



Surge protection for light strips

White Paper



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For economic reasons, fluorescent tubes (with a diameter of 26 mm or 16 mm) and electronic ballasts are used for light strips in industrial, commercial and agricultural buildings.

In high halls, light strips with an extremely narrow-beam illumination are installed. In this case, the regular replacement of luminaires alone (about 16,000 lighting hours in case of 26 mm tubes, about 20,000 lighting hours in case of 16 mm tubes) entails high costs since aerial lift devices are required and the luminaires are usually replaced outside working hours.

But what if individual electronic ballasts are destroyed by surges or an entire light strip fails? In this case, immediate action is required since the necessary minimum illumination is frequently no longer ensured which may lead to a decrease in work performance and accidents.

The IEC 60364-4-44 (HD 60364-4-44) standard deals with the "protection against overvoltages of atmospheric origin or due to switching". Section 443.3.2.2 describes that surge protective devices (type 2 or type 3 arresters) can be used for commercial buildings.

The often long supply lines of the light strips are highly susceptible to surges. Even a type 2 surge arrester or type 1 combined arrester in the power distribution board cannot prevent that the voltage peak is displaced into the lamps. Therefore, an additional surge arrester must be installed in close proximity to the light strip.

The risk of surges entering the light strips is considerably reduced if the frequently used class I light strips (PE connection) are installed. If light strips feature luminaires with double or reinforced insulation, the light strip cables are often routed in a metal rail and are thus largely protected due to shielded design of the metal rail.

In practice, light strips are operated with alternating current (230 V/50 Hz) and three-phase current (3x 230/400 V/50 Hz). For both types of supply, the maximum number of luminaires to be connected depends on the cross-section of the series

connected cables. To be able to consider the inrush currents of the electronic ballasts for the fuses, the luminaire manufacturer specifies the maximum number of the relevant luminaires depending on the rated currents of the overcurrent protective devices. This means that only 13 T26/58 W twin-lamp electronic ballasts may be connected to e.g. a 16 A circuit breaker with characteristic B although the operating current is $13 \times 0.58 \text{ A} = 7.54 \text{ A}$. Since luminaires do not cause overload, the line must only be protected against short-circuits. The voltage drop is also not determined depending on the rated current of the overcurrent protective device, but on the operating current of the luminaires.

In practice, type 3 surge arresters are used to protect small-sized light strips operated with alternating current with backup fuses up to 16 A (**Figure 1**). Thanks to their compact design, these surge arresters can be installed in the luminaire housing.

For light strips operated with three-phase current with backup fuses up to 25 A, it is advisable to use DIN rail mounted type 3 surge arresters in a flush-mounted enclosure with an adequate degree of protection which can be directly installed on the DIN rail (**Figure 2**). This type of installation is recommended for the supply lines of pendent luminaires (length of several metres). The flush-mounted enclosure should be installed at the cable tray if the light strips described above are mounted next to a ceiling (**Figure 3**).

If powerful light strips are supplied with three-phase current (nominal current > 25 A) via long cable distances, larger cross-sections must frequently be installed due to the voltage drop and the loop impedance. In such cases, the cable cross-section close to the connection point of the light strip is reduced to the cross-section to be connected to the terminal (in the majority of cases 2.5 mm^2) via a junction box. To this end, it is advisable to install type 2 surge arresters which are available for TN-S and TT systems. These surge arresters may only be used for backup fuses up to max. 125 A which is out of the question due to the short-circuit load on the light strip wiring.

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Figure 1 Type 3 surge arrester installed in an office luminaire

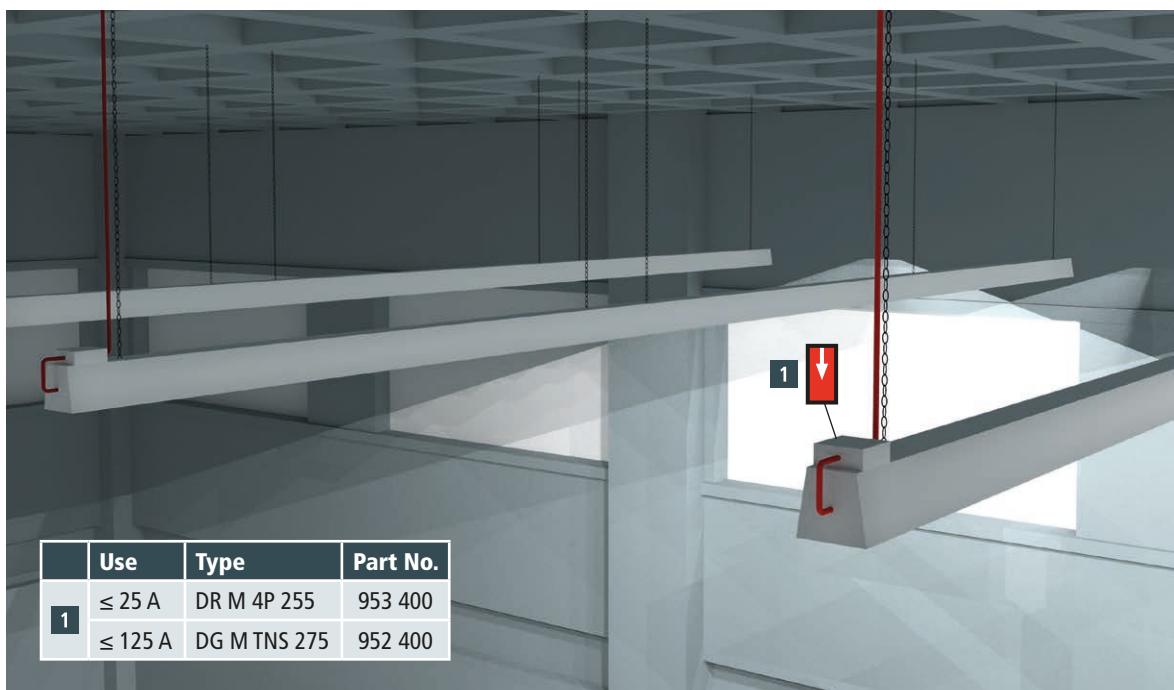


Figure 2 Type 2 / type 3 surge arrester in a flush-mounted enclosure installed on the mounting rail of a light strip

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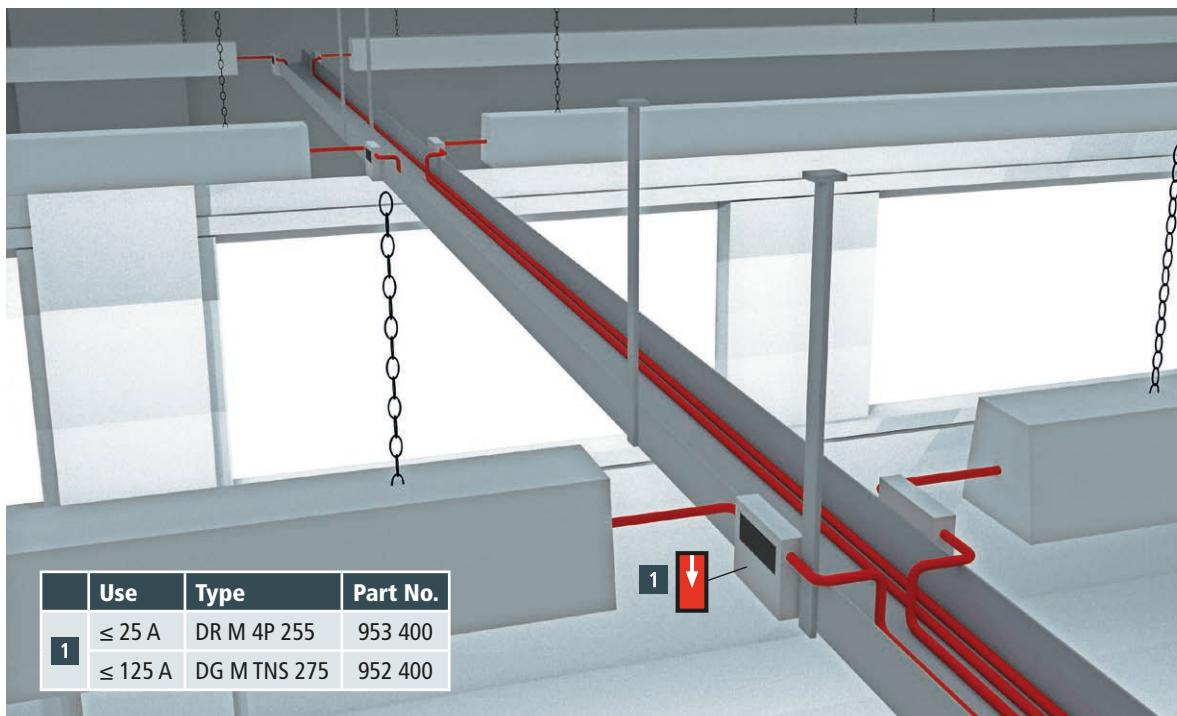


Figure 3 Type 2/type 3 surge arrester in a flush-mounted enclosure installed on a cable tray

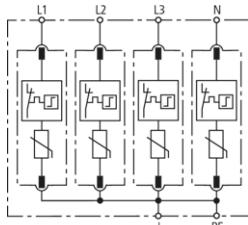
DEHNguard

DG M TNS 275 (952 400)

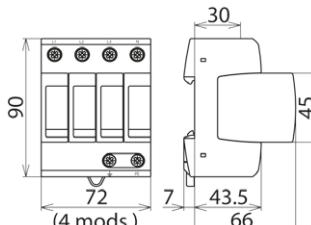
- Prewired complete unit consisting of a base part and plug-in protection modules
- High discharge capacity due to heavy-duty zinc oxide varistors / spark gaps
- High reliability due to "Thermo Dynamic Control" SPD monitoring device



Figure without obligation



Basic circuit diagram DG M TNS 275



Dimension drawing DG M TNS 275

Modular surge arrester for use in TN-S systems.

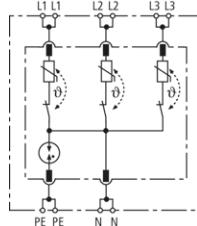
Type Part No.	DG M TNS 275 952 400
SPD according to EN 61643-11 / IEC 61643-11	type 2 / class II
Nominal a.c. voltage (U_N)	230 / 400 V (50 / 60 Hz)
Max. continuous operating a.c. voltage (U_C)	275 V (50 / 60 Hz)
Nominal discharge current (8/20 μ s) (I_n)	20 kA
Max. discharge current (8/20 μ s) (I_{max})	40 kA
Voltage protection level (U_P)	≤ 1.5 kV
Voltage protection level at 5 kA (U_P)	≤ 1 kV
Response time (t_A)	≤ 25 ns
Max. mains-side overcurrent protection	125 A gG
Short-circuit withstand capability for max. mains-side overcurrent protection (I_{SCCR})	50 kA _{rms}
Temporary overvoltage (TOV) (U_T) – Characteristic	335 V / 5 sec. – withstand
Temporary overvoltage (TOV) (U_T) – Characteristic	440 V / 120 min. – safe failure
Operating temperature range (T_U)	-40 °C ... +80 °C
Operating state / fault indication	green / red
Number of ports	1
Cross-sectional area (min.)	1.5 mm ² solid / flexible
Cross-sectional area (max.)	35 mm ² stranded / 25 mm ² flexible
For mounting on	35 mm DIN rails acc. to EN 60715
Enclosure material	thermoplastic, red, UL 94 V-0
Place of installation	indoor installation
Degree of protection	IP 20
Capacity	4 module(s), DIN 43880
Approvals	KEMA, VDE, UL, VdS
Weight	443 g
Customs tariff number	85363030
GTIN	4013364108455
PU	1 pc(s)

DR M 4P 255 (953 400)

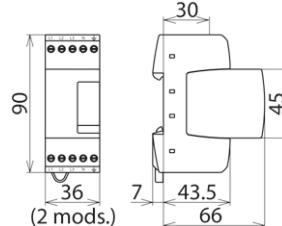
- Four-pole surge arrester consisting of a base element and plug-in protection module
- High discharge capacity due to heavy-duty zinc oxide varistor/spark gap combination
- Energy coordination with other arresters of the Red/Line product family



Figure without obligation



Basic circuit diagram DR M 4P 255



Dimension drawing DR M 4P 255

Four-pole surge arrester consisting of a base part and plug-in protection module; FM version with floating remote signalling contact

Type	DR M 4P 255
Part No.	953 400
SPD according to EN 61643-11	Type 3
SPD according to 61643-1/11	Class III
Nominal a.c. voltage (U_N)	230/400 V
Max. continuous operating a.c. voltage (U_C)	255/440 V
Nominal load current a.c. (I_L)	25 A
Nominal discharge current (8/20 μ s) (I_n)	3 kA
Total discharge current (8/20 μ s) [L1+L2+L3+N-PE] (I_{total})	8 kA
Combined impulse (U_{OC})	6 kV
Combined impulse [L1+L2+L3+N-PE] ($U_{OC\ total}$)	16 kV
Voltage protection level [L-N] (U_P)	\leq 1000 V
Voltage protection level [L/N-PE] (U_P)	\leq 1500 V
Response time [L-N] (t_A)	\leq 25 ns
Response time [L/N-PE] (t_A)	\leq 100 ns
Max. mains-side overcurrent protection	25 A gL/gG or B 25 A
Short-circuit withstand capability for mains-side overcurrent protection with 25 A gL/gG	6 kA _{rms}
Temporary overvoltage (TOV) [L-N] (U_T)	335 V / 5 sec.
Temporary overvoltage (TOV) [L/N-PE] (U_T)	400 V / 5 sec.
Temporary overvoltage (TOV) [N-PE] (U_T)	1200 V / 200 ms
TOV characteristic [L-N]	withstand
TOV characteristic [L/N-PE]	withstand
TOV characteristic [L+N-PE]	safe
Operating temperature range (T_U)	-40°C...+80°C
Operating state/fault indication	green / red
Number of ports	1
Cross-sectional area (min.)	0.5 mm ² solid/flexible
Cross-sectional area (max.)	4 mm ² stranded/2.5 mm ² flexible
For mounting on	35 mm DIN rails acc. to EN 60715
Enclosure material	thermoplastic, red, UL 94 V-0
Place of installation	indoor installation
Degree of protection	IP 20
Capacity	2 modules, DIN 43880
Approvals, Certifications	KEMA, VDE, UL
Weight	138 g
Customs tariff number	85363030
GTIN	4013364115767
PU	1 pc(s)

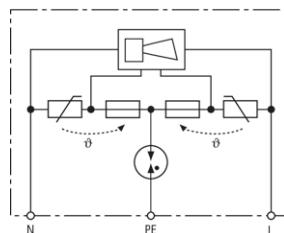
DEHNflex

DFL M 255 (924 396)

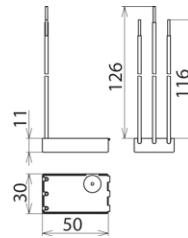
- Acoustic fault indication
- Compact design
- For use in flush-mounted systems, cable ducts and flush-type boxes



Figure without obligation



Basic circuit diagram DFL M 255



Dimension drawing DFL M 255

Surge arrester for use in all types of installation systems for terminal equipment; compact dimensions

Type Part No.	DFL M 255 924 396
SPD according to EN 61643-11	Type 3
SPD according to IEC 61643-1/1-11	Class III
Nominal a.c. voltage (U_N)	230 V
Max. continuous operating a.c. voltage (U_C)	255 V
Nominal discharge current (8/20 μ s) (I_n)	1.5 kA
Total discharge current (8/20 μ s) [L+N-PE] (I_{total})	3 kA
Combined impulse (U_{oc})	3 kV
Combined impulse [L+N-PE] ($U_{OC\ total}$)	6 kV
Voltage protection level [L-N] (U_P)	≤ 1.25 kV
Voltage protection level [L/N-PE] (U_P)	≤ 1.5 kV
Response time [L-N] (t_A)	≤ 25 ns
Response time [L/N-PE] (t_A)	≤ 100 ns
Max. mains-side overcurrent protection	32 A gL/gG or B/C 32 A
Short-circuit withstand capability for mains-side overcurrent protection with 32 A gL/gG	6 kA _{rms}
Temporary overvoltage (TOV) [L-N] (U_T)	335 V / 5 sec.
Temporary overvoltage (TOV) [L/N-PE] (U_T)	400 V / 5 sec.
Temporary overvoltage (TOV) [L+N-PE] (U_T)	1200 V + U_{CS} / 200 ms
TOV characteristic [L-N]	withstand
TOV characteristic [L/N-PE]	withstand
TOV characteristic [L+N-PE]	safe
Fault indication	acoustic signal on
Number of ports	1
Operating temperature range (T_U)	-25°C...+40°C
Terminal wires	1 mm ² , 120 mm long
Enclosure material	thermoplastic, red, UL 94 V-2
Place of installation	indoor installation
Degree of protection of installed device	IP 20
Dimensions	30 x 50 x 11 mm
Weight	32 g
Customs tariff number	85363010
GTIN	4013364091016
PU	1 pc(s)



**Surge Protection
Lightning Protection
Safety Equipment
DEHN protects.**

**DEHN + SÖHNE
GmbH + Co.KG.**

**Hans-Dehn-Str. 1
Postfach 1640
92306 Neumarkt
Germany**

**Tel. +49 9181 906-0
Fax +49 9181 906-1100
info@dehn.de
www.dehn-international.com**



www.dehn-international.com/partners

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