

PROTEC Z LV the universal solution for transient switching protection for LV motors, generators, transformer LV secondaries, VSD and UPS equipment

NTSA has developed the ultimate solution for protecting these devices both from lightning and transient switching spikes.

Previous attempts concentrated on trying to combine the lightning and transient switching into one device. The downside of such an approach is that the lightning is in close proximity to the transient switching section. Drawing upon NTSA's deep knowledge of both aspects we developed an optimized and universal solution.

The lightning section is totally separated from the transient switching section and this result in optimal grading between the Class 1 device and the PROTEC Z LV unit, ensuring total surge protection for the machinery that is thus protected both for current and overvoltage spikes.

Description of the lightning protection module

We use a MER Class 1 10-350 25 kA device with superb characteristics as per attached data sheet.

This front end device has been successfully used in the most demanding applications ranging from telecommunication applications to banking servers to mining applications. It offers full protection against lightning in these applications both for the phases and the neutral earth leg. Visual and remote indications of element failure of the system are included on the device

Description of the transient switching section

The wholesale use of vacuum breakers and contactors in industry particularly on LV motors, generators, transformer secondaries, VSD and UPS equipment has led to many failures of these devices and control mechanisms. Vacuum breakers have the propensity to generate spikes up to 6 times the line to line voltage. The spikes have a rise time from 0.1 to 2 microseconds. A typical frequency spectrum between 100-300 kHz is common in these applications. The PROTEC Z LV is uniquely able to protect the windings of the motors, generators, transformer secondaries and the control cards of the UPS and VSD units.

At operating frequency of 50-60 Hz the PROTEC Z LV acts as a quasi-open circuit, with few mA flowing

When the spike "signature" as described above is presented to the filter it will conduct the spike to the device earth, thus preventing the spike to cause damage to the devices.

The filter is uniquely tuned to protect against these destructive spikes. More over the filter also has an integral clip device to ensure that the IEEE winding ageing limit is never

exceeded. This is particularly important for motors, generators and transformer LV secondaries.

The filter is operative from -40 to +70degrees Celsius. It can withstand THD (V) up to 15%. The design is such that it can be directly mounted on the motors, generators and transformer secondaries without any provision for machine vibration effects. IP55 is allowed for to IEC specification publication 529

The flexible cable of 1500 mm can be shortened but not extended. These cables need to be connected to the incoming phases to the machine or device. The phase sequence does not have to be observed in order to connect this filter.

The filter earth stud needs to be connected to machine or device earth with a cable of less than 0.2 Ohm overall resistance and minimum a cross-section of 10 mm squared. It is imperative that the lightning earth and machine earth are connected and that the resistance between the two earths is less than 0.2 Ohm with a cross section of minimum 16 mm squared.

Single phase operation of the system

In some cases a single phase operation is required. The only changes to be done are use one phase connection of the filter and isolate the other two wires. The lightning section can be reduced likewise if appropriate. The three phase lightning section can safely accommodate three single phase filters.

Types of filters

The transient switching filters are available in two types 400V and 690 V 50/60 Hz

- 400V filters span voltages from 480V to 320V
- 690V filters span voltages from 760V to 500V

Options

Branding and barcoding can be negotiated with NTSA

Normal warranty on the filter is 1 year from delivery. Increased warranty can be negotiated with NTSA

Other color coding on the 1500 mm wire can be requested subject to an acceptable order size

Other voltages on request and subject to an acceptable order size

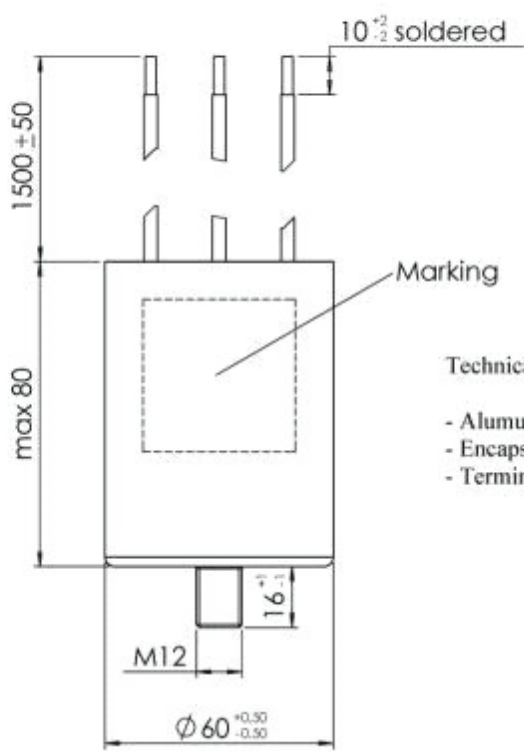
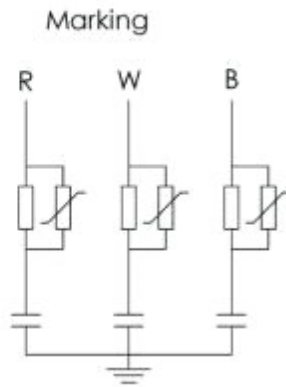
Testing of the filter

The filter needs to be taken out of service by disconnecting the leads and shorting these individually to the earth stud, so that the possible remnant charge on the capacitor phases is totally neutralized. Test with a capacitance meter in the micro Farad range and confirm that the capacitance between the earth stud and each phase is between 0.45 and 0.6 micro Farad. If the reading is outside these values, replace the filter.

Technical notes for the various applications:

- One MER unit is required preferably before the vacuum breaker of the installed load. Normally one unit is required per transformer. If the transformer has several secondary cores, more MER units may be required. See also notes for single phase motors.
- The filter needs to be installed **in front of the VSD** and after the vacuum breaker.
- Transformers where the HV side is switched with vacuum breaker will benefit from a PROTEC Z HV filter
- In application with LV generators, the filter needs to be connected to the alternator output before the breaker
- Ensure that the filter earth, machine earth, MER earth and general earth are properly connected with the correct cross sections and per local regulations. It is important that no extreme potential differences occur between the various elements as enumerated above in the case of a lightning incident
- Machine earth is defined as follows: **Motor**, motor earth connection. **Generator**, alternator earth. **VSD and UPS**, the respective earths. **Transformer LV secondaries**, the general transformer earth.

Drawing and layout of the PROTEC Z LV



- Technical data:
- Aluminium case
 - Encapsulated with epoxy resin
 - Terminals: stranded wire H07V2-K 2,5 mm

NORTHERN TECHNOLOGIES SA

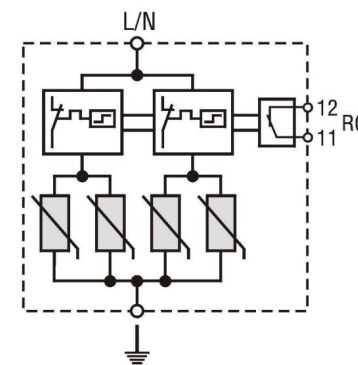
MER 25 / 320V Clas I,II – IEC; Class B - VDE



$$I_{IMP} (10/350) = 25 \text{ kA}$$

$$I_{MAX} (8/20) = 150 \text{ kA}$$

$$U_P (I_{IMP}) < 1 \text{ kV}$$



MER 25 is an SPD for protection against partial direct and indirect lightning strikes.

Protective element is MOV.

MER 25 is intended for protection in zones O_A-1.

Location of use: main distribution boards

Type	MER 25 / 320V
Certified under; tested to	UL 1449,(UL file E213469); IEC – 61643-1
Class (IEC)	I, II
Max permitted operating voltage	335V
Nominal discharge current (8/20) I _n	70kA
Max discharge current (8/20) I _{max}	150kA
Max discharge current (10/350) I _{imp}	25kA
Protection level Up – at I _{imp} (10/350)	1.2kV
Response time t _A	<25 ns
Back –up fuse (if mains is > 250A)	250Agl
Short – circuit capability to	25kA / 50Hz
Temperature range	-40°C+80°C

INSTALLATION and MAINTENANCE INSTRUCTIONS

For

Class 1 MER25/400/4P

LIGHTNING ARRESTER 3-PHASE 4-POLE DIN RAIL MOUNTED ARRESTER

To be installed in the 1st AC incoming DB.

The MER25/400/4P consists of 4 high energy metal oxide varistor (MOV) modules with a current rating of 25KA at 10/350 class 1 waveform.

The protection is between each phase and neutral and neutral to earth.

Figure 1. Model No: MER25/400/4P



WARNING

- Verify the SPD unit is the correct voltage configuration for the installation.
- All units must be installed and prepared only by qualified personnel in accordance with all relevant local electrical safety standards.
- Dangerous voltages may exist near the SPD modules.
- The MER25/400/4P must be mounted in a suitable rain-proof enclosure when used outdoors or a suitable IP rated enclosure when mounted indoors. The enclosure should provide adequate electrical and safety protection, prevent ingress of moisture and water, and allow visual indication to be inspected.
- All instruction must be followed for proper and safe operation.

MOUNTING INSTRUCTIONS (Figure 2)

1. The MER25/400/4P should be installed in the M3 DB (1st incoming AC DB on site)
2. The SPD should be mounted as close as possible to the site main incoming circuit breaker.
3. The 4 modules combined takes up 8 ways on a standard 35mm DIN rail (140mm)
4. A 4-way busbar connects the neutral terminals of the MER25/400/4P.

WIRING INSTRUCTIONS (Figure 2)

1. Use minimum 10MM² multistrand panel wire.
2. Use bootlace ferrals on the ends of cables to avoid wire stand breakage.
3. Connection of Phases to SPD.
 - Terminate cable between fuse terminal of phase 1 of SPD and the load side of the site circuit breaker phase 1 terminal.
 - Terminate cable between fuse terminal of phase 2 of SPD and the load side of the site circuit breaker phase 2 terminal.
 - Terminate cable between fuse terminal of phase 3 of SPD and the load side of the site circuit breaker phase 3 terminal.
 - Note: Both bottom terminals of the SPD modules are common to that module, they are internally connected.
4. Terminal Cable between neutral terminal (top) and neutral bar in the distribution board.

The cable should be inserted into any of the terminals marked "N". The cable will be inserted with the neutral terminal into the SPD terminal, therefore in that terminal there will be a cable and a neutral lug.

5. Cable lengths between the SPD and the interface points (main CB's & earth bar) should be as short as possible to a maximum of 500mm.
6. Terminate earth connection between bottom terminal of module marked 'E'(first module on left) and the internal AC BD earth bar.
7. Avoid 90° bends in cables.

MAINTENANCE AND REPAIR

1. The MER25/400/4P requires no preventative maintenance.
2. Each module has two alert windows. If a RED flag appears in either of the windows on a module, that module should be replaced.
3. Power to the MER25/400/4P must be turned off before replacing damaged modules.
Replacement of the MER25/400/4P modules must be done by qualified personnel in accordance to all relevant electrical safety standards and procedures.

