Lightning Surge Protectors for Electronics Equipment M-RESTER

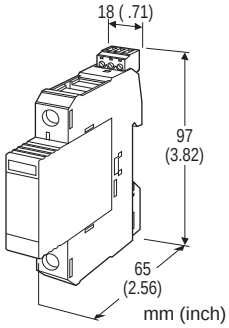
ONE-PORT SURGE PROTECTOR
BETWEEN NEUTRAL AND PROTECTIVE EARTH

Functions & Features

• Designed to protect electronics equipment from induced lightning surges with gas discharge tube
• One-port surge protector according to IEC 61643-1
• Connected between neutral and protective earth
• High discharge current capacity of 40 kA (8/20 µs)
• Protect against overvoltage between N and PE caused by earth fault
• No interruption of power supply even when the head element is removed: easy maintenance and replacing
• Degraded head element is automatically separated from the power lines to prevent overheating, with a relay contact output to alert the failure status
• Head-base connection is keyed so that only a head element of correct line voltage can be mounted

Typical Applications

• Protection between N and PE of TT system
• Low-voltage distribution board
• Combination with installation for large load current



MODEL: MAKN–220[1]

ORDERING INFORMATION

• Code number: MAKN-220[1]
Specify a code from below for [1].
(e.g. MAKN-220/AN)

OPERATIONAL VOLTAGE

220: 220 V AC

[1] OPTIONS

Configuration

Blank: With alarm output
/AN: Without alarm output
/BN: Head element for replacement

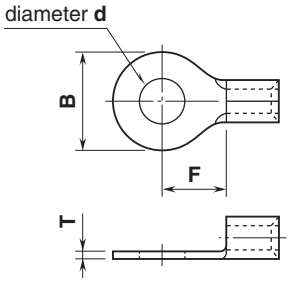
RELATED PRODUCTS

• One-port surge protector for power supply use (model: MAKF)
• Single mount adaptor (model: MBS)
• Wiring bridge (model: CNB)

GENERAL SPECIFICATIONS

Construction: Plug-in
Degree of protection: IP20 (If the solderless terminals are covered with insulation tubes.)
Surge protection type: Voltage switching type one-port SPD (IEC 61643-1)
Discharge element: Gas discharge tube
Connection
Line: M5 screw terminal (spring up-screw type) (torque: 2.5 N·m)
Alarm output: Euro type connector terminal (torque: 0.25 N·m)
Applicable wire size
Line connection: See the sloderless terminal drawing.
Alarm output: 0.14 to 1.5 mm^2, stripped length 7 mm
Housing material: Flame-resistant resin (black)
Alarm output: The SPDT relay trips when the thermal breaker operates and/or the head element is removed.
Rated load: 250 V AC @0.5 A (resistive load)
125 V DC @0.2 A (resistive load)
Minimum switching load: 5 V DC, 1 mA
Line voltage identification key: The connection of the head element and the base is keyed for exact matching.
Safety function: Thermal breaker incorporated
Failure indicator: The check window color changes from green (normal) to black (failed and the thermal breaker separated the M-rester from the circuit).

• Applicable Solderless Terminal Size



d : M5 use
B ≤ 13.0 mm
F ≥ 7.0 mm
T ≤ 1.8 mm

INSTALLATION

Operating temperature: -5 to +55°C (23 to 131°F)
Operating humidity: 30 to 90 %RH (non-condensing)
Mounting: DIN rail; Surface mounting available with the Single Mount Adaptor model: MBS.
Weight: 100 g (3.53 oz)

PERFORMANCE

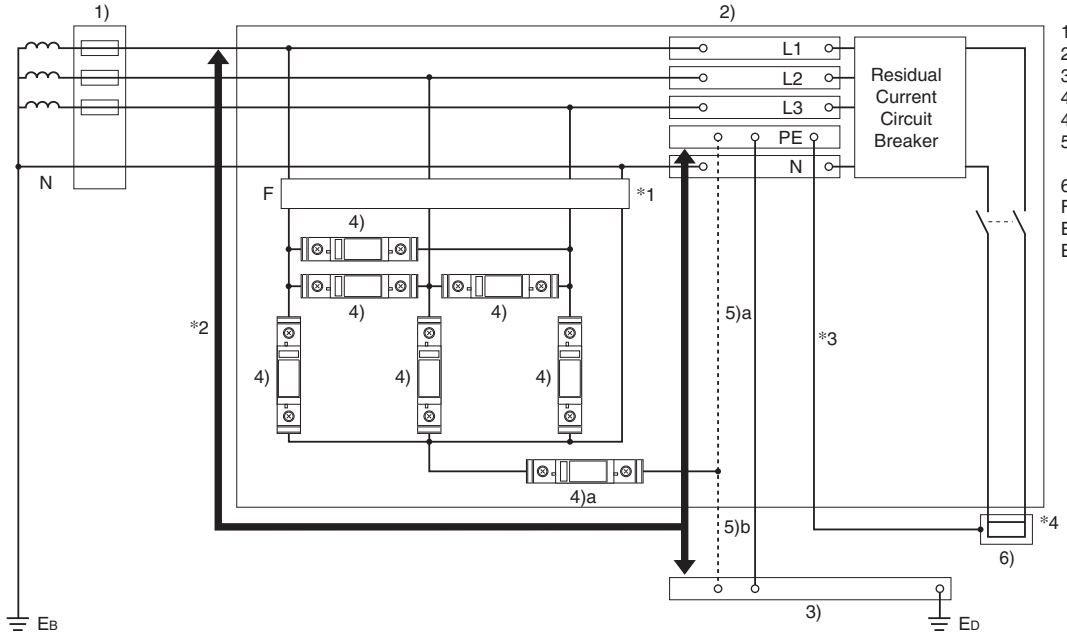
Response time: ≤ 100 nsec
Maximum discharge current: 40 kA (8/20 µsec.)
Nominal discharge current: 20 kA (8/20 µsec.)
TOV value: 1200 V/0.2 sec.
Insulation resistance: ≥ 100 MΩ with 500 V DC
(N or PE to alarm output)
Dielectric strength: 2000 V AC @1 minute
(N or PE to alarm output)
Surge protection: IEC 61643-1 Class II
Leakage current: ≤ 100 µA at the discharge voltages listed in the table below.

MODEL	Uc (AC) (V)	DISCHARGE VOLTAGE (Vmin)	Up @6kV (1.2/50 µs), 5kA (8/20 µs) (Vmax)
MAKN-220	260	400	1500

CONNECTION EXAMPLES

■ INSTALLATION EXAMPLES

When power supply side (N) and equipment side (PE) are earthed independently (TT system), installs this unit between N and PE. Install one-port surge protector for power supply (model: MAKF) between L to L and L to N. The installation procedure of the three-phase/4-wire system is shown below as an example.



1) : Protective device of the switchgear
2) : Switchgear
3) : Main earth terminal or busbar
4) : MAKF
4)a : MAKN
5) : Earth conductor
5)a and/or 5)b
6) : Protected device
F : Circuit breaker
EB : Mains earth electrode
ED : Switchgear's earth electrode

*1. The circuit breaker must be installed. Molded-case circuit breaker (MCCB) or residual current circuit breaker with overcurrent protection (RCD) can be used.
The rated interrupting capacity of the circuit breaker must be greater than the highest amount of current that could be available in the circuit.
Install MCCB (rated current 20 – 30A) that has element for each phase. Or RCD with protection from nuisance tripping against transit voltages type or time-delay overcurrent protection type is recommended.
Recommended sensitivity current rating: 30mA

*2. Cable length between the branch point and the earthing: 0.5 meters or less recommended

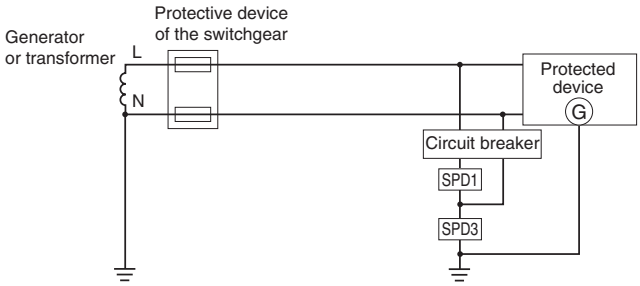
*3. The protected device's metal enclosure must be cross-wired to the earth terminal of the MAKN. If the protected device has no earth terminal, earth only the MAKN.

*4. In order to protect an electronic circuit such as measuring equipment or communication equipment, we recommend to use surge protectors which have serial impedance incorporated such as M-System's models MAX, MMA or MAH.

■ CONNECTION EXAMPLES BY POWER SYSTEMS

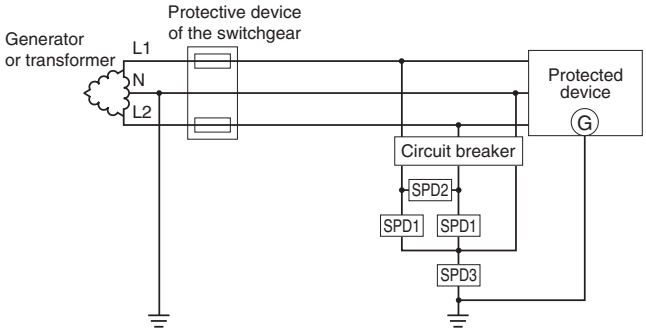
Connection examples of MAKF and MAKN are shown as following.

• Single-phase/2-wire connection



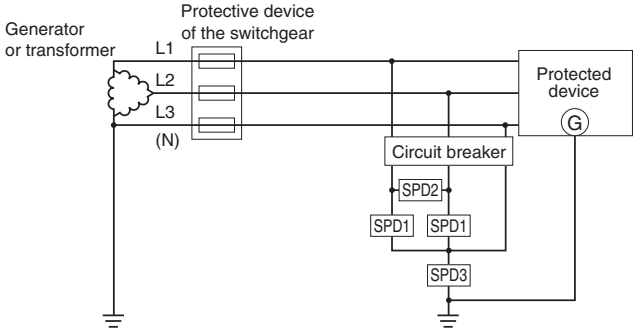
POWER SYSTEM (e.g.)	SPD1	SPD3
Single-phase/2-wire, 110V AC	MAKF-240x	MAKN-220x
Single-phase/2-wire, 220V AC	MAKF-240x	MAKN-220x

• Single-phase/2-wire (three-phase delta connection earthed in the middle of phases) or single-phase/3-wire connection



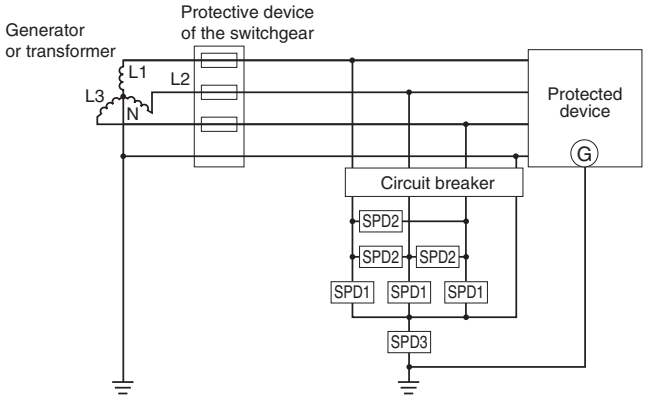
POWER SYSTEM (e.g.)	SPD1	SPD2	SPD3
Single-phase/2-wire, 110V AC	MAKF-240x	MAKF-240x	MAKN-220x
Single-phase/3-wire, 220/110V AC	MAKF-240x	MAKF-240x	MAKN-220x

• Three-phase/3-wire connection (delta)



POWER SYSTEM (e.g.)	SPD1	SPD2	SPD3
Three-phase/3-wire, 220V AC	MAKF-240x	MAKF-240x	MAKN-220x

• Three-phase/4-wire connection (star)



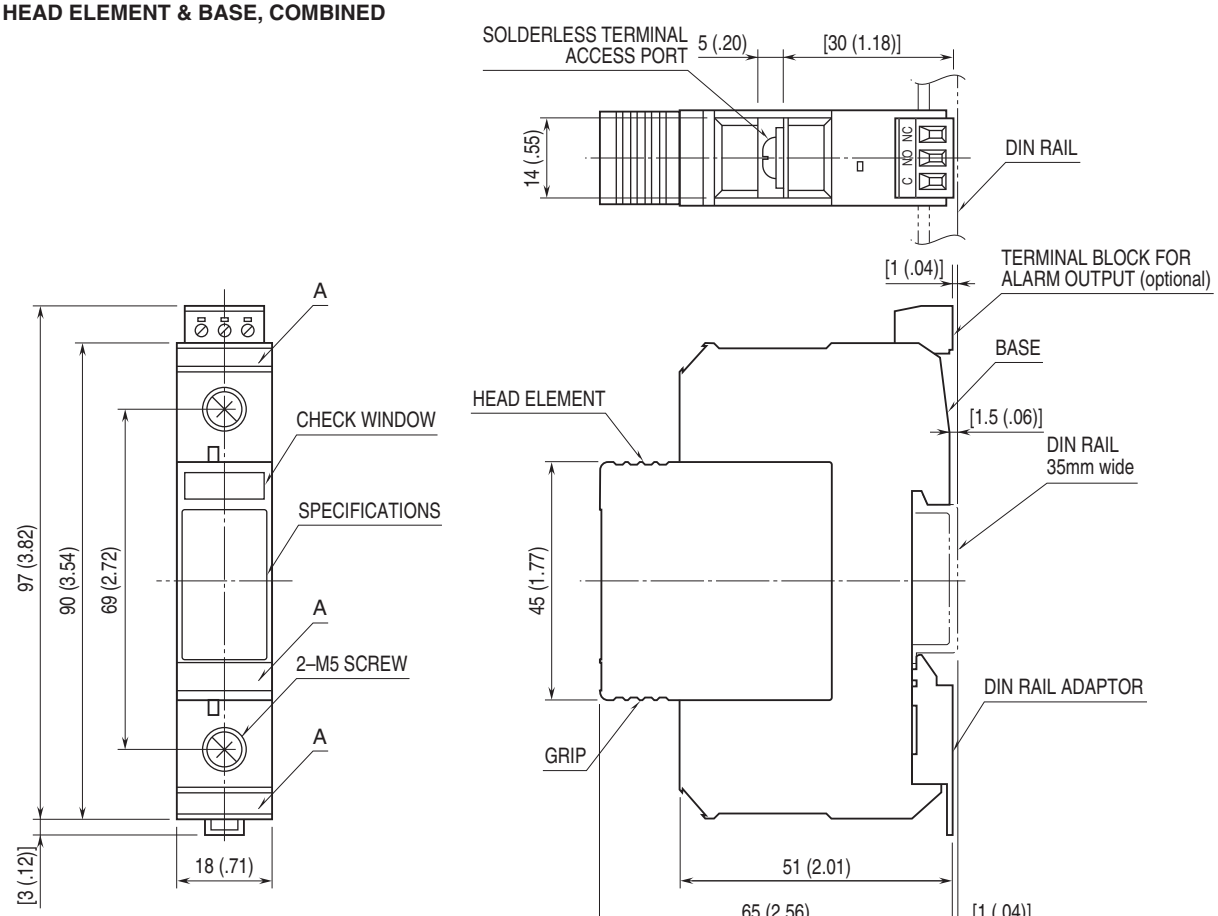
POWER SYSTEM (e.g.)	SPD1	SPD2	SPD3
Three-phase/4-wire, 220V AC	MAKF-240x	MAKF-240x	MAKN-220x
Three-phase/4-wire, 440V AC	MAKF-400x	MAKF-400x	MAKN-220x

■ ALARM OUTPUT

When the alarm output is to be transmitted remotely via outdoor cables, a surge protector for the signal line is required. Choose a circuit breaker with alarm output. Configure a logical OR sequence so that the alarm trips when both or either of the MAKF, MAKN or the breaker alarm trips.

EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm (inch)

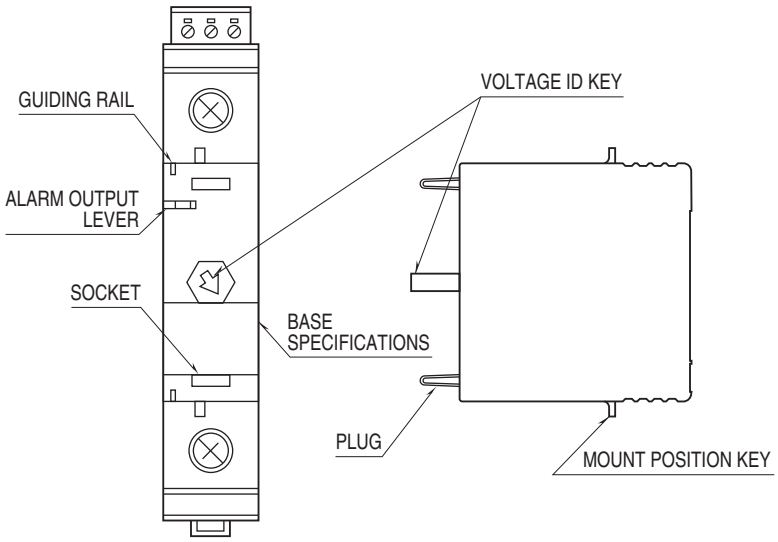
■ **HEAD ELEMENT & BASE, COMBINED**



A : Place marking labels here.

•When mounting, no extra space is needed between units.

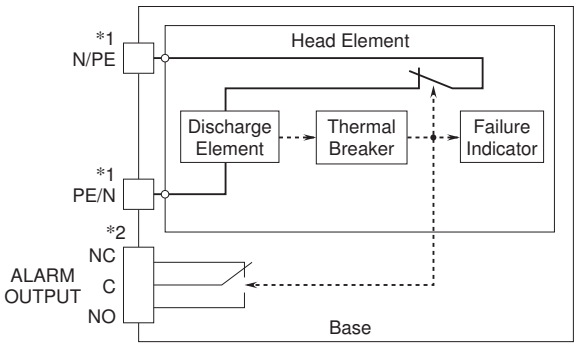
■ **HEAD ELEMENT & BASE, SEPARATED**



■ **MARKING LABELS**
(terminal identifiers, tag name labels)

L1	L2	L3
N	E	G
PE		

SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM



*1. M5 screw terminal
*2. Terminal block provided for the alarm output option.

⚠ Specifications are subject to change without notice.