

## Lightning Surge Protectors for Electronics Equipment M-RESTER

### ONE-PORT SURGE PROTECTOR FOR POWER SUPPLY USE

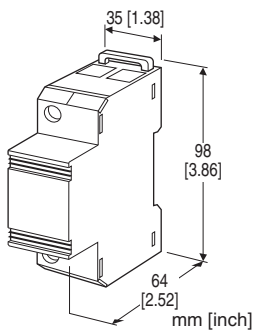
(class I)

#### Functions & Features

- Designed to protect electronics equipment from direct lightning surges entering through power supply cables.
- Connected in parallel between the power and ground lines regardless of load current
- High discharge current capacity of 25 kA (10/350 μsec.)
- Detect degraded discharge element, with a relay contact output to alert the failure status.

#### Typical Applications

- Installation in service entrance switch gear



### MODEL: MAL-[1][2]

#### ORDERING INFORMATION

- Code number: MAL-[1][2]

Specify a code from below for each of [1] and [2].  
(e.g. MAL-230Y)

#### [1] OPERATIONAL VOLTAGE

230: 230 V AC

400: 400 V AC

#### [2] ALARM OUTPUT

A: With

Y: Without

(Select '230' for 'Operational Voltage' code.)

#### RELATED PRODUCTS

- Wiring bridge (model: CNB2)
- One-port surge protector between N and PE (model:

MALN)

#### ■ Coordination of surge protector (Class II)

Unnecessary when this surge protector and the device to protect are adjacent (less than 10 m).

- One-port surge protector for power supply use (model: MAKF)
- One-port surge protector between N and PE (model: MAKN)
- Lightning surge protector for three-phase power supply (model: MAT2)

#### GENERAL SPECIFICATIONS

**Degree of protection:** IP20

**Surge protection type:** Voltage switching type one-port SPD (IEC 61643-1)

**Discharge element:** Gas discharge tube

#### Connection

**Line:** Push-lock screw terminal (torque: 4.5 N·m)

**Alarm output:** Euro type connector terminal

(torque: 0.25 N·m)

#### Applicable wire size

**Line connection:** 8 - 35 mm<sup>2</sup>, stripped length 15 mm

**Alarm output:** 0.2 - 1.5 mm<sup>2</sup>, stripped length 7 mm

**Housing material:** Flame-resistant resin

**Alarm output:** Trips when the thermal breaker operates. (N.C. contact)

**Rated load:** 250 V AC @ 0.5 A

#### INSTALLATION

**Operating temperature:** -5 to +55°C (23 to 131°F)

**Operating humidity:** 30 to 90 %RH (non-condensing)

**Mounting:** DIN rail

**Weight:** 230 g (0.51 lb)

## PERFORMANCE

**Response time:** ≤ 50 nsec.

**Follow current interrupting rating**

- MAL-230x: 4 kA
- MAL-400A: 0.75 kA

**Maximum discharge current:** 25 kA (10/350 μsec.)

**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 I

MODEL	Uc (AC) (V)	DISCHARGE VOLTAGE (V min)	Up (V max)
MAL-230x	255	400	1000
MAL-400A	440	650	2000

Uc = Maximum continuous operational voltage

Up = Voltage protection level

## STANDARDS & APPROVALS

**EU conformity:**

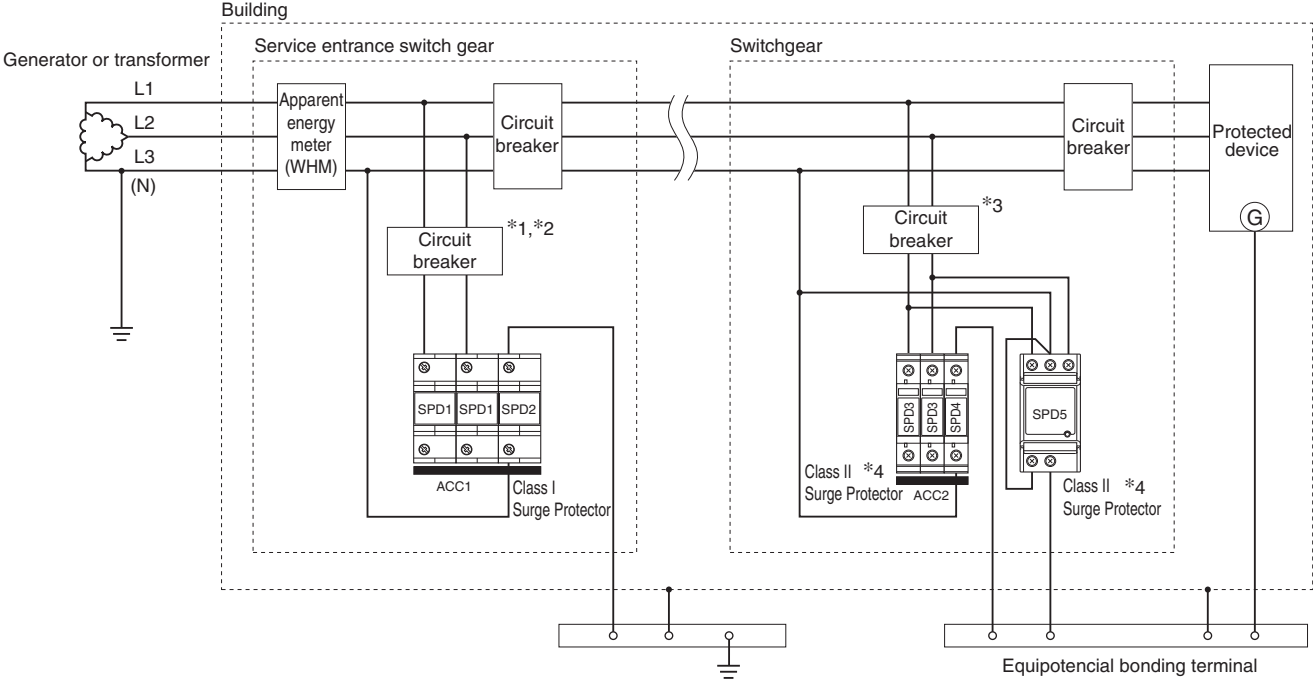
Low Voltage Directive

EN 61643-11

RoHS Directive

## CONNECTION EXAMPLES

**INSTALLATION EXAMPLES: Three phase/3-wire (delta connection) TT Systems**  
 Lightning is a natural phenomenon and this unit could receive surges exceeding the discharge withstand current rating. Then, there is a possibility of burning out and result in short-circuits because of exceeding the processing capacity. Upon to save a backup, the circuit breaker must be installed on the power supply side of the surge protector. Molded-case circuit breaker (MCCB) or residual current circuit breaker with overcurrent protection (RCD) can be used.

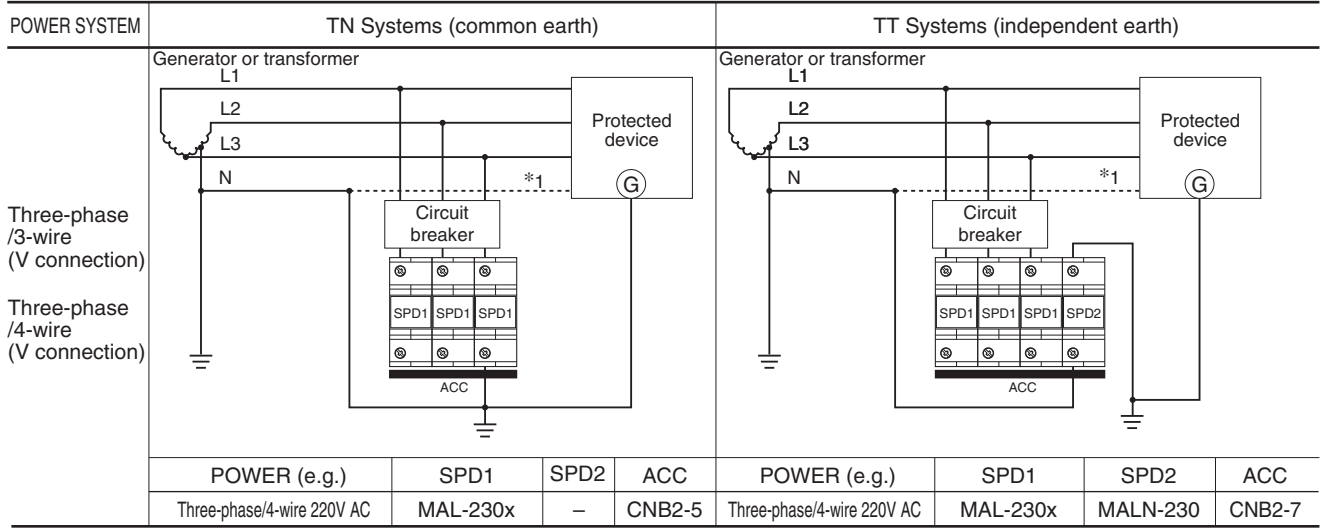


- \*1. The circuit breaker's rating current must be of 150 A, and the rated interrupting capacity selected must be the greater between 30 kA or the highest amount of current that could be available in the circuit. For monitoring the operation of the circuit breaker we recommend also using the alarm switch (AL).
- \*2. The use of RCD with time-delay overcurrent protection is recommended upon to prevent unnecessary operation with surge current (Recommended sensitivity current rating: 30mA)
- \*3. Install an MCCB for backup saving of class II surge protector. Refer to the data sheets of the class II surge protector for details.
- \*4. If the service entrance switchgear and switchgear or protective device wiring distance is more than 10 m, install the class II surge protector on the power supply downstream. Class II surge protector is the combination of SPD3 and SPD4 or SPD5

POWER (e.g.)	Class I Surge Protector		Class II Surge Protector			ACCESSORY	
	SPD1	SPD2	SPD3	SPD4	SPD5	ACC1	ACC2
Three phase/3-wire 220V AC	MAL-230x	MALN-230	MAKF-240x	MAKN-220x	MAT2-2404xx	CNB2-5	CNB-3

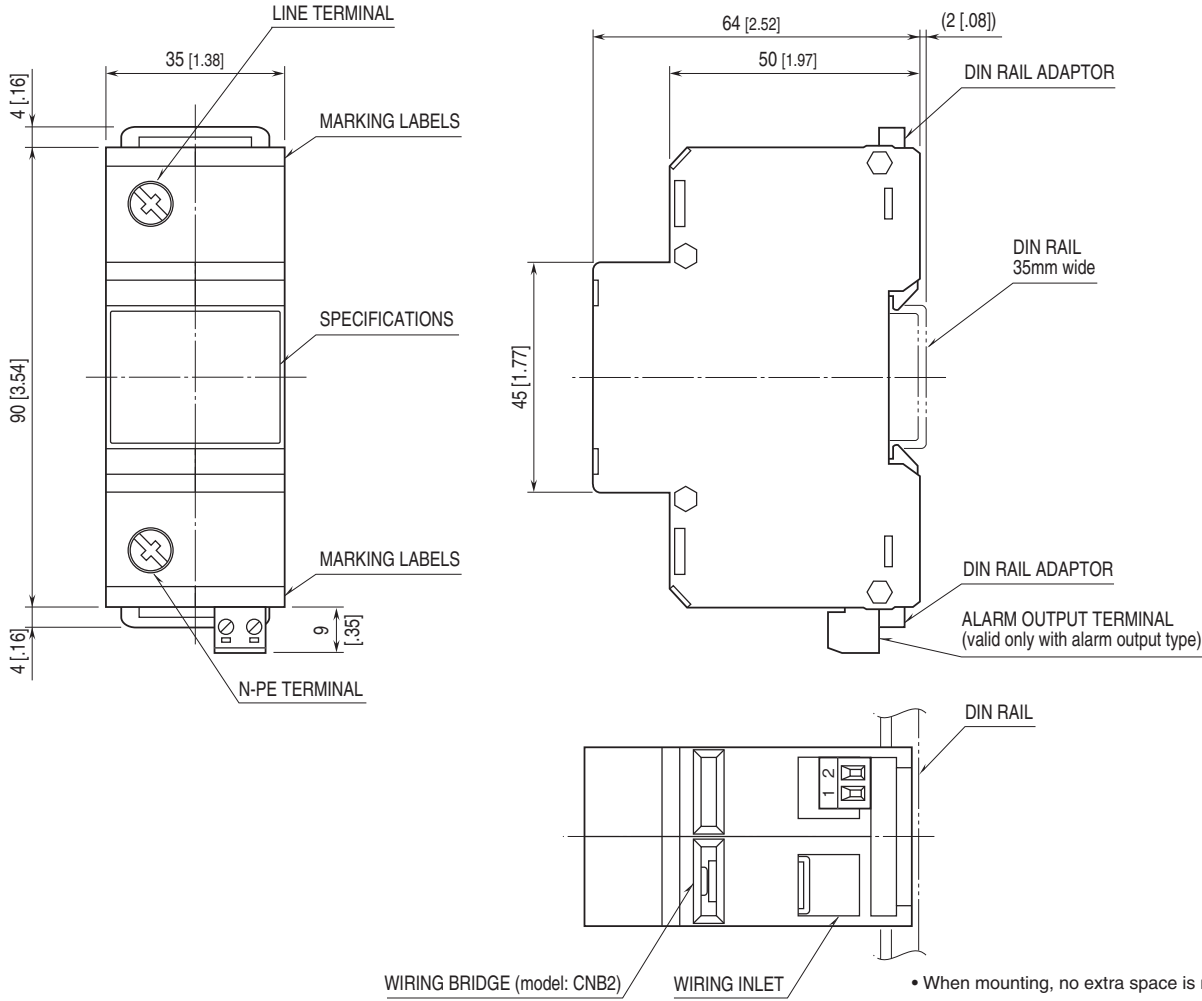
## CONNECTION EXAMPLES BY POWER SYSTEMS

POWER SYSTEM	TN Systems (common earth)				TT Systems (independent earth)			
Single-phase /2-wire								
	POWER (e.g.)	SPD1	SPD2	ACC	POWER (e.g.)	SPD1	SPD2	ACC
	Single-phase/2-wire 110V AC Single-phase/2-wire 220V AC	MAL-230x MAL-230x	- -	- -	- -	Single-phase/2-wire 110V AC Single-phase/2-wire 220V AC	MAL-230x MAL-230x	MALN-230 MALN-230
Single-phase /3-wire								
	POWER (e.g.)	SPD1	SPD2	ACC	POWER (e.g.)	SPD1	SPD2	ACC
	Single-phase /3-wire 220/110V AC	MAL-230x	-	CNB2-4	Single-phase /3-wire 220/110V AC	MAL-230x	MALN-230	CNB2-5
Three-phase /3-wire (delta connection)								
	POWER (e.g.)	SPD1	SPD2	ACC	POWER (e.g.)	SPD1	SPD2	ACC
	Three-phase/3-wire 220V AC	MAL-230x	-	CNB2-4	Three-phase/3-wire 220V AC	MAL-230x	MALN-230	CNB2-5
Three-phase /4-wire (star connection)								
	POWER (e.g.)	SPD1	SPD2	ACC	POWER (e.g.)	SPD1	SPD2	ACC
	Three-phase/4-wire 220V AC Three-phase/4-wire 400V AC	MAL-230x MAL-400A	- -	CNB2-5 CNB2-5	Three-phase/4-wire 220V AC Three-phase/4-wire 400V AC	MAL-230x MAL-400A	MALN-230 MALN-230	CNB2-7 CNB2-7

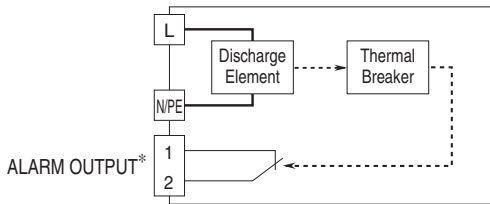


\*1. Wiring only for three-phase/4-wire

## EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm [inch]



**SCHEMATIC CIRCUITRY**



\*Terminal block provided for the alarm output option.  
Schematic shows the operation in normal conditions.



Specifications are subject to change without notice.