Basics of Surge Protection

Ing. Jiří Prchal

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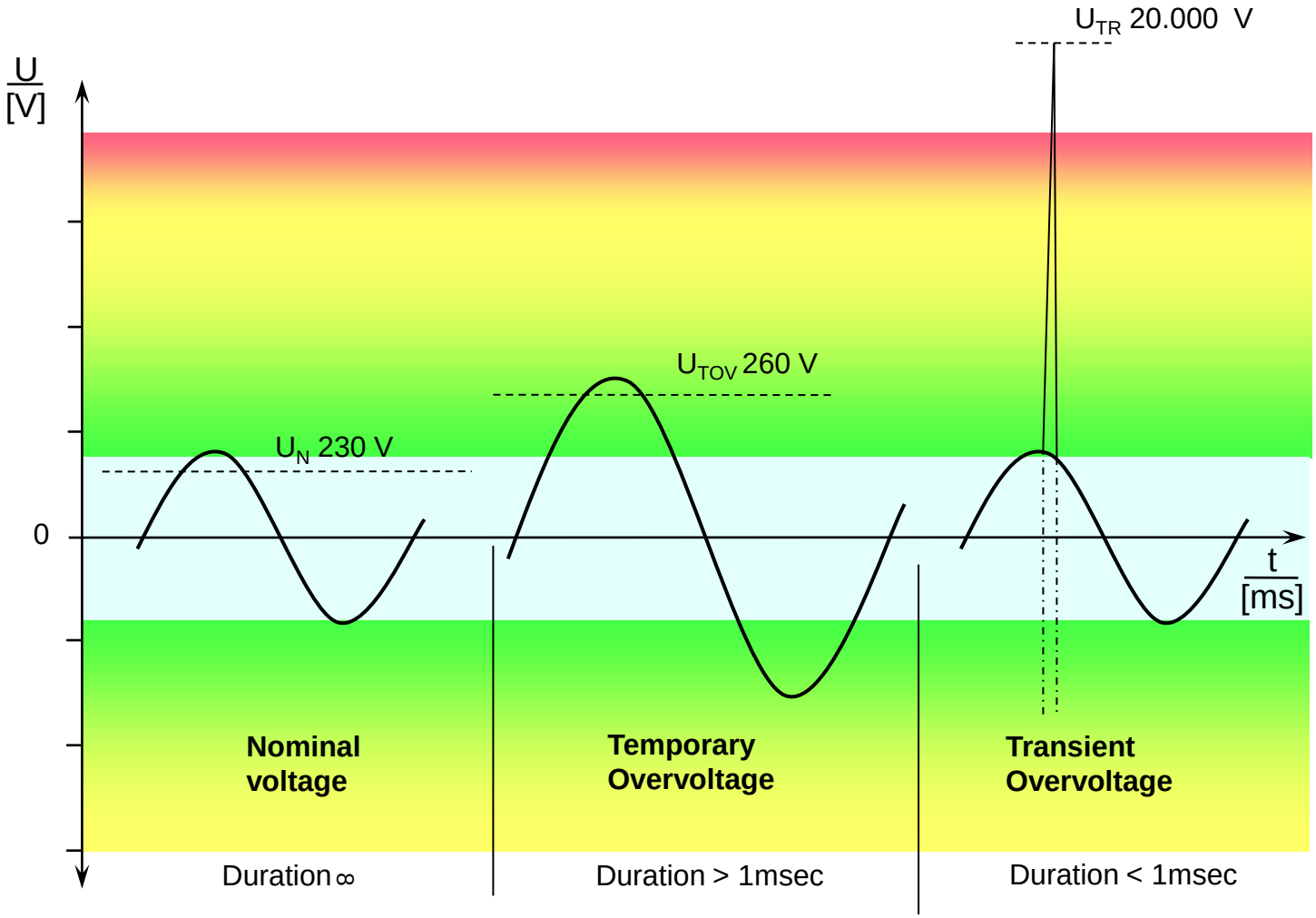
Surges – What are we talking about?



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Kinds of surges

- Nuclear Explosion (NEMP)

- Lightning (LEMP)

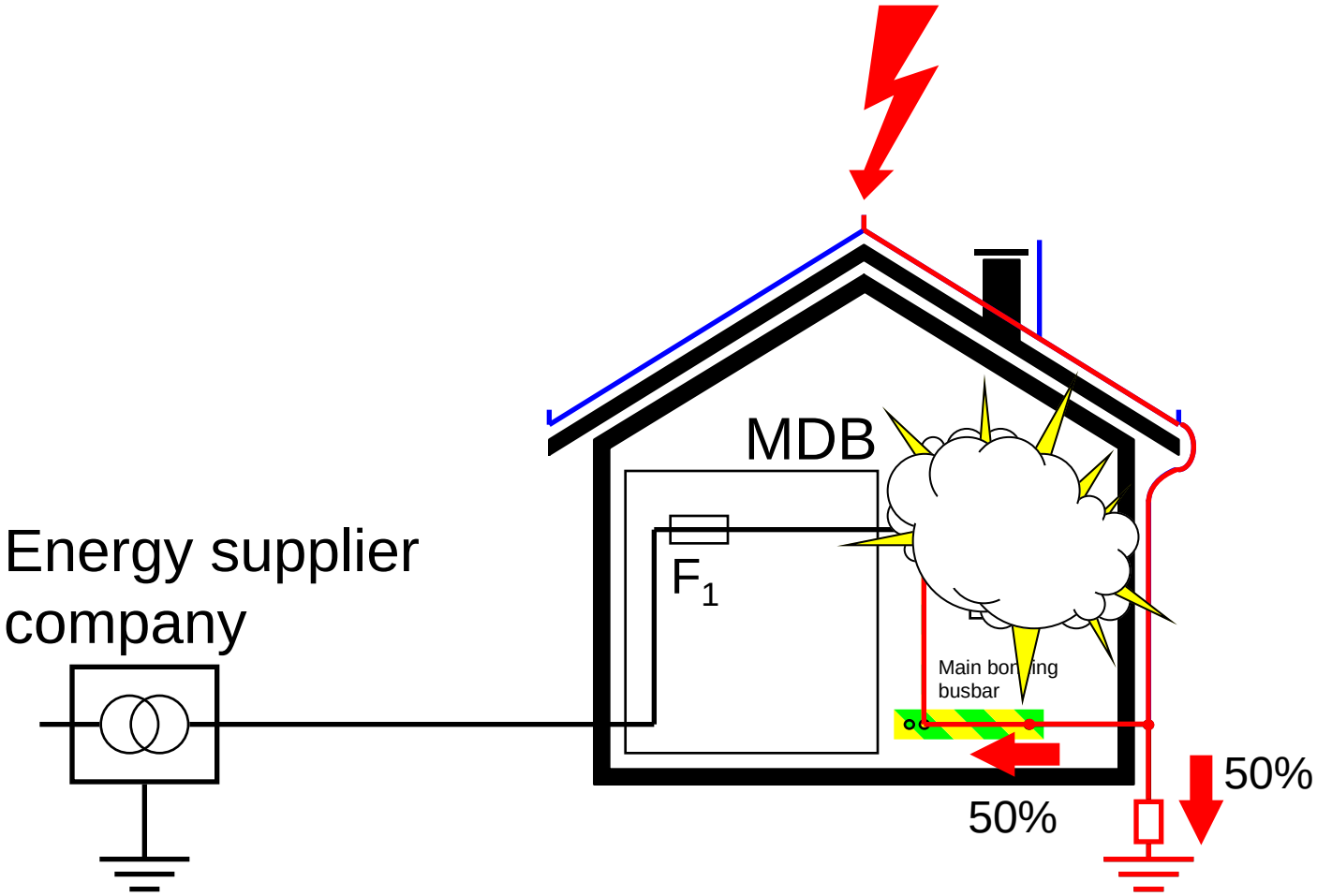
- Switching action (SEMP)

- Electrostatic Discharge (ESD)

Lightnings are not predictable

Lightning rod of the
Space Shuttle launch pad

How does a lightning enter the building?



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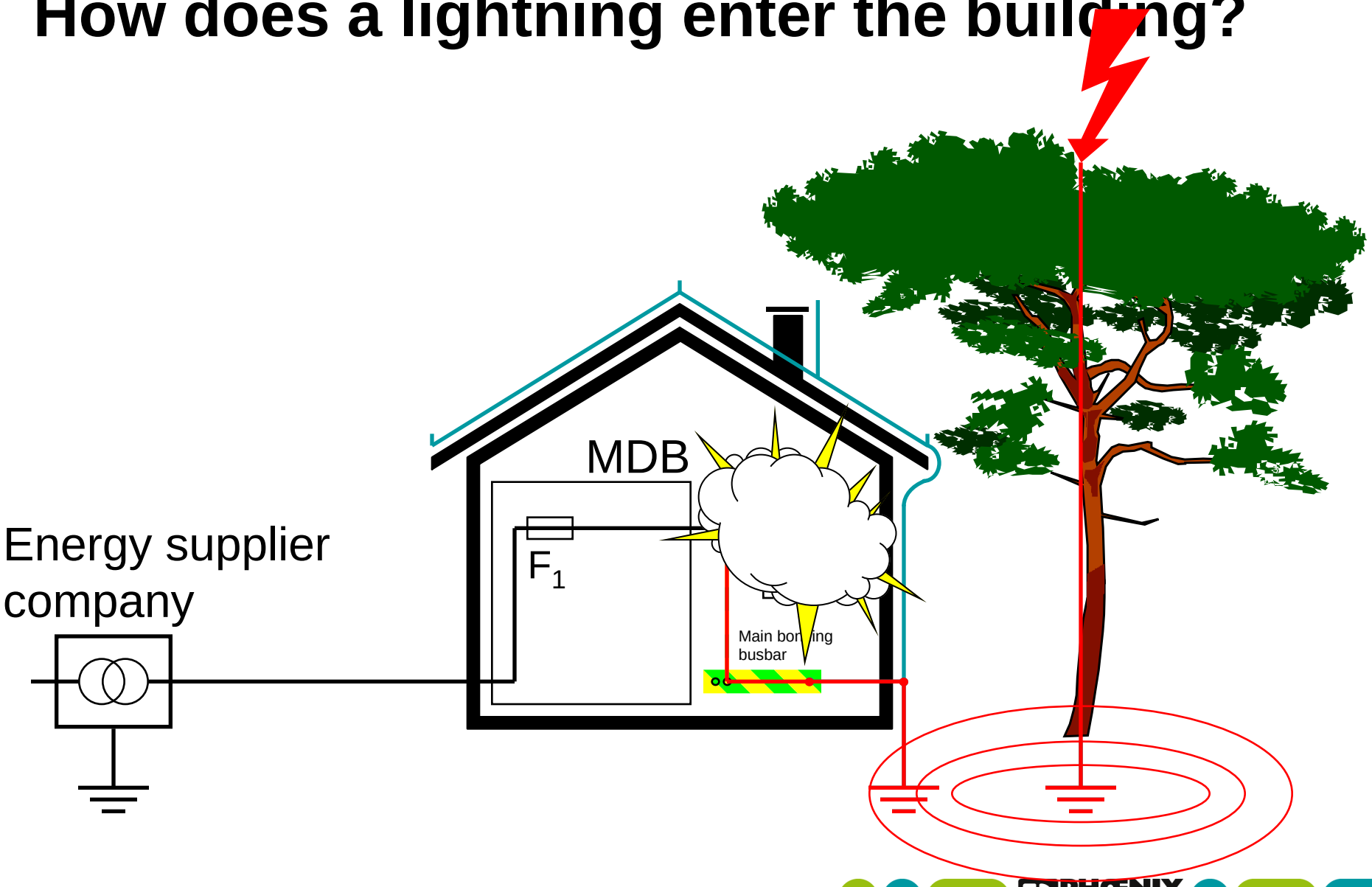

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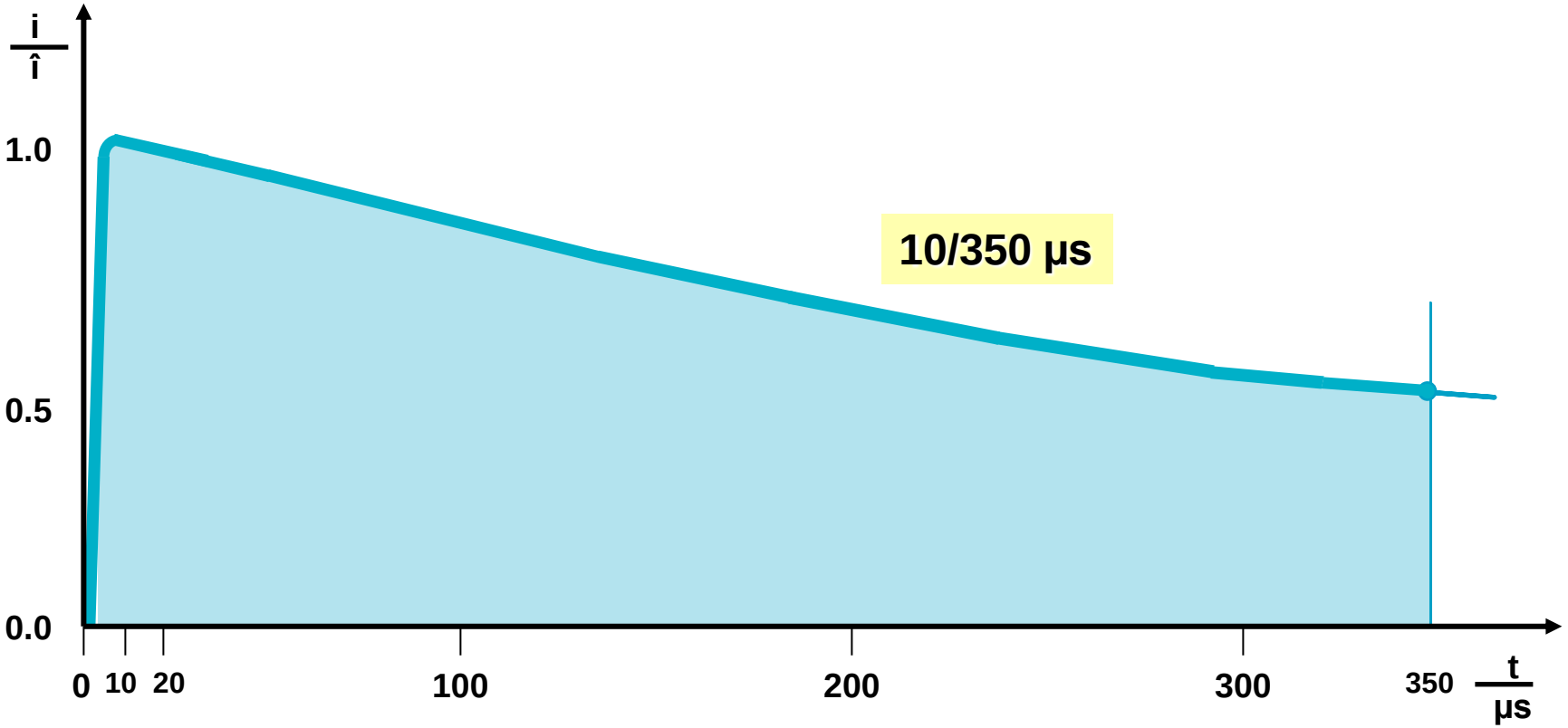
Lightning Electromagnetic Pulse



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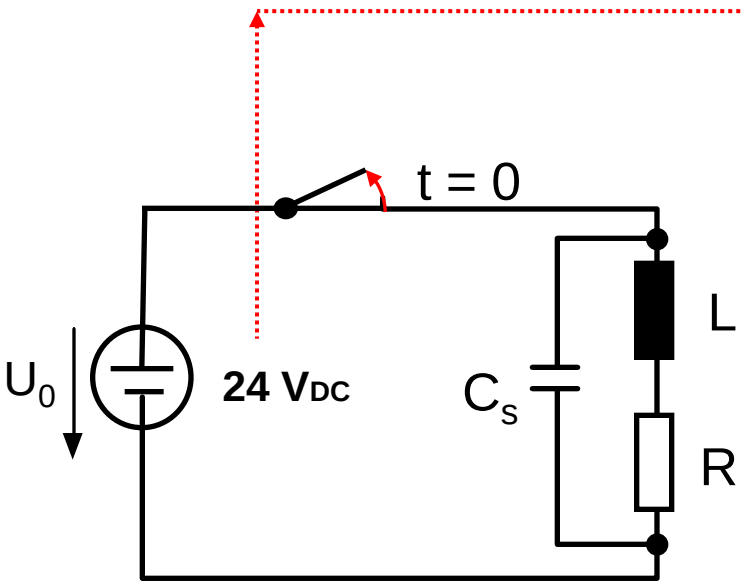
Switching Electromagnetic Pulse (SEMP)

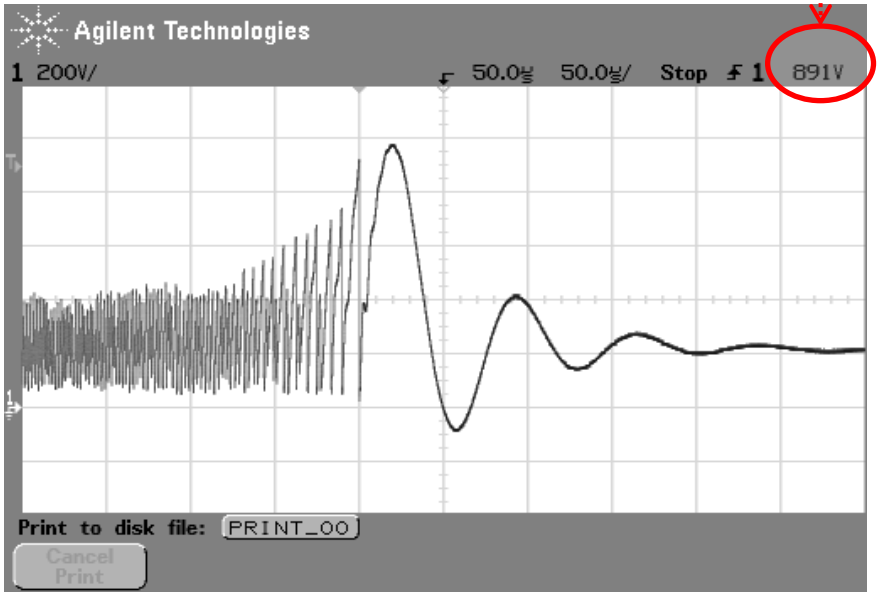
Switching 500 kV

Sources for SEMPs

- Switchgear
- Frequency converters
- Blowing fuses / Triggered MCBs
- Motor starters
- Relays
- Etc.

Switching electromagnetic pulse (SEMP)





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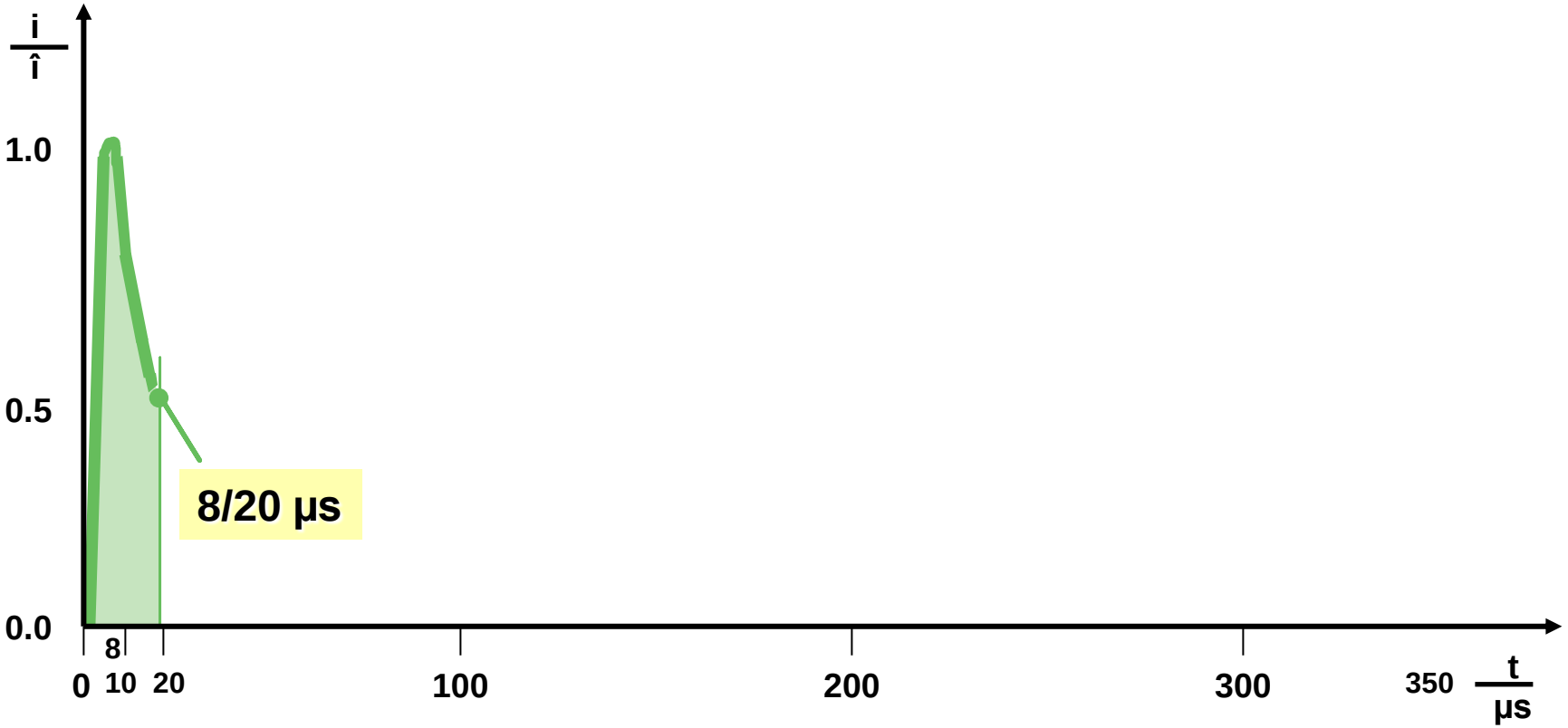
Switching Electromagnetic Pulse



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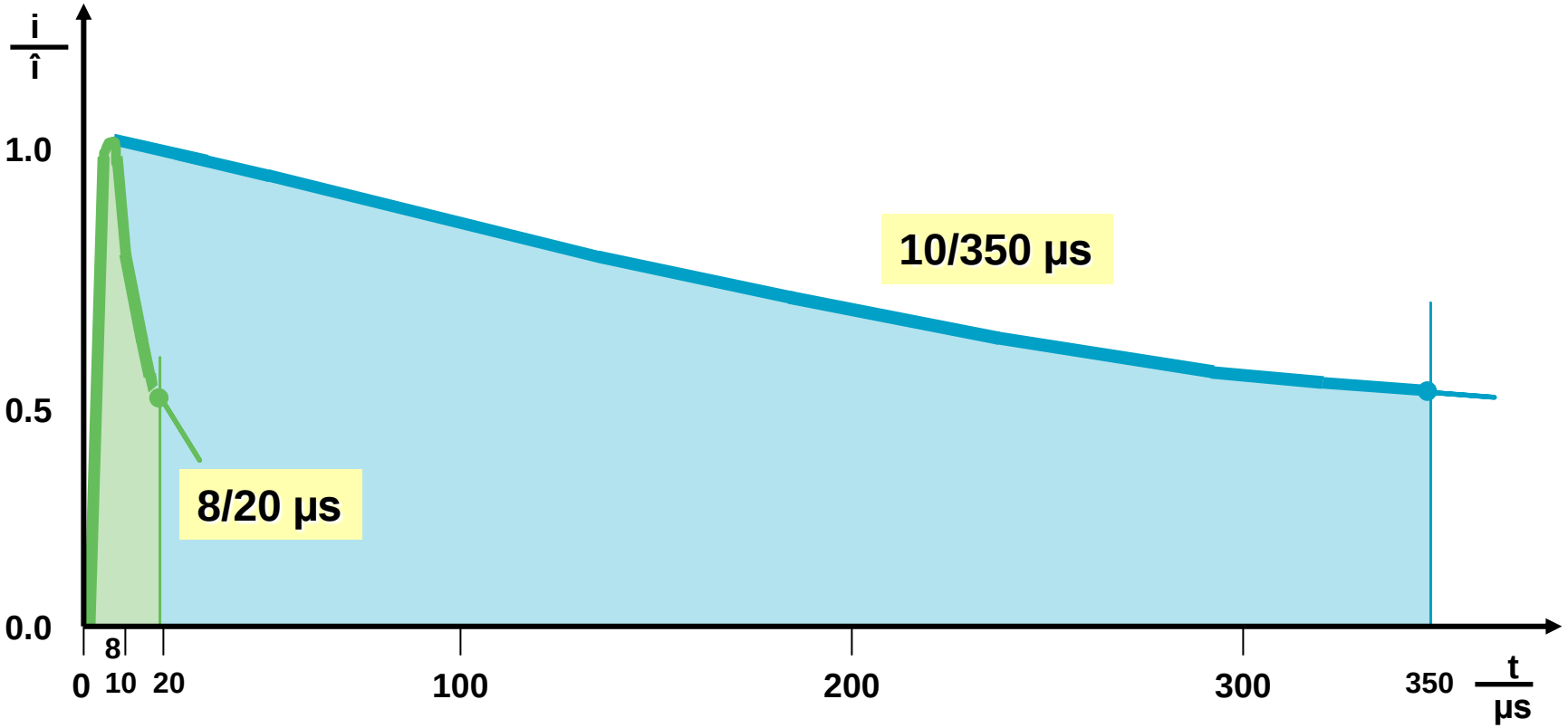
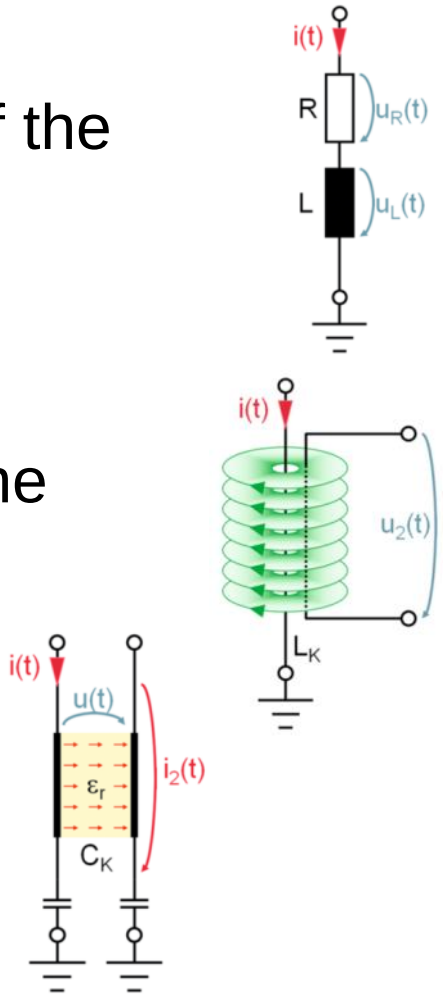
Comparison of surge currents



Coupling mechanisms

Mechanisms of coupling

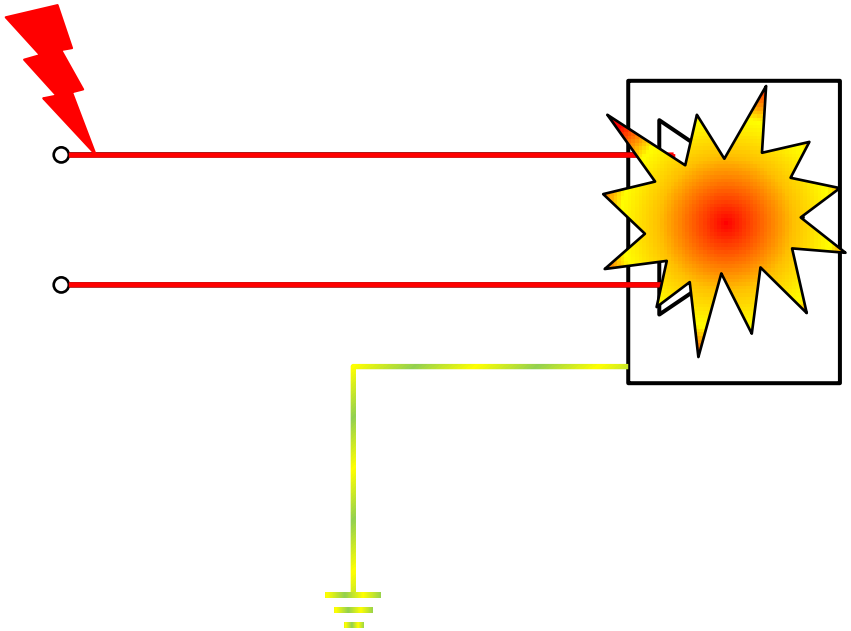
- Galvanic
  - High voltage drop due to the inductance of the wire
- Induktive
  - Voltage is imposed on adjacent wires by the electromagnetic field
- Capacitive
  - Influence is insignificant



Function principle of SPDs

Surge protection: Function principle

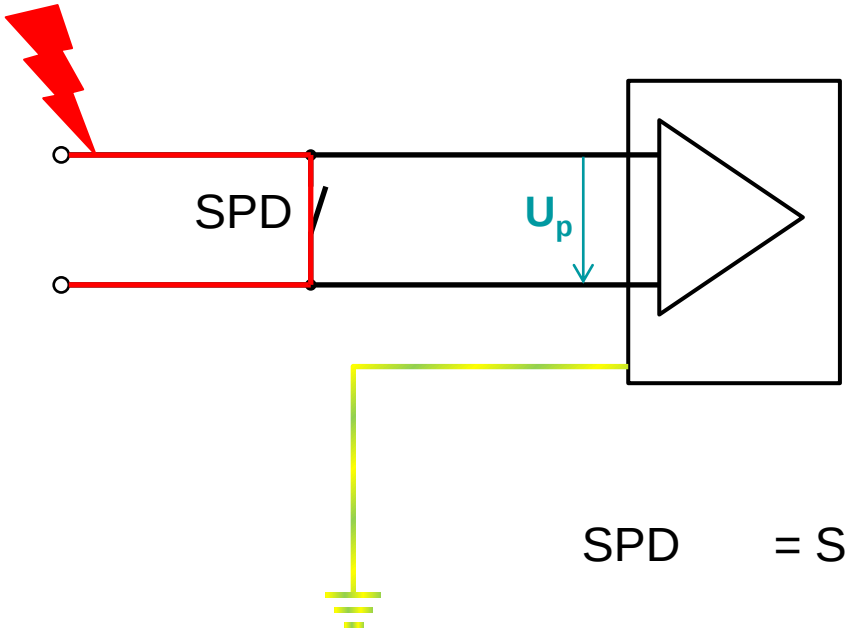
- Surge on a wire - unprotected



Surge is conducted to the device

Surge protection: Function principle

- Surge on a wire - protected

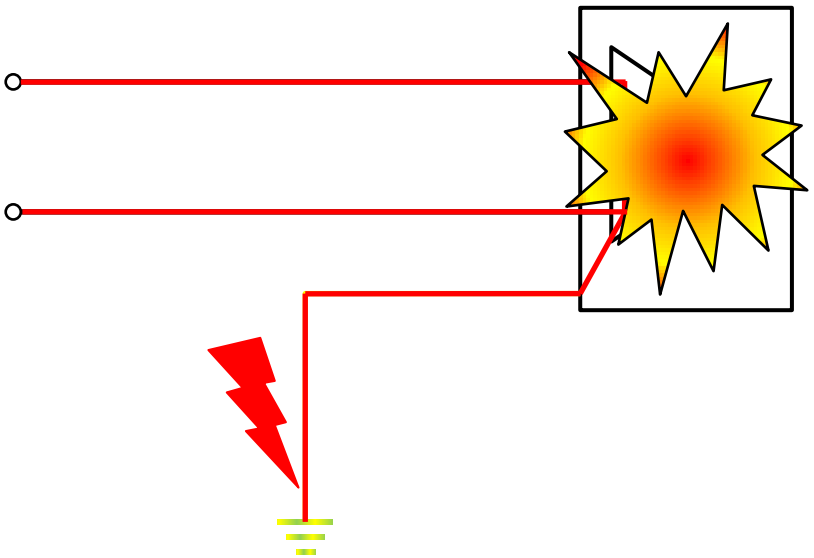


Surge is discharged by the SPD

SPD = Surge Protective Device

Surge protection: Function principle

- Surge coming from earth - unprotected



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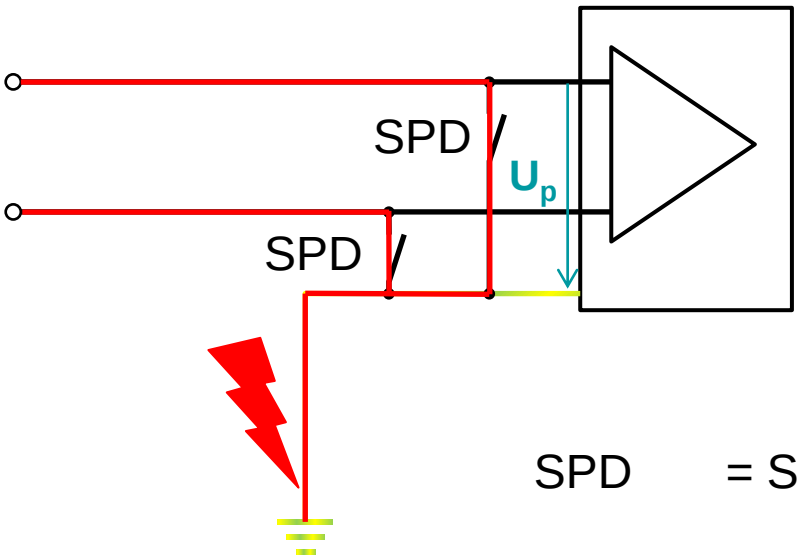
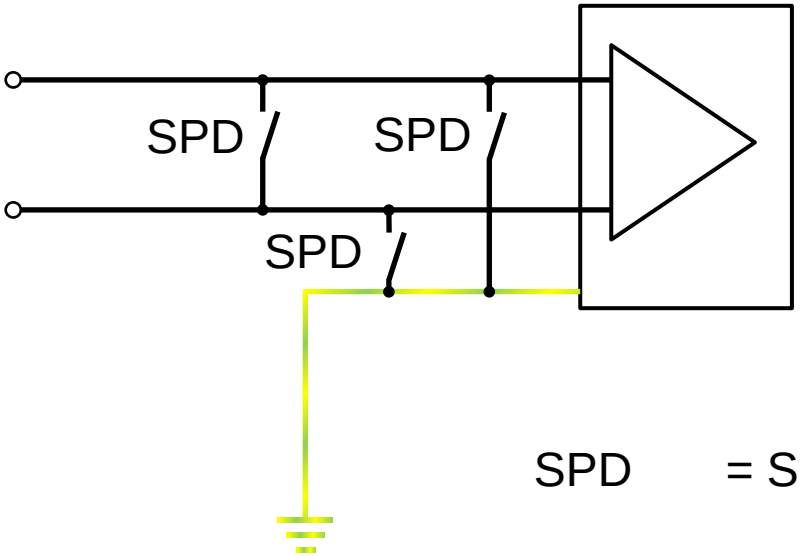


Surge is discharged by the SPD

SPD = Surge Protective Device

Surge protection: Function principle

- Optimized protection



Surge is discharged by the SPD

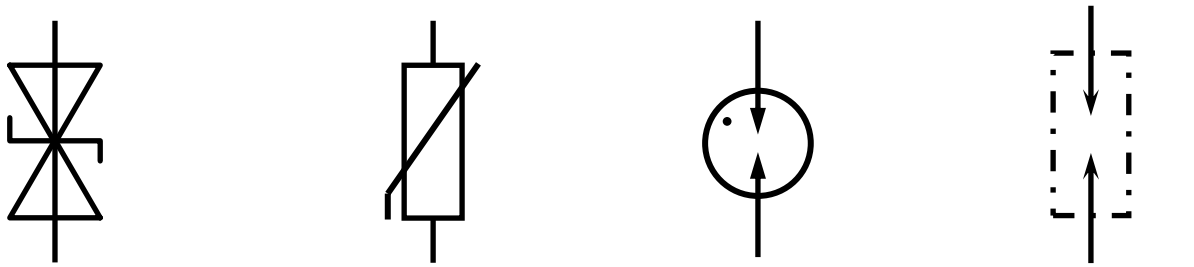
SPD = Surge Protective Device

Typical physical quantities of SPD

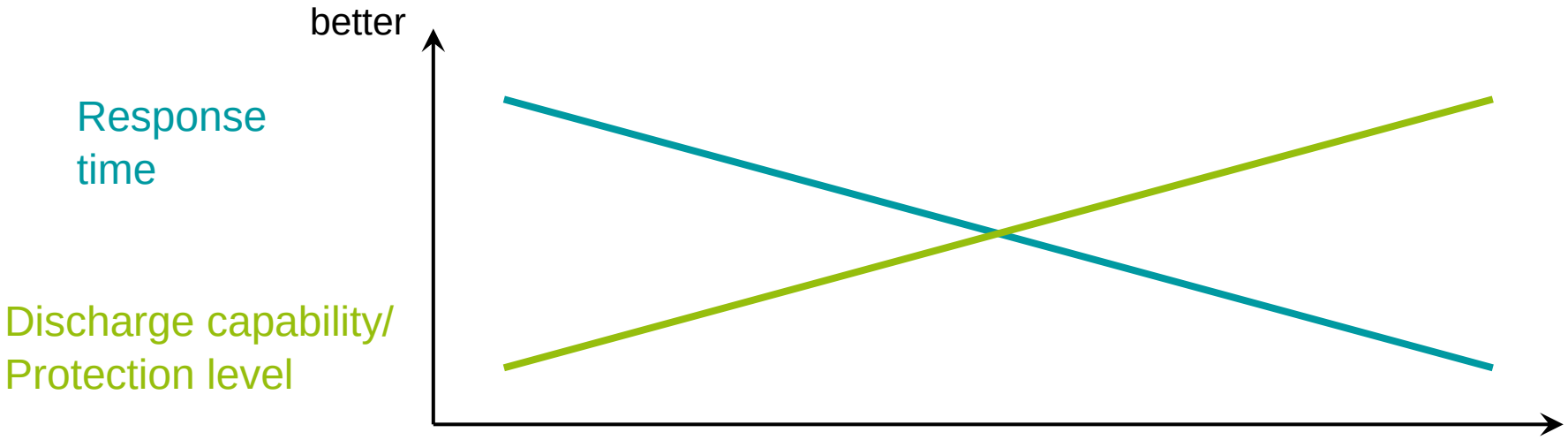
Name	Designation	Explanation
Nominal voltage	U_N	Nominal system voltage
Max. continuous operating voltage	U_C	
Protection level	U_p	Highest voltage the SPD
Impulse discharge current	I_{imp}	• Lightning currents • 10/350 µs current impulse • Only for SPD Type 1
Nominal discharge current	I_n	• Surge currents • 8/20 µs current impulse • Only für SPD Type 2
Max. discharge current	I_{max}	• Surge current • 8/20 µs current impulse • Only für SPD Type 2
Combination wave	U_{OC}	• Voltage peaks • 1,2/50 µs voltage impulse • Only for SPD Type 3

Does surge protection work?

Devices for surge protection



Suppressor diode | Varistor | Gas Discharge Tube | Spark gap



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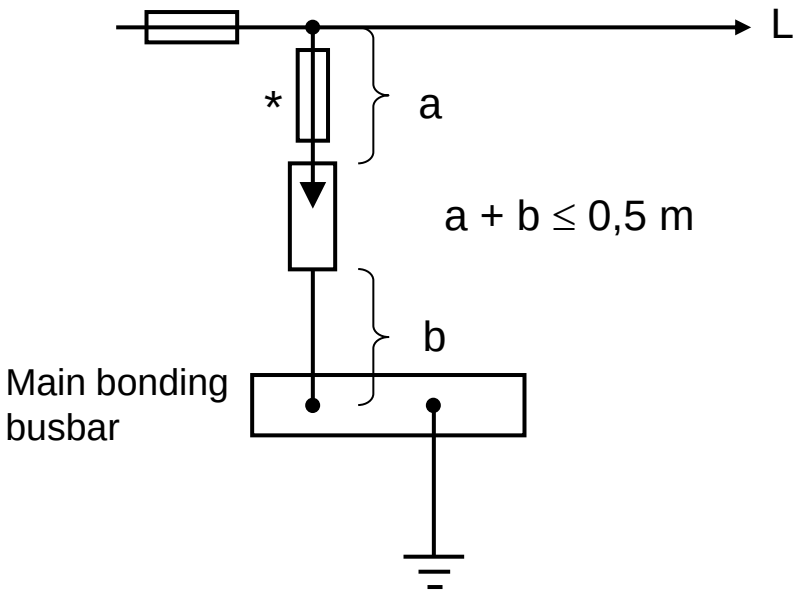
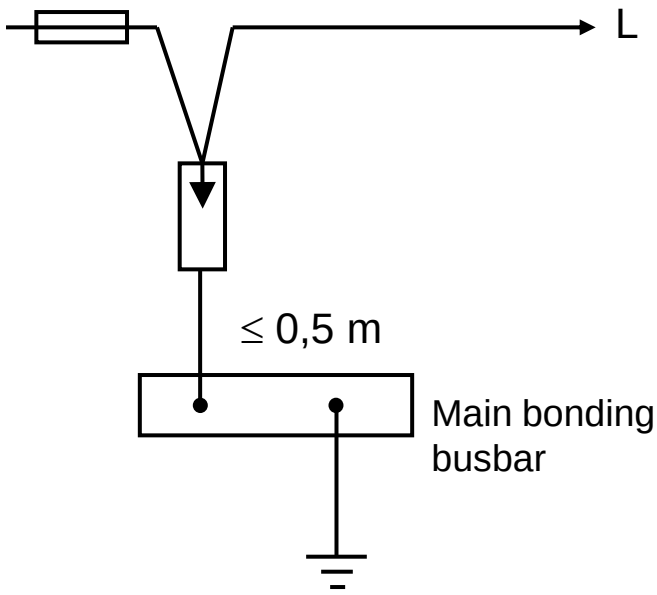
Types of connection

Stub line connection

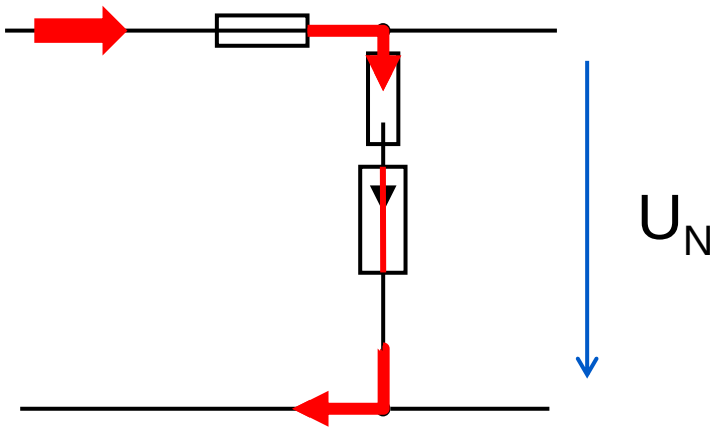


V-shape connection



* Additional fuse (compulsory / optional)

Why fuses in front of SPDs?



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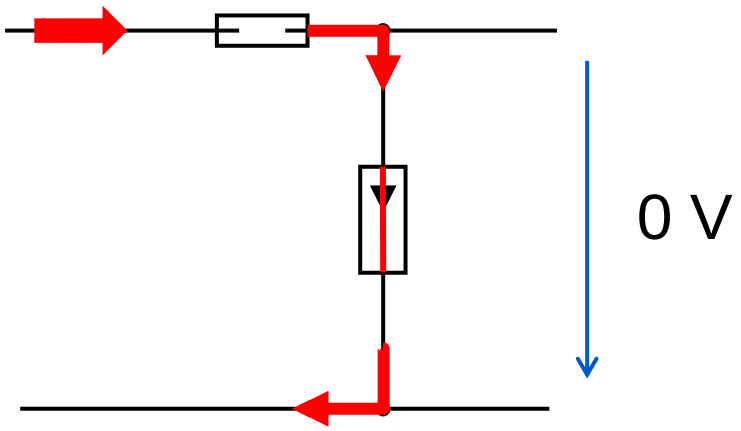

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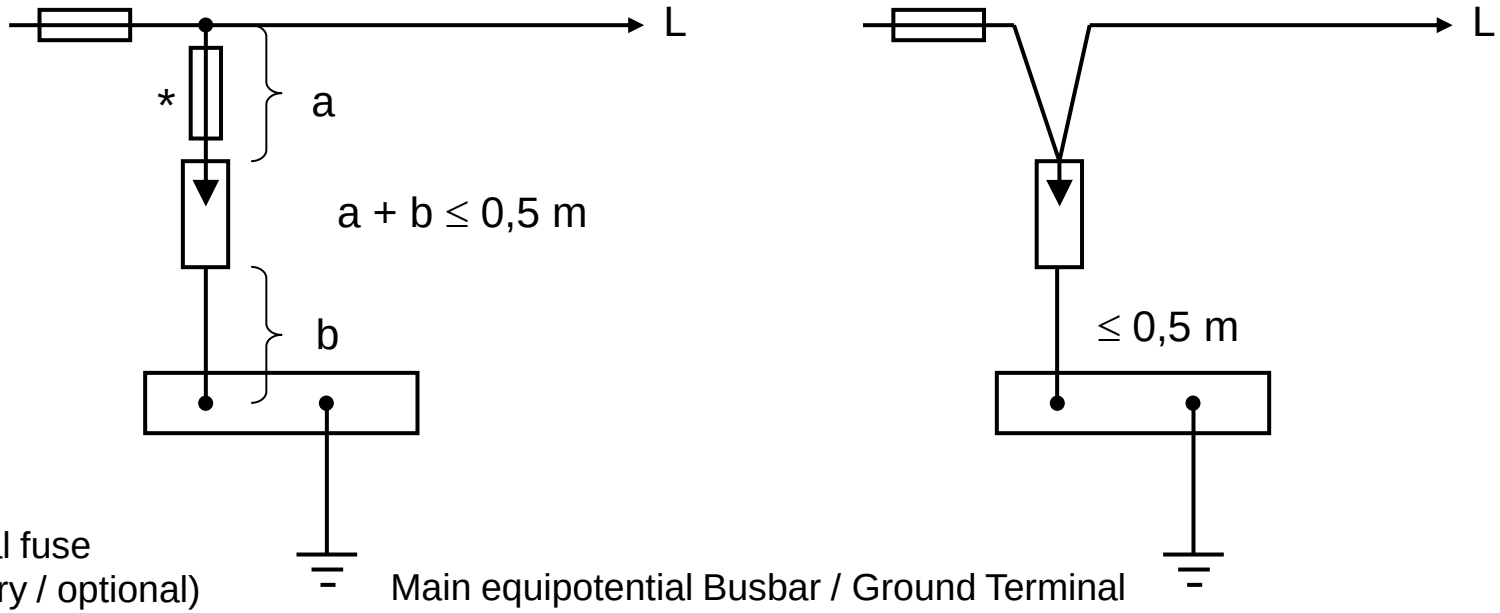

* Additional fuse
(compulsory / optional)

Main equipotential Busbar / Ground Terminal

Max. availability of the installation

Max. security of the installation

Trabtech Safe Energy Control

Surge Protection Reinvented

Lightning current and surge arrester type 1 + type 2

Lightning current arrester type 1 with integrated back-up fuse

Surge arrester type 2

Device protection type 3

Lightning current arrester type 1

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Safe Energy Control Family

FLASHTRAB SEC PLUS T1

Line follow current free spark gap

FLASHTRAB SEC PLUS 440 T1

Pluggable spark gap for 440V systems

FLASHTRAB SEC HYBRID T1 + 

Pluggable T1 arrester + back-up fuse

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Safe Energy Control Family

FLASHTRAB SEC T1 + T2

Combination of T1 and T2 arrester on 35 mm per pole

VALVETRAB SEC T2

Smallest type 2 arrester for DIN-rail

→ I_{SCCR} up to 50 kA, max. fuse 315 A gG

PLUGTRAB SEC T3

Device protection with integrated fuse for AC and DC systems

Design
Highlights

All mounting orientation

Identical appearance

Turn, code, plug

Good handling

Screwdriver lever

Eye-catching signaling

Individual marking space

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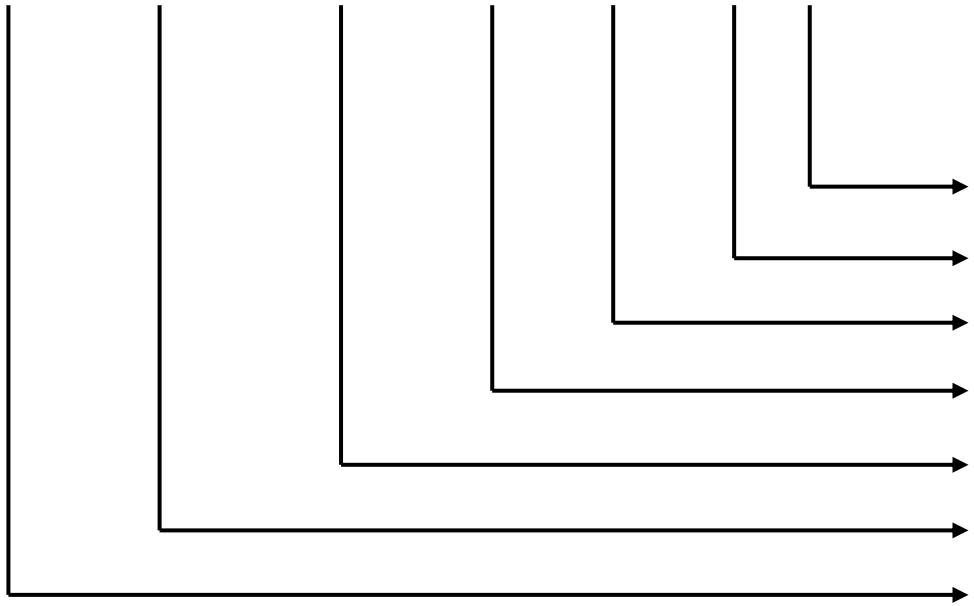
Name

Explanation

FLT-SEC-T1+T2-3S-350/25-FM



Remote:	Function Monitoring
I_{imp}:	25 kA
U_C:	350 V
Model:	3+1
Class:	Type 1 + Type 2
Family:	Safe Energy Control
Product:	FLASHTRAB

Surge protection concept with Safe Energy Control

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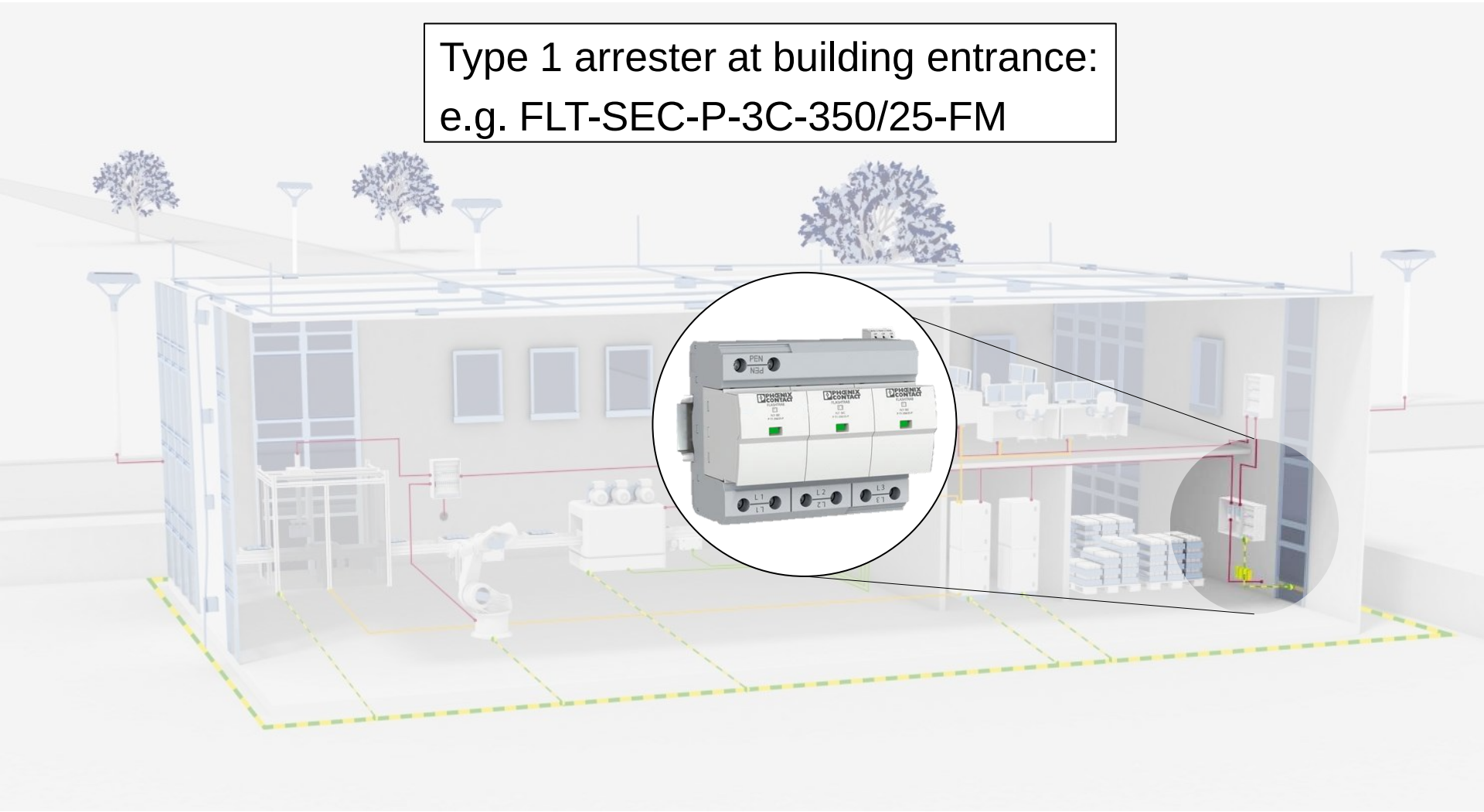
Surge protection concept with Safe Energy Control

Type 1 arrester at building entrance:
e.g. FLT-SEC-P-3C-350/25-FM



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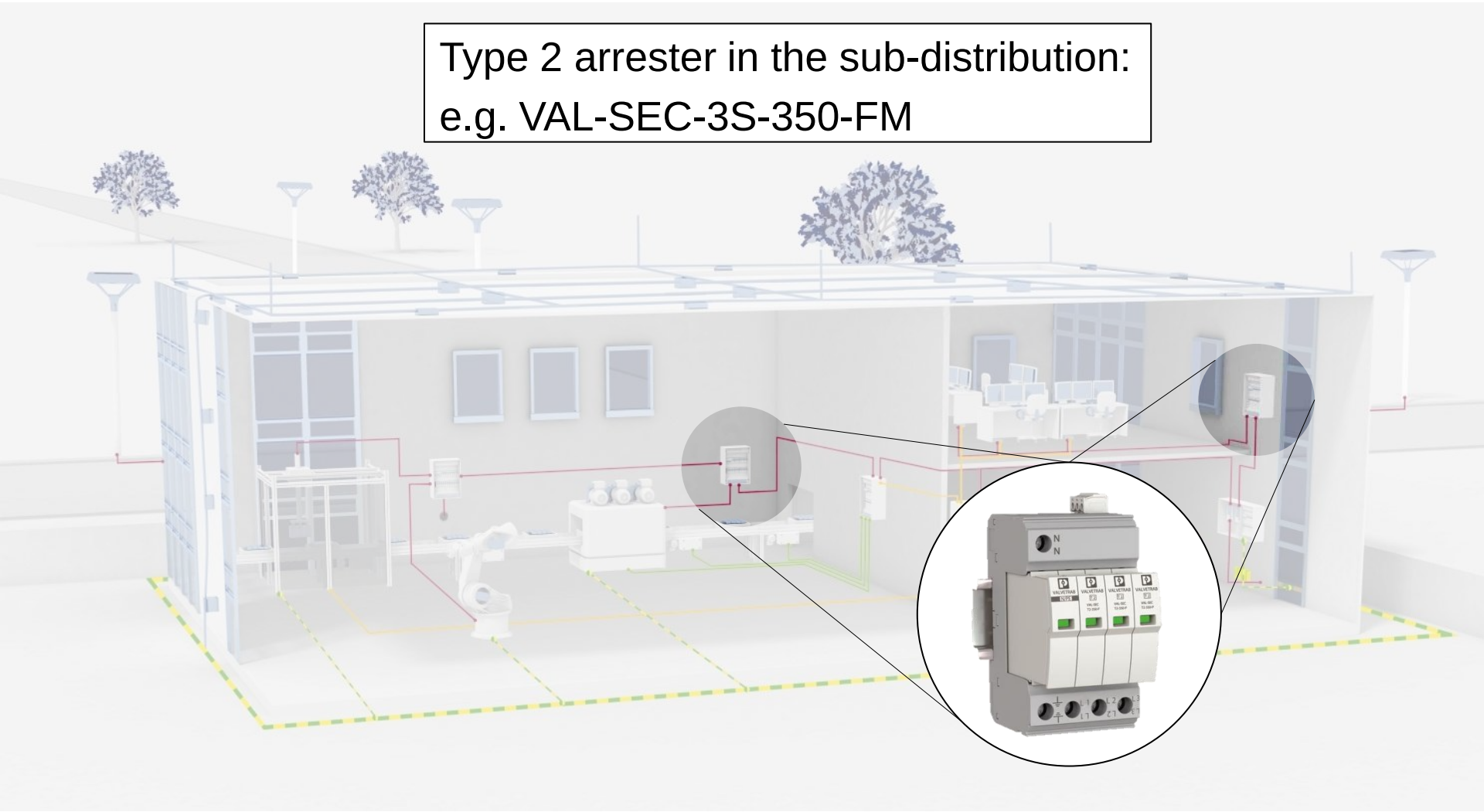
Surge protection concept with Safe Energy Control

Type 2 arrester in the sub-distribution:
e.g. VAL-SEC-3S-350-FM



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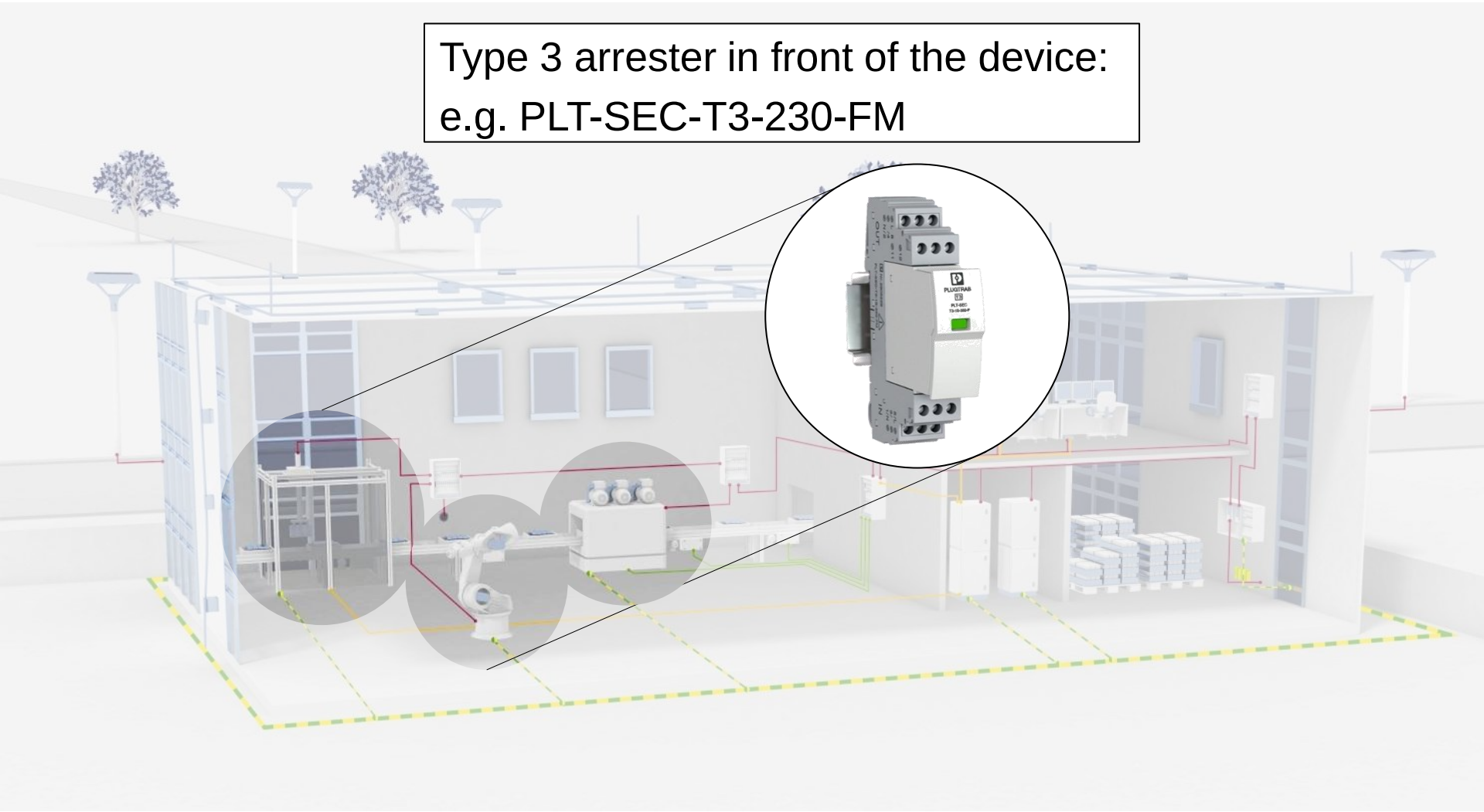
Surge protection concept with Safe Energy Control

Type 3 arrester in front of the device:
e.g. PLT-SEC-T3-230-FM



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Safe Energy Control – key features

Safe Energy Control means:

- Impact-free and durable
- Back-up fuse free solution for every application
- Compact and pluggable
- High performance and quality

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Impact-free and durable

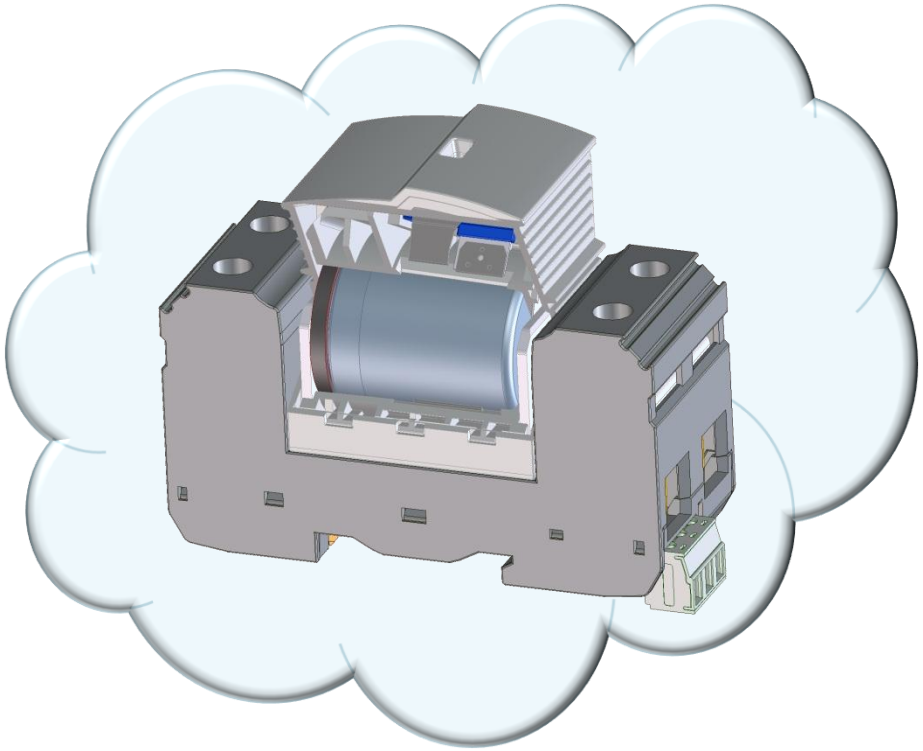
- Line follow current free spark gap:
  The smooth way to discharge lightning currents.

  Minimum of energy is led through the SPD and the electrical installation.

- High durability:

  Less stress for the SPD and the electrical installation.

  Minimal maintenance costs.



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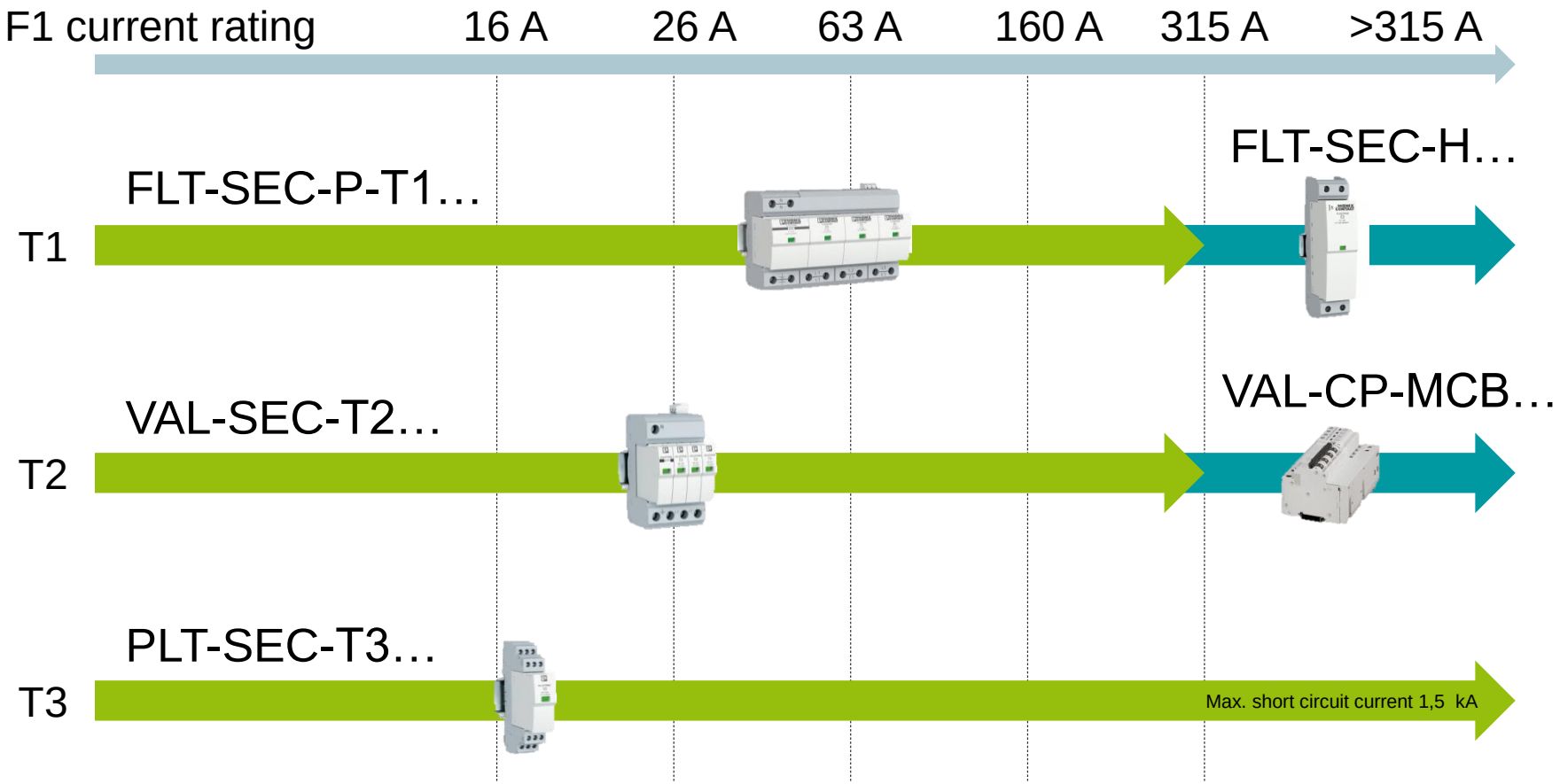
Backup-fuse free solution for every application



Maximum back-up fuse rating

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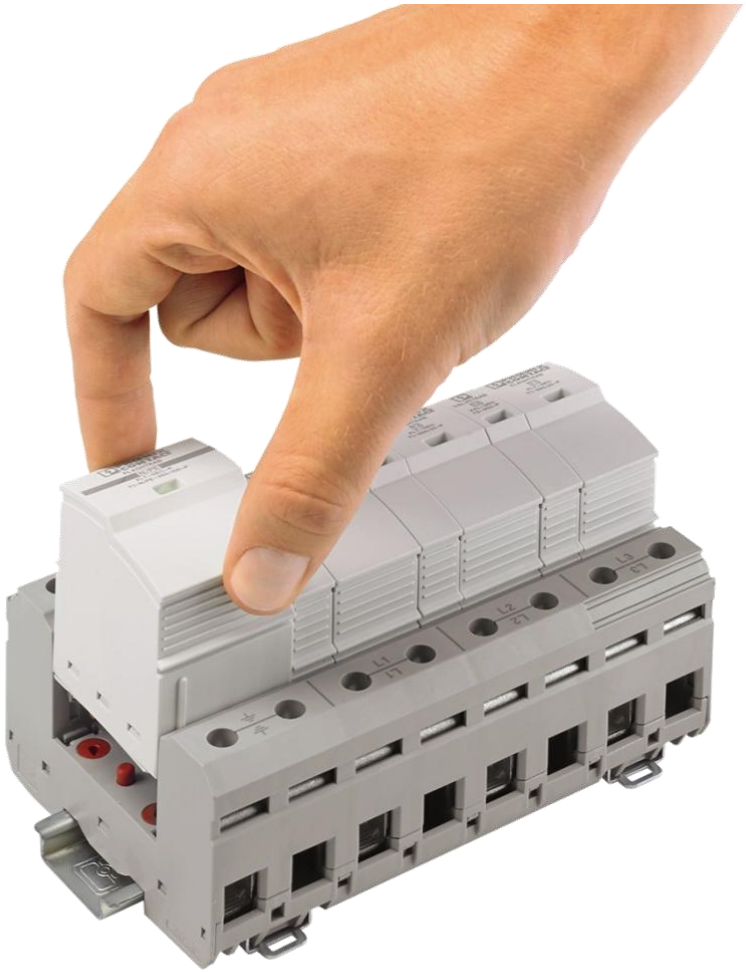
Compact and pluggable

- All arresters are pluggable
- All arresters are space-saving and easy to install
- Smallest T1+T2, T2 and T3 arrester



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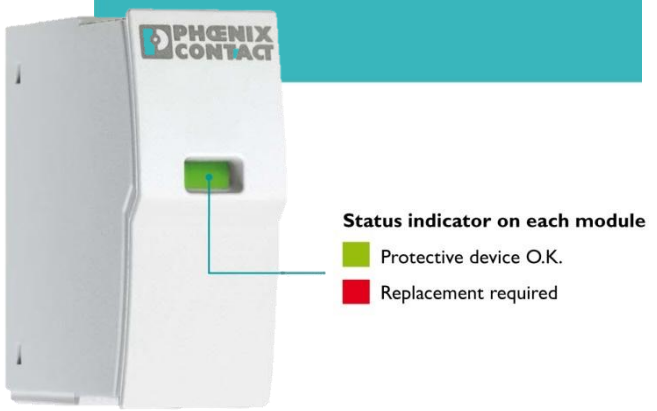
High performance and quality

- SPDs with Safe Energy Control Technology are extremely powerful and durable – for greater availability and less stress for the system
- We provide free replacement plugs for the first five years
- All SEC products showing a red status will be replaced for free

Getting the green light -
We bet that you won´t see red for five years

With low-wear protective devices, you won‘t have to worry about replacing wear parts for at least five years.
Because of the SEC technology, the high-quality components are particularly durable. However, should the status indicator signal the need for replacement within the first five years following your purchase, you will receive free replacement plugs. You only have to send back the affected plug to us.



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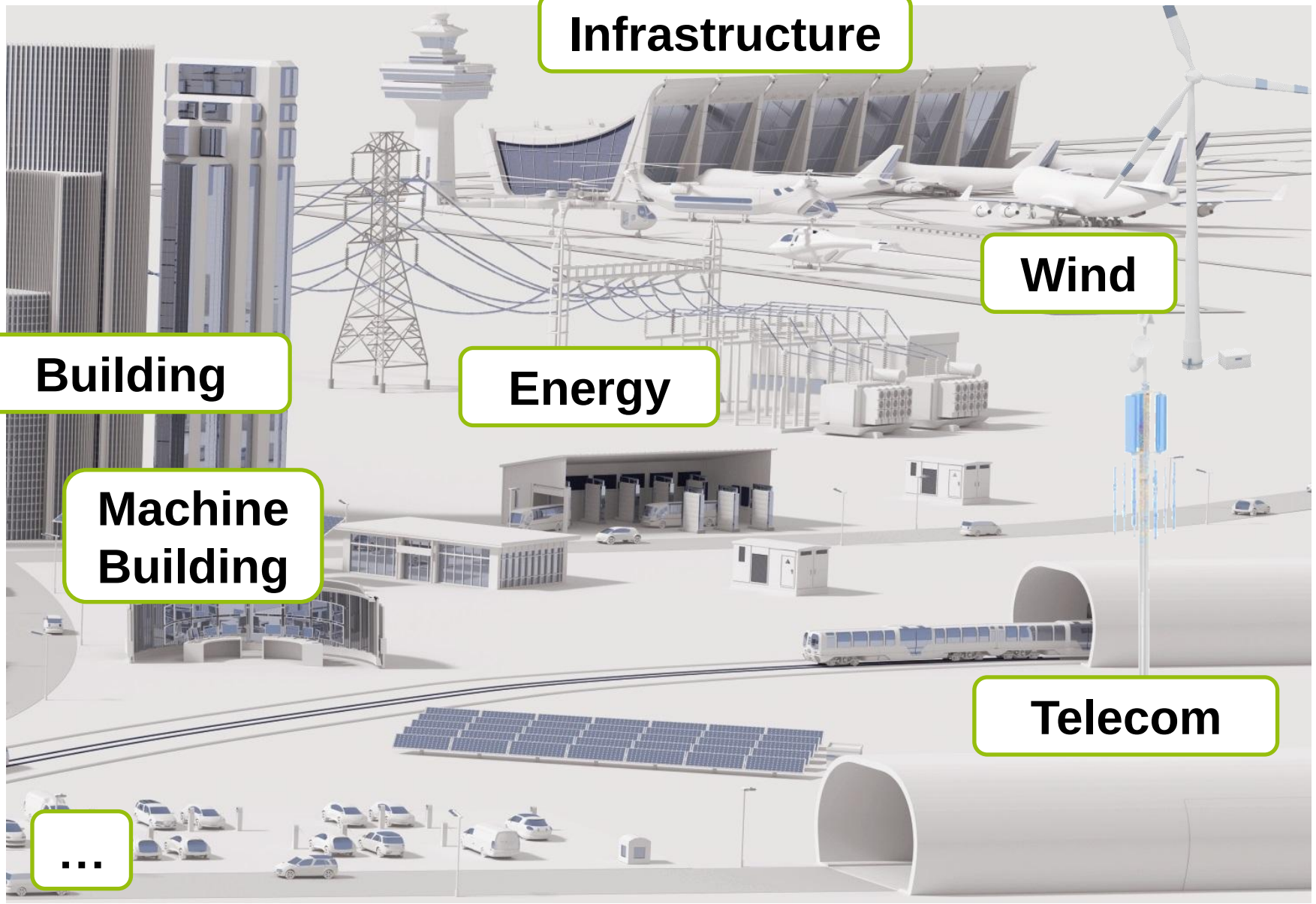

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Infrastructure

Building

...

Cornerstone for each reliable lightning protection

T1

- High performance
- Best protection
- Durable

FLT-SEC-PLUS

FLT-SEC-HYBRID

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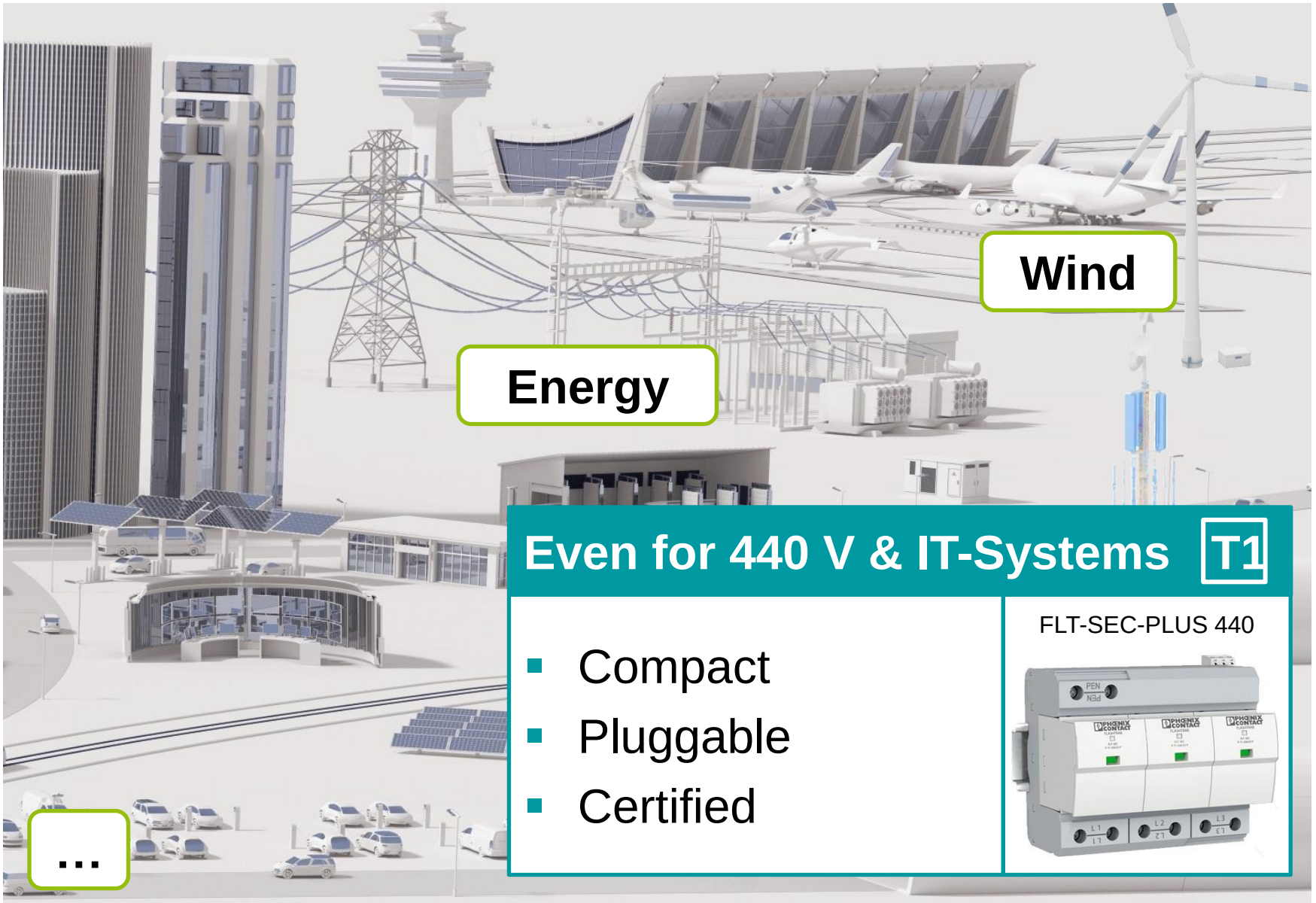

Even for 440 V & IT-Systems

T1

- Compact
- Pluggable
- Certified

FLT-SEC-PLUS 440

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Building

Universal protection T1 + T2

- Lightning protection for sensitive devices
- Space-saving and easy installation

FLT-SEC-T1+T2

Telecom

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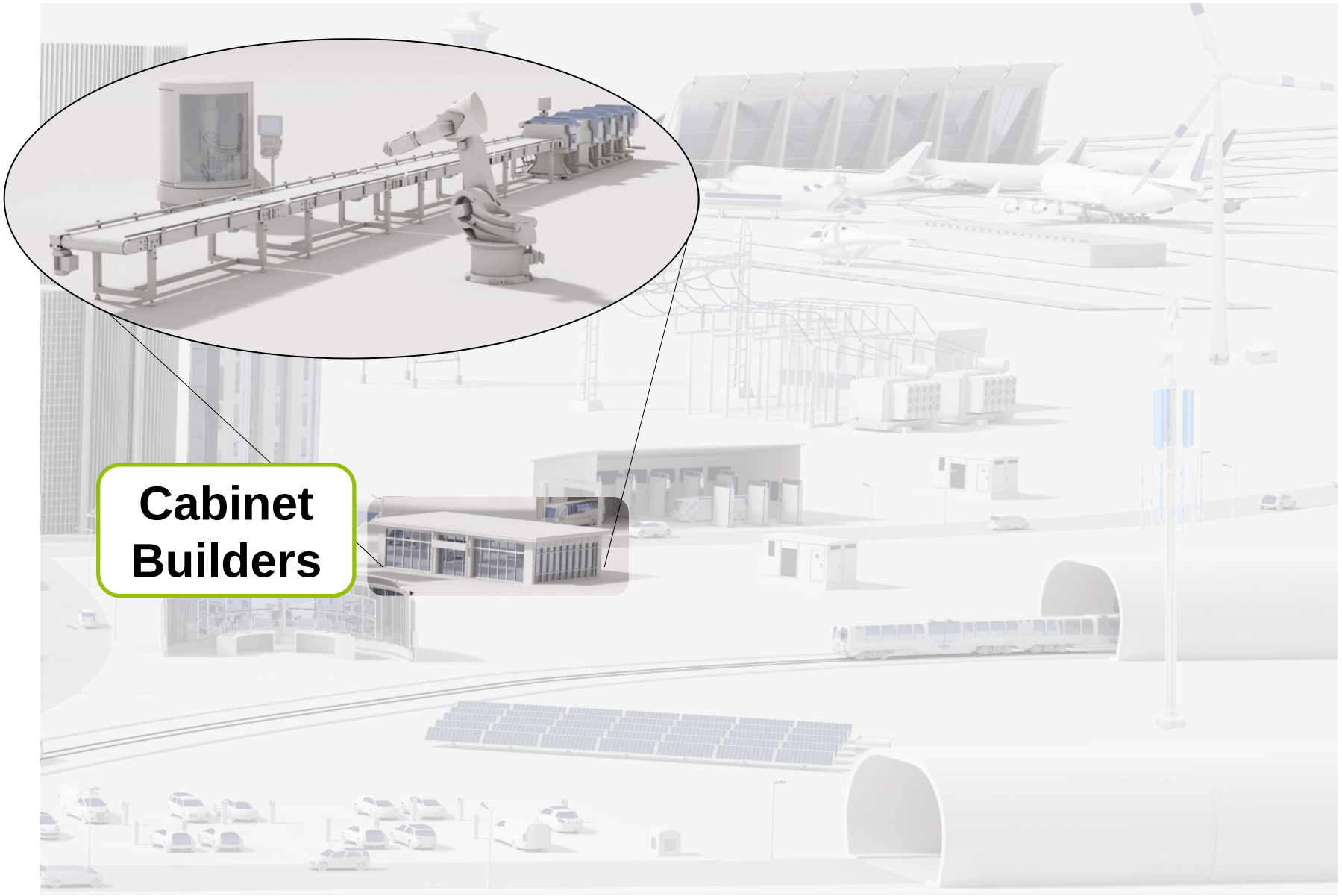

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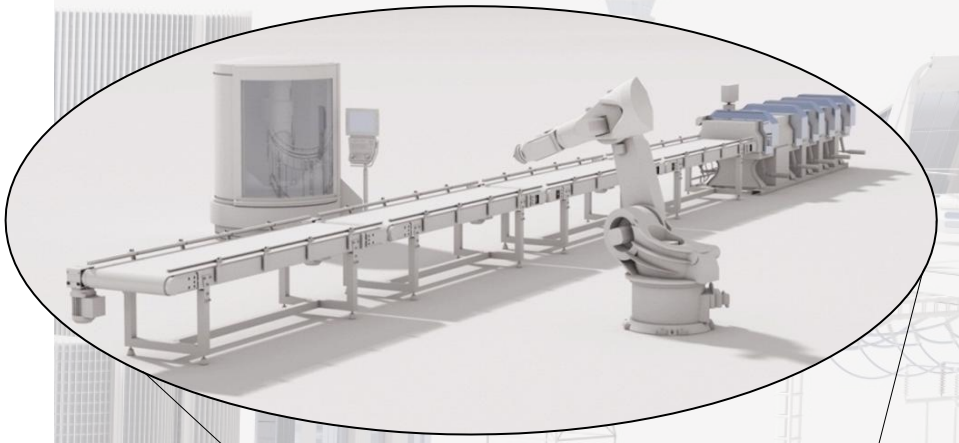

Cabinet Builders

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Most compact T2

- 30% less space needed
- High max. back-up fuse rating

VAL-SEC

Certified protection T3

- Save the space of a separate fuse
- Pluggable

PLT-SEC

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Děkuji za pozornost