TBS
Transient and lightning protection systems

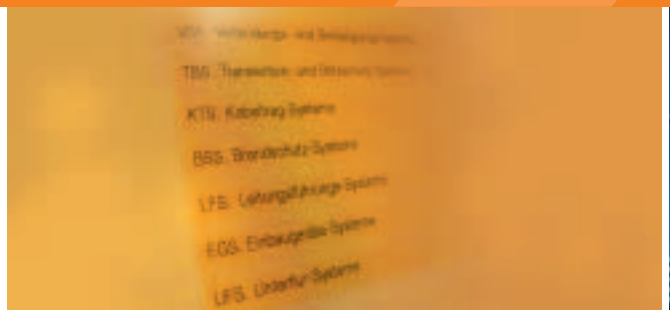
With extensive planning aids for safe installation

OBO BETTERMANN

OBO. Used by professionals.

OBO knows what professionals need: perfect solutions for all electrical installation applications. User-friendly, practical products for fast and uncomplicated installation supported by a comprehensive training programme and the OBO expert hotline and on-site assistance. OBO – the brand with the hot wire to the customer.

Systems Quality



Conducting electricity, routing data, controlling energy – carrying a complete range of over 30,000 articles, OBO offers user-friendly products and practical solutions for a professional data and electrical infrastructure in electrical installations. And as anyone working with OBO quality products knows, one goes hand in glove with the other. Versatility coupled with integrated thinking – something we as a system manufacturer take for granted.

- Seamless and complete programme for all aspects of an electrical installation
- Over 30,000 items in seven product units
- On-going product maintenance and further development
- Proprietary development and production facilities

Professionals need quality. A quality offered by all OBO brand products and services:

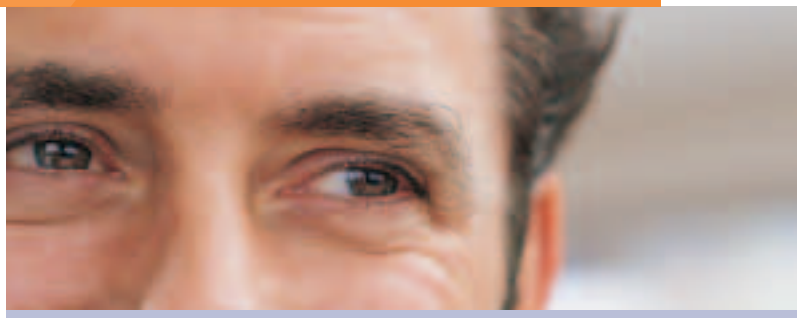
- QA certification to DIN EN ISO 9001:2000
- Tested material and manufacturing quality
- Numerous national and international test seals and certificates: GS and VDE marks, UL approvals
- Active involvement in national and international standardisation bodies
- Perfect logistical solutions for packing and shipping applications
- All products in this catalogue are CE-compliant. This also applies to standard parts such as screws and nuts that are components of various product systems.

OBO BETTERMANN

Professional transient and lightning protection – an extremely "hot" topic. The purpose of this catalogue is to provide you with established information on this complex of topics and take you through the steps required to achieve reliable lightning and surge protection. We use typical real-life examples and key theoretical principles. We would also like to extend an invitation: make use of our extensive seminar programme on these topics. Call our hotline or visit www.obo.de where you will find the latest dates.

Your OBO TBS Team

Local Support & Advice



OBO BETTERMANN has subsidiaries, regional branches and representatives in over 50 countries. All centres ensure that OBO gets to the customer faster and better.

● = Branch ● = Agency

- Argentinia
- Australia
- Austria
- Belgium
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- Bulgaria
- China
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- Denmark
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- Norway
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- South Africa
- Spain
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- Yugoslavia

Experts in their field, OBO staff provide professional support and advice: with solutions, application tips and hints and practical seminars in OBO centres and branches.

Technical telephone hotline
+49 (0) 23 73/89-15 00

Technical fax hotline
+49 (0) 23 73/89-15 50

Technical e-mail hotline
hotline@obo.de

Telephone ordering
+49 (0) 23 73/89-222

Fax ordering
+49 (0) 23 73/89-16 61

e-mail ordering
auftragsannahme@obo.de

Internet
www.obo-bettermann.com

OBO transient and lightning protection system at a glance

OBO Bettermann has been offering components for professional lightning protection for over 80 years. The very first installation materials developed over the years to become a complete range of standards-compliant lightning protection components. A growing need for internal lightning protection emerged as electro-technology moved into private households, offices and business establishments. OBO responded swiftly: surge protections systems for electrical equipment have been part of the range since the end of the 1970s. Today, OBO offers an entire product range for:

1. **Surge protection systems**
2. **Equipotential bonding systems**
3. **Lightning protection systems**
4. **Earthing systems**

Contents

Minor cause, major effect: damage caused by surges

Our dependency on electrical and electronic equipment continues to increase, in both our professional and private lives. Data networks in companies, for auxiliary equipment in hospitals and fire departments for example, are vital for the real-time transfer of information that has long since been indispensable. Sensitive databases, e.g. in banks or media publishers, need reliable transmission paths.
It is not only lightning strikes that pose a latent threat to these systems. More and more frequently, today´s electronic aids are damaged by surges caused by remote lightning discharges or switching operations in large electrical systems. During thunderstorms, too, high volumes of energy are instantaneously released. These voltage peaks can penetrate a building through all manner of conductive connections and cause enormous damage.

Lightning strike in the historical Worpswede town hall. Damage: approx. €1.7 million.

Fire in a residential building caused by a direct lightning strike

What are the consequences of damage caused by surges in our daily lives?

The most obvious one is the destruction of electrical equipment. In private households, these are specifically:

- TV/video recorders
- Telephone systems
- Computer systems, hifi systems
- Kitchen equipment
- Monitoring systems
- Fire alarm systems

The failure of such equipment certainly incurs great expense.

What happens when the following suffer outage times/consequential damage:

- Computers (loss of data)
- Heating and hot water system
- Lift, garage door and roller shutter drive
- Activation and/or destruction of the fire/burglar alarm system (costs incurred by false alarm)?

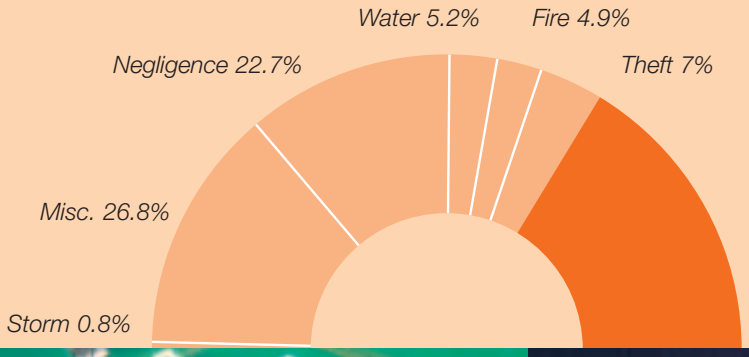
A “vital” topic perhaps, particularly in office buildings.

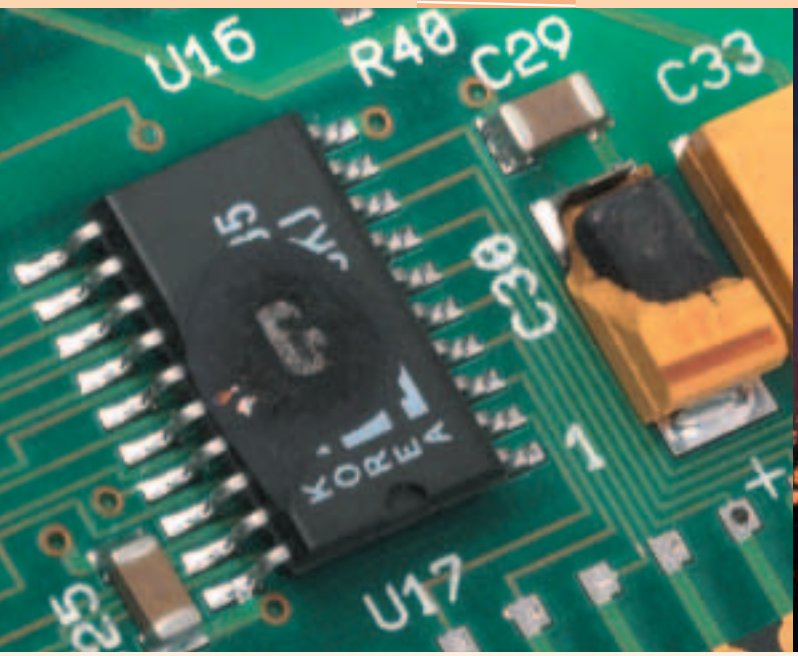
- Can your company continue to operate smoothly without a host computer or server?
- Have all important data been backed-up in good time?

Growing sums of damage

Current statistics and estimates of property insurers reveals: damage levels caused by surges – excluding consequential or outage costs – long since reached drastic levels due to the growing dependency on electronic “aids”. It´s no surprise, then, that property insurers are checking more and more claims and stipulating the use of devices to protect against surges. Information on protection measures is contained, e. g. in Directive VDS 2010.

Damage events reported by an insurer of electronic equipment
Analysis of approx. 9,000 damage events:





PC boards destroyed by surges

A real calculation example:

May 2004: During a storm, a lightning strike with 167 registered discharges hits the roof of a warehouse. An office building is situated nearby (1 km). Partial lightning currents couple with the office building via the data cable and power supply connection.

Result:	
25 PCs destroyed	**12.500 €**
1 server partially destroyed	**8.000 €**
Telephone system (repairs)	**1.400 €**
4 telephones/fax machines	**600 €**
Cost of restoring data	**4.000 €**
Interim damage sum	**26.500 €**
2 days without telephone contact	**?? €**
2 days of production outage	**?? €**
Costs for a long-life OBO surge protection concept with a 5-year warranty	**approx. 5.000 €**

What causes surges?

Transient surges: the largest voltage peaks in the low-voltage consumer network are caused by lightning discharges. The high energy content of lightning surges when a direct strike hits the external lightning protection system or a low-voltage over-head line usually causes – without internal lightning and surge protection – total outage of the connected consumers and damage to the insulation. Yet induced voltage peaks in building installations and energy or data supply cables can also reach many times the nominal operating voltage. Switching surges, too, which in fact do not cause such high voltage peaks as lightning discharges but occur much more frequently, can result in immediate system failure.

Direct lightning strike into a building

If a lightning strike hits the external lightning protection system or earthed roof structures capable of carrying lightning current (e.g. roof antenna), the lightning energy can be safely diverted in advance to the ground potential. However, this has not yet been done with a lightning protection system alone: due to its impedance, the building´s entire earthing system is raised to a high potential. This potential increase causes the lightning current to be split over the building´s earthing system and also over the power supply systems and data cables to the adjacent earthing systems (adjacent building, low-voltage transformer).
Threat value: up to 200 kA (10/350)

Direct lightning strike into a low-voltage over-head line

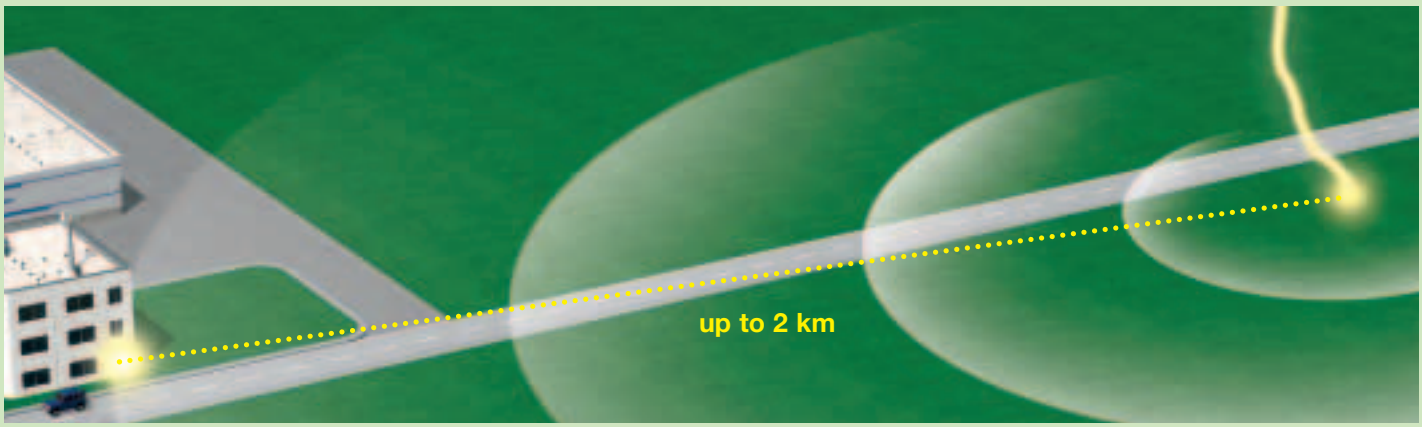
A direct lightning strike into a low-voltage over-head line or data cable can couple high partial lightning currents in an adjacent building. Electrical equipment in buildings at the end of the low-voltage over-head line are at particular risk of damage caused by surges.
Threat value: up to 100 kA (10/350)

As a rule, switching surges amount to two to three times the operating voltage, lightning surges on the other hand can sometimes reach 20 times the nominal voltage value and transport a high energy content. Often, failures occur only after a time delay as the aging process of electronic components in the affected devices triggered by smaller transients causes insidious damage. A number of different protection measures are required. These depend on the exact cause and/or impact point of the lightning discharge.

Switching surges in the low-voltage system

Switching surges are caused by switch-on and switch-off operations, by switching inductive and capacitive loads and by interrupting short-circuit currents. Particularly when production plants, lighting systems or transformers are switched off, electrical equipment located in close proximity can be damaged.
Threat value: several kA (8/20)

Coupling of surges through local or remote lightning strike



Even if lightning protection and surge protection equipment is installed, a local lightning strike creates additional high magnetic fields, which in turn induce high voltage peaks in line systems. Inductive or galvanic coupling can cause damage within a radius of up to 2 km around the lightning impact point.
Threat value: several kA (8/20)

Gradual surge reduction with lightning protection zones

The lightning protection zone concept described in international standard IEC 62305-4 (DIN V VDE V 0185 Part 4) has proved to be practical and efficient. This concept is based on the principle of gradually reducing surges to a safe level before they reach the terminal device and cause damage. In order to achieve this situation, a building´s entire energy network is split into lightning protection zones (LPZ = Lightning Protection Zone). Installed at each transition from one zone to another is a surge arrester for equipotential bonding. These arresters are graded according to the requirement class in question.

A concept with a host of benefits

The key benefits of this concept are:

- Minimisation of coupling in other line systems through deflecting high-energy and dangerous lightning currents precisely where the lines enter the building
- Malfunction prevention with magnetic fields
- Cost-efficient, plannable individual protection concept for new, extended and converted buildings

OBO surge protectors are classified in accordance with DIN EN 61643-11 into three type classes – Type 1, Type 2 and Type 3 (previously B, C and D). These standards contain building regulations, requirements and tests for surge arrestors used in AC networks with nominal voltages of up to 1,000 V and nominal frequencies of between 50 and 60 Hz. This classification enables arresters to be matched to different requirements with regard to location, protection level and current-carrying capacity. The table on this page shows how the devices are classified with regard to the valid IEC, EN and VDE test standards. It also shows which OBO surge protectors are to be installed in the energy supply network and their respective function.

LPZ 0 A	Unprotected zone outside the building. Direct lightning action, no shielding against electromagnetic interference pulses LEMP (Lightning Electromagnetic Pulse).
LPZ 0 B	Zone protected by external lightning protection system. No shielding against LEMP.
Zone transition LPZ 0 B ▸ LPZ 1	Protection equipment intended for lightning protection equipotential bonding in accordance with DIN V VDE V 0185-3 with direct or close lightning strikes. ▸ Devices: Type 1 (Class I, Requirement Class B), e.g. MC 50-B VDE ▸ Max. protection level according to standard: 4 KV ▸ Installation, e.g. in the main distributor box/at entry to building ▸ **From page 24**
LPZ 1	Zone inside the building. Low partial lightning energies possible.
Zone transition LPZ 1 ▸ LPZ 2	Protection equipment intended for surge protection in accordance with DIN VDE 0100-443 for surges running through the supply network caused by remote lightning strikes or switching operations. ▸ Devices: Type 2 (Class II, Requirement Class C), e.g. V 20-C ▸ Max. protection level according to standard: 2.5 KV ▸ Installation, e.g. in the power distributor, sub-distributor box ▸ **From page 43**
LPZ 2	Zone inside the building. Low surges possible.
Zone transition LPZ 2 ▸ LPZ 3	Protection equipment intended for surge protection. Portable consumers at sockets and power supplies. ▸ Devices: Type 3 (Class III, Requirement Class D), e.g. FineController FC-D ▸ Max. protection level according to standard: 1.5 KV ▸ Installation, e.g. at end consumer ▸ **From page 58**
LPZ 3	Zone inside the building (can also be the metal housing of consumer). No interference pulses through LEMP or surges present.

Get smart

Software-supported planning and selection aid for lightning and surge protectors

Version 3.0 of OBO ÜSS Construct for planning entire surge and EMC concepts contains all the latest information on the status of technology, on standards and on TBS products. This OBO ÜSS Construct is an indispensable tool for anyone involved in the subject of EMC of buildings.

Seminars:
Having a competitive edge with professional knowledge

We aim to acquaint you with current developments, trends, standards and regulations that will support and strengthen your competitive position. Theoretical principles are important – but our seminars also focus on transferring knowledge for everyday use. Our seminars are therefore accompanied by workshops designed to put what you have learned into practice.

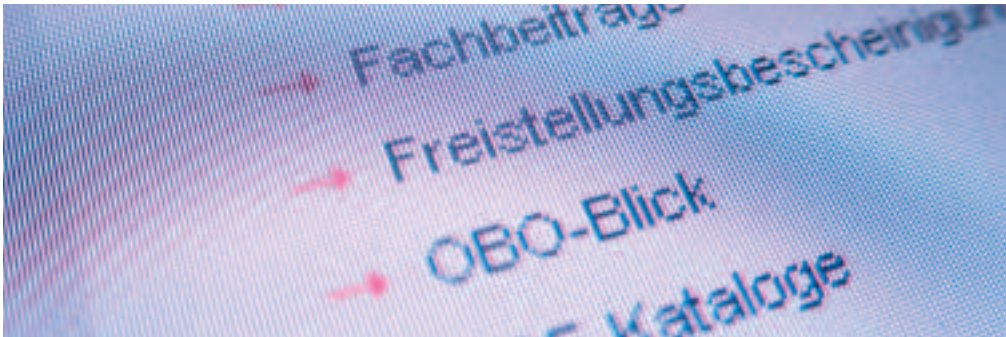
- External lightning protection
- Surge protection in energy technology
- Surge protection in communication and data engineering

Visit www.obo.de to find dates, venues and descriptions of seminars

OBO SEMINARE

Internet

Current, supplementary information on our products, downloads, tender texts and specialist articles can be found at **www.obo-bettermann.com**



“BET” (Lightning Protection and EMC Technology Centre)

Since as early as 1995, the “BET”, (Lightning Protection and EMC Technology Centre) in Menden founded by Ulrich L. Bettermann has been closely involved in the further development and testing of external lightning protection components, earthing materials, equipotential bonding components and the testing of lightning current and surge arresters. In this independent testing institute, protection systems were put through their paces under practical conditions.

The services offered by BET range from tests with lightning surge current to the testing of lightning protection components and lightning protection structures through to extensive series of surge protector tests. Electromagnetic compatibility tests, testing and expertise and compiling reports are also BET functions, as are the provision of training programmes and seminars. Surge protection is a complex topic. Benefit from the expertise and experience we have garnered in this field. We provide you with competent and detailed information on this subject in printed and digital format. We also offer practical seminars on surge protection in our Training and Conference Centre.
Contact us so that we can reserve a place for you at BET!

www.bet-menden.de

BET services:

Lightning protection examinations and lightning tests

- **Surge current tests on waveforms 8/20 and 10/350 up to 200 kA**
- **Surge voltage tests on waveforms 1.2/50 up to 20 kV and waveforms 10/700 and 10/1000 up to 5 kV**
- **Ageing tests in accordance with DIN 50021; IEC 60068-2-52; ISO 7253, ISO 9227 and EN ISO 6988 on lightning protection components**