



# Surge protection in low-voltage switchgear assemblies

White Paper



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IEC 60364-4-44 and  
IEC 60364-5-53

- SPD at supply point
- Requirements on protection level
- Requirements on impulse current

Protection against short-circuiting

Effective protective distance of SPDs

Requirements on cable lengths and cross-sections of SPDs

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The publication of the installation standards IEC 60364-4-44 and IEC 60364-5-53 in September 2015 made the use of surge protective devices (SPDs) compulsory. This requirement is no longer just valid for commercial and industrial facilities, but also holds unconditional validity for residential buildings: houses and flats. The surge protective devices are now, as a general rule, to be installed at the supply point of the facility (in the vicinity of the entrance point into the building). This supply point may be the main distribution board (MDB)/low voltage main distribution.

In the MDB/low voltage main distribution, it is obligatory to have an SPD to protect against common-mode interference (active line to ground). In order to protect against lightning current and switching overvoltage, facilities with external lightning protection must have a combined arrester. With regard to the parameters discharge capacity, short-circuit withstand capability and follow current extinguishing capability, it is only possible to use type 1 SPDs as combined arresters in the main distribution board (MDB)/low voltage main distribution.

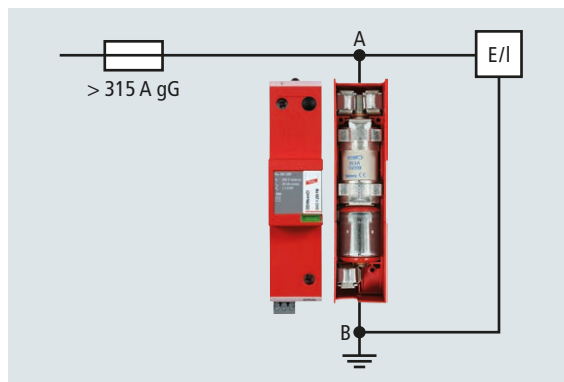


Figure 1 DEHNvenCI as a combined arrester SPD type 1 ( $U_p \leq 1.5$  kV) with integrated SPD fuse protection

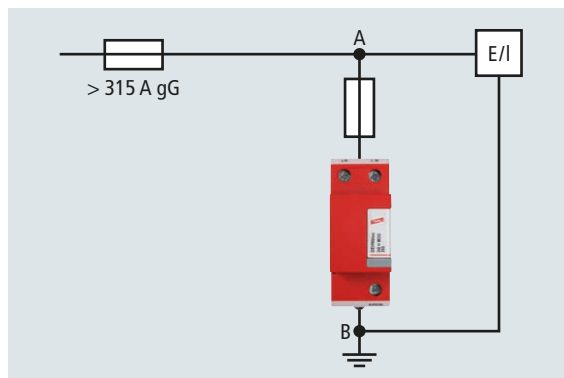


Figure 2 DEHNbloc modular as a coordinated arrester SPD type 1 ( $U_p \leq 2.5$  kV) with external SPD fuse protection

Here one simply distinguishes between SPDs with integrated fusing (Figure 1) and with external fusing (Figure 2).

In the case of external SPD fusing, the overcurrent protective device applied may not be tripped before reaching the maximum SPD  $I_{imp}$  (10/350  $\mu$ s) or  $I_n$  (8/20  $\mu$ s). The time-current characteristic of gG fuses is applied as a reference value for overcurrent protective devices. Should there be a circuit breaker upstream of the SPD, its characteristic must be compared with the characteristic of the maximum permissible gG fuse (Table 1).

As the actual protection level of the system is determined by the voltage drop over the connection wires and the external overcurrent protective device, SPDs with integrated fuses hold advantages because their protection level ( $U_p$ ) already makes allowances for voltage drops via the fuse (Figure 3).

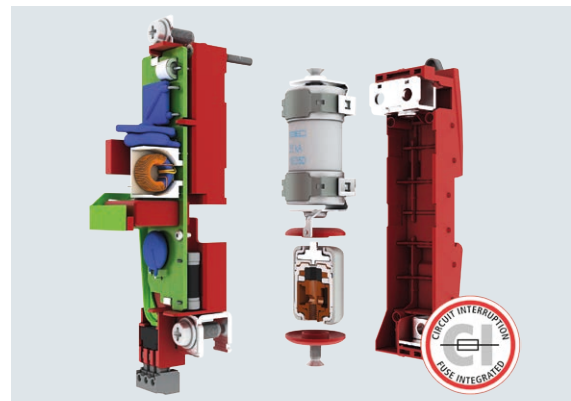


Figure 3 DEHNvenCI as a combined arrester SPD type 1 with integrated fuse protection

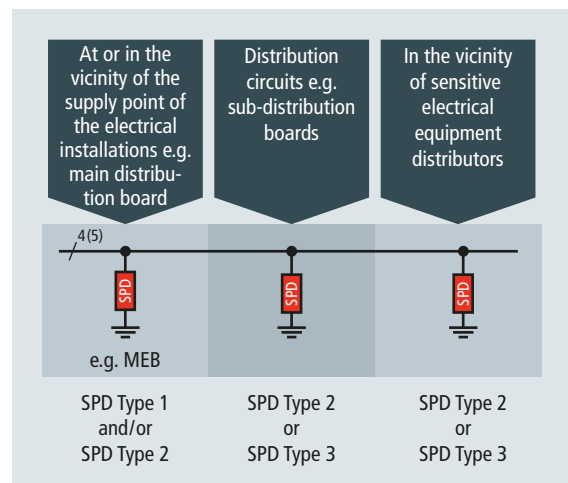


Figure 4 Energy-coordinated SPD downstream of the main distribution board

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|                                                                                                                                                  | Surge arrester DEHNguard                                                              |                     |                                    | Lightning current arrester DEHNventil                                                 |                       |                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------|------------------------------------|---------------------------------------------------------------------------------------|-----------------------|------------------------------------|
|                                                                                                                                                  | Nominal discharge current 20 kA (8/20 µs)<br>in TN-S system                           |                     |                                    | Lightning current impulse 25 kA (10/350 µs)<br>in TN-S system                         |                       |                                    |
| Minimum cross section terminal                                                                                                                   | 1.5 mm <sup>2</sup>                                                                   |                     |                                    | 10 mm <sup>2</sup>                                                                    |                       |                                    |
| Minimum cross section earthing conductor S3                                                                                                      | 6 mm <sup>2</sup>                                                                     |                     |                                    | 16 mm <sup>2</sup>                                                                    |                       |                                    |
|                                                                                                                                                  | Minimum cross section conductor S2 + S3 / impulse current carrying capability of fuse |                     |                                    | Minimum cross section conductor S2 + S3 / impulse current carrying capability of fuse |                       |                                    |
| gG 63 A D02                                                                                                                                      | 10 mm <sup>2</sup>                                                                    | 23.1 kA*<br>8/20 µs |                                    |                                                                                       |                       |                                    |
| gG 80 A D03                                                                                                                                      | 10 mm <sup>2</sup>                                                                    | 23.2 kA*<br>8/20 µs |                                    |                                                                                       |                       |                                    |
| gG 100 A D03                                                                                                                                     | 16 mm <sup>2</sup>                                                                    | 41.4 kA*<br>8/20 µs |                                    |                                                                                       |                       |                                    |
| gG 100 A NH                                                                                                                                      | 16 mm <sup>2</sup>                                                                    | n/a                 |                                    |                                                                                       |                       |                                    |
| gG 125 A NH                                                                                                                                      | 16 mm <sup>2</sup>                                                                    | n/a                 | Max. overcurrent protective device | 16 mm <sup>2</sup>                                                                    | 11.3 kA*<br>10/350 µs |                                    |
| gG 160 A NH                                                                                                                                      |                                                                                       |                     |                                    | 25 mm <sup>2</sup>                                                                    | 15.3 kA*<br>10/350 µs |                                    |
| gG 200 A NH                                                                                                                                      |                                                                                       |                     |                                    | 35 mm <sup>2</sup>                                                                    | 19.7 kA*<br>10/350 µs |                                    |
| gG 250 A NH                                                                                                                                      |                                                                                       |                     |                                    | 35 mm <sup>2</sup>                                                                    | 27.9 kA*<br>10/350 µs |                                    |
| gG 315 A NH                                                                                                                                      |                                                                                       |                     |                                    | 50 mm <sup>2</sup>                                                                    | 34.2 kA*<br>10/350 µs | Max. overcurrent protective device |
| * The kA values stated are calculated values according to IEC 61643-12<br>Lightning current in the TN-S system is distributed over 5 conductors. |                                                                                       |                     |                                    |                                                                                       |                       |                                    |

Table 1 Cross-sectional area of PVC insulated copper conductors H-07VK depending on the nominal discharge current, lightning current and mains current related I<sup>2</sup>t value for max. 5 s

If the SPD in the main distribution board (MDB)/low voltage main distribution cannot guarantee the required rated impulse withstand voltage level, additional type 2 and type 3 SPDs are necessary in the system and/or further distribution boards. These SPDs must be energy-coordinated (**Figure 4**).

If the cable between the SPD and the electrical device (e.g. subsequent distribution board, terminal device) requiring protection is longer than 10 m, additional protection measures need to be taken.

The protection level  $U_p$  of the SPD should not exceed 80 % of the rated impulse withstand voltage level of the relevant

electrical equipment. The reason for this is the arising voltage drop ( $U = L \cdot di/dt$ ) on the connection wire with a max. length of 0.5 m (active conductor to the SPD and from there to the PE/PEN conductor) (**Figure 5**). An exception to this is the equipotential bonding conductor from the SPD to the main/earthing busbar.

This need not be considered, if a connection version is selected which does not cause a voltage drop to the SPD, i.e. connection in series (**Figure 6**), or, as shown in **Figure 3**, when using an SPD set with integrated backup fuse.

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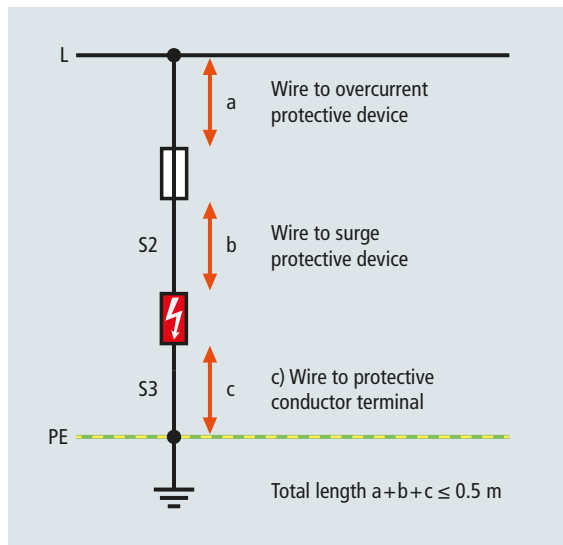


Figure 5 Maximum total length of wires of 0.5 m, which in connection with the 80 % reduction still maintain the rated impulse withstand voltage

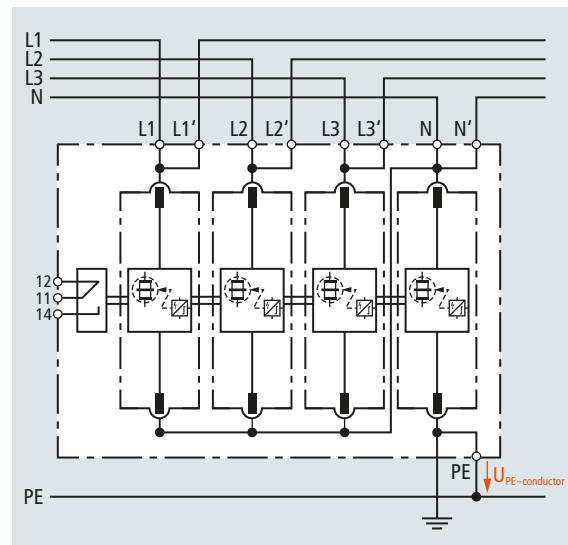


Figure 6 DEHNventil in series connection with low voltage drop  $U_{PE-conductor}$  on the PE-conductor between the PE-terminal and double terminal for smaller main distribution boards up to max. 125 A load current

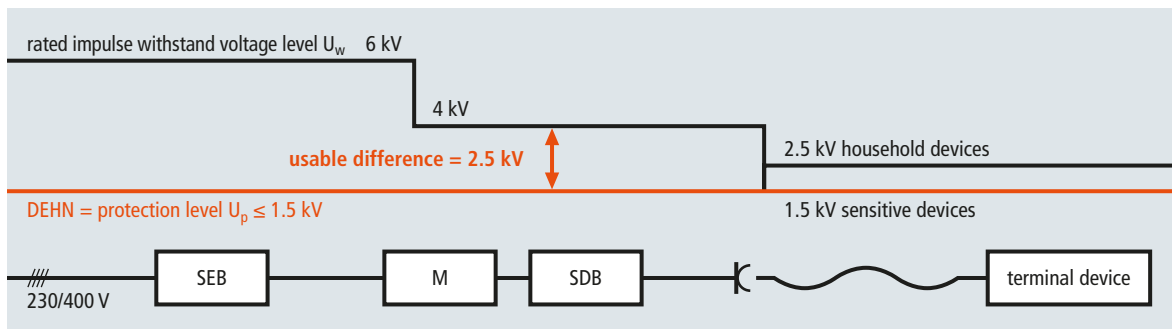


Figure 7 Usable voltage difference ( $U_w - U_p$ ) through the use of a DEHNventil, to make it possible to use wires longer than 0.5 m

| Voltage drop occurring         |                                           |        |        |
|--------------------------------|-------------------------------------------|--------|--------|
| Current impulse (8/20 $\mu$ s) | Voltage drop for cables laid straight [m] | 0.5 m  | 2 m    |
| 5 kA                           | 500 V                                     | 250 V  | 1000 V |
| 10 kA                          | 1000 V                                    | 500 V  | 2000 V |
| 12,5 kA                        | 1250 V                                    | 625 V  | 2500 V |
| 20 kA                          | 2000 V                                    | 1000 V | 4000 V |
| 25 kA                          | 2500 V                                    | 1250 V | 5000 V |

Table 2 Voltage drop in connection cables with different impulse current loads

As the inductivity of a round conductor in the relevant cross-sectional area (16–50 mm<sup>2</sup>) is approx. 1  $\mu$ H/m, assuming an impulse current of 10kA 8/20  $\mu$ s, there is a drop in voltage of approx. 1 kV/m. This means that in a main distribution board with 4 kV rated impulse withstand voltage one could connect a DEHNventil ( $U_p = 1.5$  kV) with an additional cable length of approx. 1 m (Figure 7). When calculating with higher or lower values than 25 kA 8/20  $\mu$ s, the cable lengths should be reduced or increased linearly (Table 2).

Here it is important to note that the original protection level of a DEHNventil ( $U_p \leq 1.5$  kV) is now no longer available for electrical equipment with lower rated impulse withstand

# Surge protection in low-voltage switchgear assemblies

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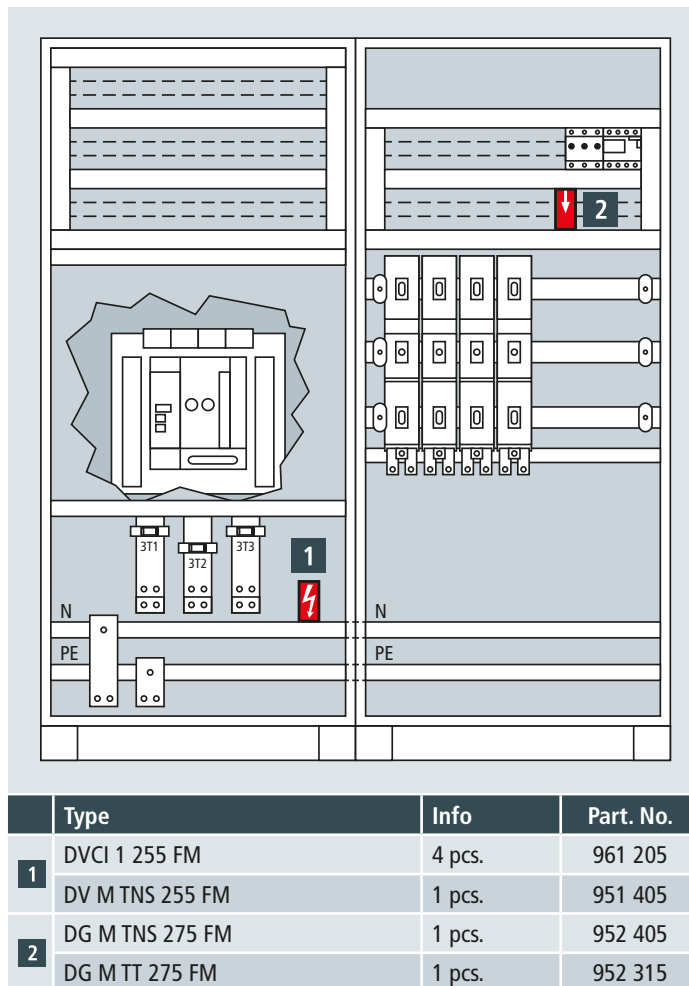


Figure 8 Main distribution board with longer connection wires than 0.5 m to type 1 or type 2 SPDs to comply with overvoltage category I (rated impulse withstand voltage  $\leq 1.5$  kV) in the outgoing panels

voltage and must therefore be ensured by SPDs with a lower protection level (**Figure 8**).

If local conditions do not permit the realisation of these requirements, the user has the following possibilities to solve this problem:

- ➔ Selection of an SPD with a lower protection level.  
**Table 2** offers help with regard to selection and arrangement. The values stated were interpolated with the formula  $U = L \cdot di/dt$  in accordance with impulse current values at  $8/20 \mu s$  to IEC 60364-5-53 (**Table 2**).
- ➔ Selection of an SPD with integrated backup fuse



Figure 9 Additional local equipotential bonding, e.g. via the metal enclosure/mounting plate of the switchgear installation

- ➔ Installation of a second, coordinated SPD at the equipment to be protected
- ➔ Connection in series
- ➔ Additional local equipotential bonding, e.g. via the metal enclosure of the switchgear installation (**Figure 9**).

If a TN-C system is fed into a main distribution board and the central earthing point is at the separation point of the PEN conductor to the PE and N conductor, another SPD in 3+0 configuration can be installed at a maximum distance of 0.5 m (**Figure 10**).

An important SPD parameter is the necessary short-circuit withstand capacity  $I_{SCCR}$ , which must be at least that of the short-circuit current occurring at the point of connection.

### Protection of information technology cables

It should be noted, that although the IEC 60364-4-44 and IEC 60364-5-33 do not comprise the protection of data and telecommunications cables, they do clearly recommend that it is only possible to provide complete and effective surge protection if one includes these cables. When surge protection is required for the energy supply, it should also be considered for data cables.

# Surge protection in low-voltage switchgear assemblies

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Nowadays, many functional modules in buildings have both a mains power supply and telecommunications connections. As a result, interference can be coupled through both channels. Typical information technology cables which should be connected are, e.g.

- ➔ Telephone and DSL connections
- ➔ Satellite and broadband cable systems

- ➔ Data lines (e.g. Ethernet)
- ➔ Building automation (e.g. KNX-Bus)
- ➔ Sensors (e.g. external sensors for heating).

DEHN + SÖHNE offers a wide variety of solutions depending on the interface and the location. These include products which can simply be mounted on the wall, on a DIN rail or for KNX building automation (**Figure 11**).

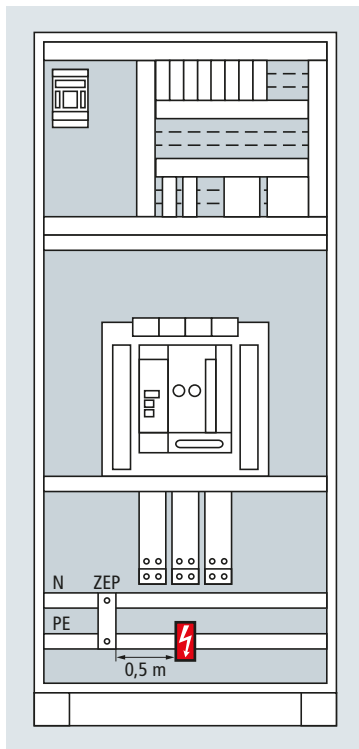


Figure 10 Possible application of 3 x DEHNvenCI in 3+0 configuration in the TN-S system under observation of the maximum distance of 0.5 m to the separation point PEN → PE + N



Figure 11 DEHNgate – coaxial arrester for satellite and broadband cable systems, BLITZDUCTOR for mounting on a DIN rail, DEHNpatch for the Ethernet port of a PC system, BUSsector for KNX building automation, DEHNpatch in 19" distributor, DEHNbox for simple and flexible wall-mounting

## DEHNvenCI

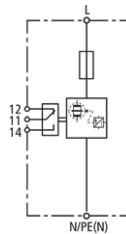
### DVCI 1 255 FM (961 205)

Spark-gap-based combined lightning current and surge arrester with integrated lightning current carrying backup fuse

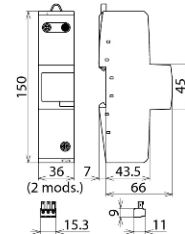
- Maximum system availability due to RADAX Flow follow current limitation
- Capable of protecting terminal equipment



Figure without obligation



Basic circuit diagram DVCI 1 255 FM



Dimension drawing DVCI 1 255 FM

Combined lightning current and surge arrester with integrated lightning current carrying backup fuse.

| Type                                                       | DVCI 1 255 FM                                                                                                                            |
|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Part No.                                                   | 961 205                                                                                                                                  |
| SPD according to EN 61643-11 / IEC 61643-11                | type 1 / class I                                                                                                                         |
| Energy coordination with terminal equipment                | type 1 + type 2                                                                                                                          |
| Energy coordination with terminal equipment ( $\leq 10$ m) | type 1 + type 2 + type 3                                                                                                                 |
| Nominal voltage (a.c.) ( $U_N$ )                           | 230 V (50 / 60 Hz)                                                                                                                       |
| Maximum continuous operating voltage (a.c.) ( $U_C$ )      | 255 V (50 / 60 Hz)                                                                                                                       |
| Lightning impulse current (10/350 $\mu$ s) ( $I_{imp}$ )   | 25 kA                                                                                                                                    |
| Specific energy (W/R)                                      | 156.25 kJ/ohms                                                                                                                           |
| Voltage protection level ( $U_P$ )                         | $\leq 1.5$ kV                                                                                                                            |
| Follow current extinguishing capability (a.c.) ( $I_n$ )   | 50 kA <sub>rms</sub>                                                                                                                     |
| Follow current limitation / Selectivity                    | no tripping of a 20 A gG fuse up to 50 kA <sub>rms</sub> (prosp.)                                                                        |
| Response time ( $t_A$ )                                    | $\leq 100$ ns                                                                                                                            |
| Max. mains-side overcurrent protection                     | not required                                                                                                                             |
| Rated breaking capacity of the internal backup protection  | 100 kA                                                                                                                                   |
| Temporary overvoltage (TOV) ( $U_T$ ) – Characteristic     | 440 V / 120 min. – withstand                                                                                                             |
| Operating temperature range ( $T_U$ )                      | -40 °C ... +80 °C                                                                                                                        |
| Operating state / fault indication                         | green / red                                                                                                                              |
| Number of ports                                            | 1                                                                                                                                        |
| Cross-sectional area (L, N/PE(N)) (min.)                   | 10 mm <sup>2</sup> solid / flexible                                                                                                      |
| Cross-sectional area (L, N/PE(N)) (max.)                   | 50 mm <sup>2</sup> stranded / 35 mm <sup>2</sup> 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 module(s), DIN 43880                                                                                                                   |
| Approvals                                                  | KEMA                                                                                                                                     |
| Type of remote signalling contact                          | changeover contact                                                                                                                       |
| Switching capacity (a.c.)                                  | 250 V / 0.5 A                                                                                                                            |
| Switching capacity (d.c.)                                  | 250 V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A                                                                                               |
| Cross-sectional area for remote signalling terminals       | max. 1.5 mm <sup>2</sup> solid / flexible                                                                                                |
| Extended technical data:                                   | For use in switchgear installations with prospective short-circuit currents of more than 50 kA <sub>rms</sub> (tested by the German VDE) |
| – Max. prospective short-circuit current                   | 100 kA <sub>rms</sub> (220 kA <sub>peak</sub> )                                                                                          |
| – Limitation / Extinction of mains follow currents         | up to 100 kA <sub>rms</sub> (220 kA <sub>peak</sub> )                                                                                    |
| Supplementary data:                                        | -----                                                                                                                                    |
| – Nominal discharge current (8/20 $\mu$ s) ( $I_n$ )       | 25 kA                                                                                                                                    |
| Weight                                                     | 435 g                                                                                                                                    |
| Customs tariff number (Comb. Nomenclature EU)              | 85363090                                                                                                                                 |
| GTIN                                                       | 4013364145115                                                                                                                            |
| PU                                                         | 1 pc(s)                                                                                                                                  |

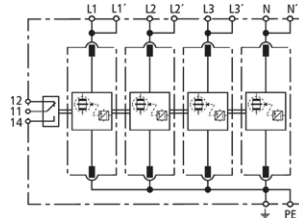
## DEHNventil

### DV M TNS 255 FM (951 405)

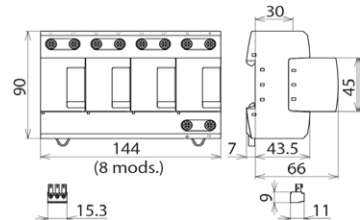
- Prewired spark-gap-based type 1 and type 2 combined lightning current and surge arrester consisting of a base part and plug-in protection modules
- Maximum system availability due to RADAX Flow follow current limitation
- Capable of protecting terminal equipment



Figure without obligation



Basic circuit diagram DV M TNS 255 FM



Dimension drawing DV M TNS 255 FM

Modular combined lightning current and surge arrester for TN-S systems.

| Type                                                                        | DV M TNS 255 FM                                                                                                                          |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Part No.                                                                    | 951 405                                                                                                                                  |
| SPD according to EN 61643-11 / IEC 61643-11                                 | type 1 + type 2 / class I + class II                                                                                                     |
| Energy coordination with terminal equipment ( $\leq 10$ m)                  | type 1 + type 2 + type 3                                                                                                                 |
| Nominal voltage (a.c.) ( $U_N$ )                                            | 230 / 400 V (50 / 60 Hz)                                                                                                                 |
| Max. continuous operating voltage (a.c.) ( $U_C$ )                          | 264 V (50 / 60 Hz)                                                                                                                       |
| Lightning impulse current (10/350 $\mu$ s) [L1+L2+L3+N-PE] ( $I_{total}$ )  | 100 kA                                                                                                                                   |
| Specific energy [L1+L2+L3+N-PE] (W/R)                                       | 2.50 MJ/ohms                                                                                                                             |
| Lightning impulse current (10/350 $\mu$ s) [L, N-PE] ( $I_{imp}$ )          | 25 kA                                                                                                                                    |
| Specific energy [L,N-PE] (W/R)                                              | 156.25 kJ/ohms                                                                                                                           |
| Nominal discharge current (8/20 $\mu$ s) [L/N-PE]/[L1+L2+L3+N-PE] ( $I_n$ ) | 25 / 100 kA                                                                                                                              |
| Voltage protection level [L-PE]/[N-PE] ( $U_P$ )                            | $\leq 1.5$ / $\leq 1.5$ kV                                                                                                               |
| Follow current extinguishing capability (a.c.) ( $I_f$ )                    | 50 kA <sub>rms</sub>                                                                                                                     |
| Follow current limitation / Selectivity                                     | no tripping of a 20 A gG fuse up to 50 kA <sub>rms</sub> (prosp.)                                                                        |
| Response time ( $t_A$ )                                                     | $\leq 100$ ns                                                                                                                            |
| Max. backup fuse (L) up to $I_K = 50$ kA <sub>rms</sub>                     | 315 A gG                                                                                                                                 |
| Max. backup fuse (L-L')                                                     | 125 A gG                                                                                                                                 |
| Temporary overvoltage (TOV) [L-N] ( $U_T$ ) – Characteristic                | 440 V / 120 min. – withstand                                                                                                             |
| Operating temperature range [parallel] / [series] ( $T_U$ )                 | -40 °C ... +80 °C / -40 °C ... +60 °C                                                                                                    |
| Operating state / fault indication                                          | green / red                                                                                                                              |
| Number of ports                                                             | 1                                                                                                                                        |
| Cross-sectional area (L1, L1', L2, L2', L3, L3', N, N', PE, $\pm$ ) (min.)  | 10 mm <sup>2</sup> solid / flexible                                                                                                      |
| Cross-sectional area (L1, L2, L3, N, PE) (max.)                             | 50 mm <sup>2</sup> stranded / 35 mm <sup>2</sup> flexible                                                                                |
| Cross-sectional area (L1', L2', L3', N', $\pm$ ) (max.)                     | 35 mm <sup>2</sup> stranded / 25 mm <sup>2</sup> 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                                                                    | 8 module(s), DIN 43880                                                                                                                   |
| Approvals                                                                   | KEMA, VDE, UL                                                                                                                            |
| Type of remote signalling contact                                           | changeover contact                                                                                                                       |
| Switching capacity (a.c.)                                                   | 250 V / 0.5 A                                                                                                                            |
| Switching capacity (d.c.)                                                   | 250 V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A                                                                                               |
| Cross-sectional area for remote signalling terminals                        | max. 1.5 mm <sup>2</sup> solid / flexible                                                                                                |
| Extended technical data:                                                    | For use in switchgear installations with prospective short-circuit currents of more than 50 kA <sub>rms</sub> (tested by the German VDE) |
| – Max. prospective short-circuit current                                    | 100 kA <sub>rms</sub> (220 kA <sub>peak</sub> )                                                                                          |
| – Limitation / Extinction of mains follow currents                          | up to 100 kA <sub>rms</sub> (220 kA <sub>peak</sub> )                                                                                    |
| – Max. backup fuse (L) up to $I_K = 100$ kA <sub>rms</sub>                  | 315 A gG                                                                                                                                 |
| Weight                                                                      | 1,36 kg                                                                                                                                  |
| Customs tariff number (Comb. Nomenclature EU)                               | 85363090                                                                                                                                 |
| GTIN                                                                        | 4013364108165                                                                                                                            |
| PU                                                                          | 1 pc(s)                                                                                                                                  |

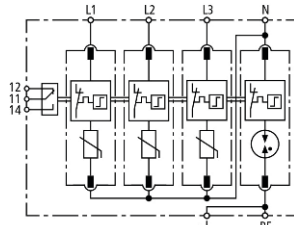
## DEHNguard

### DG M TT 275 FM (952 315)

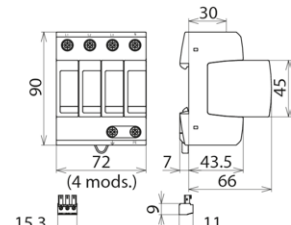
- Prewired complete unit consisting of a base part and plug-in protection modules
- High discharge capacity due to heavy-duty zinc oxide varistors / spark gaps
- High reliability due to "Thermo Dynamic Control" SPD monitoring device



Figure without obligation



Basic circuit diagram DG M TT 275 FM



Dimension drawing DG M TT 275 FM

Modular surge arrester for use in TT and TN-S systems (3+1 configuration); with floating remote signalling contact.

| Type                                                                                         | DG M TT 275 FM                                            |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Part No.                                                                                     | 952 315                                                   |
| SPD according to EN 61643-11 / IEC 61643-11                                                  | type 2 / class II                                         |
| Nominal voltage (a.c.) ( $U_N$ )                                                             | 230 / 400 V (50 / 60 Hz)                                  |
| Max. continuous operating voltage (a.c.) [L-N] ( $U_C$ )                                     | 275 V (50 / 60 Hz)                                        |
| Max. continuous operating voltage (a.c.) [N-PE] ( $U_C$ )                                    | 255 V (50 / 60 Hz)                                        |
| Nominal discharge current (8/20 $\mu$ s) ( $I_n$ )                                           | 20 kA                                                     |
| Max. discharge current (8/20 $\mu$ s) ( $I_{max}$ )                                          | 40 kA                                                     |
| Lightning impulse current (10/350 $\mu$ s) [N-PE] ( $I_{imp}$ )                              | 12 kA                                                     |
| Voltage protection level [L-N]/[N-PE] ( $U_P$ )                                              | $\leq 1.5 / \leq 1.5$ kV                                  |
| Voltage protection level [L-N] / [N-PE] at 5 kA ( $U_P$ )                                    | $\leq 1 / \leq 1.5$ kV                                    |
| Follow current extinguishing capability [N-PE] ( $I_R$ )                                     | 100 A <sub>rms</sub>                                      |
| Response time [L-N] ( $t_A$ )                                                                | $\leq 25$ ns                                              |
| Response time [N-PE] ( $t_A$ )                                                               | $\leq 100$ ns                                             |
| Max. mains-side overcurrent protection                                                       | 125 A gG                                                  |
| Short-circuit withstand capability for max. mains-side overcurrent protection ( $I_{SCCR}$ ) | 50 kA <sub>rms</sub>                                      |
| Temporary overvoltage (TOV) [L-N] ( $U_T$ ) – Characteristic                                 | 335 V / 5 sec. – withstand                                |
| Temporary overvoltage (TOV) [L-N] ( $U_T$ ) – Characteristic                                 | 440 V / 120 min. – safe failure                           |
| Temporary overvoltage (TOV) [N-PE] ( $U_T$ ) – Characteristic                                | 1200 V / 200 ms – withstand                               |
| 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 <sup>2</sup> solid / flexible                      |
| Cross-sectional area (max.)                                                                  | 35 mm <sup>2</sup> stranded / 25 mm <sup>2</sup> 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                                             |
| Type of remote signalling contact                                                            | changeover contact                                        |
| Switching capacity (a.c.)                                                                    | 250 V / 0.5 A                                             |
| Switching capacity (d.c.)                                                                    | 250 V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A                |
| Cross-sectional area for remote signalling terminals                                         | max. 1.5 mm <sup>2</sup> solid / flexible                 |
| Extended technical data:                                                                     |                                                           |
| Voltage protection level [L-PE] ( $U_P$ )                                                    | 1.5 kV                                                    |
| Weight                                                                                       | 415 g                                                     |
| Customs tariff number (Comb. Nomenclature EU)                                                | 85363030                                                  |
| GTIN                                                                                         | 4013364108486                                             |
| PU                                                                                           | 1 pc(s)                                                   |

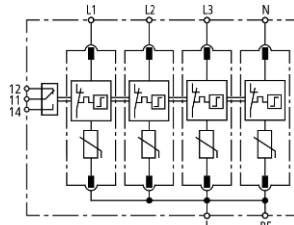
## DEHNguard

### DG M TNS 275 FM (952 405)

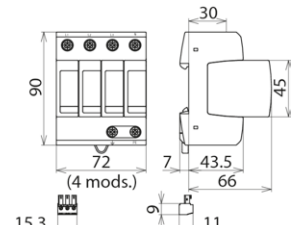
- Prewired complete unit consisting of a base part and plug-in protection modules
- High discharge capacity due to heavy-duty zinc oxide varistors / spark gaps
- High reliability due to "Thermo Dynamic Control" SPD monitoring device



Figure without obligation



Basic circuit diagram DG M TNS 275 FM



Dimension drawing DG M TNS 275 FM

Modular surge arrester for use in TN-S systems; with floating changeover contact.

| Type                                                                                         | DG M TNS 275 FM                                           |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Part No.                                                                                     | 952 405                                                   |
| SPD according to EN 61643-11 / IEC 61643-11                                                  | type 2 / class II                                         |
| Nominal voltage (a.c.) ( $U_N$ )                                                             | 230 / 400 V (50 / 60 Hz)                                  |
| Max. continuous operating voltage (a.c.) ( $U_C$ )                                           | 275 V (50 / 60 Hz)                                        |
| Nominal discharge current (8/20 $\mu$ s) ( $I_n$ )                                           | 20 kA                                                     |
| Max. discharge current (8/20 $\mu$ s) ( $I_{max}$ )                                          | 40 kA                                                     |
| Voltage protection level [L-PE]/[N-PE] ( $U_P$ )                                             | $\leq 1.5$ / $\leq 1.5$ kV                                |
| Voltage protection level [L-PE] / [N-PE] at 5 kA ( $U_P$ )                                   | $\leq 1$ / $\leq 1$ kV                                    |
| Response time ( $t_A$ )                                                                      | $\leq 25$ ns                                              |
| Max. mains-side overcurrent protection                                                       | 125 A gG                                                  |
| Short-circuit withstand capability for max. mains-side overcurrent protection ( $I_{SCCR}$ ) | 50 kA <sub>rms</sub>                                      |
| 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 <sup>2</sup> solid / flexible                      |
| Cross-sectional area (max.)                                                                  | 35 mm <sup>2</sup> stranded / 25 mm <sup>2</sup> 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                                             |
| Type of remote signalling contact                                                            | changeover contact                                        |
| Switching capacity (a.c.)                                                                    | 250 V / 0.5 A                                             |
| Switching capacity (d.c.)                                                                    | 250 V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A                |
| Cross-sectional area for remote signalling terminals                                         | max. 1.5 mm <sup>2</sup> solid / flexible                 |
| Weight                                                                                       | 453 g                                                     |
| Customs tariff number (Comb. Nomenclature EU)                                                | 85363030                                                  |
| GTIN                                                                                         | 4013364108462                                             |
| PU                                                                                           | 1 pc(s)                                                   |

[www.dehn-international.com/partners](http://www.dehn-international.com/partners)



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

DEHN + SÖHNE  
GmbH + Co.KG.

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