

WHITE PAPER 2018

STOP
TO OVERVOLTAGE PROBLEMS
WITH THE NEW RANGE OF
ZOTUP SPDs



ZOTUP[®]
INNOVATIVE SURGE PROTECTION

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ZOTUP IS AN ITALIAN COMPANY THAT HAS BEEN PASSIONATELY DEVELOPING
AND PRODUCING SURGE PROTECTION DEVICES FOR MORE THAN 30 YEARS



Picture 1 - ZOTUP company protected TOD's S.p.A. plants with its surge protection devices. The picture represents TOD'S headquarter in Sant'Elpidio a Mare, central Italy.

This article is divided into three parts: after a description of the company and its growth over the years, surge arresters, their main features and advantages are described.

Finally, a successful case history is presented: with **ZOTUP** SPDs, the plants of **TOD'S S.p.A** - Italian company leader in the production of footwear, clothing and luxury accessories - have been protected.

The company

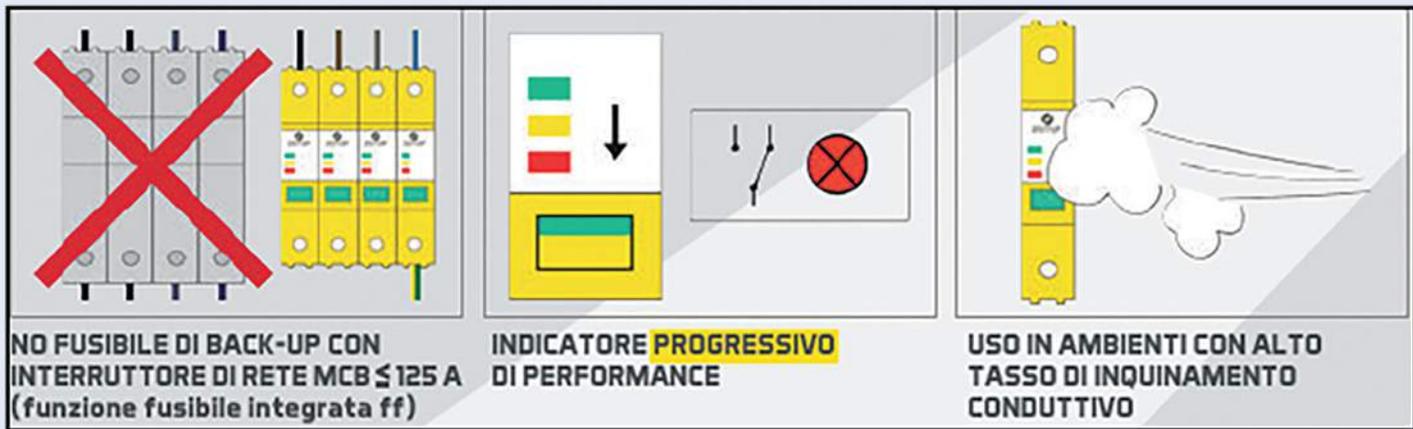
The company was founded in 1986 and it has therefore been present on the market for over 30 years: an Italian company born at a family level thanks to the owner's passion, grown and consolidated over the years till becoming well-know in the field both at national and international level.

The company is based in Bergamo, where technical, commercial, marketing and administrative offices are located. The production is made in Italy and the warehouse is organized in a flexible and dynamic way.

The distribution of **ZOTUP** surge protection devices throughout the country takes place within 24 hours (48 hours for the islands).

Also, in order to guarantee the maximum speed in deliveries, direct shipments to construction sites, end users and distributors' branches are organized. Design, construction and sale of surge arresters are the core business of the company, leading the company to become a leader in the Italian market with strong international perspectives. The completion of the 30th year of presence on the market, in 2016, was the turning point for the company.

A first sign was the launch of **products of the new range of surge arresters**, characterized by high performances thanks to the adoption of the latest technology, developed with a long research and development work inside the company.



Picture 2 - In 2016 ZOTUP launched a new technology which characterizes an entire family of SPDs which are able to satisfy several application requirements, thanks to their peculiar features

ZOTUP stands out in the current market for offering its customers products and services characterized by high quality standards. These are the key elements in the company: high innovation, investments in R&D, implementation of the offer in terms of service and technical support, internationalization.

As for the last one, among **ZOTUP** goals there has always been the expansionist ambition towards foreign markets. That's why for several years the company has taken part in international exhibitions such as MEE in Dubai, Elecrama in India, Hannover and Frankfurt fair in Germany. Furthermore, the company's international network operates and consolidates thanks to agencies in India, Iran and Turkey.

The international activity goes hand in hand with national initiatives: from fairs organized by the main distributors of electrical equipment to technical seminars organized in Italian cities in collaboration with the Orders of Engineers and Industrial Experts.

Last but not least, **ZOTUP** keeps its presence strong and steady on the national market thanks to an efficient sales network, with agencies present in each Italian region and a technical team with specialists who offer daily assistance by telephone, mail, attendance at the dealer's desk, inspections and on-site visits.

The ZOTUP product range

ZOTUP offers surge protection devices for each application:

- Low Voltage
- DC applications
- Photovoltaic systems (PV)
- Wind Turbines
- Public Lighting (protection for LED)
- Telecommunication and signalling
- Data transmission and antenna
- Railway installations
- Cathodic Protection Plants
- Medium Voltage

The offer is wide and complete.

The products comply with IEC and EN standards and benefit from the KEMA-KEUR Quality Mark.

Continuous innovation is the cornerstone of **ZOTUP** philosophy.

After four years and a half of research and development, with over 330 laboratory tests and 4 international patents, the company launched in 2016 **a new technology** that characterizes an entire family of surge arresters, which are able to meet different application needs thanks to their own peculiar features (picture 2).

> INTEGRATED FUSE FUNCTION (ff)

On the occasion of the eventual end of life of the arrester, **ZOTUP** SPDs have the integrated **fuse function** that guarantees, under certain conditions, the open circuit failure mode, without the use of back-up fuses placed in series. The elimination of fuses (internal or external fuses) and fuse connection cables eliminates the problem of the fuse rating, improving the overall protection level and reducing the overall dimensions inside the panel.

> PROGRESSIVE PERFORMANCE INDICATOR

The new SPDs allow to monitor their level of degradation locally, by means of the **progressive performance status indicator**, and remotely by means of a changeover contact which is activated when the performance reaches its minimum state. In this way, we moved from the "end-of-life status" information to a preventive information that allows the SPD replacement on time. This type of information is of fundamental importance, since it allows to prevent the possible damage of the equipment which needs to be protected in case of impulsive overload of the surge arrester.

> POLLUTION DEGREE 3

This feature allows the use of these SPDs even in particularly severe environments due to the presence of conductive elements such as: dust, salt air, humidity, condensation. In presence of conductive pollution, SPDs can suffer serious damage, even in the absence of overvoltage.



Picture 3 - ZOTUP SPD type L 25/100 230 t ff 4, code 215 140



Picture 4 - ZOTUP SPD type L 25/100 230 t ff, code 215 100



Picture 5 - Example of protection of an already existing CED board of big dimensions with ZOTUP SPD ILF 4P 400

ZOTUP, thanks to intensive research into materials and a specifically oriented project, meets the requirements of **Pollution Degree 3 up to 400 V and goes beyond the Temperature Extended Range.**

FOCUS ON PRODUCTS:

ZOTUP surge protection devices

Here below we present two types of **ZOTUP** products, with their technical characteristics and applications.

SPDs for Low Voltage applications:

ZOTUP SPD type **L 25/100 230 t ff** code **215 100**, where:

- “L” indicates the Limiting technology,
- “25” is the impulse discharge current I_{imp} (10/350 μ s),
- “100” is the maximum discharge current I_n (8/20 μ s),
- “230” is the value of the voltage to the ground to which the SPD is subjected,
- “t” indicates the presence of the remote signal contact,
- “ff” indicates the SPD family with the new technology, it means Fuse Function.

L 25/100 230 t ff (picture n. 4) is a voltage limiting SPD providing a single mode of protection, typically installed at the origin of the installation (e.g. in the Main Distribution Board (MDB)), in TN-systems or in TT-systems in combination with N-PE SPD model I 100, I 52 and with connection type CT2 (1+1 or 3+1). It provides the following features and benefits:

- Impulse test classification: Test class I and II / Type 1 and 2 (according to IEC/EN 61643-11);
- L 25/100 230 t ff is a voltage limiting SPD for the protection of low voltage installations and equipment against direct and indirect lightning effects;
- Backup protection is not required with an upstream MCB ≤ 125 A or up to an $I_{scrr} \leq 4$ kA rms;
- The impulse current is divided into two independent branch circuits, each branch providing its own disconnector and Status Indicator;
- Three colour Status Indicator with progressive indication of remaining performance.

The fields of application are manifold, such as installation in the power centers for protection of industrial plants with TN-S distribution system and installation in the panel for protection of tertiary plants with TT distribution system. The versatility of this SPD is reflected in the internal features that allow to achieve high levels of protection of the equipment, starting from the power centers. Currently the presence of electronic equipment sensitive to overvoltage is very widespread and this equipment are already present inside low voltage general boards and power centers. Achieving effective reliable protection, tailored to one’s needs, is a fundamental aspect that must be taken into consideration.



Picture 6 - ZOTUP SPD type L 13/40 230 t ff 4, code 214 140



Picture 7 - ZOTUP SPD type C 6, code 358 006

Surge arresters for applications with additional interference filtering demand

ZOTUP has always focused on technological innovation as the milestone of its research activity.

The purpose is to obtain protection against direct and indirect atmospheric discharges, as well as induced overvoltage, in an effective and reliable manner.

Another fundamental aspect is the attenuation of high frequency conducted disturbances, in order to significantly reduce malfunctions and failures of electronic equipment due to the harmonics associated with network interference. This type of disturbance is part of a specific regulation, that is the ECM, electromagnetic compatibility.

One of the fields of considerable importance for the protection from both direct and indirect discharges and problems related to electromagnetic compatibility is the one where Data Centers, CED and DCS are installed.

The extent of damage due to out-of-service Data Centers has required the adoption of increasingly important protection measures.

Overvoltage of atmospheric origin, as well as high frequency electromagnetic disturbances, concur to generate events whose conclusions are often "catastrophic". In these systems a specific high-performance overvoltage protection has become essential.

Direct lightning strikes are the main sources of devastating destructive effects; indirect discharges and the electromagnetic disturbances conducted in high frequency are sources of numerous damages, whose origin is not easy to identify, but whose effects are just as terrible for plants in which continuity of operation is indispensable.

All these phenomena must be appropriately intercepted in order to protect the plants connected to the grid and thus to guarantee their integrity and the necessary continuity of operation.

This aspect is particularly relevant when the equipment to be protected are servers located inside Data Centers, Data Centers, TLC or DCS plants for the supervision and control of industrial processes, where service continuity and data integrity are fundamental elements.

Considering these problems, it is essential to include surge protection devices in these systems, to protect from direct or indirect discharges (high performance SPDs). It is also essential to insert broad-spectrum filters capable of attenuating the conducted electromagnetic disturbances which cover a frequency range from 150 kHz to 30 MHz.

ZOTUP SPDs and filters called **ILF 4P 250** and **ILF 4P 400** (picture 5), manufactured for high nominal currents (respectively of 250 and 400 A), are devices that perform all the functions previously indicated. They are Type 1, 2 and 3, according to Standards IEC/EN 61643-11 Ed. 1.

To understand the high degree of performances of these devices with respect to LEMP (lightning electromagnetic pulse), high frequency electromagnetic disturbances and how brilliantly they face and overcome the stresses generated by the same power supply network (such as temporary overvoltage and switching pulses), and it is fundamental to know and evaluate the following parameters in individual cases:

- overvoltage and overcurrent of atmospheric and switching origin;
- temporary overvoltage TOV;
- levels of protection;
- short circuit withstand capability;
- follow current interrupt rating I_{fi};
- response time;
- noise level attenuation in common mode (asymmetric attenuation);
- noise level attenuation in differential mode (symmetric attenuation).



Picture 8 - ZOTUP SPD type S-F 1/6, code 318 008



Picture 9 - ZOTUP SPD type L 7/30 230 t ff 4, code 217 140

The use of **ZOTUP** protection devices such as **ILF 4P 250** and **ILF 4P 400** allows full protection from electromagnetic interference, both with high and low energy content and with high frequency. **ILF 4P 250** and **ILF 4P 400** SPDs can also be used in replacement of the isolation transformers (when adopted with the filter function). According to the classic theory, the introduction of an isolation transformer modifies the system of energy distribution, generating an IT system downstream for which it is essential to adopt complex measures to control insulation. The adoption of ILF SPDs avoids this problem, as the TN distribution system is not modified.

This family of **ZOTUP** surge arresters, compared with isolation transformers, also allows lower energy dissipation with consequent cost savings.

Usually, in fact, the efficiency of an isolation transformer is about 96-97%; while the yields of **ILF 4P 250** and **400** are around 99%. Furthermore, **ZOTUP** SPDs and filters are particularly suitable and effective when they are installed as local protection, i.e. dedicated to individual devices, to be protected in coordination with SPDS tested for protection against direct and indirect discharges.

The symmetrical and asymmetric attenuation constants offer a wide frequency range, within which they are able to guarantee excellent noise level attenuation.

The family of surge arresters and filters is even wider: from single-phase to three-phase systems.

The choice of the correct type of SPDs and filters is based on the rated load current.

Here below are the typical nominal currents associated with single-phase protections:

- 8A, 16A, 25A, 32A, 50A and 80A

and to three-phase protections plus neutral:

- 32A, 50A, 80A and 120A

The wide range of surge arresters and filters allows to make an effective and efficient coordination for overvoltage protection.



Picture 10 - ZOTUP SPD type S-ASI 5, code 340 005



Picture 11- ZOTUP SPD type L 3/30 230 t ff 4, code 210 140



CASE HISTORY: ZOTUP PROTECTS TOD'S COMPANY

In the last few years **ZOTUP** has built a close collaboration with the Italian company **TOD'S S.p.A.**, which is leader in the production of luxury footwear, clothing and accessories, with headquarters in Sant'Elpidio a Mare (province of Fermo, central Italy).

The manufacturing company was founded in the early 1900s when Mr. Filippo Della Valle opened a small shoe factory. The company moved from the family level to the industrial and later international level at the end of the '70s, with Mr. Diego Della Valle entering the firm, and the beginning of the process of progressive development of the business. Today **TOD'S S.p.A.** is the operating holding company of a Group, which ranks among the main players in the world of luxury goods, with the brand names Tod's, Hogan, Fay and Roger Vivier.

Over the years, **ZOTUP** has been involved in protecting **TOD'S** production plans in Italy. In particular, in 2016 **ZOTUP** managed the protection of the Energy Distribution of all the electric boards and all the signal circuits of **TOD'S** Headquarter in Sant'Elpidio a Mare, central Italy (picture 1). The work was carried out in collaboration with Engr. Gabriele Romanelli, Head of **TOD'S** Corporate Technical Office, assisted by the consultant Engr. Marco Valigi of the Technical Bureau **FLU.PROJECT**.

In this context it was decided to coordinate a series of highly effective SPDs that guarantee continuity of operation and protection of highly sensitive utilities such as CNC machines, CED, Video Surveillance and Intrusion detection systems.

Below are listed the installed SPDs:

- Power Centers Protection: **ZOTUP** SPD type **L 25/100 230 t ff 4** code **215 140** (picture 3).
- Protection of the Department Distribution Boards and of Area Boards: **ZOTUP** SPD type **L 13/40 230 t ff 4**, code **214 140** (picture 6). Following important weather events, the plant of Sant'Elpidio a Mare was hit by several lightning, which involved the intrusion detection systems, video surveillance and intercom systems.

ZOTUP was involved, in collaboration with external consultants, in order to guarantee the protection of these plants.

- For the protection of signal lines of anti-intrusion system boards, **ZOTUP** SPD type **S-ASI 12**, code **340 012** was installed.
- Concerning the protection of video surveillance plants, infrared cameras have been protected both sides (camera and NVR) with the following products:
 - **ZOTUP** SPD type **C 6**, code **358 006**, (picture 7) for CCTV protection on coaxial cable.

- **ZOTUP** SPD type **S-F 1/6**, code **318 008**, for the protection of IP cameras (picture 8).
- **ZOTUP** SPD type **S-ASI 5**, code **340 005**, for the protection of telemetries (picture 10).
- Concerning the intercom system, the **ZOTUP** team used the following product, to ensure the both sides protection of devices:
 - **ZOTUP** SPD type **S-ASI 48**, code **340 048**, for protection of signal lines.

After the positive conclusion of the protection work in Sant'Elpidio a Mare and considered **TOD'S** satisfaction, **ZOTUP** was later involved in the protection of the new production plan of Arquata del Tronto. The new Arquata factory was built by **TOD'S** in one of the municipalities most affected by the disastrous earthquake of 2016, with the aim of supporting the territory and sending a tangible signal of hope to the young people of the area.

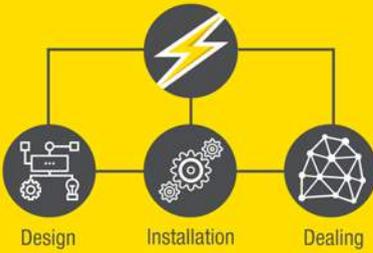
On this occasion, **ZOTUP** protected all the distribution boards with the following products:

- **ZOTUP** SPD type **L 7/30 230 t ff 4**, code **217 140** (picture 9)
- **ZOTUP** SPD type **L 3/30 230 t ff 4**, code **210 140** (picture 11).

SERVICE

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