



# About OTOWA



*To make a solution  
from the trouble brilliantly*

Our vision is to contribute Safety & Secure society that will not be threaten from the power of "Lightning". Our mission is to offer our the best solution and fulfill against all lightning disaster by highly development lightning protection system. Furthermore, OTOWA provides the most effective solution from design to maintenance with thoroughly reseaching invasion route of lightning and damage situation.

# OTOWA will respond to your every need!

## the wide range of product lines

OTOWA is the leading company for lightning protection in Japan  
OTOWA is determined to contribute to our society by delving into lightning, finding way to live in harmony with lightning.

We provide the various range as distribution line, office, industries, railway, household and so on.

In addition, we are able to provide custom-made lightning protection under the on-demand contract.



## Lightning protection as Consulting

To consider the lightning protection with whole facilities.

It depends on the site condition, electric line system and other factors, the solution is different.

Lightning protection is a part of the crisis control

It is important to compare between the risk of lightning and solution cost, then, plan to the most effective solution.

- The risk of lightning...lightning frequency, facility importance, assumed damage loss and so on
- Solution cost...the cost of installation SPD



## OTOWA Suggestion of OTOWA group company solution

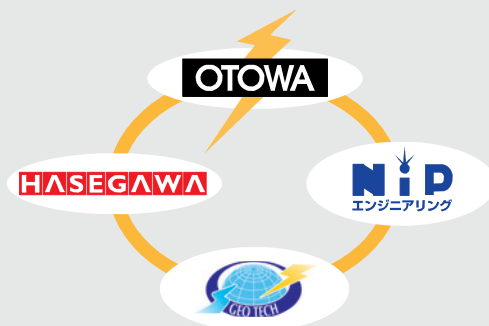
NIP Engineering...maintenance for PV system and solution for buildings

GEOTECH...the specialized grounding system

HASEGAWA Electric...Providing Safety of electric system

OTOWA Electric...The specialized solution company from powerful natural energy "lightning"

OTOWA Group companies perform and provide as total system solution



## It has literally world high level energy capacity test facility

Possible to perform the 10/350 $\mu$ s wave lightning current impulse up to 220kA.

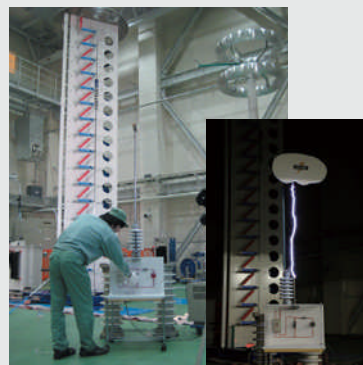
We design the top of high-performance facilities, use the various facilities and evaluate the product by ourselves.

Therefore, we accept the compliant test such as JIS or IEC from highly performance reputation.

The largest high current impulse generator originally designed and developed by OTOWA.

It is able to perform 10/350 wave lightning current test up to 220kA artificially.

Lightning Technology Center Impulse Voltage Generator



Confronting the Power of Lightning over 7 decades,  
that's what makes us proud.



Otowa has been the leading company for lightning protection in Japan that has specialized in researching powerful natural energy LIGHTNING since establishment of the company. We have found mission in protecting our highly electricity-dependent and IT networked society from the destructive forces of lightning surge. Otowa is determined to contribute to our society by delving into lightning phenomena and finding ways to live in harmony with it.

Mr. Yoshida Osamu  
President of OTOWA ELECTRIC CO., LTD.



Bronze prize of the 1st Lightning Picture Contest : "A twinkle by Light" (Sep. 24 1994)

## Advanced Material Technology Expert and Lightning Protection Specialist

### Unique development history of Zinc Oxide material and the mass production technology

The three core values of creativity, originality, and technology development are the driving force of Otowa as the Lightning Protection Specialist. The enterprising spirit centered on these three values lead us to Zinc Oxide Block, the key element of Lightning Protection Equipment.

In general, the resistor voltage is generated by the flowing current, and it increases and decreases in proportion to the current. But Zinc Oxide Blocks function to limit the change of terminal voltage to an extremely small level for the surge currents ranging from small to very large, such as those associated with lightning surges.

Zinc Oxide Blocks are ceramics that functions as insulator up until a specified voltage is applied; then they function as conductor for the range of over-voltage exceeding the specified value, and serve to limit the terminal voltage under the lightning condition.

The development of Zinc Oxide Blocks as a pioneer and mass production technology with huge commercial supply to the market have led us to the world best level of quality stabilization, the superior performance and achievement of reduction in size and weight. Each of the Lightning Protection products with our own Zinc Oxide Block element exhibits these merits in a wide variety of fields and applications.

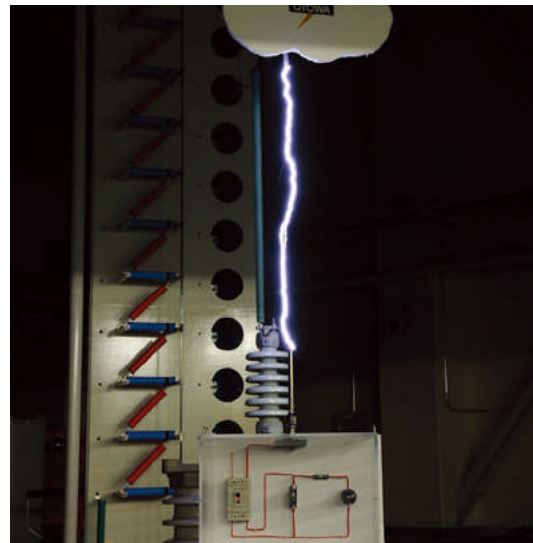
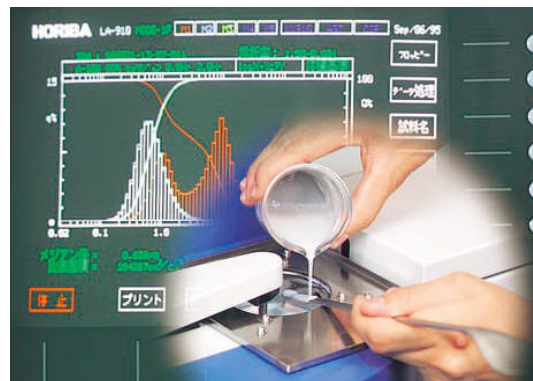
### Otowa takes on the challenge of developing new materials

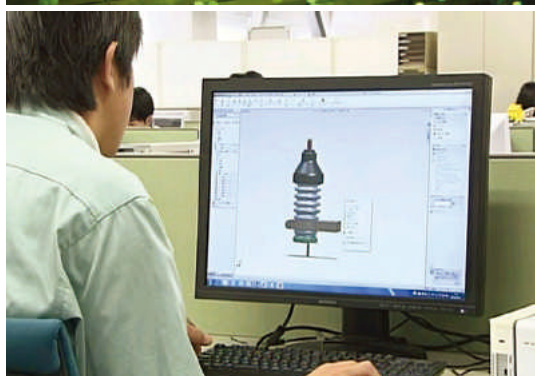
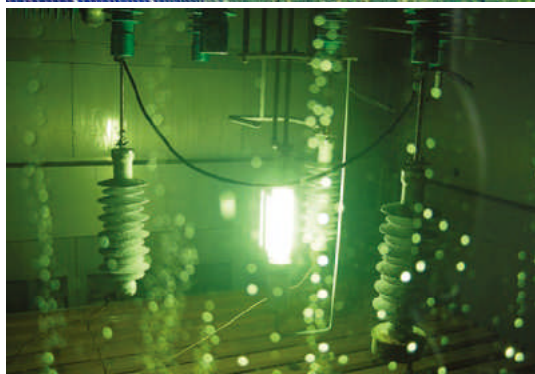
For a long time, the outer housings of the arresters were all made of porcelain, but Otowa has challenged the development of new housing materials in various applications.

We directed our attention to polymeric and composite materials, which have excellent physical benefits and also superior weathering properties, and succeeded in manufacturing a wide range of material solutions with the strength of our own material technology.

Polymers have a number of features including plasticity of forming various composite materials with excellent weathering properties such as resistance to sunlight, rain, salt and air and they are lightweight with one-fifth of that weight of porcelain. Their features of the excellent physical properties and versatility to cope with many complex mechanical requirements allow us to design high functioning products being introduced to LV and MV electrical systems.

Inspired with a will “make the impossible possible”, Otowa will continue to enthusiastically develop and introduce high functional materials.





## Development of surge & noise protection systems by state-of-art technologies

### Challenging new fields... Developing products of high added value

Since establishment of Otowa, all efforts have been aimed toward developing the highest performance and quality lightning protection materials and equipment. In parallel with development of superior Zinc Oxide material, there have been advancements in developing wide variety of lightning and surge related measuring instruments and apparatus including lightning radar, lightning current observation systems and DC withstand voltage test equipment. Those fusion approaches of technologies allow us to introduce all the merits in wide variety products with high added value to the industry.

In the development of the new products, to which the technical knowledge from material and process of Zinc Oxide Blocks has been applied, and in other endeavors, the combined technologies of Otowa demonstrate outstanding utility.

### Surge & Noise solution consultant service

Low-voltage electronic equipment, which is susceptible even to the effects of minute lightning surges, need to be thoroughly inspected and studied in conjunction with surrounding weather condition and other physical conditions, thus for determining the nature of lightning in that region, effective surge protection measures corresponding to each factor are required.

Otowa accurately tackles all consulting projects related to domestic and overseas lightning surge and noise troubles, and offers services as full-scale consultant for total support of optimum lightning surge and noise protection systems.

### Original production technology provides a high level of quality.

Excellent production technology is indispensable to achieve a high level of quality and efficient productivity. As the top surge protection product manufacturer in Japan, Otowa's core technologies have developed together with production technology.

Otowa has accomplished the highest efficiency manufacturing line by collecting many comments and proposals from the work site, and independently developed production systems required in processes including zinc oxide element molding process, sintering furnaces, and other production machines as well as the total production line control. Otowa exhibits its forte in achieving high quality and effective cost.



# **Lightning protection system**



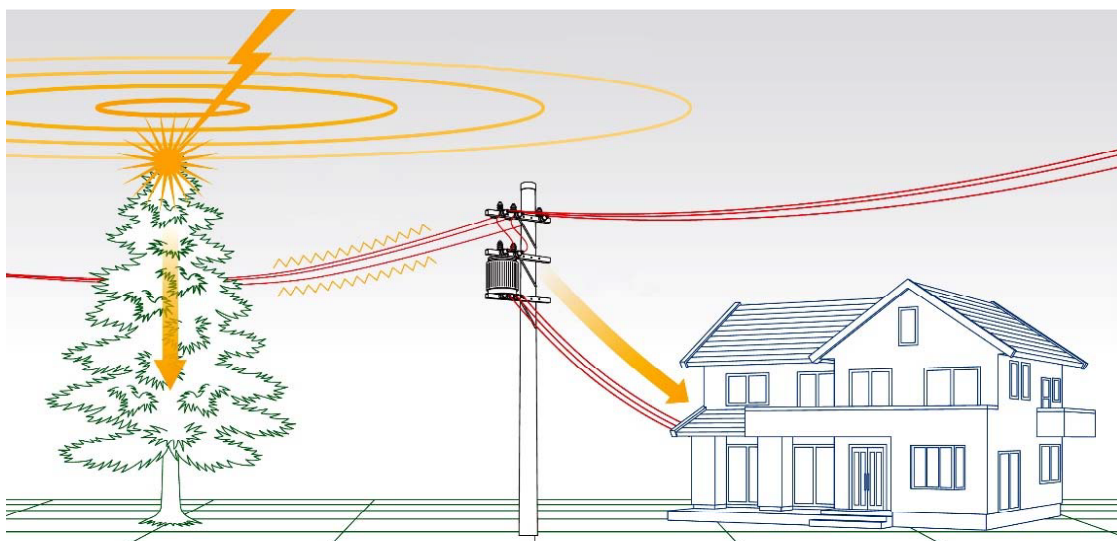
**F**ailure of technical installations and systems in residential and functional buildings is very unpleasant and expensive. Therefore, faultless operation of devices must be ensured both during normal operation and thunder-storms. A professional solution allows to take adequate protection measures. The lightning protection zone concept, for example, enables designers, constructors and operators of buildings and installations to consider, implement and monitor different protection measures. All relevant devices, installations and systems are thus reliably protected at a reasonable expense.

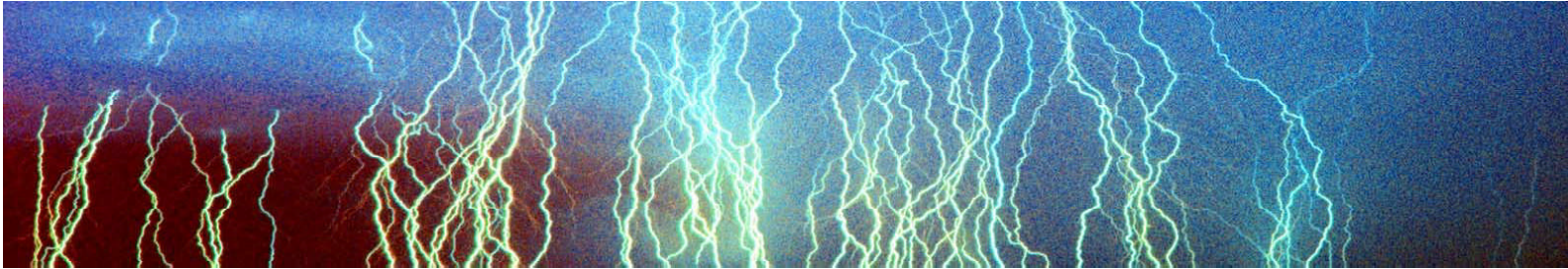


## Sources of interference

Surges occurring during a thunderstorm are caused by direct / near by lightning strikes or remote lightning strikes . Direct or near by lightning strikes are lightning strikes to a building, its surroundings or electrically conductive systems entering the building (e.g. low-voltage supply,

telecommunication and data lines). The resulting impulse currents and impulse voltages as well as the associated **Lightning Electromagnetic Pulse (LEMP)** are particularly dangerous for the devices to be protected with regard



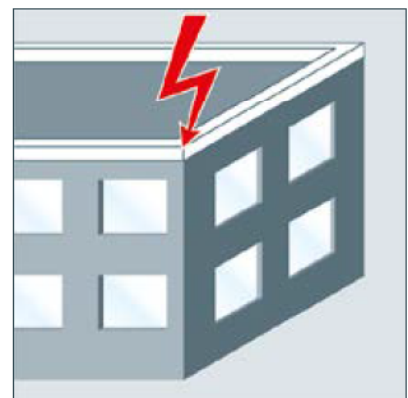


to the amplitude and energy content involved. In case of a direct or nearby lightning strike, surges are caused by the voltage drop at the conventional earthing impedance  $R$  stand the resulting potential rise of the building in relation to the remote earth. This means the highest load for electrical installations in buildings. The characteristic parameters of the impulse current present (peak value, rate of current rise, charge, specific energy) can be described by means of the 10/350  $\mu\text{s}$  impulse current wave form. They have been defined in international, European and national standards as test current for components and devices protecting against direct lightning strikes.

In addition to the voltage drop at the conventional earthing impedance, surges are generated in the electric building installation and the systems and devices connected to it due to the inductive effect of the electromagnetic lightning field. The energy of the induced surges and of the resulting impulse currents is far lower than the energy of a direct lightning impulse current and is therefore described by a 8/20  $\mu\text{s}$  impulse current wave form. Components and devices that do not have to conduct currents resulting from direct lightning strikes are therefore tested with such 8/20  $\mu\text{s}$  impulse currents.

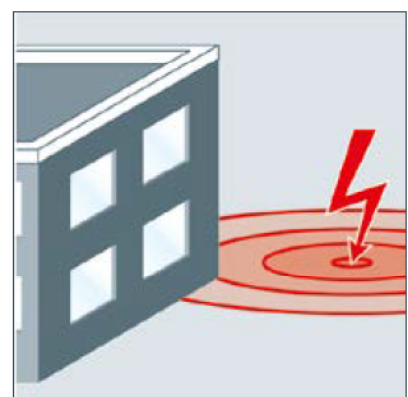
### Direct lightning strikes

are a common cause for building fires and mechanical damage to buildings. This can be prevented by an external lightning protection system. Nevertheless, the lightning currents flowing in case of a direct lightning strike cause a local potential rise of the earth potential in the protected building. As a result, flashover to supply systems entering the building may occur. Therefore, lightning current arresters must be installed to protect electrical installations and systems.



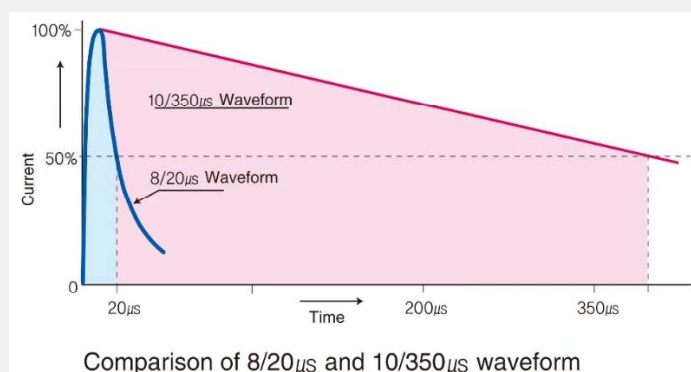
### Nearby lightning strikes

cause transient voltage impulses on the supply lines of the building due to the high lightning electromagnetic field (LEMP)\*. These voltage impulses can reach peak values of several 1,000 volts. Surge arresters for power supply and information technology systems are required to protect electrical installations and systems.



# Wave forms of the Surges

The types of SPDs are categorized by testing currents having wave forms simulating the characteristics and energy size of the impulse currents.



**10/350µs wave form** : The Lightning currents that can occur with a direct lightning strike can be simulated with the surge current of 10/350µs wave form. The Class1 SPD for protection of direct lightning surges and external lightning protection components are tested using this wave form.

**8/20µs wave form** : The surges created by remote lightning strikes and switching operations – indirect lightning surges - are simulated with the test impulse of 8/20µs wave form. The SPDs of Class2 and 3 are tested with this test impulse.

## Protection scheme

Lightning strikes are called remote if they occur at a farer distance to the object to be protected, strike medium-voltage overhead lines or their surroundings or occur as cloud-to-cloud lightning discharges. Similar to induced surges, the effects of remote lightning strikes on the electrical installation of a building are handled by device sand components which have been dimensioned according to 8/20 µs impulse current waves. Surges caused by switching operations (SEMP) are, for example, generated by:

- Disconnection of inductive loads (e.g. transformers, reactors, motors)
- Arc ignition and interruption (e.g. arc welding equipment)
- Tripping of fuses

The effects of switching operations in the electrical installation of a building can also be simulated by impulse currents of 8/20 µs wave form under test conditions. To ensure continuous availability of complex power supply and information technology systems even in case of direct lightning interference, further surge protection measures for electrical and electronic installations and devices based on a lightning protection system for the building are required. It is important to take all causes of surges into account. To do so, the lightning protection zone concept as described in IEC 62305-4 is applied.



Figure 4.1 Components of a lightning protection system

The function of a lightning protection system is to protect structures from fire or mechanical destruction and persons in the buildings from injury or even death.

A lightning protection system consists of an external and an internal lightning protection system (**Figure 4.1**).

The functions of the external lightning protection system are:

- ➡ To intercept direct lightning strikes via an air-termination system
- ➡ To safely conduct the lightning current to the ground via a down-conductor system
- ➡ to distribute the lightning current in the ground via an earth-termination system

The function of the internal lightning protection system is:

- ➡ To prevent dangerous sparking inside the structure. This is achieved by establishing equipotential bonding or maintaining a separation distance between the components of the lightning protection system and other electrically conductive elements inside the structure.

Lightning equipotential bonding reduces the potential differences caused by lightning currents. This is achieved by connecting all isolated conductive parts of the installation directly by means of conductors or surge protective devices (SPDs) (**Figure 4.2**).

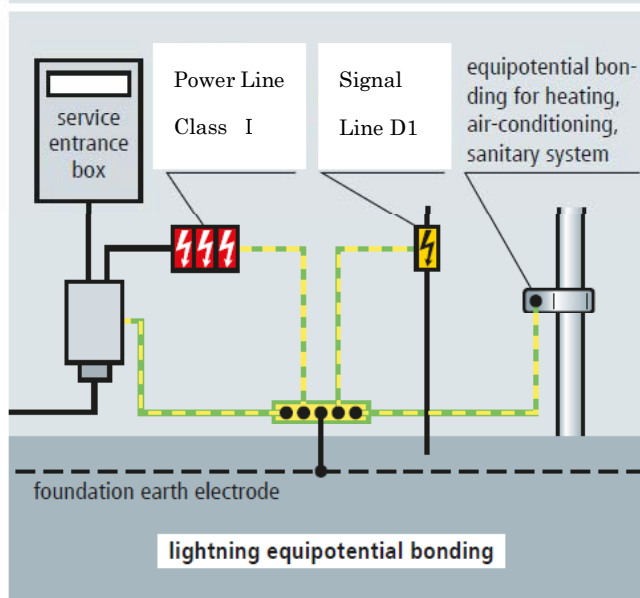
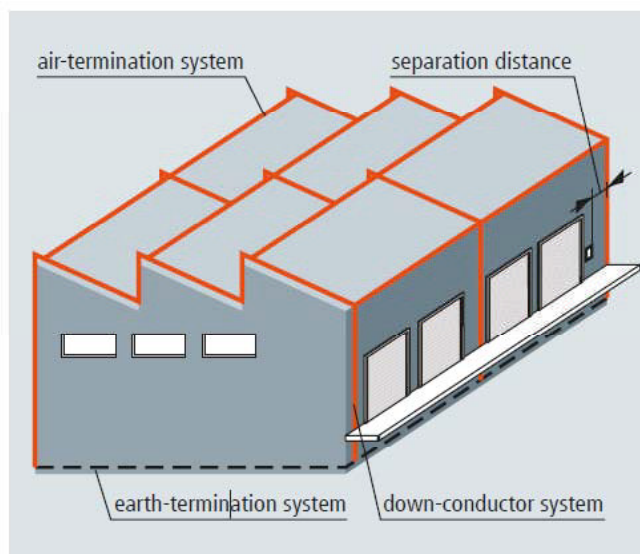


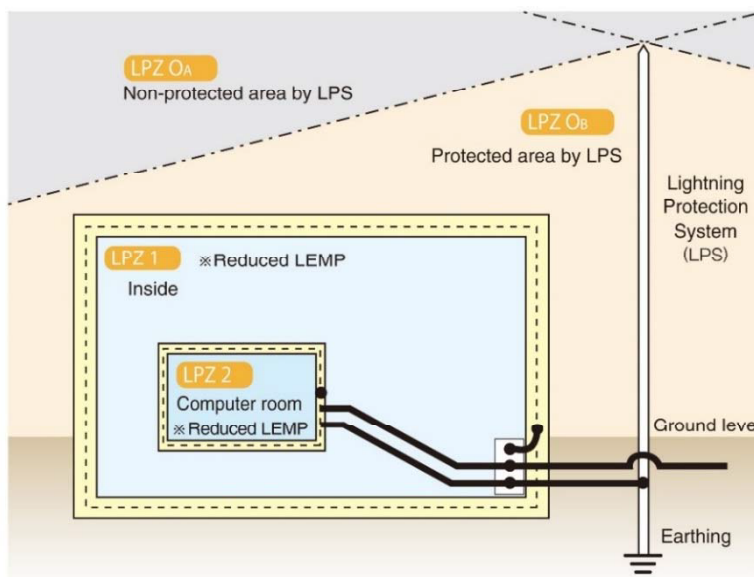
Figure 4.2 Lightning protection system (LPS)

The four classes of LPS I, II, III and IV are determined using a set of construction rules including dimensioning requirements which are based on the relevant lightning protection level. Each set comprises class-dependent (e.g. radius of the rolling sphere, mesh size) and class-independent (e.g. cross-sections, materials) requirements.

To ensure permanent availability of complex information technology systems even in case of a direct lightning strike, additional measures, which supplement the lightning protection measures, are required to protect electronic systems against surges. These comprehensive measures are described

# Lightning protection zone concept

The building is divided into different endangered zones. These zones help to define the necessary protection measures, in particular the lightning and surge protection devices and components. Part of an EMC compatible (EMC: Electro Magnetic Compatibility) lightning protection zone concept is the external lightning protection system (including air-termination system, down-conductor system, earth-termination system), equipotential bonding, spatial shielding and surge protection for the power supply and information technology systems. Definitions apply as classified.



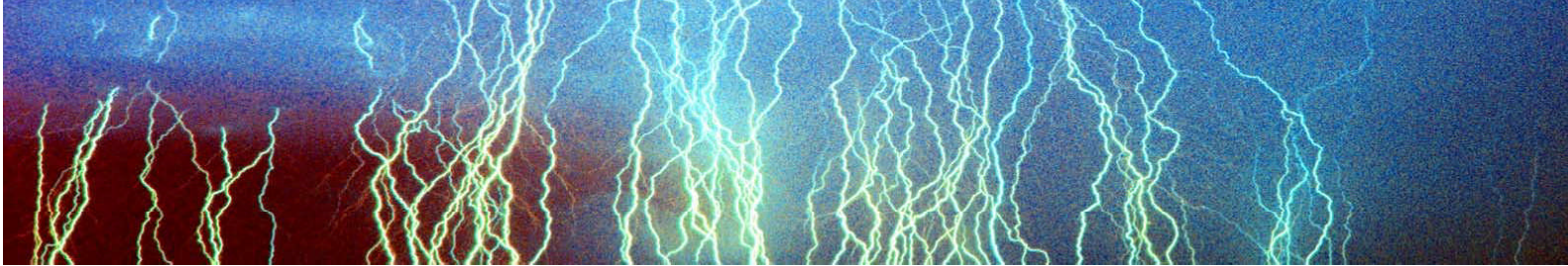
According to the requirements and loads placed on surge protective devices, they are categorized as lightning current arresters "Class I", surge arresters "Class II". The highest requirements are placed on the discharge capacity of lightning current arresters "Class I" used at the transition from lightning protection zone 0A to 1 or 0A to 2. These arresters must be capable of conducting partial lightning currents of 10/350  $\mu$ s wave form

## Lightning Protection Zone concept

several times without being destroyed in order to prevent the ingress of destructive partial lightning current into the electrical installation of a building. At the transition point from LPZ 0B to 1 or downstream of the lightning current arrester "Class I" at the transition point from LPZ 1 to 2 and higher, surge arresters "Class II" are used to protect against surges. Their task is both to reduce the residual energy of the upstream protection stages even further and to limit the surges induced or generated in the installation itself.

The lightning and surge protective measures at the boundaries of the lightning protection zones described above equally apply to power supply and information technology systems. All measures described in the EMC compatible lightning protection zone concept help to achieve continuous availability of electrical and electronic devices and installations.





#### IEC 62305-4:2010

##### Outer zones:

##### LPZ 0

Zone where the threat is due to the unattenuated lightning electromagnetic field and where the internal systems may be subjected to full or partial lightning surge current.

LPZ 0 is subdivided into:

##### LPZ 0A

Zone where the threat is due to the direct lightning flash and the full lightning electromagnetic field. The internal systems may be subjected to full lightning surge current.

##### LPZ 0B

Zone protected against direct lightning flashes but where the threat is the full lightning electromagnetic field. The internal systems may be subjected to partial lightning surge currents.

##### Inner zones (protected against direct lightning flashes):

##### LPZ 1

Zone where the surge current is limited by current sharing and isolating interfaces and/or by SPD at the boundary. Spatial shielding may attenuate the lightning electromagnetic field.

##### LPZ 2 ... n

Zone where the surge current may be further limited by current sharing and isolating interfaces and/or by additional SPD at the boundary. Additional spatial shielding may be used to further attenuate the lightning electromagnetic field.





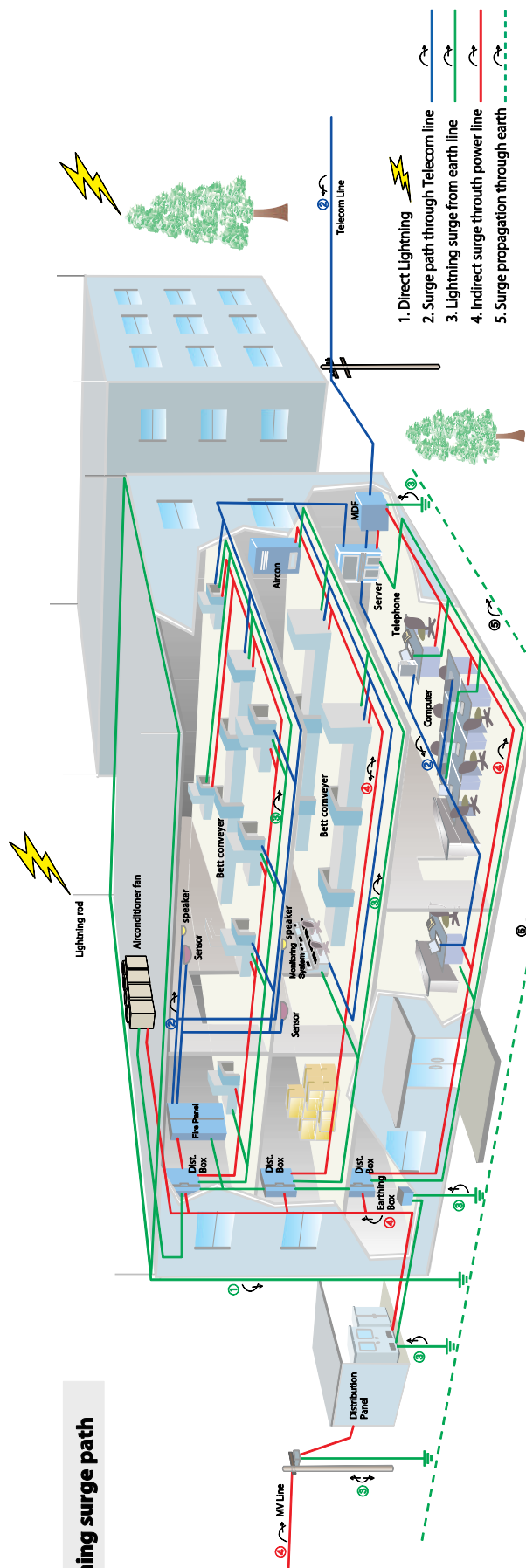
# **Solutions by application**



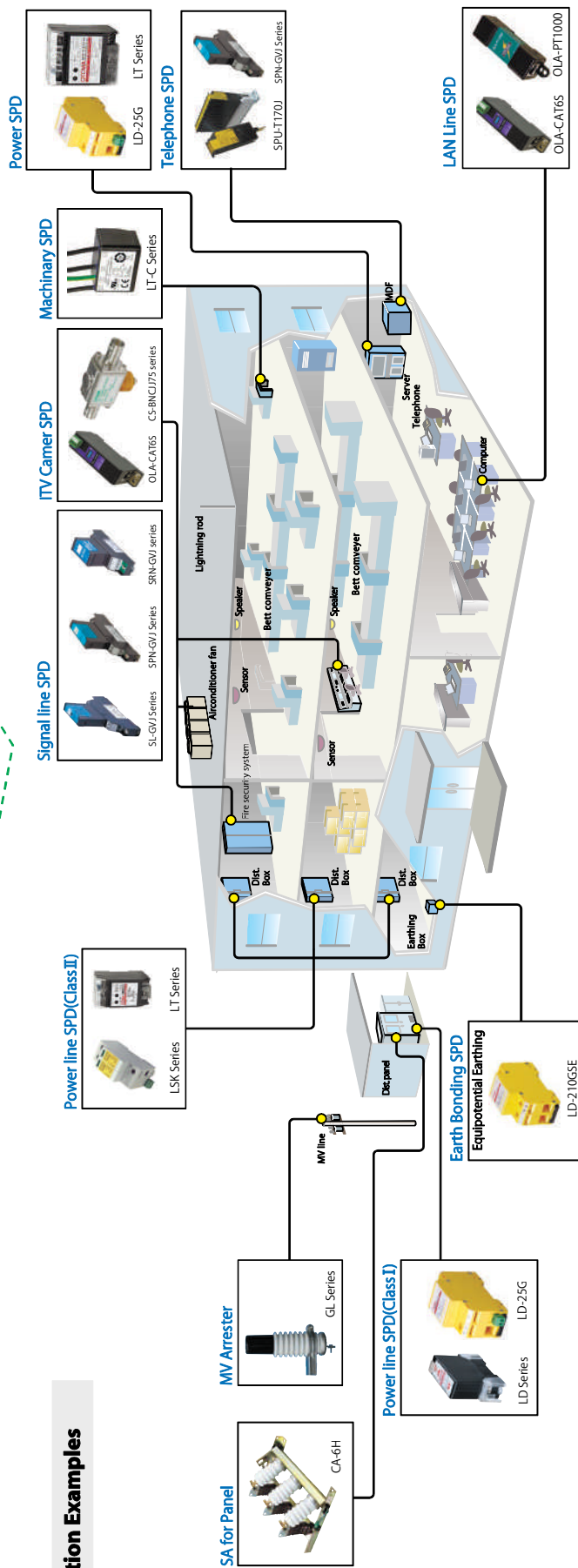


# Lightning Protection for Industrial Plants

## Lightning surge path

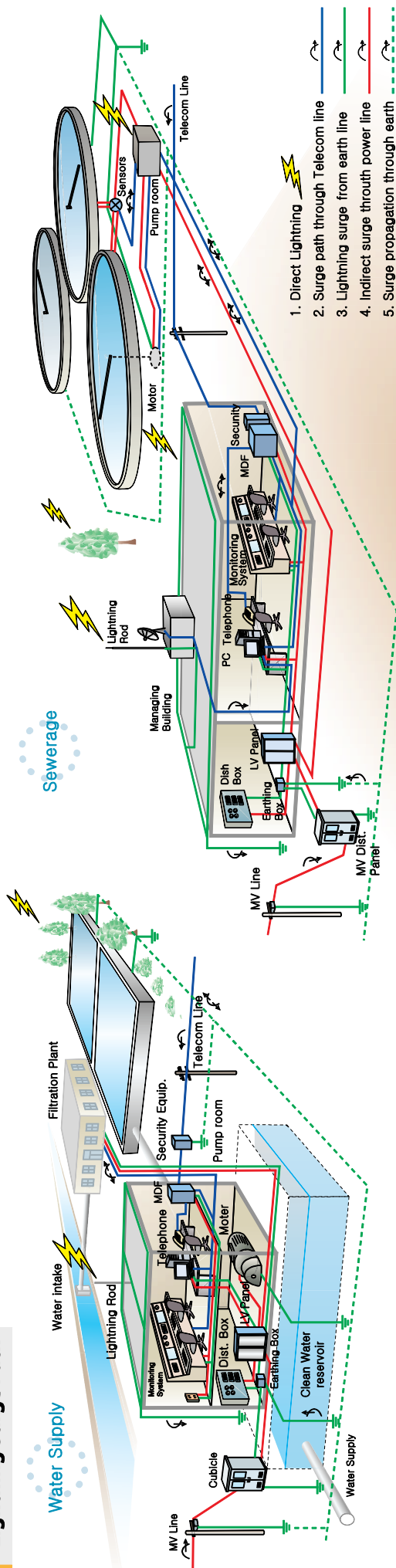


## Installation Examples

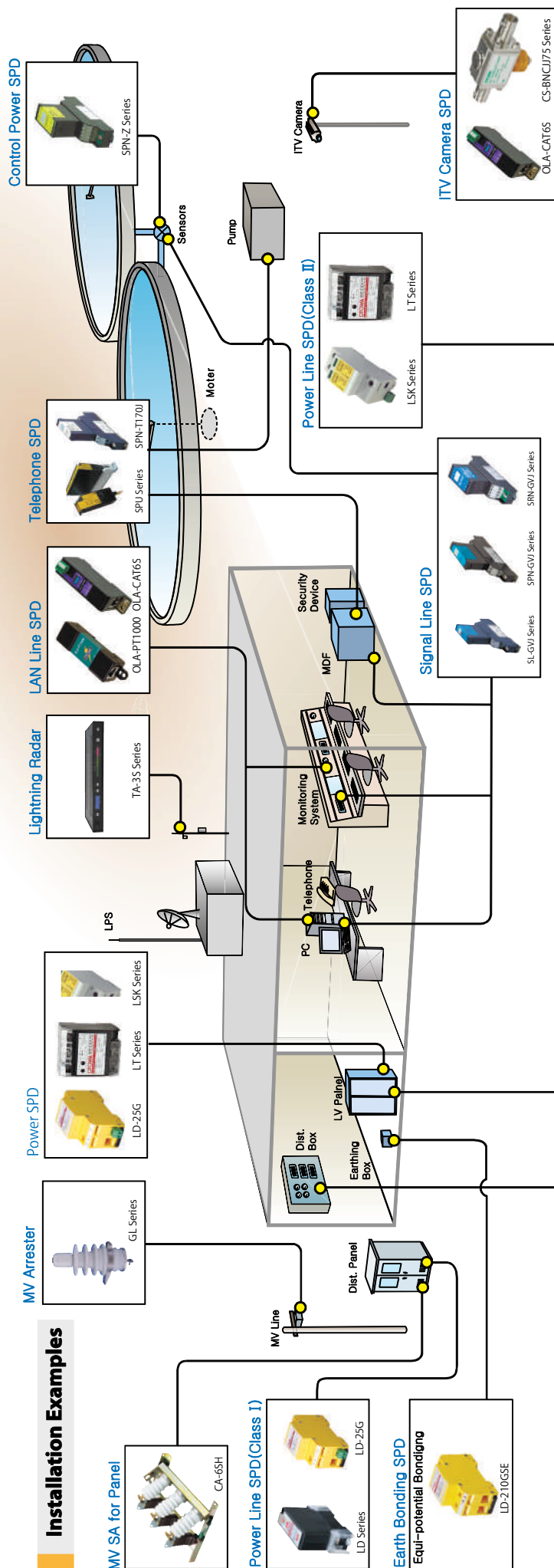


# Lightning Protection for Water and Sewage System

## Lightning Surge Path

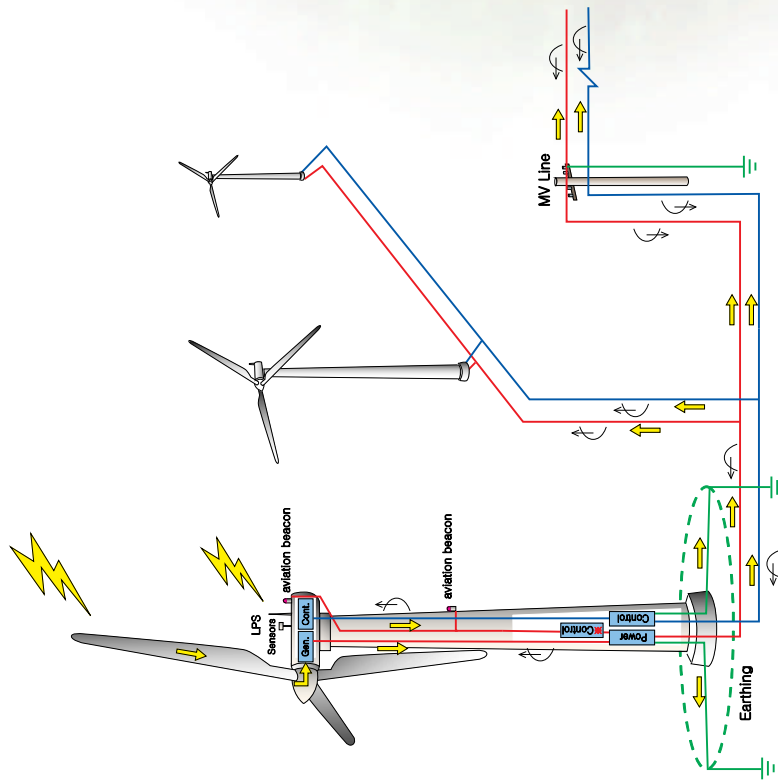


## Installation Examples



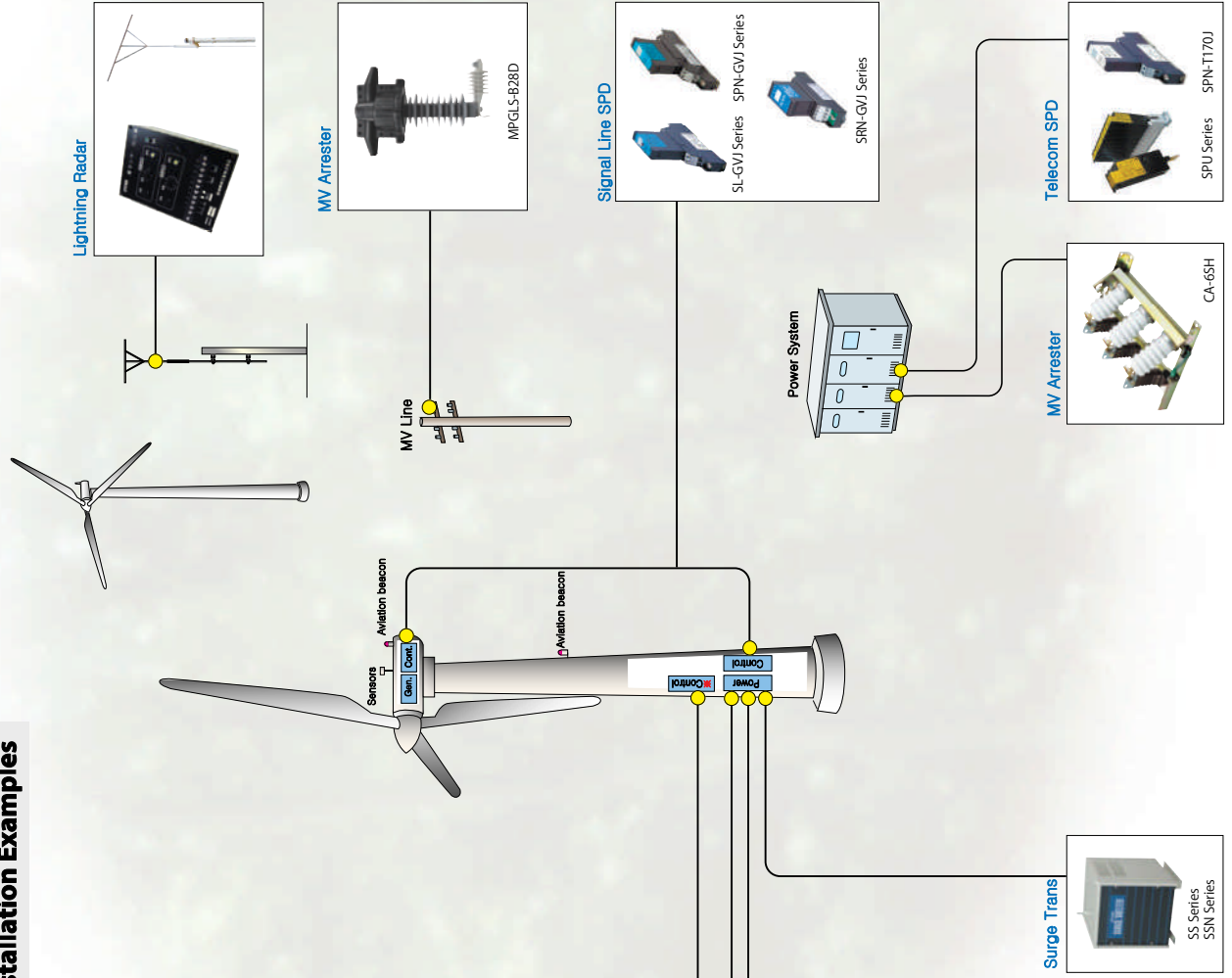
# Lightning Protection for Wind Power Generation System

## Lightning Surge Path

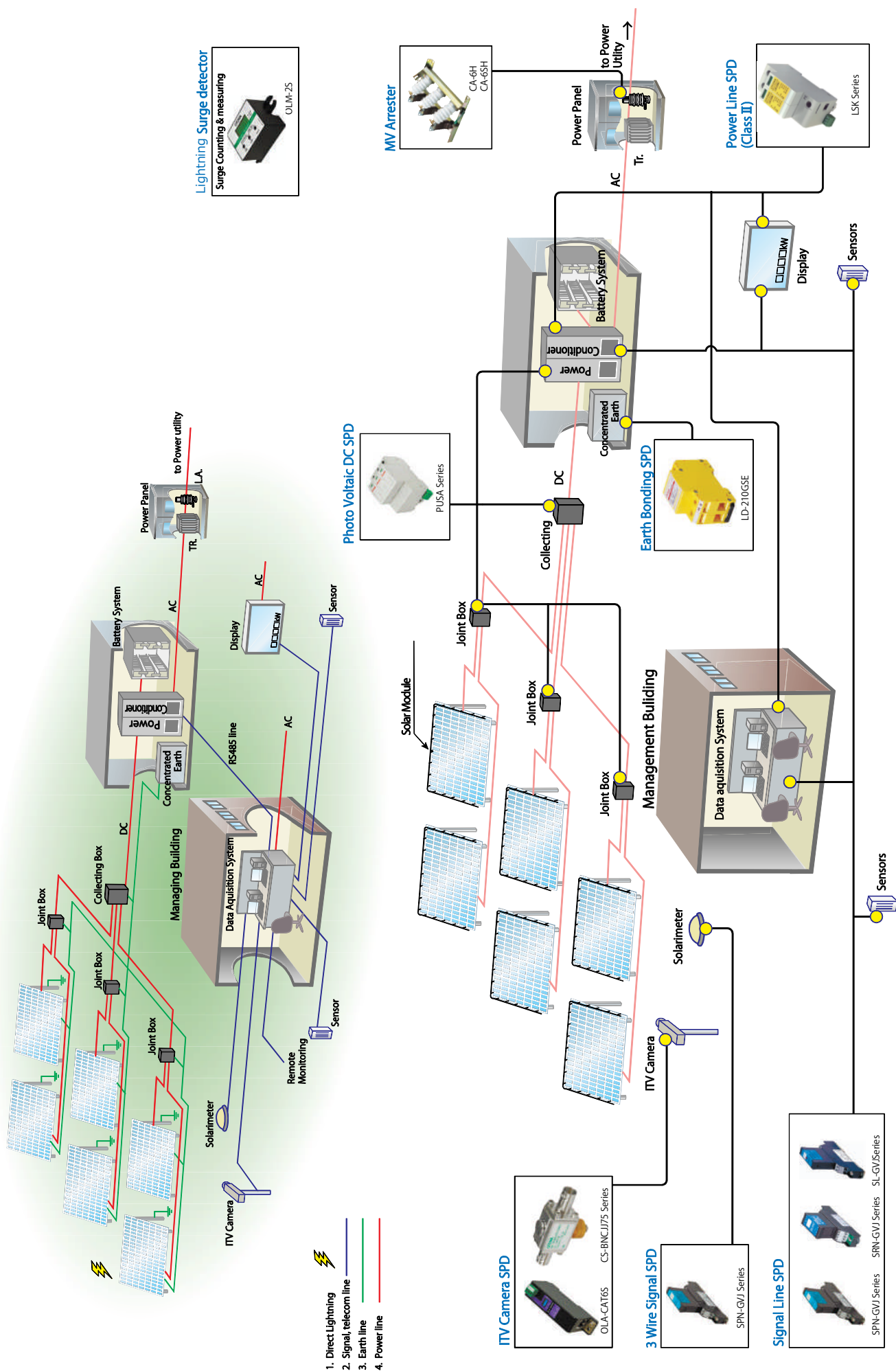


1. Direct Lightning
2. Surge path through Telecom line
3. Lightning surge from earth line
4. Indirect surge through power line
5. Surge propagation through earth

## Installation Examples



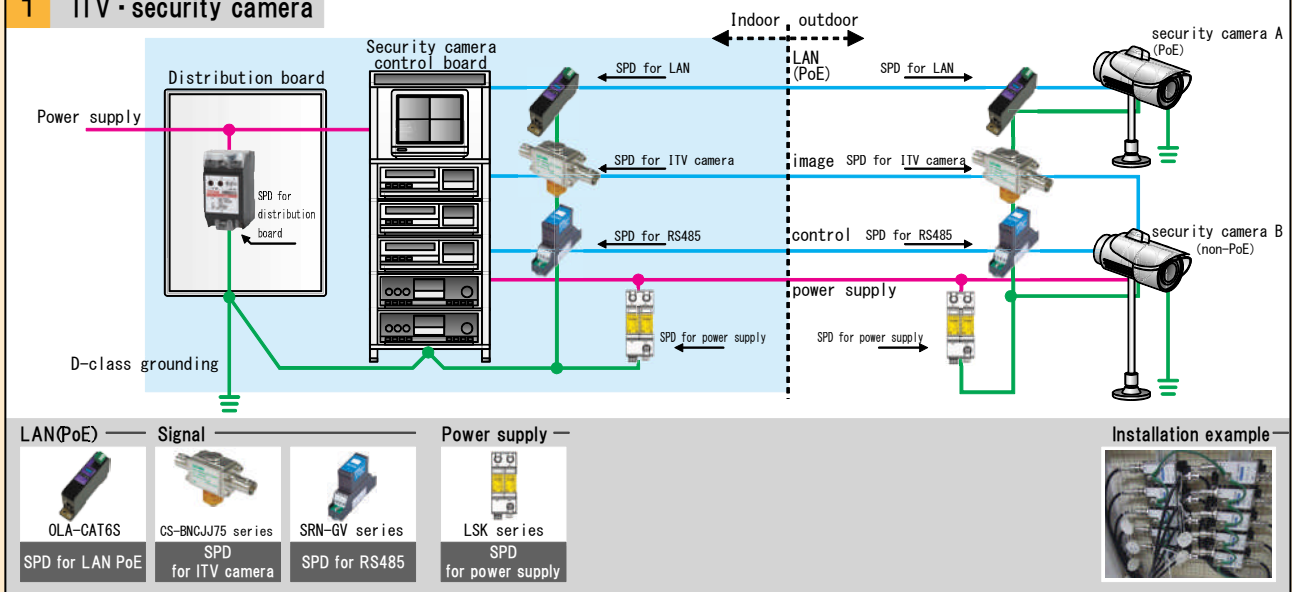
# Lightning protection for Photovoltaic System



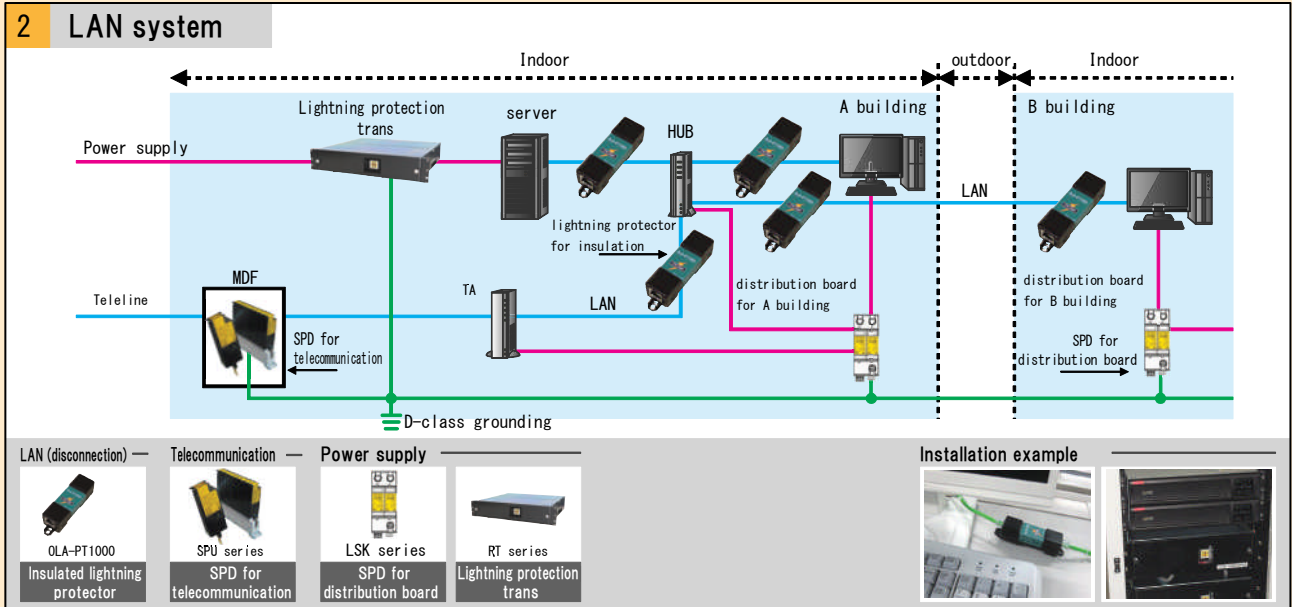
## System Example

Telecommunication system is exposed high risk from lightning damage due to many lines and long lines it is able to perform the most effective protection by selecting the appropriate SPD depends on the situation

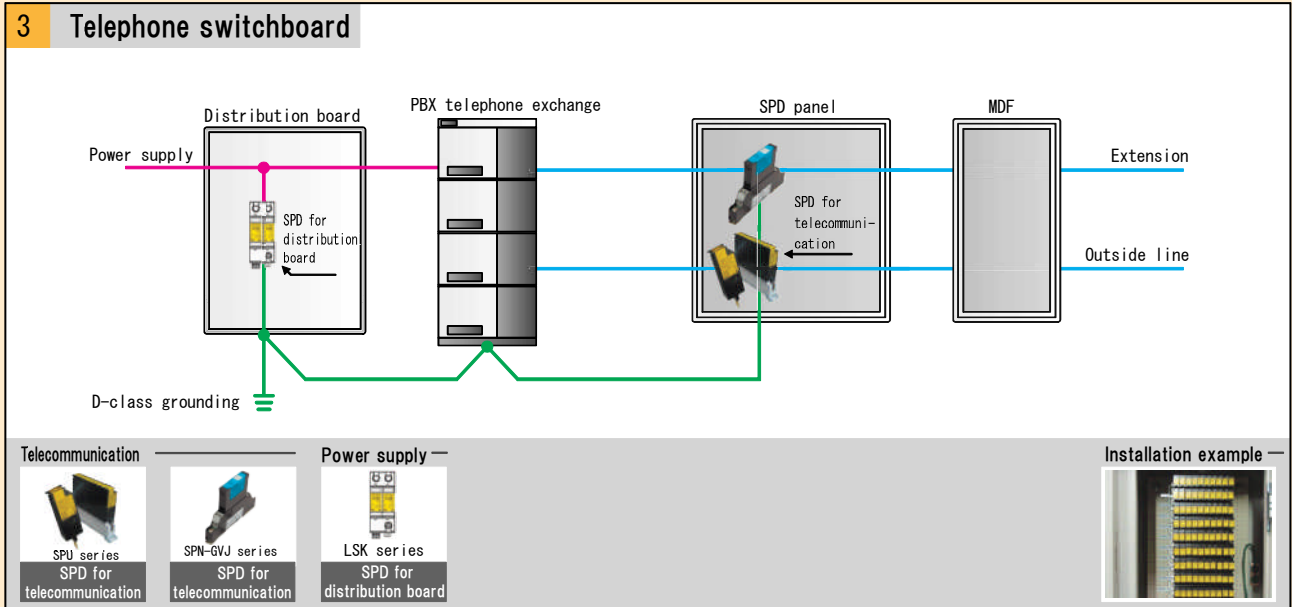
### 1 ITV - security camera



### 2 LAN system



### 3 Telephone switchboard

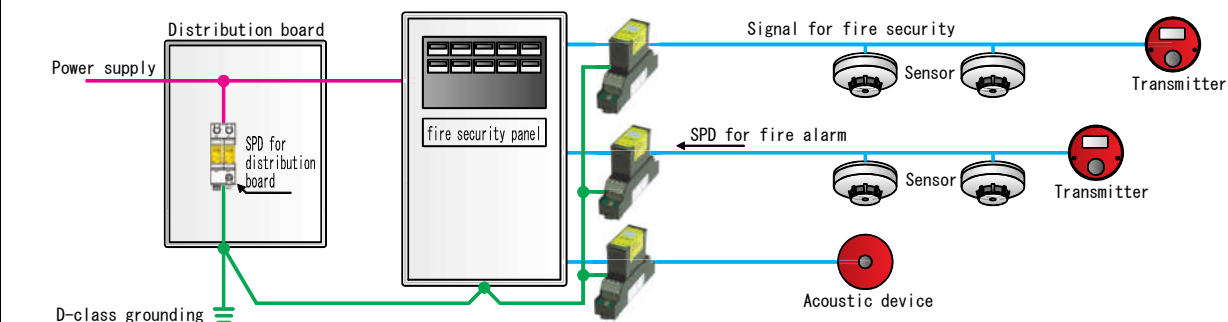


One  
point  
advice

## Installation line individually each building ...installation SPD each

In case of installation line (the metal line installs outside) different building, it is exposed to influence the lightning surge easily, it is able to reduce the risk by installing SPD each line entrance.

### 4 fire security system



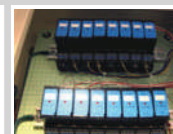
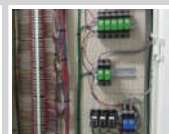
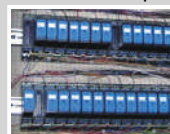
Signal for fire a Security



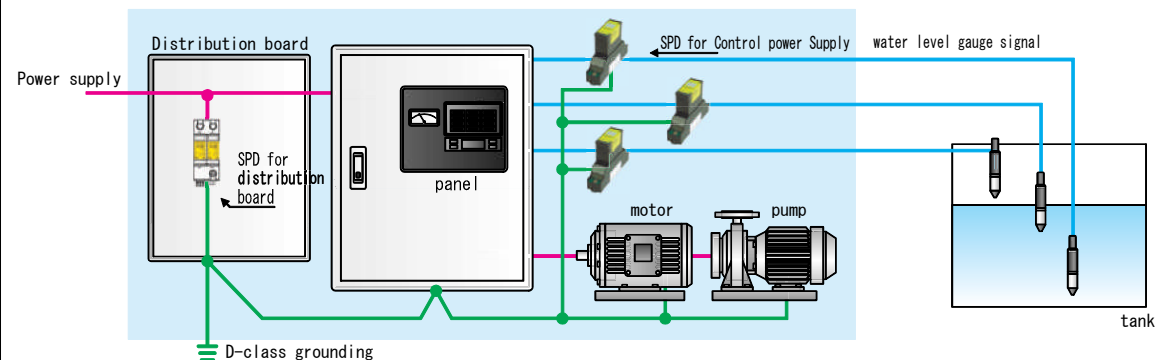
Power supply



Installation example



### 5 pump control system



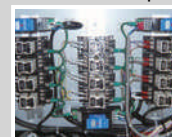
Control Power supply



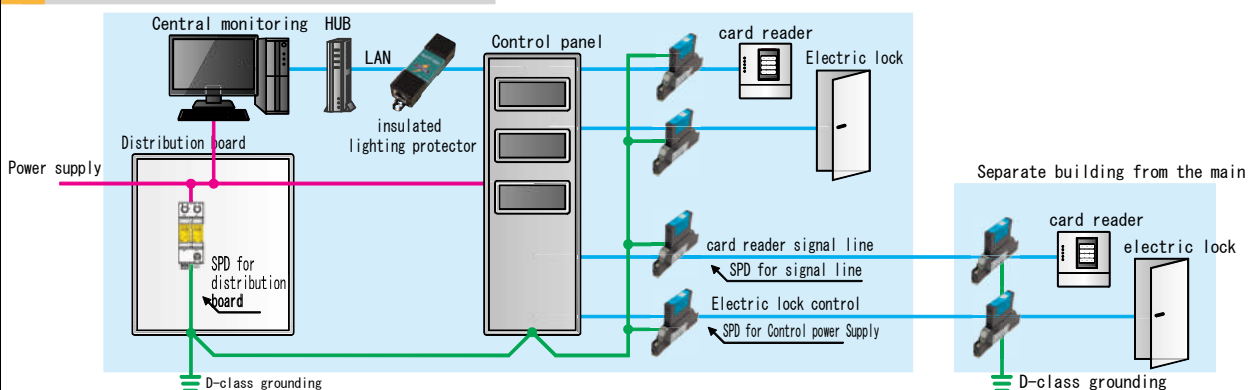
Power supply



Installation example



### 6 The Entry-Exit management system



Electric lock control



Card reader signal line



LAN (disconnection)



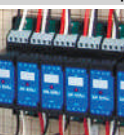
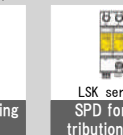
Power supply

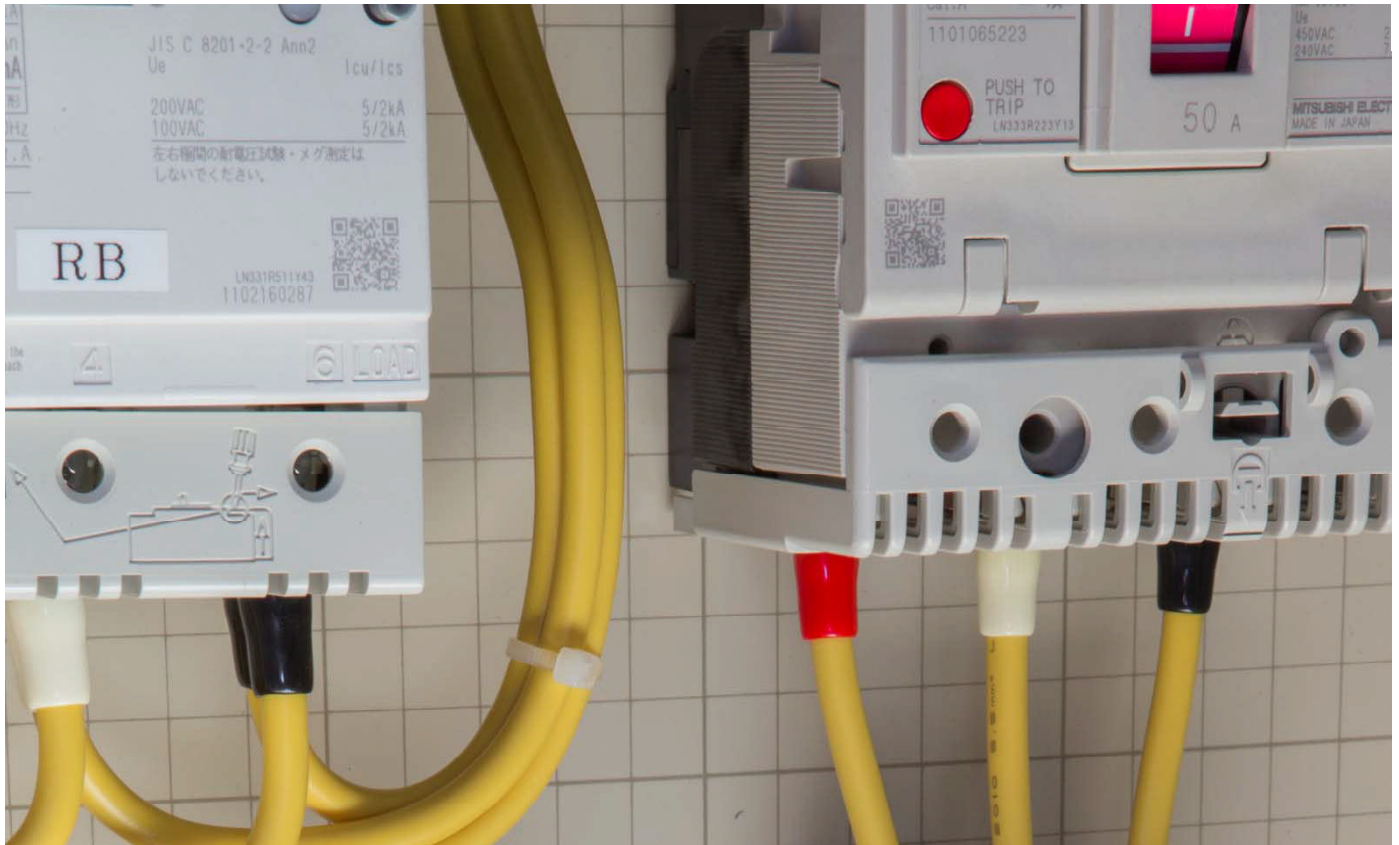


Power supply

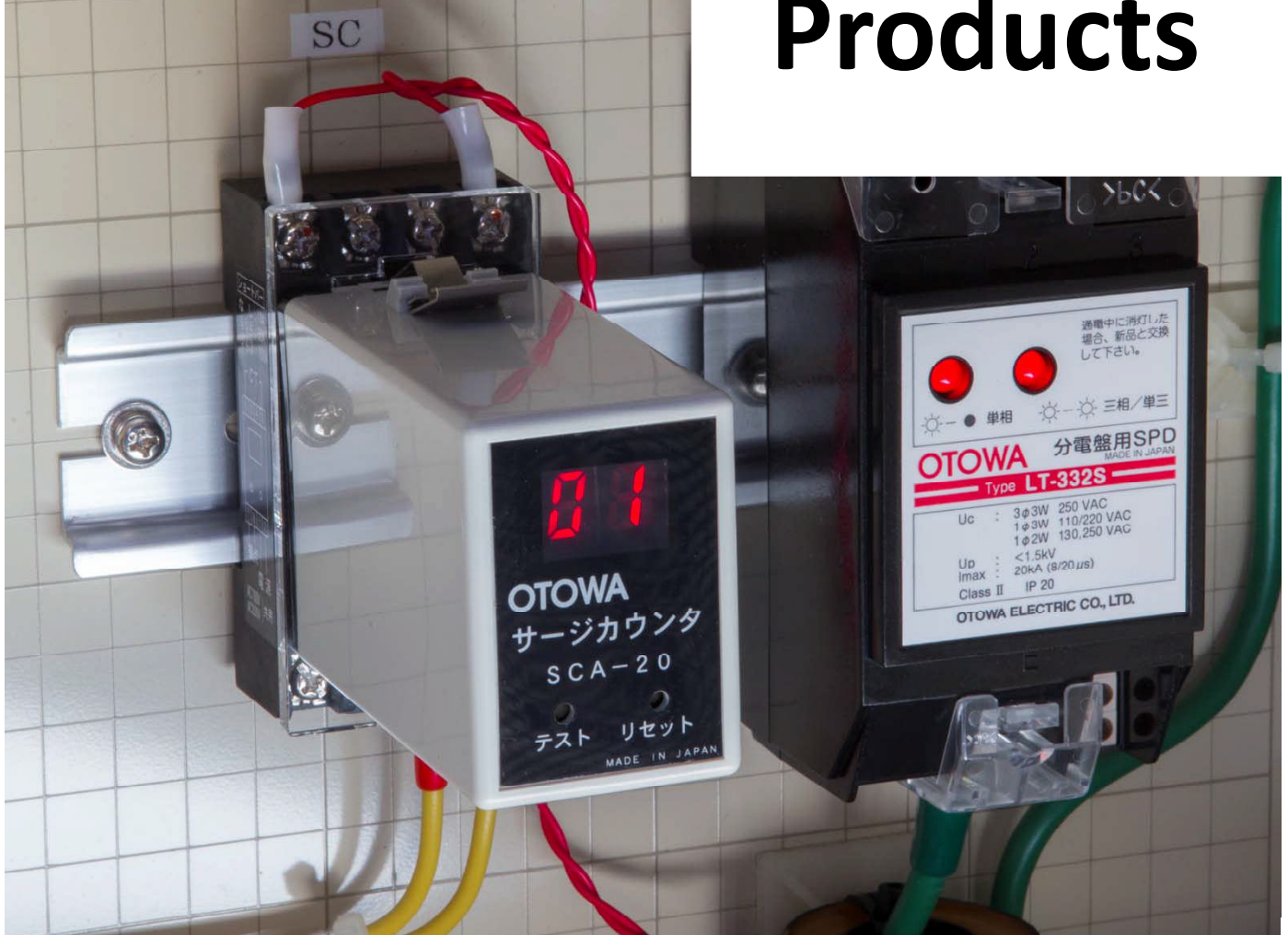


Installation example



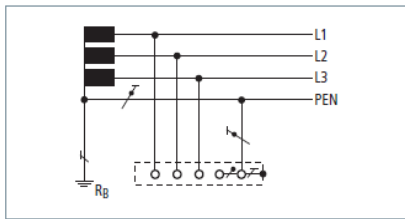


# Products

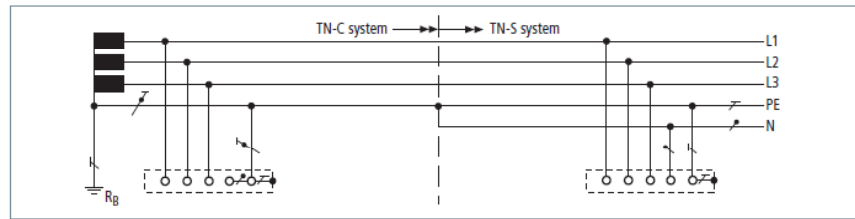


# International power Supply Systems

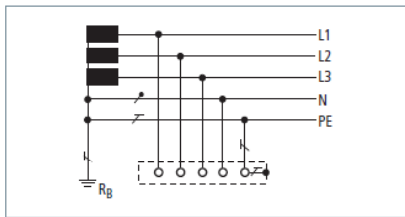
## International system configurations\* according to IEC 60364-1



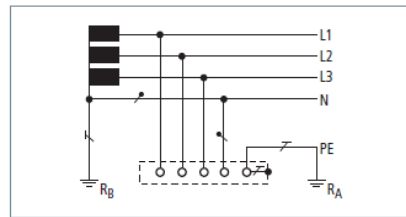
**TN-C system** 230 / 400 V



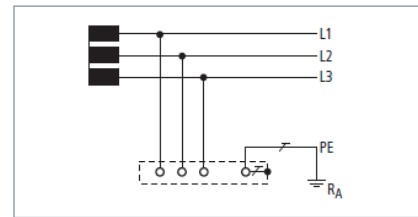
**TN-C-S system** 230 / 400 V



**TN-S system** 230 / 400 V

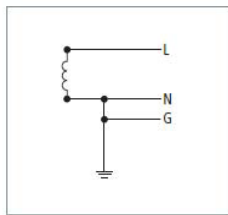


**TT system** 230 / 400 V



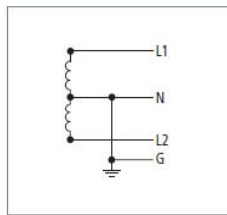
**IT system** 230 V

## Further international system configurations\*



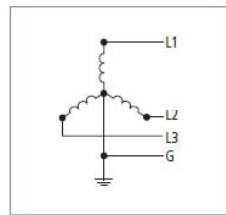
**single-phase; 3 conductors**

(1 Ph, 2 W + G)  
110 V  
120 V  
220 V  
240 V



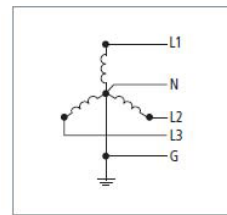
**single-phase; 4 conductors  
Split Phase or Edison**

(1 Ph, 3 W + G)  
120 V / 240 V



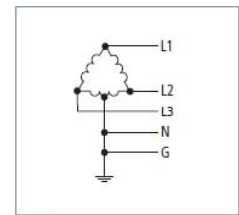
**three-phase; 4 conductors**

(3 Ph Y, 3 W + G)  
480 V



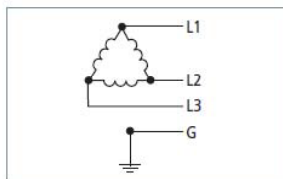
**three-phase; 5 conductors**

(3 Ph Y, 4 W + G)  
120 V / 208 V  
277 V / 480 V



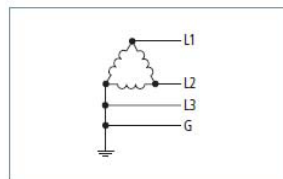
**three-phase; 5 conductors  
Delta "Highleg"**

(3 Ph Δ, 4 W + G)  
120 V / 240 V



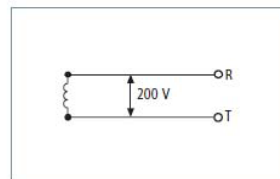
**three-phase; 4 conductors  
Delta "Ungrounded"**

(3 Ph Δ, 3 W + G)  
240 V  
480 V



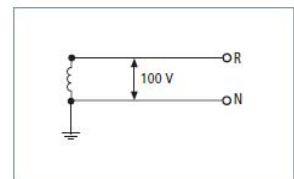
**three-phase; 4 conductors  
Delta "Grounded Corner"**

(3 Ph Δ, 3 W + G)  
240 V  
480 V



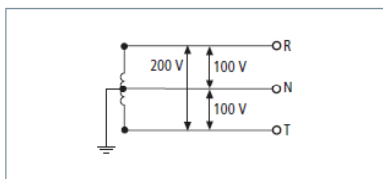
**single-phase; 2 conductors**

(1 Ph, 2 W)  
200 V

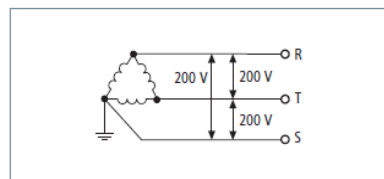


**single-phase; 2 conductors**

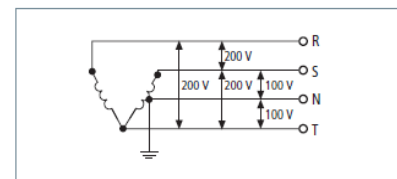
(1 Ph, 2 W)  
100 V



**single-phase; 3 conductors**  
(1 Ph, 3 W)  
100 V / 200 V



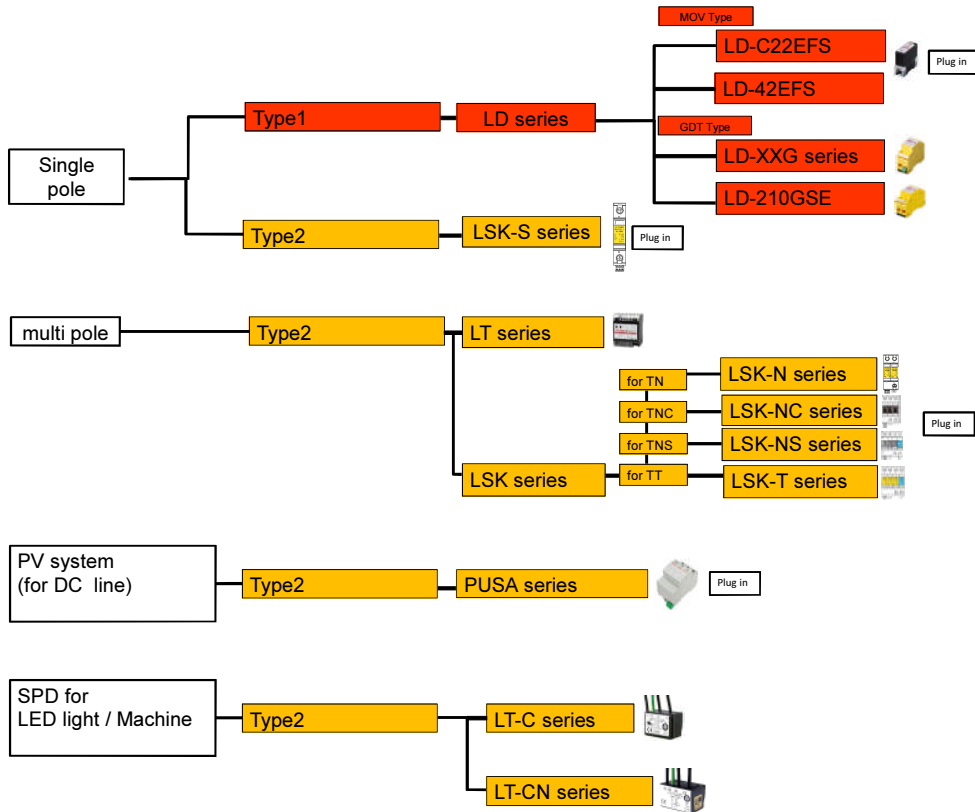
**three-phase; 3 conductors**  
(3 Ph, 3 W)  
200 V



**three-phase; 3 conductors + single-phase;  
3 conductors**  
100 V / 200 V; 200 V

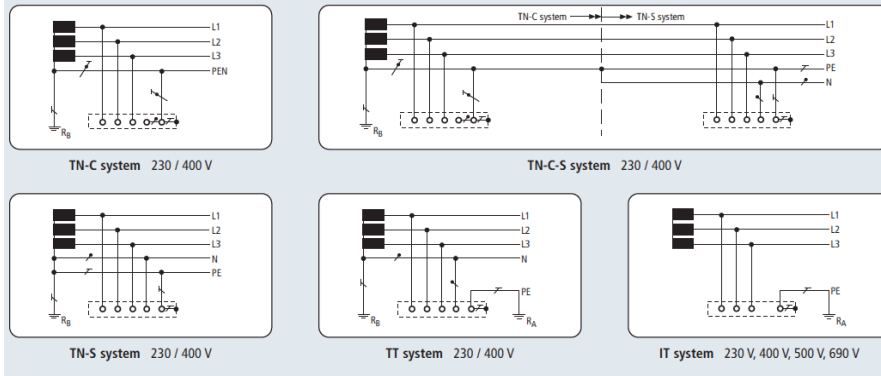
\* System according to the earth connection (according to IEC 60364-1)

## OTOWA Power line SPD

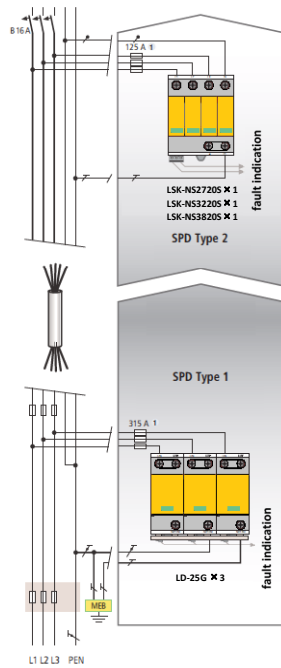


			Spec	OTOWA Type No.
Power line	Type1	MOV	Uc:275V Iimp:25kA	LD-C22EFS
			Uc:510V Iimp:25kA	LD-42EFS
		GDT	Uc:255V Iimp:25kA	LD-22G
			Uc:255V Iimp:50kA	LD-25G
			Uc:255V Iimp:100kA (N-PE)	LD-210GSE
			Uc:275V In:20kA Imax:40kA	LT-122HT,LT-122HTS
Power line Type2	Type2		Uc:275V / 440V In:20kA Imax:40kA	LT-44T2HT,LT-44T2HTS
			Uc:275V In:20kA Imax:40kA	LSK-S2720S
	Type2 Plug in	1 Pole	Uc:320V In:20kA Imax:40kA	LSK-S3220S
			Uc:510V In:20kA Imax:40kA	LSK-S5120S
			Uc:255V In:20kA Imax:40kA (N-PE : GDT Type)	LSK-S2520GS
		TN system	Uc:275V In:20kA Imax:40kA	LSK-N2720S
			Uc:320V In:20kA Imax:40kA	LSK-N3220S
			Uc:440V In:20kA Imax:40kA	LSK-NC4420S
		TNC system	Uc:275V In:20kA Imax:40kA	LSK-NC2720S
			Uc:320V In:20kA Imax:40kA	LSK-NC3220S
			Uc:440V In:20kA Imax:40kA	LSK-NC4420S
		TNS system	Uc:275V In:20kA Imax:40kA	LSK-NS2720S
			Uc:320V In:20kA Imax:40kA	LSK-NS3220S
			Uc:385V In:20kA Imax:40kA	LSK-NS3820S
		TT system	Uc:275/255V In:20kA Imax:40kA	LSK-T2720S
			Uc:320/255V In:20kA Imax:40kA	LSK-T3220S
			Uc:385/255V In:20kA Imax:40kA	LSK-T3820S
	PV for DC line	Type2	Ucpv:660Vdc In:20kA Imax:40kA	PUSA-0640-YS
			Ucpv:1060Vdc In:20kA Imax:40kA	PUSA-1040-YS
			Ucpv:1500Vdc In:10kA Imax:40kA	PUSA-1540-YS
	LED Light / Machine		1Φ 2W Uc:275V In:2.5kA Imax:5kA	LT-C12G801W
			1Φ 2W Uc:275/480V In:2.5kA Imax:5kA	LT-C14G801W
			3Φ 3W Uc:3ΦY 275V 3ΦΔ 275V In:2.5kA Imax:5kA	LT-C32G801W
			3Φ 3W Uc:3ΦY 480V 3ΦΔ 280V In:2.5kA Imax:5kA	LT-C34G801W
			3Φ 3W Uc:3ΦY 550V 3ΦΔ 320V In:2.5kA Imax:5kA	LT-C35G102W
			1Φ 2W Uc:275V In:2.5kA Imax:5kA	LT-CN12G801W
LED Light / Machinet / NFPA79 (UL 1449 Listing)			1Φ 2W Uc:275/480V In:2.5kA Imax:5kA	LT-CN14G801W
			3Φ 3W Uc:3ΦY 275V 3ΦΔ 275V In:2.5kA Imax:5kA	LT-CN32G801W
			3Φ 3W Uc:3ΦY 480V 3ΦΔ 280V In:2.5kA Imax:5kA	LT-CN34G801W
			3Φ 3W Uc:3ΦY 550V 3ΦΔ 320V In:2.5kA Imax:5kA	LT-CN35G102W

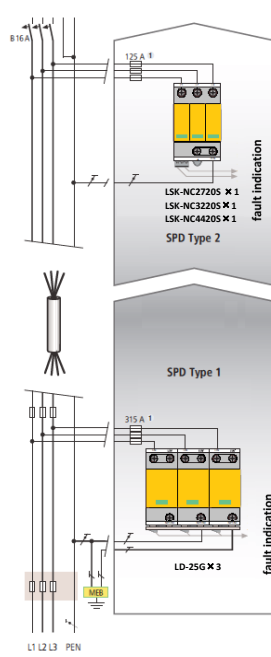
International system configurations\* according to IEC 60364-1



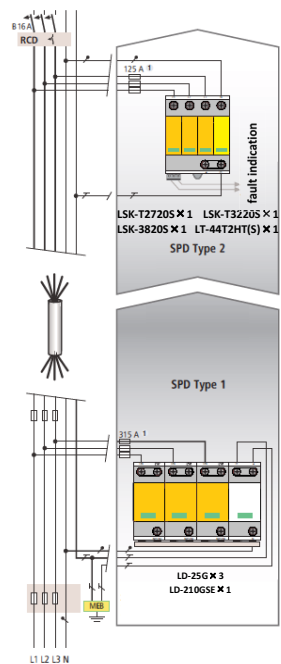
TN system: Example: Office building – Separation of the PEN conductor in the main distribution board



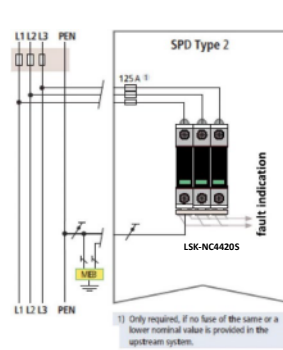
TN system: Example: Office building – Separation of the PEN conductor in the sub-distribution board



TT system: Example: Office building

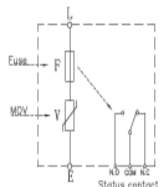


TN system: Industrial building TN-C 400/690 V



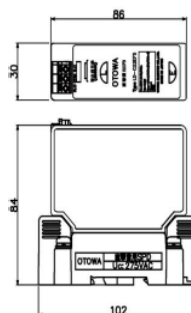
**OTOWA Power line Type1 SPD(MOV) LD-C22EFS / LD-42EFS**

**Coordinated and modular single-pole SPD with high follow current limitation; with remote signalling contact for monitoring system (floating changeover contact).**

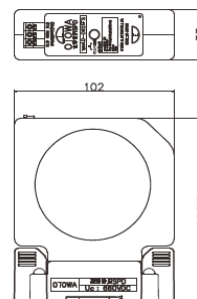


Basic Circuit Diagram

- Large energy protection capability with superior MOV unit
- Low protection level :  $U_p \leq 1300V$
- Very fast response time ( $\leq 3nsec$ ), Decoupling inductance not required
- Discharge capacity up to 25kA (10/350 $\mu s$ )
- Appropriate for earth bonding
- Operating state / fault indication by red indicator flag



LD-C22EFS



LD-42EFS

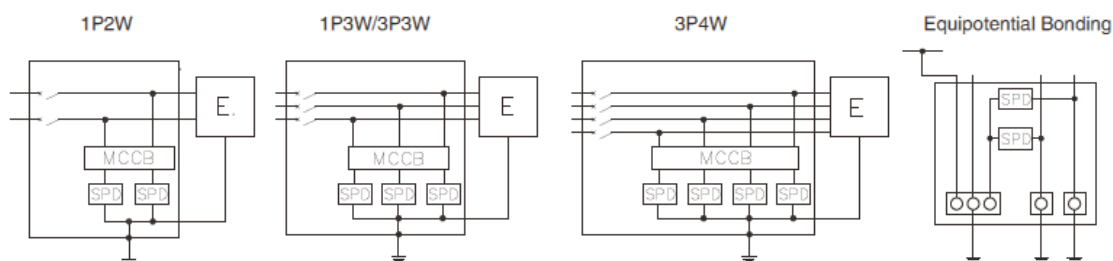
Dimension drawing

Type	LD-C22EFS	LD-42EFS
SPD according to EN 61643-11 / IEC 61643-11	Type1	
Nominal a.c. voltage ( $U_n$ )	230V(50 / 60 Hz)	440V(50 / 60 Hz)
Max. continuous operating a.c. voltage ( $U_c$ )	275V(50 / 60 Hz)	510V(50 / 60 Hz)
Nominal discharge current ( $I_n$ )	25kA	
Lightning impulse current (10/350 $\mu s$ ) ( $I_{imp}$ )	25kA	
Voltage protection level ( $U_p$ )	$\leq 1.3kV$	$\leq 2.5kV$
Response time (tA)	$\leq 3ns$	
Max. main-side over current protection	315A	
Short-circuit withstand capability	50kA	
Operating temperature range	$-20^{\circ}C \sim +50^{\circ}C$	
Operating state / fault indication	Indication bar flag Failure mode contact	
Number of ports	1	
Cross-sectional area (min.)	8mm <sup>2</sup> Stranded	
Cross-sectional area (max.)	22mm <sup>2</sup> Stranded	
For mounting on	35mm DIN rails / bolt	
Enclosure material	thermoplastic, UL 94 V-0	
Place of installation	Indoor installations	
Degree of protection	IP 20	
Poles (terminal)	1	
Conformity to environment	Comply to RoHS requirement	
Type of remote signalling contact	changeover contact	
a.c. switching capacity	250V / 0.5A	
d.c. switching capacity	125V / 0.2A ;	
Cross-sectional area for remote signalling terminals	0.75 ~ 1.25mm <sup>2</sup> solid / flexible	

## ***OTOWA Type1 SPD LD-EFS Series***



### Connection



### Other information



OTOWA web site



LD-C22EFS



LD-42EFS

Instruction manual

### Manufacturer



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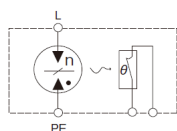
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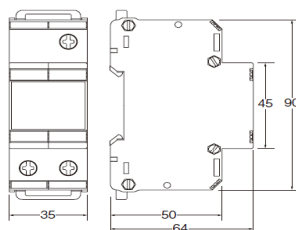
### Agency

## OTOWA Power line Type1 SPD (GDT) LD-22G,LD-25G

**Coordinated and modular single-pole SPD with high follow current limitation.**



Basic Circuit Diagram



Dimension drawing

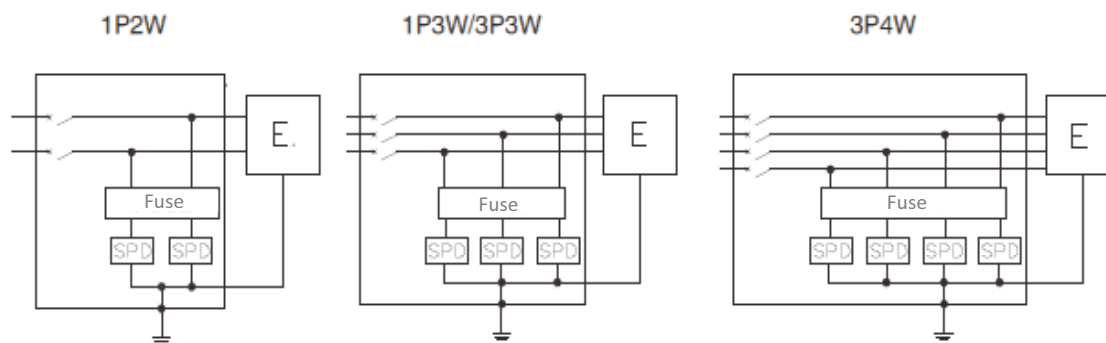
- Discharge capacity up to 50kA (10/350 $\mu$ s)
- Low voltage protection level
- EU RoHS Compliant with regulated substances

Type	LD-22G	LD-25G
SPD according to EN 61643-11/IEC 61643-11	Type1	
Nominal a.c. voltage (Un)	230V (50 / 60 Hz)	
Max. continuous operating a.c. voltage (Uc)	255V (50 / 60 Hz)	
Lightning impulse current (10/350 $\mu$ s) (Iimp)	25kA	50kA
Voltage protection level (Up)	$\leq 1.0$ kV	$\leq 4.0$ kV
Follow current extinguishing capability a.c. (Ifi)	17.5kArms	4.0kArms
Response time (tA)	$\leq 50$ ns	
Max. backup fuse	250 A gL/gG	
Operating temperature range	-40°C ~ +85°C	-40°C ~ +80°C
Number of ports	1	
Cross-sectional area (L/N, N/PE (N)) (max.)	50mm <sup>2</sup> stranded / 35mm <sup>2</sup> flexible	
Recommended conductor cross section	25mm <sup>2</sup>	
For mounting on	35mm DIN rails acc. To EN 60715	
Enclosure material	thermoplastic, UL 94 V-0	
Place of installation	Indoor installations	
Degree of protection	IP 20	
Capacity	2 module(s) DIN 43880	
Conformity to environment	Comply to RoHS requirement	
Remote signalling contact	Normal: ON Failure: OFF	
a.c. switching capacity	250V / 2A	
Cross-sectional area for remote signalling terminals	max. 1.5mm <sup>2</sup> solid / flexible	

## OTOWA Type1 SPD LD-22G,LD-25G



### Connection



### Other information



OTOWA web site



Instruction manual

### Manufacturer



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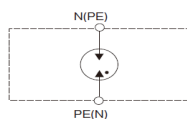
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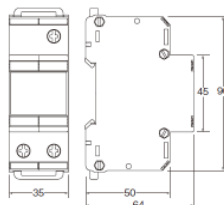
### Agency

**OTOWA Power line Type1 SPD (GDT) LD-210GSE (N-PE)**

**Coordinated and modular single-pole N-PE SPD for  $U_c=255V$ ; with remote signalling contact for monitoring system (floating contact).**



Basic Circuit Diagram



Dimension drawing

- Discharge capacity up to 100kA (10/350 $\mu$ s)
- Total current arrester specifically designed for installation in "3+1" and "1+1" circuits of TT systems according to IEC 60364-5-53 between neutral conductor N and protective conductor PE
- EU RoHS Compliant with regulated substances

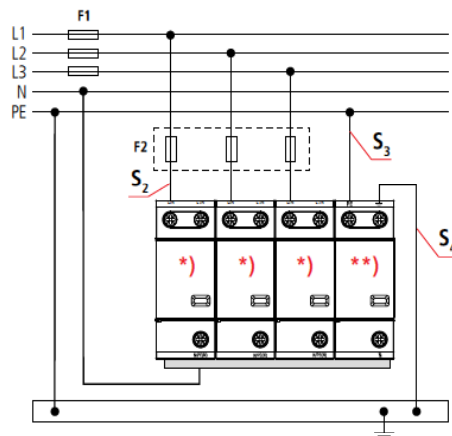
Type	LD-210GSE
SPD according to EN 61643-11/IEC 61643-11	Type1
Max. continuous operating a.c. voltage ( $U_c$ )	255V (50 / 60 Hz)
Lightning impulse current (10/350 $\mu$ s) ( $I_{imp}$ )	100kA
Voltage protection level ( $U_p$ )	$\leq 1.5kV$
Follow current extinguishing capability a.c. ( $I_{fi}$ )	100Arms
Response time (tA)	$\leq 50ns$
Operating temperature range	$-40^{\circ}C \sim +80^{\circ}C$
Number of ports	1
Cross-sectional area (N, PE) (max.)	50mm <sup>2</sup> stranded / 35mm <sup>2</sup> flexible
Recommended conductor cross section	25mm <sup>2</sup>
For mounting on	35mm DIN rails acc. To EN 60715
Enclosure material	thermoplastic, UL 94 V-0
Place of installation	Indoor installations
Degree of protection	IP 20
Capacity	2 module(s) DIN 43880
Conformity to environment	Comply to RoHS requirement
Remote signalling contact	Normal:ON Failure:OFF
a.c. switching capacity	250V / 2A
Cross-sectional area for remote signalling terminals	max. 1,5mm <sup>2</sup> solid / flexible

## Type1 SPD(GDT) LD-210GSE



### Connection

#### TT/TN-S (3+1)



\*) : LD-22G or LD-25G

\*\*) : LD-210GSE

### Other information



OTOWA web site



Instruction manual

### Manufacturer



# OTOWA ELECTRIC CO.,LTD.

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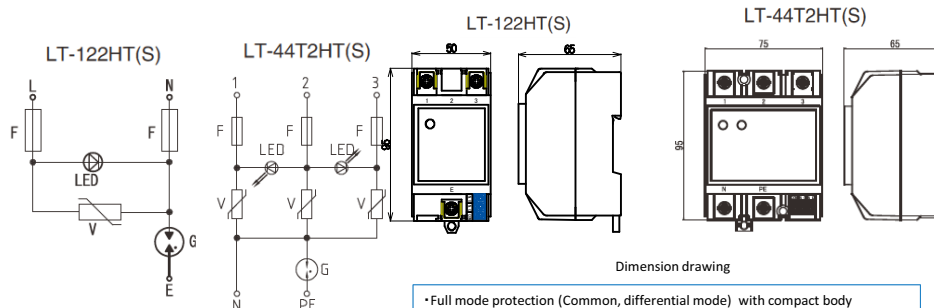
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### Agency

## OTOWA Power line Type2 SPD LT Series

Combination type SPD for power line ; with floating remote signalling contact.



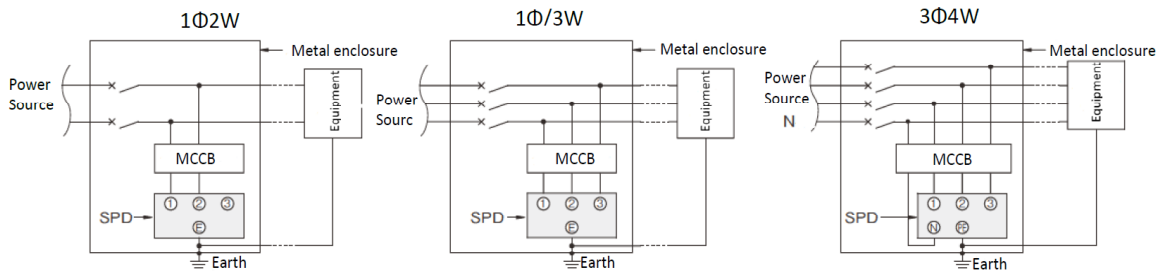
- Full mode protection (Common, differential mode) with compact body
- Low protection level :  $U_p \leq 1.5kV$  and very fast response time ( $\leq 3nsec$ )
- LED status indicator and signal contact
- Highly reliable disconnection system
- EU RoHS Compliant with regulated substances

Type	LT-122HT	LT-122HTS	LT-44T2HT	LT-44T2HTS
SPD according to EN 61643-11 / IEC 61643-11	Type2			
Nominal a.c. voltage (Un)	220 V (50 / 60 Hz)		220 / 380 V (50 / 60 Hz)	
Max. continuous operating a.c. voltage (Uc)	275 V (50 / 60 Hz)		275/440V (50 / 60 Hz)	
Nominal discharge current (8/20 μs) (In)	20kA		20kA	
Max. discharge current (8/20 μs) (Imax)	40kA		40kA	
Voltage protection level (Up)	L-E : ≤ 1.5kV		L-PE : ≤ 1.5kV	
Response time	L-N : ≤ 3ns		L-L-L-N : ≤ 3ns	
Short-circuit withstand capability for max. mains-side overcurrent protection	25 kA rms			
Operating temperature range (Tu)	-25°C ~ +70°C			
Operating state / fault indication	LED On : normal / Off : failure			
Number of ports	1			
Cross-sectional area (min.)	5.5mm <sup>2</sup> stranded			
Cross-sectional area (max.)	14mm <sup>2</sup> stranded			
For mounting on	35mm DIN rails			
Enclosure material	thermoplastic, UL 94 V-0			
Place of installation	Indoor installations			
Degree of protection	IP 20			
Poles (terminal)	L, N, E		L1, L2, L3, N, PE	
Type of remote signalling contact	-	changeover contact	-	changeover contact
a.c. switching capacity	-	250V / 1.5A	-	250V / 1.5A
d.c. switching capacity	-	110V / 0.2A	-	110V / 0.2A
Cross-sectional area for remote signalling terminals	-	Stranded 0.75mm <sup>2</sup> to 1.25mm <sup>2</sup> Rigid φ 0.4mm to φ 1.2mm	-	Stranded 0.75mm <sup>2</sup> to 1.25mm <sup>2</sup> Rigid φ 0.4mm to φ 1.2mm

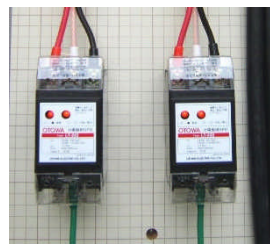
## OTOWA Type2 SPD LT Series



### Connection



### Installation example



### Other information



OTOWA web site



(LT-122HT(S))



(LT-44T2HT(S))

Instruction manual

### Manufacturer



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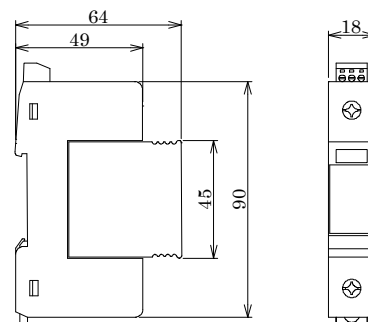
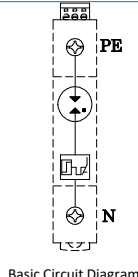
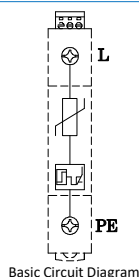
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### Agency

## OTOWA Power line Type2 SPD LSK-S Series

**Pluggable single-pole SPD consisting of a base part and plug-in protection**



### LSK-SXXXXXS

- Multi-purpose SPD consisting of a base element and plug-in protection module.
- High discharge capacity due to heavy duty zinc oxide varistors.
- Operating state/fault indication by green/red indicator flag in the inspection window.
- Easy to replace the of protection modules without tools

### LSK-SXXXXGS

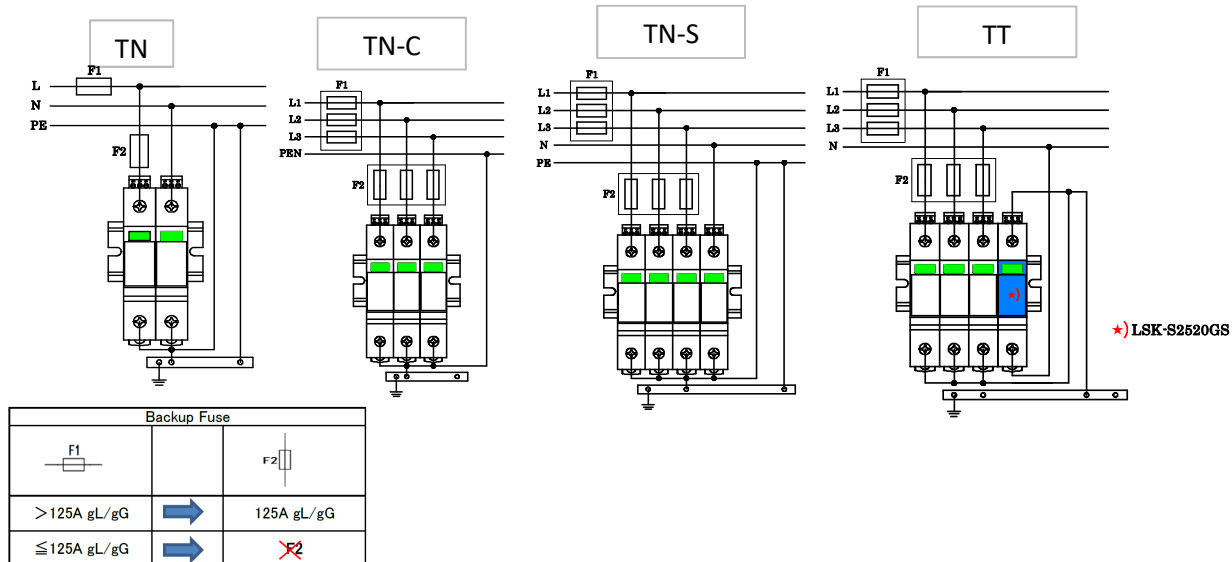
- Specifically designed for use in "3+1" and "1+1" circuits of TT systems according to IEC 60364-5-53 between neutral conductor N and protective conductor PE
- High discharge capacity
- EU RoHS Compliant with regulated substances

Type	LSK-S2720S	LSK-S3220S	LSK-S5120S	LSK-S2520GS
SPD according to EN 61643-11 /IEC 61643-11	Type2			
Nominal a.c. voltage (Un)	230V(50 / 60 Hz)	230V(50 / 60 Hz)	460V(50 / 60 Hz)	—
Max. continuous operating a.c. voltage (Uc)	275V (50 / 60 Hz)	320V (50 / 60 Hz)	510V (50 / 60 Hz)	255V (50 / 60 Hz)
Nominal discharge current (8/20 μ s) (In)	20kA			
Max.discharge current (8/20 μ s) (Imax)	40kA			
Voltage protection level (Up)	≤ 1.4kV	≤ 1.5kV	≤ 2.5kV	≤ 1.5kV
Response time (tA)	≤ 25ns			≤ 100ns
Max. mains-side overcurrent protection	125 A gG			—
Short-circuit withstand capability for max. mains-side overcurrent protection (Iscrr)	25 kA rms			—
Temporary overvoltage (TOV) (Ut) —Characteristic —withstand mode	335V / 5sec.	335V / 5sec.	675V / 5sec.	1200V / 200ms
Temporary overvoltage (TOV) (Ut) —Characteristic —safe failure mode	440V 120min.	440V 120min.	880V 120min.	—
Operating temperature range (Tu)	-40℃~ +85℃		-40℃~ +70℃	
Operating state / fault indication	Green : Normal / Red : Failure			
Number of ports	1			
Cross-sectional area (min.)	1.5mm <sup>2</sup> solid / flexible			
Cross-sectional area (max.)	35mm <sup>2</sup> stranded / 25mm <sup>2</sup> flexible			
For mounting on	35mm DIN rails acc. to EN 60715			
Enclosure material	thermoplastic, UL 94 V-0			
Place of installation	Indoor installations			
Degree of protection	IP 20			
Capacity	1 module(s)			
Approvals	TUV, CE		—	—
Conformity to environment	Comply to RoHS requirement			
Type of remote signalling contact	changeover contact			
a.c. switching capacity	250V / 0.5A			
d.c. switching capacity	250V / 0.1A ; 125V / 0.2A ; 75V / 0.5A			
Cross-sectional area for remote signalling terminals	max. 1.5mm <sup>2</sup> solid / flexible			

## OTOWA Type2 SPD LSK-S Series



### Connection



### Other information



OTOWA web site



Instruction manual

### Manufacturer



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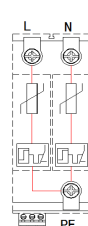
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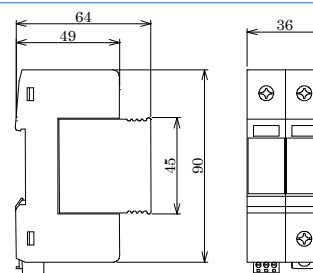
### Agency

## OTOWA Power line Type2 SPD LSK-N for TN system

**Modular SPD for use in single-phase TN systems; with floating remote signalling contact.**



Basic Circuit Diagram



Dimension drawing

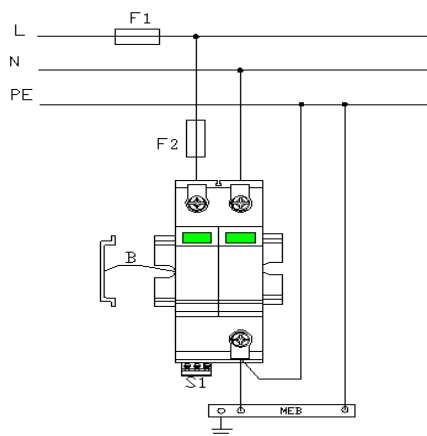
- Prewired complete unit consisting of a base part and plug-in protection modules.
- High discharge capacity due to heavy duty zinc oxide varistors.
- Easy to replace the protection modules without tools.

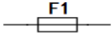



Type	LSK-N2720S	LSK-N3220S
SPD according to EN 61643-11/IEC 61643-11	Type2	
Nominal a.c. voltage (Un)	230V (50 / 60 Hz)	230V (50 / 60 Hz)
Max. continuous operating a.c. voltage (Uc)	275V (50 / 60 Hz)	320V (50 / 60 Hz)
Nominal discharge current (8/20 μs) (In)	20kA	
Max. discharge current (8/20 μs) (Imax)	40kA	
Voltage protection level (Up)	≤ 1.4kV	≤ 1.5kV
Response time (tA)	≤ 25ns	
Max. mains-side overcurrent protection	125 A gL/gG	
Short-circuit withstand capability for max. mains-side overcurrent protection (Iscsr)	25 kA rms	
Temporary overvoltage (TOV) (Ut) -Characteristic -withstand mode	335V / 5sec.	335V / 5sec.
Temporary overvoltage (TOV) (Ut) -Characteristic -safe failure mode	440V 120min.	440V 120min.
Operating temperature range (Tu)	-40°C ~ +85°C	
Operating state / fault indication	Green : Normal / Red : Failure	
Number of ports	1	
Cross-sectional area (min.)	1.5mm <sup>2</sup> solid / flexible	
Cross-sectional area (max.)	35mm <sup>2</sup> stranded / 25mm <sup>2</sup> flexible	
For mounting on	35mm DIN rails acc. to EN 60715	
Enclosure material	thermoplastic, UL 94 V-0	
Place of installation	Indoor installations	
Degree of protection	IP 20	
Capacity	2 module(s)	
Approvals	TUV, CE	
Conformity to environment	Comply to RoHS requirement	
Type of remote signalling contact	changeover contact	
a.c. switching capacity	250V / 0.5A	
d.c. switching capacity	250V / 0.1A ; 125V / 0.2A ; 75V / 0.5A	
Cross-sectional area for remote signalling terminals	max. 1.5mm <sup>2</sup> solid / flexible	

## OTOWA Type2 SPD LSK-N Series



### Connection



Backup Fuse		
		
$> 125\text{A gL/gG}$		125A gL/gG
$\leq 125\text{A gL/gG}$		<del>F2</del>

### Other information



OTOWA web site



Instruction manual

### Manufacturer



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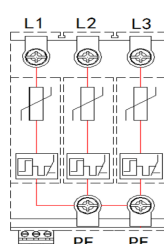
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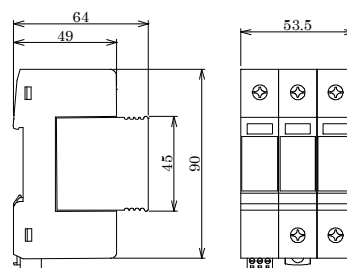
### Agency

## OTOWA Power line Type2 SPD LSK-NC for TN-C system

**Modular SPD for use in TN-C systems; with floating remote signalling contact.**



Basic Circuit Diagram



Dimension drawing

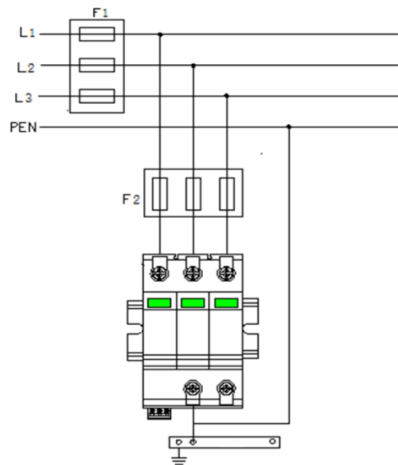
- Prewired complete unit consisting of a base part and plug-in protection modules.
- High discharge capacity due to heavy duty zinc oxide varistors.
- Easy to replace the protection modules without tools

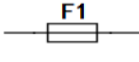



Type	LSK-NC2720S	LSK-NC3220S	LSK-NC4420S
SPD according to EN 61643-11 / IEC 61643-11	Type2		
Nominal a.c. voltage (Un)	230 / 400 V (50 / 60 Hz)	230 / 400 V (50 / 60 Hz)	400 / 690 V (50 / 60 Hz)
Max. continuous operating a.c. voltage (Uc)	275V (50 / 60 Hz)	320V (50 / 60 Hz)	440V (50 / 60 Hz)
Nominal discharge current (8/20 $\mu$ s) (In)	20kA	20kA	20kA
Max. discharge current (8/20 $\mu$ s) (Imax)	40kA	40kA	40kA
Voltage protection level (Up)	$\leq 1.4$ kV	$\leq 1.5$ kV	$\leq 2.5$ kV
Response time (tA)	$\leq 25$ ns		
Max. mains-side overcurrent protection	125 A gL/gG		
Short-circuit withstand capability for max. mains-side overcurrent protection (Iscor)	25 kA rms		
Temporary overvoltage (TOV) (Ut) -Characteristic -withstand mode	335V / 5sec.	335V / 5sec.	580V / 5sec.
Temporary overvoltage (TOV) (Ut) -Characteristic -safe failure mode	440V 120min.	440V 120min.	765V 120min.
Operating temperature range (Tu)	$-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$		$-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$
Operating state / fault indication	Green : Normal / Red : Failure		
Number of ports	1		
Cross-sectional area (min.)	1.5mm <sup>2</sup> solid / flexible		
Cross-sectional area (max.)	35mm <sup>2</sup> stranded / 25mm <sup>2</sup> flexible		
For mounting on	35mm DIN rails acc. to EN 60715		
Enclosure material	thermoplastic, UL 94 V-0		
Place of installation	Indoor installations		
Degree of protection	IP 20		
Capacity	3 module(s)		
Approvals	TUV, CE		—
Comformity to environment	Comply to RoHS requirement		
Type of remote signalling contact	changeover contact		
a.c. switching capacity	250V / 0.5A		
d.c. switching capacity	250V / 0.1A ; 125V / 0.2A ; 75V / 0.5A		
Cross-sectional area for remote signalling terminals	max. 1.5mm <sup>2</sup> solid / flexible		

## OTOWA Type2 SPD LSK-NC Series



### Connection



Backup Fuse		
		
$> 125A \text{ gL/gG}$		$125A \text{ gL/gG}$
$\leq 125A \text{ gL/gG}$		<del><math>F2</math></del>

### Other information



OTOWA web site



Instruction manual

### Manufacturer



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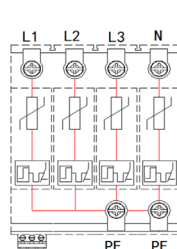
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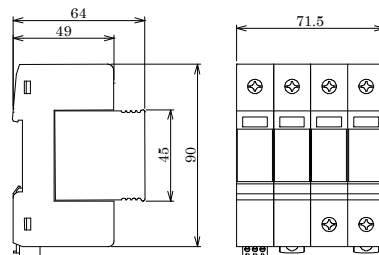
### Agency

## OTOWA Power line Type2 SPD LSK-NS for TN-S system

**Modular SPD for use in TN-S systems; with floating remote signalling contact.**



Basic Circuit Diagram



Dimension drawing

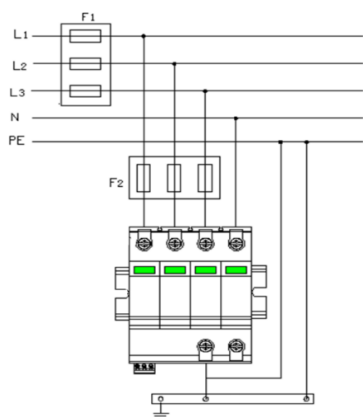
- Prewired complete unit consisting of a base part and plug-in protection modules.
- High discharge capacity due to heavy duty zinc oxide varistors.
- Easy to replace the protection modules without tools.
- EU RoHS Compliant with regulated substances





Type	LSK-NS2720S	LSK-NS3220S	LSK-NS3820S
SPD according to EN 61643-11 / IEC 61643-11	Type2		
Nominal a.c. voltage (Un)	230 / 400 V (50 / 60 Hz)	230 / 400 V (50 / 60 Hz)	230 / 400 V (50 / 60 Hz)
Max. continuous operating a.c. voltage (Uc)	275V (50 / 60 Hz)	320V (50 / 60 Hz)	385V (50 / 60 Hz)
Nominal discharge current (8/20 μs) (In)	20kA	20kA	20kA
Max. discharge current (8/20 μs) (Imax)	40kA	40kA	40kA
Voltage protection level (Up)	≤ 1.4kV	≤ 1.5kV	≤ 1.8kV
Response time (tA)	≤ 25ns		
Max. mains-side overcurrent protection	125 A gL/gG		
Short-circuit withstand capability for max. mains-side overcurrent protection (Iscrr)	25 kA rms		
Temporary overvoltage (TOV) (Ut) -Characteristic -withstand mode	335V / 5sec.	335V / 5sec.	335V / 5sec.
Temporary overvoltage (TOV) (Ut) -Characteristic -safe failure mode	440V 120min.	440V 120min.	440V 120min.
Operating temperature range (Tu)	-40°C ~ +85°C		
Operating state / fault indication	Green : Normal / Red : Failure		
Number of ports	1		
Cross-sectional area (min.)	1.5mm <sup>2</sup> solid / flexible		
Cross-sectional area (max.)	35mm <sup>2</sup> stranded / 25mm <sup>2</sup> flexible		
For mounting on	35mm DIN rails acc. To EN 60715		
Enclosure material	thermoplastic, UL 94 V-0		
Place of installation	Indoor installations		
Degree of protection	IP 20		
Capacity	4 module(s)		
Approvals	TUV, CE		
Conformity to environment	Comply to RoHS requirement		
Type of remote signalling contact	changeover contact		
a.c. switching capacity	250V / 0.5A		
d.c. switching capacity	250V / 0.1A ; 125V / 0.2A ; 75V / 0.5A		
Cross-sectional area for remote signalling terminals	max. 1.5mm <sup>2</sup> solid / flexible		

## OTOWA Type2 SPD LSK-NS Series



### Connection



Backup Fuse		
		
$> 125A \text{ gL/gG}$		$125A \text{ gL/gG}$
$\leq 125A \text{ gL/gG}$		<del><math>F2</math></del>

### Other information



OTOWA web site



Instruction manual

### Manufacturer



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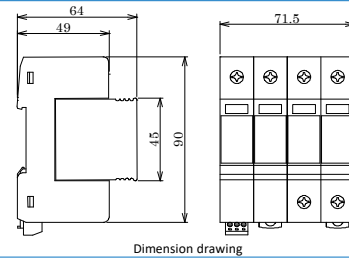
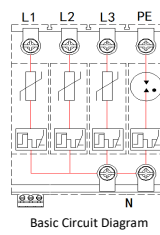
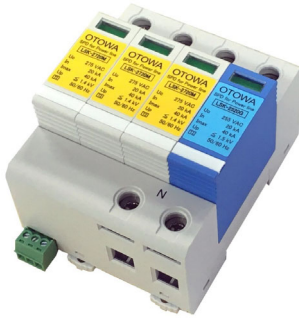
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### Agency

## OTOWA Power line Type2 SPD LSK-T for TT system

**Modular SPD for use in TT and TN-S systems ("3+1" circuit); with floating remote signalling contact.**



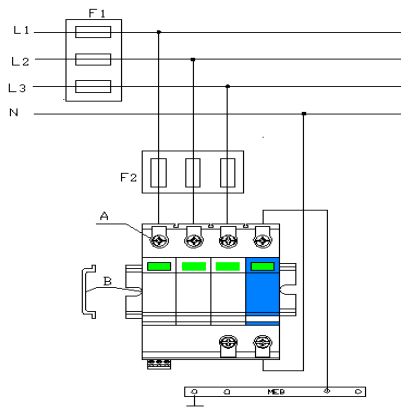
- Prewired complete unit consisting of a base part and plug-in protection modules.
- High discharge capacity due to heavy duty zinc oxide varistors / spark gap.
- Easy to replace the protection modules without tools.

Type	LSK-T2720S	LSK-T3220S	LSK-T3820S
SPD according to EN 61643-11 / IEC 61643-11	Type2		
Nominal a.c. voltage (Un)	230 / 400 V (50 / 60 Hz)	230 / 400 V (50 / 60 Hz)	230 / 400 V (50 / 60 Hz)
Max. continuous operating a.c. voltage [L-N] (Uc)	275V (50 / 60 Hz)	320V (50 / 60 Hz)	385V (50 / 60 Hz)
Max. continuous operating a.c. voltage [N-PE] (Uc)	255V (50 / 60 Hz)	255V (50 / 60 Hz)	255V (50 / 60 Hz)
Nominal discharge current (8/20 μs) (In)	20kA		
Max. discharge current (8/20 μs) (Imax)	40kA		
Voltage protection level [L-N] (Up)	≤ 1.4kV	≤ 1.5kV	≤ 1.8kV
Voltage protection level [N-PE] (Up)	≤ 1.5kV	≤ 1.5kV	≤ 1.5kV
Follow current extinguishing capability [N-PE] (Ifn)	100 Arms		
Response time [L-N] (tA)	≤ 25ns		
Response time [N-PE] (tA)	≤ 100ns		
Max. mains-side overcurrent protection	125 A gL/gG		
Short-circuit withstand capability for max. mains-side overcurrent protection (Iscor)	25 kA rms		
Temporary overvoltage (TOV) [L-N] (Ut) -Characteristic -withstand mode	335V / 5sec.	335V / 5sec.	335V / 5sec.
Temporary overvoltage (TOV) [L-N] (Ut) -Characteristic -safe failure mode	440V 120min.	440V 120min.	440V 120min.
Temporary overvoltage (TOV) [N-PE] (Ut) -Characteristic -withstand mode	1200V / 200m sec.	1200V / 200m sec.	1200V / 200m sec.
Operating temperature range (Tu)	-40°C ~ +85°C		
Operating state / fault indication	Green : Normal / Red : Failure		
Number of ports	1		
Cross-sectional area (min.)	1.5mm <sup>2</sup> solid / flexible		
Cross-sectional area (max.)	35mm <sup>2</sup> stranded / 25mm <sup>2</sup> flexible		
For mounting on	35mm DIN rails acc. to EN 60715		
Enclosure material	thermoplastic, UL 94 V-0		
Place of installation	Indoor installations		
Degree of protection	IP 20		
Capacity	3+1 module(s)		
Approvals	TUV, CE		
Conformity to environment	Comply to RoHS requirement		
Type of remote signalling contact	changeover contact		
a.c. switching capacity	250V / 0.5A		
d.c. switching capacity	250V / 0.1A 125V / 0.2A 75V / 0.5A		
Cross-sectional area for remote signalling terminals	max. 1.5mm <sup>2</sup> solid / flexible		

## OTOWA Type2 SPD LSK-T Series



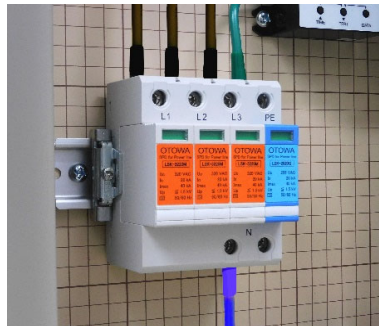
### Connection



### Backup Fuse

F1		F2
$> 125A \text{ gL/gG}$		125A gL/gG
$\leq 125A \text{ gL/gG}$		<del>F2</del>

### Installation example



### Other information



OTOWA web site

Instruction manual

### Manufacturer



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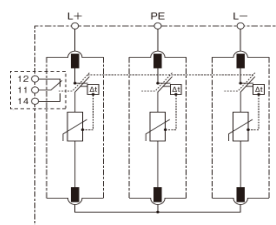
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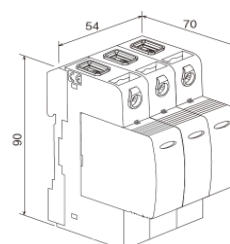
### Agency

## OTOWA Power line Type2 SPD PUSA for Photovoltaic system

**Modular multipole SPD with three-step d.c. switching device for PV system with remote signalling contact for monitoring device (floating changeover contact). EU RoHS Compliant with regulated substances**



Basic Circuit Diagram



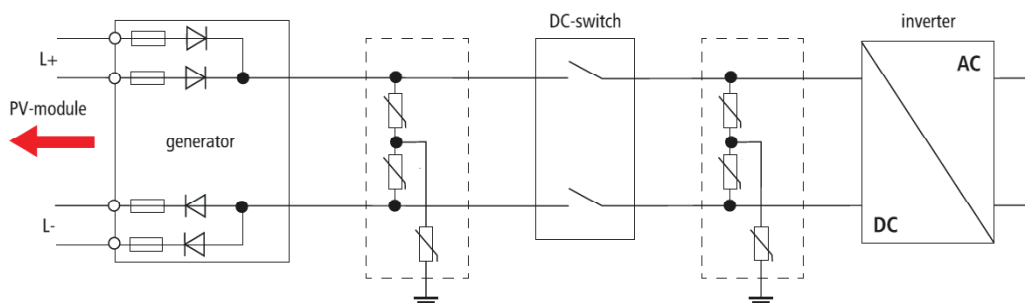
Dimension drawing

Type	PUSA-0640-YS	PUSA-1040-YS	PUSA-1540-YS
SPD according to EN 50539-31	type2		
Max. PV voltage (Ucpv)	660V	1060V	1500V
Short-circuit current rating (Iscpv)	10kA	10kA	10kA
Nominal discharge current (8/20 $\mu$ s) (In) (L-L), (L-PE)	20kA	20kA	10kA
Max. discharge current (8/20 $\mu$ s) (Imax) (L-L), (L-PE)	40kA		
Voltage protection level (Up) (L-L), (L-PE)	$\leq 2.5$ kV	$\leq 4.0$ kV	$\leq 5.0$ kV
Response time (tA)	$\leq 25$ ns		
Operating temperature range (Tu)	$-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$		
Operating state / fault indication	green / red		
Cross-sectional area (min.)	6mm <sup>2</sup> solid / flexible		
Cross-sectional area (max.)	35mm <sup>2</sup> stranded / 25mm <sup>2</sup> flexible		
For mounting on	35mm DIN rails acc. To EN 60715		
Enclosure material	thermoplastic, UL 94 V-0		
Place of installation	Indoor installations		
Degree of protection	IP 20		
Capacity	3 module(s) DIN 43880		
Conformity to environment	Comply to RoHS requirement		
Type of remote signalling contact	changeover contact		
a.c. switching capacity	250V / 1A, 125V / 3A		
Cross-sectional area for remote signalling terminals	Stranded : 0.05mm <sup>2</sup> to 2.5mm <sup>2</sup> Rigid : Max. $\phi$ 1.2mm		

## OTOWA Type2 SPD PUSA Series



### Connection



### Other information



OTOWA web site



Instruction manual

### Manufacturer



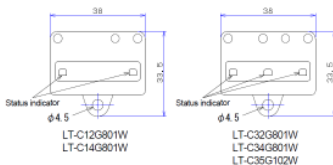
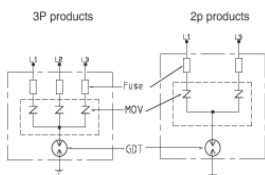
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### Agency

**OTOWA Power line Type2 SPD for Machine protection LT-C Series**
**Machine protection SPD ; with status indicator**


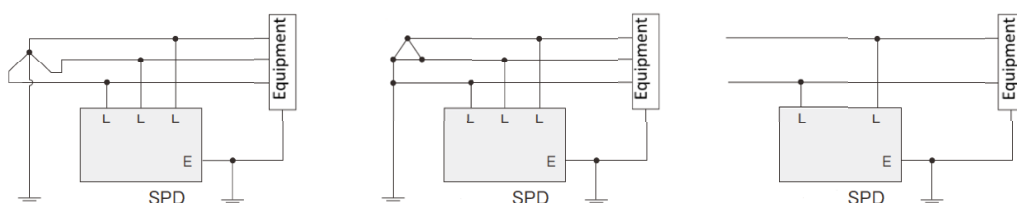
- Single / Multi Phase application with compact SPD module
- Full mode protection (Common, differential mode) with compact body
- Low protection level :  $U_p \leq 1.8kV$
- Safe disconnector integrated with status indication
- EU RoHS Compliant with regulated substances

Type	LT-C12G801W	LT-C14G801W	LT-C32G801W	LT-C34G801W	LT-C35G102W
SPD according to EN 61643-11 /IEC 61643-11	Type2				
Nominal a.c. voltage (Un)	250V (50 / 60 Hz)	L-E : 250V L-L : 430V (50 / 60 Hz)	3ΦY : 250V 3ΦΔ : 250V (50 / 60 Hz)	3ΦY : 430V 3ΦΔ : 250V (50 / 60 Hz)	3ΦY : 500V 3ΦΔ : 290V (50 / 60 Hz)
Max. continuous operating a.c. voltage (Uc)	275V (50 / 60 Hz)	L-E : 280V L-L : 480V (50 / 60 Hz)	3ΦY : 275V 3ΦΔ : 275V (50 / 60 Hz)	3ΦY : 480V 3ΦΔ : 280V (50 / 60 Hz)	3ΦY : 550V 3ΦΔ : 320V (50 / 60 Hz)
Nominal discharge current (8/20 μs) (In)	2.5kA				
Max. discharge current (8/20 μs) (Imax)	5kA				
Voltage protection level (Up)	≤1.5kV	≤1.8kV	≤1.5kV	≤1.8kV	≤2.0kV
Response time	L-L : ≤3ns				
Application system	1 phase		3 phase		
mode of protection	Common & Differential Mode				
Operating temperature range (Tu)	-20℃～ +70℃				
Operating state / fault indication	Green / red				
Cross-sectional area	AWG16×250mm				
For mounting on	M4 screw				
Enclosure material	thermoplastic, UL 94 V=0				
Place of installation	Indoor installations				
Degree of protection	IP 20				
Certification	UL1449 / CSA / TUV				

## OTOWA Type2 SPD LT-C Series



### Connection



### Other information



OTOWA web site



Instruction manual

### Manufacturer



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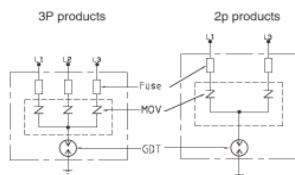
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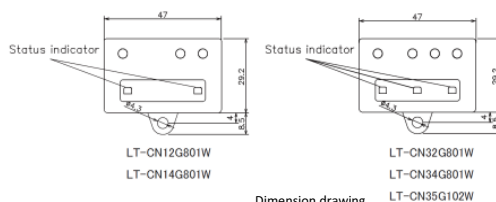
### Agency

## OTOWA Power line Type2 SPD for Machine protection LT-CN Series

### Machine protection SPD ; with status



Basic Circuit Diagram



Dimension drawing

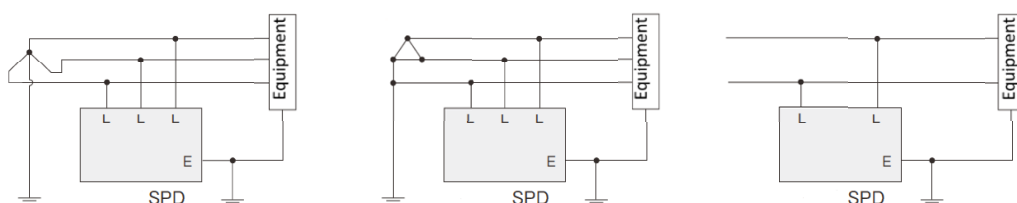
- NFPA79 (UL Listing)
- Single / Multi Phase application with compact SPD module
- Full mode protection (Common, differential mode) with compact body
- Low protection level : Up  $\leq 1.8kV$
- Safe disconnector integrated with status indication
- EU RoHS Compliant with regulated

Type	LT-CN12G801W	LT-CN14G801W	LT-CN32G801W	LT-CN34G801W	LT-CN35G102W
SPD according to EN 61643-11 / IEC 61643-11	Type2				
Nominal a.c. voltage (Un)	250V (50 / 60 Hz)	L-E : 250V L-L : 430V (50 / 60 Hz)	3Φ Y : 250V 3Φ Δ : 250V (50 / 60 Hz)	3Φ Y : 430V 3Φ Δ : 250V (50 / 60 Hz)	3Φ Y : 500V 3Φ Δ : 290V (50 / 60 Hz)
Max. continuous operating a.c. voltage (Uc)	275V (50 / 60 Hz)	L-E : 280V L-L : 480V (50 / 60 Hz)	3Φ Y : 275V 3Φ Δ : 275V (50 / 60 Hz)	3Φ Y : 480V 3Φ Δ : 280V (50 / 60 Hz)	3Φ Y : 550V 3Φ Δ : 320V (50 / 60 Hz)
Nominal discharge current (8/20 μs) (In)	2.5kA				
Max. discharge current (8/20 μs) (Imax)	5kA				
Voltage protection level (Up)	≤1.5kV	≤1.8kV	≤1.5kV	≤1.8kV	≤2.0kV
Response time	L-L : ≤3ns				
Application system	1 phase		3 phase		
mode of protection	Common & Differential Mode				
Operating temperature range (Tu)	-20°C~ +60°C				
Operating state / fault indication	Green / red				
Cross-sectional area	AWG14 x 250mm				
For mounting on	M4 screw				
Enclosure material	thermoplastic, UL 94 V-0				
Place of installation	Indoor installations				
Degree of protection	IP 20				
Certification	UL1449 Listing / NFPA79 / CSA / TÜV				

## OTOWA Type2 SPD LT-CN Series



### Connection



### Other information



OTOWA web site



Instruction manual

### Manufacturer



# OTOWA ELECTRIC CO.,LTD.

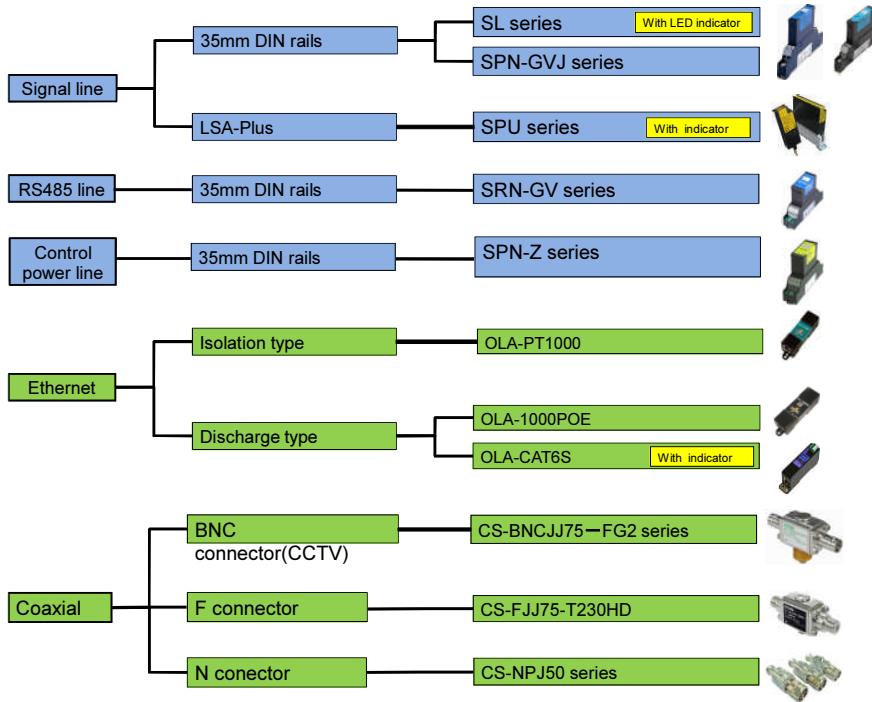
5-6-20, Shioe, Amagasaki-city, Hyogo Pref. 〒661-0976, Japan

**CONTACT US**


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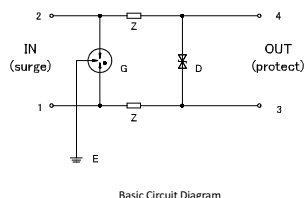
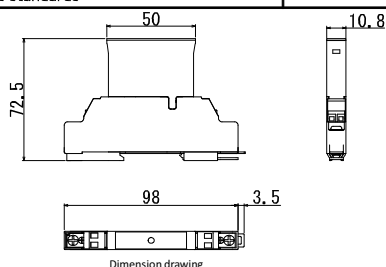
### Agency


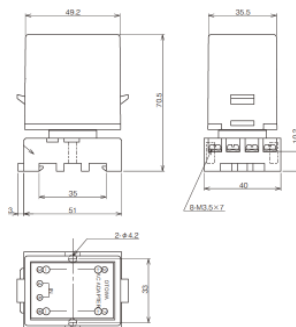
## Signal and Data line SPD



		Spec	OTOWA Type No.
Signal line	DIN rail with indicator	Un:5V In:10kA Iimp:5kA	SL-GV5J
		Un:12V In:10kA Iimp:5kA	SL-GV12J
		Un:24V In:10kA Iimp:5kA	SL-GV24J
		Un:48V In:10kA Iimp:5kA	SL-GV48J
		Un:170V In:10kA Iimp:5kA	SL-T170J
	DIN rail	Un:24V In:10kA Iimp:5kA	SPN-GV24J
		Un:48V In:10kA Iimp:5kA	SPN-GV48J
		Un:170V In:10kA Iimp:5kA	SPN-T170J
	LSA-Plus with indicator	Un:24V In:10kA Iimp:2.5kA	SPU-GV24J
		Un:170V In:10kA Iimp:2.5kA	SPU-T170J
Control power line	DIN rail	Un:24Vac In:10kA Iimp:2kA	SPN-Z24J
		Un:48Vac In:10kA Iimp:2kA	SPN-Z48J
Signal line Data line	RS485	Un:5V Uc:5.5V In:10kA Iimp:5kA	SRN-GV5J
		Un:12V Uc:12.6V In:10kA Iimp:5kA	SRN-GV12J
		Un:24V Uc:28.0V In:10kA Iimp:5kA	SRN-GV24J
		Un:38V Uc:42.0V In:10kA Iimp:5kA	SRN-GV38J
	Ethernet	Isolation type 1000BASE-T ≤1000MHz	OLA-PT1000
		Discharge type Uc:60V In:5kA Iimp:2.0kA 1000BASE-T ≤100MHz PoE+	OLA-1000POE
		Discharge type Uc:60V In:10kA Iimp:2.5kA 1000BASE-TX ≤250MHz PoE++	OLA-CAT6S
	CCTV Coaxial	BNC connector Uc:60Vdc 100kHz-3.0GHz 75Ω 50W	CS-BNCJJ75-T90FG2
		BNC connector Uc:140Vdc 100kHz-3.0GHz 75Ω 80W	CS-BNCJJ75-T230FG2
	Coaxial	F connector Uc:80Vdc 0-3.3GHz 75Ω 80W	CS-FJJ75-T230HD
		N connector Uc:250Vdc 0-3GHz 50Ω 50W	CS-NPJ50-T230LT
		N connector Uc:250Vdc 0-3GHz 50Ω 100W	CS-NPJ50-T350LT
		N connector Uc:430Vdc 0-2GHz 50Ω 200W	CS-NPJ50-600

OTOWA Signal line SPD SL-GV series Pluggable DIN Rail mounted SPDs with LED status indication					
<div> <div>Space saving SPD module for protecting one pair of balanced interfaces with electrical isolation.</div> <div>  <ul style="list-style-type: none"> <li>Plug-in Module with LED status indication</li> <li>Low voltage protection level</li> <li>Easy to replace the protection modules</li> <li>No signal disconnection if the protection module is removed</li> <li>DIN rail mounted device</li> </ul> </div> </div>					
Type	SL-GV5J	SL-GV12J	SL-GV24J	SL-GV48J	SL-T170J
SPD Class (Category)	C2 , D1				
Nominal d.c. Voltage (Un)	5V	12V	24V	48V	150V
Max. continuous operating d.c. voltage (Uc)	5.7V	13.0V	25.2V	52V	170V
Rated current	100mA				200mA
AC Durability	60Hz 0.5A 1sec 5shots				
Voltage protection level C2:8/20 $\mu$ s:5kA D1:10/350 $\mu$ s:2.5kA	L-L : $\leq$ 35V L-E : $\leq$ 400V	L-L : $\leq$ 45V L-E : $\leq$ 400V	L-L : $\leq$ 60V L-E : $\leq$ 400V	L-L : $\leq$ 115V L-E : $\leq$ 400V	L-L : $\leq$ 400V L-E : $\leq$ 500V
C2 Nominal discharge current (8/20 $\mu$ s)	5kA				
C2 Total Nominal discharge current (8/20 $\mu$ s) (In)	10kA				
D1 Lightning impulse current (10/350 $\mu$ s)	2.5kA				
D1 Total Lightning impulse current (10/350 $\mu$ s) (Iimp)	5kA				
Insertion Loss	$\leq$ 1.5dB				
Series impedance per line	9.1 ohm(s)				
Cut-off frequency line-line (fG) Characteristic impedance 600 $\Omega$	4.8MHz	1.1MHz	2.7MHz	4.8MHz	4.0MHz
Typical Capacitance line-line (at 1MHz, 1Vrms)	$\leq$ 180pF	$\leq$ 850pF	$\leq$ 500pF	$\leq$ 180pF	$\leq$ 200pF
Operating temperature range (Tu)	-20°C ~ +60°C				
Weight	approx. 60g				
Enclosure material / Color	Polycarbonate/Black				
Place of installation	Indoor installations				
Degree of protection (Plugged-in)	IP20				
Status indication	Operating state: LED lighting (need 5V dc)				
For mounting on	35mm DIN rails acc. to EN 60715				
Cross-sectional area	AWG 28 - 12 (AWG12It may not be usable depending on the outer diameter of the cable sheath.)				
Test standards	IEC 61643-21				



Optional accessories	
<p>SL-205A</p> 	<p>•Power source for emitting LED</p> <p>Input : 90 — 250V (AC 50/60Hz) Output : 5V (DC)</p> <p>LEDs of up to 50 pieces of SPD can be emitted</p> <p>Terminal : M3.5 screw terminal Installation method : 35mm DIN rail or M4 screw Max SPD numbers: 50pcs.</p> 
SL-CN10	Common bouding bar For LED status indication, use DC3-5V

Other information

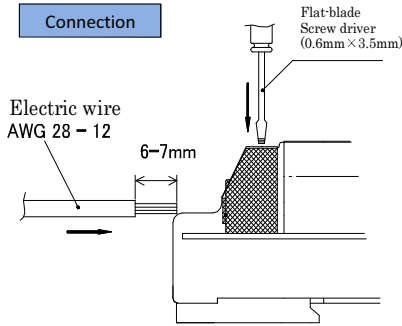


OTOWA web site

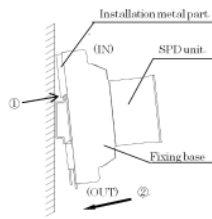


Instruction manual

CAT.No.EN-AS-06 `21.10

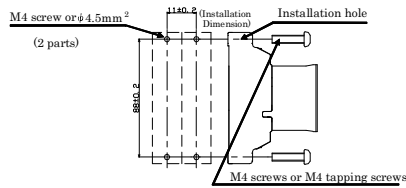


#### Installing the fixing base



#### [Installation to DIN rail]

The SPD should be installed to the rail for equipment installation (35mm width of DIN standard rail)  
After positioning the installation metal part ① of the SPD to DIN rail, push the SPD into DIN rail with arrow direction of ② until the end.



#### [Removing SPD from DIN rail]

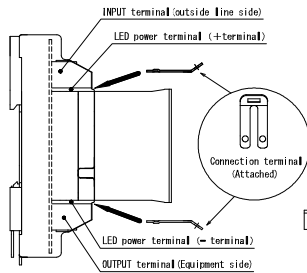
- (1) After inserting the flat-blade screw driver to the square hole of the slider ① and tilting it with arrow direction of ②, pull out the slider with arrow direction of ③.
- (2) Pull off the SPD from DIN rail with arrow direction of ④, holding the fixing base.

#### [Installation method to panel or board]

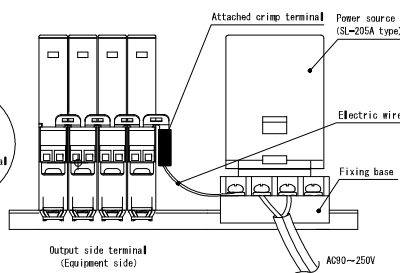
- (1) When installing the SPD to panel or board directly, Loosen the M4 screws of earth terminal on the fixing base and remove the installation metal part for DIN rail.
- (2) Holes must be punched or drilled on panel, and install the fixing base of the SPD

#### Status indication

##### Install on DIN Rail, Common earth with Bonding bar



##### LED Status indication by DC 3-5V power



#### Regular maintenance

- (1) Confirm the LED indicator of the SPD is emitting during regular maintenance.  
In case of no connection of DC3-5V, LED does not emit. Confirm the LED is emitted when applying DC3-5V by a battery.  
Be sure to use the special power source at DC3-5V (Separate selling : SL-205A type), if LED is emitting at all times.
- (2) If LED lamp does not emit, SPD has no function of it. Replace it with new SPD immediately.
- (3) It is recommended that the SPD is replaced about every 10 years, though the condition of the SPD is determined during regular maintenance.  
(10 years is the nominal life of the part, but cannot be guaranteed, due to the differences in service conditions.)

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#### Agency

## OTOWA Signal line SPD SPN-GVJ series Pluggable DIN Rail mounted SPDs

**Space saving SPD module for protecting one pair of balanced interfaces with electrical isolation.**



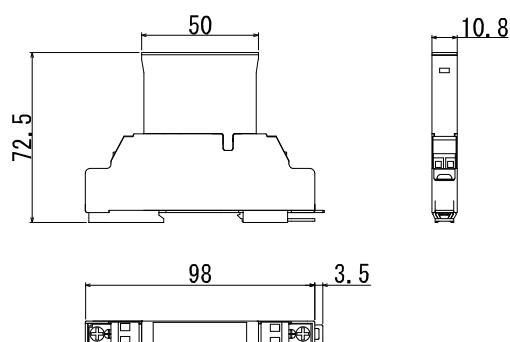
SPN-GV24J



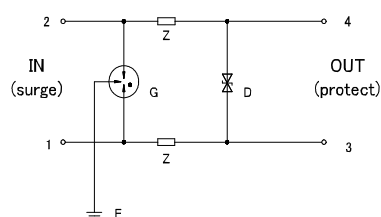
SPN-T170J

- Plug-in Module
- Low voltage protection level
- Easy to replace the protection modules
- No signal disconnection if the protection module is removed
- DIN rail mounted device
- EU RoHS Compliant with regulated substances

Type	SPN-GV24J	SPN-GV48J	SPN-T170J
SPD Class (Category)	C2 , D1		
Nominal d.c. Voltage (Un)	24V	48V	150V
Max. continuous operating d.c. voltage (Uc)	25.2V	52V	170V
Rated current	100mA		200mA
AC Durability	60Hz 0.5A 1sec 5shots		
Voltage protection level C2:8/20 $\mu$ s:5kA D1:10/350 $\mu$ s:2.5kA	L-L : $\leq 60V$ L-E : $\leq 400V$	L-L : $\leq 115V$ L-E : $\leq 400V$	L-L : $\leq 400V$ L-E : $\leq 500V$
C2 Nominal discharge current (8/20 $\mu$ s)	5kA		
C2 Total Nominal discharge current (8/20 $\mu$ s) (In)	10kA		
D1 Lightning impulse current (10/350 $\mu$ s)	2.5kA		
D1 Total Lightning impulse current (10/350 $\mu$ s) (Iimp)	5kA		
Insertion Loss	$\leq 1.5$ dB		
Series impedance per line	9.1 ohm(s)		
Cut-off frequency line-line (fG)	2.7MHz	4.8MHz	4.0MHz
Characteristic impedance 600 $\Omega$			
Typical Capacitance line-line (at 1MHz, 1Vrms)	$\leq 500$ pF	$\leq 180$ pF	$\leq 200$ pF
Operating temperature range (Tu)	$-40^{\circ}C \sim +70^{\circ}C$		
Weight	approx. 60g		
Enclosure material / Color	Polycarbonate/Black		
Place of installation	Indoor installations		
Degree of protection (Plugged-in)	IP20		
For mounting on	35mm DIN rails acc. to EN 60715		
Cross-sectional area	AWG 28 - 12 $\times$ (AWG12It may not be usable depending on the outer diameter of the cable sheath.)		
Test standards	IEC 61643-21		



Dimension drawing



Basic Circuit Diagram

### Other information



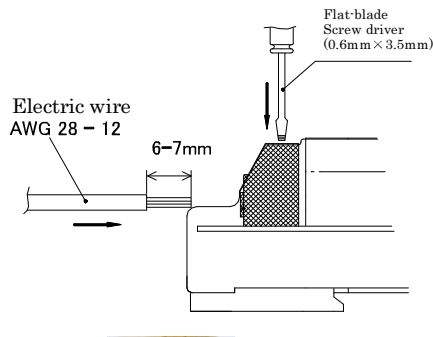
OTOWA web site



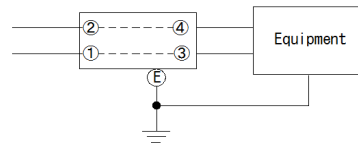
Instruction manual

CAT.No.EN-AS-06 '21.10

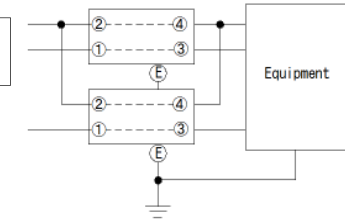
**Connection**



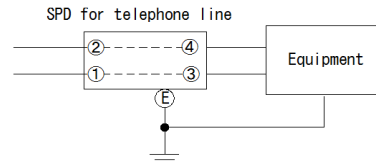
**2 lines connection**



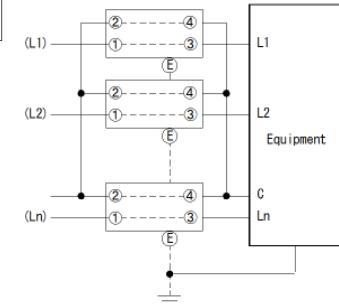
**3 lines connection (2 SPDs are used)**



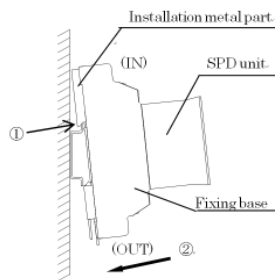
**Connection to telephone line**



**Connection to both common line and signal line  
(The number of SPD depends on signal lines.)**

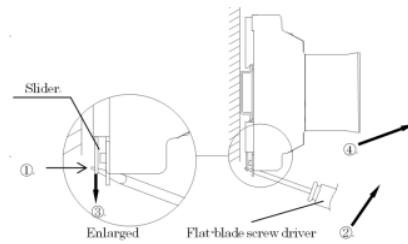


**Installing the fixing base**



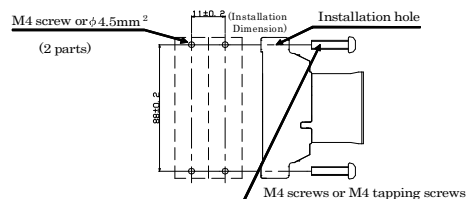
**[Installation to DIN rail]**

The SPD should be installed to the rail for equipment installation (35mm width of DIN standard rail)  
After positioning the installation metal part ① of the SPD to DIN rail, push the SPD into DIN rail with arrow direction of ② until the end.



**[Removing SPD from DIN rail]**

(1) After inserting the flat-blade screw driver to the square hole of the slider ① and tilting it with arrow direction of ②, pull out the slider with arrow direction of ③.  
(2) Pull off the SPD from DIN rail with arrow direction of ④, holding the fixing base.



**[Installation method to panel or board]**

(1) When installing the SPD to panel or board directly,  
Loosen the M4 screws of earth terminal on the fixing base and remove the installation metal part for DIN rail.  
(2) Holes must be punched or drilled on panel, and install the fixing base of the SPD by M4 screws or M4 tapping screws.

**Manufacturer**



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**Agency**

## OTOWA Signal line SPD SRN-GV series for RS485

SPD for a wide range of applications, e.g. for balanced four-wire RS485/422 interfaces or temperature sensors. Direct or indirect shield earthing, connection of a signal ground (SG).

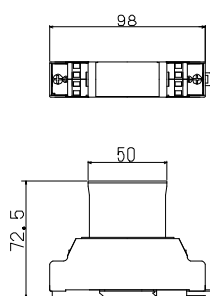


- Plug-in Module
- Easy to replace the protection modules
- No signal disconnection if the protection module is removed
- DIN rail mounted device

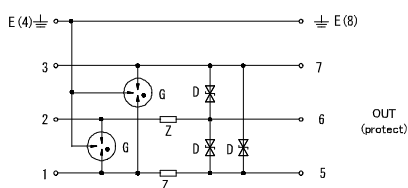
- Terminals for four bus lines and SG
- Direct or indirect shield earthing

Note )  
Other Applications  
(Adaptable depending on Protected equipment)  
SR-GV24J : Intercom line  
SR-GV38J : Fire alarm line

Type	SRN-GV5J	SRN-GV12J	SRN-GV24J	SRN-GV38J
SPD Class (Category)	C2 , D1			
Nominal d.c. voltage (Un)	5V	12V	24V	38V
Max. continuous operating d.c. voltage (Uc)	5.5V	12.6V	28.0V	42.0V
Rated current	250mA			
AC Durability	60Hz 0.5A 1sec 5shots			
Voltage protection level C2:8/20 $\mu$ s:5kA D1:10/350 $\mu$ s:2.5kA	L-L : $\leq$ 45V L-E : $\leq$ 400V	L-L : $\leq$ 55V L-E : $\leq$ 400V	L-L : $\leq$ 150V L-E : $\leq$ 400V	L-L : $\leq$ 200V L-E : $\leq$ 400V
C2 Nominal discharge current (8/20 $\mu$ s)	5kA			
C2 Total Nominal discharge current (8/20 $\mu$ s) (In)	10kA			
D1 Lightning impulse current (10/350 $\mu$ s)	2.5kA			
D1 Total Lightning impulse current (10/350 $\mu$ s) (Iimp)	5kA			
Insertion Loss	$\leq$ 1.5dB			
Series impedance per line	3.0 ohm(s)			
Cut-off frequency line-line (fG)	$\leq$ 140MHz (Characteristic impedance 600 $\Omega$ )	$\leq$ 8MHz (Characteristic impedance 100 $\Omega$ )	$\leq$ 80MHz (Characteristic impedance 600 $\Omega$ )	$\leq$ 35MHz (Characteristic impedance 100 $\Omega$ )
Typical Capacitance line-line (at 1MHz, 1Vrms)	$\leq$ 30pF	$\leq$ 200pF	$\leq$ 50pF	$\leq$ 60pF
Operating temperature range (Tu)	$-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$			
Weight	approx. 90g			
Enclosure material / Color	thermoplastic, UL 94 V-0 / Gray			
Place of installation	Indoor installations			
Degree of protection (Plugged-in)	IP20			
For mounting on	35mm DIN rails acc. to EN 60715			
Cross-sectional area	AWG 28 - 12※ (AWG12It may not be usable depending on the outer diameter of the cable sheath.)			
Test standards	IEC 61643-21			



Dimension drawing



Basic Circuit Diagram

## Other information



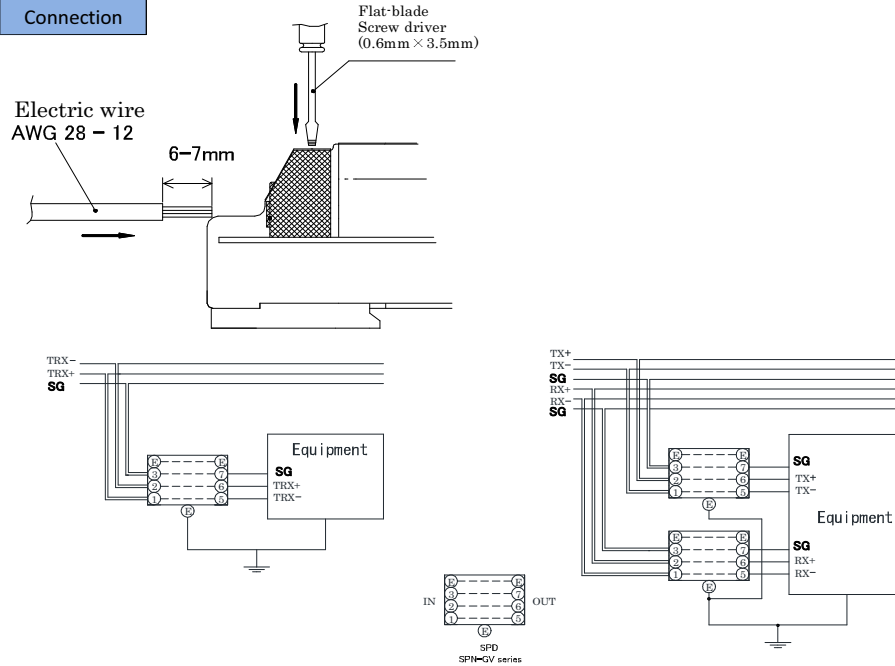
OTOWA web site



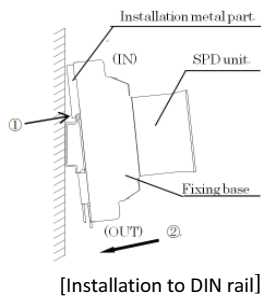
Instruction manual

CAT.No.EN-AS-06`21.10

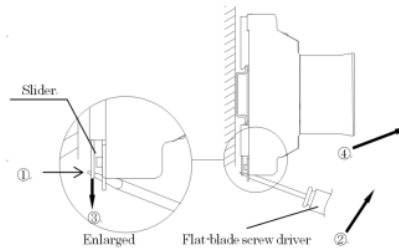
### Connection



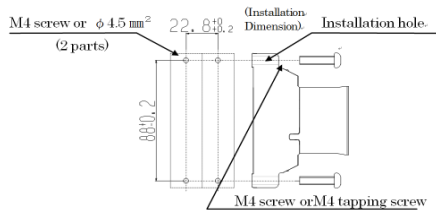
### Installing the fixing base



The SPD should be installed to the rail for equipment installation (35mm width of DIN standard rail)  
After positioning the installation metal part ① of the SPD to DIN rail, push the SPD into DIN rail with arrow direction of ② until the end.



- (1) After inserting the flat-blade screw driver to the square hole of the slider ① and tilting it with arrow direction of ②, pull out the slider with arrow direction of ③.
- (2) Pull off the SPD from DIN rail with arrow direction of ④, holding the fixing base.



### [Installation method to panel or board]

- (1) When installing the SPD to panel or board directly, Loosen the M4 screws of earth terminal on the fixing base and remove the installation metal part for DIN rail.
- (2) Holes must be punched or drilled on panel, and install the fixing base of the SPD by M4 screws or M4 tapping screws.

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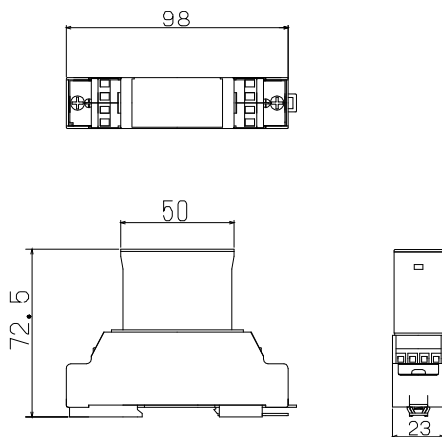
### Agency

## OTOWA Signal line SPD SPN-Z series for Control power line

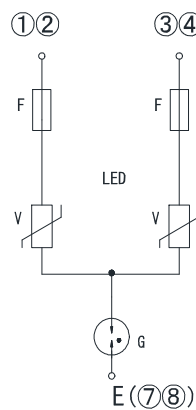
**SPD for Control power line DC/AC 24-48V****SPD consisting of a base part and plug-in protection module**

- Terminals for four bus lines and SG
- Direct or indirect shield earthing
- DIN rail mounted device
- EU RoHS Compliant with regulated substances

Type	SPN-Z24J	SPN-Z48J
SPD Class (Category)	C2 , D1	
Nominal a.c. voltage (Un)	24V	48V
Max. continuous operating a.c. voltage (Uc)	25V	50V
Max. continuous operating d.c. voltage (Uc)	35V	70V
Rated current	10A	
AC Durability	60Hz 0.5A 1sec 5shots	
Voltage protection level C2:8/20 $\mu$ s:5kA D1:10/350 $\mu$ s:2.5kA	L-L : $\leq 170V$ L-E : $\leq 600V$	L-L : $\leq 290V$ L-E : $\leq 600V$
C2 Nominal discharge current (8/20 $\mu$ s)	5kA	
C2 Total Nominal discharge current (8/20 $\mu$ s) (In)	10kA	
D1 Lightning impulse current (10/350 $\mu$ s)	1kA	
D1 Total Lightning impulse current (10/350 $\mu$ s) (Iimp)	2kA	
frequency	50/60Hz	
Operating temperature range (Tu)	-40°C ~ +60°C	
Weight	approx. 100g	
Enclosure material / Color	thermoplastic, UL 94 V-0 / Gray	
Place of installation	Indoor installations	
Degree of protection (Plugged-in)	IP20	
For mounting on	35mm DIN rails acc. to EN 60715	
Cross-sectional area	AWG 28 ~ 12※ (AWG12It may not be usable depending on the outer diameter of the cable sheath.)	
Test standards	IEC 61643-21	



Dimension drawing



Basic Circuit Diagram

## Other information

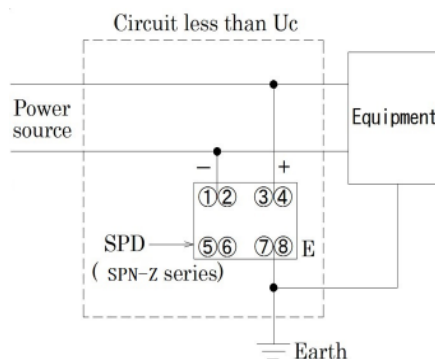
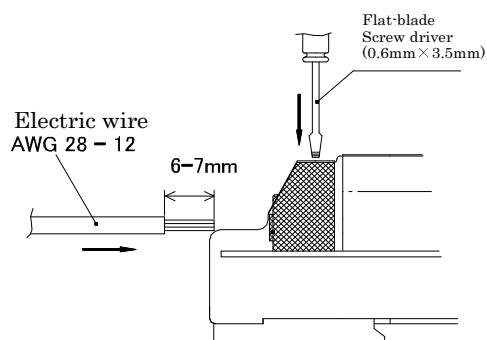


OTOWA web site

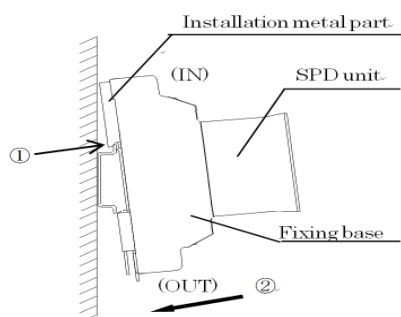


Instruction manual

**Connection**

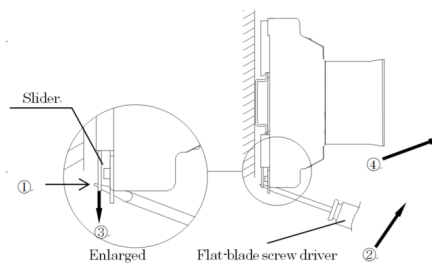


**Installing the fixing base**



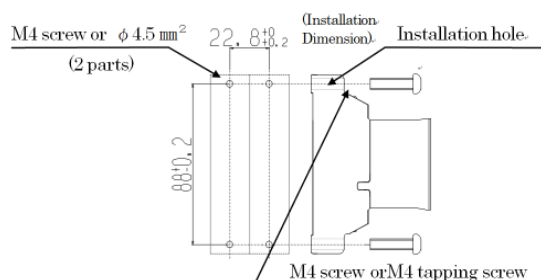
**[Installation to DIN rail]**

The SPD should be installed to the rail for equipment installation (35mm width of DIN standard rail)  
After positioning the installation metal part ① of the SPD to DIN rail, push the SPD into DIN rail with arrow direction of ② until the end.



**[Removing SPD from DIN rail]**

- (1) After inserting the flat-blade screw driver to the square hole of the slider ① and tilting it with arrow direction of ②, pull out the slider with arrow direction of ③.
- (2) Pull off the SPD from DIN rail with arrow direction of ④, holding the fixing base.



**[Installation method to panel or board]**

- (1) When installing the SPD to panel or board directly, Loosen the M4 screws of earth terminal on the fixing base and remove the installation metal part for DIN rail.
- (2) Holes must be punched or drilled on panel, and install the fixing base of the SPD by M4 screws or M4 tapping screws.

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5-6-20, Shioe, Amagasaki-city, Hyogo Pref. 〒661-0976, Japan

**CONTACT US**

<https://www.otowadenki.com>

**Agency**

## OTOWA Signal line SPD SPU series for LSA Technology

## SPD with indicator, Easy Visual confirmation of operating state



- LSA disconnection block function integrated in the SPD provides protection during testing, disconnecting and patching
- Low voltage protection level for the protection of terminal
- Operating state / fault indication by red indicator flag
- EU RoHS Compliant with regulated substances

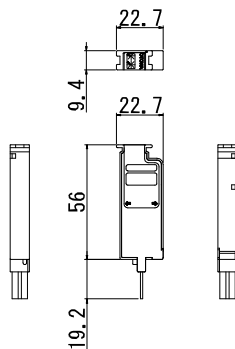
Type	SPU-GV24J	SPU-T170J
SPD Class (Category)	C2 , D1	
Nominal d.c. voltage (Un)	24V	48V
Max. continuous operating d.c. voltage (Uc)	36,5V	170V
Rated current	120mA	
AC Durability	60Hz 0,5A 1sec 5shots	
Voltage protection level C2:8/20 $\mu$ s:2kA D1:10/350 $\mu$ s:1kA	L-L : $\leq 80V$ L-E : $\leq 500V$	L-L : $\leq 350V$ L-E : $\leq 500V$
C2 Nominal discharge current (8/20 $\mu$ s)	5kA	
C2 Total Nominal discharge current (8/20 $\mu$ s) (In)	10kA	
D1 Lightning impulse current (10/350 $\mu$ s)	1kA	
D1 Total Lightning impulse current (10/350 $\mu$ s) (Iimp)	2,5kA	
Insertion Loss	$\leq 1,0dB$ (at 10MHz) $\leq 1,5dB$ (at 35MHz)	$\leq 1,0dB$ (at 5MHz) $\leq 1,5dB$ (at 10MHz)
Series impedance per line	9,5 ohm(s)	
Cut-off frequency line-PG (fG) Characteristic impedance 100 $\Omega$	35MMz	10MHz
Typical Capacitance(at 1MHz, 1Vrms)	L-L : $\leq 600pF$ L-E : $\leq 5pF$	L-L : $\leq 100pF$ L-E : $\leq 5pF$
Operating temperature range (Tu)	-10°C ~ +50°C	
Weight	approx. 14g	
Enclosure material / Color	Polycarbonate/Black	
Place of installation	Indoor installations	
Degree of protection	IP 20 (when plugged in)	
Fault indication	Red pin come out	
Test standards	IEC 61643-21	

## Optional accessories (LSA Technology)

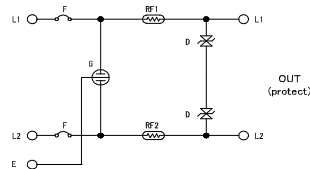
10-pair Earth bar



Type : 5909 3 041-00



Dimension drawing



Basic Circuit Diagram

## Other information

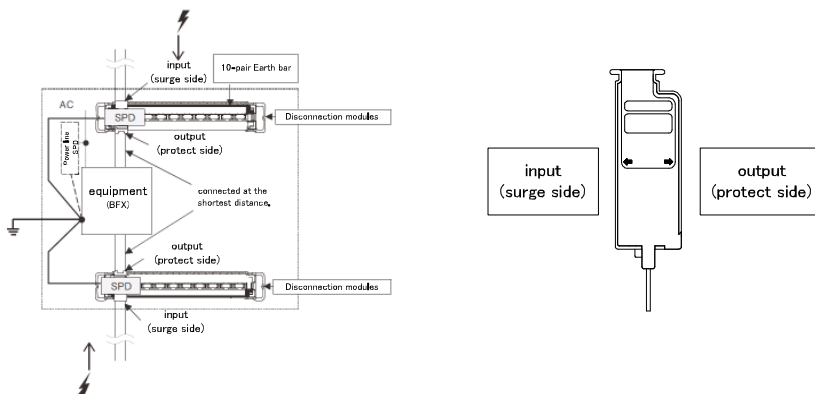


OTOWA web site



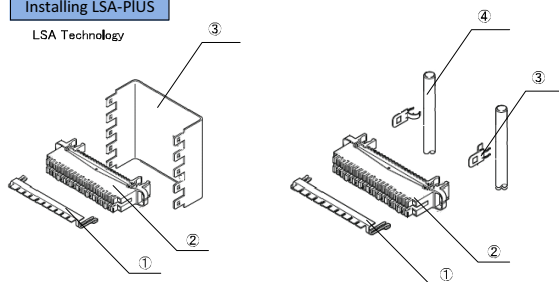
Instruction manual

Connection



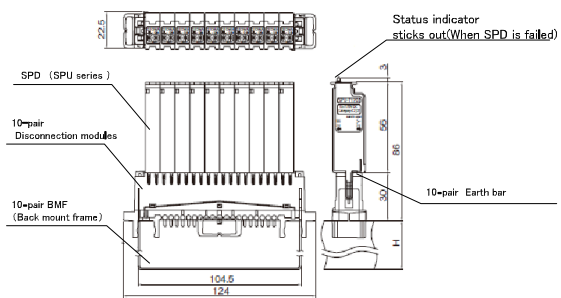
Installing LSA-PIUS

LSA Technology



[Installation to BMF]  
 ① 10-pair Earth bar  
 ② 10-pair Disconnection modules  
 ③ 10-pair BMF (Back mount frame)  
 ※Be sure to ground the BMF.

[Installation to PF]  
 ① 10-pair Earth bar  
 ② 10-pair Disconnection modules  
 ③ Earth clip for LSA profile  
 ④ LSA Profile rod  
 ※Be sure to ground the LSA Profile

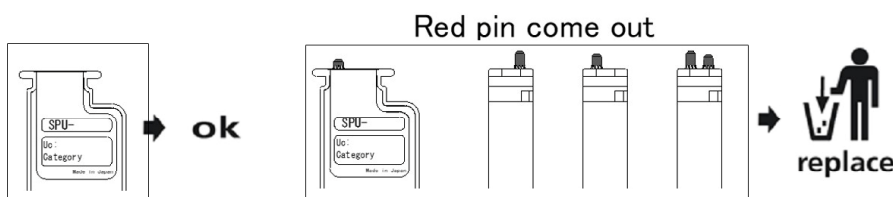


[Installation to 10-pair BMF]

Relative product

LSA-PIus	
	Type
10-pair Earth bar	5909 3 041-00
10-pair Disconnection modules	6089 1 121-60 6089 1 121-02
10-pair BMF 1Layer H:22mm	MF-22-01
10-pair BMF 3Layer H:22mm	MF-22-03
10-pair BMF 5Layer H:30mm	MF-30-05
10-pair BMF 10Layer H:50mm	MF-50-10-M
Earth clip for LSA profile	6089 3 202-00
LSA Profile rod	6460 1 046-05
	6460 1 046-10
	6460 1 046-20

Regular maintenance



Manufacturer



**OTOWA ELECTRIC CO.,LTD.**

5-6-20, Shioe, Amagasaki-city, Hyogo Pref. 〒661-0976, Japan

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Agency

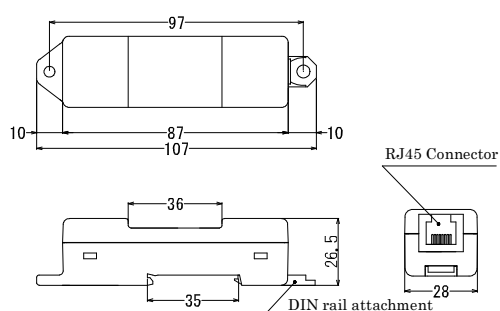
**OTOWA Isolation Type Surge protector OLA-PT1000 for Data Networks and Ethernet Applications**

**LAN line Isolation type Surge Protector are specialized for application of LAN.**  
**Designed and tested to manage the transient overvoltages invading the Local Area Network of data centers, important computer room and offices connected to the broadband network.**

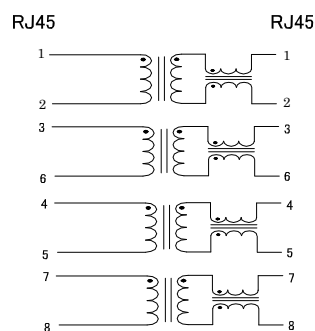


- 10BASE-T, 100BASE-T, 1000BASE-T
- DIN Rail installation
- Ground wire unnecessary
- EU RoHS Compliant with regulated substances

Type	OLA-PT1000
AC withstand Voltage	5kV 2sec
Impulse withstand voltage (1.2/50 $\mu$ s)	7kV
Insertion Loss	$\leq 1.5$ dB
Bandwidth	1-100MHz
Connector	RJ45 socket / RJ45 socket
Application	10BASE-T (IEEE802.3i) 100BASE-TX (IEEE802.3u) 1000BASE-T (IEEE802.3ab)
Applicable wire	UTP category 5e, 6, 6A
Available transmission classes	Up to Category 5e
Operating temperature range (Tu)	-20°C ~ +70°C
Weight	approx. 40g
Enclosure material / Color	Polycarbonate / Black
Degree of protection	IP 20
For mounting on	35mm DIN rails, or M4 screw



Dimension drawing



Basic Circuit Diagram

## Other information



OTOWA web site

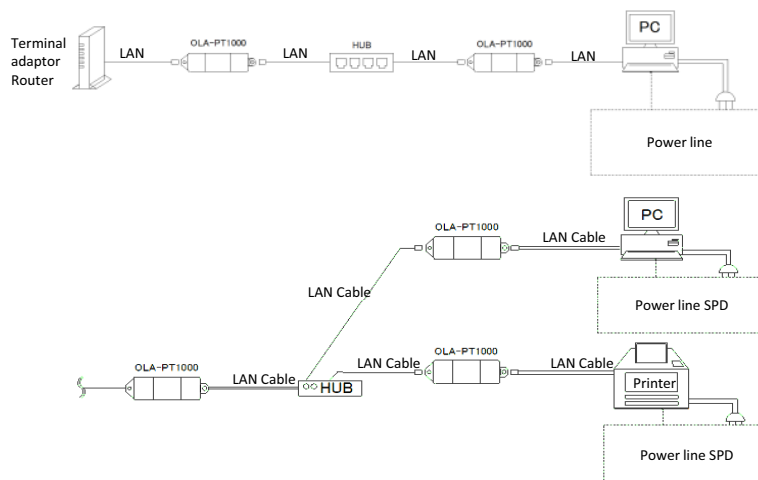


Instruction manual

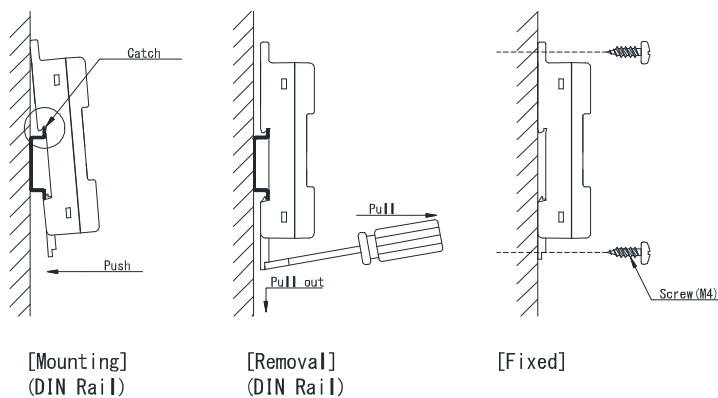
## OTOWA Isolation Type Surge protector OLA-PT1000 for Data Networks and Ethernet Applications



### Connection



### Installing the fixing base



- 1) The main body is on the DIN rail with the slider down please install it.
- 2) Hook the upper hook on the back of the main unit to the DIN rail.
- 3) Push the lower side of the main unit.
- 4) When removing the slider with a flathead screwdriver push it down and pull it forward to remove the lower side of the main unit.
- 5) Remove the upper side of the main unit from the DIN rail.
- 6) For mounting on a wood board, use M4 screws in the upper and lower round holes please fix it.

### installation example



#### Manufacturer



**OTOWA ELECTRIC CO.,LTD.**

5-6-20, Shioe, Amagasaki-city, Hyogo Pref. 〒661-0976, Japan

**CONTACT US**

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#### Agency

## OTOWA SPD OLA series for Data Networks and Ethernet Applications

Universal SPD for Industrial Ethernet, Power over Ethernet (PoE++ according to IEEE 802.3bt up to 60V) and similar applications in structured cabling systems according to Class D up to 250MHz. Protection of all pairs by powerful gas discharge tubes. DIN rail mounted adapter type with sockets.



OLA-1000POE

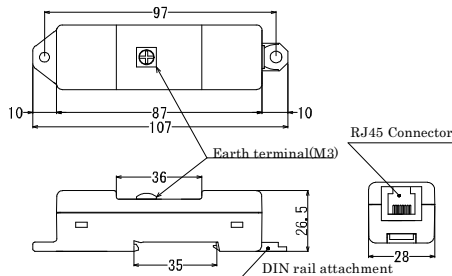


OLA-CAT6S

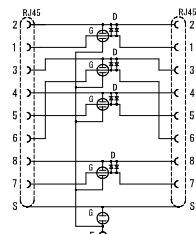
- Ideally suited for retrofitting, protection of all lines
- For use in structured cabling systems according to Class D up to 250MHz
- Power over Ethernet (PoE++ according to IEEE 802.3bt)
- For installation in conformity with the lightning protection zone concept at the boundaries from OB-2 and higher
- EU RoHS Compliant with regulated substances

Type	OLA-1000POE	OLA-CAT6S	With indicator
SPD Class	C2 , D1		
Max. continuous operating d.c. voltage (Uc)	60V		
Nominal current (IL) Total line	1A	2A	
Impulse Durability (C2:8/20 $\mu$ s) Total line/SG-PG	5kA	10kA	
Impulse Durability(D1:10/350 $\mu$ s) Total line/SG-PG	2.0kA	2.5kA	
Voltage protection level line-PG (up)	$\leq 500V$		
Transmission Frequency	DC~100MHz	DC~250MHz	
Insertion loss	$\leq 1.0dB$ (at 100MHz)	$\leq 1.0dB$ (at 100MHz) $\leq 3.0dB$ (at 250MHz)	
Capacitance line-line	$\leq 30pF$	$\leq 20pF$	
Correspondence communication standard	10BASE-T (IEEE802.3i) 100BASE-TX (IEEE802.3u) 1000BASE-T (IEEE802.3ab)	10BASE-T (IEEE802.3i) 100BASE-TX (IEEE802.3u) 1000BASE-T (IEEE802.3ab)	
Power over Ethernet	PoE (IEEE802.3af) PoE Plus (IEEE802.3at) PoE++ (IEEE802.3bt) Alternative A, B,	PoE (IEEE802.3af) PoE Plus (IEEE802.3at) PoE++ (IEEE802.3bt) LTPoE++ UPoE HDBaseT Alternative A, B, 4-pair mode up to 120W	
Operating state / fault indication	—	blue / red	
Type of remote signalling contact	—	changeover contact	
d.c. switching capacity	—	DC30V / 0.5A	
Operating temperature range (Tu)	-20°C~+60°C	-40°C~+75°C	
Weight	approx. 60g	approx. 70g	
Enclosure material / Color	Polycarbonate/Black		
Degree of protection	IP 20		
For mounting on	35mm DIN rails acc. To EN 60715		
Connection (input/output)	RJ45 socket / RJ45 socket		
Available transmission classes	Up to Category 5e	Up to Category 6	
Pinning	1/2, 3/6, 4/5, 7/8		
Earthing via	35mm DIN rails, or M4 screw	35mm DIN rails, or M4 screw	
Test standards	IEC 61643-21		

OLA-1000POE

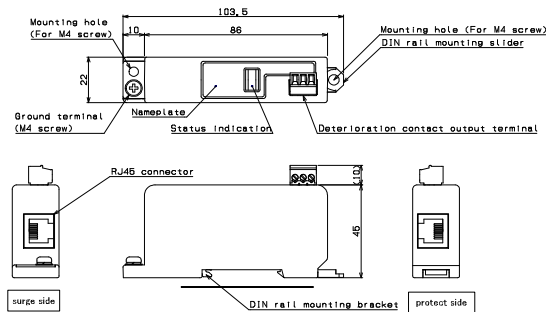


Dimension drawing

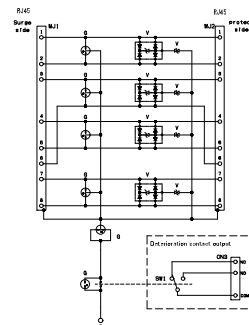
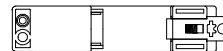


Basic Circuit Diagram

OLA-CAT6S



Dimension drawing



Basic Circuit Diagram

## Other information



OTOWA web site

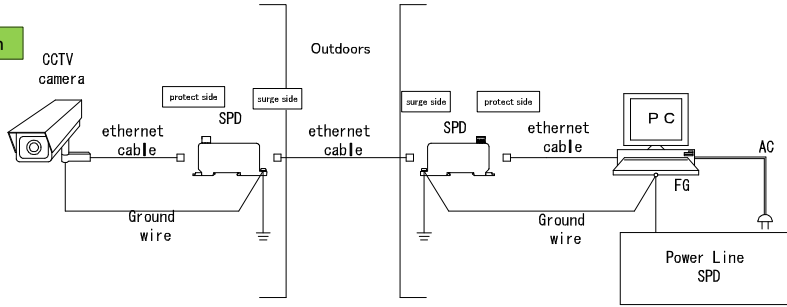


Instruction manual

CAT.No.EN-AS-06 `21.10

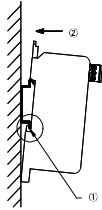


### Connection



### Mounting method

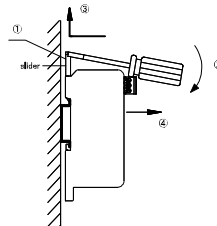
#### OLA-CAT6S



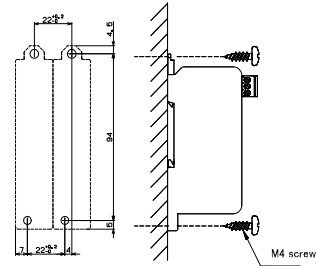
[Installation to DIN rail]

The SPD should be installed to the rail for equipment installation (35mm width of DIN standard rail)

After positioning the installation metal part ① of the SPD to DIN rail, push the SPD into DIN rail with arrow direction of ② until the end.



(1) After inserting the flat-blade screw driver to the hole of the slider (1) and tilting it with arrow direction of ②, pull out the slider with arrow direction of ③.  
(2) Pull off the SPD from DIN rail with arrow direction of ④, holding the fixing base.

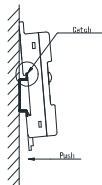


[Installation method to panel or board]

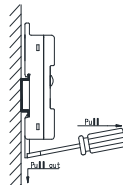
Holes must be punched or drilled on panel, and install the fixing base of the SPD by M4 screws or M4 tapping screws.

### Status indication

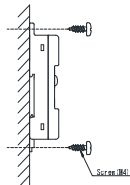
### Deterioration contact output terminal



[Mounting]  
(DIN Rail)



[Removal]  
(DIN Rail)



[Fixed]

- 1) The main body is on the DIN rail with the slider down please install it.
- 2) Hook the upper hook on the back of the main unit to the DIN rail.
- 3) Push the lower side of the main unit.
- 4) When removing the slider with a flathead screwdriver push it down and pull it forward to remove the lower side of the main unit.
- 5) Remove the upper side of the main unit from the DIN rail.
- 6) For mounting on a wood board, use M4 screws in the upper and lower round holes please fix it.

## OTOWA SPD for Coaxial Connection

Otowa High Frequency Surge Protective Device for coaxial cable are generally applicable for various signal lines. They are designed and tested to manage the transient overvoltages caused by lightning strikes on coaxial cables even sometimes connected directly to outside areas. The coaxial product lines cover the TV and CCTV systems and others with C2 and D1 impulse durability. They are available with N, BNC, F connections.



CS-BNCJ75-...



CS-FJJ75-T230HD

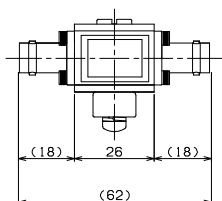
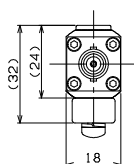


CS-NPJ50-...

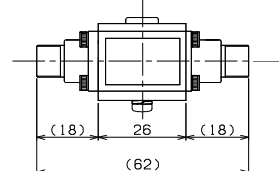
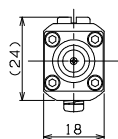
- SPD Class (Category)C2, D1 lightning durability
- Superior high frequency performance
- Protect surges from aerial antenna of Digital TV, BS, CS broadcasting line

Type	CS-BNCJJ75-T90FG2	CS-BNCJJ75-T230FG2	CS-FJJ75-T230HD	CS-NPJ50-T230LT	CS-NPJ50-T350LT	CS-NPJ50-800
SPD Class (Category)	BNC		C2, D1	N		
Connector type	socket / socket		socket / socket	socket / plug		
Bandwidth	100kHz ~ 3.0GHz		0 ~ 3.0GHz	0 ~ 3.0GHz	0 ~ 3.0GHz	0 ~ 2.0GHz
Impedance	75Ω		75Ω	50Ω	50Ω	50Ω
Insertion loss	100kHz ~ 1.5GHz : ≤0.2 dB 1.5GHz ~ 2.2GHz : ≤0.4 dB 2.2GHz ~ 3.0GHz : ≤0.6 dB		DC ~ 2.15GHz : ≤ 0.3 dB 2.15GHz ~ 2.6GHz : ≤0.4 dB 2.6GHz ~ 3.3GHz : ≤0.8 dB	0 ~ 2.0GHz : ≤ 0.2 dB	0 ~ 3.0GHz : ≤ 0.2 dB	0 ~ 1.0GHz : ≤ 0.1 dB 1.0 ~ 2.0GHz : ≤ 0.2 dB
Max. Continuous operating voltage (Uc)	60 Vdc		140 Vdc	80Vdc	250 Vdc	250 Vdc
Voltage protection level (8/20 μs : Up)	L-L : ≤630V L-E : ≤700V		L-L : ≤650V L-E : ≤800V	≤ 650 V	≤ 800 V	≤ 1200 V
C2 Nominal discharge current (8/20 μs)	20kA		15kA	20kA		
D1 Lightning impulse current (10/350 μs)	2.5kA		2.5kA	2.5kA		
Maximum allowable power	50W		80W	50W	100W	200W
Rated current	—		—	—	—	—
Overstressed fault Mode	mode 2		mode 2	mode 2	mode 2	mode 2
Voltage Standing Wave Ratio (VSWR)	100kHz ~ 1.5GHz : ≤1.1 1.5GHz ~ 2.2GHz : ≤1.2 2.2GHz ~ 3.0GHz : ≤1.4		0 ~ 2.15GHz : ≤1.3 2.15GHz ~ 2.60GHz : ≤1.4 2.60GHz ~ 3.3GHz : ≤2.0	0 ~ 2.0GHz : ≤1.2	0 ~ 3.0GHz : ≤1.2	0 ~ 1.0GHz : ≤1.1 1.0 ~ 2.0GHz : ≤1.2
Shield earthing	indirectly via an integrated spark gap		Directly	Directly		
Operating temperature range (TU)	-20 ° C ~ +80 ° C					
Weight	approx. 90g		approx. 85g	approx. 110g		
Degree of protection (if lines are connected)	IP 20			IP65 Only when the connector part (socket / plug) has been given an appropriate drip-proof treatment		IP 20
Location category	Indoor					
Test standards	IEC 61643-21					

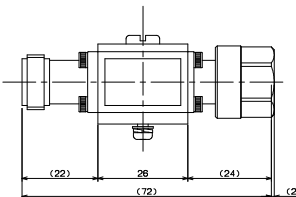
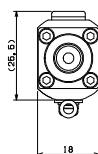
## Dimension drawing



CS-BNCJ75-...FG

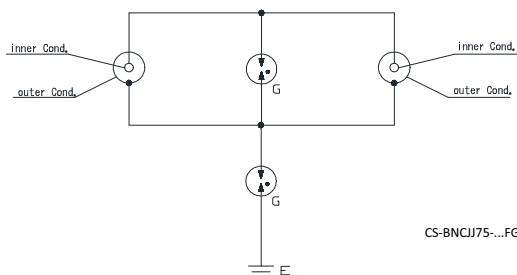


CS-FJJ75-T230HD

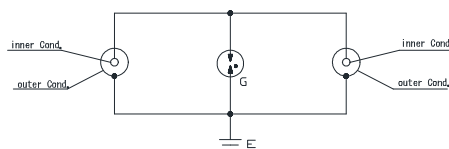


CS-NPJ50-...

## Circuit diagram



CS-BNCJ75-...FG

CS-FJJ75-T230HD  
CS-NPJ50-...

## Other information



OTOWA web site



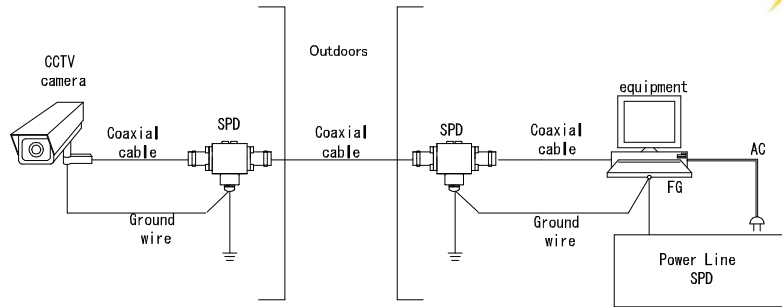
Instruction manual

## OTOWA SPD for Coaxial Connection

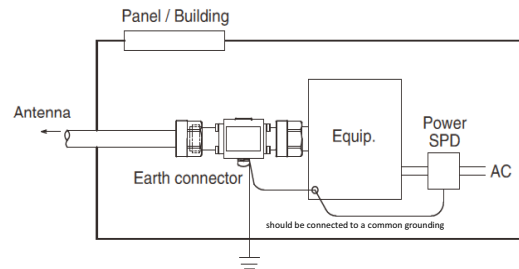
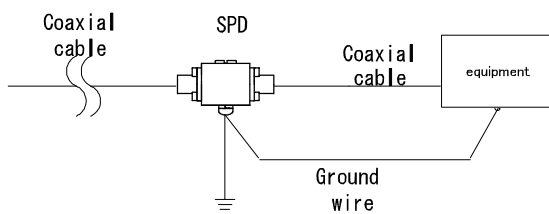


### Connection

When shield is not grounded indirectly via an integrated spark gap



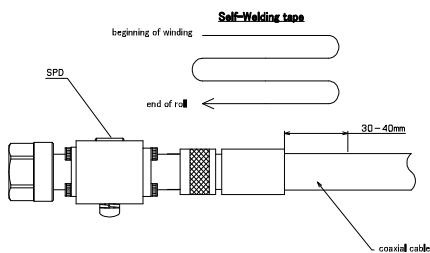
Shield earthing  
When the shield has the same potential as the ground



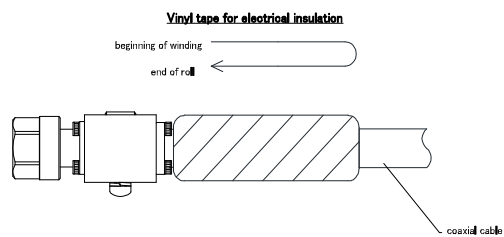
### Drip-Proof treatment method

CS-NPJ50-T230LT, CS-NPJ50-T350LT

1. cleaning  
Remove oil, water droplets, dust, etc. from the area to be taped.
2. Winding of Self-Welding tape  
From the base of the connector on the SPD side, while stretching the tape so that the width becomes about 3/4, wind the tape at least twice toward the cable side so that about half of the tape width overlaps and no gap is formed.  
Wrap the self-fusing tape around the coaxial cable 30 ~ 40 mm.



3. Winding of weatherproof vinyl tape for electrical insulation  
A weather-resistant vinyl tape for electrical insulation is wound round and round one or more times from the self-fusion tape similarly without clearance. The winding direction is opposite to the direction of the self-fusion tape. Always use weather-resistant vinyl tape.



### Manufacturer



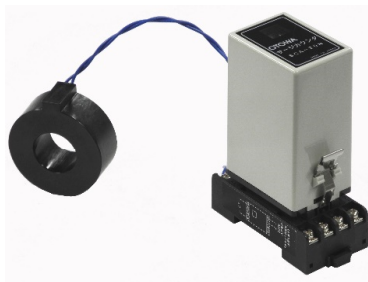
**OTOWA ELECTRIC CO.,LTD.**

5-6-20, Shioe, Amagasaki-city, Hyogo Pref. 〒661-0976, Japan

<https://www.otowadenki.com>

### Agency

## OTOWA Other Products



Surge counter (SCA-20N)



Surge recorder (SCA-20N)



Lightning memory (OLM-2/OLM-2S)



SPD Checker (AT-2KH)



## OTOWA Surge counter

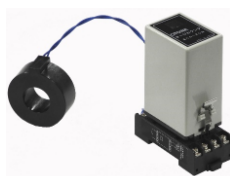
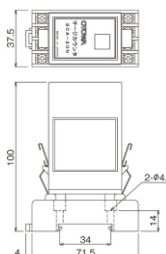
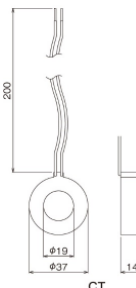
### Surge counter

OTOWA Surge counter can detect above certain lightning current that flows through earth wire and can indicate the number of them. EU RoHS Compliant with regulated substances

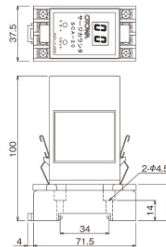
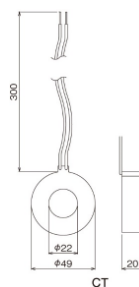


Dimension drawing (SCA-20)

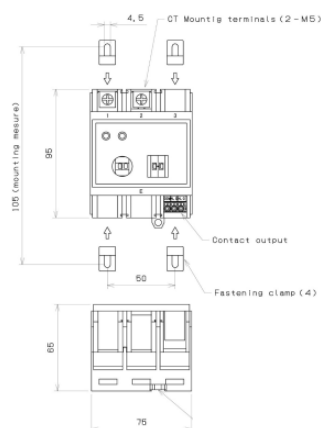
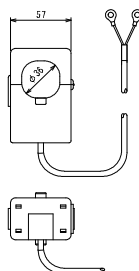
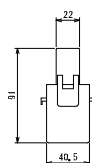
Dimension drawing



Dimension drawing (SCA-20N)



Dimension drawing (SCA-12N200KS)



Type	SCA-20	SCA-20N	SCA-12N200KS
Power source voltage	90V~240V (50Hz~60Hz)	unnecessary	unnecessary
Operating current (8/20 $\mu$ s)	10A/50A/100A Changing the current setting by short bar Initial current setting : 50A	100A	
Max. current	20kA (8/20 $\mu$ s)	50kA (8/20 $\mu$ s or 10/350 $\mu$ s)	200kA (8/20 $\mu$ s or 10/350 $\mu$ s)
Indication	2 digits LED (count max:254 times)	Electro-magnetic counter 2digits (count max. 99 times)	
Signal contact	Operating time for 500ms.	-	Operating time for 5ms.
Capacity of signal contact output	DC 30V 1A, AC125V 0.5A	-	DC 3V 2A, AC 12V 0.5A
Installing method	35mm DIN rail / M4 screw	35mm DIN rail / M4 screw	35mm DIN rail
Operating temperature	-10°C ~ +60°C		-10°C ~ +50°C

### Other information



OTOWA web site



Manual SCA-20



Manual SCA-20N

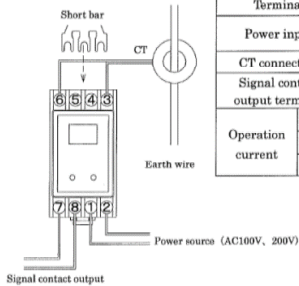


Manual SCA-12N200KS

# OTOWA Surge counter

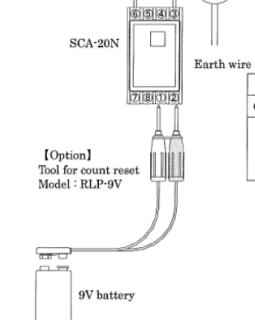
## Connection

### SCA-20



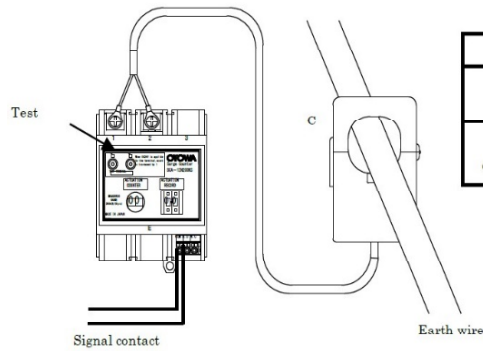
Terminal	Terminal No.	Explanation
Power input	①-②	AC100V or 200V(50/60Hz)
CT connection	③-⑥	—
Signal contact output terminal	⑦-⑧	a type contact
Operation current	10A (No short bar)	Short bar connection
	50A ⑥-⑤-④	
	100A ⑤-④-③	

### SCA-20N



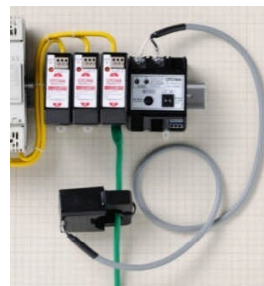
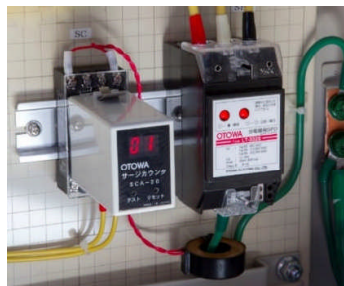
Terminal	Terminal No.	Explanation
CT connection	③-⑥	—
Count reset	①-②	①9V (DC) ②0V (Only for operating the indicator count.)

### SCA-12N200KS



Terminal	Terminal No.	Explanation
Test terminal	—	For operation check (DC23V~DC25V)
signal contact output terminal	COM—NO—NC	a type contact (COM-NO) b type contact (COM-NC)

## installation example



## Manufacturer



**OTOWA ELECTRIC CO.,LTD.**

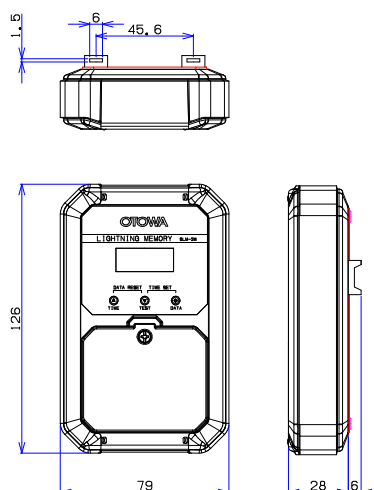
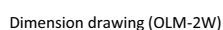
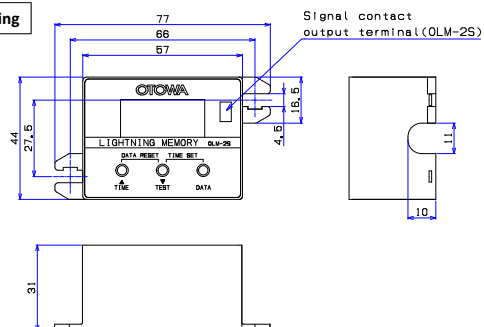
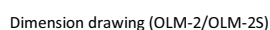
5-6-20, Shioe, Amagasaki-city, Hyogo Pref. 〒661-0976, Japan

**CONTACT US**

<https://www.otowadenki.com>

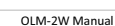
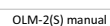
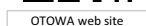
## Agency

OTOWA Lightning memory can detect and record above certain lightning current that flows through earth wire and can indicate the number and current level, date, time of them. EU RoHS Compliant with regulated substances



Type		OLM-2	OLM-2S	OLM-2W
Power source		LR03 (AAA) type Alkali battery 2 pieces		
Range of record surge current (8/20 $\mu$ s)		100/1000A		500/5000A
Max. current		25kA (8/20 $\mu$ s)		100kA (10/350 $\mu$ s)
Recorded data		Range of Surge current, year, month, day, time		
Recording medium		Internal memory		
Number of recording data		99		
Signal contact		-	operating time for 1s. (Open collector output)	-
Capacity of signal contact output		-	DC 80V 50mA	-
Installing method		Cable tie / M4 screw	Cable tie / M4 screw	Cable tie
Operating temperature	Measurement	-20°C ~ +50°C		
	Indication	0°C ~ +50°C		

## Other information



## ***OTOWA Lightning memory***

### Connection

#### OLM-2/OLM-2S

##### 1) Installation by screws

Earth wire is passed through the bottom dent and fix it by M5 or M6 screws. (2 parts, 1.5 to 2N•m)



##### 2) Installation by cable ties

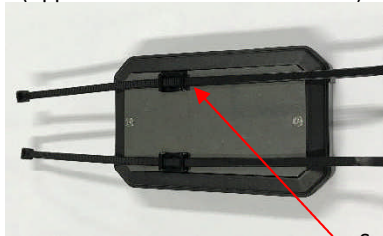
Earth wire is passed through the bottom dent and fix it by 2 cable ties.



#### OLM-2W

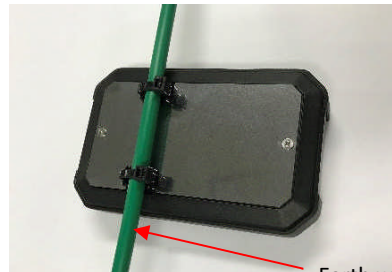
① Insert the cable ties into the hole of on back of the product.

(Applied bandwidth: 2.3 to 4.8mm)



Square hole

② Fix the product to the earth wire by tightening the cable tie.

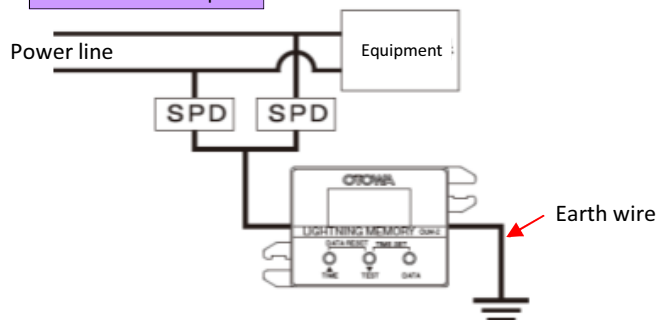


Earth wire

### installation example



### installation example



### Manufacturer



# **OTOWA ELECTRIC CO.,LTD.**

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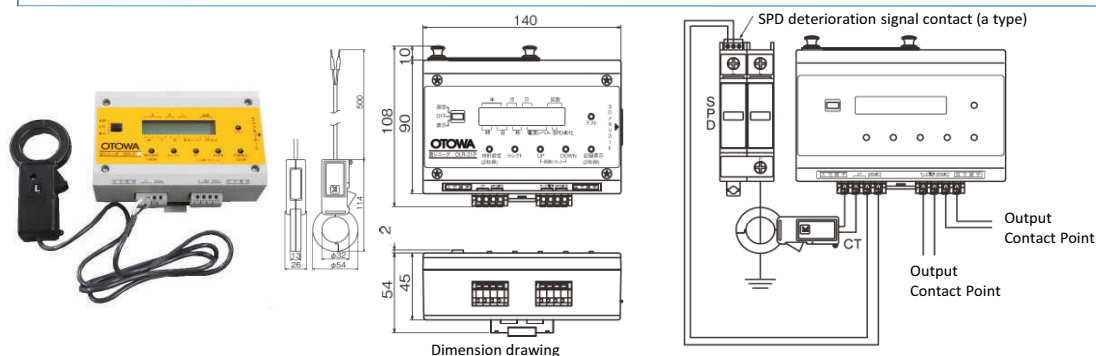
**CONTACT US**

<https://www.otowadenki.com>

### Agency

**OTOWA****OTOWA Surge recorder****Surge recorder**

**OTOWA Surge recorder can detect and record above certain lightning current that flows through earth wire and can indicate the number and current level, date, time of them.**



Type	OLR-31C
Power source	LR03(AAA) × 4 (3 years)
Range of record surge current (8/20 $\mu$ s)	100A/500A/1000A
Max. current	25kA (8/20 $\mu$ s or 10/350 $\mu$ s)
Recorded data	Range of surge current, year, month, day, time
Recording interval	5sec
Recording medium	SD card (2GB)
Number of recording data	999 (text data)
Signal contact	operating time for 1sec.
Capacity of signal contact output	Type of contact : a DC 30V 1A, AC125V 0.5A
Installing method	35mm DIN rail / M4 screw
Operating temperature	0°C ~ +50°C

**Other information**

OTOWA web site



Manual

**Manufacturer****OTOWA ELECTRIC CO.,LTD.**

5-6-20, Shioe, Amagasaki-city, Hyogo Pref. 〒661-0976, Japan

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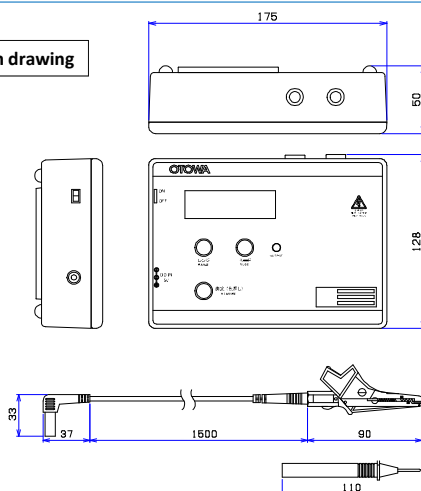
**OTOWA****OTOWA SPD Checker****SPD Checker**

**OTOWA SPD Checker can easily measure reference voltage and discharge voltage of various low voltage SPD.**



Dimension drawing

Dimension drawing



Type	AT-2KH
Power source	LR6(AA) × 4 or AC 100V-240V
Maximum output voltage	DC 1500V
Minimum measure voltage	Reference voltage(V1mA) : 10V Discharge voltage : 70V
Range of Voltage	150V / 700V / 1500V
Degree of accuracy	±5.0%rdg ±1dgt (Reference voltage) ±10%rdg ±1dgt (Discharge voltage)
Operating temperature	0°C ~ +50°C

**Other information**

OTOWA web site



Manual

**Manufacturer****OTOWA ELECTRIC CO.,LTD.**

5-6-20, Shioe, Amagasaki-city, Hyogo Pref. 〒661-0976, Japan

**CONTACT US**<https://www.otowadenki.com>**Agency**



# Damage investigation · solution proposal

## Precise Analysis by lightning protection specialist



The lightning protection method varies depending on various conditions such as the location of buildings and electrical wiring.

### Please contact us

We support all lightning countermeasures such as lightning protection of electrical equipment, external / internal lightning protection, grounding system and so on.

### Consulting · investigation

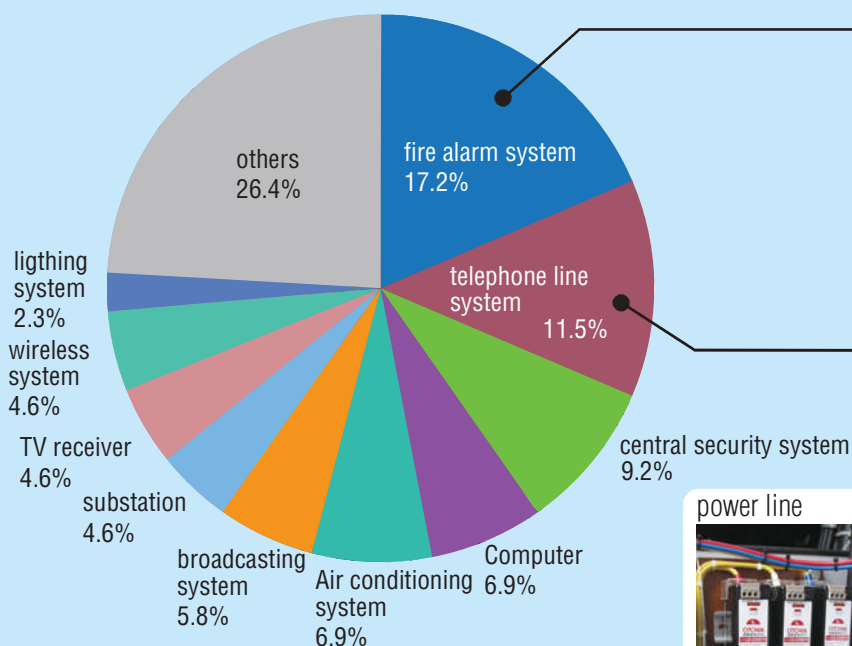
We check the route cause of lightning damage(environment of facility and climate), with priority on safety of equipment, instrument and the customer. We conduct on site investigation as necessary.

### Solution design and proposal

We propose the high-performance solution considering the cost effectiveness and safety.

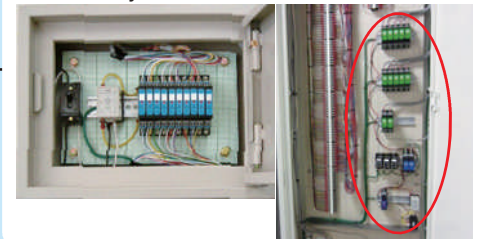
### ● Facilities lightning troubles occur

Lightning solution is necessary for fire alarm system, telephone system and security camera exposed to influence of lightning surge with long wiring.

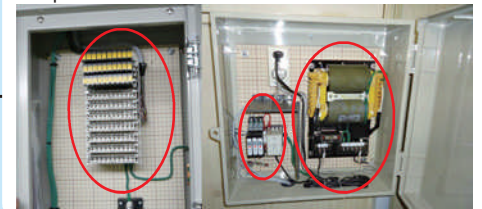


### ● Example of lightning protection

fire alarm system



telephone line



power line



# construction

## Provide the various products



Lightning protection measures can protect equipment by installing suitable SPDs at appropriate places. Various product lineups are available, including lightning arresters for power distribution, office, industrial, railway vehicles and household use. Customized lightning protection can be provided on demand.

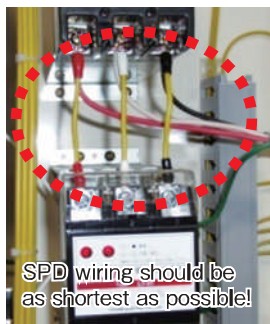
## We work with group companies specialized in external lightning protection and grounding technology

OTOWA has group companies in all areas of expertise related to lightning, such as NIP engineering specialized for ELPS and Geotech specialized in grounding technology etc.. So we implement optimal lightning countermeasures by the specialists of the lightning protection from various fields.

### Example of SPD installation



If wiring in a coil shape, overvoltage may occur.



### Grounding work



We provide not only installation SPD but also other various construction.

# Maintenance

## Maintenance service at any time

To build optimum lightning protection system, maintenance and inspection and feed back are essential. To answer the question if the lightning protection measures really work, we propose optimal measures based on actual simulations of your facilities. When performing maintenance work, OTOWA Group companies such as NIP Engineering conduct various maintenance inspections.

In addition, there are products such as surge counters that can see the effect of SPD, so it is best for judging the service life of SPD and the effect of lightning protection.

### Maintenance work

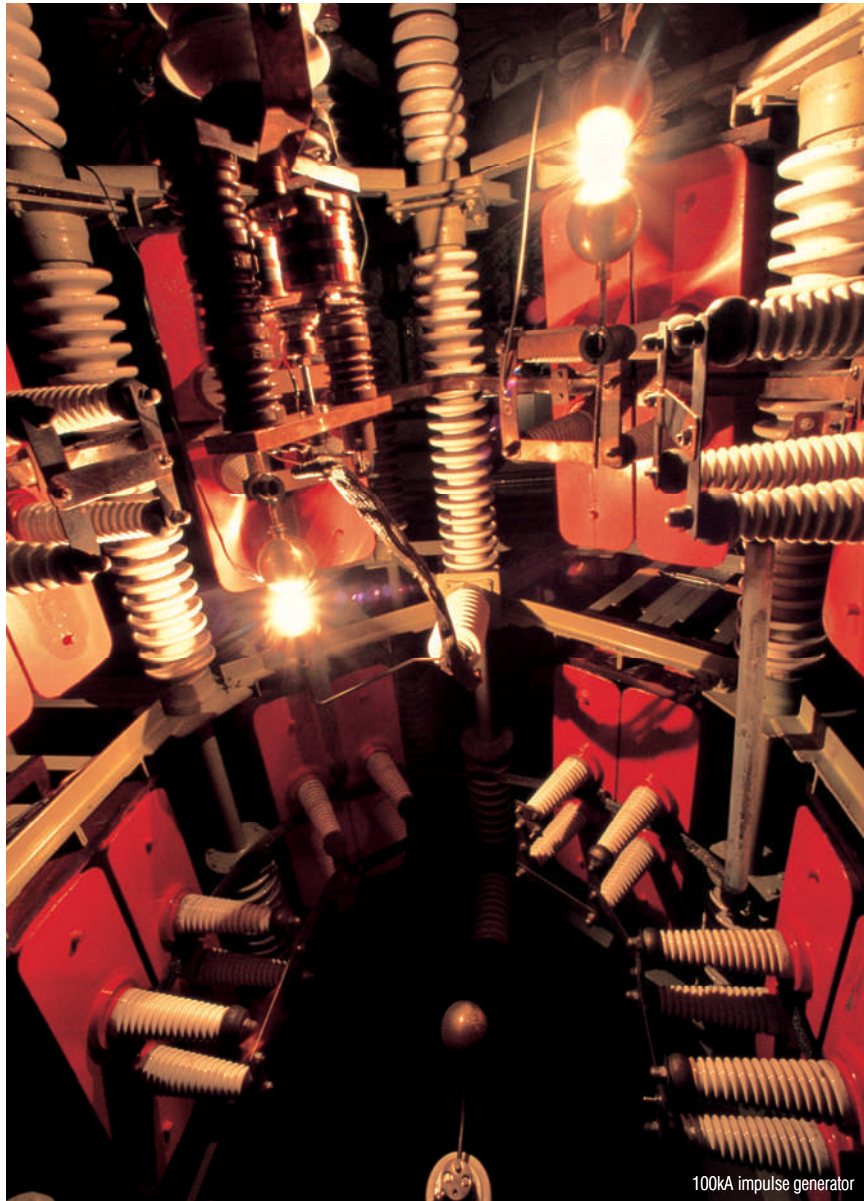


### Lightning recorder used as an index of maintenance

Just by connecting a recorder to the ground wire of the SPD, you can know the current level and time of the lightning.



Non-power type Surge counter is also available.



100kA impulse generator

## Certain technology creates reliable products

Our development test facilities in 1970 (picture) is highly performed as developing products with maintenance over and over. Since establishment of OTOWA, we focus on "lightning", design the latest test facilities and develop the technology. In Lightning Technology Center, it is able to provide the various service as literally the highest performed test facilities in the world and test according to the latest international standard.

# Contract test service

High current impulse generator (220kA)

We contribute to "improvement quality・low cost" of new technology and develop products

We perform based on JIS・IEC standards and reproduction test from lightning damage when we receive the damaged product.

We also provide to investigate and solve the volatile problem, then.

## ■Target test (apply for JIS・IEC standard)

- Withstand lightning surge test for electrical products (Impulse voltage test・current test)
- Withstand commercial frequency voltage test for electrical products
- Operation test for high/low voltage arrester
- Protection coordination test for high/low voltage arrester
- Mechanical strength: vibration test・ tensile and compression test
- Environmental test:cold/heat・solt mist・sunlight etc

## ■The flow of contract test



## ■Primaly test and facility

### Current impulse test

Simulation for lightning cuurent  
Representive wave form:10/350μs  
Highest generate current:220kA

### Voltage impulse test

Simulation for lightning voltage  
Wave form: 1.2/50μs  
Maximum generated voltage:1500V  
Maximum charge voltage:1600kV

### Lightning impulse current test

Simulation for lightning current  
Wave form:4/10μs or 8/20μs  
Maximum generated current:100kA

### Open/close impulse voltage test

Wave form:250/2500μs  
Maximum generated voltage:1000kV

### Lightning surge test (combination wave form)

Maximum generated voltage:40kV (1.2/50μs)  
Maximum generated current:20kA (8/20μs)

### Surge immunity test (Combination wave form)

It is able to peform marginal test for the lightning protection prodcut and allowance lightning surge test  
Maximum generated voltage:15kV (1.2/50μs)  
Maximum generated current :7.5kA (8/20μs)

### Environmental test・Vibration test

It is able to perform each environmental test ・vibration test to ensure liliability using the products sustainably  
・ Combination environmental test (Polymar material for test)  
・ Electrodynamic vibration test  
Excitation force:sine wave 16kN  
vibration frequency:5~3000Hz  
The maximum displacement:51mmp-p  
・ Constant temperature and humidity chamber  
Temperature:-40℃~200℃ Humidity:0~98%

### Simulation house for lightning test

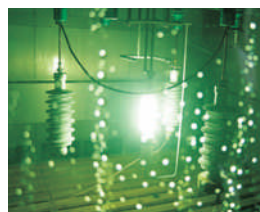
We simulate the various cases of lightning surge as using the real size model house in Lightning Technology Center.

### Current withstand voltage test

Maximum generate voltage:150kV



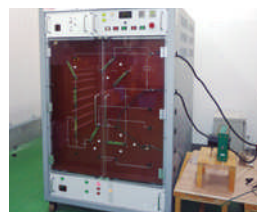
Combination environmental test



the situation of combination environmental test



Electrodynamic vibration test



Combination wave form generator



Lightning Technology Center  
Amagasaki city, Hyogo, Japan



# **Basics of Lightning phenomenon**

## What does lightning look like?

A lightning flash is only centimetres thick, however, every metre shines as bright as 1 million 100 watt light bulbs since the lightning flash is electrically charged.

It may come as a surprise that a lightning flash, with few exceptions, travels from the ground to the clouds! Fractions of a second before the actual lightning flash there is a downward leader, however, this is hardly visible to the human eye.

## What causes lightning?

Lightning originates from thunder cells which may have a diameter of several kilometres. Positively and negatively charged areas are created due to an uneven distribution of ice and water as well as updraft and downdraft winds in the cloud.

If the voltage differences become too high, an electrical discharge occurs (lightning flash). The thunder cells only last about 30 minutes and cause two to three lightning flashes per minute during this time.

Let's review our physics lessons

## What types of lightning are there?

There are cloud-to-ground flashes, ground-to-cloud flashes and cloud-to-cloud flashes.

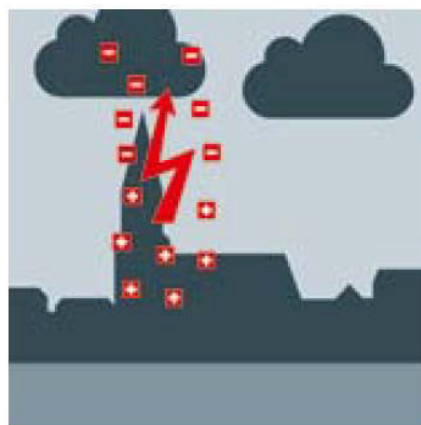
**Cloud-to-ground flash**, the electrically charged clouds equalise with the ground below. The lightning discharge is initiated by downward leaders from the cloud to the ground. They frequently hit flat ground and low buildings. Branching to the ground is characteristic of cloud-to-ground flashes.

**Ground-to-cloud flashes**, also referred to as upward flashes, may strike very high, exposed objects such as steeples, radio masts or mountain peaks. Upward branching is characteristic of ground-to-cloud flashes.

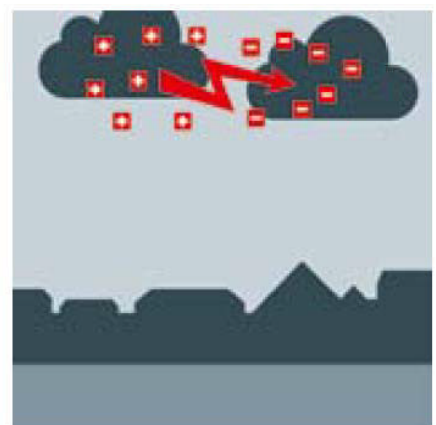
**Cloud-to-cloud flashes** occur within a cloud or between two clouds, however, they do not occur between clouds and the ground.



Cloud-to-ground flashes



Ground-to-cloud flashes



Cloud-to-cloud flashes

# What types of lightning are there?

There are cloud-to-ground flashes, ground-to-cloud flashes and cloud-to-cloud flashes. In case of a cloud-to-ground flash, the electrically charged clouds equalize with the ground below. The lightning discharge is initiated by downward leaders from the cloud to the ground. They frequently hit flat ground and low buildings. Branching to the ground is characteristic of cloud-to-ground flashes.

Ground-to-cloud flashes, also referred to as upward flashes, may strike very high, exposed objects such as steeples, radio masts or mountain peaks. Upward branching is characteristic of ground-to-cloud flashes.

Cloud-to-cloud flashes occur within a cloud or between two clouds, however, they do not occur between clouds and the ground.



Ground-to-cloud flashes



Cloud-to-cloud flashes

## How to identify a thunderstorm?

Outdoors is the most dangerous place to be during a thunderstorm. Therefore always keep an eye on the weather: Look for cumulus clouds with a typical „cauliflower“ or “candy floss” shape that may form towering clouds. Muggy weather with increasing wind, rolls of thunder, sheet lightning and falling air pressure are all signs that a thunderstorm is approaching.



Thundercloud like a candy floss!

## How fast Does lightning approach?

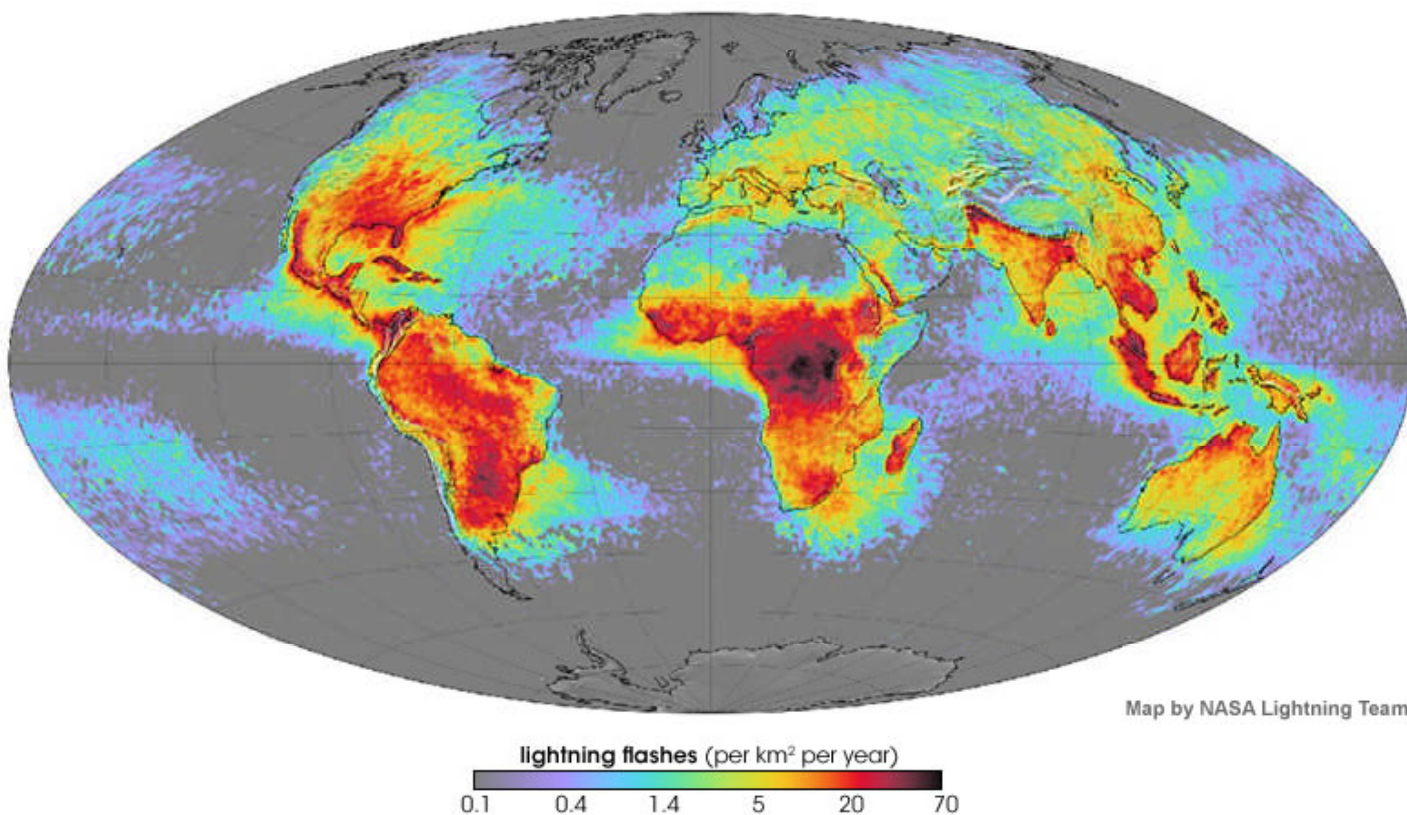
If you do not hear thunder 30 seconds after you saw a lightning flash you are on the safe side as the thunderstorm is far enough away. If you hear thunder 15 seconds after a lightning flash, it is only about 5 km away. You are at high risk if you hear thunder less than 5 seconds after a lightning flash. A lightning flash travels at about 300,000 km/s and is approximately 900,000 times faster than the relatively slow sound wave which has a speed of “only” about 330 m/s. This is why you see the flash quite a while before you hear the thunder.

## Estimating the distance from a thunderstorm

A common rule of thumb for roughly estimating the distance from a thunderstorm is to count the number of seconds between a flash of lightning and the next clap of thunder. Divide this number by 3 to get the number of kilometres.

### World Lightning Map

Lightning is not uniformly distributed across the Earth.



**World Lightning Map:** The map above shows the average yearly counts of lightning flashes per square kilometer based on data collected by NASA's Lightning Imaging Sensor on the Tropical Rainfall Measuring Mission satellite between 1995 and 2002. Places where less than one flash occurred (on average) each year are gray or light purple. The places with the largest number of lightning strikes are deep red, grading to black.



# **Terms and Definitions**

## Surge Protective Devices (SPDs)

Surge protective devices are devices consisting mainly of voltage-controlled resistors (varistors, suppressor diodes) and/or spark gaps (discharge paths). Surge protective devices are used to protect other electrical equipment and installations against impermissibly high surges and/or to establish equipotential bonding.

Surge protective devices are classified:

- a) according to their use into:
  - **Surge protective devices for power supply systems and equipment** (OTOWA Power line SPDs)  
for nominal voltage ranges up to 1000 V -according to EN 61643-11:2012 in type 1 / 2 / 3 SPDs -according to IEC 61643-11:2011 in class I / II / III SPDs
  - **Surge protective devices for IT systems and equipment** (OTOWA Signal line SPDs)  
for protecting modern electronic systems in telecommunications and signal-processing networks with nominal voltages up to 1000 V a.c. [root-mean-square value (rms)] and 1500 V d.c against the indirect and direct effects of lightning strikes and other transients, -according to IEC 61643-21:2012, EN 61643-21:2013 and DIN VDE 0845-3-1.
  - **Isolating spark gaps for earth-termination systems or equipotential bonding** (OTOWA Power line SPDs)
  - **Surge protective devices for use in photovoltaic installations** (OTOWA Power line SPDs)  
for nominal voltage ranges up to 1500 V - according to EN 50539-11:2014 as type 1 / 2 SPDs
- b) according to their impulse current discharge capacity and protective effect into:
  - **Lightning current arresters "OTOWA Class I SPDs"**  
for interference resulting from direct or nearby lightning strikes for protecting installations and equipment [for use at the boundaries between lightning protection zones (LPZ) 0A and 1].
  - **Surge arresters "OTOWA Class II SPDs"**  
for remote lightning strikes, switching overvoltages as well as electrostatic discharges for protecting installations, equipment and terminal devices {for use at the boundaries downstream of LPZ 0B}.

## Technical data

The technical data of surge protective devices comprise information defining their conditions of use according to:

- use (e.g. installation, power supply conditions, temperature)
- **performance in case of interference** (e.g. impulse current discharge capacity, follow current extinguishing capability, voltage protection level, response time)
- performance during operation (e.g. nominal current, attenuation, insulation resistance)

## Categories according to IEC 61643-21:2012

A number of impulse voltages and impulse currents are described in IEC 61643-21:2012 for testing the current carrying capability and voltage limitation of impulse interference. Table 3 of this standard lists these into categories and provides preferred values. In Table 2 of the IEC 61643-22 standard the sources of transients are assigned to the different impulse categories according to the decoupling mechanism. Category C2 includes inductive coupling (surges), category D1 galvanic coupling (lightning currents "OTOWA Class I SPDs"). The relevant category is specified in the technical data.

OTOWA surge protective devices surpass the values in the specified categories. Therefore, the exact value for the impulse current carrying capability is indicated by the nominal discharge current (8/20  $\mu$ s) and the lightning impulse current (10/350 $\mu$ s).

## Combination wave Uoc

A combination wave is generated by a hybrid generator (1.2/50 ps, 8/20 [is] with a fictitious impedance of 2 Q. The open-circuit voltage of this generator is referred to as Uoc. Uoc is a preferred indicator for *Class III* arresters since only these arresters may be tested with a combination wave (according to IEC/EN 61643-11).

## Cut-off frequency fc

The cut-off frequency defines the frequency-dependent behaviour of an arrester. The cut-off frequency is equivalent to the frequency which induces an insertion loss (at) of 3 dB under certain test conditions (see EN 61643-21:2013). Unless otherwise indicated, this value refers to a 50 Q system.

## Degree of protection

The IP degree of protection corresponds to the protection categories described in IEC/EN 60529.

## Direct Current Disconnection

When using SPD in d.c. applications, disconnection must be reliably ensured even if there are no zero crossings. The specifically developed DC Disconnection (DCD) acts as a wedge similar to a blocking valve and interrupts the direct current. Consequently, the devices of the "OTOWA Class II SPDs" DC series are capable of safely interrupting direct currents, thus preventing fire damage caused by d.c switching arcs.

## Disconnecting time ta

The disconnecting time is the time passing until the automatic disconnection from power supply in case of a failure of the circuit or equipment to be protected. The disconnecting time is an application-specific value resulting from the intensity of the fault current and the characteristics of the protective device.

## Energy coordination of SPDs

Energy coordination is the selective and coordinated interaction of cascaded protection elements (= SPDs) of an overall lightning and surge protection concept. This means that the total load of the lightning impulse current is split between the SPDs according to their energy carrying capability. If energy coordination is not possible, downstream SPDs are insufficiently relieved by the upstream SPDs since the upstream SPDs operate too late, insufficiently or not at all. Consequently, downstream SPDs as well as terminal equipment to be protected may be destroyed. DIN CLC/TS 61643-12:2010 describes how to verify energy coordination. "OTOWA Class I SPDs" offer considerable advantages due to their voltage-switching characteristic (see WAVE BREAKER FUNCTION).

## Frequency range

The frequency range represents the transmission range or cut-off frequency of an arrester depending on the described attenuation characteristics.

### Insertion loss

With a given frequency, the insertion loss of a surge protective device is defined by the relation of the voltage value at the place of installation before and after installing the surge protective device. Unless otherwise indicated, the value refers to a 50  $\Omega$  system.

### Lightning impulse current $I_{jmp}$

The lightning impulse current is a standardised impulse current curve with a 10/350  $\mu s$  wave form. Its parameters (peak value, charge, specific energy) simulate the load caused by natural lightning currents. Lightning current and combined arresters must be capable of discharging such lightning impulse currents several times without being destroyed.

### Mains-side overcurrent protection $I$ arrester backup fuse

Overcurrent protective device (e.g. fuse or circuit breaker) located outside of the arrester on the infeed side to interrupt the power-frequency follow current as soon as the breaking capacity of the surge protective device is exceeded. No additional backup fuse is required since the backup fuse is already integrated in the SPD (see relevant section).

### Maximum continuous operating voltage $U_c$

The maximum continuous operating voltage (maximum permissible operating voltage) is the r.m.s. value of the maximum voltage which may be connected to the corresponding terminals of the surge protective device during operation. This is the maximum voltage on the arrester in the defined non-conducting state, which reverts the arrester back to this state after it has tripped and discharged. The value of  $U_c$  depends on the nominal voltage of the system to be protected and the installer's specifications (IEC 60364-5-53).

### Maximum continuous operating voltage $U_{cpv}$ for a photovoltaic (PV) system

Value of the maximum d.c. voltage that may be permanently applied to the terminals of the SPD. To ensure that  $U_{cpv}$  is higher than the maximum open-circuit voltage of the PV system in case of all external influences (e.g. ambient temperature, solar radiation intensity),  $U_{cpv}$  must be higher than this maximum open-circuit voltage by a factor of 1,2 (according to CLGTS 50539-12). This factor of 1.2 ensures that the SPDs are not incorrectly dimensioned.

### Maximum discharge current $I_{max}$

The maximum discharge current is the maximum peak value of the 8/20  $\mu s$  impulse current which the device can safely discharge.

### Maximum transmission capacity

The maximum transmission capacity defines the maximum high-frequency power which can be transmitted via a coaxial surge protective device without interfering with the protection component.

### Nominal discharge current $I_n$

The nominal discharge current is the peak value of a 8/20  $\mu s$  impulse current for which the surge protective device is rated in a certain test programme and which the surge protective device can discharge several times.

### Nominal load current (nominal current) $I_L$

The nominal load current is the maximum permissible operating current which may permanently flow through the corresponding terminals.

### Nominal voltage $U_n$

The nominal voltage stands for the nominal voltage of the system to be protected. The value of the nominal voltage often serves as type designation for surge protective devices for information technology systems. It is indicated as an r.m.s. value for a.c. systems.

### N-PE arrester

Surge protective devices exclusively designed for installation between the N and PE conductor.

### Operating temperature range $T_u$

The operating temperature range indicates the range in which the devices can be used. For non-self-heating devices, it is equal to the ambient temperature range. The temperature rise for self-heating devices must not exceed the maximum value indicated.

### Protective circuit

Protective circuits are multi-stage, cascaded protective devices. The individual protection stages may consist of spark gaps, varistors, semiconductor elements and gas discharge tubes (see Energy coordination).

### Protective conductor current $I_{PE}$

The protective conductor current is the current which flows through the PE connection when the surge protective device is connected to the maximum continuous operating voltage  $U_c$ , according to the installation instructions and without load-side consumers.

### Remote signalling contact

A remote signalling contact allows easy remote monitoring and indication of the operating state of the device. It features a three-pole terminal in the form of a floating changeover contact. This contact can be used as break and  $I$  or make contact and can thus be easily integrated in the building control system, controller of the switchgear cabinet, etc.

## Response time $t_A$

Response times mainly characterise the response performance of individual protection elements used in arresters. Depending on the rate of rise  $du/dt$  of the impulse voltage or  $di/dt$  of the impulse current, the response times may vary within certain limits.

## Return loss

In high-frequency applications, the return loss refers to how many parts of the "leading" wave are reflected at the protective device (surge point). This is a direct measure of how well a protective device is attuned to the characteristic impedance of the system.

## Series resistance

Resistance in the direction of the signal flow between the input and output of an arrester.

## Shield attenuation

Relation of the power fed into a coaxial cable to the power radiated by the cable through the phase conductor.

## Short-circuit withstand capability

The short-circuit withstand capability is the value of the prospective power-frequency short-circuit current handled by the surge protective device when the relevant maximum backup fuse is connected upstream.

## Short-circuit rating $U_{cpv}$ of an SPD in a photovoltaic (PV) system

Maximum uninfluenced short-circuit current which the SPD, alone or in conjunction with its disconnection devices, is able to withstand.

## Temporary overvoltage (TOV)

Temporary overvoltage may be present at the surge protective device for a short period of time due to a fault in the high-voltage system. This must be clearly distinguished from a transient caused by a lightning strike or a switching operation, which last no longer than about 1 ms. The amplitude  $U_t$  and the duration of this temporary overvoltage are specified in EN 61643-11 (200 ms, 5 s or 120 min.) and are individually tested for the relevant SPDs according to the system configuration (TN, TT, etc.). The SPD can either a) reliably fail (TOV safety) or b) be TOV-resistant (TOV withstand), meaning that it is completely operational during and following temporary overvoltages.

## Thermal disconnecter

Surge protective devices for use in power supply systems equipped with voltage-controlled resistors (varistors) mostly feature an integrated thermal disconnecter that disconnects the surge protective device in case of overload and indicates this operating state. The disconnecter responds to the "current heat" generated by an overloaded varistor and disconnects the surge protective device if a certain temperature is exceeded. The disconnecter is designed to disconnect the overloaded surge protective device in time to prevent a fire. It is not intended to ensure protection against indirect contact. The function of these thermal disconnecters can be tested by means of a simulated overload / ageing of the arresters.

## Total discharge current $I_{total}$

Current which flows through the PE, PEN or earth connection of a multipole SPD during the total discharge current test. This test is used to determine the total load if current simultaneously flows through several protective paths of a multipole SPD. This parameter is decisive for the total discharge capacity which is reliably handled by the sum of the individual paths of an SPD.

## Voltage protection level $U_p$

The voltage protection level of a surge protective device is the maximum instantaneous value of the voltage at the terminals of a surge protective device, determined from the standardised individual tests:

- Lightning impulse sparkover voltage  $1,2/50 \mu s$  (100%)
- Sparkover voltage with a rate of rise of  $1 \text{ kV}/\mu s$
- Measured limit voltage at a nominal discharge current  $I_n$

The voltage protection level characterises the capability of a surge protective device to limit surges to a residual level. The voltage protection level defines the installation location with regard to the overvoltage category according to IEC 60664-1 in power supply systems. For surge protective devices to be used in information technology systems, the voltage protection level must be adapted to the immunity level of the equipment to be protected (IEC 61000-4-5:2017).



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