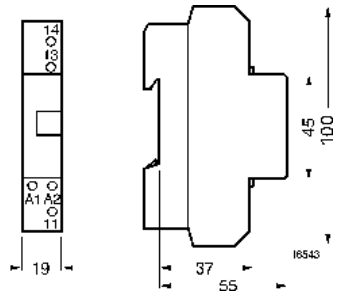
	额定电压 U_e~ Rated Voltage U_e~ (V)	额定电流 Rated Current (A)	额定控制电压 U_c(V) Rated Control Voltge U_c (V)	模数 MW	订货号 Order No.
 1 通道 模式 1 转换 1 channel model 1 CO 	250	16	~230	2	5TT3 301
 2 通道 模式 2 转换 2 channel model 2 CO 	250	10	~230	3	5TT3 302
 感光器(墙式安装) Light sensor (With wall mounting)					5TT3 390

外形尺寸 Dimension drawings

模数化继电器
Modular relays



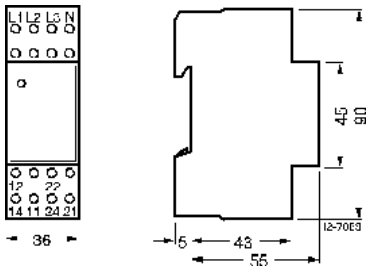
5TT3 04. 5TT3 05. 5TT3 06. 5TT3 07.
5TT3 081



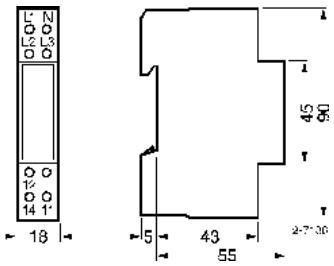
5TT3 080 可铅封
Sealable version

模数化产品 Modular devices

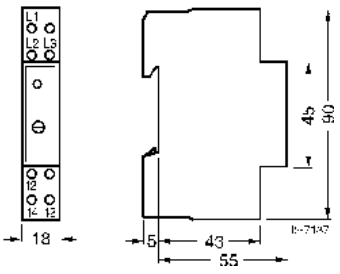
欠电压 / 过电压继电器
Under/overvoltage relay
5TT3 408



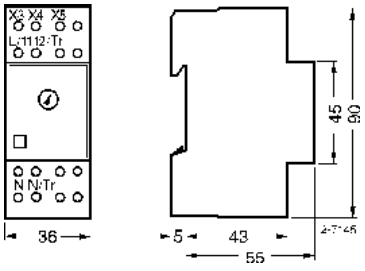
相监视器
Phase monitor
5TT3 421



相同步监视器
Phase sequence monitor
5TT3 423



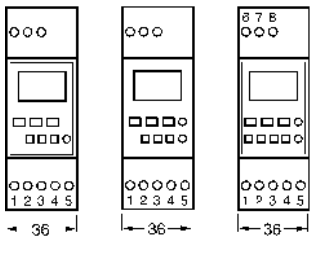
电流监视器
Current monitor
5TT6 110



4

外形尺寸 Dimension drawings

数字式时间开关
Digital time switches

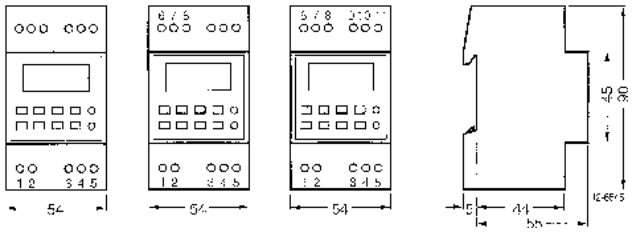


7LF4 110
7LF4 111
7LF4 112
7LF4 113

7LF4 114

7LF4 120
7LF4 121

模数装置
Modular devices

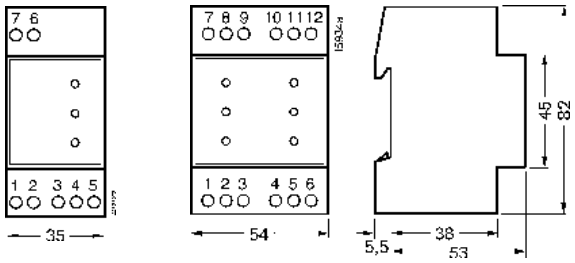


7LF4 150

7LF4 151

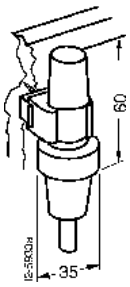
7LF4 152
7LF4 153
7LF4 154

感光电子开关
Photo Electric Switches



5TT3 301

5TT3 302



5TT3 390

说明 Description

雷雨不再构成威胁
避雷器和过电压保护电器的协调使用
昂贵的电子设备日益广泛地应用于各行各业，如商业、工业、政府机构以及家庭。静电放电、操作过电压或雷击过电压常常是引发这些高灵敏设备产生事故的主要原因。特别是在雷击时，方圆 1.5km 范围中的电子设备由于电磁场的作用与电线传导的过电压而遭致损坏。然而，当前的技术水平已能建立起有效的保护。

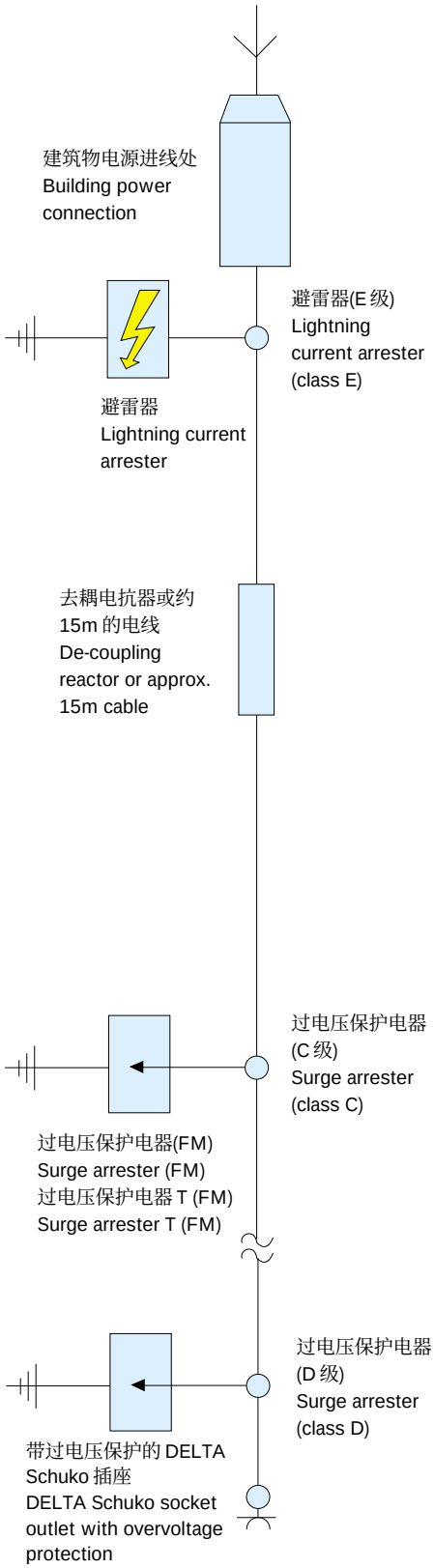
电力系统和电厂的过电压保护电器，按照 DIN VDE0675-6(11.89)的规定，它们的使用范围可分为 A、B、C、D 四个级别。西门子公司提供的B-D级的过电压保护电器涵盖了低压侧从配电设备到插座的全部电气安装领域。

在配电系统内，B 和 C 级过电压保护电器可卡装在符合 EN50022 规定的 35mm 的帽型安装轨上。D 级过电压保护模块用来保护灵敏电子设备(如PC)，可安装在模数DELTA Schuko插座上。

在德国每年约发生 100 万次雷击，所产生的过电压对电子设备构成潜在危害。

Thunderstorms - no problem
Coordinated use of lightning current-and surge arresters

Wolfgang Pilsl
Expensive electronic equipment is being increasingly used in all kinds of businesses - industry, government and local government facilities and domestic households. Electrostatic discharge, overvoltage caused by switching or by lightning often cause these highly sensitive units to fail. Electronic equipment is especially prone up to 1.5km way from lightning strikes due to the electromagnetic fields and cable-borne overvoltages. However, effective protection is now available.
Overvoltage protective devices for power systems and plants are subdivided into Classes A, B, C and D depending on their application areas, according to DIN VDE 0675-6 (11.89). Siemens offers overvoltage protective devices for Classes B to D, which cover the complete installation on the low-voltage side, from the distribution up to the socket outlet.
In distribution systems, Class B and C devices are snapped onto 35 mm mounting rails, conforming to EN 50022. Class D overvoltage protective modules can protect sensitive electronic equipment such as PCs. They can be mounted on the modular DELTA Schuko socket outlets.
In Germany, approximately one million lightning strikes per year represent a potential hazard for electronic equipment due to overvoltages.



从能量角度考虑的西门子避雷器和过电压保护电器的协调使用，从而可避免电子设备的损坏以及事故造成的费用损失
The coording ated use of Siemens lightning arresters and surge arresters from an energy perspective avoids damage and subsequent costs

4

说明 / Description

面向电磁兼容性(EMC)的雷电保护区域新概念

按照DIN VDE0185 规定的经典的"外部和内部雷电保护概念", 对于拥有大量电子设备的工厂和供电系统已不再满足要求。于是出现了 DIN IEC1312-1(VDE 0185 第103部分)中规定的最近时兴的面向 EMC 的雷电保护区域新概念。

在建筑物内外的这些区域是受到屏蔽措施的限制, 如采用金属罩壳(金属面板、护板、金属壳体等)。

雷电保护区域的划分是采用标识数字 0~3。0A保护区域是直接受到雷击的地方, 由这里辐射出未衰减的雷击电磁场(LEMP); 其次的 0B 区域是指没有直接受到雷击, 但却处于强的电磁场。

保护区域 1 已位于建筑物内, 直接在外墙的屏蔽措施之后, 如混凝土立面的钢护板后面。此处的电磁场要弱得多(一般为 30dB)。

在保护区域 2 中的终端电器可采用集中保护, 例如通过保护和中性共用线而大大减弱电磁场。

保护区域3是电子设备或装置内部需要保护的范围。

保护区域1~3在采取下述措施后可保证电子设备不受干扰地工作, 即使在雷击造成的干扰电磁环境中也可不受干扰。

立足能量观点正确地协调使用避雷器和过电压保护电器

面向 EMC 的雷电保护区域新概念对避雷器和过电压保护电器的安装地点做了规定并对它们提出了具体的要求。

从保护区域0A到保护区域1的过渡范围中, 避雷器必须接受大部分雷电电流。这样, 位于其后的、置于其它各区域中的过电压保护电器就不会遭致损坏, 确保完成它们的任务。避雷器有火花间隙, 它将直接雷击的冲击电流波(10/350ms)削减到较弱的冲击电流波。此时火花间隙必须能够可靠地断开在泄放过程中产生的电网后续电流。远距离雷击时的冲击电压可产生(8/20ms)的冲击电流波。

在保护区域1至保护区域2的过渡范围中, 必须泄放剩余的冲击电流波, 并将电压减至供电系统或设备能够承受的水平。最适合的辅助手段是配装一个金属氧化物压敏电阻。它具有快速响应的动作特性和很小的剩余电压。

在保护区域2至保护区域3的过渡范围中, 要特别注意终端电器。压敏电阻限制了由通断过程和磁感应而在相线和中性线之间产生的过电压。最好是用充气的火花间隙将冲击电流引入大地。

主要优点

- 从配电屏到插座的过电压保护和雷电保护。
- B和C级电压保护电器可卡装到35mm安装轨上。
- D级过电压避雷器可装在DELTA Schuko插座上。
- 避雷器和过电压保护电器均符合DIN IEC1312-1(VDE 0185第103部分)中规定的面向EMV雷电保护区域新概念中提出的各项要求。

立足能量观点, 协调使用避雷器和过电压保护电器, 这可和强电领域中的熔断器的选择性相比较。这与熔断器的选择性分级一样, 在过电压保护电器的尺寸设计时, 应考虑到位于其后面保护区域中的过电压保护电器在出现过电压时不会发生过载。

A concept for EMC-oriented lightning protection zones

The classic "outer and inner lightning protection concept" according to DIN VDE 0185 has proven itself to be no longer adequate for plants and systems with a substantial amount of electronic equipment. This is where the newly-developed concept of the EMC-oriented lightning protection zones, according to DIN IEC 1312-1 (VDE 0185 Part 103), comes into its own.
These zones, inside and outside a building, are limited by screening measures, which are provided, for example, suing metal enclosures (metal facades, covers, metal housing etc.).
Lightning protection zones are classified according to numbers 0 to 3. In this case, protection zone 0A is the location where the lightning directly strikes. The undampened, electromagnetic field of the lightning (LEMP) radiates from here. The next zone 0B indicates that there is no direct lightning strike, but the zone is saturated with strong electromagnetic fields.
Protection zone 1 is located within a building, directly behind the screening effect of the external wall (e.g. steel reinforcement structure of concrete facades). The electromagnetic field is considerably weaker here (typically 30 dB).
Terminal devices are centrally protected in protection zone 2. This is achieved by ensuring that the electromagnetic field is significantly reduced, e.g. using potential bonding rails.
Protection zone 3 is the protected zone within and electronic device or unit.
Protection zones 1 to 3 guarantee disturbance-free operation of electronic equipment using the subsequently described measures, even in a noisy electromagnetic environment caused by lightning strikes.

Arresters correctly coordinated from the energy perspective

The concept of EMC-oriented lightning protection zones defines, among other things, the locations of arresters as well as the demands placed on them.
At the transition from protection zone 0A to protection zone 1, lightning current arresters must accept a large proportion of the lightning current, so that the surge arresters in the following zones can still fulfill their fuction, undamaged. Lightning current arresters have spark gaps with which the impulse wave of the direct lightning strike (10/350ms) is reduced to a weaker impulse wave. In this case, the spark gap must also be able to reliably interrupt the subsequent current at discharge. Surge voltages for remote lightning strikes result in surge current waves of 8/20ms.
At the transition from protection zone 1 to protection zone 2, the remaining surge current wave must be discharged and the voltages reduced to a level which the system or plant can handle. A metal oxide varistor is the optimum device (a varistor is a voltage-dependent resistor) which has fast response characteristics and low residual voltages.
The transition from protection zone 2 to protection zone 3 is especially oriented to the terminal devices. Varistors limit the voervoltages between the phase and neutral conductors caused by switching operations and magnetic induction. The surge currents are best discharged to ground using gas-filled spark gaps.

Advantages at a glance

- Overvoltage- and lightning protection from the distribution up to the socket outlet
- Class B and C surge arresters can be snapped onto 35mm mounting rails
- Class D overvoltage arresters can be mounted on DELTA Schuko socket outlets
- Protective devices according to the requirements of the EMC-oriented lightning protection concept according to DIN IEC 1312-1 (VDE 0185 Part 103)

The coordination of lightning current arresters and overvoltage arresters from a energy perspective can be essentially compared with the discrimination of fuses in power circuits. Just like grading fuses ,surge arresters must be dimensioned so that ther do not overload the arresters of the following protection zones when overvoltages occur.

主配电屏中安装的避雷器
Lightning arrester fitted in a main distribution board

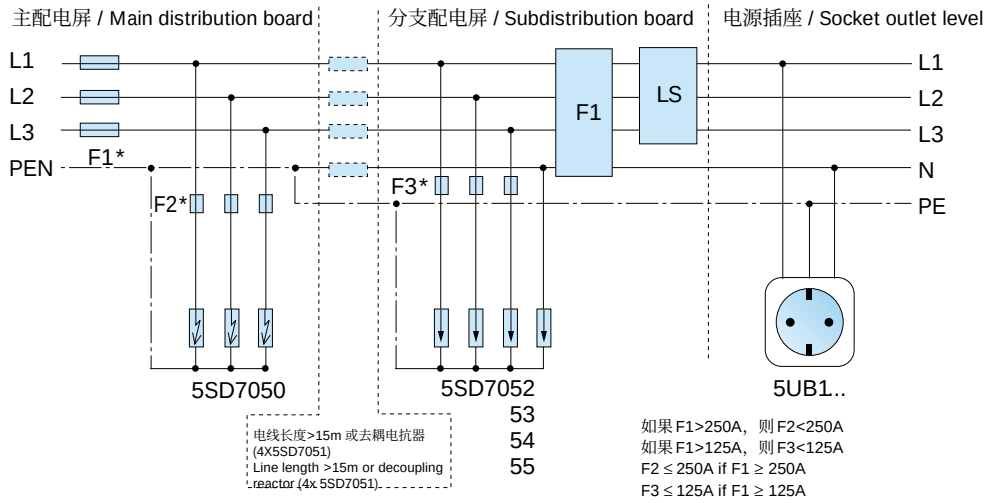
分支配电屏中与小型断路器一起安装的过电压保护电器
Surge arrester fitted in combination with miniature circuit breakers in a subdistribution board

技术参数							Technical data
	避雷器 Lighting arrester	过电压保护器 Surge arrester				过电压保护插座 Surge arrester socket	去耦电抗器 Decoupling reactor
订货号 Order No.	5SD7 050	5SD7 052	5SD7 053	5SD7 054	5SD7 055	5 UB1... 5 UH1...	5SD7 051
测试 / TESTED	E DIN VDE 0675, Part 6/11.89 and Part 6/A1/03.96						
需求等级 Requirement categroy	B	C				D	
额定电压 Rated voltage Uc of arrester (最大允许操作电压) (max. permissible operating voltage)	255V/50Hz	275/50Hz				255/50Hz	
正常电压 / Nominal voltage	230V/50Hz						500V/50Hz
额定控制电压下切断后续电流 Follow current quenching at Uc	$4kA_{rms}$						
放电能力 / Discharge capacity 1 极(10/350) limp 1 极(8/20) Isn 1 极(8/20) Isnmax	75kA	15kA 40kA				3kA L(N)->PE, L->N 5kA L+N->PE	
保护等级 / Protective level Up	<=3.5kV	<=1kV				<=1.25kV/<=1.5kV	
反应时间 Response time tA	<=100ns	<=25ns				25ns L->N 100ns L(N)->PE	
最大后备熔断器, 如果电源系统中没有事先安装 Max. back-up fuse, if not already fitted in power system	250A gL/gG	125A gL/gG				16A gL/gG or C16A	35A gL/gG
有最大后备熔断器的短路强度 Short-circuit strength with max. back-up fuse	50kA/50Hz						
最小连接导线截面 Min. connecting conductor cross-section	$10mm^2$ 单芯 / 多芯 $10mm^2$ solid /stranded	$1.5mm^2$ 单芯 / 多芯 $1.5mm^2$ solid/stranded				$0.75mm^2$	$1.5mm^2$ 单芯 / 多芯 $1.5mm^2$ solid/stranded
最大连接导线截面 Max. connecting conductor cross-section	$50mm^2$ 多芯 /$35mm^2$ 多芯 $50mm^2$ stranded / $35mm^2$ stranded	$35mm^2$ 多芯/$25mm^2$ 多芯 $35mm^2$ stranded/$25mm^2$ stranded				$2.5mm^2$	$35mm^2$ 多芯 /$25mm^2$ 多芯 $35mm^2$ stranded /$25mm^2$ stranded
温度范围 / Temperature range	(-40°C...+80°C)					(-25°C...+80°C)	(-40°C...+80°C)
防护等级 / Degree of protection	IP20					IP20	IP20
安装 / Mounting	符合 IEC 50022 标准的 35mm 安装导轨 35mm mounting rail to IEC 50022					表面安装 Surface mounting	see arrester
安装尺寸符合 DIN43880 Mounting dimensions to DIN 43880	2MW	1MW					2MW
名义电流 / Nominal current In							35A
名义感抗 / Nominal inductance Ln							15µH±20%
直流电阻 DC restistance Rcu							大约 4m 欧姆 approx. 4mOhm
可视功能指示器 / 错误显示 Optical function indicator /fault indicator	no	yes				yes	no
远程指示器 / Reemote indicator	no	no	yes	no	yes	no	no

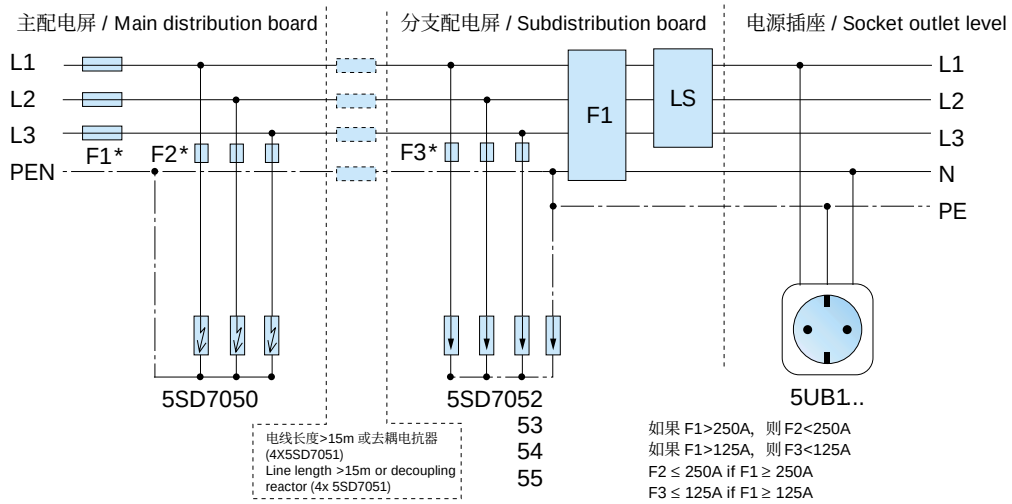
4

接线图 / Connection diagrams

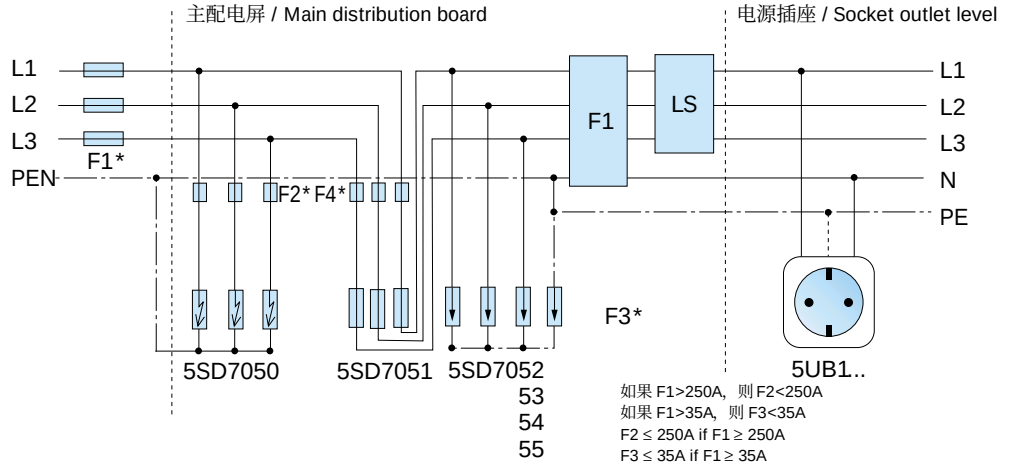
在主配电屏中装有保护和中性共用线 PEN 的 TN 系统
TN system with opeing of the PEN in the main distribution board



分支配电屏中装有保护和中性共用线 PEN 的 TN 系统
TN system with opening of the PEN in the subdistribution board



直接连接分支配电屏的 TN 系统
TN system with directly connected subdistribution board



过电压保护电器、去耦电抗器、断路器和小型断路器可与母线相接以适应给定的条件(见样本)。
Surge arresters, decoupling reactors, earth-leakage circuit-breakers and miniature circuit-breakers can be interconnected with busbars to suit the given conditions (see catalog).

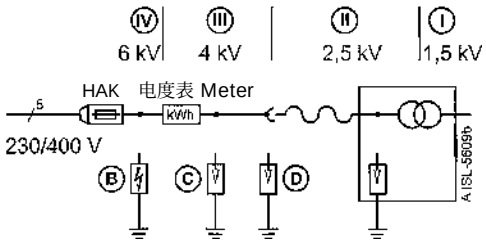
选型和技术数据 / Selection and ordering data

5SD7 05 避雷装置和过电压保护器
用于低压安装 (室内安装)

5SD7 05 lighting current and surge arresters
for low-voltage installations (indoor installations)

选择依据
- 230V AC 电源电压 (应注意接地)
- 过压分类 (标准 DIN VDE0110/IEC Publ. 664) 额定脉冲电压

Selection criteria
- 230V AC line supply voltage (phase with respect to ground)
- Overvoltage category (DIN VDE 0110/IEC Publ. 664) rated impulse voltage



等级 (标准 DIN VDE0675 第 6 部分)
Class (DIN VDE 0675 Part6)

	模数 MW	订货号 Order No.	包装 Packing 件 /Unit	重量 Weight 1 件 /1 unit kg
 避雷装置，B 级 Lighting current arrester, Class B • 符合 E DIN VDE 0675 第 6/11.89 部分和第 6/A1/03/96 部分 Acc. to E DIN VDE 0675, Part 6/11.89 and Part 6/A1/03.96 • 将电源电缆连接放电保护电势接地 To incorporate power cables in the lighting protection potential bonding • 最大容许工作电压: 255V/50···60Hz Max. permissible operating voltage: 255V/50···60Hz				
避雷装置 Lighting current arrester • 放电脉冲电流 (10/350) Lighting impulse current (10/350) 单极 75kA Single-pole 75kA	2	5SD7 050	1	0.365
 去耦电抗器 Decoupling reactor • 用于与能量有关的避雷装置和电涌放电器，放电脉冲电流为 10/350µs。 For the energy-related coordination of lighting current arresters and surge arresters for a lighting impulse current 10/350µs. • 使用集总电感代替其它必要电缆长度，以在避雷装置和电涌放电器间去耦。 The concentrated inductance replaces the otherwise necessary cable length to provide decoupling between the lighting current arrester and the surge arrester • 额定电压: 500V/50···60Hz Rated voltage: 500V/50···60Hz • 电感: 15µH ± 20% Inductance: 15µH ± 20%	2	5SD7 051	1	0.520

4

选型和技术数据 Selection and ordering data

5SD7 05 避雷装置和过电压保护器
5SD7 05 lighting current and surge arresters

	模数 MW	订货号 Order No.	包装 Packing 件 /Unit	重量 Weight 1 件 /1 unit kg
过电压保护器，C 级 Surge arrester, Class C • 符合 E DIN VDE 0675 第 6/11.89 部分和第 6/A1/03/96 部分 Acc. to E DIN VDE 0675, Part 6/11.89 and Part 6/A1/03.96				
 过电压保护器 Surge arrester • 使用具有双监控功能的热力控制绝缘放电隔离开关，具有较高的监控可靠性 High monitoring reliability and safety using the "Thermo Dynamic Control" isolating arrester disconnector debvice with double monitoring function • 在窗口中使用红色标记显示故障 Fault indication using a red marking in the window • 导线和齿杆连接多功能接线端子 Multi-function terminal for conductor and toothed bar connection • 最大容许工作电压: 275V AC/350V DC Max. permissible operating voltage: 275V AC/350V DC • 额定放电电流 (8/20) 15kA Nominal discharge current (8/20) 15kA 单极 Single-pole	1	5SD7 052	1	0.125
远程显示过电压保护器 Surge arrester with remote display • 设计如 5SD7 052，但具有另外三路接线端子连接远程显示器。 Design as for 5SD7 052, however, with additional three-pole terminal to connect the remote display • 当监控设备响应时 (由于过载故障放电器与电源隔离)，通过转换开关远程信号连接。 When the monitoring device responds (the defective arrester is isolated from the line supply as a result of overload), the remote signaling connections are switched via a floating changeover contact 单极 Single-pole	1	5SD7 053	1	0.135
 插入式过电压保护器 Plug-in surge arrester • 设计如 5SD7 052，但由底座元件和插入保护组件两部分组成 Design as for 5SD7 052, however, in two sections, consisting of a base element and inserted protective block 单极 Single-pole	1	5SD7 054	1	0.110
远程显示插入式过电压保护器 Plug-in surge arrester with remote display • 设计如 5SD7 054，但具有另外三路接线端子连接远程显示器。 Design as for 5SD7 054, however, with additional three-pole terminal to connect the remote display • 当监控设备响应时 (由于过载故障放电器与电源隔离)，通过转换开关远程信号连接。 When the monitoring device responds (the defective arrester is isolated from the line supply as a result of overload), the remote signaling connections are switched via a floating changeover contact 单极 Single-pole	1	5SD7 055	1	0.115

选型和技术数据 Selection and ordering data

5SD7 05 避雷装置和过电压保护器
5SD7 05 lighting current and surge arresters

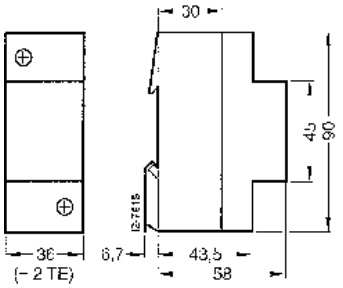
	模数 MW	订货号 Order No.	包装 Packing 1 件 /1 unit 件 /Unit	重量 Weight kg
过压防护放电器插件 Plug-in part for surge arrester, plug-in 1-pole	1	5SD7 061	0.115	1

4

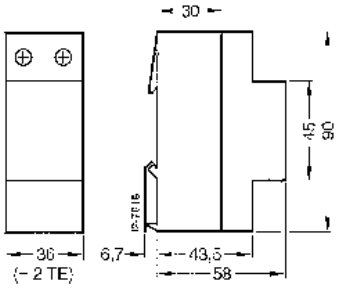
外形尺寸 Dimension drawings

5SD7 05 避雷装置和过电压保护器
5SD7 05 lighting current and surge arresters

5SD7 050
5SD7 056
5SD7 057
5SD7 060

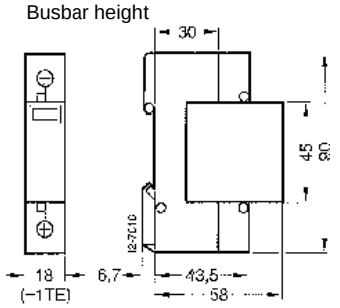


5SD7 051

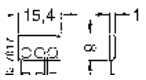


5SD7 052
5SD7 053
5SD7 054
5SD7 055
5SD7 058

汇流排高度
Busbar height

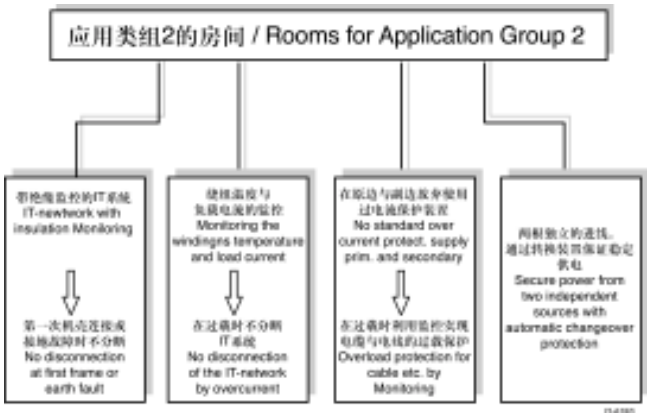


插件 /Plug-in part




SIEMENS
Isolations-Überwachung

绝缘和负载监控保护
Insulation and load monitoring
根据DIN VDE 0107/öVE-EN 7/1991
使用在医疗用途的房间
in medically used rooms
according to DIN VDE 0107/öVE-EN 7/1991



医疗用途的房间如医院、医生诊疗室、家庭血透室的供电系统必须满足特殊要求。

只要很小的电流流过人体，就会给病人健康甚至生命带来危险。这种危险是由于使用医疗电器来检查、治疗与监控病人而存在。医疗用途房间的电气安装因此必须具有补充的保护措施，在DINVDE0107/10.94 或 öVE-EN7/1991 的标准中，对所谓应用类组 2 的医疗用途房间中指定的供电方式，提出了带有绝缘监控的 IT 系统保护措施的要求，应用这种保护措施时，在第一次故障情况下并不引起分断，而无危险地继续运行。对于带有隔离变压器的 IT 系统，为了能持续地检测绝缘 IT 系统的电阻，就需配备各种合适的具有试验和信号组合装置的绝缘保护电器。此外，为了降低事故的风险，也必须防止隔离变压器的过载。

在 IT- 系中通过报警进行保护

7VC1646-6AA00 绝缘保护电器是归属 N系统，它的宽度为4-TE，能在 24V至230V交流50Hz至60Hz 的 IT- 系统中作综合性使用(也可用在三相交流 IT 系统中)。

为了尽早地识别相应的绝缘故障，通过报警 - 发光 - 二极管可超前显示大于 250KW 的绝缘电阻。这样，就能预先考核供电系统与消除出现的缺陷。为了能进一步提高保护水平，也可将报警的动作值从 50kW 调节到100kW。此外，采用两根测量线，即可考核被监控IT-系统上的现有连接。当出现第一次机壳连接与接地故障时，在IT-系统和大地之间经过保护导线而流过很小的故障电流，然而在这里不允许使用通过分断进行保护。通过绝缘保护电器中的电子计算模块，可以从故障电流中算出绝缘电阻，如低于整定的动作值，报警的发光二极管就发光，报警继电器动作。

光和声的报警信号

绝缘故障是通过两个无电位的触点进行报警，在一个触点上连接着 7XV9306 试验和报警组合装置，这种试验和报警组合装置必须装在医疗用途房间中，以便有关人员及时觉察到故障报警。试验和故障报警装置上装有薄膜键钮，并可通过声光(黄色的发光二极管)显示与报警、蜂鸣器的声信号可通过键钮复位，只有在消除绝缘故障后，黄色的发光二极管才会熄灭。

试验和报警组合装置可方便地安装在60mm 电器插座内。在绝缘保护电器上最多可直接接上两个试验和报警组合装置。通过 7XV9308 附加的耦合模块也可直接连接信号和主令电器(例 3SB 系列)。

The electrical equipment for medically used rooms, e.g. hospitals, doctors practices or also for home dialysis are subject to particular requirements.
The health or even the life of patients can be endangered, if even minimal currents flow through the human body. This danger exists due to the use of electromedical equipment to treat, examine or monitor the patient.
The electrical installations of medically used rooms must therefore incorporate additional protective measures. DIN VDE 0107/10.94 and öVE-EN 7/1991 specify certain types of power supplies for such rooms; the application group 2 specifies an IT network with insulation monitoring as the protective measure. With this protective measure, when the first fault occurs, the supply is not disconnected and safe operation can continue.
The IT network incorporates an isolation transformer. The insulation resistance of the IT network should be continuously monitored, using a suitable insulation monitor and appropriate test and signal combination unit. Furthermore the isolation transformer must be monitored for overload, in order to minimise the risk of a failure.

Protection by signal in the IT network

The insulation monitor 7VC16 46-6AA00 from the *N System* with only 4 modular spacings can be used universally in IT networks of 24V to 230V AC at 50Hz to 60Hz (also in three-phase IT networks). In order to provide advance notice of an imminent insulation failure, an LED indicates when the insulation resistance is already below 250 kΩ, therefore allowing the installation to be tested and the appearing defect remedied. To further enhance the protection level, the operating value for the signal can be adjusted from 50 kΩ to 100 kΩ. Through the use of two measuring cables the existing connection to the IT network is also tested.
If a fault to frame or earth now occurs, a very small fault current flows between the IT network and earth via the protective conductor. In this case, however, protection by disconnection may not be utilised. The fault current flows through the electronic evaluation unit in the insulation monitor calculating the insulation resistance. When the resulting value is below the set operating value the LED lights up and the signal relay switches on.

Optic and acoustic signal

Two potential-free contacts provide the insulation failure signals. The test and signal combination unit 7XV93 06 is connected to one of these contacts. The test and signal combination units must be installed in the medically used room, such that the fault signal can be perceived by the personnel. The test and signal combination unit has a sealed keypad and indicates the fault both acoustically and optically (yellow LED). The acoustic signal is a buzzer that can be cancelled by means of a button. Only if the insulation failure is rectified does the yellow signal LED go out.
The test and signal combination unit is easily installed into a 60 mm mounting box. A maximum of two test and signal combination units are directly connectable to the insulation monitor. By using an additional coupling module 7XV93 08, signal and command devices (e.g. the 3SB range) are directly connectable.

试验和报警组合装置

试验和报警组合装置应与DELTA flach－电白色的开关和插座产品纲领相配合。此时, 如使用嵌壁式安装可用5TG311型1格框架, 防护型式为IP44。

如用于液体消毒剂的医疗房间时可用高的防护型式IP44来保护试验和报警组合装置。

在凸壁式安装时应选用合适的外壳与框架。

变压器的过载报警

为了确保最大的运行可靠性, 除了绝缘电阻外，对建议采用的单相-隔离变压器也需进行监控保护。应用N-系统的7XV93 48-6AD00负载保护电器可对3.15kVA至8kVA的隔离变压器(单相变压器)进行两种测量：

- 通过埋在绕组中的正温度系数半导体(热敏电阻)对变压器的过高发热进行报警
- 通过 7XV93 07 电流互感器来控制过电流

由于变压器的过载使绕组温度升高而只能延时报警。因此, 控制负载电流十分重要，应用负载保护电器例如在接通大功率电器时可直接显示出过载，电线和电缆也可借此防止过载。不允许使用过电流保护装置。同样, 在这里分断是意味着IT-系统的停电，也就是医疗电器的事故, 如同绝缘保护电器一样, 在负载保护电器上也装有用于过载报警的无电位的触点。借助7XV93 08的耦合模块又可与信号和主令电器相连接。

负载保护>N<电器的调节可能性

温升和过电流在负载保护电器上是通过电子测量线路来检测与计算的, 发光二极管中是显示温升、过电流以及工备状态，通过电位计可根据变压器的不同功率来调节过载时的动作值以及报警信号的动作延时, 通过可调的滞后(%)可确定过电流阈值(达到此值时过电流报警灯熄灭)。

过载报警是通过另一套专用的7XV93 05试验和报警组合装置进行声光显示，它是单独装在绝缘保护电器的试验和报警组合装置旁边，这两套试验和报警组合装置应与DELTAflach 在设计上协调一体。

>N<耦合模块作为连接元件

绝缘保护电器和负载保护电器, 通常是像一对鸳鸯而双双装在建筑电气安装用的配电柜中，如果两个保护电器与信号和主令电器相连接而工作，此时，就必须考虑到标准：声信号必须是可以应答回复的。

在使用试验和报警组合装置时, 可通过它的电子模块进行应答回复, 如与单独的信号和主令电器相连接, 则由它们来承担 N 系统的耦合模块7XV9307的任务。此时，各信号灯、按钮和只有 1 个蜂鸣器是直接连接的，供电必须由另外的AC24V安全变压器来承担, 例如, 额定电流为1.5A 的 4AC9928-0AA 型(可接 16V)。

转换装置

必须满足标准中提出的在IT-系统供电时的监控要求, 为此, 为了在故障情况下实现可靠的转换，就需要所谓的转换装置，将“ 优先供电 ”转换到“ 线路 2 ”上就能保证无故障的运行。优先线路在这里是由安全供电电源(SV)来供电的,“ 线路 2 ”是用“ 一般的电源(AV)供电的 ”。

- 通过对“ 优先供电 ”的电压降的持续监控来控制转换

转换值：

- < 0.7 x V_N 在没有手术灯时的运行
- < 0.9 V_N 在具有手术灯时的运行

在小于0.5秒时间内, 转换装置就能完成转换，从而使医疗电器能继续工作, 通过快速的转换, 在具有附加的安全供电装置(ZSV)时也可将手术灯包括在安全供电范围内，连接一台，也可连接 2 台单相-隔离变压器。自愿地在 TüV 巴伐利亚试验站进行试验并取得证书的转换装置为设计人员和安装人员提供了解决方案，长年在为制造医院用的配电柜上积累的经验，对此也作出了贡献。完全能符合最新标准规定的操作安全性与可靠性。所以不需要在现场再设警告指示牌。通过特别紧凑的布线, 可排除电缆折断。所有的开关电器，例如 3TF 系列接触器以及辅助继电器，除了绝缘和负载保护电器外, 都可在STAB和SIKUS建筑电气安装用配电柜生产纲领中装在3+6 排的电器支架上。所有进出线都接在端子接线排上。使用类别为AC3的接触器是为3.5-8kVA单相变压器设计的。试验和报警组合装置或信号和主令电器的供电，均由装在柜内的AC 24V、1.5A的安全变压器承担。另外与建筑物中央主控技术的连接均通过安全隔离来实施。

*) In Austria to öVE-EN7/1991 from the “central safety power supply (ZSV)”!

The test and signal combination units

The test and signal combination units match the appearance of the switch and socket outlet range DELTA flaeche electronic white. They can be flush mounted with IP 44 rating, using the 1 gang frame 5TG4 311. Also with the IP 44 degree of protection, the test and signal combination units are protected from liquid disinfectant. For surface mounting (IP 20) a suitable housing and frame is available.

Overload signal for isolation transformer

To assure utmost safety, besides monitoring the insulation it is also recommended that the single-phase isolation transformers be monitored. With the *N System* load monitor 7XV93 48-6AD00 for isolation transformers from 3.15 kVA up to 8 kVA (single-phase transformers) two measurements can be derived:

- Overheating of the transformer is measured by thermistors embedded in the transformer windings.
- Overcurrent is recorded by the current transformer 7XV93 07 CT.

The rising temperature of the windings due to overloading of the isolation transformer can only be signalled after a delay. Therefore it is essential that the load current is also recorded. Thereby, for example, an overload due to switching on powerful devices can be directly displayed.
Cables and conductors should also be protected from overload. Standard overcurrent protection is not admitted, since by disconnection of the IT-network the supply to the electromedical equipment would also be lost. As with the insulation monitor the load monitor has potential free contacts for the overload signals. Using an additional coupling module 7XV93 08 signal and command devices can also be connected.

Possible adjustments of the >N< type load monitor

The load monitor has an electronic measurement switch for evaluating overtemperature and overcurrent. LEDs are used to indicate overtemperature, overcurrent and operational. A potentiometer is used for setting the pick up value of the overload in accordance with the transformer rated power. The operating delay for the signal is also adjustable. By the adjustable hysteresis (%) the overcurrent threshold (current value at which overcurrent signal is cancelled) can also be set.
The signal on overload can be optically and acoustically indicated via a special test and signal combination unit 7XV93 05. It is of the same design as the test and signal combination unit for insulation monitors, and can be mounted adjacent to each other in DELTAflaeche design.

The >N< type coupling module as binding element

Insulation and load monitors are usually mounted in the same distribution board. If it is required that both protective devices operate with signal and command devices from the *N System*, the standards should also be complied with. The acoustic signal must be cancellable.
When the test and signal combination unit is used, the cancelling is achieved by the electronics of the unit.
The coupling module 7XV93 07 provides this facility for signal and command devices. The individual indicator lights, pushbuttons and only one buzzer are directly connected. Additional power must be provided by an AC 24 V safety transformer, for example the type 4AC99 28-0AA with 1.5 A rated current (connection 16 V).

Complete solution for STAB and SIKUS changeover protection

The standard stipulates that monitoring of the power supply for the IT-network should be assured.
To ensure safe changeover during a fault a so-called changeover protection is required. By changeover from the essential supply to supply 2 a disturbance free operation is assured. The essential supply is fed from a “safety power supply (SV)” and “supply 2” from the “general power supply (AV)” *).

- By permanent monitoring for a drop in voltage the changeover to the “essential supply” is controlled.

Changeover value:

- 0,7 x V_N at operation without OP lighting.
- 0,9 x V_N at operation with OP lighting.

Within as little as 0.5 sec. the changeover protection switches and secures the supply such that the operation of electro-medical devices can continue. Due to the fast changeover time it also possible to include a pre-planned additional interruption free ZSV for the OP lighting. The connection of one, but also of two single-phase isolation transformers is possible. With the changeover protection certifiable by the technical inspectorate TöV of Bavaria, a concept has been devised in this respect for the planner/installer. The considerable experience in the building of distribution boards or hospitals also made a ontribution. High safety and eliability according to the new status of the standards are understandable. Thus additional warning information labels are not necessary. By using especially narrow cable entries the possibility of damaging cables is ruled out. All necessary switching devices, such as the 3TF contactor range as well as control relays, are installed adjacent to the insulation and load monitors on one 3+6 row chassis (H3/B1) from the STAB and SIKUS distribution board ranges. All incoming and outgoing cables are connected to terminal blocks and contactors with an AC3 rating are sized for the single-phase transformer ratings of 3.15 -8kVA. For supplying the test and signal combination units or signal and command devices, an AC 24V safety transformer, 1.5A, is installed.
An additional connection with secure separation for a building management system etc. is possible.

*) In Austria to öVE-EN7/1991 from the “central safety power supply (ZSV)”!

绝缘和监控保护装置
Insulation and Monitoring Devices

7VC16 46 >N< 绝缘保护电器 / 7VC16 46 >N< Type insulation monitor

- 符合 DIN VDE 0107/10.94 标准，适合作绝缘监控保护
- 可对 AC 24-230V, 50-60Hz IT-系统的绝缘电阻进行持续的监控检测
- 用叠加 DC 24V-测量电压的常规测量原理
- 试验按钮用于 42 kΩ- 试验电阻
- +/- 槽连接螺钉，适用于电动螺丝刀

应用
- 在 IT- 系统中监控绝缘电阻
- 可使用于交流和三相交流 - 变压器
- 用发光二极管来显示 IT-系统的绝缘电阻

特点
- 通过故障的预显示及早识别产生的大于 250 kΩ 的绝缘故障
- 通过可调的 100 kΩ 或 50 kΩ 动作值来提高保护水平
- 可直接连接 2 个 7XV93 06 试验 - 报警组合装置
- 电源线和保护导线的连接受到监控保护
- 2 个无电位转换触点用作故障信号
- 安装体积小，宽度为 4 TE

- Suitable for insulation monitoring according to DIN VDE 0107/10.94 / öVE- EN 7/ 1991
- Permanent monitoring of insulation resistance for an IT-network with AC 24-230V, 50-60Hz
- Protected measurement principle with superimposed DC 24 V measuring voltage
- Test button for 42 kΩ test resistance
- +/- terminal screws, suitable for power-driver

Application
- Monitoring the insulation resistance in IT networks.
- Suitable for single and three-phase isolation transformers.

- Indication of the IT-networks insulation resistance by LEDs.

Benefit
- Early recognition of an imminent insulation failure below 250 kΩ by a fault signal
- The protection level can be increased by selecting an operating value of 100 kΩ or 50 kΩ
- Two test and signal combination units 7XV93 06 can be directly connected
- Connection monitoring of the network and PE conductors
- Two potential free changeover contacts for fault signal
- Space-saving only 4 modular widths

		订货号 / Order No.	包装 / Packing 件 / Unit	重量 / Weight 1 件 / 1 Unit kg
	>N< 绝缘保护电器 / >N< type insulation monitor	7VC16 46-6AA00	1	0.300

技术数据见第 5/11 页。
尺寸图与接线端子连接见第 7/22 页。
不接地工业电网用其它绝缘保护电器，见产品样本 R 2.8 (E50001-K4502-A181-A1)。

For technical data, see page 5/11
For dimensions and termination details, see page 7/22.
For further insulation monitors for unearthed industrial networks, see Catalog R 2.8 (E50001-K4502-A181-A1).

7XV93 >N< 负载保护电器 / 7XV93 >N< Type load monitor

- 符合DIN VDE 0107/10.94 / öVE-EN 7/1991 标准的隔离变压器用过载 - 监控保护装置
- 适用于 3.15～8 kVA 单相变压器
- 报警和工作用 - 发光二极管 - 显示
- 变压器绕组温度的监控保护
- 可监控的 IT - 系统电流：5～63A (可调节)
- 动作延时: 0-10s (可调节)

应用

- 用正温度系数半导体(热敏电阻)监控绕组的温度。
- 用 7XV93 07 电流互感器监控单相负载电流.。

特点

- 可自由调定过电流阈值
- 使过电流报警消除的电流值可预选滞后
- 可直接连接2台7XV93 05试验和报警组合装置
- 有二个无电位触点供作过载 - 信号使用
- 体积小，安装宽度为 4 TE
- 可用试验按钮检查功能

- Overload monitoring protection for isolation transformers
- According to DIN VDE 0107/10. 94 / öVE-EN 7/1991
- Suitable for single-phase transformers rated 3.15 ~ 8kVA
- Signal and operation LED's
- Monitoring the transformer winding temperature
- Monitoring the IT-networks current: 5-63A (adjustable)
- Operating delay: 0-10 s (adjustable)

Application

- Temperature monitoring of the windings using PTC thermistors.
- Monitoring the single-phase load current via the current transformer 7XV93 07.

Benefit

- Freely adjustable overcurrent settings
- Preselectable hysteresis current value at which the overcurrent signal is cancelled
- Two test and signal combination units 7XV93 05 can be directly connected
- Two potential free contacts for overload signals
- Space-saving (only 4 modular widths)
- Functional test by test button

		订货号 / Order No.	包装 / Packing 件 / Unit	重量 / Weight 1 件 / 1 Unit kg
	>N< 负载保护电器 / >N< type load monitor	7XV93 48-6AD00	1	0.300
	电流互感器 / Current transformer 连接在负载保护电器上，可用于额定功率至 8kVA 的隔离变压器 for connection to load monitor for isolation transformers up to a rated power of 8kVA	7XV93 07	1	0.075

技术数据见第 5/15 和第 5/18 页。
尺寸图与接线端子连接见第 7/22 页。

For technical data, see pages 5/15 and 5/18.
For dimensions and termination details, see page 7/22.

7XV93 试验和报警组合装置 / 7XV93 Test and signal combination unit

- 符合DIN VDE 0107/10.94 / öVE-EN 7/1991 标准，用声光显示工作信号和故障报警
- 不需要附加电流，可直接接在绝缘保护电器和负载保护电器上
- 最佳地与 DELTA fl he 电白色开关和插座生产纲领在设计上协调成一体

应用
- 通过蜂鸣器与发光二极管用声和光显示工作信号和故障报警。
- 用试验按钮和消除按钮检查功能。

特点
- 结构紧凑，适宜安装在市场上通用的 60mm 电器插座盒中(开关和空腔插座盒)
- 可以安装在电缆通道 - 电器连接盒中
- 维护方便的薄膜键盘
- 带有合适的安装框架和凸壁式用的外壳，在嵌壁和凸壁式安装时防护型式达 IP44
- 由于在 SMD- 技术中采用微电子，耗电量极小
- 与电白色 DELTA 生产纲领中的开关与插座可在设计上协调成一体
- 标注采用德、英、意、荷、西等多种语言(如需其它语言，请垂询)

- For the optical and acoustic display of operation and fault signals according to DIN VDE 0107/10.94 / öVE- EN 7/1991
- For direct connection to insulation monitor and load monitor without<R>additional power supply
- Optically the unit matches the design of the switch and socket outlet range DELTA flaeche electronic white

Application
- Optical and acoustic display of operation and fault signals by buzzers and LEDs.
- With test and cancelling button for functional testing.

Benefit
- Due to compact measurements, it is suitable for the flush mounting into a standard 60mm box (switch and hollow-wall boxes)
- Mounting in cable dado trunking is also possible
- Easy-care sealed keypad
- Degree of protection IP44 for flush and surface mounting with suitable mounting frame and wall box.
- Micro electronics with SMD technology, therefore only low power consumption
- Combinable with switches and socket outlets of the DELTA flaeche electronic white design
- Multilanguage labelling strip in German, English, Italian, Spanish and Dutch enclosed (further languages on inquiry)

	订货号 / Order No.	包装 / Packing 件 / Unit	重量 / Weight 1 件 / 1 Unit kg
0.8mm 导线用的接线端子，不带框架 Terminals for cables with 0.8mm without frames			
用于绝缘保护电器 [1] / for insulation monitor [1]	7XV93 06	1	0.100
用于负载保护电器 [1] / for load monitor [1]	7XV93 05		
用于供电 [1] [2] / for power supply [1] [2]	7XV93 11		
嵌壁式安装用框架 Frames for flush mounting 带有电器嵌件 - 密封，电白色 with gasket, electronic white IP 44，单格 84 x 84mm / IP 44, 1 fold 84 x 84mm	5TG4 311	10	0.020
凸壁式安装用凸壁 - 外壳 Housing for surface mounting 电白色 / electronic white 单格 77 x 41 x 77mm / 1fold 77 x 41 x 77mm	5TG2 086	1	0.040
凸壁式 - 外壳安装用框架 Frames for surface mounting housing 电白色 / electronic white 单格 75 x 75mm / 1fold 75 x 75mm	5TG2 201	10	0.010

技术数据见第 5/18 页。
尺寸图见第 7/23 页。
特殊的信号板请垂询。
1) 在与4AC99 28-0AA安全变压器连接时应用AC 16 V-连接端子。
2) 从 1996 年 8 月起开始供货。

For technical data, see page 5/18.
For dimensions, see page 7/22.
Special units for operating panels on inquiry.
1) The 16 V AC connection is to be used when connecting to 4 AC 9928-0AA safety transformer.
2) Delivery as of 8/96.

7XV93 08 >N< 耦合模块

7XV93 08 >N< Type coupling module

- 将信号和主令电器, 例3SB系列, 连接在绝缘保护电器和 -/ 或负载保护电器上
- 用外围的 AC 24V 安全变压器向耦合模块、信号灯和蜂鸣器供电 (见第 4/39 页)
- 无电位触点具有很高的载流能力

应用

- 绝缘保护电器和 / 或负载保护电器与信号和主令电器共同工作的耦合位置, 例如在手术-信号板或监控保护盘中。
- 不需外部接线的情况下，故障声响报警即可应答回复。
- 采用封闭结构型式适宜安装在信号板中。

特点

- 使信号和主令电器的接线方便
- 只要一个蜂鸣器就能为四个声响故障报警，并仅需一个按钮作为应答回复
- 防止触电的 +/- 槽连接螺钉也适宜用电动螺丝刀
- 体积小，安装宽度为 4TE
- 绝缘保护电器与负载保护电器的外壳是相同的
- 多台信号板可并联运行

- For connection of signal and command devices for example the 3SB.. range to the insulation and/or load monitor
- Power supply for coupling module, indicator lights and buzzers is derived from an external AC 24V safety transformer (see page 4/27)
- Potential free contacts with high loading capacity

Application

- Coupler for common operation of insulation and/or load monitor with signal and command devices, for example in operating or monitoring panels
- Cancelling of the acoustic fault signal is possible without additional external circuit devices
- Suitable for mounting into panels due to compact design

Benefit

- Facilitates wiring of signal and command devices
- Only one buzzer is required for all 4 acoustic fault signals, also only one acknowledgement pushbutton
- Shockproof +/- terminal screws also suitable for power driver
- Space-saving (only 4 modular widths)
- Same housing design as the insulation and load monitor
- Parallel operation from several panels is possible

		订货号 / Order No.	包装 / Packing 件 / Unit	重量 / Weight 1 件 / 1 Unit kg
	>N< 耦合模块 / >N< type coupling monitor	7XV93 08	1	0.200

技术数据见第 5/20 页。
尺寸图与接线端子连接见第 7/23 页。

For technical data, see page 5/20.
For dimensions and termination details, see page 7/23.

7XV93 10 转换装置 / 7XV93 10 Changeover protection

- 根据DIN VDE 0107/10.94 / öVE-EN 7/1991 标准的规定，IT 系统是用符合MED-USE 107/10.94 Si 规定的转换装置
- 已经试验的卡装件可装在 STAB- 和 SIKUS建筑电气安装用配电系统的电器安装架上(6+3 排) [1)]
- 可用于 1 台或 2 台变压器，接线就绪
- 转换时间可调节到< 0.5秒, 电压阈值也可调节(具有“ 补充安全供电装置ZSV ”时“ 线路 2 ”上是 0.9 x U_N)，适用于带手术 - 灯具的运行
- 端子排上的接线全部完成
- 没有必要再悬挂警告指示牌
- 转换屏的外壳包括在供货范围中

应用

- 通过不会发生触头熔焊的 3TF 系列接触器将 “ 优先供电 ” 转换到 “ 线路 2 ” 上。
- 全部带有绝缘保护电器和负载保护电器
- 能满足相关标准的全部要求
  DIN VDE 0107/10.94 / öVE-EN 7/1991;
  DIN VDE 0660 第 600 部分 /04.94;
  EN 60 439-1, 1994;
  IEC 439-1
  以及事故预防标准 VBG 4.5。

特点

- 自愿地经过 TöV 巴伐利亚试验站试验并取得证书
- 设计与安装简单方便
- 综合应用于 3.15～8 kVA 变压器
- 节省时间与费用
- 由于已经公认的中立方试验，技术验收十分简便
- 通过安全隔离可与建筑物的主控技术系统相连接
- 用 AC24V/1.5A 安全变压器为声光信号供电
- 寿命长，保护水平高
- 不需要另行准备电器安装架
- 为免导线断裂，布线紧密
- 电缆断裂不会影响功能

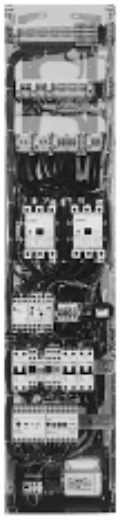
- Changeover protection MED-USE 107/10/94Si for IT networks according to DIN VDE 0107/10.94 /öVE-EN 7/1991
- Type tested mounting kit on chassis (6+3 rows) for STAB and SIKUS distribution board system [1)]
- Fully wired for one or two transformers
- Suitable for operation with OP-lighting due to the adjustable changeover time <0.5 seconds and voltage threshold (0.9 x U_N with the pre-planned additional safety power supply ZSV taking over supply [2)]
- All cabling installed and wired to terminal blocks
- No fixing of warning label necessary
- Panel covers contained in scope of supply

Application

- Weld-free switching from the “essential supply” to “supply 2” using the 3TF range of contactors
- Complete with insulation monitor and load monitor
- Fulfils all the demands of the relevant standards:
  DIN VDE 0107/10.94 / öVE-EN 7/1991;
  DIN VDE 0660 Part 600/04.94;
  EN 60 439-1, 1994;
  IEC 439-1
  and the accident prevention standard VBG 4.5

Benefit

- Tested and certified by technical inspectance (TüV Bavaria)
- Simplified planning and installation
- Universal for transformers of 3.15 - 8kVA
- Time and cost saving
- Easier acceptance due to recognised testing
- Connection with secure isolation to building management system
- With AC 24 V/15 A safety transformer for optical and acoustic signals
- High protection level and long service life
- Chassis already supplied
- Narrow cable entries to avoid damaging cables
- No impaired function due to damaged cables

		订货号 / Order No.	包装 / Packing 件 / Unit	重量 / Weight 1 件 / 1 Unit kg
	转换装置 / Changeover Device	7XV93 10	1	18.200

接线图见第 5/22 页。
尺寸图见第 7/23 页。
1) 如用于其它配电系统时，则请对电器安装架另行垂询。

For connection diagrams, see page 5/22.
For dimension drawings, see page 7/23.
1) Chassis for other distribution boards on inquiry.

IT- 系统用变压器 / Transformer for IT networks

- 变压器是使用于 DIN VDE 0107 规定的医疗用房间中的 IT- 系统
- 结构型式符合 DIN VDE 0551 第 1 部分(EN 60 742)规定的隔离变压器，保护等级 I
- 原边和副边绕组之间的静态屏蔽带绝缘的连接
- 用热敏电阻保护(正温度系数半导体)
- 短路电压 U_z 3%, 空载电流 i_o3%, 接通电流(峰值) 8 x I_{1N}
- 变压器一次侧的短路保护是采用工作等级为aM、gL/gG的熔断体或具有 C 特性的小型断路器

单相变压器
中间抽头作绝缘监控保护

- Transformers for IT networks in medically used rooms according to DIN VDE 0107
- Version as isolation transformer according to DIN VDE 0551 Part 1 (EN 60 742), with protection class I
- Static screen between primary and secondary winding with isolated connection
- With thermistor protection (PTC thermistor)
- Short circuit voltage $u_z \leq 3\%$, rated current io ≤ 3%, switching current (inrush) 8 x I_{IN}
- Short circuit protection for the primary circuit of the transformer, with fuses having an operating class aM/gL/gG or MCBs with C characteristic

Single-phase transformers
Center tapped for insulation monitoring

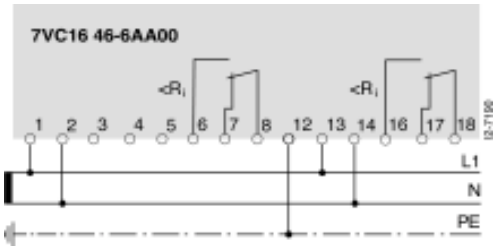
	额定功率 Rated power $P_{S(S1)}$ kVA	空载时电压上升率 Voltage rise on no-load U_A %	额定电压 输入 Input U_{1N} V	输出 Output U_{2N} V	I_N A	订货号 Order No.	重量 1 件 Weight 1 Unit kg
	2.5	3.6	230	230	25	4AT30 11-1TA71-3M	35
	3.15	3.6			35, 32	4AT36 01-1TA71-3M	33
	4	3.6			35, 40	4AT36 11-1TA71-3M	36
	5	3.6	230	230	50	4AT39 01-1TA71-3M	45
	6.3	3.6			50	4AT39 11-1TA71-3M	49
	8	3.7			50	4AT43 01-1TA71-3M	63

主令电器和信号灯以及变压器见产品样本 NS K。
For control device and indicator lights and other transformers, see Catalog NS K.

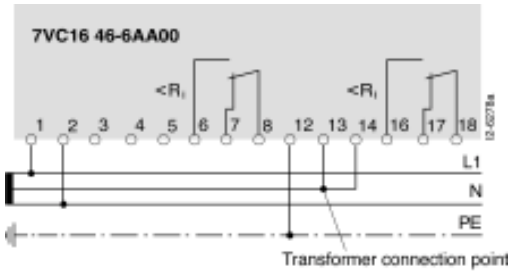
7VC16 46 >N< 绝缘保护电器，技术说明		7VC16 46 >N< Type insulation monitor, technical data
符合 DIN VDE 0100, 0107, 0110, 0609 标准 According to DIN VDE 0100, 0107, 0110, 0609		7VC16 46-6AA00
被保护的 IT- 系统电压 / Monitor IT network voltage	V AC	24 - 230
工作电压 / Operating voltage	V AC	230 (+10%/-20%)
频率 / Frequency	Hz	50...60
功率 / Power consumption	VA	<5 (在 230V 时) / < 5 (at 230V AC)
仪表熔断器 mT (已插接) / Device-fuse mT (installed)	A	0.1 (5mm x 20mm)
直流测量电压 / DC voltage measurement	V DC	24
直流测量电流 / DC current measurement	mA	<0.2
直流内电阻 / DC resistance	kΩ	120
交流内电阻 / AC resistance	kΩ	120
工作制 / Mode		DB (持续工作制)
绝缘类组(DIN VDE 0110) / Insulation group (DIN VDE 0110)		C
干扰电压强度(DIN VDE 0843 T.4) / Noise-free (DIN VDE 0843 T.4)		清晰度 4 / Severity 4
振荡强度(DIN IEC 68 T.2...6) Resistance to vibration (DIN IEC 68T.2...6)	Hz	10...150, 20 循环, 5gn / 10...150, 20 cycles, 5 gn
最大允许的外界直流电压 / maximum external DC voltage (不会损坏电器，极性任意) (without damaging the devices, polarity as desired)	V	200
辅助电压 / Auxiliary supply (足够用于 2 个 7XV93 06 试验和报警组合装置) (sufficient for 2 test and signal combination units 7XV93 06)	V AC mA	约 24 / approx. 24 50
信号触点 / Signalling contact: 最大控制电压 / max. switching voltage	V AC / V DC	2 x 变换触点 (无电位) / 2 x changeover (potential free) 250/300
持续控制电流 / switching current	A AC / A DC	10/5
最大控制功率 / max. switching power	VA AC / W DC	1250/35...250
额定对地电容 / Nominal capacity against earth	µF	10
动作值 / Operating values	kΩ	100/50
故障显示 / Fault display	kΩ	<100/<50
故障预显示 / Fault about to occur	kΩ	<250
防护型式符合 DIN 40 050 和 IEC 144 Degree of protection to DIN 40 050 and IEC 144	卡装件 / Installed 接线端子/ Terminals	IP 30 IP 10
仓库温度 / Storage temperature	°C	-20...+70
周围温度 / Ambient temperature	°C	-5...+50
接线端子型式 / Type of connection		不会失落的 +/- 槽接线端子螺丝 M 3.5，带自行导向的垫片 self retaining +/- terminal screw M 3.5 with self stabilising terminal clamp
接线截面 / Terminal capacity	mm^2	≤ 1.5

7VC16 46 >N< 绝缘保护电器，电源连接 / 7VC16 46 >N< Type insulation monitor, network connection

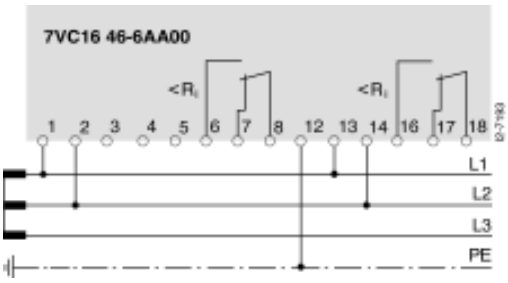
绝缘保护电器连接在 IT- 系统上
Connection of insulation monitor to the IT network



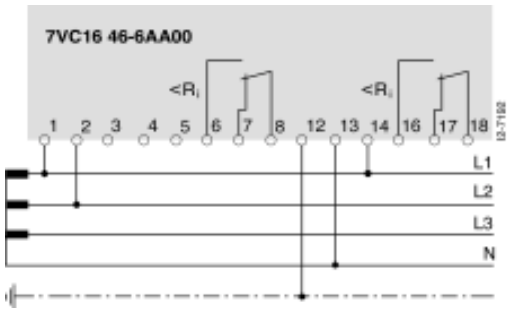
单相电网 1/N/PE ~230V
Single-phase supply network 1/N/PE ~230V



带中间抽头的单相电网 1/N/PE ~230V
Single-phase supply network with central tap 1/N/PE ~230V



三相交流电网 3/PE ~230V
Three-phse supply network 3/PE ~230V

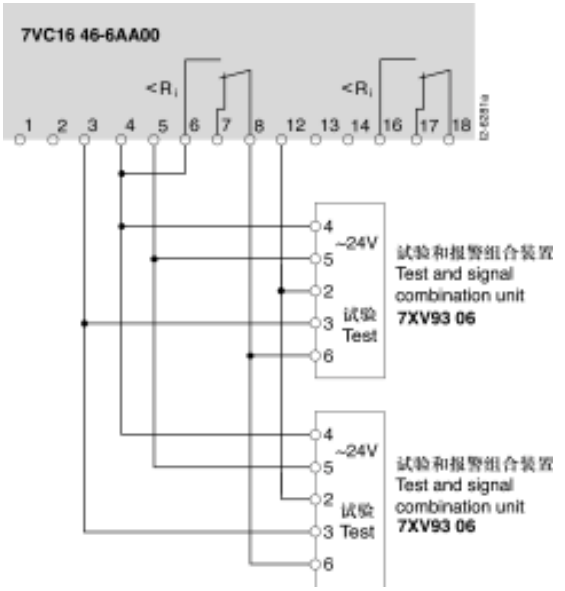


三相交流电网 3/N/PE ~230V
Three-phase supply network 3/PE ~230V

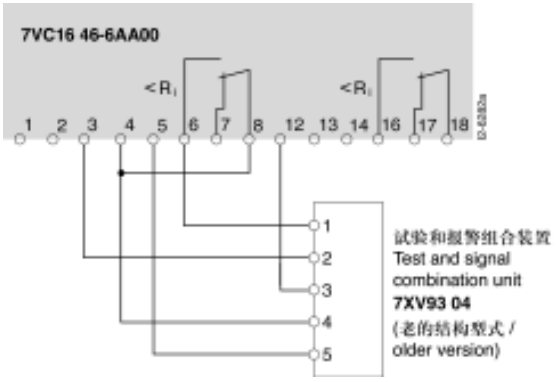
供电电压～230 V 可取自变压器的原边，但也可取自变压器的副边。
The 230V AC supply voltage on the primary side can also be taken from an isolating transformer secondary.

接在 >N< 绝缘保护电器上 — Connection to >N< type insulation monitor

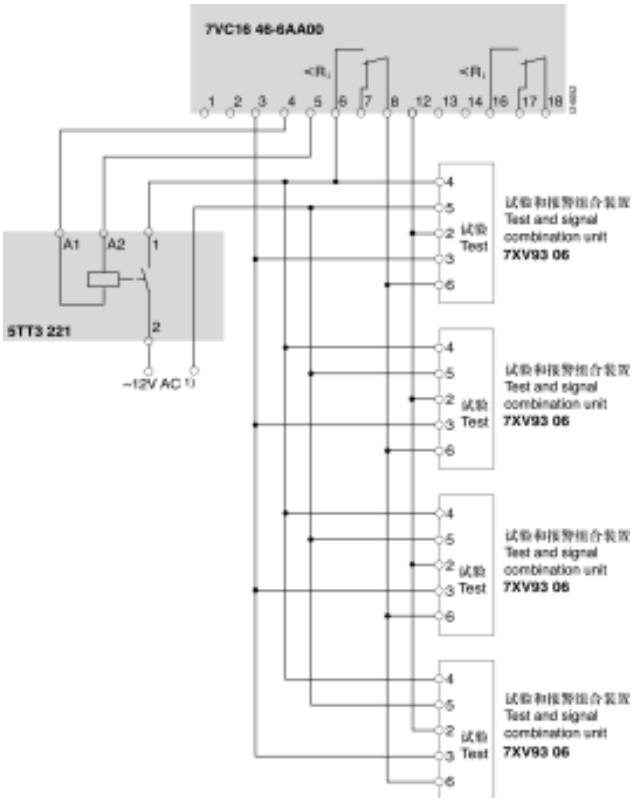
7XV93 06



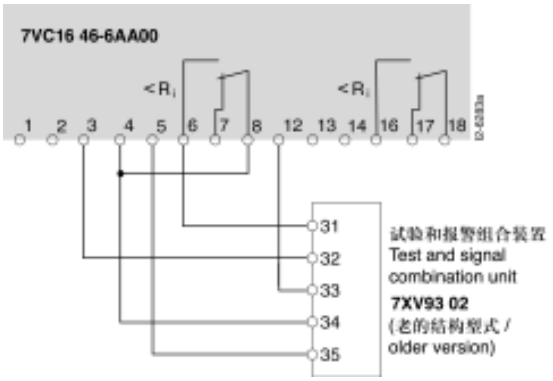
7XV93 04 (老的结构型式 / older model)



7XV93 06



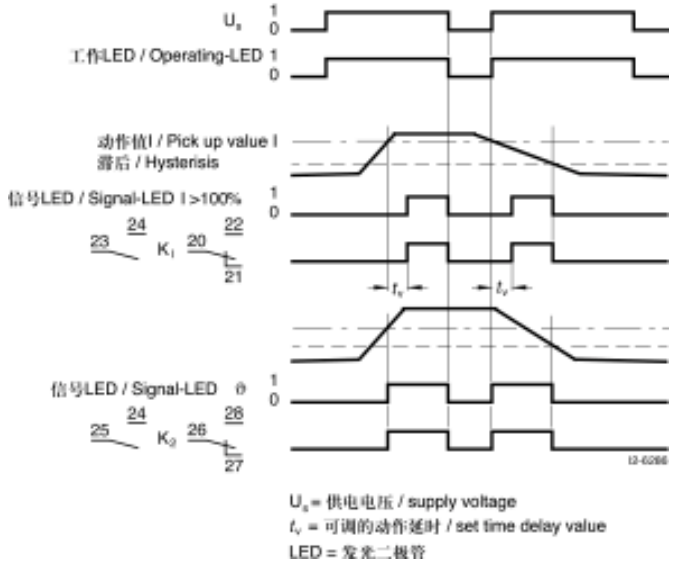
7XV93 02 (老的结构型式 / older model)



7VX93 48 >N< 负载保护电器，技术说明		7VX93 48 >N< Type load monitor, technical data
符合 DIN VDE 0100、0107、0110、0609 标准 According to DIN VDE 0100, 0107, 0110, 0609		7VX93 48-6AD00
被保护的 IT- 系统的电流 / Monitor IT network current	A	5...63 (可调) / 5...63 (adjustable)
过电流阈值的滞后 / Hysteresis for overcurrent sensitivity	%	2...10 (可调) / 2...10 (adjustable)
过电流报警的延时时间 / Time delay for overcurrent signal	s	0...10 (可调) / 0...10 (adjustable)
正温度系数半导体(PTC)的动作值 Operating value of thermistors (PTC)	kΩ	3.8...4
正温度系数半导体(PTC)的回复值 Drop out value of thermistors (PTC)	kΩ	1.3...1.5
工作电压 / Operating voltage	V AC	230 (+10%/-20%)
频率 / Frequency	Hz	50...60
功率 / Power consumption	VA (V)	<2.5 (在 230V 时) / <2.5 (at 230)
工作制 / Mode		DB (持续工作制)
绝缘类组(DIN VDE 0110) / Insulation group (DIN VDE 0110)		C
额定绝缘电压 / Nominal insulation voltage	V	250
试验电压(DIN VDE 0110) / Test voltage (DIN VDE 0110)	V	3000
干扰电压强度(DIN VDE 0843 T.4) Noise-free (DIN VDE 0843 Part 4)		清晰度 4 / severity 4
振荡强度(DIN IEC 68 T.2...6) Resistance to vibration (DIN IEC 68 Parts 2...6)	Hz	10...150, 20 循环, 5gn / 10...150, 20 cycles, 5 gn
辅助电压 / Auxiliary power (足够为 2 个 7XV93 05 试验和报警组合装置供电) (sufficient for 2 test and signal combination unit 7XV93 05)	V DC mA	12 35
信号触点：/ Signal contact: 最大控制电压 / Max. switching voltage	V AC / V DC	250/300
持续控制电压 / Switching current	V AC / A DC	10/5
最大控制功率 / Max. switching power	VA AC / W DC	1250/50...250
触头类别，过电流信号 Contact type overcurrent signal		1 变换触点(无电位) + 1 常开触点 1 changeover (potential free) + 1 normally open
触头类别，过热温度 Contact type over temperature		1 变换触点(无电位) + 1 常闭触点 1 changeover (potential free) + 1 normally closed
故障显示(发光二极管) / Fault display (LED)		过电流，过热温度 / overcurrent, overtemperature
防护型式符合 DIN 40 050 和 IEC 144 Degree of protection to DIN 40 050 and IEC 144	卡装件 / installations 接线端子 / terminals	IP 30 IP 10
仓库温度 / Storage temperature	°C	-25...+70
周围温度 / Operating temperature	°C	-5...+60
接线端子型式 Type of connection		不会失落的 +/- 槽接线端子螺丝 M3.5 self retaining +/- terminal screws M 3.5 with self stabilising terminal clamp
带自行导向的接线垫片 / Terminal capacity		
接线截面 / Conductor cross section	mm^2	≤ 1.5
通向隔离变压器正温度系数半导体(PTC)的连接 Max. connection to the PTC thermistor of the isolating transformer	km km	在 1.5mm^2 时： 2.200 / at 1.5mm^2: 2.200 在 2.5mm^2 时： 4.000 / at 2.5mm^2: 4.000

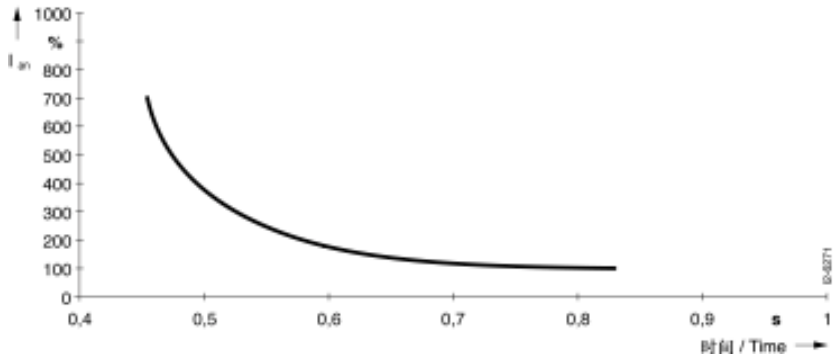
时间计算图 / 滞后计算图 Timing diagram / Hysterisis diagram

时间计算图 7XV93 48-6AD00
Timing diagram 7XV93 48-6AD00



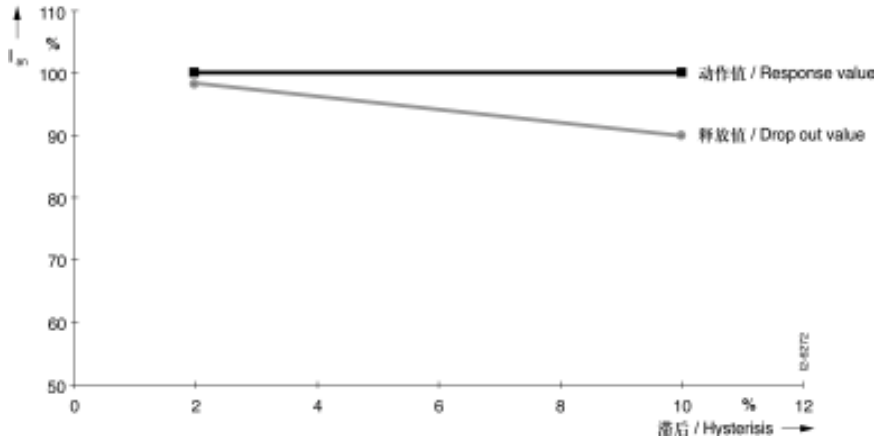
U_s = 供电电压 / supply voltage
t_v = 可调的动作延时 / set time delay value
LED = 发光二极管

时间计算图 7XV93 48-6AD00
Timing diagram 7XV93 48-6AD00



7XV93 48-6AD00 负载保护电器过电流部分的滞后与相应整定值之间的关系
Intrinsic response elay of the overcurrent section of the 7XV93 48-6AD00 load monitor as a function of the line current

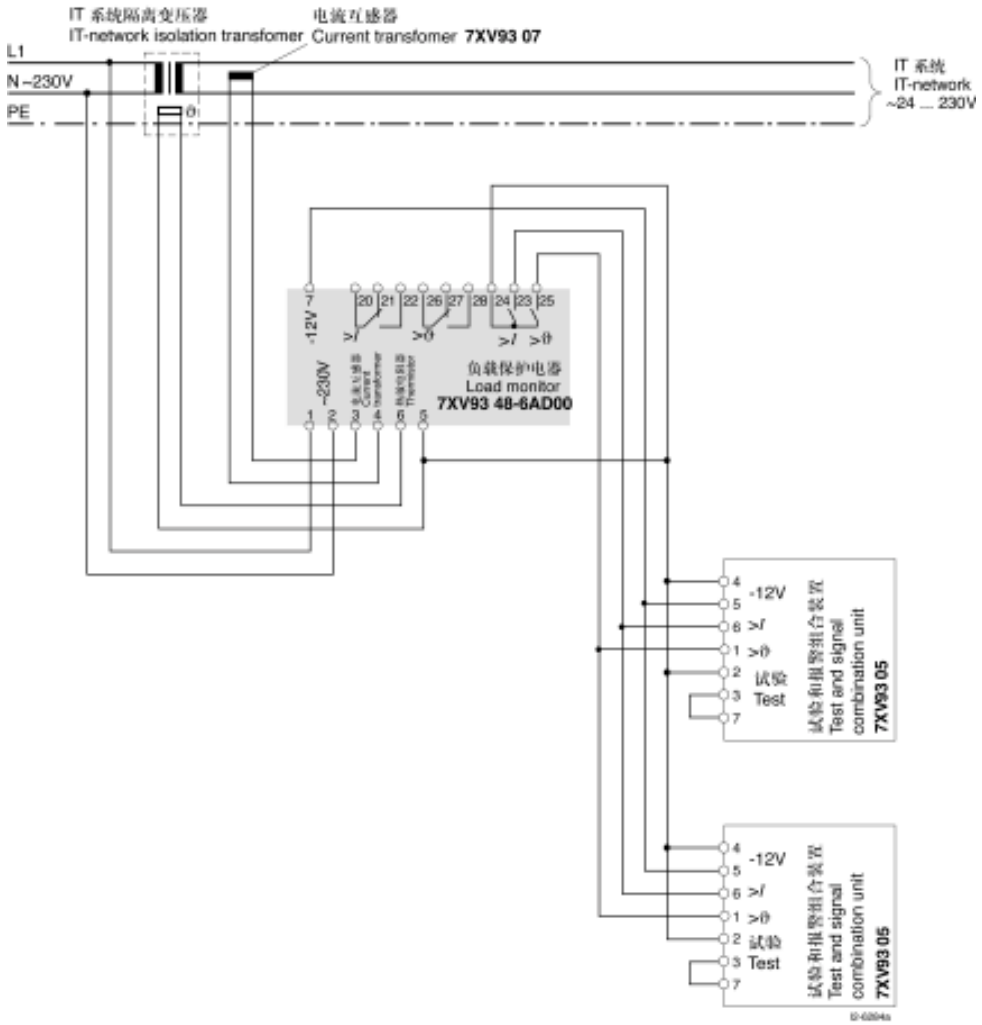
滞后计算图 7XV93 48-6AD00
Hysterisis diagram 7XV93 48-6AD00



7XV93 48-6AD00 负载保护电器过电流部分的固有动作延时与电网电流的关系
Hysteresis of the overcurrent section of the 7XV93 48-6AD00 load monitor as a function of the appropriate setting.

7XV93 48 >N< 负载保护电器，总接线图 / 7XV93 48 >N< Type load monitor, block diagram

7XV93 48-6AD00



7XV93 07 电流互感器，技术数据 / 7XV93 07 Current transformers, technical data		
		7XV93 07
互感器电流 / Primary current	A AC	50
副边电流 / Secondary current	mA AC	50
频率 / Frequency	Hz	50...60
原边导线插入孔 / Aperture for primary cable	mm	Ø3
DIN- 应用等级 / DIN-application class		GKF
周围温度 / Ambient temperature	°C	-5...+60
接线截面，二次侧 / Terminal capacity secondary circuit	mm^2	≤ 1.5 (用于扁线包套 6.3 x 0.8) / ≤ 1.5 (for push-on connectors 6.3 x 0.8)

7XV93 试验和报警组合装置，技术数据 / 7XV93 Test and signal combination unit, technical data			
			7XV93 05, 7XV93 06, 7XV93 11
工作显示 / Operation indicator			LED (绿色)
防护型式符合 DIN 40 050 Degree of protection according to DIN 40			IP 20 IP 44 用电器 - 嵌件 - 密封(只用于嵌壁式) / IP 44 with gasket (flush only)
仓库温度 / Storage temperature		°C	-20...+70
周围温度 / Operating temperature		°C	-5...+50
接线端子 / Connection terminals		mm^2	≤ 1.5
标志字样片可插入 / Labelling strip insert (enclosed / 附加)			使用的语言：/ In the following languages: 德、英、西、法、意、荷 / German, English, Spanish French, Italian, Dutch
只仅 7XV93 05 Only 7XV93 05	工作电压 / Operating voltage 功率 / Power consumption 故障显示(LED) / Fault display (LED)	V DC W V DC/V AC	12 (+10%/-20%) <1.2 在 / < 1.2 at 12/24 过电流(黄色)，过热温度(绿色) / overcurrent (yellow),, overtemperature (yellow)
只仅 7XV93 06 Only 7XV93 06	工作电压 / Operating voltage 功率 / Power consumption 故障显示(LED) / Fault display (LED)	V AC VA V AC	24 (+10%/-20%) 1.2 在 / 1.2 at 24 绝缘故障(黄色) / insulation failure (yellow)
只仅 7XV93 11 Only 7XV93 11	工作电压 / Operating voltage 功率 / Power consumption 故障显示(LED) / Fault display (LED)	V AC W V DC/~V AC	12 (+10%/-20%) <1.2 在 / < 1.2 at 12/24 电网 1/2 停电事故(黄色) / network 1/2-failure (yellow)

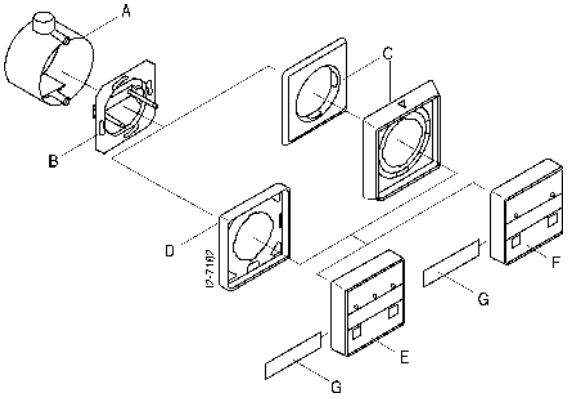
7XV93 08 >N< 耦合模块，技术数据 / 7XV93 08 >N< type coupling module, technical data		
符合 DIN VDE 0100、0107、0110、0435 T.303、0609 标准 According to DIN VDE 0100, 0107, 0110, 0435 Part 303, 0609		7XV93 08
额定工作电压 / Rated operational voltage	V AC	50
交流电压的频率 / AC voltage frequency	Hz	50...60
振荡强度 (DIN IEC 68 T.2...6) Vibration resistance (DIN IEC 68 Part 2...Part 6)	Hz	10...150，20 循环，5gn / 10...150, 20 cycles, 5gn
防护型式符合 DIN 40 050 和 IEC 144 Degree of protection according to DIN 40 050 and IEC 144		IP 10
仓库温度 / Storage temperature	°C	-20...+70
周围温度 / Ambient temperature	°C	-5...+60
接线端子螺丝 / Terminal screws		不会跌落的 +/- 槽接线端子螺丝 M 3.5，带有自行导向的连接垫片 Captive +/- terminal screws M 3.5 with self-stabilising terminal clamps
接线截面 / Conductor cross section	mm^2	≤ 1.5

1) 在单独连接试验和报警组合装置 7XV93 05/7XV93 06/7XV91 11 和使用安全变压器 4AC99 28-0AA 时，必须使用 AC 16V 变压器连接！

1) When only connecting text and signal combination units 7XV93 05/ 7XV93 06/7XV91 11 and when using the 4AC99 28-0AA safety transformer, the 16V AC transformer connection must be used!

7XV93 试验和报警组合装置，组成 / 安装

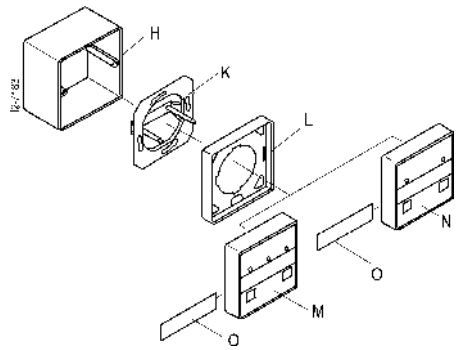
7XV93 Test and signal combination unit, construction/mounting



A 开关 - 插座盒 60mm 用螺丝固定，例如 5VA3 12
B 悬挂卡箍，包括在供货范围中
C 框架 84mm 尺寸带电器嵌件密封 IP44，防溅水，电白色
1 格，84 x 84，5TG4 311
D 或框架 75mm 尺寸，电白色
1 格，75 x 75，5TG2 201
E 7XV93 05/7XV93 11 试验和报警组合装置
F 7XV93 06 试验和报警组合装置
G 标志字样片，包括在供货范围中

A Switch boxes 60mm with screw fixing e.g. 5VA3 12
B Support-frame for combination unit
C Frame size 84mm, with gasket splash-proof, electronic white
1fold, 84 x 84, 5TG4 311
D or Frame size 75mm, electronic white
1fold, 75 X 75, 5TG2 201
E Test and signal combination unit 7XV93 05/7XV93 11
F Test and signal combination unit 7XV93 06
G Labelling strip delivered with unit

- 嵌壁式安装 IP20 或防溅水 IP44
  Flush mounting IP 20 ir splaxh-proof IP 44
- 试验和报警组合装置 7XV93 05/7XV93 06/7XV93 11 带标志字样片
  Test and signal combination unit 7XV93 05/7XV93 06/7XV93 11 with labelling strips

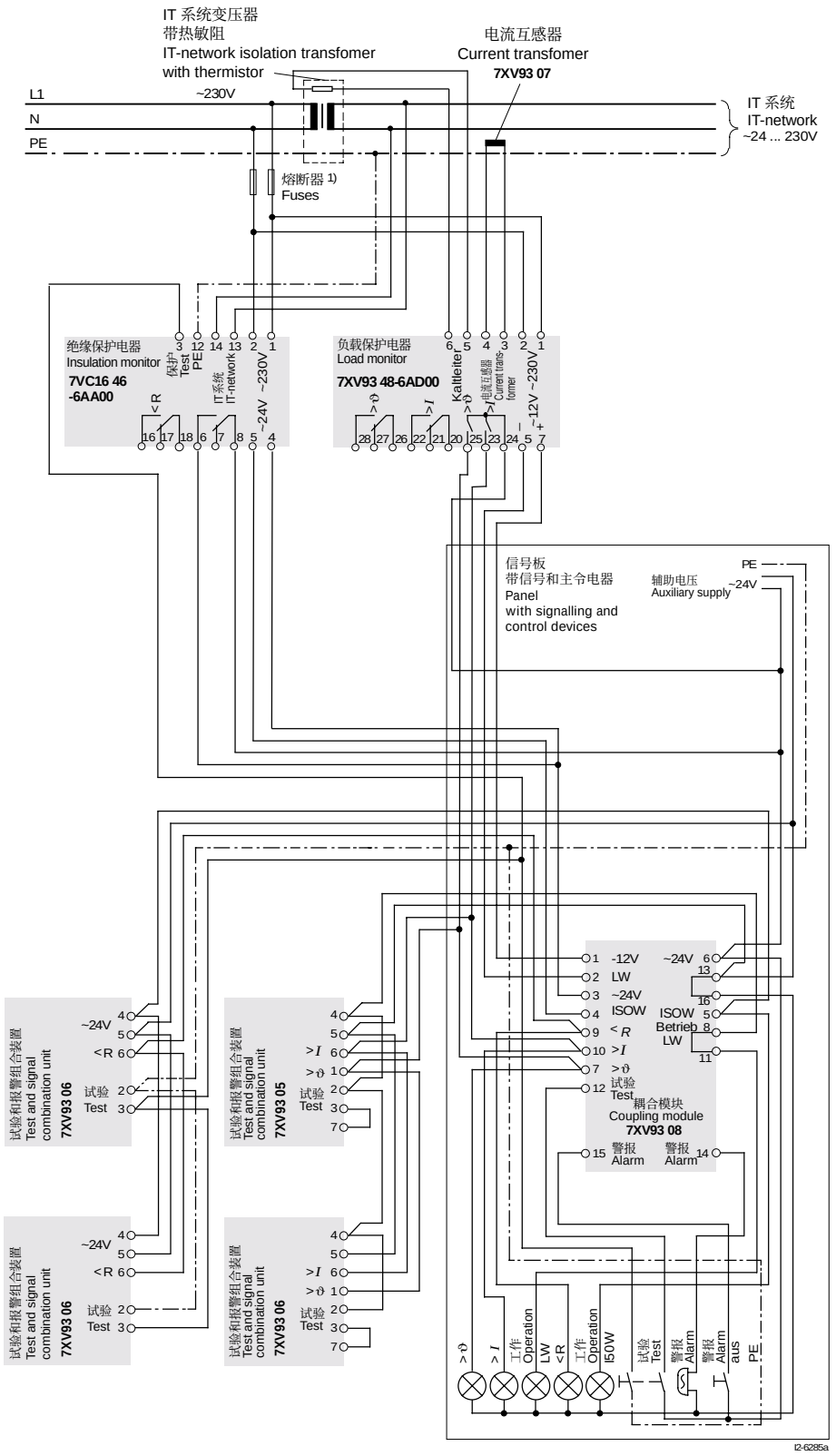


H 凸壁式安装用外壳，电白色
1 格，77 x 41 x 77，5TG2 086
K 悬挂卡箍，包括在供货范围中
L 框架 75 mm 尺寸，电白色
1 格，75 x 75，5TG2 201
M 试验和报警组合装置 7XV93 05/7XV93 11
N 试验和报警组合装置 7XV93 06
O 标志字样片，包括在供货范围中

H Surface mounting housing, electronic white
1fold, 77 x 41 x 77, 5TG2 086
K Support-frame for combination unit
L Frame size 75mm, electronic white
1fold, 75 x 75, 5TG2 201
M Test and signal combination unit 7XV93 05/7XV93 11
N Test and signal combination unit 7XV93 06
O Labelling strip delivered with unit

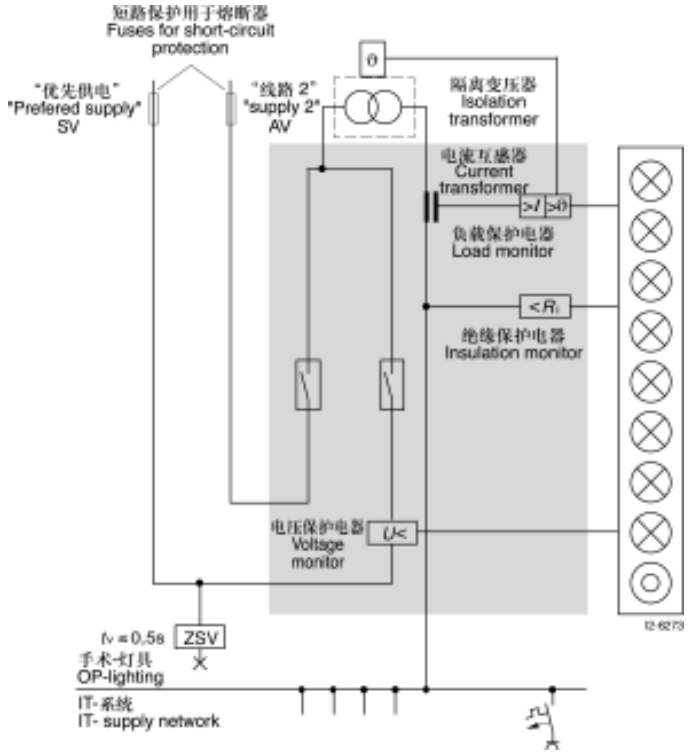
- 凸壁式安装(IP 20)
  Surface mounting (IP 20)
- 试验和报警组合装置 7XV93 05/7XV93 06/7XV93 11 带有标志字样片
  Text and signal combination unit 7XV93 05/7XV93 06/7XV93 11 with labelling strip

7XV93 48 >N< 负载保护电器，总接线图 / 7XV93 48 >N< Type load monitor, block diagram



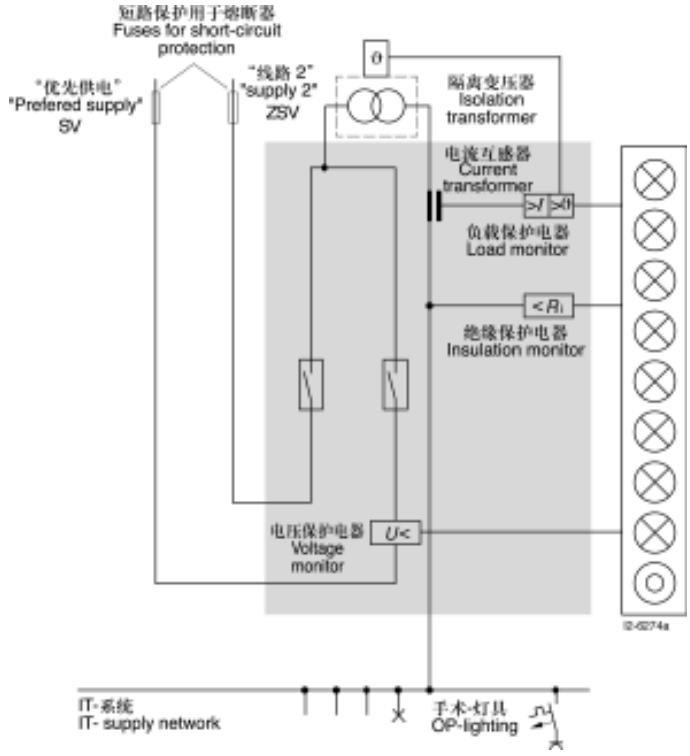
接线原理图 Block diagram

根据 DIN VDE 0107/10.94 第 3.3.3.2/3.3.3.8 节规定，应用类组 2 医疗用房间中用的转换装置，“ 线路 2 ” 由 “ AV ” 供电
Changeover protection for room in application group 2 to DIN VDE 0107/10.94 sections 3.3.3.2/3.3.3.8 ”supply 2” fed from “AV”



试验和报警组合装置 / 信号和主令电器 / 建筑物主控技术
Test- and signal combination units/ Signal- and cvontrol devices/Building management system

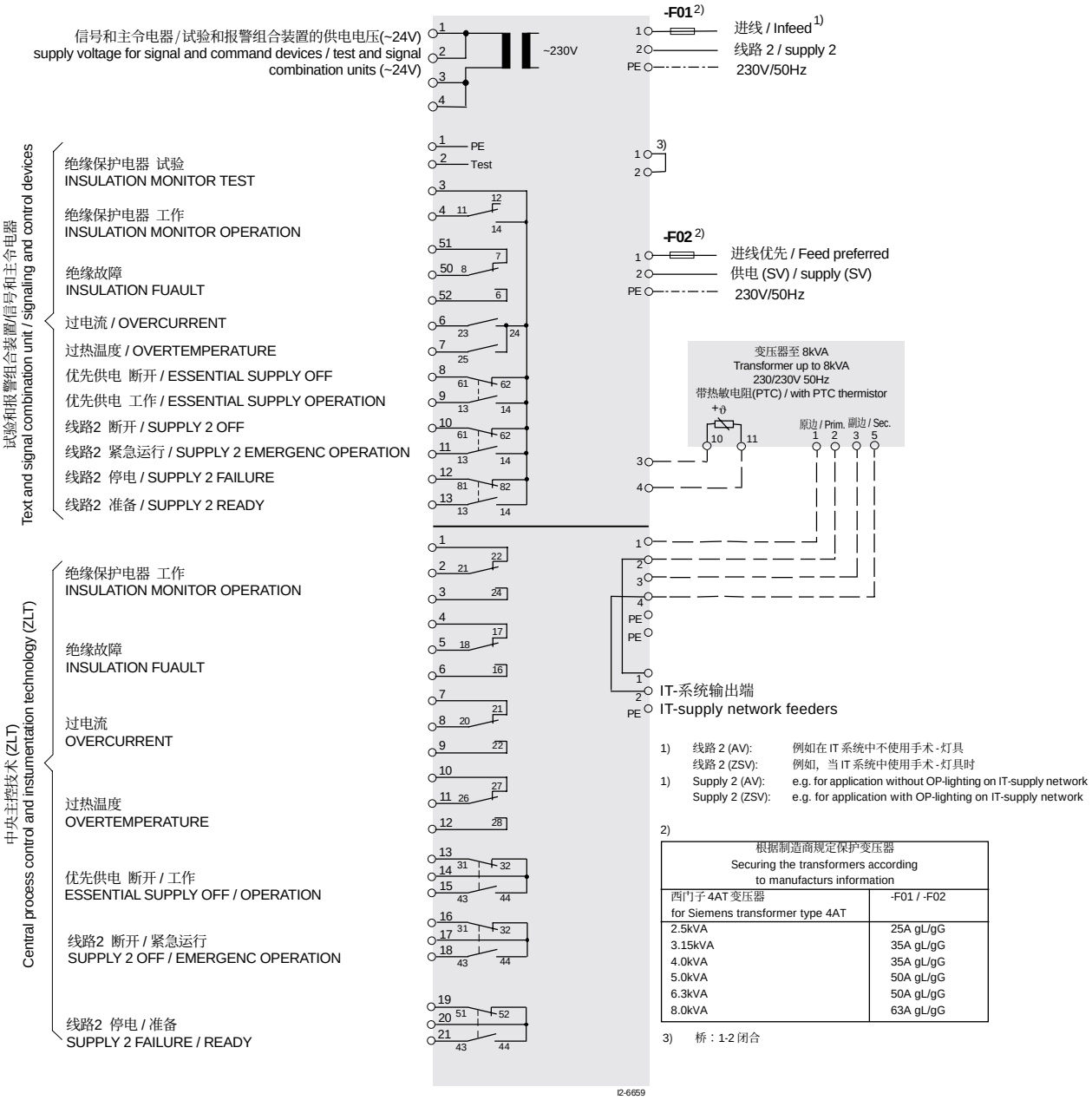
根据 DIN VDE 0107/10.94 第 3.3.3.2/3.3.3.8 节规定，应用类组 2 医疗用房间中用的转换装置，“ 线路 2 ” 由 “ CSP ” 供电
Changeover protection for room in application group 2 to DIN VDE 0107/10.94 sections 3.3.3.2/3.3.3.8 ”supply 2” fed from “CSP”



试验和报警组合装置 / 信号和主令电器 / 建筑物主控技术
Test- and signal combination units/ Signal- and cvontrol devices/Building management system

接线原理图 Block diagram

根据DIN VDE 0107/10.94 第 3.3.3.2/3.3.3.8 节规定，应用类组2医疗用房间中用的转换装置，“ 线路 2 ” 由 “ AV ” 供电
Changeover protection for room in application group 2 to DIN VDE 0107/10.94 sections 3.3.3.2/3.3.3.9 “supply 2” fed from “AV”



1) 线路 2 (AV): 例如在 IT 系统中不使用手术 - 灯具
线路 2 (ZSV): 例如，当 IT 系统中使用手术 - 灯具时
1) Supply 2 (AV): e.g. for application without OP-lighting on IT-supply network
Supply 2 (ZSV): e.g. for application with OP-lighting on IT-supply network

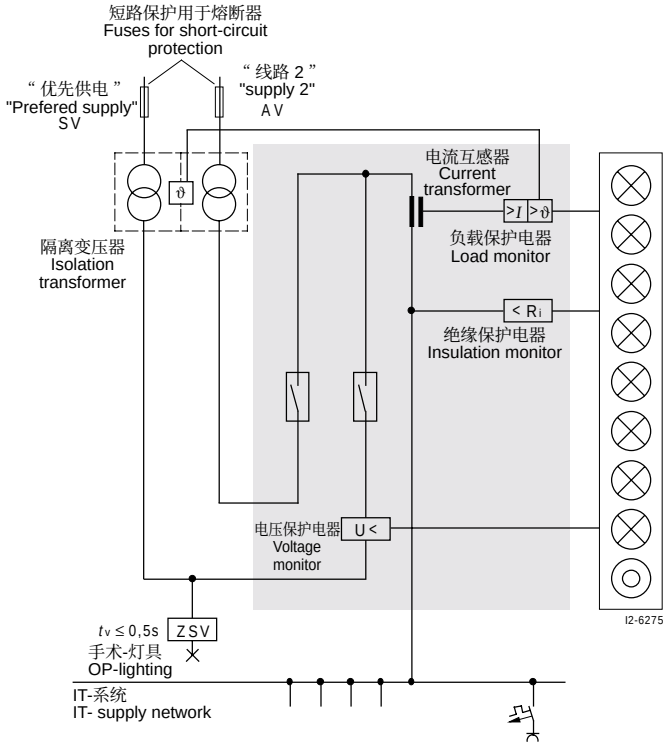
2)

根据制造商规定保护变压器 Securing the transformers according to manufacturs information	
西门子 4AT 变压器 for Siemens transformer type 4AT	-F01 / -F02
2.5kVA	25A gL/gG
3.15kVA	35A gL/gG
4.0kVA	35A gL/gG
5.0kVA	50A gL/gG
6.3kVA	50A gL/gG
8.0kVA	63A gL/gG

3) 桥：1-2 闭合

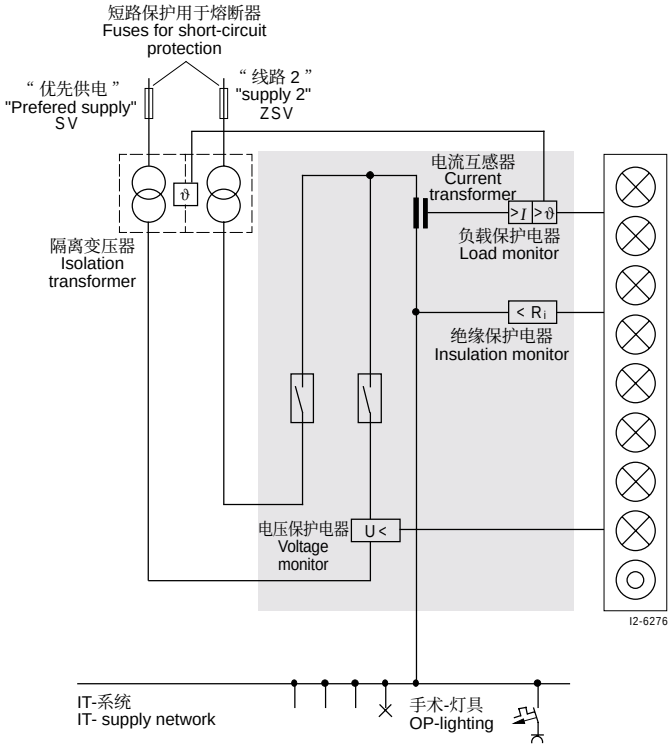
接线原理图 Block diagram

根据 DIN VDE 0107/10.94 第 3.3.3.2/3.3.3.8 节规定，应用类组 2 医疗用房间中用的转换装置，“ 线路 2 ” 由 “ AV ” 供电
Changeover protection for room in application group 2 to DIN VDE 0107/10.94 sections 3.3.3.2/3.3.3.8 ”supply 2” fed from “AV”



试验和报警组合装置 / 信号和主令电器 / 建筑物主控技术
Test- and signal combination units/ Signal- and cvontrol devices/Building management system

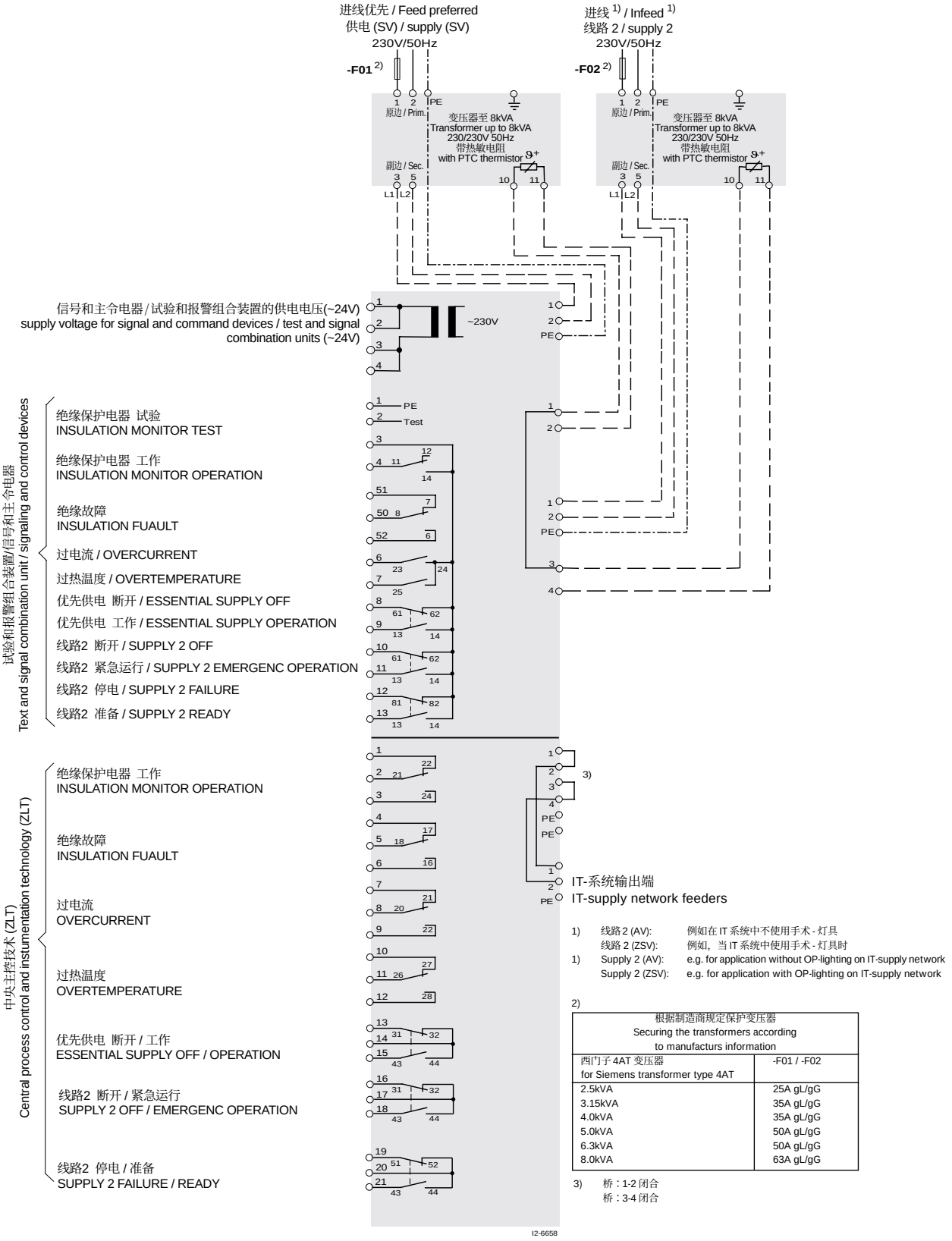
根据 DIN VDE 0107/10.94 第 3.3.3.2/3.3.3.8 节规定，应用类组 2 医疗用房间中用的转换装置，“ 线路 2 ” 由 “ CSP ” 供电
Changeover protection for room in application group 2 to DIN VDE 0107/10.94 sections 3.3.3.2/3.3.3.8 ”supply 2” fed from “CSP”



试验和报警组合装置 / 信号和主令电器 / 建筑物主控技术
Test- and signal combination units/ Signal- and cvontrol devices/Building management system

接线原理图 Block diagram

根据DIN VDE 0107/10.94 第 3.3.3.2/3.3.3.8 节规定，应用类组2医疗用房间中用的转换装置，“ 线路 2 ”由“ AV ”供电
Changeover protection for room in application group 2 to DIN VDE 0107/10.94 sections 3.3.3.2/3.3.3.9 “supply 2” fed from “AV”



1) 线路 2 (AV): 例如在 IT 系统中不使用手术 - 灯具
线路 2 (ZSV): 例如，当 IT 系统中使用手术 - 灯具时
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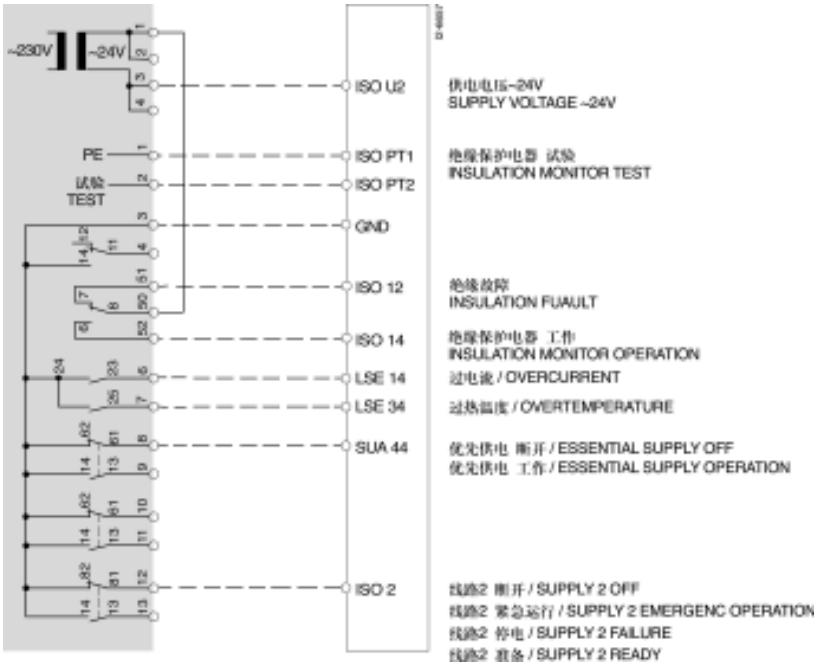
6.3kVA	50A gL/gG
8.0kVA	63A gL/gG

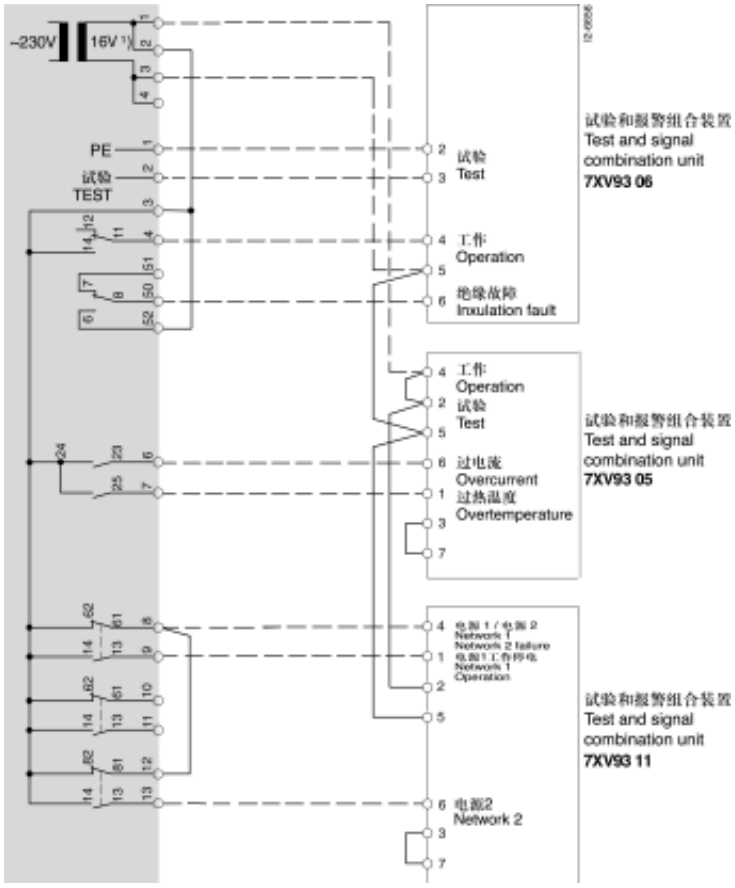
3) 桥：1-2 闭合
桥：3-4 闭合

接线原理图 Block diagram

试验和报警组合装置 (MK 型 2417，奔腾产品) 的连接
Connecting the test and signal combination unit from (type MK 2417)



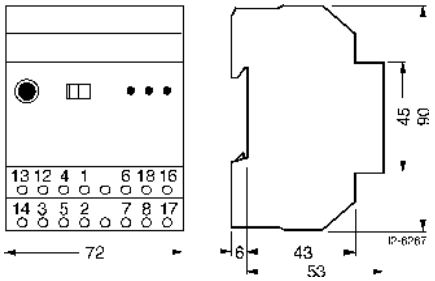
试验和报警组合装置连接在绝缘保护电器、负载保护电器和供电电源上
Connecting the test and signal combination unit to >N< type insulation monitor, >N< type load monitor and power supply



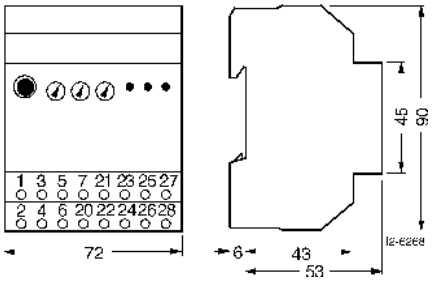
1) 例如，也可用 5SX2 202-72A, C 特性小型断路器
The secondary output of the 4AC99 28-0AA safety transformer should be changed over to the 16V AC connection.

外形尺寸 Dimension drawings

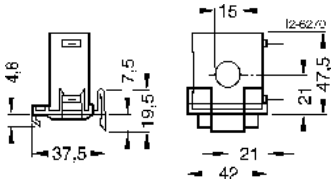
7VC16 46-6AA00 >N< type insulation monitor



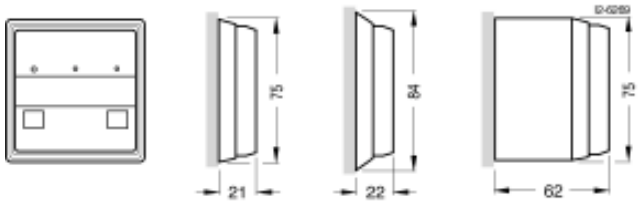
7XV93 48-6ad00 >N< type insulation monitor



7XV93 07 current transformer

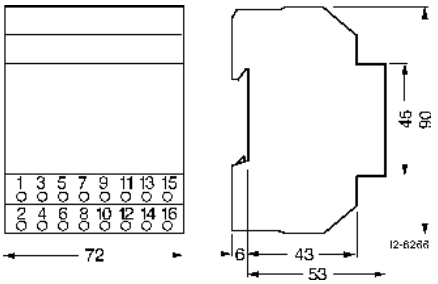


7XV93 test and signal combination unit

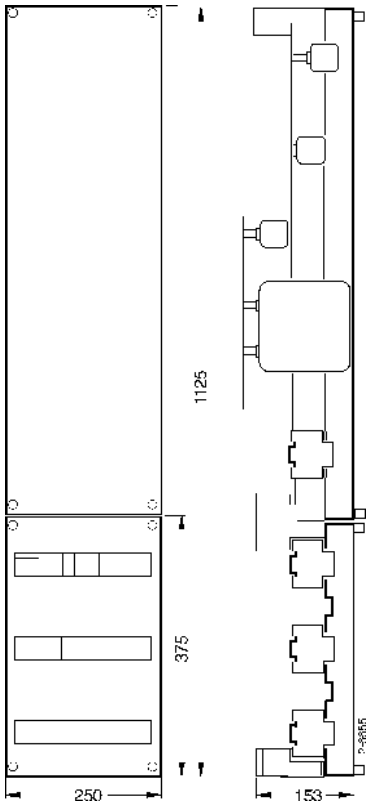


7XV93 05 7XV93 06 7XV93 11	Flush mounting with 75mm frames	Flush mounting with 75mm frames	Flush mounting with 75mm frames

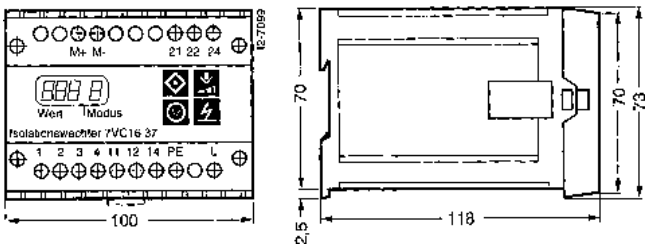
7XV93 08 >N< type coupling module



7XV93 changeover device



7VC1 637-5 insulation monitor



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