Lightning Surge Protectors for Electronics Equipment M-RESTER

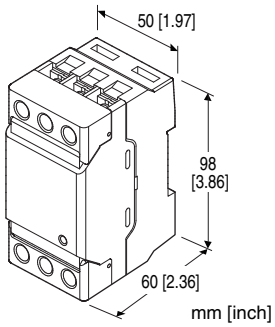
LIGHTNING SURGE PROTECTOR FOR THREE-PHASE POWER SUPPLY

Functions & Features

• Connected in parallel between the power and earth lines regardless of load current
• Applicable to single phase 2/3-wire and threephase 3/4-wire system
• High discharge current capacity 20 kA or 40 kA (8/20 µs)
• Degraded head element is automatically separated from the power lines by the incorporated thermal breaker, and the LED lamp (turns off) and the relay contact alerts the failure status.
• Complies with IEC 61643-1 Class II

Typical Applications

• Low-voltage distribution board
• Combination with installation for large load current



CE

MODEL: MAT2-[1][2][3][4]

ORDERING INFORMATION

• Code number: MAT2-[1][2][3][4]
Specify a code from below for each of [1] through [4].
(e.g. MAT2-2403MY)

[1] OPERATIONAL VOLTAGE

240: 240 V AC
440: 440 V AC

[2] POWER SYSTEM

3: Single-phase 2/3-wire, Three-phase 3-wire
(Select '240' for 'Operational voltage' code.)
4: Single-phase 2/3-wire, Three-phase 3/4-wire

[3] MAXIMUM DISCHARGE CURRENT

M: 20kA (8/20 µsec.)
H: 40kA (8/20 µsec.)

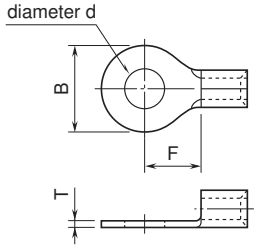
[4] ALARM OUTPUT

A: With
Y: Without

GENERAL SPECIFICATIONS

Construction: Standalone; terminal access at the front
Degree of protection: IP20 (If the solderless terminals are covered with insulation tubes.)
Surge protection type: Voltage limiting type one-port SPD
Connection
Line: M5 screw terminal (torque: 2.5 N·m)
Alarm output: Tension clamp
Applicable wire size
Line: See the drawing below.
Alarm output: 0.13 to 1.5 mm^2, stripped length 8 mm
Screw terminal
Line: Nickel-plated steel
Alarm output: Tin-plated copper alloy
Housing material: Flame-resistant resin (black)
Alarm output: SPDT relay contact trips when the thermal breaker operates.
OUTPUT TERMINAL A1 – C
Normal: Open
Failure or power off: Close
OUTPUT TERMINAL A2 – C
Normal: Close
Failure or power off: Open
Rated load:
250 V AC @1 A (resistive load)
24 V DC @1 A (resistive load)
Safety function: Thermal breaker incorporated
Monitor LED: Green LED turns on during normal condition and turns off during failure condition, power off or the thermal breaker operating.

• **Applicable Solderless Terminal Size**



d : M5 use
B ≤ 13.0 mm
F ≥ 7.0 mm
(F ≥ 8.2 mm for sharing terminals)
T ≤ 1.8 mm

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INSTALLATION

Operating temperature: -5 to +55°C (23 to 131°F)
Operating humidity: 30 to 90 %RH (non-condensing)
Mounting: DIN Rail
Weight: 300 g (0.66 lb)

PERFORMANCE

Response time: ≤ 3 nanoseconds (≤ 20 nanoseconds for N to PE)
Insulation resistance: ≥ 100 MΩ with 500 V DC (line to alarm output)
Dielectric strength: 2000 V AC @1 minute (line to alarm output)
Surge protection: IEC 61643-1 Class II
EN 61643-11 Class II

MODEL	MAX. CONTINUOUS OPERATING VOLTAGE (Uc)	DISCHARGE VOLTAGE (Vmin)	VOLTAGE PROTECTION LEVEL (Up)	OPERATIONAL VOLTAGE RANGE *1 (50 / 60Hz)
MAT2-240	Between lines: 240V AC N to PE: 320V AC	Between lines: 400V N to PE: 550V	1500V	1-phase/2-wire, 3-phase/3-wire: 90 – 240V AC 1-phase/3-wire: 90 / 180 – 120 / 240V AC 3-phase/4-wire: 170 – 240V AC
MAT2-440	Between lines: 440V AC N to PE: 320V AC	Between lines: 780V N to PE: 550V	2500V	1-phase/2-wire, 3-phase/3-wire: 240 – 440V AC 1-phase/3-wire: 200 / 400 – 220 / 440V AC 3-phase/4-wire: 350 – 440V AC

MODEL	MAX. LEAKAGE CURRENT @Uc			
	ALARM OUTPUT		WITH	WITHOUT
MAT2-240	Line to Line	1 to 2	28mA *2	6mA *3
		Other sections	2mA	2mA
	N to PE		10µA	10µA
MAT2-440	Line to Line	1 to 2	22mA	6mA
		Other sections	2mA	2mA
	N to PE		10µA	10µA

*1. MAT2 is operational as an SPD despite the voltage less than the minimum. However, the functions of the monitor LED and the alarm output are not guaranteed.
*2. Approx. 12mA @100V AC
*3. Approx. 3mA @100V AC

MODEL	MAX. DISCHARGE CURRENT (Imax)	NOMINAL DISCHARGE CURRENT (In)
MAT2-xM	20kA (8/20µsec)	10kA (8/20µsec)
MAT2-xH	40kA (8/20µsec)	20kA (8/20µsec)

STANDARDS & APPROVALS

EU conformity:
EMC Directive
EMI EN 61000-6-4
EMS EN 61000-6-2
Low Voltage Directive
EN 61643-11
RoHS Directive

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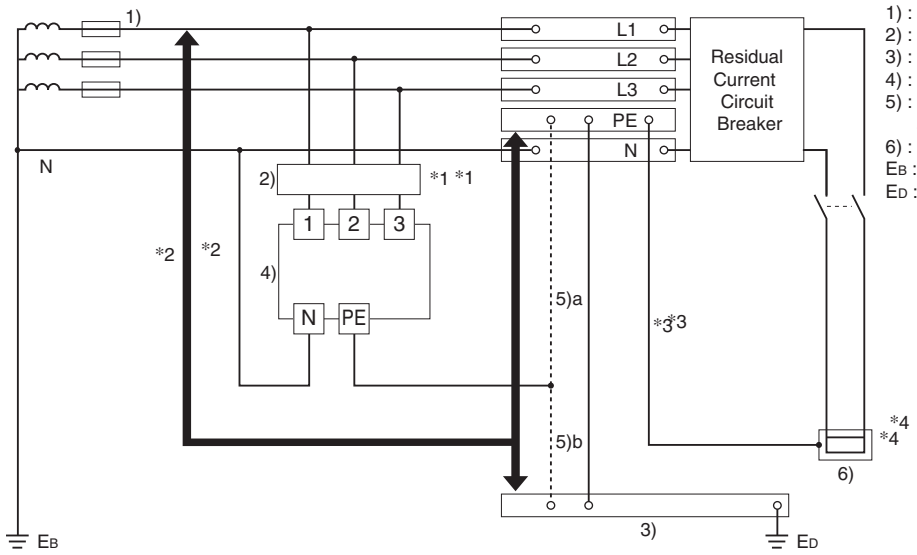
CONNECTION EXAMPLES

■ **INSTALLATION EXAMPLES: Three-phase 4-wire connection**



1) : Protective device of the switchgear
2) : Circuit breaker
3) : Main earth terminal or busbar
4) : MAT2
5) : Earth conductor
5)a and/or 5)b
6) : Protected device
EB : Main's 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 time-delay overcurrent protection 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 MAT2. If the protected device has no earth terminal, earth only the MAT2.

*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, MAH.

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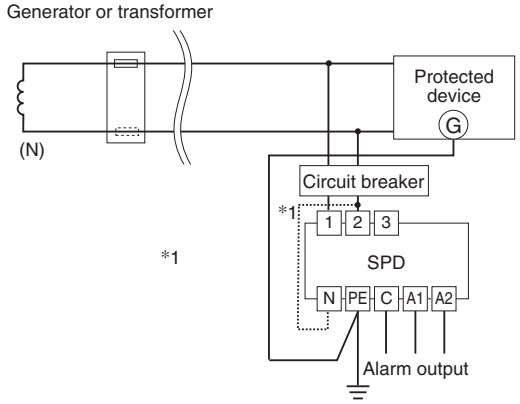
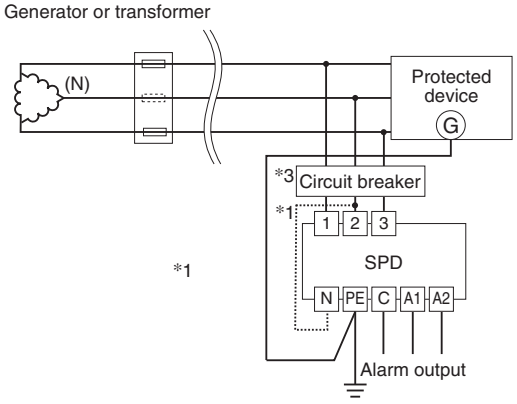
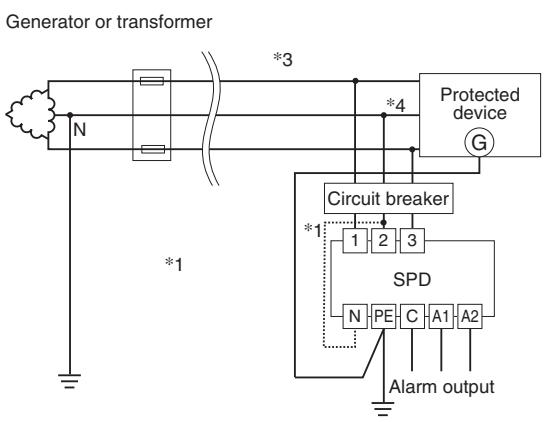
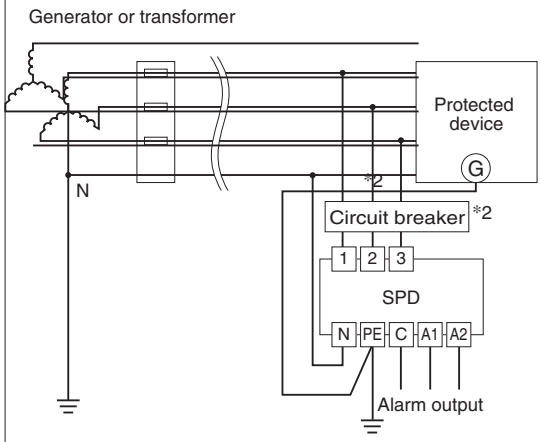
■ **CONNECTION EXAMPLES BY POWER SYSTEMS**

Abnormal voltages appearing in case of a light load or a fault earth loop must be within the maximum continuous operational voltage when selecting the MAT2 models.

<table>
<tr><td>POWER SYSTEM</td><td colspan="2">Single-phase/2-wire</td><td colspan="2">Three phase/3-wire (delta connection)</td></tr>
<tr><td>CONNECTION</td><td colspan="2"> 
</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="3">EXAMPLE</td><td>Power System (example)</td><td>SPD</td><td>Power System (example)</td><td>SPD</td></tr>
<tr><td>Single-phase/2-wire 110V AC</td><td>MAT2–240x</td><td>Three-phase/3-wire 220V AC</td><td>MAT2–240x</td></tr>
<tr><td>Single-phase/2-wire 220V AC</td><td>MAT2–240x</td><td>Three-phase/3-wire 400V AC</td><td>MAT2–4404x</td></tr>
<tr><td>POWER SYSTEM</td><td colspan="2">Single-phase/2-wire
(three-phase delta connection
earthed in the middle of phases)
Single-phase/3-wire</td><td colspan="2">Three-phase/4-wire (star connection)</td></tr>
<tr><td>CONNECTION</td><td colspan="2"> 
</td><td colspan="2"> 
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<tr><td>Single-phase/2-wire 220V AC</td><td>MAT2–4404x</td><td>Three-phase/4-wire 400V AC</td><td>MAT2–4404x</td></tr>
<tr><td>Single-phase/3-wire 220/110V AC</td><td>MAT2–240x</td><td></td><td></td></tr>
<tr><td>Single-phase/3-wire 400/200V AC</td><td>MAT2–4404x</td><td></td><td></td></tr>
</table>

*1. For TT system, in order to ensure safe failure mode at TOV due to earth fault on high-voltage systems, connect between terminal 2 and N of the MAT2.
*2. For TT system, in order to ensure safe failure mode at TOV due to earth fault on high-voltage systems, install a four-pole (three-pole plus neutral) circuit breaker.
*3. For 440V AC three-phase/3-wire system, use a residual current circuit breaker with overcurrent protection.
*4. For single-phase/2-wire system, connect lines to terminal 1 and 2 of the MAT2. For single-phase/3-wire system, connect the neutral line to terminal 2 of the MAT2.

■ **ALARM OUTPUT**

When the alarm output is to be transmitted remotely via outdoor cables, a surge protector for the signal line is required.

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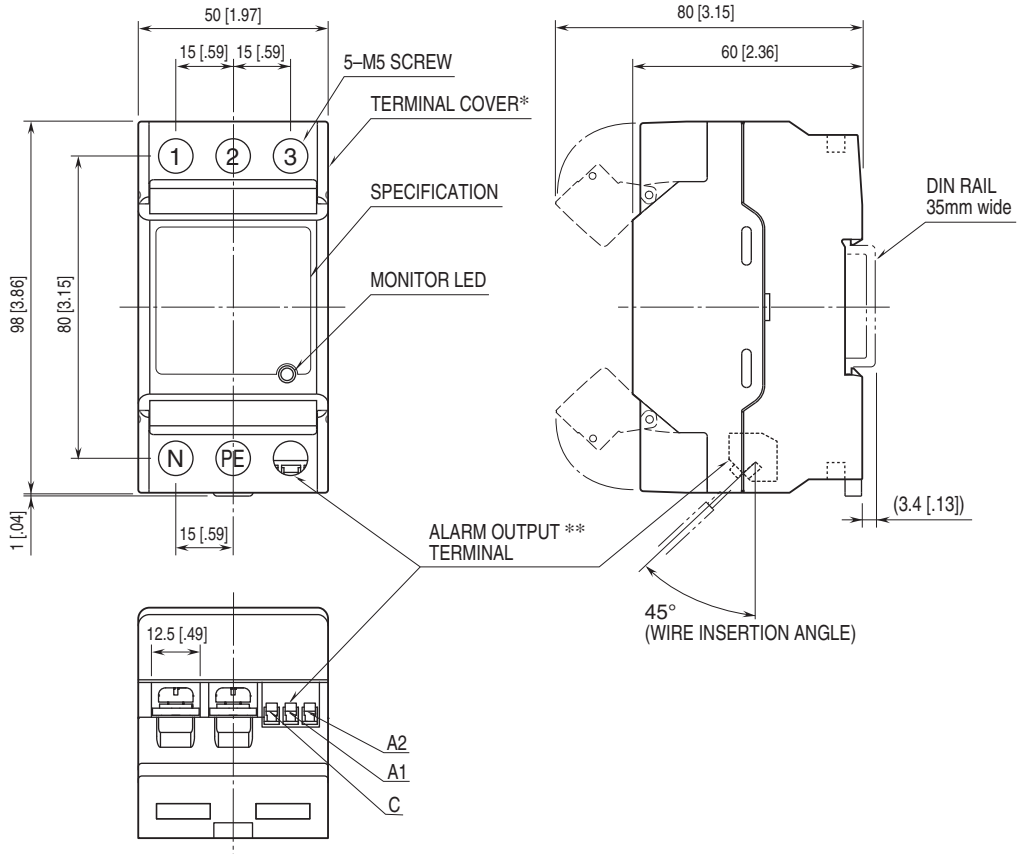
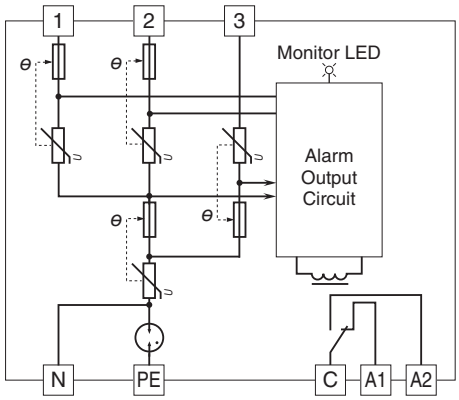
EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm [inch]



* Open/close type.
** Only for 'Alarm output' code 'A'.

SCHEMATIC CIRCUITRY



ϴ: Thermal breaker
Note: Terminals C, A1 & A2 are available for 'Alarm output' code 'A.'
The schematic shows the relay contact status of a thermal trip or power off.

⚠ Specifications are subject to change without notice.

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