



2009产品简介(修订版本)



Surge Arresters and Switching Spark Gaps 气体放电管和开关放电器

Welcome to the World of Electronic Components and Modules 欢迎来到电子元件和模块世界



EPCOS is a leading manufacturer of electronic components, modules and systems. Our broad portfolio includes capacitors, inductors and ferrites, EMC filters, sensors and sensor systems, nonlinear resistors, and arresters, as well as SAW and BAW components and RF modules. As an innovative technology-driven company, EPCOS focuses on technologically demanding growth markets in the areas of information and communications technology, automotive, industrial, and consumer electronics. We offer our customers both standard components as well as application-specific solutions.

EPCOS has design, manufacturing and marketing facilities in Europe, Asia and the Americas. We are continuously strengthening our global research and development network by expanding R&D activities at our production locations, primarily in Eastern Europe, China and India. With our global presence we are able to provide our customers with local development and manufacturing know-how and support in the early phases of their projects.

EPCOS is continually improving its processes and thus the quality of its products and services. The Group is ISO/TS 16949 certified and remains committed to constantly reviewing and systematically improving its quality management system.

爱普科斯是领先的电子元件、模块和系统的制造商。公司的产品组合包括电容器、电感器和铁氧体、EMC滤波器、传感器和传感器系统、非线性电阻器、放电管、以及声表面波、体声波元件和射频模块。作为一家技术导向型的公司，爱普科斯重点关注增长迅速的尖端技术市场，范围包括汽车电子产品、信息和通信技术、工业电子产品和消费电子产品。公司可为客户提供标准元件以及特殊应用解决方案。

爱普科斯在欧洲、亚洲以及美洲都有设计、制造和营销机构。我们正在不断加强全球研发网络，扩大我们主要在东欧、中国和印度的生产基地研发活动。凭借遍布全球的网络，公司可在项目的早期阶段为客户提供本地开发和制造专业技术和支持。

爱普科斯不断提高工艺水平，从而提高其产品和服务质量，公司通过了ISO/TS 16949认证，并致力不断审查和全面提高其质量管理体系。

Surge Arresters and Switching Spark Gaps 气体放电管和开关放电器



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* Added new product information on page 28 新产品信息在第28页

Important Notes

重要事项

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application**. As a rule, EPCOS is either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether an EPCOS product with the properties described in the product specification is suitable for use in a particular customer application.
2. We also point out that **in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified**. In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or lifesaving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.
3. **The warnings, cautions and product-specific notes must be observed.**

4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous)**. Useful information on this will be found in our Material Data Sheets on the Internet (www.epcos.com/material). Should you have any more detailed questions, please contact our sales offices.
5. We constantly strive to improve our products. Consequently, **the products described in this publication may change from time to time**. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order.

We also **reserve the right to discontinue production and delivery of products**. Consequently, we cannot guarantee that all products named in this publication will always be available.

The aforementioned does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.
6. Unless otherwise agreed in individual contracts, **all orders are subject to the current version of the "General Terms of Delivery for Products and Services in the Electrical Industry" published by the German Electrical and Electronics Industry Association (ZVEI)**.
7. The trade names EPCOS, BAOKE, Alu-X, CeraDiode, CSMP, CSSP, CTVS, DeltaCap, DigiSiMic, DSSP, FormFit, MiniBlue, MiniCell, MKD, MKK, MLSC, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, SIP5D, SIP5K, ThermoFuse, WindCap are **trademarks registered or pending** in Europe and in other countries. Further information will be found on the Internet at www.epcos.com/trademarks.

以下内容适用于所有上述产品:

1. 本出版物的某些部分包括本公司产品在特定领域的适用性声明。这些声明基于我们对所涉及领域对产品的通用要求的了解。尽管如此, 仍需明确指出的是, 此类声明并不能作为本公司产品在特定终端应用中适用性的约束性声明。通常, 爱普科斯要么不熟悉特定客户的应用, 要么比客户自己了解的要少。因此, 客户有责任检查和确定爱普科斯产品是否具有适用于特定应用的特性。
2. 还需指出的是, 个别情况下, 即便按照规定的方法操作, 现有的技术仍不能完全排除无源电子元件在正常使用寿命前发生故障或失效。具有很高安全要求的应用, 特别是电子元件故障或失效可能导致生命安全或健康问题的应用(如事故预防或救生系统)中, 必须采用合适的终端应用设计或必要的措施(如安装保护电路或冗余电路), 确保发生电子元件故障或失效时不会对他人产生伤害。
3. **必须严格遵守所有警告、注意和产品提示。**

4. 为满足特定技术要求, 本出版物所述的有些产品可能包含特定区域内限制的物质(如, 被认为有害的物质)。相关信息, 可查看我们网站(www.epcos.com/material)上的“物料清单”。如果有更细节的问题, 请联系我们的销售部门。
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上述声明不适用于就客户指定产品签署的偏离上述声明的个别协议的情形。
6. 除非合同另有规定, 所有订货都应符合德国电子电气工业协会(ZVEI)发布的最新“电气行业产品销售和服务通用条款”的规定。
7. 商标EPCOS、BAOKE、Alu-X、CeraDiode、CSMP、CSSP、CTVS、DeltaCap、DigiSiMic、DSSP、FormFit、MiniBlue、MiniCell、MKD、MKK、MLSC、MotorCap、PCC、PhaseCap、PhaseCube、PhaseMod、PhiCap、SIFERRIT、SIFI、SIKOREL、SilverCap、SIMDAD、SiMic、SIMID、SineFormer、SIOV、SIP5D、SIP5K、ThermoFuse及WindCap是公司在欧洲或其他国家的注册商标或正在审查的商标。详细信息, 请访问www.epcos.com/trademarks

注: 本页内容请以英文版本为准。

Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

请阅读第4页的重要信息, 以及第70页的敬告和警告。

Surge Arresters

气体放电管



Excessive voltages and the resulting surge currents can damage or even destroy communications equipment, data transmission and energy supply systems. Injury to human beings cannot always be excluded either. Such excessive voltages may be due to a number of factors. They include:

- Atmospheric fields and discharges (thunderstorms)
- Inductive coupling from power supply lines, e.g. triggered by switching processes
- Direct contact between communications and power supply lines
- Electrostatic discharges

Gas-filled surge arresters offer optimal protection in these cases. They limit surge voltages quickly and safely to uncritical values and reliably discharge any dangerous currents that may occur.

At the top with competence and know-how

Our manufacturing plants supply an extensive range of surge arresters, meeting the most diverse requirements of our customers. Thanks to our international business operations, we have developed a significant advance in the sector of overvoltage protection. Our involvement in national and international committees enables us to play an active role in questions of standardization.

过电压及其导致的浪涌电流破坏甚至摧毁通信设备、数据传输和电源系统，并且不排除造成人身伤害的可能。这类过电压可能是由多种因素引起的。

包括：

- 大气层放电（雷电）
- 来自供电线路的感应耦合，例如由开关过程引起的
- 通信线路和电力线路的直接接触
- 静电放电

气体放电管可以在上述情形中提供最佳的保护功能。这类放电管能够安全、迅速地限制浪涌电压至安全水平，并可靠地排除危险电流。

爱普科斯竭尽所能

爱普科斯的工厂可以提供各种气体放电管，满足客户的不同要求。通过开拓国际业务，爱普科斯在过电压防护领域已经处于绝对领先地位。公司还参与国内和国际行业标准的制定并发挥重要作用。

Surge Arresters

气体放电管



Tried and tested millions of times over

Our customers include many international manufacturers and suppliers of telecommunications systems and manufacturers of surge voltage protection devices and installations. They appreciate our extensive range of types, which enables high flexibility in matching to the most diverse circumstances. They rely on the standard of quality with which we manufacture our arresters in large numbers, more than 100 million items annually.

The development of our surge arresters is based on international standards such as ITU-T, K.12, IEC 61643-311 (EN 61643-311), IEC 61643-11 (EN 61643-11), RUS PE-80/IEEE 465.1 and DIN VDE 0845, Part 2. They are also used to enable modules/equipment to meet various regulatory requirements including ITU K20/K21, IEC 61000-4-5, Telcordia GR1361/GR974/1089.

Customer requirements are our first priority

Our aim is to work together with our customers to provide optimal solutions for their applications in surge-voltage protection. We do this on the basis of our range of standard types, but are equally interested in responding to new requirements. If you have any questions on surge arresters, do not hesitate to contact us. Our experienced specialists will be happy to give you comprehensive advice.

上百万次的测试

爱普科斯的客户包括许多跨国运营的电信系统制造商和供应商以及浪涌电压保护设备和装置制造商。这些客户十分赞赏本公司的产品类型多样，可以灵活适应各种不同环境。客户信赖爱普科斯的质量标准。根据这些标准公司大量生产放电管，每年生产的数量超过1亿只。

爱普科斯气体放电管的研制基于以下国际标准：ITU-T、K.12、IEC 61643-311 (EN 61643-311)、IEC 61643-11 (EN 61643-11)、RUS PE-80/IEEE 465.1 以及DIN VDE 0845, Part 2。气体放电管用在模块和设备上，使这些设备可以满足各种法规要求，如ITU K20/ K21、IEC 61000-4-5以及Telcordia GR1361/ GR974/1089。

公司宗旨：客户的要求优先

爱普科斯的目标是与客户共同努力，浪涌电压防护提供最优的解决方案。公司按照已有的标准型号范围开展这一工作，但是同样会对新的要做出响应。如果您对气体放电管有任何疑问，请随时与本公司联系。爱普科斯的资深专家乐于为您提供全方位的建议。

Surge Arresters

气体放电管



Surge arresters in brief

Gas-filled surge arresters operate on the gas-physical principle of the highly effective arc discharge. Electrically, surge arresters act as voltage-dependent switches. As soon as the voltage applied to the arrester exceeds the spark-over voltage, an arc is formed in the hermetically sealed discharge region within nanoseconds. The high surge current handling capability and the arc voltage, which is almost independent of the current, short-circuit the overvoltage. When the discharge has died down, the arrester extinguishes and the internal resistance immediately returns to values of several 100 MΩ.

The surge arrester thus meets almost perfectly all requirements made on a protective element. It reliably limits the overvoltage to permissible values, and – under normal operating conditions – the high insulation resistance and the low capacitance contribute to the fact that an arrester has virtually no impact on the system to be protected.

Key characteristics

■ DC spark-over voltage	70 ... 5500 V
■ Impulse discharge current (8/20 μs)	max. 100 kA
■ Impulse discharge current (10/350 μs)	max. 100 kA
■ Alternating discharge current (1 s)	max. 20 A
■ Alternating discharge current (0.2 s)	max. 300 A
■ Arc voltage	max. 35 V
■ Insulation resistance	min. 1 GΩ
■ Capacitance	min. 0.5 pF

气体放电管简介

气体放电管按照高效率弧光放电的气体物理原理工作。从电气的角度看，气体放电管相当于压敏开关。一旦施加到放电管的电压超过击穿电压，密封的放电区域会在毫秒级内形成电弧。高浪涌电流处理能力和几乎独立于电流的电弧电压使过电压短路。当放电结束，放电管熄灭，内部电阻立即返回数百兆欧姆。

气体放电管近乎完美地满足保护性元件的所有要求。它能够可靠地将过电压限制在允许的数值范围内，并且在正常工作条件下，由于高绝缘阻抗和低电容特性，放电管对受保护的系统不会有实质上的影响。

主要特性

■ 直流击穿电压	70 ... 5500 V
■ 冲击放电电流 (8/20 μs)	最大值 100 kA
■ 冲击放电电流 (10/350 μs)	最大值 100 kA
■ 工频放电电流 (1 s)	最大值 20 A
■ 工频放电电流 (0.2 s)	最大值 300 A
■ 弧光电压	最大值 35 V
■ 绝缘电阻	最小值 1 GΩ
■ 电容	最小值 0.5 pF

Overview of Type Series

型号系列一览表

2-electrode arresters 二极放电管														
Latest data sheets are available at www.epcos.com/arresters 请登录 www.epcos.com/arresters 获取最新的规格书														
														
型号系列	S20	S50	S80	S30	ES	EM	M5	EC	EF	A6/N8	A7	A8	A83	V1
耐流等级 ¹⁾ kA/A	SMD types 贴片型			Light duty 小功率						Medium duty 中功率		Heavy duty 大功率		
	0.5 / 0.5	5 / 5	20 / 20	2 / 2	2.5 / 2.5	2.5 / 2.5 2 / 2; 1.5	5 / 5	5 / 5	5 / 5	10 / 10	5 / 2.5 10 / 10	20 / 20	20 / 20	20 / 20
外形尺寸 mm (Ø x h)	3.2x1.6x1.6	5.7x5x5	8.4x8.4x6	4.5x3.2x2.7	4.7x4	5.5x6	5x5	8x6	8x6	8x6	8x8	8x6	8x20	11.8x17.4
页码	28	28	28	29	30	31/32	33	34	40	35	38/39	36	37	41
V _{sdCN} ²⁾ (V)														
75														
90														
150														
170														
200														
230														
250														
260														
270														
300														
350														
400														
420														
470														
500														
600														
800														
1000														
1400														
1500														
1600														
2000														
2200														
2500														
3000														
3500														
3600														
4000														
4500														
5500														
Typical applications 典型应用	Customer premises equipment such as DSL modems, WLAN routers, TV sets and cable modems 用户初级设备, 如DSL调制解调器、WLAN路由器、电视机和电缆调制解调器									Crossover junctions for overhead cables, underground cables, subscriber protection 架空电缆和地下电缆转接接头、终端保护		Overhead lines and installations particularly susceptible to lightning threats, subscriber protection in exposed locations 高架线和容易遭受雷电袭击的装置、以及处在暴露位置的终端保护		

Surge arresters are usually classified by their discharge capability.
The overview above relates type series to discharge classes and shows the available voltage ratings.
According to their discharge class the individual type series can be assigned to typical applications.

气体放电管通常根据其放电能力分类。
以上的概述将产品的型号系列和耐流等级联系起来并列出可用的额定电压值。
根据耐流级别, 单个的产品型号系列可以指派到典型应用上。

1) Surge current: 10 x 8/20 µs wave in total; AC current: 10 x 1s / 50 Hz in total
1) 浪涌电流: 10 x 8/20 µs总电流波; 工频电流: 10 x 1 s/50 Hz 总电流

2) Nominal DC spark-over voltage
2) 标称直流击穿电压

Overview of Type Series

型号系列一览表

3-electrode arresters 三极放电管				Latest data sheets are available at www.epcos.com/arresters 请登录 www.epcos.com/arresters 获取最新的规格书						
										
型号系列	EK	EZ	T9	ER	EK	T3	T8	T2	T2/T5	T6
耐流等级 ¹⁾ kA/A	10 / 10	5 / 5	5 / 5	10 / 10	10 / 10	10 / 10	10 / 10	20 / 10	20 / 10 (US spec.)	20 / 20
外形尺寸 mm (Ø x h)	8.3x14	5x7.6	5x7.6	6.3x8.1	6.8x10	6x8	8x10	8x10	8x10	9.5x11.5
页码	41	42	43	44	45	46	47/48/49	50/51	53	52
V _{sdcN} ²⁾ (V)										
75										
90										
150										
230										
250										
260										
300										
350										
420										
500										
600										
650										
Typical applications 典型应用	Main distributor and subscriber protection in regions with high frequency of lightning strikes 在经常遭受雷电袭击的地区使用的主配线架和终端保护	Underground cables and private branch exchanges in densely populated regions as well as main distributors 人口稠密地区使用的地下线缆和私用分支交换机以及主配线架	Crossover junctions for overhead cables, underground cables, subscriber protection 架空电缆和地下线缆转接接头和终端保护				Overhead lines and installations particularly susceptible to lightning threats, subscriber protection in exposed locations 高架线和容易遭受雷电袭击的装置, 以及处在暴露位置的终端保护			

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1) 浪涌电流: 10 x 8/20 µs总电流波; 工频电流: 10 x 1 s / 50 Hz 总电流

2) Nominal DC spark-over voltage
2) 标称直流击穿电压

Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

请阅读第4页的重要信息, 以及第70页的敬告和警告。

Overview of Type Series

型号系列一览表

AC power line protection 交流电源线保护

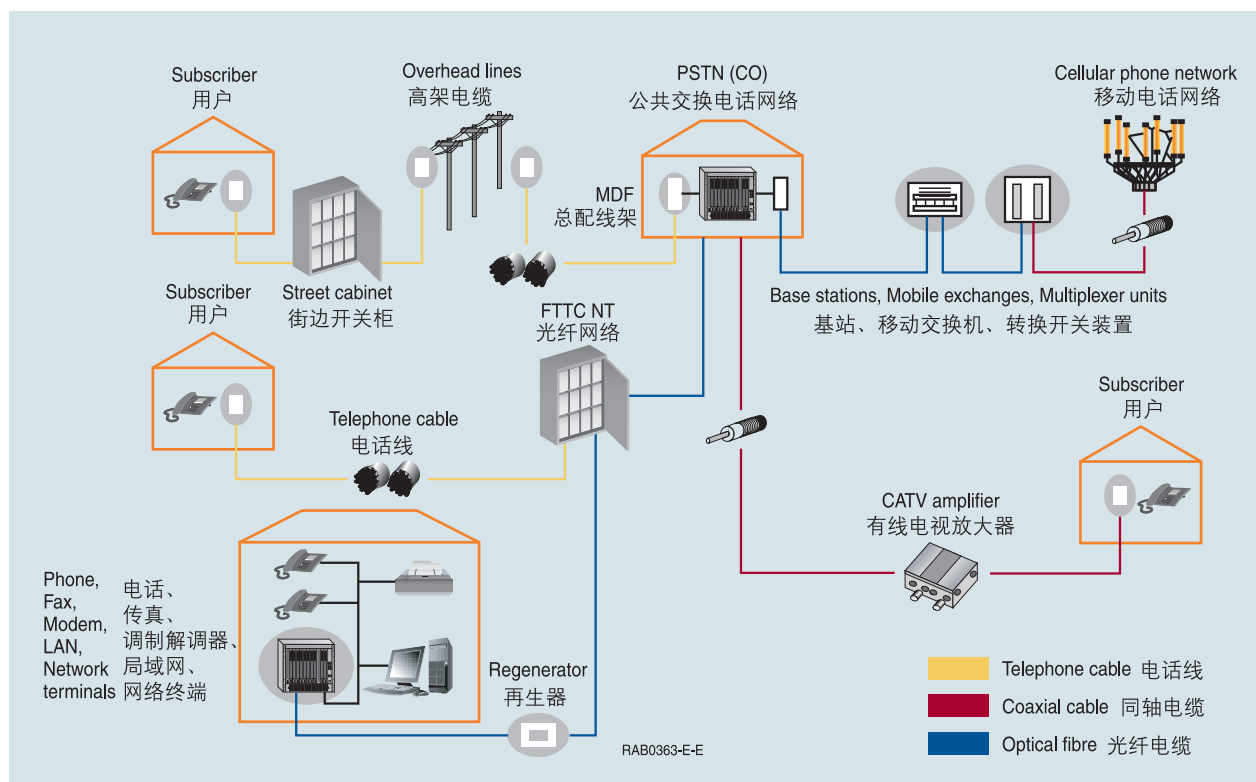
Latest data sheets are available at www.epcos.com/arresters
请登录 www.epcos.com/arresters 获取最新的规格书

						
型号系列	V1	D20	L1	H3	M5	A8
保护等级	Max. duty 最大功率					
	I & II	I & II	I	I	II & III	II & III
外形尺寸 mm (Ø x h)	12x17	20x4	30x12	30x30	5x5	8x6
页码	54/55	54	54	54	55	55
V _{sdN} ²⁾ (V)						
70						
90						
150						
200						
230						
250						
300						
350						
420						
500						
600						
800						
1000						
1400						
1800						
Typical applications 典型应用	AC power line protection, class I & II I 级和 II 级交流电源线保护				AC power line protection, class II & III II 级和 III 级交流电源线保护	

Protection class to EN 61643-11.
See product profile for 500 V and 800 V types. Types for other listed voltages are available on request.
保护等级符合 EN 61643-11。
见 500 V 和 800 V 类型产品简介。其它所列电压的型号可定制。

1) Nominal DC spark-over voltage
1) 标称直流击穿电压

Applications 应用



Gas-filled surge arresters are classical components for protecting the installations of the telecommunications. It is essential that IT and telecommunications systems - with their high-grade but sensitive electronic circuits - be protected by arresters. They are thus fitted at the input of the power supply system together with varistors and at the connection points to telecommunication lines. They have become equally indispensable for protecting base stations in mobile telephone systems as well as extensive cable television (CATV) networks with their repeaters and distribution systems.

These protective components are also indispensable in other sectors:

- In AC power transmission systems, they are often used with current-limiting varistors
- In customer premises equipment such as DSL modems, WLAN routers, TV sets and cable modems
- In air-conditioning equipment

The integral black-box concept offers graduated protection by combining arresters with varistors, PTC thermistors, diodes and inductors to create an ideal solution for many applications.

气体放电管是保护电信设备的传统电子元件。在IT和高级电信系统中的敏感电子电路必须由放电管保护。放电管和压敏电阻一起安装在电源系统的输入端以及连接电信线缆的连接点。在保护移动通讯系统的基站以及带中继设备和分布系统的有线电视网络（CATV）同样是不可缺少的。

这些保护性的电子元件在其他领域也是同等重要的：

- 在交流电传输系统中，它们通常和压敏电阻一起使用
- 用户初级设备，如DSL调制解调器、WLAN路由器、电视机和电缆调制解调器
- 空调设备

运用黑匣子理念，通过将放电管和压敏电阻、PTC热敏电阻、二极管以及电感器结合在一起，创造出理想的保护应用解决方案。

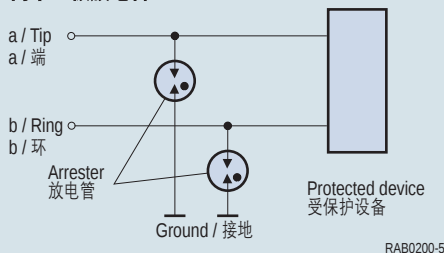
Applications 应用

Telephone/fax/modem protection 电话/传真机/调制解调器的保护

Typical / 典型产品:

- 230-V arrester/放电管
- 350-V arrester/放电管

Two 2-electrode arresters 两个二极放电管



One 3-electrode arrester 一个三极放电管

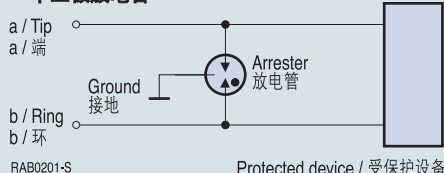


Fig./ 图1

Signal line protection 信号线保护

Typical / 典型产品:

- 75-V arrester/放电管
- 90-V arrester/放电管
- 230-V arrester/放电管

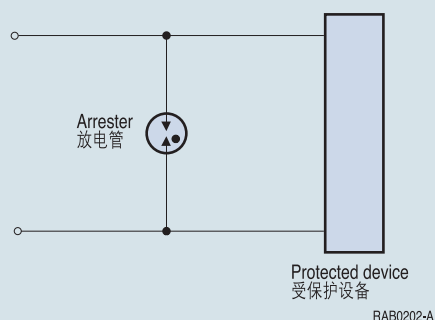


Fig./ 图2

Telephone/fax/modem protection

Telephones, faxes and modems are equipped with sophisticated but sensitive electronics. Typical circuits used to protect them with surge arresters are shown in Fig. 1. These arresters protect against common-mode interference voltages, i.e. surge voltages that appear in both lines to ground. In the event of an overvoltage, the arrester protects both exchange lines by conducting the surge current away to ground.

Signal line protection

Signal circuits are often run with no ground conductor. A 2-electrode arrester circuit located between the two signal lines prevents the formation of large potential differences at the input of the equipment to be protected before they can cause any damage (Fig. 2). This circuit offers differential-mode protection.

电话/传真机/调制解调器的保护

越来越多的电话、传真机和调制解调器配备精密的电子装置。应用气体放电管保护这些设备的典型电路图见图1。这些放电管可保护免受共模干扰电压影响，如出现在两条接地线内的浪涌电压。如果出现过压的情况，放电管将浪涌电流向地导通从而保护交换机线路。

信号线的保护

信号电路经常没有接地导体。位于两条信号线之间的一个二极放电管电路可以在受保护设备输入端在破坏发生之前阻止大电位差的形成（见图2）。该电路提供差模保护。

Basic circuit configurations 基本电路配置

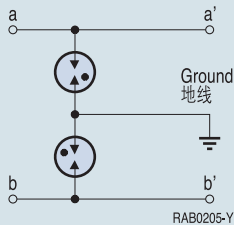


Fig. / 图 3

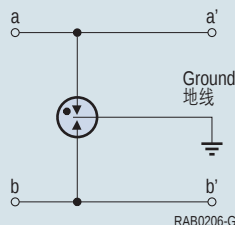


Fig. / 图 4

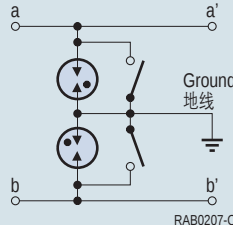


Fig. / 图 5

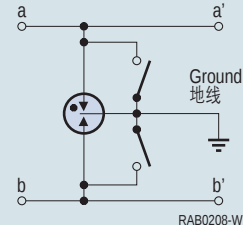


Fig. / 图 6

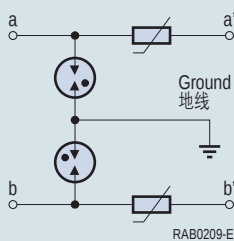


Fig. / 图 7

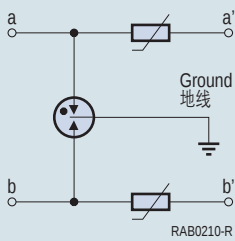


Fig. / 图 8

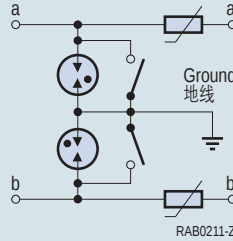


Fig. / 图 9

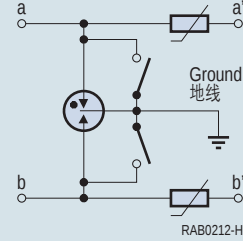


Fig. / 图 10

Protective circuits

The following basic circuits illustrate standard configurations for surge arresters used in protection circuits for the telecommunications sector. 3-point protection solutions contain only an arrester whereas 5-point protection solutions make additional use of current-limiting components such as PTC thermistors.

3-point protection

3-point protection circuits are connected between the a/b wires and ground and operate by conducting the voltage surge to ground. Both 2-electrode (Fig. 3) and 3-electrode arresters (Fig. 4) are used. Arresters with a failsafe mechanism (Figs. 5 and 6) represent another alternative. For further information about this variant see page 22.

5-point protection

A 5-point protection circuit contains a current-limiting component, usually a PTC thermistor, in addition to the arrester. The thermistor blocks further current flow through it by assuming a very high resistance in the event of an overcurrent.

Figs. 7 and 8 show circuits with 2 and 3-electrode arresters, while Figs. 9 and 10 show variants with a fail-safe mechanism (for details refer to page 22). However, it may not always be possible to reset an activated thermistor in systems with constant current feed.

保护电路

下列基本电路说明了气体放电管应用于通信领域线路保护的标准结构。三端保护解决方案仅使用一个放电管，而五端保护解决方案需另加限流元件，如正温度系数热敏电阻。

三端保护

三端保护线路连接a/b线和地线，并通过将浪涌电压导入地下而起到保护作用。二极（图3）和三极放电管（图4）都应用于其中。带失效保护卡的放电管（图5和图6）则代表另一种形式。更多信息见第22页。

五端保护

除放电管外，五端保护电路还包括限流元件，通常为PTC热敏电阻。当发生过电流时，热敏电阻呈高阻抗状态以阻止更大电流通过。

图7和图8显示的是装有二极和三极放电管的电路，而图9和图10显示的是装有失效保护卡的放电管的另一种形式（详细信息见第22页）。但是，在有恒定电流供应的情况下，已被激活的热敏电阻可能不会恢复到低阻抗状态。

Applications 应用

CATV/Coax line protection 有线电视/同轴电缆保护

Typical / 典型 :

- 145-V arrester/放电管
- 150-V arrester/放电管
- 230-V arrester/放电管

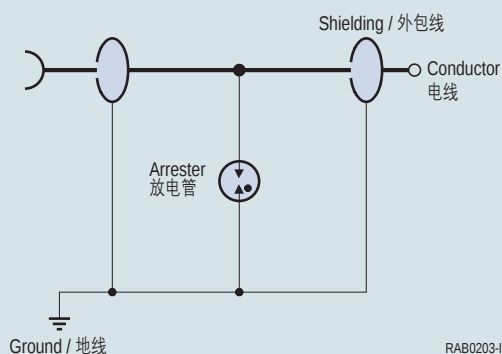


Fig. / 图 11

AC line protection 交流线路保护

Typical / 典型 :

- 270-V arrester/for 110 VAC 用于110 VAC的270 V放电管
- 470-V arrester/for 230 VAC 用于230 VAC的470 V放电管
- 600-V arrester/for 230 VAC 用于230 VAC的600 V放电管
- 800-V arrester/for 400 VAC 用于400 VAC的800 V放电管

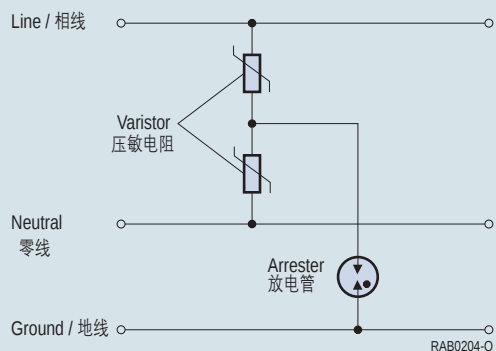


Fig. / 图 12

Cable TV/coaxial cable protection

Arresters are particularly well suited for protecting the coaxial cables frequently laid in CATV networks, as they do not disturb the system even at high frequencies thanks to their low self-capacitance of typ. 0.5 to 1 pF. The arrester is contained in the coaxial protection module where it is connected between the central conductor and the shielding. It is recommended to ground either the shielding or the housing of the protection module, depending on the application (Fig. 11).

AC line protection

Telecommunications installations as well as CATV amplifiers, CB transmitters, home entertainment systems, computers and similar equipment can be exposed to voltage surges conducted via the power network. The combination of a surge arrester and a varistor offers proven protection in these cases. The phase and neutral conductors are connected to ground potential of both protection elements (Fig. 12).

EPCOS arresters can be used in SPD (Surge Protective Devices), which fulfill EN/IEC 61643-11 class I, II or III requirements.

有线电视/同轴电缆保护

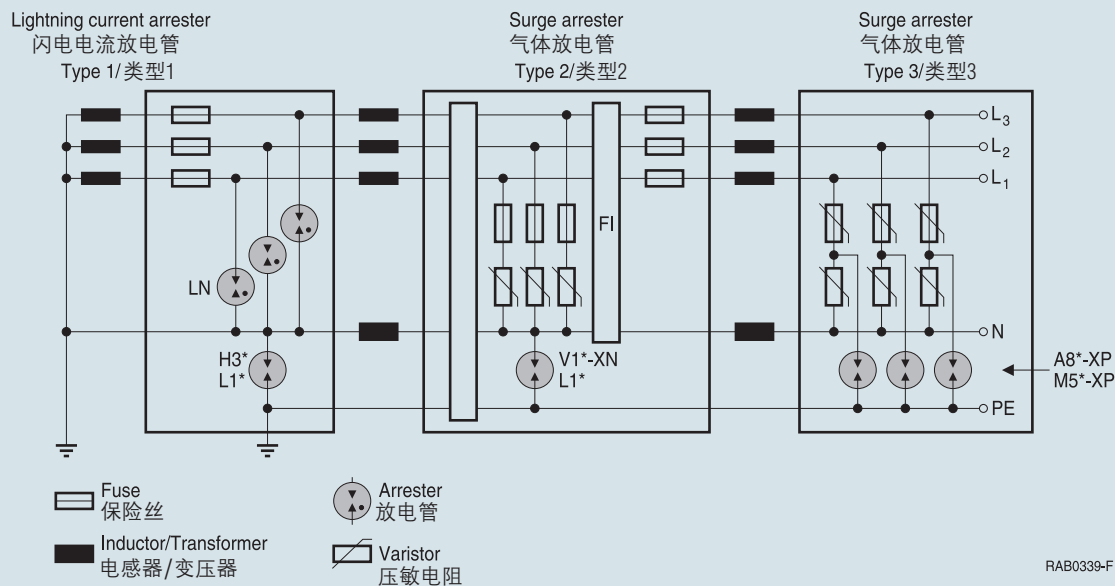
气体放电管特别适用于有线电视网络中的同轴电缆保护。由于放电管具有很低的寄生电容（一般为0.5至1 pF），即使在高频状态都不会对系统造成干扰。放电管置于保护模块中并与导体和外包线连接。根据实际应用，外包线或者保护模块的外盒必须接地（图11）。

交流线路的保护

通讯装置及有线电视放大器、CB传送器、家用娱乐系统、电脑以及类似设备都有可能接触到电网所感应的浪涌电压。结合使用气体放电管和压敏电阻可对上述情况实施有效保护。通过带有这两种保护元件的串联线路使相线和零线接地（图12）。

爱普科斯放电管可用于符合EN/IEC 61643-11 I、II和III级要求的浪涌保护装置（SPD）。

Lightning protection zone concept 闪电保护区概念



N-PE arresters

In TT and TN-C-S systems the so called N-PE arrester is positioned between neutral and protective ground where it is exposed to the sum of the lightning surge currents from all discharge lines. This means that – depending on the classification of the building to the lightning classes defined by DIN VDE 0185-305 – it must carry a direct lightning current of 50, 75 or 100 kA of waveform 10/350 μ s. To this must be added inductively coupled currents with a waveform of 8/20 μ s and a maximum value of up to 150 kA. The IEC 61643-11 standard specifies a test program which includes both waveforms as well as a sinusoidal follow current of up to 100 A that may occur in the event of operation. The limitation of this follow current to the duration of a half-wave, known as its lightning-current discharge capability, is a key characteristic of the arrester.

For products see pages 55/56.

N-PE放电管

在TT和TN-C-S系统中，所谓的N-PE放电管被置于零线和保护性地线之间，暴露于来自所有放电线路的闪电浪涌电流。这意味着，根据DIN VDE 0185-305规定的建筑物闪电等级的分类，它可以携带10/350 μ s波形的50、75或100 kA直流闪电电流。必须增加8/20 μ s波形、最大值为150 kA的感应耦合电流。IEC 61643-11标准指定了测试程序，包括波形以及工作过程中可能出现的最高达100 A的正弦曲线持续电流。持续电流对半波持续时间的限制被称为闪电电流放电能力，是放电管的主要特性之一。

产品见第55/56页。

Construction 结构

Basic construction of 2- and 3-electrode arresters 二极和三极放电管的基本结构

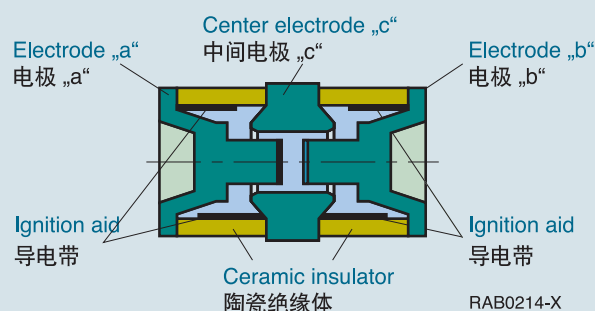
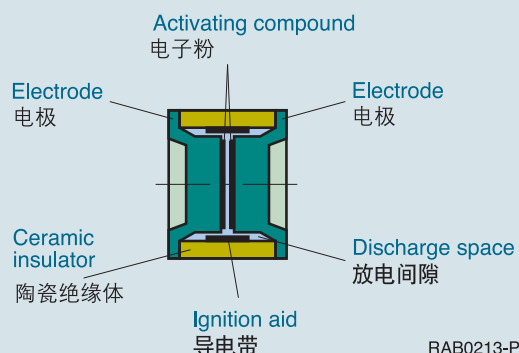


Fig. / 图 14

The electrical properties of an open gas-discharge path depend greatly on environmental parameters such as gas type, gas pressure, humidity and pollution. Stable conditions can only be ensured if the discharge path is shielded against these environmental influences. The design principle of surge arresters is based on this requirement.

A proven technique of connecting insulator and electrode ensures hermetic sealing of the discharge space. The type and pressure of the gas in the discharge space can thus be selected on the basis of optimum criteria. The rare gases argon and neon are predominantly used in gas-filled arresters since they ensure optimum electrical characteristics throughout the entire useful life of the component. An activating compound is applied to the effective electron emission surfaces of the electrodes, themselves separated typically by less than 1 mm, to reduce the work function of the electrons and to guarantee the stability of the ignition voltage even after repeated current loads.

Gas-filled surge arresters feature an optimum relationship between size, impulse discharge capability and a longer than average useful life.

开放型气体放电通路的电气性能主要取决于环境参数，如气体的种类、压力以及湿度和污染程度。只有在其放电通路外加保护层才能抵抗外在环境的影响，以确保稳定的工作条件。气体放电管的设计原理即基于此要求。

采用绝缘体与电极封接技术，可确保放电间隙的气密性。由此，可优化选择放电管中气体的种类和压力。氖、氩两种稀有气体在放电管的使用寿命期间保证了最佳电气性能，从而成为首选气体。在电极的有效电子发射表面涂有激活化合物，电极间距一般小于1 mm，以提高电子发射能力。因此，即使在重复加载电流后也能保证击穿电压的稳定。

爱普科斯的气体放电管最有效地配合了管型和冲击放电能力，具有比一般放电管更长的使用寿命。

Construction 结构

Basic construction of 3-electrode arresters with failsafe function 带失效保护卡三极放电管的基本结构

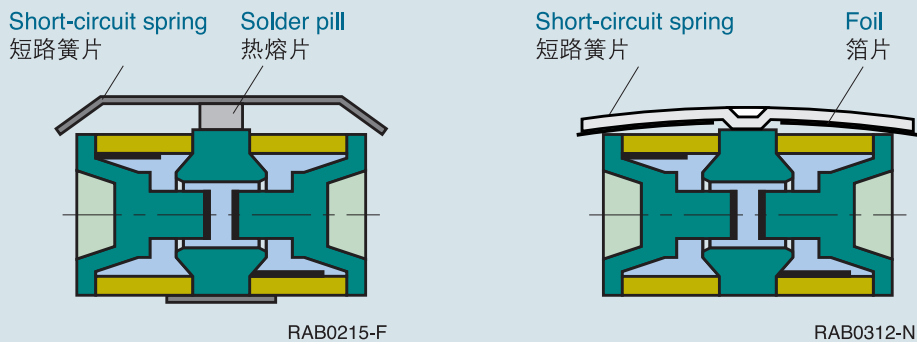


Fig. / 图 15

To achieve excellent response characteristic at fast rise times ignition aids has been attached to the cylindrical internal surface of the insulator. It speeds up the gas discharge by distorting the electric field. EPCOS gas arresters thus feature a fast response characteristic with high reproducibility. The electrical characteristics of the arrester, such as DC spark-over voltage, pulsed and AC discharge current handling capability as well as its service life, can be optimized to the specific requirements of various systems. This is achieved by varying the gas type and pressure as well as the spacing of the electrodes and the emission-promoting coating of the electrodes.

Variants such as the 3-electrode arrester with an external short-circuit spring offer an application-specific solution in the event of contact between telecommunications and power lines. (For further information see page 22.)

为在快速上升时获得最佳响应特性，在放电管的绝缘体内表面附加导电带，通过其作用以改变电场分布，使气体放电加快。爱普科斯气体放电管具有快速响应的特性及高度可重复性。气体放电管的电气特性，如直流击穿电压、脉冲和放电电流处理能力和使用寿命等能按各种通讯系统要求进行调整优化。这种调整是通过改变气体的种类和压力、电极间距及涂敷材料来实现。

其它形式如外部带有短路簧片装置的三极放电管，主要是在通讯线路和电力线搭接时提供特殊应用。（详细信息见第22页）

Function 功能

Limitation of a sinusoidal overvoltage by a surge arrester

气体放电管对过压正弦波的限制

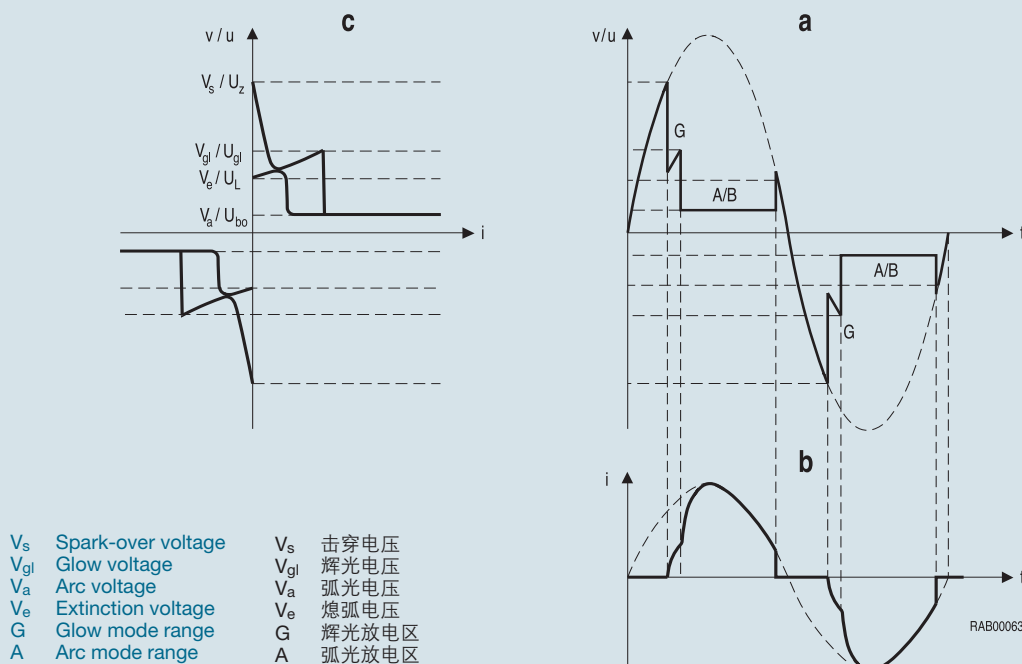


Fig. / 图 16

Fig. 16a shows the voltage curve at the arrester and Fig. 16b the current as a function of time when limiting a sinusoidal voltage surge.

Fig. 16c The V/I characteristic of the surge arrester was obtained by combining the graphs of voltage and current as a function of time.

图16a显示了放电管的电压曲线，图16b描述了限制正弦波电压时的电流-时间函数。

图16c结合电压/电流-时间函数所获得的气体放电管的电气特性。

Protection principle

Generally, a spark-over occurs whenever surge voltages exceed the electric strength of a system's insulation. This discharge limits the surge voltage and reduces the interference energy within a short period of time. As the arc with its high current handling capability is ignited, it prevents a further rise in surge voltage due to its low arc voltage of some 10 V. Gas-filled arresters utilize this natural principle of limiting surge voltages.

保护原理

一般来说，当击穿电压超过系统绝缘的耐电强度时，放电管被击穿放电，从而在短时间内限制浪涌电压及减少干扰能量。当具有大电流处理能力的弧光放电时，由于弧光电压低，仅几十伏左右，从而防止了浪涌电压的进一步上升。气体放电管利用这一自然原理实现了对浪涌电压的限制。

Function 功能

Operating mode

A simplified surge arrester can be compared with a symmetrical low-capacitance switch whose resistance may jump from several $G\Omega$ during normal operation to values $<1\ \Omega$ after ignition caused by a surge voltage. The arrester automatically returns to its original high-impedance state after the surge has subsided.

Fig. 16a shows the voltage curve at the arrester and Fig. 16b the current as a function of time when limiting a sinusoidal voltage surge.

Virtually no current flows during the time that the voltage rises to the spark-over voltage V_s of the arrester. After ignition, the voltage drops to the glow voltage level V_{gl} (70 to 200 V depending on the type, with a current of several 10 mA up to about 1.5 A) in the glow-mode range G. As the current increases further, transition to arc mode A occurs. The extremely low arc voltage V_a of 10 to 35 V typical for this mode is virtually independent of the current over a wide range. With decreasing over-voltage (i.e. in the second half of the wave), the current through the arrester decreases accordingly until it drops below the minimum value necessary to maintain the arc mode. Consequently, the arc discharge stops suddenly and, after passing through the glow mode, the arrester extinguishes at a voltage V_e .

The V/I characteristic of the surge arrester shown in Fig. 16c was obtained by combining the graphs of voltage and current as a function of time.

Response behavior

Static response behavior

If a voltage with a low rate of rise (typical 100 V/s) is applied to the arrester, the spark-over voltage V_s will be determined mainly by the electrode spacing, the gas type and pressure, and by the degree of pre-ionization of the enclosed noble gas. This ignition value is defined as the DC spark-over voltage V_{sdc} .

Dynamic response behavior

At fast rate of rise, the spark-over voltage V_s of the arrester exceeds V_{sdc} . This effect is caused by the finite time necessary for the gas to ionize. All these dynamic spark-over voltages are subject to considerable statistical variation. However, the average value of the spark-over voltage distribution can be significantly reduced by attaching

工作方式

简易气体放电管可看作是一个低电容的对称开关，在正常工作时，电阻为 $G\Omega$ 级，着火后跌至 $1\ \Omega$ 以下。浪涌消失后放电管恢复到高阻抗状态。

图16a显示了放电管的电压曲线，图16b描述了限制正弦波电压时的电流-时间函数。

电压上升到击穿电压 V_s 期间，基本上没有电流通过。着火后，电压降至辉光状态区G内，辉光电压水平 V_{gl} （70-150 V，电流从10毫安至1.5安培，根据管型定）。随着电流进一步增加，跃变到弧光状态A。在这种状态下，弧光电压极低，一般为10-35 V，在很宽的范围内基本与电流无关。随着过电压降低（例如波形第二个半周），过放电管的电流相应降到维持弧光状态所需的最小值以下。此时弧光放电骤然停止，经过辉光状态后，放电管在电压 V_e 处熄灭。

图16c结合电压/电流-时间函数所获得的气体放电管的电气特性。

响应特性

静态响应特性

在低上升速率电压（大约100 V/s）下，击穿电压 V_s 主要取决于两电极间的距离、气体种类和压力，以及填充的惰性气体的预电离度。此着火电压值即直流击穿电压 V_{sdc} （静态范围）。

动态响应特性

在较快上升速率电压下，放电管的击穿电压 V_s 大于 V_{sdc} 。这种效应是由气体电离需要一定的时间所产生的。这些动态击穿电压都有相当大的离散性。但通过在放电管内壁涂上导电带可显著降低其公差上限击穿电压的分布。

Function 功能

Typical response behavior of a 230-V arrester
230-V放电管的典型反应模式

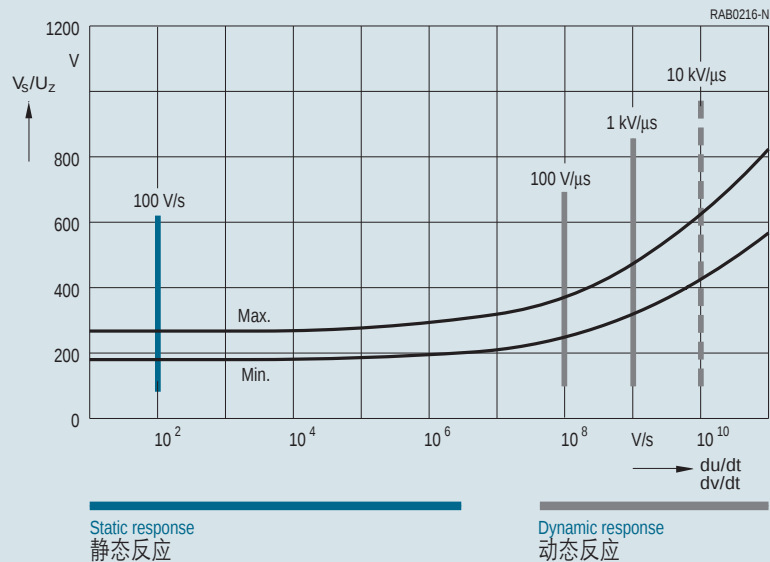


Fig. / 图 17

the ignition aid to the inside surface of the arrester. This reduces the upper limit of the tolerance field considerably and also limits the spread of the spark-over voltage. The ignition voltage in this dynamic range is defined as the impulse spark-over voltage V_{si} . EPCOS gas-filled surge arresters are thus independent of permanent pre-ionization in order to reach this characteristic value (V_{si}), which is crucial for evaluating their protection quality in practical applications.

As a result of the harmonization of national and international specifications, the two voltage rates of rise of 100 V/μs and 1 kV/μs (ITU-T, K.12 and IEC 61643-311) are used to evaluate the dynamic characteristic of surge arresters. An example for other rates of rises, such as the 10 kV/μs is shown in Fig. 17.

并有效地降低击穿电压的分布，此范围内的着火电压即冲击击穿电压 V_{si} 。冲击击穿电压在实际应用中是评估放电管保护水平的关键因素。爱普科斯气体放电管充分满足此特性且不需要永久预电离。

由于国内与国际规格的统一，100 V/μs和1 kV/μs 电压上升速率（ITU-T、K.12和 IEC 61643-11）均用于评估气体放电管的动态特性。其他电压上升速率（如 10 kV/μs）示例见图17。

Function 功能

Extinction features

AC operation:

After the surge has subsided, the arrester normally extinguishes since its arc voltage drops below the minimum value in the subsequent zero crossing of the AC voltage. However, this behavior does not apply to operation with a low-impedance power supply. In this case, it is essential to consider the very low internal resistance of the line and of the ignited surge arrester. The maximum permissible follow current of the arrester may be exceeded between the decay of the surge and the subsequent zero crossing. This follow current can reach values up to several 1000 A (refer to page 26).

Note: The follow current must be limited so that the arrester can be properly extinguished when the surge has decayed. The arrester might otherwise heat up and ignite adjacent components.

DC operation:

This condition can be found in the protection of telecommunications systems. When continuously operated with DC voltage, the surge arrester must be able to extinguish after the surge has subsided. Surge arresters easily satisfy this requirement when used in communications circuits as these are usually highly resistive throughout. In the case of systems with higher DC voltages or low impedance, the arrester's extinction features must be examined in each individual case.

Highly specific extinction conditions result from the following conditions:

- The DC operating voltage is lower than the minimum arc voltage (10 to 35 V depending on the type)
- or lower than the glow voltage (60 to 200 V depending on the type).

In the latter case, it must be ensured that the maximum current drawn from the operating voltage source can no longer maintain the arc discharge mode (several 100 mA depending on the type) after the surge has subsided.

熄弧特性

交流工作状态:

浪涌过后，一般放电管会熄弧，因为交流电压过零时其值会降至放电管的弧光电压以下，但是在低阻抗的电流供给情况下，此熄弧特性不能完全实现。这种情况的出现基本上是因为电路的低内阻和着火后的放电管的低电阻（几个欧姆）所造成的。放电管实际通过的电流可能超过允许最大续流量，此电流可高达几千安培（见26页）。

备注：浪涌过后，放电管的续流应该受到限制，否则放电管可能启动周边元件。

直流电工作状态:

在通讯系统防护上，一般使用直流电源。在持续的直流电压下，浪涌过后放电管应该能够熄弧。因为通讯线路一般具有高阻抗性，故用于其中的放电管能轻易满足此要求。当系统中存在高直流电压或低阻抗时，必须根据个别情况对放电管的熄弧性能进行确认。

下列情况会造成特殊的熄弧状况：

- 当直流电压低于最低弧光电压时（10-35 V，依型号而定）
- 或低于辉光电压（60-200 V，依型号而定）

在后一种情况下，浪涌过后，应确保通过的最大电流不能维持弧光放电（几百毫安，依类型而定）。

Function 功能

Failsafe characteristic 失效保护卡特性

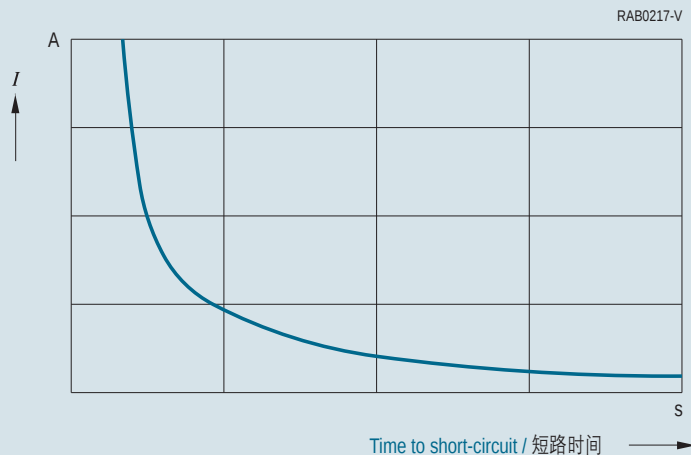


Fig. / 图 18

Failsafe function

In the case of influences such as a direct contact between the power and telecommunication lines, current will flow through the ignited arrester for a long period of time. The arrester then heats up. When this happens, the hardware must be protected from thermal overload. The heating is detected by a failsafe mechanism. The spacer (solder pellet or plastic foil), which initially keeps the short-circuit spring at a distance from the electrodes, melts at a temperature determined by the choice of material used. The short-circuit spring, to which a bias tension is applied, then drops onto the arrester body and short-circuits the electrodes.

Figure 18 shows a typical short-circuit characteristic as a function of the current flowing through the arrester. This characteristic can be affected by the thermal conductivity of the holder. The coordination between component and package must therefore be subsequently verified by a type test.

Note: The materials used in the sensor for monitoring the arrester's temperature are triggered at temperatures above 200 °C (solder) or 140 °C/260 °C (plastic foil) depending on their composition. The melting temperatures of the solder or plastic foil are up to 300 °C. These temperatures exceed the melting point of standard commercial soft solders used in further processing. This discrepancy must be considered when deciding on the location of the arrester, which may have to be additionally secured by mechanical means. The thermal radiation to adjacent components is another factor of importance.

失效保护卡功能

在电源线和通讯线路搭接时，通常电流会长时间地持续通过击穿后的放电管，从而使放电管升温。这种情况下，为了避免周边硬件过热，可通过保护卡装置来监测其受热情况。配置在短路簧片上的分离器（锡焊料或塑料），开始时使短路簧片与电极保持一定的距离，当温度超过使用材料的熔点时锡焊料熔化，簧片偏压使簧片下降并接触放电管电极，使放电管短路。

图18显示以通过放电管电流为函数的短路特性。此特性受制于簧片的热传导性。因此必须通过型式试验来验证部件配套的协调性。

备注：在保护卡上作为传感器以监控放电管温度的材料一般大约在 200 °C（锡焊料）或 140 °C/260 °C（塑料膜）时被熔化。锡焊料和塑料膜的熔化温度高达 300 °C。此温度一般超过在进一步加工中所使用的标准商业软锡焊料的熔点。决定放电管的安装位置时，必须考虑到这种矛盾。此情况可通过另外的机械加固方式来解决。同时，放电管对周边元件的热辐射也不容忽视。

Definitions, Measuring Conditions 定义和测试条件

Spark-over voltages 击穿电压

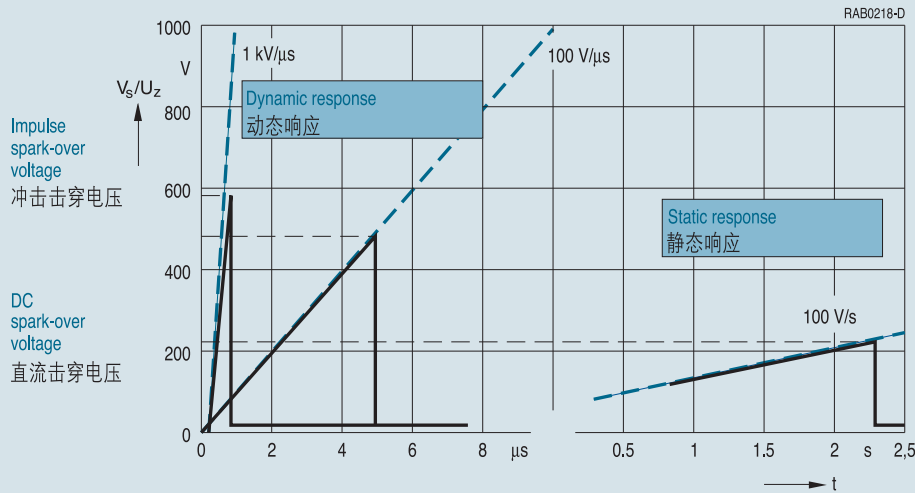


Fig./ 图 19

DC spark-over voltage V_{sdc}

This voltage is determined by applying a voltage with a low rate of rise $dv/dt = 100 \text{ V/s}$ (Fig. 19).

Due to the physical phenomenon of a gas discharge the values are subject to statistical variation.

Nominal DC spark-over voltage V_{sdcN}

This is a rated value used to designate a surge arrester. The operating characteristics and tolerances as well as limit and test values are referred to V_{sdcN} . It represents the individual values of the DC spark-over voltage, which are subject to statistical variations due to the physical phenomena of gas discharge.

Tolerance of V_{sdcN}

The tolerance in % is generally specified as a percentage of V_{sdcN} . Tolerance specifications take into account individual and batch variations in arrester production.

Impulse spark-over voltage

The impulse spark-over voltage characterizes the dynamic behavior of a surge arrester (Fig. 19). The values specified in the product part refer to a voltage rise rate of $dv/dt = 100 \text{ V/μs}$ and 1 kV/μs . Complete breakdown distribution versus rise time is available upon request.

直流击穿电压 V_{sdc}

此值由施加一低上升速率 $dv/dt = 100 \text{ V/s}$ 的电压 (图19) 所确定。

由于气体放电的物理现象，数值是以统计变量为条件得出的。

标称直流击穿电压 V_{sdcN}

用于表示放电管的额定值。其工作特性和公差以及限制值和测试值均参照 V_{sdcN} 。鉴于气体放电管的物理现象，此额定值是以统计变量为条件得出的。它代表直流击穿电压的标准值。

V_{sdcN} 容差

此容差一般用 V_{sdcN} 的百分数来表示。容差用于限制单个和批量放电管生产中的 V_{sdcN} 变化。

冲击击穿电压

冲击击穿电压表示气体放电管的动态特性 (图19)。本目录产品部分所列数据参照的电压上升速率为 $dv/dt = 100 \text{ V/μs}$ 和 1 kV/μs 。完整的冲击击穿电压分布与上升时间数据可根据要求提供。

Definitions, Measuring Conditions

定义和测试条件

Standard impulse discharge current 8/20 μ s 标准冲击放电电流 8/20 μ s

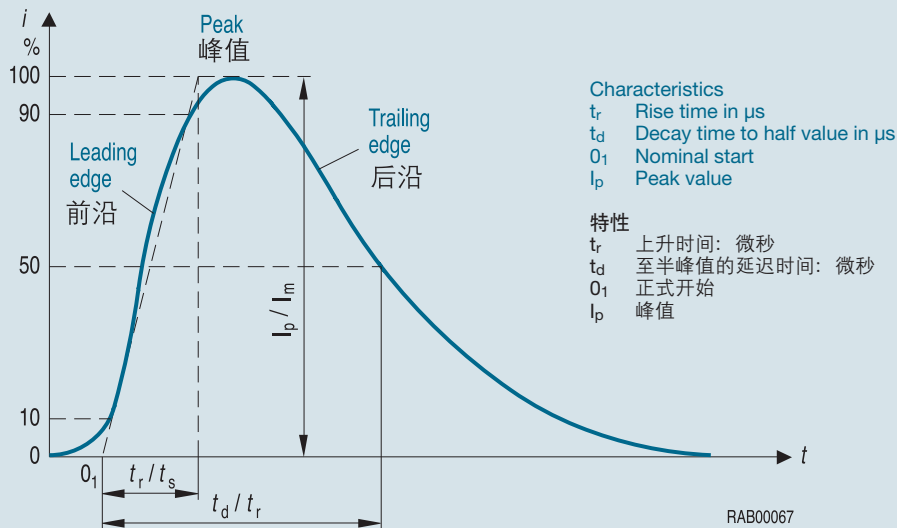


Fig. / 图 20

Nominal impulse discharge current 8/20 μ s

Rated discharge current of the 8/20 μ s wave (Fig. 20).

- Requirements of ITU-T and DIN VDE: 10 discharges.
- Additional requirement of ITU-T: no accumulation of the DUT temperature during consecutive discharges.

Single-impulse discharge current

Single loading with an 8/20 μ s wave (Fig. 20).

Impulse discharge current 10/350 μ s

1 discharge of rated discharge current 10/350 μ s

Nominal alternating discharge current

Rated RMS value of an AC current at 50 Hz, 1 s.

- Requirements of ITU-T: 10 discharges (no accumulation of the DUT temperature).
- Requirement of DIN VDE: 5 discharges.

AC discharge current

RMS value of AC current for 9 cycles at 50 Hz

- Requirement of RUS PE-80: 11 cycles at 60 Hz

标称冲击放电电流 8/20 μ s

指 8/20 μ s波形的额定放电电流 (图20)。

- ITU-T和DIN VDE要求: 10 次放电。
- ITU-T的附加要求: 连续放电期间无DUT温度累积。

单次冲击放电电流

8/20 μ s 波形的单次负载 (图20)。

冲击放电电流 10/350 μ s

1一次10/350 μ s额定放电电流放电。

标称耐工频电流

交流电流50 Hz/1 s的额定有效值。

- ITU-T要求: 10次放电 (无DUT温度累积)。
- DIN VDE要求: 5次放电。

交流放电电流

交流电流在9周期/50 Hz时的额定有效值。

- RUS PE-80要求: 11周期/60 Hz。

Definitions, Measuring Conditions

定义和测试条件

Maximum follow current

For the type series EF* (data sheet see page 39) we specify this performance feature as the maximum permissible peak current which may flow from the supply current source through the arrester in the interval between the decay of the surge and the following zero crossing of the AC voltage. This discharge may be repeated ten times with an interval of 30 s.

For notes about power line applications refer to page 26.

Service life

Up to 300 discharges of rated discharge current 10/1000 μ s.

Insulating resistance R_{ins}

Ohmic resistance of the non-ignited arrester:

– EPCOS surge arresters ¹⁾	$> 10^{10} \Omega$
– Requirement of ITU-T	$> 10^9 \Omega$
– Requirement of DIN VDE	$> 10^{10} \Omega$

As a rule, the arrester is tested with a test voltage of 100 V DC. This value is reduced to 50 V DC for types with 90 and 150 V DC.

1) Unless otherwise specified

Capacitance C

Self-capacitance of the arrester without holder:
EPCOS surge arresters 0.5 pF ... 3 pF
(depending on type)

Requirement of ITU-T	$< 20 \text{ pF}$
Requirement of DIN VDE	$< 5 \text{ pF}$

Test configuration for 3-electrode arresters

The specified spark-over voltages, insulating resistance and capacitance refer to the respective measurements between one of the two wire electrodes (a/b) and the center electrode (c).

Unless otherwise specified, the impulse or AC current is applied simultaneously from the two line electrodes to the center electrode with the defined value as the total current through the center electrode (c).

最大续流量

对于EF系列（见规格书第39页），我们设定此特性为在浪涌衰减至下一过零的交流电压期间，从电流供应源通过放电管的最大允许电流。在30秒钟时限内这种放电可以重复10次。

电源线应用见第26页。

使用寿命

额定放电电流10/1000 μ s条件下300次放电。

绝缘电阻 R_{ins}

未着火放电管的绝缘电阻:

– 爱普科斯气体放电管 ¹⁾	$> 10^{10} \Omega$
– ITU-T 要求:	$> 10^9 \Omega$
– DIN VDE 要求:	$> 10^{10} \Omega$

一般情况下，用测试电压100 V DC来测试放电管。

90 和150 V DC型号的放电管的测试电压为50 V DC。

1) 除非另有说明。

电容 C

放电管自身电容（不加卡簧）:

– 爱普科斯气体放电管:	0.5 ... 3 pF (依型号而定)
– ITU-T 要求:	$< 20 \text{ pF}$
– DIN VDE 要求:	$< 5 \text{ pF}$

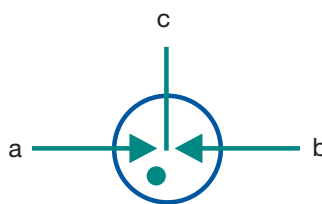
三极放电管测试形式

参照相关的测试方法，检测任意一端电极a/b到中间电极c之间的特定击穿电压、绝缘电阻及电容。

除非另有说明，本目录上所注明的冲击或交流耐电流是从两端电极同时加载到中间电极上的总电流。

Circuit symbol for
2- and 3-electrode
arresters:

a, b Tip/ring (line)
electrode
c Center electrode



二极和三极放
电管电路标志:

a, b 两边（线）电极
c 中间电极

Notes for Power Line Applications

电源线路应用说明

Follow current effect 持续电流效应

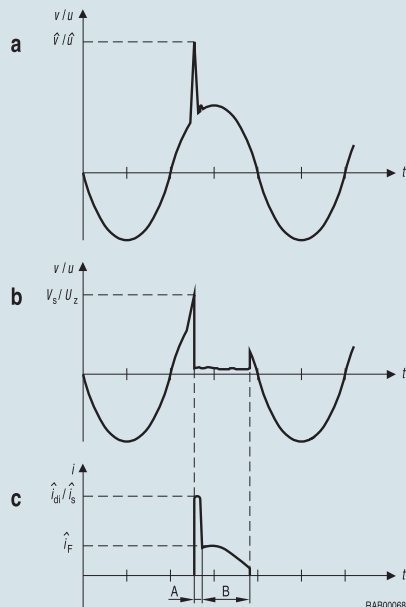


Figure / 图 21a
AC operating voltage and superimposed impulse voltage $\hat{v}$
交流工作电压和叠加冲击电压 $\hat{v}$

Figure / 图 21b
Impulse voltage limited by a surge arrester
 V_s Spark-over voltage of surge arrester
气体放电管限制的冲击电压
 V_s 放电管的击穿电压

Figure / 图 21c
Impulse discharge current and follow current through the surge arrester
 $\hat{i}_{di}$ Maximum impulse discharge current
 $\hat{i}_F$ Maximum follow current
A Impulse discharge current range
B Follow current range
通过气体放电管的冲击放电电流和持续电流
 $\hat{i}_{di}$ 最大冲击放电电流
 $\hat{i}_F$ 最大持续电流
A 冲击放电电流范围
B 持续电流范围

Fig. / 图 21

Surge arresters must not be operated directly in power supply networks. Because of the extremely low internal resistance of these networks, an excessive current which as a rule exceeds the permissible follow current would flow through the ignited arrester. The arrester no longer extinguishes and can reach very high temperatures.

Varistors connected in series with the arrester are well suited for limiting the follow current. EPCOS metal oxide varistors of the SIOV series offer high reliability for this application. The table below shows a selection of these components. To stop the arrester from responding during normal operation, a permissible tolerance of the line voltage of +10% and a possible derating of the arrester of -20% were taken into account.

气体放电管不得直接在电源网络中工作。由于这些网络的内部电阻极低，可能会产生超过持续电流允许范围的电流，并通过放电管。这样放电管就不会熄灭，并产生极高温。

放电管采用和压敏电阻串联可有效限制持续电流。爱普科斯SIOV系列金属氧化物压敏电阻为该应用提供了高可靠性。下表说明了对元件的选择。要防止正常操作时的放电管响应，线路电压可有+10%容差，放电管可有-20%的容差。

Line voltage V_{rms} 线路电压 V_{rms} (V)	Follow current arrester 持续电流放电管		Varistor 压敏电阻	
	Type/型号	Ordering code / 订货号	Type/型号	Ordering code / 订货号
110	EF270X	B88069X4131S102	S20K150	B72220S0151K101
230	EF470X	B88069X5080S102	S20K250	B72220S0251K101
400	EF800X	B88069X2641S102	S20K460	B72220S0461K101

Note: In the event of particularly frequent and severe surges as well as large fluctuations in line voltage, the dimensioning for each individual combination must be checked.

备注：如果出现经常性、强烈的浪涌以及大的线路电压波动，必须检查每个组合。

Designation System

放电管标志说明

Designation System
放电管标志说明

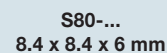
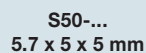
2-electrode arresters / 二极放电管			
Type/型号	Dimensions/外形尺寸	Discharge class/耐流等级	Page/页码
S20	3.2 x 1.6 x 1.6 mm	0.5 kA / 0.5 A	28
S50	5.7 x 5 x 5 mm	5 kA / 5 A	28
S80	8.4 x 8.4 x 6 mm	20 kA / 20 A	28
S30	4.5 x 3.2 x 2.7 mm	2 kA / 2 A	29
M5	5 x 5 mm	5 kA / 5 A	33
A6/N8	8 x 6 mm	10 kA / 10 A	35
A8/A83	8 x 6 mm, 8 x 20 mm	20 kA / 20 A	36, 37
A7	8 x 8 mm	10 kA / 10 A • 5 kA / 2.5 A	38, 39
V1	11.8 x 17.4 mm	20 kA / 20 A	41
Lead styles 引线类型	without leads / 无引线 straight leads / 直引线	0 1	
Internal identification (e.g. -A, -C, -H) / 内部编码 (如 -B, -A, -C, -H)			
Nominal DC spark-over voltage (e.g. 90 V, 230 V, 350 V, 600 V) 标称直流击穿电压 (如 90 V, 230 V, 350 V, 600 V)			
Radioactive-free / 无放射性			
Position short-circuit spring / 短路簧片位置 Taped and reeled / 卷带 auf Band und Rolle			
If the meaning of the other code letters and numbers is unclear to you, inquire at EPCOS. 如果不清楚其他编码的意义, 请咨询爱普科斯。			
M51-A350XF			
Type/型号	Dimensions/外形尺寸	Discharge class/耐流等级	Page/页码
ES	4.7 x 4 mm	2.5 kA / 2.5 A	30
EM	5.5 x 6 mm	2.5 kA / 2.5 A • 2 kA / 2 A; 1.5 A	31, 32
EC	8 x 6 mm	5 kA / 5 A	34
EF	8 x 6 mm	5 kA / 5 A	40
Nominal DC spark-over voltage (e.g. 90 V, 230 V, 350 V, 400 V, 600 V) 标称直流击穿电压 (如 90 V, 230 V, 350 V, 400 V, 600 V)			
Radioactive-free / 无放射性			
Taped and reeled / 卷带 auf Band und Rolle			
If the meaning of the other code letters and numbers is unclear to you, inquire at EPCOS. 如果不清楚其他编码的意义, 请咨询爱普科斯。			
EM350XG			
3-electrode arresters / 三极放电管			
Type/型号	Dimensions/外形尺寸	Discharge class/耐流等级	Page/页码
EZ	5 x 7.6 mm	5 kA / 5 A	43
EK/EK (FV)	6.8 x 10 mm/8.3 x 14 mm	10 kA / 10 A	42, 46
ER	6.3 x 8.1 mm	10 kA / 10 A	45
T2	8 x 10 mm	20 kA / 10 A	51, 52
T2/T5 (USA spec.)	8 x 10 mm	—	54
T9	5 x 7.6 mm	5 kA / 5 A	44
T3	6 x 8 mm	10 kA / 10 A	47
T8	8 x 10 mm	10 kA / 10 A	48, 49, 50
T6	9.5 x 11.5 mm	20 kA / 20 A	53
Lead styles 引线类型	without leads / 无引线 straight leads / 直引线 standard / 标准 short leads / 短引线	0 1 3 5	
Internal identification (e.g. -A, -C) 内部编码 (如 -A, -C)			
Nominal DC spark-over voltage (e.g. 90 V, 230 V, 350 V, 600 V) 标称直流击穿电压 (如 90 V, 230 V, 350 V, 600 V)			
Radioactive-free / 无放射性			
Position short-circuit spring / 短路簧片位置 undefined / 未确定 on top / 顶部 below / 下部			
If the meaning of the other code letters and numbers is unclear to you, inquire at EPCOS. 如果不清楚其他编码的意义, 请咨询爱普科斯。			
T80-A230XF			

Please read Important notes on page 4 and Cautions and warnings on page 70.

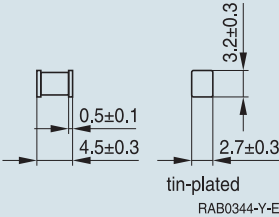
请阅读第4页的重要信息, 以及第70页的警告和警告。

S20,50,80 Series
S20,50,80系列

0.5 kA-20 kA



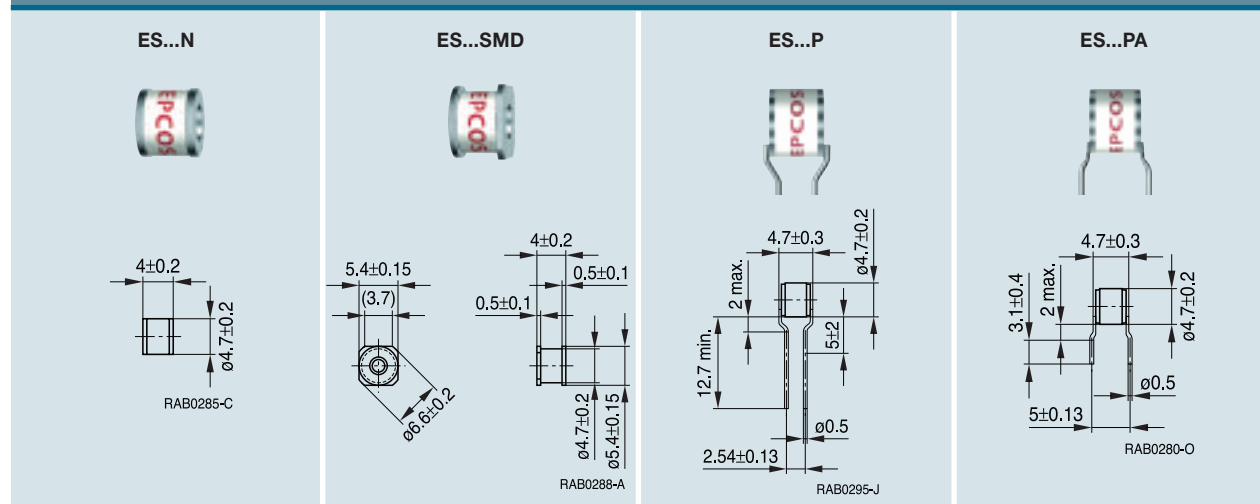
2-Electrode Arresters 二极放电管

Light-duty types 小功率系列 2 kA / 2 A • 4.5 x 3.2 x 2.7 mm				
S30-...  				
Type 型号 Ordering code 订货号	S30-A150X B88069X6071T203	S30-A300X B88069X5531T203	S30-A400X B88069X5211T203	
标称直流击穿电压 V _{sdCN}	150	300	400	V
直流击穿电压容差	± 30	± 25	± 25	%
冲击击穿电压				
测量值 @ 100 V/μs, 99%	< 500	< 700	< 800	V
典型值 @ 100 V/μs	< 400	< 650	< 750	V
测量值 @ 1 kV/μs, 99%	< 600	< 850	< 950	V
典型值 @ 1 kV/μs	< 500	< 800	< 900	V
标称耐工频电流 @ 50 Hz, 1 s	2	2	2	A
标称冲击放电电流 10次, 8/20 μs	2	1	1	kA
冲击放电电流 100次, 10/1000 μs	10	10	10	A
绝缘电阻	> 1	> 1	> 1	GΩ
电容 @ 1 MHz	< 0.5	< 0.5	< 0.5	pF

About packing see page 66.
包装见第66页。

2-Electrode Arresters 二极放电管

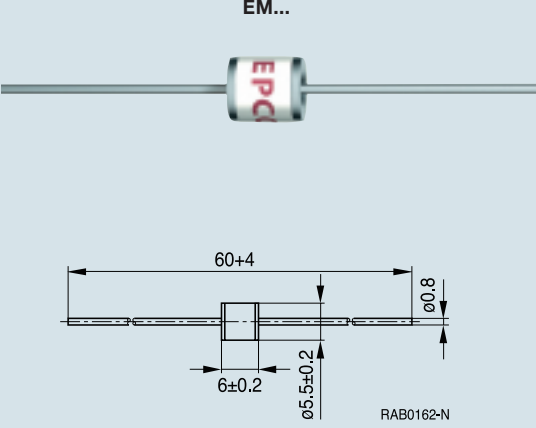
Light-duty types 小功率系列
2.5 kA / 2.5 A • Ø 4.7 x 4 mm



Type 型号 Ordering code 订货号	ES90XP B88069X5151B502	ES260XP B88069X5920B502	ES300XN B88069X4190T103 ES300XSMD B88069X4211T902 ES300XP B88069X4180B502 ES300XPA B88069X6200B502	ES350XN B88069X4951T103 ES350XSMD B88069X4911T902 ES350XP on request ES350XPA B88069X4261B502	ES400XSMD B88069X5591T902	
标称直流击穿电压 V_{SDC}	90	260	300	350	400	V
直流击穿电压容差	±20	-15/+20	±15	±15	±15	%
冲击击穿电压						
测量值 @ 100 V/μs, 99%	< 450	< 500	< 500	< 530	< 800	V
典型值 @ 100 V/μs	< 300	< 450	< 450	< 450	< 750	V
测量值 @ 1 kV/μs, 99%	< 600	< 600	< 600	< 600	< 1000	V
典型值 @ 1 kV/μs	< 550	< 550	< 550	< 530	< 850	V
标称耐工频电流 @ 50 Hz, 1 s	2.5	-	-	-	2.5	A
标称冲击放电电流 10次, 8/20 μs	2.5	2.5	2.5	2.5	2.5	kA
单次冲击放电电流 1次, 8/20 μs	5.0	5.0	5.0	5.0	5.0	kA
绝缘电阻	> 1	> 1	> 1	> 1	> 1	GΩ
电容 @ 1 MHz	< 1	< 1	< 1	< 1	< 1	pF

About packing see page 66.
包装见第66页。

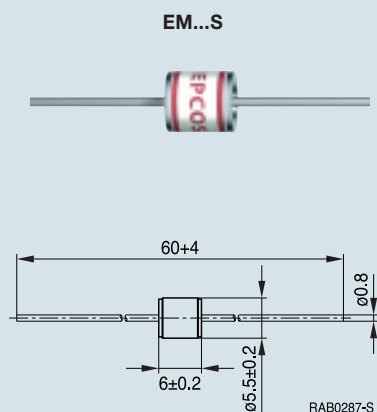
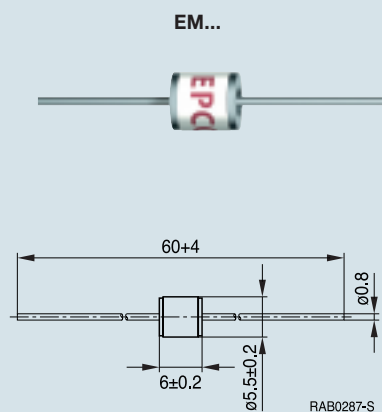
2-Electrode Arresters 二极放电管

Light-duty types 小功率系列 2.5 kA / 2.5 A • Ø 5.5 x 6 mm							
EM... 							
Type 型号 Ordering code 订货号	EM90X B88069X0190S102	EM230X B88069X0900S102	EM300X B88069X0800S102 B88069X0800T502	EM300XS B88069X1780S102	EM350X B88069X0590S102 B88069X0980T502	EM400X B88069X0200S102	
标称直流击穿电压 V _{sdCN}	90	230	300	300	350	400	V
直流击穿电压容差	± 20	± 20	-10/+15	-10/+15	± 20	± 20	%
冲击击穿电压							
测量值 @ 100 V/μs, 99%	< 400	< 650	< 700	< 500	< 800	< 800	V
典型值 @ 100 V/μs	< 330	< 600	< 600	< 450	< 700	< 750	V
测量值 @ 1 kV/μs, 99%	< 600	< 700	< 800	< 600	< 900	< 900	V
典型值 @ 1 kV/μs	< 530	< 650	< 700	< 550	< 800	< 850	V
标称耐工频电流 @ 50 Hz, 1 s	2.5	2.5	2.5	–	2.5	2.5	A
标称冲击放电电流 10次, 8/20 μs	2.5	2.5	2.5	2.5	2.5	2.5	kA
冲击放电电流 1次, 10/350 μs	0.5	0.5	0.5	0.5	0.5	0.5	kA
冲击放电电流 300次, 10/1000 μs	100	100	100	100	100	100	A
绝缘电阻	> 1	> 1	> 1	> 1	> 1	> 1	GΩ
电容 @ 1 MHz	< 1	< 1	< 1	< 1	< 1	< 1	pF

About packing see page 66.
包装见第66页。

2-Electrode Arresters 二极放电管

Light-duty / 小功率/高电压系列
2 kA / 2 A; 1.5 A • Ø 5.5 x 6 mm



Type 型号 Ordering code 订货号	EM1000X B88069X4651S102	EM2000X B88069X5600S102	EM2500XS B88069X2500S102	EM3000XS B88069X4231S102	EM3600XS B88069X4241S102	EM4000XS B88069X4251S102	
标称直流击穿电压 V_{sdCN}	1000	2000	2500	3000	3600	4000	V
直流击穿电压容差	±20	±20	±20	±20	±20	±20	%
冲击击穿电压							
测量值 @ 100 V/μs, 99%	< 1700	< 3400	< 3200	< 3800	< 4350	< 4800	V
典型值 @ 100 V/μs	< 1600	< 3200	< 3000	< 3400	< 4150	< 4200	V
测量值 @ 1 kV/μs, 99%	< 1900	< 4100	< 3500	< 4000	< 4500	< 4900	V
典型值 @ 1 kV/μs	< 1800	< 3800	< 3200	< 3500	< 4300	< 4400	V
标称耐工频电流 @ 50 Hz, 1 s	2	1.5	–	–	–	–	A
标称冲击放电电流 10次, 8/20 μs	2	2	2	2	2	2	kA
单次冲击放电电流 1次, 8/20 μs	2.5	2.5	5	5	2.5	2.5	kA
冲击放电电流 300次, 10/1000 μs	100	100	100	100	100	100	A
绝缘电阻	> 1	> 1	> 1	> 1	> 1	> 1	GΩ
电容 @ 1 MHz	< 1	< 1	< 1	< 1	< 1	< 1	pF

About packing see page 66.
包装见第66页。

Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

请阅读第4页的重要信息，以及第70页的敬告和警告。

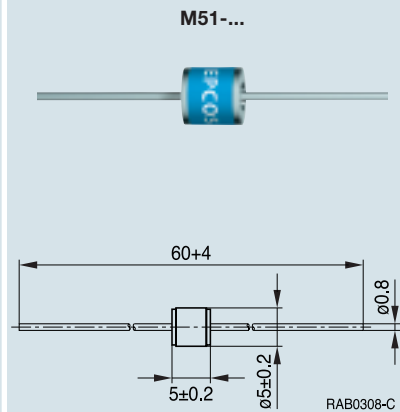
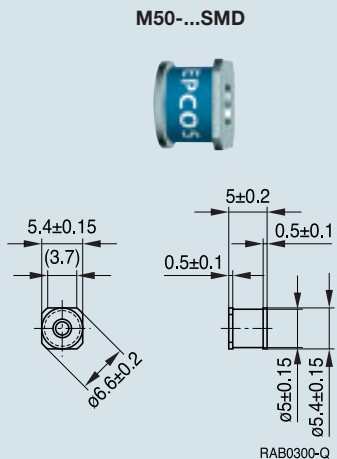
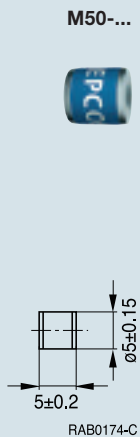
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2-Electrode Arresters 二极放电管

M5 Series · M5系列

5 kA / 5 A • Ø 5 x 5 mm

5 kA / 5 A • Ø 5 x 5 mm



Type 型号 Ordering code 订货号	M50-A75XSMD 可根据要求提供 M51-A75X B88069X6131C102	M50-C90X B88069X1590C253 M50-C90XSMD B88069X1640T902 M51-C90X B88069X5010C102	M50-A230X B88069X4600C253 M50-A230XSMD B88069X5520T902 M51-A230X B88069X2930C102	M50-A350X B88069X4630C253 M50-A350XSMD B88069X3770T902 M51-A350X B88069X4640C102	M51-A600X B88069X4590C102	
标称直流击穿 电压 V _{sdcN}	75	90	230	350	600	V
直流击穿电压容差	± 20	± 20	± 20	± 20	-5/+30	%
冲击击穿电压						
测量值 @ 100 V/μs, 99%	< 350	< 550	< 550	< 800	< 1350	V
典型值 @ 100 V/μs	< 300	< 500	< 500	< 750	< 1200	V
测量值 @ 1 kV/μs, 99%	< 650	< 600	< 650	< 900	< 1500	V
典型值 @ 1 kV/μs	< 550	< 550	< 600	< 800	< 1350	V
标称耐工频电流 @ 50 Hz, 1 s	5	5	5	5	5	A
耐工频电流 @ 50 Hz, 9周期	10	10	10	10	10	A
标称冲击放电电流 10次, 8/20 μs	5	5	5	5	5	kA
单次冲击放电电流 ¹⁾ 1次, 8/20 μs	10	10	10	10	10	kA
冲击放电电流 1次, 10/350 μs	0.5	0.5	0.5	0.5	0.5	kA
冲击放电电流 300次, 10/1000 μs	100	100	100	100	可根据要求提供	A
绝缘电阻	> 1	> 1	> 1	> 1	> 1	GΩ
电容 @ 1 MHz	< 1	< 1	< 1	< 1	< 1	pF

About packing see page 66.

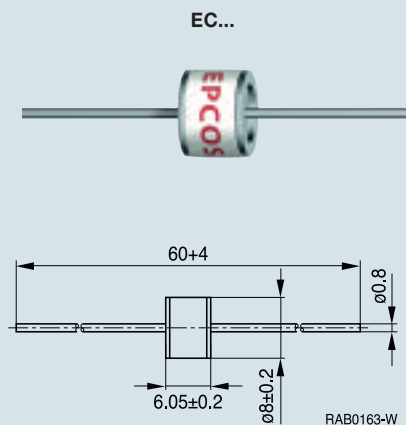
包装见第66页。

Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

请阅读第4页的重要信息, 以及第70页的敬告和警告。

2-Electrode Arresters 二极放电管

Light-duty types 小功率系列
5 kA / 5 A • Ø 8 x 6 mm



Type 型号 Ordering code 订货号	EC75X B88069X0180S102	EC90X B88069X0720S102	EC150X B88069X0880S102	EC230X B88069X0660S102	EC350X B88069X0810S102	EC600X B88069X0780S102	
标称直流击穿电压 V_{sdCN}	75	90	150	230	350	600	V
直流击穿电压容差	±20	±20	±20	±15	±15	±15	%
冲击击穿电压							
测量值 @ 100 V/μs, 99%	< 500	< 500	< 500	< 550	< 800	< 1200	V
典型值 @ 100 V/μs	< 400	< 450	< 450	< 500	< 700	< 1000	V
测量值 @ 1 kV/μs, 99%	< 700	< 600	< 650	< 700	< 900	< 1300	V
典型值 @ 1 kV/μs	< 600	< 550	< 550	< 600	< 800	< 1100	V
标称耐工频电流 @ 50 Hz, 1 s	5	5	5	5	5	10	A
耐工频电流 @ 50 Hz, 9周期	20	20	20	20	20	65	A
标称耐冲击电流 10次, 8/20 μs	5	5	5	5	5	5	kA
单次冲击放电电流 1次, 8/20 μs	10	10	10	10	10	10	kA
冲击放电电流 1次, 10/350 μs	1	1	1	1	1	1	kA
冲击放电电流 300次, 10/1000 μs	100	100	100	100	100	可根据要求提供	A
绝缘电阻	> 10	> 10	> 10	> 10	> 10	> 10	GΩ
电容 @ 1 MHz	< 1	< 1	< 1	< 1	< 1	< 1	pF

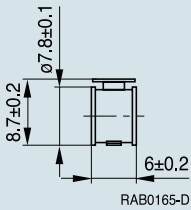
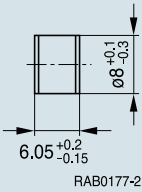
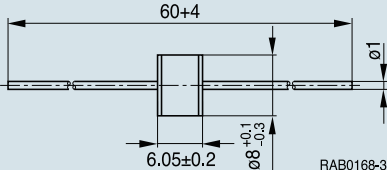
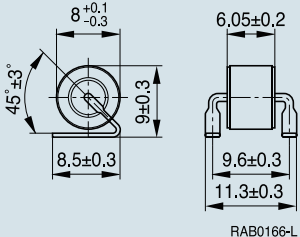
About packing see page 66.
包装见第66页。

Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

请阅读第4页的重要信息，以及第70页的敬告和警告。

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2-Electrode Arresters 二极放电管

Medium-duty types 中功率系列 10 kA / 10 A • Ø 8 x 6 mm							
A60-...F   RAB0165-D		N80-...   RAB0177-2		N81-...   RAB0168-3		N81-...SMD   RAB0166-L	
Type 型号 Ordering code 订货号	N80-C90X B88069X4890C103 N81-A90X B88069X4880S102	A60-A230XF B88069X2400C103 A61-A230XF¹⁾ B88069X2540C102	N80-A230X B88069X4900C103 N81-A230X B88069X4930S102 N81-A230XSMD B88069X4970T352	N80-A350X B88069X4910C103 N81-A350X B88069X4920S102	N80-A500X on request N81-A500XG B88069X4860T502	N80-A600X B88069X4990C103 N81-A600X B88069X2830S102	
标称直流击穿电压 V _{sdcN}	90	230	230	350	500	600	V
直流击穿电压容差	± 20	± 20	± 20	± 20	± 20	± 20	%
冲击击穿电压							
测量值 @ 100 V/μs, 99%	< 500	< 500	< 500	< 700	< 900	< 1100	V
典型值 @ 100 V/μs	< 450	< 450	< 450	< 650	< 750	< 950	V
测量值 @ 1 kV/μs, 99%	< 600	< 800	< 700	< 900	< 1100	< 1400	V
典型值 @ 1 kV/μs	< 550	< 700	< 600	< 800	< 900	< 1100	V
标称耐工频电流 @ 50 Hz, 1 s	10	10	10	10	10	10	A
耐工频电流 @ 50 Hz, 9周期	65	65	65	65	65	65	A
标称冲击放电电流 10次, 8/20 μs	10	10	10	10	10	10	kA
单次冲击放电电流 1次, 8/20 μs	12	12	12	12	12	12	kA
冲击放电电流 1次, 10/350 μs	1	—	1	1	1	1	kA
冲击放电电流 300次, 10/1000 μss	200	可根据要求提供	200	200	可根据要求提供	可根据要求提供	A
绝缘电阻	> 10	> 10	> 10	> 10	> 10	> 10	GΩ
电容 @ 1 MHz	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	pF

1) Dimensional drawing like A60-A230XF but with lead wires. Total length 60+4 mm.

About packing see page 66.

1) 尺寸图与A60-A230XF相似，但不带引线。总长度60+4毫米。

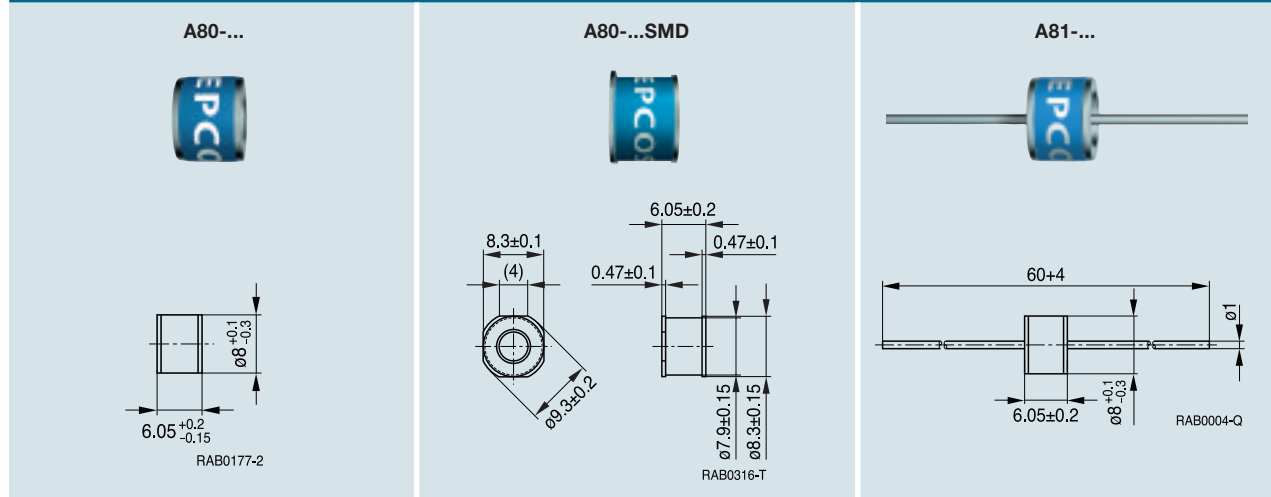
包装见第66页。

Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

请阅读第4页的重要信息，以及第70页的敬告和警告。

2-Electrode Arresters 二极放电管

Heavy-duty types 大功率系列 20 kA / 20 A • Ø 8 x 6 mm



Type 型号 Ordering code 订货号	A80-A75X 可根据要求提供 A80-A75XSMD B88069X6350T602 A81-A75X 可根据要求提供	A80-C90X B88069X1410C103 A80-C90XSMD B88069X1630T602 A81-C90X B88069X1380S102	A80-A230X B88069X2240C103 A80-A230XSMD B88069X1620T602 A81-A230X B88069X2250S102	A80-A250X B88069X2920C103 A81-A250X B88069X1500S102	A80-A350X B88069X2230C103 A81-A350X B88069X2380S102	A80-A600X B88069X2900C103 A81-A600X B88069X2880S102	
标称直流击穿电压 V_{sdcN}	75	90	230	250	350	600	V
直流击穿电压容差	± 20	± 20	± 20	± 20	± 20	± 20	%
冲击击穿电压							
测量值 @ 100 V/ μ s, 99%	< 350	< 500	< 500	< 550	< 700	< 1100	V
典型值 @ 100 V/ μ s	< 300	< 450	< 450	< 500	< 650	< 950	V
测量值 @ 1 kV/ μ s, 99%	< 650	< 600	< 650	< 700	< 900	< 1400	V
典型值 @ 1 kV/ μ s	< 600	< 550	< 550	< 650	< 800	< 1100	V
标称耐工频电流 @ 50 Hz, 1 s	20	20	20	20	20	20	A
耐工频电流 @ 50 Hz, 9周期	100	100	100	100	100	100	A
标称冲击放电电流 10次, 8/20 μ s	20	20	20	20	20	20	kA
单次冲击放电电流 1次, 8/20 μ s	25	25	25	25	25	25	kA
冲击放电电流 1次, 10/350 μ s	2.5	2.5	2.5	2.5	2.5	2.5	kA
冲击放电电流 300次, 10/1000 μ s	200	200	200	200	200	可根据要求提供	A
绝缘电阻	> 10	> 10	> 10	> 10	> 10	> 10	G Ω
电容 @ 1 MHz	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	pF

About packing see page 66.
包装见第66页。

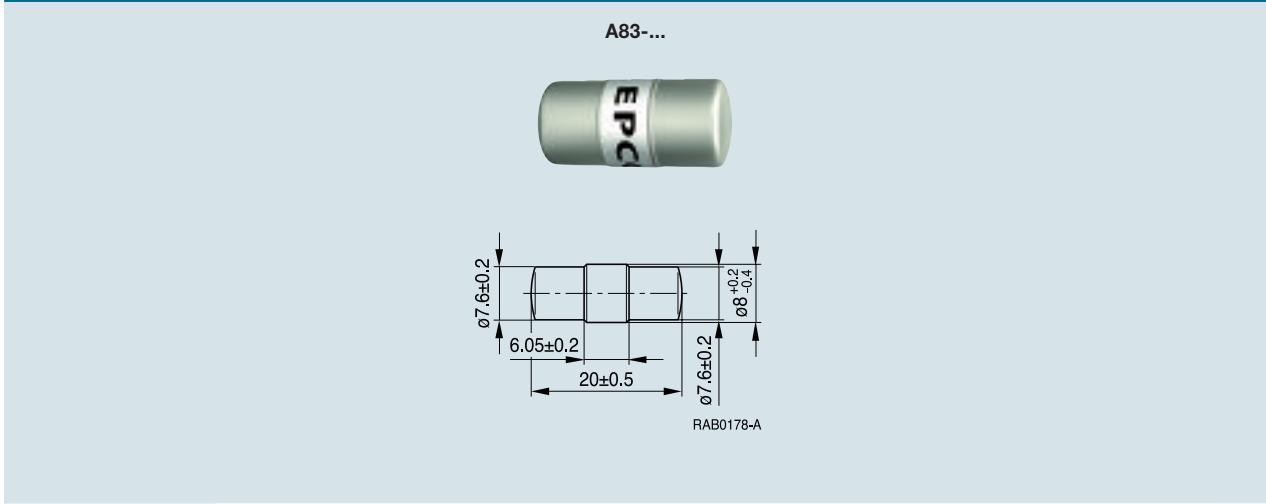
Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

请阅读第4页的重要信息，以及第70页的敬告和警告。

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2-Electrode Arresters 二极放电管

Heavy-duty types 大功率系列 20 kA / 20 A • Ø 8 x 20 mm

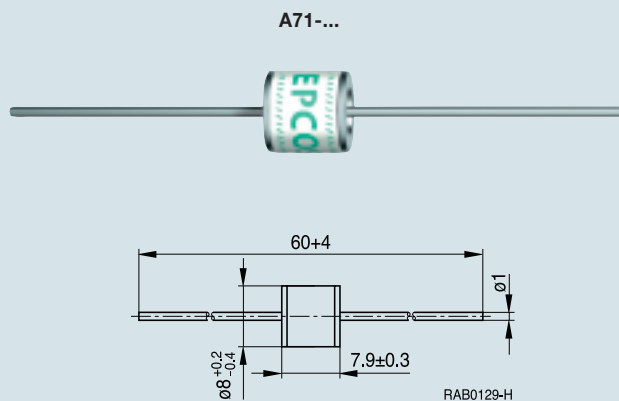


Type 型号 Ordering code 订货号	A83-C90X B88069X1450C102	A83-A150X B88069X4350C102	A83-A170X B88069X4360C102	A83-A230X B88069X1420C102	A83-A350X B88069X2860C102	A83-A600X B88069X2890C102	
标称直流击穿电压 V _{sdcN}	90	150	170	230	350	600	V
直流击穿电压容差	±20	±20	±20	±20	±20	±20	%
冲击击穿电压							
测量值 @ 100 V/μs, 99%	< 500	< 600	< 650	< 550	< 700	< 1100	V
典型值 @ 100 V/μs	< 450	< 450	< 500	< 450	< 650	< 950	V
测量值 @ 1 kV/μs, 99%	< 600	< 800	< 800	< 700	< 800	< 1400	V
典型值 @ 1 kV/μs	< 550	< 600	< 600	< 550	< 700	< 1100	V
标称耐工频电流 @ 50 Hz, 1 s	20	20	20	20	20	20	A
耐工频电流 @ 50 Hz, 9周期	100	100	100	100	100	100	A
标称冲击放电电流 10次, 8/20 μs	20	20	20	20	20	20	kA
单次冲击放电电流 1次, 8/20 μs	25	25	25	25	25	25	kA
冲击放电电流 1次, 10/350 μs	2.5	2.5	2.5	2.5	2.5	2.5	kA
绝缘电阻	> 10	> 10	> 10	> 10	> 10	> 10	GΩ
电容 @ 1 MHz	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	pF

About packing see page 66.
包装见第66页。

2-Electrode Arresters 二极放电管

Medium-duty / 大功率系列
10 kA / 10 A • Ø 8 x 8 mm



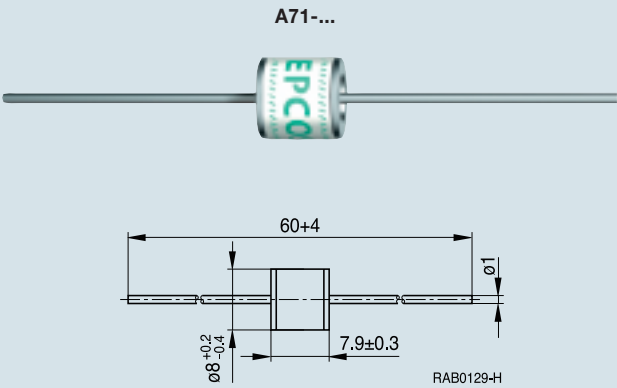
Type 型号 Ordering code 订货号	A71-H08X B88069X2140S102	A71-H10X B88069X3820S102	A71-H14X B88069X2180S102	A71-H16X B88069X2610S102	
标称直流击穿电压 V_{sdCN}	800	1000	1400	1600	V
直流击穿电压容差	±15	±15	±20	±20	%
冲击击穿电压					
测量值 @ 100 V/μs, 99%	< 1100	< 1300	< 2100	< 2300	V
典型值 @ 100 V/μs	< 1000	< 1200	< 2000	< 2200	V
测量值 @ 1 kV/μs, 99%	< 1200	< 1400	< 2200	< 2400	V
典型值 @ 1 kV/μs	< 1100	< 1300	< 2100	< 2300	V
标称耐工频电流 @ 50 Hz, 1 s	10	10	10	10	A
耐工频电流 @ 50 Hz, 9周期	65	65	65	65	A
标称冲击放电电流 10次, 8/20 μs	10	10	10	10	kA
单次冲击放电电流 1次, 8/20 μs	10	10	10	10	kA
绝缘电阻	> 10	> 10	> 10	> 10	GΩ
电容 @ 1 MHz	< 1	< 1	< 1	< 1	pF

About packing see page 66.
包装见第66页。

2-Electrode Arresters

二极放电管

Medium-duty / 中功率/ 高电压系列
5 kA / 2.5 A • Ø 8 x 8 mm



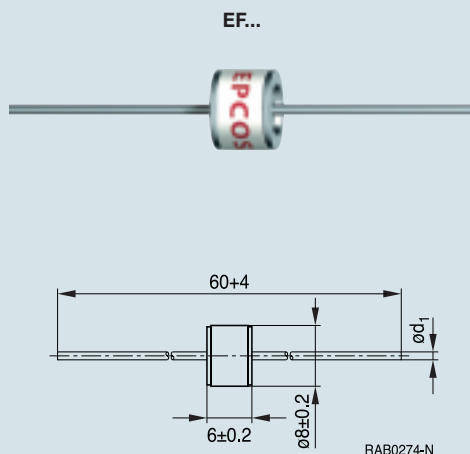
Type 型号	A71-H25X	A71-H35X	A71-H45X	A71-H55X	
Ordering code 订货号	B88069X2190S102	B88069X2200S102	B88069X2590S102	B88069X2620S102	
标称直流击穿电压 V_{sdcN}	2500	3500	4500	5500	V
直流击穿电压容差	± 20	± 20	± 20	± 15	%
冲击击穿电压					
测量值 @ 100 V/ μ s, 99%	< 3900	< 4900	< 5800	< 6500	V
典型值 @ 100 V/ μ s	< 3800	< 4800	< 5700	< 6000	V
测量值 @ 1 kV/ μ s, 99%	< 4000	< 5000	< 6000	< 7000	V
典型值 @ 1 kV/ μ s	< 3900	< 4900	< 5800	< 6500	V
标称耐工频电流 @ 50 Hz, 1 s	2.5	2.5	2.5	2.5	A
耐工频电流 @ 50 Hz, 9周期	2.5	2.5	2.5	2.5	A
标称冲击放电电流 10次, 8/20 μ s	5	5	5	5	kA
单次冲击放电电流 1次, 8/20 μ s	5	5	5	5	kA
绝缘电阻	> 10	> 10	> 10	> 10	G Ω
电容 @ 1 MHz	< 1	< 1	< 1	< 1	pF

About packing see page 66.
包装见第66页。

A7 Series · A7系列

2-Electrode Arresters 二极放电管

Types with follow current 续流系列
5 kA / 5 A • Ø 8 x 6 mm



Type 型号 Ordering code 订货号	EF270X B88069X4131S102	EF470X B88069X5080S102	EF800X B88069X2641S102	EF1500X B88069X4301S102	EF2500X B88069X5690T502	
标称直流击穿电压 V_{sdcN}	270	470	800	1500	2500	V
直流击穿电压容差	-15/+25	-15/+25	-15/+25	±20	±20	%
冲击击穿电压						
测量值 @ 100 V/μs, 99%	< 500	< 700	< 1200	< 1800	< 3700	V
典型值 @ 100 V/μs	< 450	< 600	< 1000	< 1700	< 3300	V
测量值 @ 1 kV/μs, 99%	< 550	< 800	< 1300	< 2000	< 4500	V
典型值 @ 1 kV/μs	< 500	< 700	< 1100	< 1800	< 3700	V
标称耐工频电流 @ 50 Hz, 1 s	5	5	5	5	5	A
耐工频电流 @ 50 Hz, 9周期	65	65	65	65	65	A
标称冲击放电电流 10次, 8/20 μs	5	5	5	5	5	kA
单次冲击放电电流 1次, 8/20 μs	10	10	10	10	10	kA
同一电压条件下半周期 最大持续电流 @ 50 Hz	200	200	200	200	200	A
绝缘电阻	> 10	> 10	> 10	> 10	> 10	GΩ
电容 @ 1 MHz	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	pF
引线直径 d_1	1.0	1.0	1.0	1.0	0.8	mm

About packing see page 66.
包装见第66页。

Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

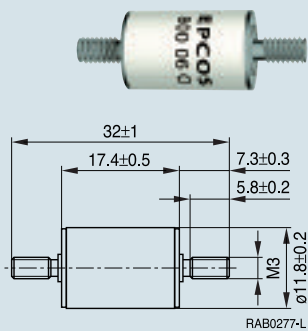
请阅读第4页的重要信息, 以及第70页的敬告和警告。

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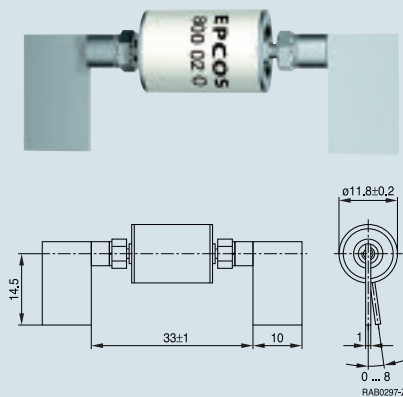
2-Electrode Arresters 二极放电管

Heavy-duty types 大功率系列
20 kA / 20 A • Ø 11.8 x 17.4 mm

V10-...



V12-...



Type 型号 Ordering code 订货号	V10-H08X B88069X9170C251 V12-H08X B88069X9240C101	V10-H14X B88069X4300C251 V12-H14X B88069X4220C101	V10-H22X B88069X4420C251	V10-H30X B88069X4330C251 V12-H30X B88069X4230C101	
标称直流击穿电压 V _{sd} cN	800	1400	2200	3000	V
直流击穿电压容差	500 ... 850	1120 ... 1630	1760 ... 2640	2250 ... 3750	V
冲击击穿电压					
测量值 @ 100 V/μs, 99%	< 1000	< 1900	< 2700	< 4500	V
典型值 @ 100 V/μs	< 900	< 1800	< 2400	< 4300	V
测量值 @ 1 kV/μs, 99%	< 1200	< 2200	< 2800	< 5000	V
典型值 @ 1 kV/μs	< 1100	< 2000	< 2500	< 4500	V
标称耐工频电流 @ 50 Hz, 1 s	20	20	20	30	A
耐工频电流 @ 50 Hz, 9周期	120	120	120	120	A
标称冲击放电电流 10次, 8/20 μs	20	20	20	20	kA
单次冲击放电电流 1次, 8/20 μs	30	30	25	25	kA
冲击放电电流 1次, 10/350 μs	5	-	-	-	kA
绝缘电阻	> 10	> 10	> 10	> 10	GΩ
电容 @ 1 MHz	< 1.5	< 1.5	< 1.5	< 1.5	pF

About packing see page 66.
包装见第66页。

Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

请阅读第4页的重要信息，以及第70页的敬告和警告。

3-Electrode Arresters

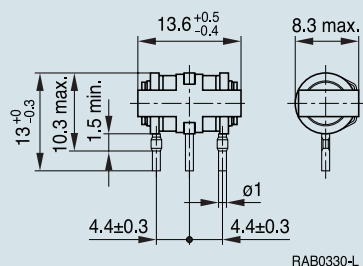
三极放电管

Hybrid Series
混合系列

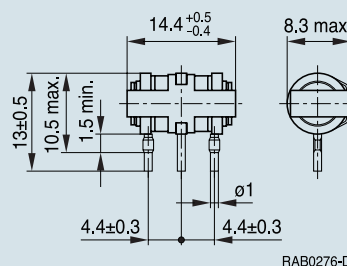
Arrester-varistor combination 放电管-压敏电阻组合

10 kA / 10 A

EK-...FV



RAB0330-L

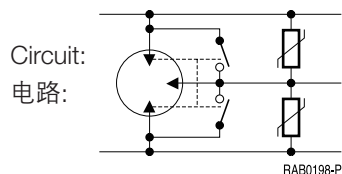


RAB0276-D

Type 型号 Ordering code 订货号	EK-A90XFV 可根据要求提供	EK-A230XFV 可根据要求提供	
标称直流击穿电压 V_{sdcN}	90	230	V
直流击穿电压容差	± 20	± 20	%
冲击击穿电压			
测量值 @ 1 V/ μ s, 99%	< 200	< 350	V
典型值 @ 1 kV/ μ s	< 170	< 320	V
标称耐工频电流 @ 50 Hz, 1 s	10	10	A
标称冲击放电电流 10次, 8/20 μ s	10	10	kA
单次冲击放电电流 1次, 8/20 μ s	20	10	kA
绝缘电阻	> 0.1	> 0.1	G Ω
电容 @ 1 MHz	< 240	< 85	pF

Currents through center electrode, half value through each line electrode. 电流通过中心电极, 每个线电极各负载一半。

About packing see page 66. 包装见第66页。



- 1) Pin separation 4.4 mm
1) 针脚间距4.4毫米

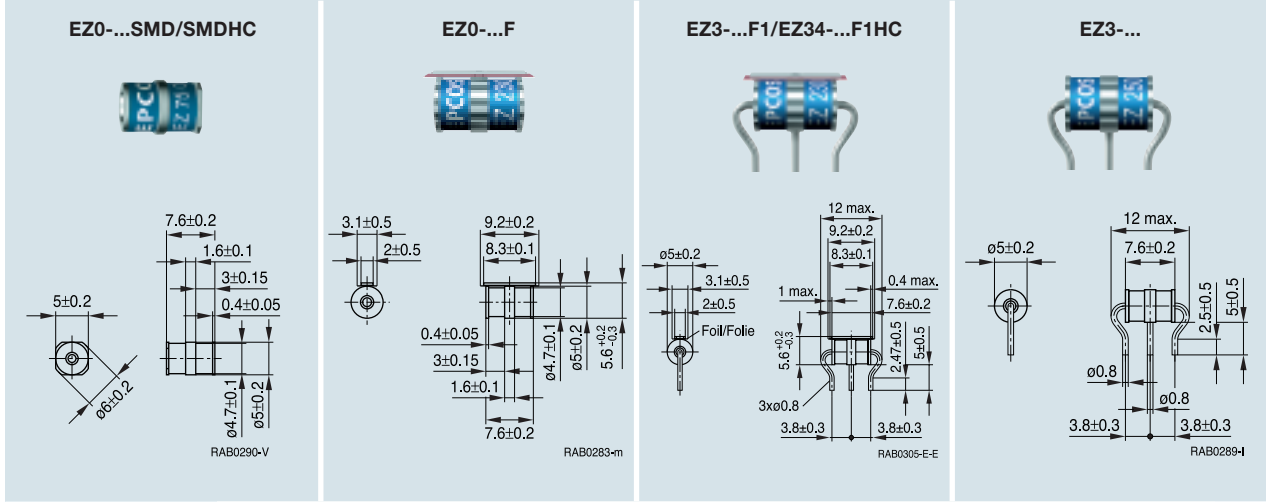
Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

请阅读第4页的重要信息, 以及第70页的敬告和警告。

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3-Electrode Arresters 三极放电管

Light-duty types 小功率系列 5 kA / 5 A • Ø 5 x 7.6 mm



Type 型号 Ordering code 订货号	EZO-A75XSMD B88069X6771T902	EZ3-A90X B88069X4991B502	EZO-A230XF B88069X5460B502 EZ3-A230X B88069X5171B502 EZ3-A230XF1 B88069X2591B502	EZ34-A230XF1HC ¹⁾ B88069X7201B502 EZO-A230XSMDHC B88069X7321T902	EZO-A350XF B88069X5111B502 EZ3-A350X B88069X5191B502 EZ3-A350XF1 B88069X4941B502	
标称直流击穿电压 V _{sdcN}	75	90	230	230	350	V
直流击穿电压容差	± 20	± 20	± 20	± 20	± 20	%
冲击击穿电压						
测量值 @ 100 V/μs, 99%	< 450	< 450	< 600	< 500	< 650	V
典型值 @ 100 V/μs	< 350	< 350	< 450	< 450	< 600	V
测量值 @ 1 kV/μs, 99%	< 600	< 600	< 750	< 650	< 800	V
典型值 @ 1 kV/μs	< 500	< 500	< 600	< 600	< 750	V
标称耐工频电流 @ 50 Hz, 1 s	10	5	5	10	5	A
耐工频电流 @ 50 Hz, 9周期	10	5	5	可根据要求提供	5	A
标称冲击放电电流 10次, 8/20 μs	10	5	5	10	5	kA
单次冲击放电电流 1次, 8/20 μs	10	5	5	可根据要求提供	5	kA
冲击放电电流 1次, 10/350 μs	1	1	1	1	1	kA
冲击放电电流 300次, 10/1000 μs	200	200	200	200	200	A
绝缘电阻	> 1	> 1	> 1	> 1	> 1	GΩ
电容 @ 1 MHz	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	pF

Currents through center electrode, half value through each line electrode. About packing see page 66.
电流通过中心电极，每个线电极各负载一半。包装见第66页。

Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

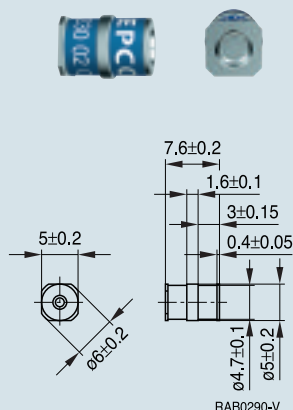
请阅读第4页的重要信息，以及第70页的敬告和警告。

3-Electrode Arresters

三极放电管

Light-duty types 小功率系列
5 kA / 5 A • Ø 5 x 7.6 mm

T90-...SMD



Type 型号 Ordering code 订货号	T90-A90XSMD B88069X2331T902	T90-A230XSMD B88069X6680T902	T90-A350XSMD B88069X4030T902	T90-A420XSMD B88069X7041T902	
标称直流击穿电压 V_{sdcN}	90	230	350	420	V
直流击穿电压容差	± 20	± 20	± 20	± 20	%
冲击击穿电压					
测量值 @ 100 V/μs, 99%	< 550	< 580	< 850	< 850	V
典型值 @ 100 V/μs	< 450	< 460	< 750	< 750	V
测量值 @ 1 kV/μs, 99%	< 700	< 750	< 1000	< 1000	V
典型值 @ 1 kV/μs	< 600	< 600	< 850	< 900	V
标称耐工频电流 @ 50 Hz, 1 s	5	5	5	5	A
耐工频电流 @ 50 Hz, 9周期	10	10	10	10	A
标称冲击放电电流 10次, 8/20 μs	5	5	5	5	kA
单次冲击放电电流 1次, 8/20 μs	5	5	5	5	kA
冲击放电电流 1次, 10/350 μs	1	2.5	可根据要求提供	1	kA
冲击放电电流 300次, 10/1000 μs	可根据要求提供	200	可根据要求提供	200	A
绝缘电阻	> 1	> 1	> 1	> 1	GΩ
电容 @ 1 MHz	< 1.5	< 1.5	< 1.5	< 1.5	pF

Currents through center electrode, half value through each line electrode.
电流通过中心电极, 每个线电极各负载一半。

About packing see page 66.
包装见第66页。

Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

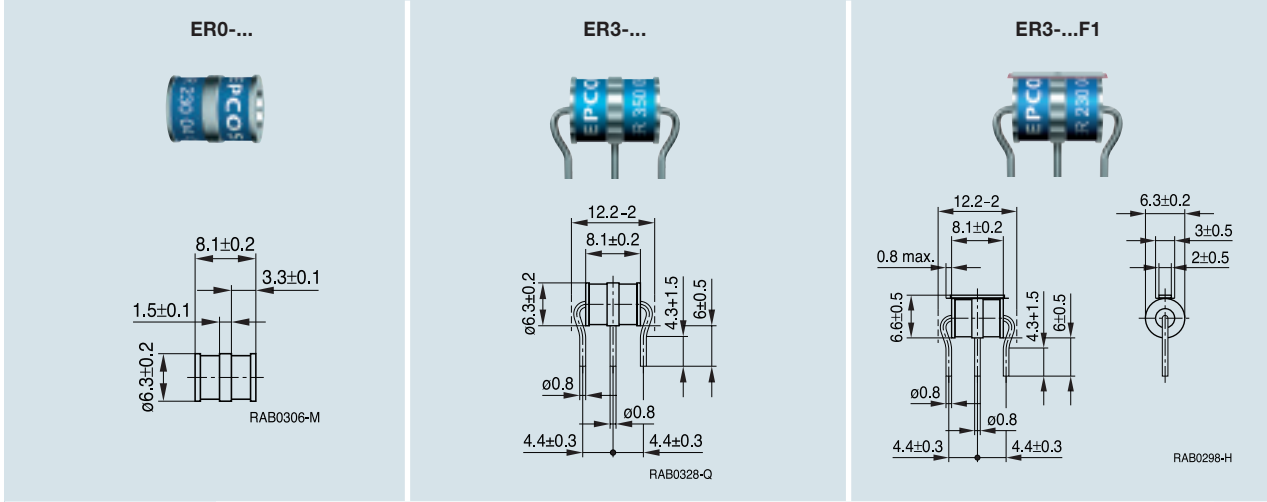
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3-Electrode Arresters

三极放电管

Medium-duty types 中功率系列
10 kA / 10 A • Ø 6.3 x 8.1 mm



Type 型号 Ordering code 订货号	ER0-A230X B88069X3491C253 ER3-A230X B88069X6021B502 ER3-A230XF1 B88069X4311B502	ER3-A250XF1 可根据要求提供	ER3-A350X 可根据要求提供 ER3-A350XF1 B88069X4721B502	
标称直流击穿电压 V _{sdCN}	230	250	350	V
直流击穿电压容差	± 20	± 20	± 20	%
冲击击穿电压				
测量值 @ 100 V/μs, 99%	< 600	< 600	< 700	V
典型值 @ 100 V/μs	< 500	< 500	< 650	V
测量值 @ 1 kV/μs, 99%	< 700	< 700	< 850	V
典型值 @ 1 kV/μs	< 600	< 600	< 800	V
标称耐工频电流 @ 50 Hz, 1 s	10	10	10	A
耐工频电流 @ 50 Hz, 9周期	30	30	30	A
标称冲击放电电流 10次, 8/20 μs	10	10	10	kA
单次冲击放电电流 1次, 8/20 μs	10	10	10	kA
冲击放电电流 1次, 10/350 μs	2	2	2	kA
冲击放电电流 300次, 10/1000 μs	200	200	200	A
绝缘电阻	> 1	> 1	> 1	GΩ
电容 @ 1 MHz	< 1.5	< 1.5	< 1.5	pF

Currents through center electrode, half value through each line electrode. 电流通过中心电极，每个线电极各负载一半。

About packing see page 66. 包装见第66页。

Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

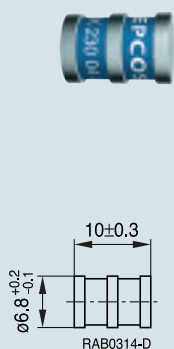
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3-Electrode Arresters 三极放电管

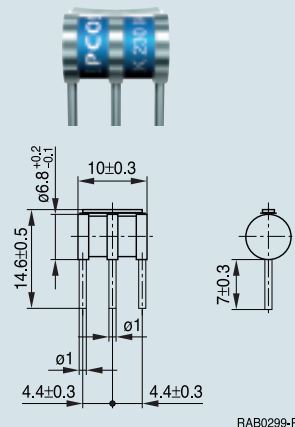
Medium-duty types 中功率系列

10 kA / 10 A • Ø 6.8 x 10 mm

EK0-...



EK4-...F1



Type 型号 Ordering code 订货号	EK0-A230X B88069X3591B502 EK4-A230X B88069X6211B502 EK4-A230XF1 B88069X2601B502	EK4-A300XF1 B88069X7241B502	EK4-C420XF1 B88069X4791B502	
标称直流击穿电压 V_{sdcN}	230	300	420	V
直流击穿电压容差	± 20	± 20	-15/+25	%
冲击击穿电压				
测量值 @ 100 V/μs, 99%	< 600	< 750	< 820	V
典型值 @ 100 V/μs	< 500	< 650	< 700	V
测量值 @ 1 kV/μs, 99%	< 700	< 850	< 950	V
典型值 @ 1 kV/μs	< 600	< 750	< 850	V
标称耐工频电流 @ 50 Hz, 1 s	10	10	10	A
耐工频电流 @ 50 Hz, 9周期	30	30	30	A
标称冲击放电电流 10次, 8/20 μs	10	10	10	kA
单次冲击放电电流 1次, 8/20 μs	10	10	10	kA
冲击放电电流 1次, 10/350 μs	2	2	3	kA
冲击放电电流 300次, 10/1000 μs	200	200	200	A
绝缘电阻	> 1	> 1	> 1	GΩ
电容 @ 1 MHz	< 1.5	< 1.5	< 1.5	pF

Currents through center electrode, half value through each line electrode. 电流通过中心电极，每个线电极各负载一半。

About packing see page 66. 包装见第66页。

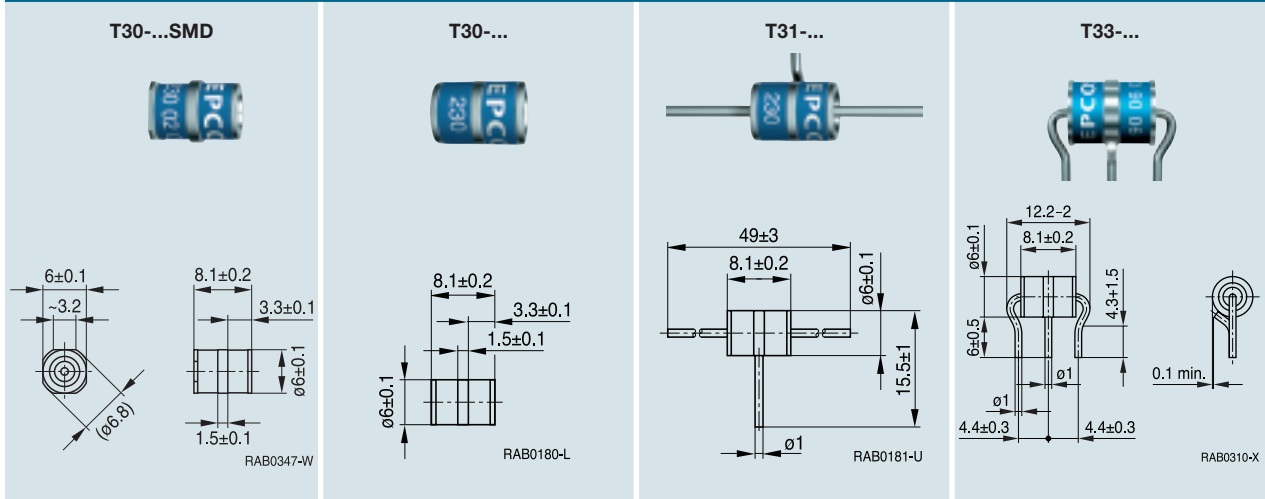
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请阅读第4页的重要信息，以及第70页的敬告和警告。

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3-Electrode Arresters 三极放电管

Medium-duty types 中功率系列
10 kA / 10 A • Ø 6 x 8 mm



Type 型号 Ordering code 订货号	T30-A90X B88069X3030C253 T31-A90X B88069X2261B252 T33-A90X B88069X2271B502	T30-A230X B88069X3060C253 T30-A230XSMD B88069X6731T702 T31-A230X B88069X3130B252 T33-A230X B88069X9800B502	T30-A250X B88069X3951C253	T30-A350X B88069X3180C253 T31-A350X B88069X3090B252 T33-A350X B88069X1470B502	T30-A420X B88069X3040C253 T30-A420XSMD B88069X4961T702	T30-A500X B88069X3070C203	
标称直流击穿电压 V _{sd} cN	90	230	250	350	420	500	V
直流击穿电压容差	± 20	± 20	± 20	± 20	-15/+25	± 20	%
冲击击穿电压							
测量值 @ 100 V/μs, 99%	< 450	< 400	< 500	< 800	< 850	< 1100	V
典型值 @ 100 V/μs	< 350	< 350	< 400	< 650	< 700	< 900	V
测量值 @ 1 kV/μs, 99%	< 500	< 450	< 550	< 900	< 950	< 1400	V
典型值 @ 1 kV/μs	< 400	< 420	< 450	< 700	< 850	< 1000	V
标称耐工频电流 @ 50 Hz, 1 s	10	10	10	10	10	10	A
耐工频电流 @ 50 Hz, 9周期	30	30	30	30	30	30	A
标称冲击放电电流 10次, 8/20 μs	10	10	10	10	10	10	kA
单次冲击放电电流 1次, 8/20 μs	10	10	10	10	10	10	kA
冲击放电电流 1次, 10/350 μs	2	2	2	2	2	2	kA
绝缘电阻	> 10	> 10	> 10	> 10	> 10	> 10	GΩ
电容 @ 1 MHz	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	pF

Currents through center electrode, half value through each line electrode. 电流通过中心电极, 每个线电极各负载一半。

About packing see page 66. 包装见第66页。

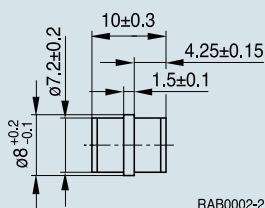
Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

请阅读第4页的重要信息, 以及第70页的警告和警告。

3-Electrode Arresters 三极放电管

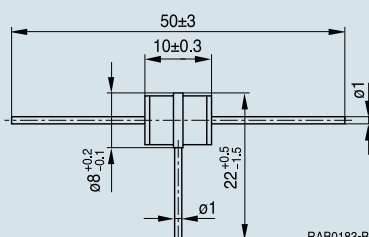
Medium-duty types 中功率系列
10 kA / 10 A • Ø 8 x 10 mm

T80-...



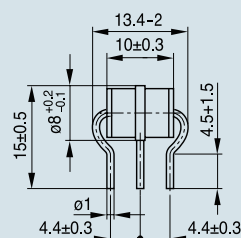
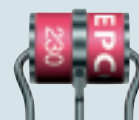
RAB0002-2

T81-...



RAB0183-B

T83-...



RAB0184-J

Type 型号 Ordering code 订货号	T80-A90X B88069X8360C203 T81-A90X B88069X8440B252 T83-A90X B88069X8300B502	T81-A150X B88069X9580B252 T83-A150X B88069X9590B502	T80-A230X B88069X9380C203 T81-A230X B88069X8470B252 T83-A230X B88069X8910B502	T80-A250X B88069X8170C203 T83-A250X B88069X8340B502	
标称直流击穿电压 V_{sdcN}	90	150	230	250	V
直流击穿电压容差	± 20	± 20	± 20	± 20	%
冲击击穿电压					
测量值 @ 100 V/μs, 99%	< 400	< 450	< 450	< 500	V
典型值 @ 100 V/μs	< 300	< 400	< 400	< 450	V
测量值 @ 1 kV/μs, 99%	< 550	< 550	< 650	< 650	V
典型值 @ 1 kV/μs	< 500	< 500	< 600	< 600	V
标称耐工频电流 @ 50 Hz, 1 s	10	10	10	10	A
耐工频电流 @ 50 Hz, 9周期	40	40	40	40	A
标称冲击放电电流 10次, 8/20 μs	10	10	10	10	kA
单次冲击放电电流 1次, 8/20 μs	15	15	15	15	kA
冲击放电电流 1次, 10/350 μs	2	2	5	2	kA
冲击放电电流 300次, 10/1000 μs	200	200	200	200	A
绝缘电阻	> 10	> 10	> 10	> 10	GΩ
电容 @ 1 MHz	< 1.5	< 1.5	< 1.5	< 1.5	pF

Currents through center electrode, half value through each line electrode. 电流通过中心电极，每个线电极各负载一半。

About packing see page 66. 包装见第66页。

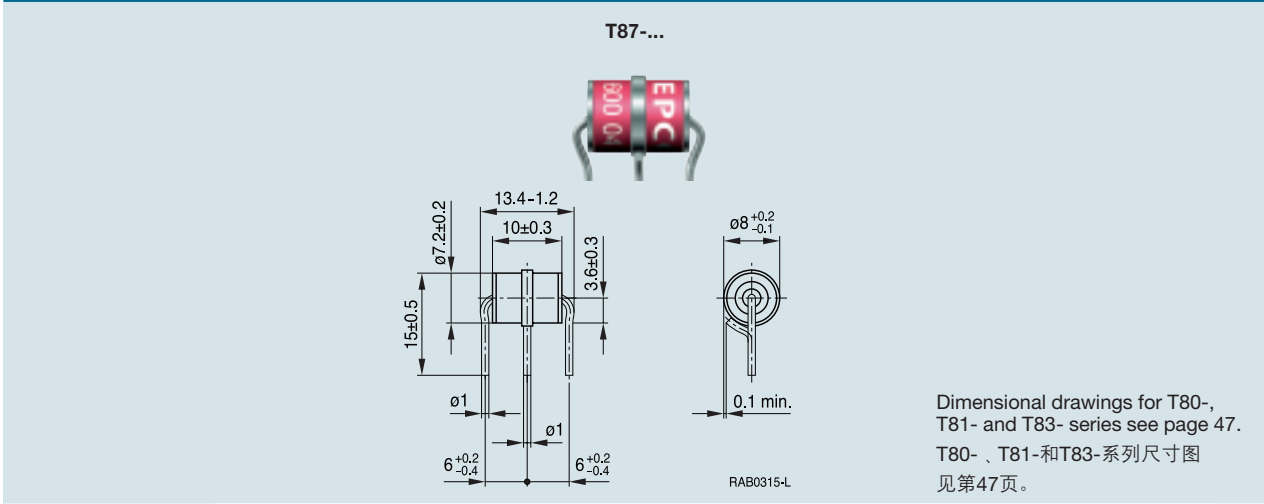
Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

请阅读第4页的重要信息，以及第70页的敬告和警告。

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3-Electrode Arresters 三极放电管

Medium-duty types 中功率系列 10 kA / 10 A • Ø 8 x 10 mm



Type 型号 Ordering code 订货号	T81-A300X B88069X9000B252 T83-A300X B88069X7990B502	T80-A350X B88069X8500C203 T81-A350X B88069X9190B252 T83-A350X B88069X8690B502	T80-A420X B88069X7910C203 T83-A420X B88069X7960B502	T83-A500X 可根据要求提供	T83-C600X B88069X8530B502 T87-C600X B88069X8550B502	
标称直流击穿电压oltage V _{sdCN}	300	350	420	500	600	V
直流击穿电压容差	± 20	± 20	± 20	± 20	-30/+17	%
冲击击穿电压						
测量值 @ 100 V/μs, 99%	< 700	< 700	< 850	< 900	< 900	V
典型值 @ 100 V/μs	< 600	< 600	< 700	< 800	< 800	V
测量值 @ 1 kV/μs, 99%	< 800	< 900	< 950	< 1100	< 1100	V
典型值 @ 1 kV/μs	< 700	< 800	< 850	< 1000	< 1000	V
标称耐工频电流 @ 50 Hz, 1 s	10	10	10	10	10	A
耐工频电流 @ 50 Hz, 9周期	40	40	40	40	40	A
标称冲击放电电流 10次, 8/20 μs	10	10	10	10	10	kA
单次冲击放电电流 1次, 8/20 μs	15	15	15	15	15	kA
冲击放电电流 1次, 10/350 μs	2	2	2	2	2	kA
冲击放电电流 300次, 10/1000 μs	200	200	200	可根据要求提供	可根据要求提供	A
绝缘电阻	> 10	> 10	> 10	> 10	> 10	GΩ
电容 @ 1 MHz	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	pF

Currents through center electrode, half value through each line electrode. 电流通过中心电极，每个线电极各负载一半。

About packing see page 66. 包装见第66页。

3-Electrode Arresters 三极放电管

T8 Series · T8系列

Medium-duty types / 中功率系列
10 kA / 10 A • Ø 8 x 10 mm

	T80-...F	T8*-...F1	T8*-...F4		
Type 型号	T80-A90XF	T80-A230XF		T80-A350XF	
Ordering code 订货号	B88069X2391B502 T83-A90XF1 B88069X8430B502 T83-A90XF4 B88069X8350B502 T83-A150XF1 B88069X9930B502	B88069X8380B502 T83-A230XF1 B88069X9420B502 T83-A230XF4 B88069X8870B502 T85-A230XF4 *) B88069X9260B502	T80-A250XF B88069X8230B502 T83-A250XF4 B88069X8990B502 T83-A260XF4 B88069X8250B502	B88069X8390B502 T83-A350XF1 B88069X9410B502 T83-A350XF4 B88069X9120B502 T85-A350XF4 *) B88069X9230B502	T83-A500XF4 B88069X3771B502
标称直流击穿电压	90/150	230	250/260	350	500
					V

*) Design with shorter lead length.
*) 引线较短。

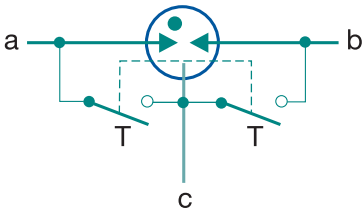
About packing see page 66.
包装见第66页。

Variants ...F1 and ...F4 are the most common positions for the short-circuit spring. The electrical characteristics are the same as those given for the corresponding types without a short-circuit spring on pages 48 and 49. Alternative voltages, lead configurations and spring positions on request.

F1和F4是最常见的短路簧片位置。其电气特性与第48页和49页无短路簧片的相应型号的电气特性相同。供选择的电压、引线配置以及簧片位置可根据要求提供。

Circuit:

a, b Tip/ring (line) electrode
c Center electrode
T Temperature-controlled short-circuit mechanism

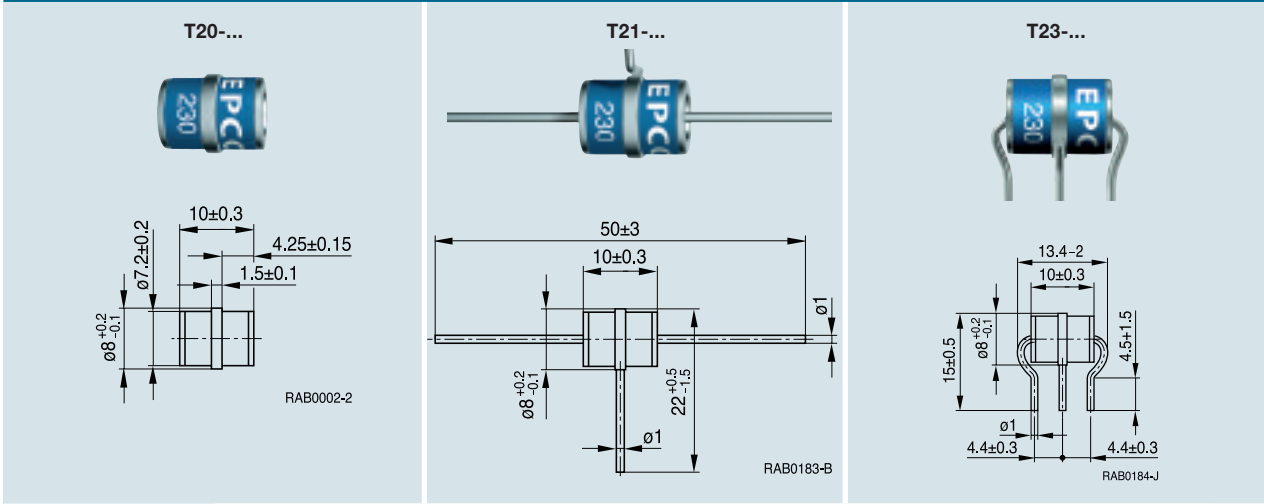


电路:

a, b 末端/环（线）电极
c 中心电极
T 温控短路机制

3-Electrode Arresters 三极放电管

Heavy-duty types 大功率系列 20 kA / 10 A • Ø 8 x 10 mm



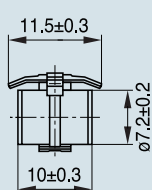
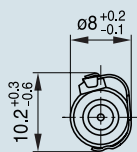
Type 型号 Ordering code 订货号	T20-A230X B88069X8710C203 T21-A230X B88069X8920B252 T23-A230X B88069X8740B502	T20-A230X 可根据要求提供 T23-A230X 可根据要求提供	T20-A250X B88069X8810C203 T21-A250X B88069X8800B252 T23-A250X B88069X8840B502	T20-A350X B88069X7320C203 T21-A350X B88069X5120B252 T23-A350X B88069X7200B502	T20-A420X B88069X7820C203 T23-A420X B88069X8070B502	
标称直流击穿电压 V _{sdcN}	230	230	250	350	420	V
直流击穿电压容差	± 20	± 20	± 20	± 20	-17/+30	%
冲击击穿电压						
测量值 @ 100 V/μs, 99%	< 400	< 400	< 500	< 650	< 750	V
典型值 @ 100 V/μs	< 350	< 350	< 400	< 550	< 700	V
测量值 @ 1 kV/μs, 99%	< 500	< 450	< 600	< 700	< 850	V
典型值 @ 1 kV/μs	< 450	< 400	< 550	< 600	< 800	V
标称耐工频电流 @ 50 Hz, 1 s	10	10	10	10	10	A
耐工频电流 @ 50 Hz, 9周期	50	50	50	50	50	A
标称冲击放电电流 10次, 8/20 μs	20	20	20	20	20	kA
单次冲击放电电流 1次, 8/20 μs	25	25	25	25	25	kA
冲击放电电流 1次, 10/350 μs	5	5	5	5	2	kA
冲击放电电流 300次, 10/1000 μs	200	200	200	200	200	A
绝缘电阻	> 10	> 10	> 10	> 10	> 10	GΩ
电容 @ 1 MHz	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	pF

Currents through center electrode, half value through each line electrode. 电流通过中心电极，每个线电极各负载一半。

About packing see page 66. 包装见第66页。

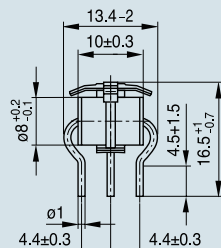
T2 Series · T2系列

T20-...F



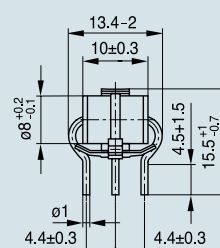
RAB0311-F

T23-...F1



RAB0189-Q

T23-...F4



BAB0190.T

*) Design with shorter lead length.

*) 引线较短。

About packing see page 66.

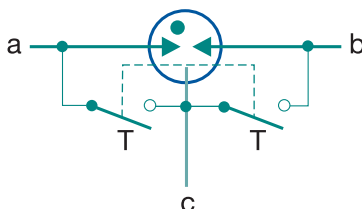
包装见第66页。

Variants ...F1 and ...F4 are the most common positions for the short-circuit spring. The electrical characteristics are the same as those given for the corresponding types without a short-circuit spring on page 51. Alternative voltages, lead configurations and spring positions on request.

F1和F4是最常见的短路簧片位置。其电气特性与第51页无短路簧片的相应型号的电气特性相同。供选择的电压、引线配置以及簧片位置可根据要求提供。

Circuit:

a, b	Tip/ring (line) electrode
c	Center electrode
T	Temperature-controlled short-circuit mechanism

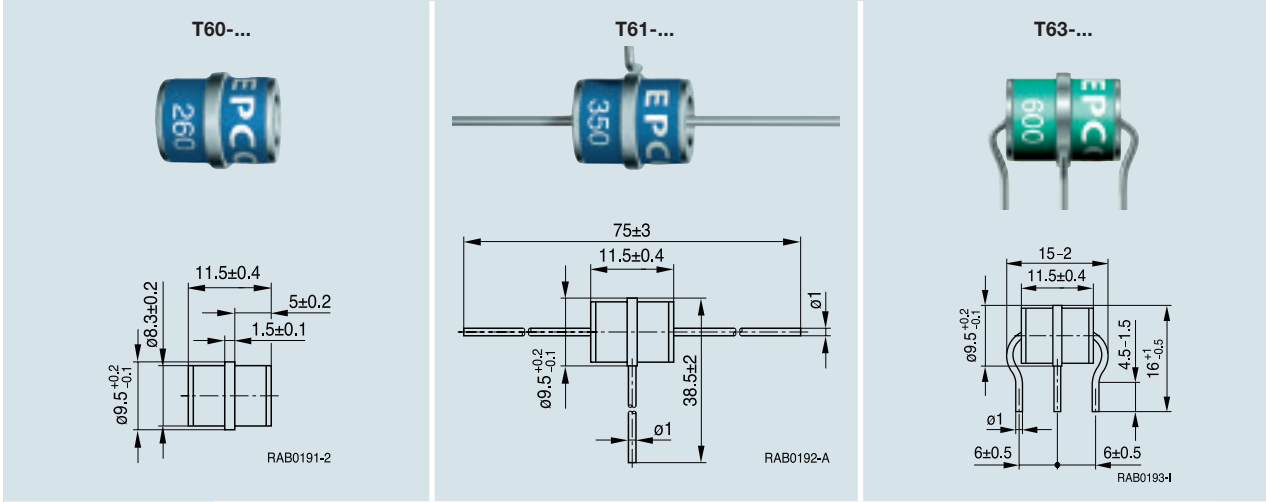


电路:

a, b	末端/环(线)电极
c	中心电极
T	温控短路机制

3-Electrode Arresters 三极放电管

Heavy-duty types 大功率系列
20 kA / 20 A • Ø 9.5 x 11.5 mm



Type 型号 Ordering code 订货号	T60-A260X B88069X7120C203	T60-C350X B88069X7450C502 T61-C350X B88069X7700B102 T63-C350X B88069X7460B102	T60-A420X B88069X6980C203	T61-C600X B88069X8820B102 T63-C600X B88069X8830B252	T61-C650X B88069X7230B102 T63-C650X B88069X6990B102	
标称直流击穿电压 V _{sdCN}	260	350	420	600	650	V
直流击穿电压容差	210 ... 310	300 ... 500	330 ... 600	420 ... 700	500 ... 800	V
冲击击穿电压						
测量值 @ 100 V/μs, 99%	< 600	< 800	< 750	< 900	< 1100	V
典型值 @ 100 V/μs	< 550	< 700	< 650	< 800	< 1000	V
测量值 @ 1 kV/μs, 99%	< 650	< 900	< 850	< 1000	< 1350	V
典型值 @ 1 kV/μs	< 600	< 800	< 750	< 900	< 1100	V
标称耐工频电流 @ 50 Hz, 1 s	20	20	20	20	20	A
耐工频电流 @ 50 Hz, 9周期	130	130	130	130	130	A
标称冲击放电电流 10次, 8/20 μs	20	20	20	20	20	kA
单次冲击放电电流 1次, 8/20 μs	40	40	40	40	40	kA
冲击放电电流 1次, 10/350 μs	可根据要求提供	5	可根据要求提供	5	5	kA
绝缘电阻	> 10	> 10	> 10	> 10	> 10	GΩ
电容 @ 1 MHz	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	pF

Currents through center electrode, half value through each line electrode. 电流通过中心电极，每个线电极各负载一半。
About packing see page 66. 包装见第66页。

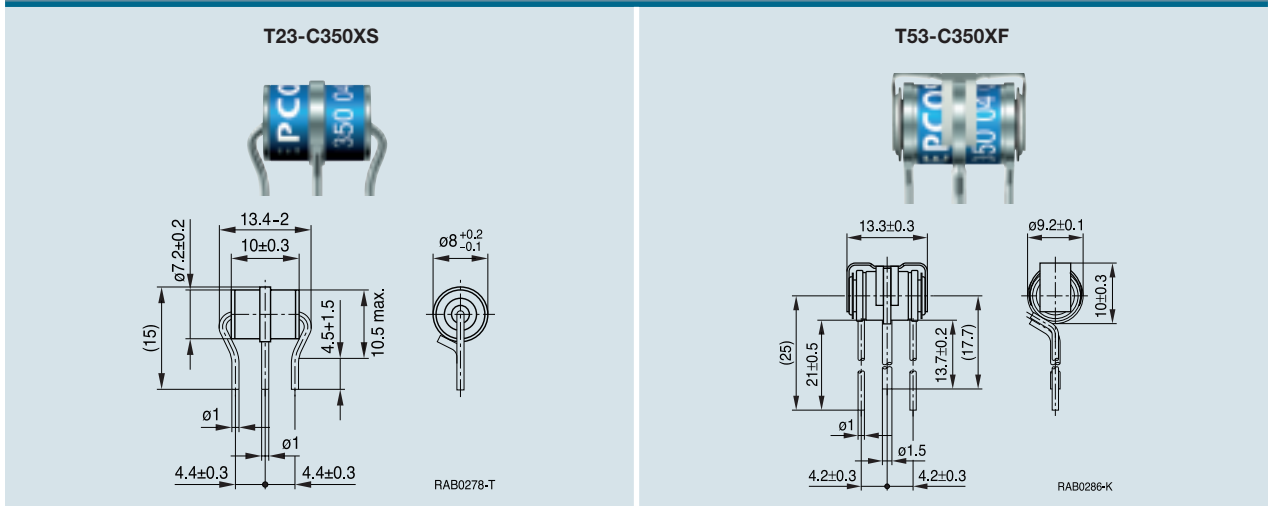
Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

请阅读第4页的重要信息，以及第70页的敬告和警告。

3-Electrode Arresters

三极放电管

Types conforming to US specifications 符合美国规格系列



Type 型号 Ordering code 订货号	T23-C350XS ¹⁾ B88069X8160B502	Type 型号 Ordering code 订货号	T53-C350XF ²⁾ 可根据要求提供
标称直流击穿电压 V _{sdCN}	350	标称直流击穿电压 V _{sdCN}	350
直流击穿电压容差	300 ... 500	直流击穿电压容差	265 ... 600
冲击击穿电压		冲击击穿电压	
测量值 @ 100 V/μs, 99%	< 650	测量值 @ 100 V/μs, 99%	< 1000
典型值 @ 100 V/μs	< 550	典型值 @ 100 V/μs	< 700
测量值 @ 1 kV/μs, 99%	< 800	测量值 @ 1 kV/μs, 99%	< 1000
典型值 @ 1 kV/μs	< 750	典型值 @ 1 kV/μs	< 800
标称耐工频电流 @ 50 Hz, 1 s	10	使用寿命 1500 次 10/1000 μs	20
耐工频电流 @ 50 Hz, 9周期	130	100 次 10/1000 μs	200
标称冲击放电电流 10次, 8/20 μs	20	50 次 10/1000 μs	600
单次冲击放电电流 1次, 8/20 μs	25	5 次 10/250 μs	4
使用寿命 400次, 10/1000 μs	1000	5 次 @ 50 Hz, 1 s	20
直流持续电压 @ 150 V / 200 mA	< 150	60 次 @ 50 Hz, 1 s	2
绝缘电阻	> 10	1 次 @ 50 Hz, 30 s	1
电容 @ 1 MHz	< 1.5	冲击复位 @ 52.5 V / 260 mA	< 150
		@ 135 V / 200 mA	< 150
		绝缘电阻	> 100
		电容 @ 1 MHz	< 3

1) Designed for RUS PE-80 Heavy Duty 用于RUS PE-80大功率系列。

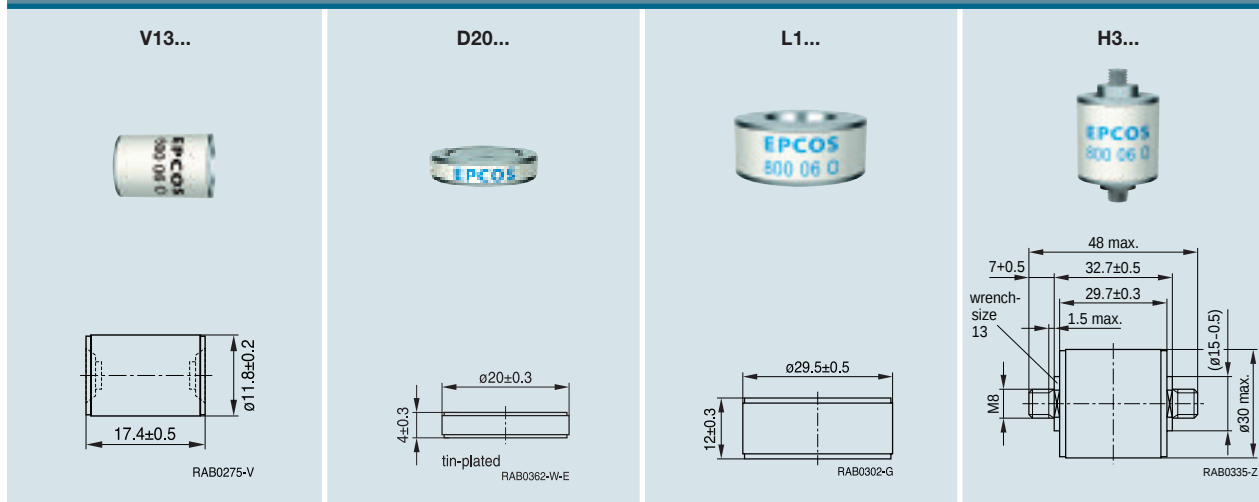
2) Designed for Telcordia GR1361/GR974-CORE 用于GR1361/GR974-CORE。

Currents through center electrode, half value through each line electrode. 电流通过中心电极，每个线电极各负载一半。

About packing see page 66. 包装见第66页。

AC Power Line Protection 交流电源线系列

Protection class I & II 保护级别 I & II



Type 型号 Ordering code 订货号	V13-A500XN B88069X6940C251	V13-A800XN B88069X4380C251	D20-A800XP 可根据要求提供	L10-A800XP1 B88069X5451B201 L1B-A800XP1 B88069X6551B201	H30-E800XP 可根据要求提供 H38-E800XP B88069X6821B101	
保护级别	I & II	I & II	I & II	I	I	
应用	N-PE	N-PE	PD	N-PE	N-PE	
标称直流击穿电压 V _{sdcN}	500	800	800	800	800	V
直流击穿电压	500 ... 850	> 600	> 550	> 600	> 600	V
冲击击穿电压 @ 1.2/50 μs, 6 kV 、 99% 测量值 (与波发生器结合 [2 Ω])	< 1300	< 1500	< 1500	< 1500	< 1500	V
I 级 最大持续工作电压 @ 50/60 Hz 标称冲击放电电流 8/20 μs 冲击电流 10/350 μs 持续电流 @ 50/60 Hz	255 40 12 100	255 40 12 100	255 20 25 100	255 50 50 100	255 V 100 100 100	kA kA A
II 级 最大持续工作电压 @ 50/60 Hz 标称放电电流 8/20 μs 最大放电电流 8/20 μs 持续电流 @ 50/60 Hz	255 40 60 100	255 40 60 100	255 20 40 100	—	—	V kA kA A
交流放电电流 (TOV at 1200 V) 一次 50 Hz, 0.2 s	300	300	—	300	300	A
绝缘电阻	> 1	> 1	> 1	> 1	> 1	GΩ

放电管符合EN 61643-11。

放电管符合EN 61643-11。

About packing see page 66.

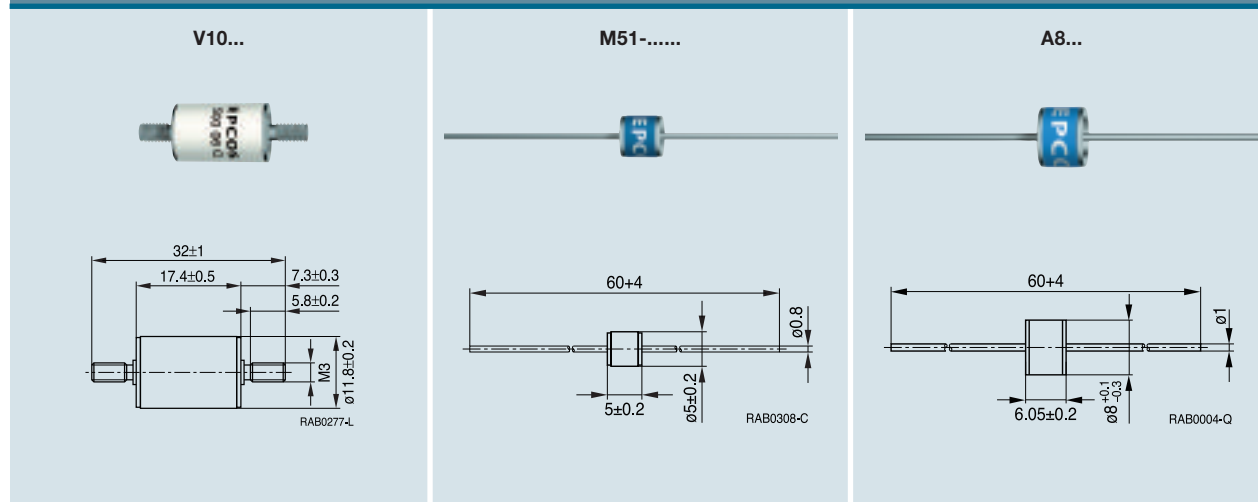
包装见第66页。

Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

请阅读第4页的重要信息, 以及第70页的敬告和警告。

AC Power Line Protection 交流电源线系列

Protection class II & III 保护级别 II & III



Type 型号 Ordering code 订货号	V10-A500X B88069X4400C251 V13-A500X B88069X4390C251	M51-A800XP B88069X4781S102 B88069X4781T502	A80-A800XP B88069X5691C103 A81-A800XP B88069X5701S102	
保护级别	II	II & III	II & III	
应用	N-PE	N-PE	N-PE	
标称直流击穿电压 V_{sdCN}	500	800	800	V
直流击穿电压	400 ... 600	> 600	> 600	V
冲击击穿电压 @ 1.2/50 μ s, 6 kV, 99% 测量值 (与波发生器结合 [2 Ω])	< 1500	< 1500	< 1500	V
II 级 最大持续工作电压 @ 50/60 Hz	255	255	255	V
标称放电电流 8/20 μ s	20	3	10	kA
最大放电电流 8/20 μ s	40	3	20	kA
持续电流 @ 50/60 Hz	100	5	100	A
交流放电电流 (TOV @ 1200 V) 一次 50 Hz, 0.2 s	300	—	—	A
绝缘电阻	> 1	> 1	> 1	G Ω

Arresters are designed to EN61643-11
放电管符合EN 61643-11。

About packing see page 66.
包装见第66页。

Switching Spark Gaps 开关放电器



The principle of the gas discharge will not only be used for overvoltage protection, but also for switching applications. Differently to surge arresters the switching spark tubes are active components and have stable performance during several hundred thousands of ignitions. They can be used in all applications, where a high voltage impulse needs to be generated. Modern high-pressure gas discharge lamps for automotive headlamps can easily be turned on as well as gas flames ignited.

The performance of these igniters is significantly determined by the properties of the switching component. An extremely fast switch which is operating almost without losses with a high insulating resistance in the non-conducting state is required. It should also be as compact as possible, rugged, highly reliable and capable of operating within a wide temperature range.

Switching spark gaps from EPCOS are designed using the advantages of the arc discharge: The enormous speed at which the arc discharge is formed ($< 50 \text{ ns}$) as well as its high current carrying capability allow the generation of short-time pulses of some $10 \mu\text{s}$ duration with extremely high current, voltage rise times and low losses. The insulating resistance in the non-conducting state is determined by the extremely low leakage currents and is in the $\text{M}\Omega$ range.

The construction of our switching spark gaps as well as the high quality standard of our manufacturing process (ISO TS 16949) satisfy the tough requirements made by the automotive industry on component reliability. Our switching spark gaps have already proven their advantageous function and reliability igniting xenon headlights for more than 15 years.

气体放电原理不仅可以用于过压保护，还可用于开关领域。与气体放电管不同的是，开关放电器属于有源部件，经过数十次点火后，仍具有稳定的性能。开关放电器可用于需要产生高压冲击的应用。现在，打开汽车前灯使用的高压气体放电灯就像点燃气体火焰一样简单。

这些点火器的性能主要取决于开关部件的特性。需要配置极速开关，该开关在不导电状态下，具有高绝缘阻抗，且损失极小。同时还应尽可能的小、坚固，应具有很高的可靠性及温度适应性。

爱普科斯开关放电器充分利用电弧放电的特点：电弧放电形成的速度 ($< 50 \text{ ns}$) 及其强大的电流负载能力使其能产生瞬间冲击 ($10 \mu\text{s}$) 以及极强的电流、电压上升时间和低损失。不导电状态下的绝缘电阻源于极低的泄电流，高达数兆欧姆。

爱普科斯的开关放电器的结构及其生产过程标准 (ISO TS 16949) 满足汽车行业多部件可靠性的严格要求。十五年的实践经验证明，爱普科斯的开关放电器在氙气前灯应用方面具有极高的功能性及可靠性优势。

Switching Spark Gaps 开关放电器

Circuit example for CAS02X CAS02X电路示例

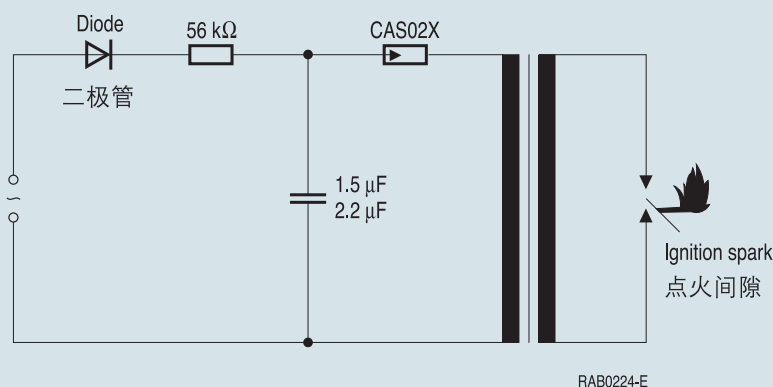


Fig. / 图 22

General technical information

The basic circuit of a pulse igniter contains a charging resistor, an ignition capacitor, a spark gap and a high-voltage transformer as shown in Fig. 22 and Fig. 23.

When the ignition voltage of the spark gap is reached, the energy stored in the capacitor will be discharged via the primary side of the transformer and generates the required high-voltage pulses on the secondary side. Their amplitude is determined by the ignition voltage of the spark gap, the used capacitance and by the winding ratio of the transformer. The repetition frequency can be set by selecting a suitable charging resistor.

The construction of gas-filled switching spark gaps is similar to that of the surge arrester with two electrodes shown in this brochure (see page 16). The electrical properties required for switching applications and the long switching life are set by matching design features such as the spacing and shape of the electrodes, the electrode activating compound, the type and pressure of the filling gas as well as the number, type and position of the ignition aids. The rugged hard-solder connection between the electrodes and the ceramic insulator ensures high reliability within a wide temperature range.

Type series CAS02X/CAM02X

Application: Igniters for gas cookers and central heating systems.

Principle: The switching spark gap generates the current pulse for the ignition transformer on the primary side. This in turn generates the high voltage required to ignite the gas mixture, typically of 12 kV, on the secondary side via its winding ratio.

通用技术信息

脉冲点火器基本电路包括充电电阻器、点火电容器、开关放电器和高压变压器，如图22和23所示。

当达到开关器要求的点火电压，电容器内储存的电能将通过变压器的一次侧释放，同时在二次侧产生所需的高压。其波幅取决于火花隙的点火电压、使用的电容以及变压器的绕线比。通过选择合适的充电电阻器可以设定其重复频率。

开关放电器的结构与二极气体放电管的结构相似（见本手册第16页）。通过匹配设计特点，如电极的间隙和形状、电极启动装置、气体的类型和压力以及点火装置的数量、类型和位置，可以设定开关应用以及开关使用寿命需要的电气特性。

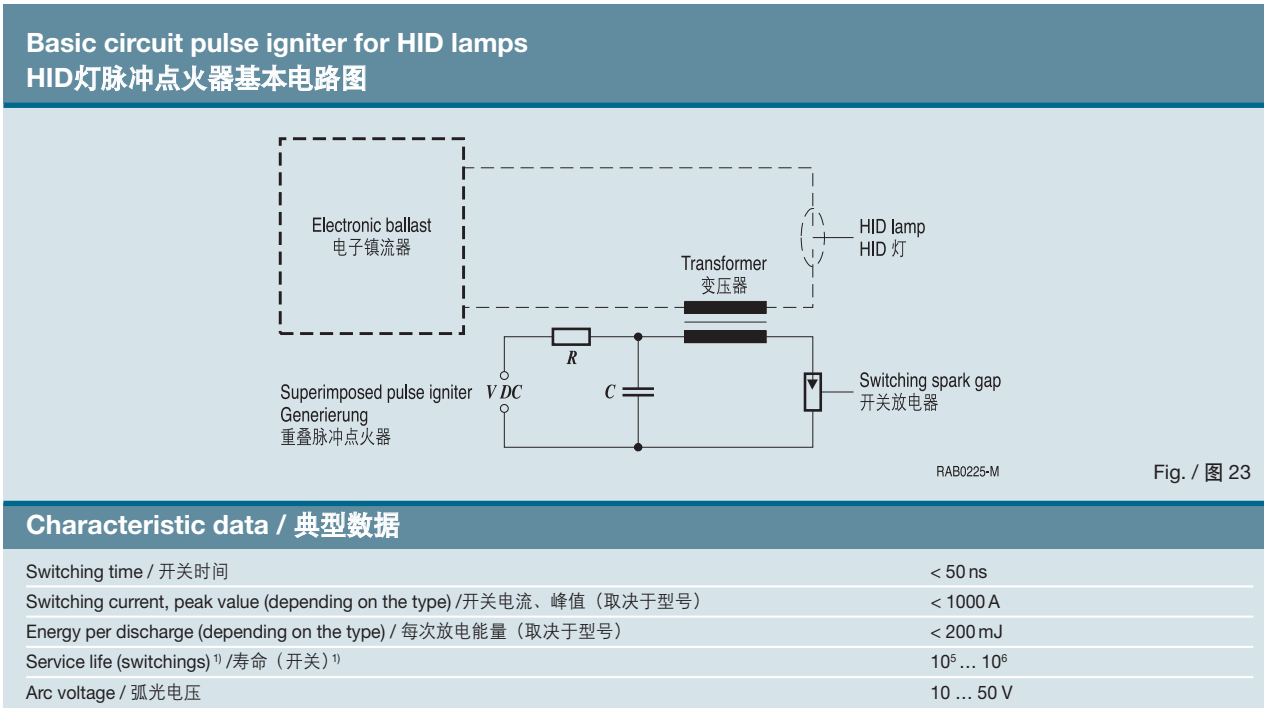
CAS02X/CAM02X 系列

应用： 煤气炉和中央供暖系统的点火器。

原理： 开关放电器在点火变压器一次侧产生电流脉冲，进而通过其绕组比在二次侧产生点燃混合气体所需的高压，一般为12 kV。

Switching Spark Gaps

开关放电器



Type series SSG

Application: Igniters for the cold and hot ignition of high and ultra-high pressure gas-discharge lamps for video and data projectors, general illumination (such as stadium and studio illumination, illumination of goods in stores), and special applications (endoscopy illumination and micro display TV).

Principle: The high-voltage pulses generated in the ignition circuit are superposed onto the lamp operating voltage supplied by the ballast. Thanks to the low losses incurred in switching with spark gaps, the ignition circuits can be dimensioned so that a few pulses suffice to ignite the high-pressure gas-discharge lamp.

Type series FS

Application: Igniters in xenon discharge lamps for automotive headlamps as well as in auxiliary lamps used in the construction and mining industries.

Feature: The FS series is designed to be used within a wide temperature range -40 °C up to +170 °C with a relatively tight range of breakdown voltages. Normally one pulse is sufficient to ignite the gas discharge lamp.

Principle: As described for the SSG.

1) The number of switching operations and the breakdown voltage occurring during the component's service life are significantly determined by the ignition circuit parameters, i.e. by the capacitance of the ignition capacitor as well as the primary inductance of the high-voltage transformer. Because the layout of the circuits depends on the user, these values have not been included in the table. Data sheets with values for switching operations and breakdown voltages obtained from standardized test circuits are available upon request.

SSG 系列

应用: 视频和数据投影仪高压/超高压气体放电灯冷/热点火器、普通照明（如体育馆和工作室照明、商店商品照明）、特殊应用（如内窥镜检查照明和微型电视）。

原理: 点火电路产生的高压脉冲与安定器产生的工作电压叠加。由于开关放电器的损失极低，所有点火器的设计可以使少量脉冲即可点燃高压气体放电灯。

FS系列

应用: 汽车前灯使用的氙气灯以及建筑和采矿行业的辅助照明灯点火器。

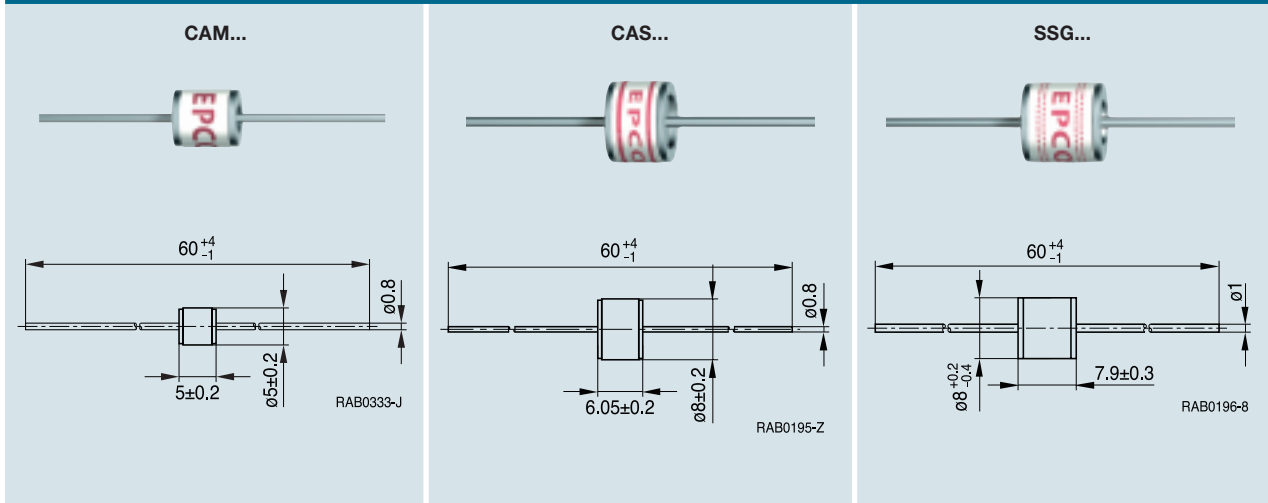
特点: FS系列具有广阔的温度适应性（-40 °C至+170 °C），而击穿电压范围相当较小。通常，一次脉冲即可点燃气态放电灯。

原理: 与SSG系列相同。

1) 元件使用期间的开关操作次数和击穿电压主要取决于点火电路的参数，即点火电容器的电容以及高压变压器的一次绕组电感。由于电路的布局由用户确定，因此这些数据未包括在表格中。采用标准化测试电路获得开关次数数据和击穿电压数据表可根据要求提供。

Switching Spark Gaps 开关放电器

Commodity types 商用系列

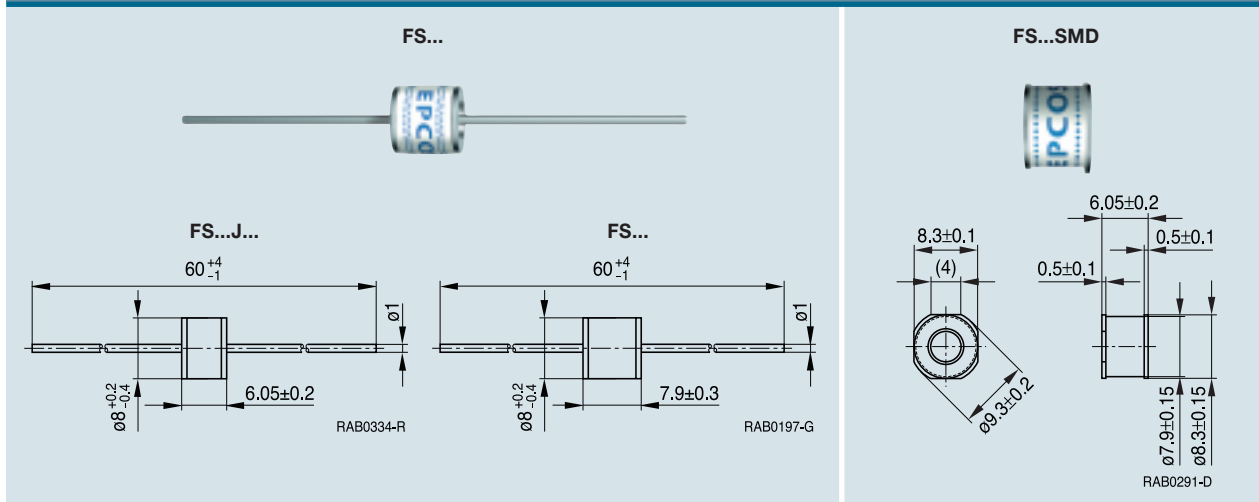


Type series 型号 Ordering code 订货号	CAM02X B88069C5410T502	CAS02X-68 B88069X0680T502	SSG3X-1 B88069X0260S102	SSG5X-1 B88069X0270S102	
标称击穿电压	230	230	3000	5000	V
初始静态击穿电压 ¹⁾	200 ... 255	200 ... 255	2550 ... 3540	4000 ... 6000	V
使用期击穿电压 ¹⁾	—	—	2400 ... 3600	3750 ... 6250	V
击穿时间	—	—	≤ 50	≤ 50	ns
开关操作 @ (25 °C) ²⁾	2 000 000	2 000 000	1 000 000	100 000	
放电峰值电流 ²⁾	300	300	50	30	A
工作温度	-20 ... +125	-20 ... +125	0 ... 100	0 ... 100	°C
绝缘电阻	> 100	> 100	> 100	> 100	MΩ

1) Ionized
1) 已电离。
2) Test circuit on request.
2) 测试电路可根据要求提供。
About packing see page 66.
包装见第66页。

Switching Spark Gaps 开关放电器

High performance types 高性能系列



Type 型号 Ordering code 订货号	FS04X-1JMG B88069X0410T502	FS06X-1NG B88069X3660T502	FS08X-1GH B88069X0340T502	FS08XJMSMD B88069X6891T602	
标称击穿电压	400	600	800	800	V
初始静态击穿电压 ¹⁾	350 ... 430	560 ... 680	704 ... 896	704 ... 896	V
使用期击穿电压 ¹⁾	340 ... 460	540 ... 700	680 ... 920	680 ... 920	V
击穿时间	≤ 50	≤ 50	≤ 50	≤ 50	ns
开关操作 (25 °C) ²⁾	200000	40000	100000	380000	
放电峰值电流 ²⁾	500	1000	650	500	A
工作温度	-40 ... +125	-40 ... +125	-40 ... +150	-40 ... +170	°C
绝缘电阻	> 100	> 100	> 100	> 100	MΩ

1) 已电离。

2) 测试电路可根据要求提供。

About packing see page 66.

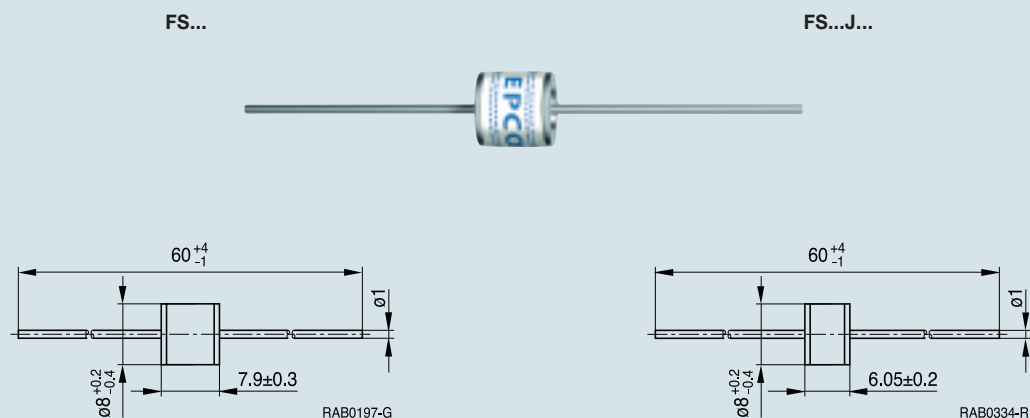
包装见第66页。

Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

请阅读第4页的重要信息, 以及第70页的敬告和警告。

Switching Spark Gaps 开关放电器

High performance types 高性能系列



Type 型号 Ordering code 订货号	FS08X-1JG B88069X3560T502	FS08X-1JGS B88069X5980T502	FS08X-1JKS on request	FS1X-1G B88069X3450T502	FS5,5X-1 B88069X3440S102	
标称击穿电压	800	850	850	1000	5500	V
初始静态击穿电压 ¹⁾	704 ... 920	748 ... 952	748 ... 952	900 ... 1130	4850 ... 6150	V
使用期击穿电压 ¹⁾	680 ... 920	720 ... 980	730 ... 980	850 ... 1150	4000 ... 6600	V
击穿时间	≤ 50	≤ 50	≤ 50	≤ 50	≤ 50	ns
开关操作 @ (25 °C) ²⁾	200000	200000	500000	200000	5000	
放电峰值电流 ²⁾	400	650	650	400	200	A
工作温度	-40 ... +150	-40 ... +150	-40 ... +150	-40 ... +125	-40 ... +125	°C
绝缘电阻	> 100	> 100	> 100	> 100	> 100	MΩ

1) Ionized

1) 已电离。

2) Test circuit on request.

2) 测试电路可根据要求提供。

About packing see page 66.

包装见第66页。

Quality 质量

No compromises

With its quality management system, and with a company-wide zero-defect campaign based on the "Six Sigma" method, EPCOS is consistently improving its process control and, as a result, the quality of its products. Numerous awards illustrate how much customers appreciate this strict approach to quality.

Today, increasingly demanding quality requirements are passed along through the entire production chain. Tougher quality standards are becoming increasingly relevant to the company's key markets, which include the automobile industry, information and communications technology as well as industrial and consumer electronics.



International QM standards

Manufacturers insist that their suppliers run QM systems that cover every function within the company and are precisely aimed at reliably controlling its processes and improving them continuously. These requirements are laid down in the international QM system standard ISO TS 16949:2002.

Corporate certification to ISO TS 16949

The EPCOS quality policy stipulates that its QM system must satisfy the requirements of the most demanding international standards in any particular case. The company has therefore been certified worldwide in accordance with ISO TS 16949:2002. The EPCOS QM system is continuously monitored and systematically developed within the company. Zero tolerance of compromise in quality also means striving for ongoing improvement in a continuous process, whereas process control is the key to business success. It is the only way to ensure products and services of the highest quality and thus customer satisfaction.

卓越品质

通过内部质量管理体系以及公司范围内基于“六西格玛”的零差错运动, 爱普科斯不断改善过程控制, 不断提高产品质量。众多的奖项已说明顾客对这一严格的质量控制途径的认可。



目前, 对整个供应链的质量要求不断提高。更加严格的质量标准与公司主要市场的关系越来越密切, 其中包括汽车行业、信息和通讯技术以及工业和消费电子行业。

国际质量管理标准

生产商坚持要求供应商采用涵盖公司所有功能部门、严格控制生产过程并不断改进过程的质量管理体系。这些要求在国际质量管理体系标准ISO TS 16949:2002中都有规定。

ISO TS 16949 认证

爱普科斯质量方针规定, 任何特定条件下, 质量管理体系必须满足最严格的国际标准。因此, 本公司已经通过ISO TS 16949:2002的全球认证。爱普科斯质量管理体系始终处于监控之下, 并得以不断地、系统地发展。质量零差错同时还意味着在连续的过程中不断改进, 而过程控制是事业成功的关键。这是确保产品和服务质量、满足顾客需求的唯一途径。

注: 本页内容请以英文版本为准。

Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

Quality 质量

UL certification

Surge arresters from EPCOS are recognized to UL 497B under UL file E163070, UL 497 under file E214013 and UL 1449 under File E217608.

Quality monitoring

100% test

Arresters and spark gaps are individually tested for correct operation before dispatch.

Sampling inspections

In our quality tests, we apply sampling inspections based on the following internationally recognized standard: MIL-STD-105E, normal inspection level II.

These quality monitoring processes are applied within the scope of statistical process control (SPC) to the process steps, the type and delivery inspections as well as the reliability inspections. Our delivery inspection (including simulation of the customer's incoming inspection) operates with the test features V_{sdc} and R_{ins} unless otherwise agreed. For our outgoing quality inspection we practice AQL 0.65 or better. The average outgoing quality (AOQ) is measured regularly in ppm and evaluated on the basis of these values.

For switching spark gaps, application oriented lifetime tests are carried out (see individual data sheets).

Reliability inspections

The following tests are carried out on the basis of the international standards IEC or DIN EN 60068:

- Lifetime tests
- Temperature cycling tests:
 - Arresters $-40\text{ °C} \dots +90\text{ °C}$
 - Switching spark gaps $-40\text{ °C} \dots +125\text{ °C}$
- Humidity tests (relative humidity = 93%)
- Continuous shock tests ($a = 400\text{ ms}^{-2}$)
- Vibration tests ($f = 10$ to 500 Hz)
- Tension/bending tests of the lead wires
- Torsional strength tests of the lead wires
- Solderability tests
- Inspection of mechanical dimensions

The frequency and stress parameters used in these tests depend on the component types.

The product and dispatch packaging is monitored to DIN EN 24180 (strain, vibration and impact tests) as well as by means of transport tests performed under practical conditions.

Electrical stress

In the most international specifications, the failure modes for surge arresters are determined. Other failure modes are as follows:

UL认证

爱普科斯气体放电管已经过认证, 符合UL 497B (文件号 E163070)、UL 497 (文件号 E214013) 和UL 1449 (文件号 E217608) 的要求。

质量监控

100%测试

发货前, 放电管和开关放电器已经过单独测试, 符合正常工作要求。

抽检

测试中, 爱普科斯采用了基于以下国际标准的抽检: MIL-STD-105E常规检查 II级。

这些质量监控过程涵盖动态 (SPC) 过程控制、过程步骤、型式和发货检验以及可靠性检验。除非另有规定, 否则爱普科斯的发货检验 (包括模拟客户进货检验) 采用 V_{sdc} 和 R_{ins} 测试, 出货质量检验采用 AQL 0.65 或更高版本。平均出货质量以 ppm 进行测量, 并以这些数值为基础进行评价。

对于开关放电器, 爱普科斯采用了应用寿命测试 (见单独规格书)。

可靠性检验

以下测试, 爱普科斯采用了国际标准 IEC 或 DIN EN 60068:

- 寿命测试
- 温度循环测试:
 - 放电管 $-40\text{ °C} \dots +90\text{ °C}$
 - 开关放电器 $-40\text{ °C} \dots +125\text{ °C}$
- 湿度测试 (相对湿度 = 93%)
- 连续冲击测试 ($a = 400\text{ ms}^{-2}$)
- 振动测试 ($f = 10$ bis 500 Hz)
- 引线拉力/弯曲测试
- 引线扭转强度测试
- 可焊性测试
- 机械尺寸检测

这些测试中使用的频率和应力参数取决于元件的型号。

产品和包装符合 DIN EN 24180 要求 (应力、振动和冲击测试), 同时通过实际条件下的运输测试进行监控。

电气应力

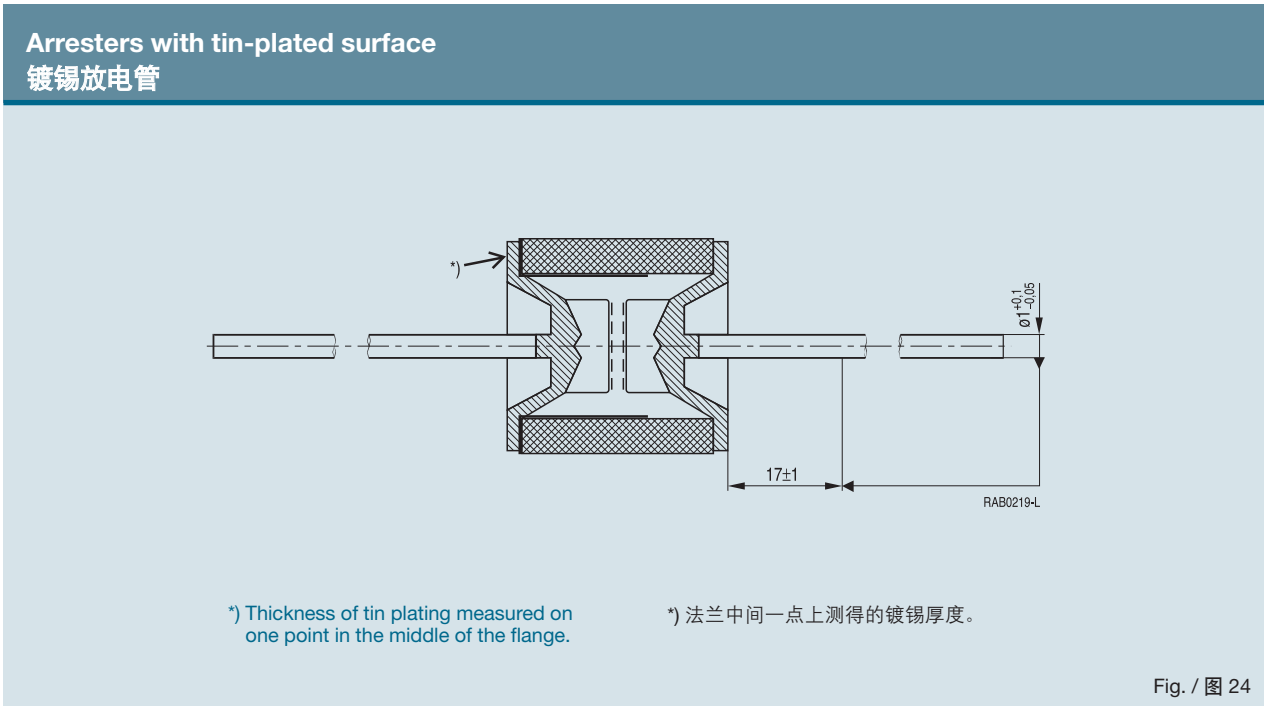
大多数国际规范都确定了气体放电管的故障模式。其他故障模式如下:

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Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

请阅读第4页的重要信息, 以及第70页的敬告和警告。

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- Nominal discharge current and nominal alternating discharge current

Failure criteria:

Total failure

Failures due to variations:

Permissible failure rate:
- Short circuit

$V_{sdc} < 0.7 \times V_{sdcN}$

$V_{sdc} > 1.3 \times V_{sdcN}$

$< 5\%$
- Single-discharge current and alternating discharge current

Failure criteria:

Total failure

Failures due to variations:

Permissible failure rate:
- Short circuit

$V_{sdc} < 0.5 \times V_{sdcN}$

$V_{sdc} > 1.5 \times V_{sdcN}$

$\leq 5\%$

Layer thickness test of electrolytic surfaces

The electrolytic layers of the surge arresters and switching spark gaps are monitored during the manufacturing process at the measuring point shown in Fig. 24.

Climatic framework conditions

The diverse requirements profiles for surge arresters and switching spark gaps are used to derive various temperature ranges for operation and storage. Due to their predominant use in telecom applications arresters have to comply with ITU-T, K.12, unless otherwise specified.

For switching spark gaps, the standards of the automotive industry are generally applied.

Temperature values are given in the product part of this brochure or in data sheets which are available at www.epcos.com/arresters.

注: 本页内容请以英文版本为准。

- 标称放电电流和标称耐工频电流

失效标准:

完全失效

变量失效

允许故障率:
- 短路

$V_{sdc} < 0.7 \times V_{sdcN}$

$V_{sdc} > 1.3 \times V_{sdcN}$

$< 5\%$
- 单次放电电流和耐工频电流

失效标准:

完全失效

变量失效

允许故障率:
- 短路

$V_{sdc} < 0.5 \times V_{sdcN}$

$V_{sdc} > 1.5 \times V_{sdcN}$

$\leq 5\%$

镀层厚度测试

生产过程中对放电管和开关放电器的电镀层进行监控, 测量点见图24。

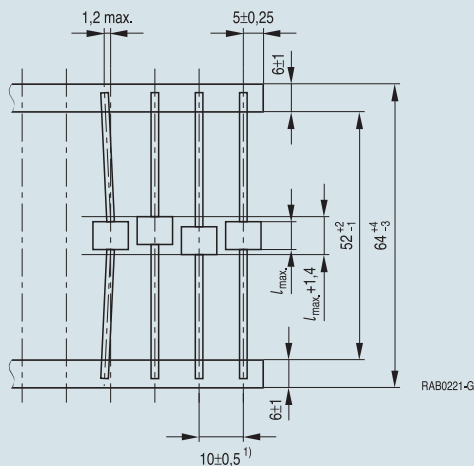
天气条件

体放电管和开关放电器的众多要求都用于确定工作和储存温度范围。由于这些产品主要用于电信领域, 放电管必须符合ITU-T, K.12的要求, 除非另有规定。对于开关放电器, 汽车行业的标准一般都可适用。

温度数值可参考本手册产品部分或网站www.epcos.com/arresters上的规格书。

Taping and Packing 包装

Tape packaging to EN 60286-1 胶带包装符合 EN 60286-1

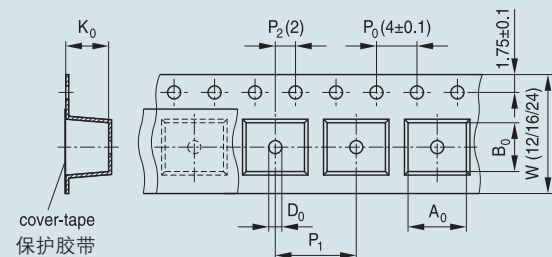


1) Permissible deviation
over 10 spacings ±2

1) 10个间隙间允许的误差为±2

Fig. / 图 25a

Tape packaging to EN 60286-3 胶带包装符合 EN 60286-3



Specification and tolerances
to EN 60286-3
规格和容差符合EN 60286-3

RAB0364-M-E

Fig. / 图 25b

Packing

Surge arresters and switching spark gaps are supplied in various packing types and packing units. These are encoded in the last four digits of the ordering codes.

Depending on the design, 2-electrode arresters with a terminal wire will be preferentially supplied taped to EN 60286-1. The wire length available for processing in the taped arresters is correspondingly reduced (see Fig. 25a).

In general unleaded arresters are delivered in plastic tapes to EN 60286-3 (see Fig. 25b).

包装

气体放电管和开关放电器有多种包装类型和包装单位，以订货号的后4位表示。

根据设计的不同，带端子线的二极放电管首选胶带包装，符合EN 60286-1的要求。用于加工的引线长度也相应减少（见图25a）。

通常，不带引线的放电管以符合EN 60286-3要求的塑料胶带包装（见图 25b）。

Ordering code system / 订货号系统

订货号: B88069X1234 **S 102**

Packing / 包装		Packing unit / 包装单位	
S =	Strip / 条带	代码	Pcs./个
T =	Standard tape / 标准胶带	101	10
B =	Blister tray / 气泡胶带	102	100
C =	Bulk packing / 散装	103	1000
		202	200
		203	2000
		251	25
		252	250
		253	2500
		352	350
		403	4000
		502	500
		902	900

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Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

请阅读第4页的重要信息，以及第70页的敬告和警告。

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Mounting Information

安装信息

Bending lead wires 弯曲引线

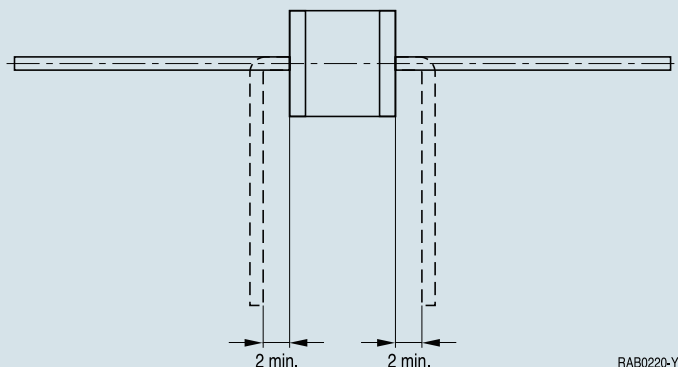


Fig. / 图 26

Bending and truncating lead wires

The processing of surge arresters may involve the bending or truncating of lead wires. It must then absolutely be ensured that the metal-ceramic compound (electrodes/ceramic insulator) is not subject to mechanical stress and that no sudden stresses affect the ceramic.

A minimum spacing of 2mm must be observed between the body and the bend point (**Fig. 26**). This ensures that the strength at the welding point between wire and electrode is not diminished.

The bending pattern of the surge arresters supplied by EPCOS may differ from that described above.

弯曲和剪切引线

气体放电管的加工可能涉及到引线的弯曲或剪切。然后必须完全确定金属—陶瓷组合（电极/陶瓷绝缘体）不会承受机械应力，并且陶瓷不会受到突然应力。

引线本身和弯曲点必须保持至少2毫米的间距（图26），确保引线 and 电极之间焊接点的强度不会降低。

爱普科斯提供的气体放电管的弯曲形式可能与上述有所不同。

注: 本页内容请以英文版本为准。

Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

请阅读第4页的重要信息，以及第70页的敬告和警告。

Mounting Information

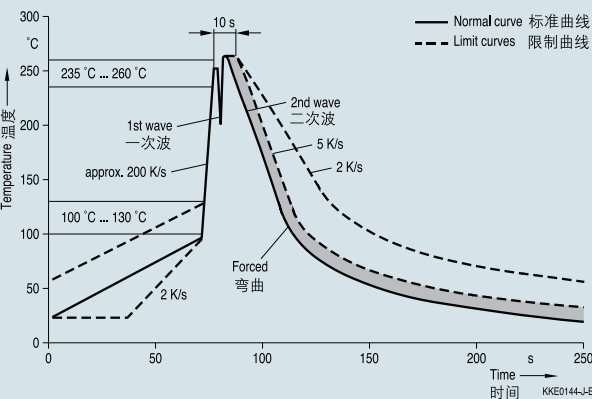
安装信息

Recommended soldering profiles

建议焊接曲线

Wave soldering

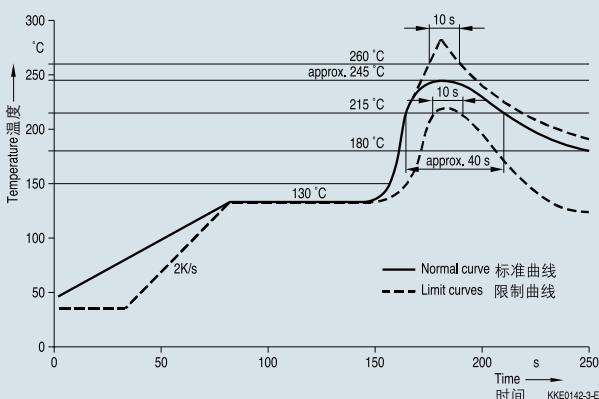
波峰焊



Soldering profile applied to a single soldering process.
单次焊接过程的焊接曲线

Reflow soldering

回流焊



Temperature rise rate: 3 °C/s
温度上升速率: 3 °C/s

Fig. / 图 27

Soldering of tin plated arresters

Wettability test (to IEC 60068-2-58)

Test criterion: wetting of soldering areas

镀锡放电管的焊接

润湿性测试（符合IEC 60068-2-58）

测试标准：焊接区域的润湿

Solder 焊料	Solder bath temperature 焊锡槽温度	Dwell time 停留时间
Sn 95.5/Ag3.8/Cu 0.7	263 (±3) °C	< 3 s

Note: Soldering of surge arresters with failsafe mechanism need to be examined individually.

注：带失效保护卡装置的气体放电管的焊接应进行个体检验。

注：本页内容请以英文版本为准。

Please read *Important notes* on page 4 and *Cautions and warnings* on page 70.

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Environmental Protection

环保

Global environment management

With our global environmental management in accordance with ISO 14001 we are protecting the environment to the same high standard in all parts of the world.

The same requirements are placed on every EPCOS site; external institutes ensure, at regular intervals, that they are being observed.

As well as satisfying both statutory requirements and those imposed by the relevant authorities, our environmental management system aims to utilize natural resources efficiently. For that reason, we use our technological expertise to design and manufacture our electronic components in the most environmentally compatible way possible. We are continuously optimizing our products and processes in order to use materials in a way that minimizes the impact on resources, to use substitutes for hazardous materials wherever possible, and to reduce waste to a minimum.



Material data sheets

An obligatory list of materials and substances has its foundations in our environmental management system, and this guarantees that a consistent procedure is applied to all EPCOS products. We are, moreover, active on a large number of committees, working groups and commissions associated with the electronics industry, with the aim of pushing forward the standardization of materials data sheets for electronic components. The materials contained in our products are listed in detail on this kind of material data sheet, so that customers, in turn, can satisfy the environmental conditions imposed upon them.

EPCOS posts material data sheets on the Internet under www.epcos.com/material

Substances in components regulated by law (RoHS)

Although components are not directly covered by Directive 2002/95/EU (RoHS), EPCOS observes this directive on the basis of the current state of knowledge. With due consideration to the exceptions defined in the Annex to 2002/95/EU, all EPCOS products are free of:

- Cadmium and cadmium compounds
- Hexavalent chromium
- Mercury and mercury compounds
- PBBs and PBDEs
- Surge arresters and switching spark gaps are free from lead and lead compounds.

全球环境管理

通过实行符合ISO 14001的全球环境管理，爱普科斯在世界任何地点都能达到相同的环保标准。

所有爱普科斯公司、分公司及外部研究院都采用相同的要求，并定期检查其执行情况。

在满足法律要求以及相关方面的规定的同时，爱普科斯的环境管理体系的目的还在于有效利用自然资源。鉴于此，爱普科斯以最环保的方式利用专业技术设计和生产无源电子元件。爱普科斯不断优化产品和工艺，以便以最环保的方式利用材料，尽量选择有害材料的替代材料，将浪费降到最低。

材料清单

爱普科斯的环境管理体系采用强制材料和物质清单，确保所有爱普科斯产品都采用一致的程序。同时，爱普科斯积极参加各类与电子行业有关的委员会、工作组和协会，以期推动无源电子元件材料清单的标准化。爱普科斯的产品所含的材料都详细地纪录在此类清单上，因而客户也可以满足对他们的环保要求。

爱普科斯将材料清单公布在网站上 www.epcos.com/material.

法律 (RoHS) 限制的物质

尽管指令2002/95/EU (RoHS) 并未涉及一下元件，但是爱普科斯仍以最新的认识来遵守该指令。充分考虑到2002/95/EU附件中确定的例外，所有爱普科斯产品均不含有：

- 镉和镉化合物
- 六价铬
- 汞和汞化合物
- 多溴联苯 (PBB) 及多溴联苯醚 (PBDE)
- 气体放电管和开关电器不含铅和铅化合物

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Cautions and Warnings

敬告和警告

Correct application and strict adherence to the important information listed below will ensure optimum performance for the components specified in this brochure.

Please consult your local EPCOS sales organization if one or more limits cannot be adhered to.

- The surge arrester must be selected so that the maximum expected follow current can be quenched.
- The follow current must be limited so that the arrester can be properly extinguished when the surge has decayed. The arrester might otherwise heat up and ignite adjacent components.
- The short-circuit spring does not trigger until 140, 200, 260 and 300 °C is reached depending on the sensor material. Care must be taken to limit the thermal radiation onto adjacent parts to safe values.
- Depending on the incorporation position, the surge arrester may have to be additionally secured by mechanical means.
- If the contacts of the surge arresters are defective, current stress can lead to the formation of sparks and loud noises (bang).
- Surge arresters must not be operated directly in power supply networks.
- Surge arresters may become hot in the event of longer periods of current stress (danger of burning).
- Surge arresters and switching spark gaps may be used only within their specified values. In the event of overload, the lead contacts may fail or the component may be destroyed.
- Damaged surge arresters must not be re-used.
- Surge arresters with triggered short-circuit mechanisms must not be re-used.
- Ensure appropriate handling of components passed on for subsequent industrial processing
- Operatives who suffer from excessive sensitivity to metals must wear light gloves when performing manual placement operations.
- Surge arresters should be disposed of in the same way as industrial waste resembling household refuse. In individual cases, any legal stipulations departing from this rule must be observed.

正确的应用以及严格遵守以下重要信息有助于确保获得元件的最佳性能。

如果不能确保遵守某些限制, 请咨询当地爱普科斯销售办事处。

- 必须对气体放电管进行挑选, 以便能熄灭最大预期持续电流。
- 必须限制持续电流, 这样才能在浪涌衰退时正确熄灭放电管。否则, 可能导致放电管发热, 进而启动周边元件。
- 由于传感器材料的不同, 达到140 °C、200 °C、260 °C或300 °C时才能触发短路簧片。必须将对周边元件的热辐射限制在安全值之内。
- 由于组合位置不同, 放电管可能需要采用其它机械方法固定。
- 如果放电管的触点有缺陷, 电流应力可能会造成火花及噪音。
- 放电管不得直接连接在电源网络中。
- 如果长时间承受电流应力, 放电管可能会发热 (有燃烧的危险)。
- 气体放电管和开关放电器只能用于指定的范围之内。如果超负荷, 可能导致引线触点故障或元件损坏。
- 不得使用损坏的放电管。
- 不得使用失效保护装置已触发的放电管。
- 确保元件在制程中传送方式得当。
- 对金属过敏的操作人员进行手工操作时应戴手套。
- 应安装生活垃圾类工业废物处理放电管。个别情况下, 必须遵守不符合此条规定的法律规定。

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