INSTRUCTION MANUAL

LIGHTNING SURGE PROTECTOR FOR POWER SUPPLY USE (fast response: 3 nsec.)

MODEL **MMAJ**

BEFORE USE ....

Thank you for choosing M-System. Before use, please check contents of the package you received as outlined below.
If you have any problems or questions with the product, please contact M-System's Sales Office or representatives.

■ PACKAGE INCLUDES:

Lightning surge protector.....(1)

■ MODEL NO.

Confirm Model No. marking on the product to be exactly what you ordered.

■ INSTALLATION / INSTRUCTION MANUAL

This manual describes necessary points of caution when you use this product, including installation, connection and basic maintenance procedures.

LIMITATION APPLICABLE TO M-RESTER

The M-RESTER will protect electronics equipment from damage caused by lightning by absorbing most of the surge voltages.

However, M-RESTER may not be effective against certain extremely high voltages caused by a direct or almost direct hit by lightning.

M-RESTER must be installed according to this installation / instruction manual.

POINTS OF CAUTION

■ ENVIRONMENT

- Indoor use. Install the surge protector on a place where the monitor LED can be easily visible.
- It is possible to be hit by a certain strong lightning exceeding the capacity of this unit. The surge protector may will be destroyed by such high lightning energy. Be sure to install the surge protector inside a metal enclosure for safety.
- Do not install the surge protector where it is subjected to continuous vibration. Do not subject the unit to physical impact.
- Environmental temperature must be within -5 to +55°C (23 to 131°F) and with relative humidity within 30 to 90% RH in order to ensure adequate life span and operation.
- Do not perform the installation, wiring or checking the M-RESTER during thunder storms.

■ DIELECTRIC STRENGTH TEST

- Disconnect the earth conductor before conducting a dielectric strength test. If the test is performed, connecting to the earth, the surge protector will start discharging at the described discharge voltage, resulting as insulation failure. Be sure to connect the earth conductor after the testing is complete.

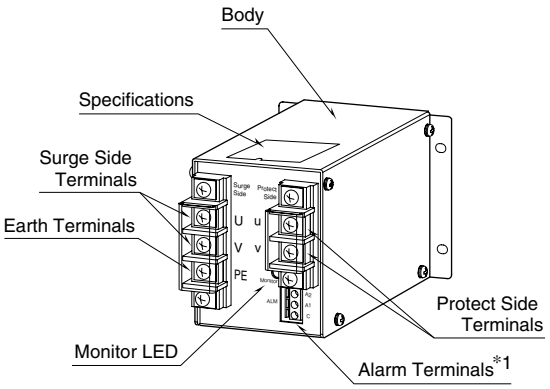
■ RATED CURRENT

- Be sure that the rated current of protected device does not exceed the maximum load current specification of the M-RESTER.
- Be sure to install a breaker which matches the current rating at the power source side of the M-RESTER.

■ AND....

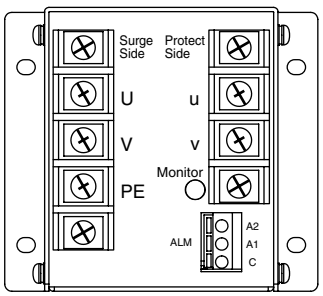
- We recommend that you keep spare surge protectors so that you can replace them when necessary.
- Lightning surge can enter not only through signal lines but also through power supply lines. We recommend that you also use the surge protectors for power line for sufficient protection.

COMPONENT IDENTIFICATION



*1. Only for "alarm output" option

■ FRONT VIEW



PERFORMANCE

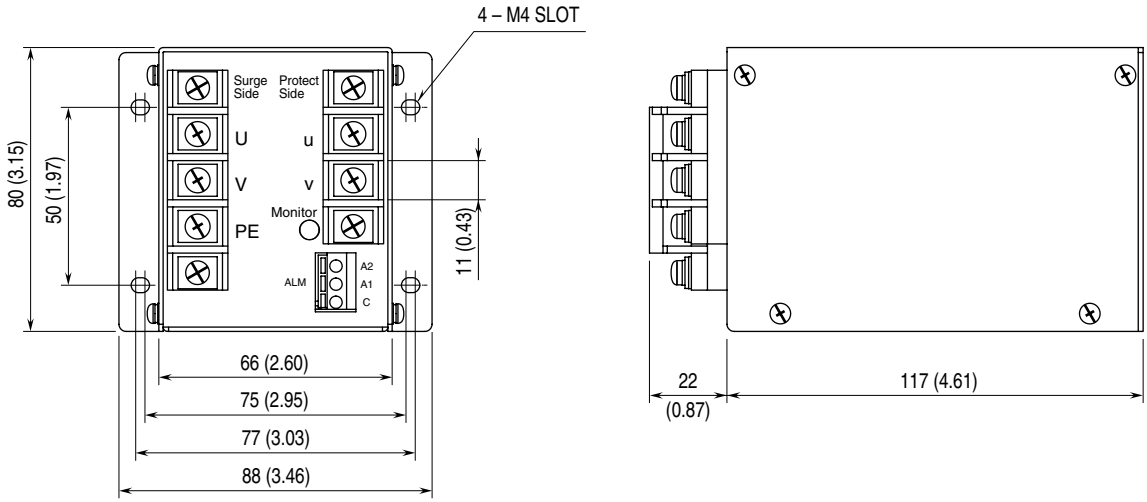
	MMAJ-100xxx	MMAJ-200xxx
Max. Continuous Operating Voltage (Uc)	132V AC	264V AC
Operational Voltage Range *1	85 – 132V AC	170 – 264V AC
Discharge Voltage (Vmin)	Line to line: 190V Line to earth: 300V	Line to line: 380V Line to earth: 450V
Voltage Protection Level (Up)	900V	1500V
Leakage Current @ Uc	Line to line: Without Alarm 6mA, With Alarm 20mA Line to earth: 10µA	
Nominal Discharge Current (In)	MMAJ-xxL: 5kA MMAJ-xxM: 10kA	
Max. Load Current *2	MMAJ-x10: 10A MMAJ-x20: 20A MMAJ-x30: 30A	
Voltage Drop	≤ 1V	
Surge Energy Attenuation Ratio @8/20 µs (Line to earth)	MMAJ-10010: -56 dB MMAJ-10020: -56 dB MMAJ-10030: -40 dB	MMAJ-20010: -53 dB MMAJ-20020: -53 dB MMAJ-20030: -40 dB
Response Time (Line to line)	3 nsec.	
Insulation Resistance	≥ 100 MΩ with 500V DC (line to alarm output to housing)	
Dielectric Strength	2000V AC @1 minute (line to alarm output to housing)	

*1. MMAJ 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. Refer to Derating Curve

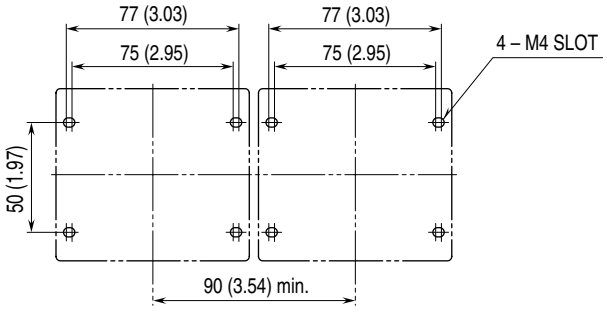
INSTALLATION

Refer to the drawings below. The unit weighs heavily. Mount it on a rigid wall.

■ EXTERNAL DIMENSIONS unit: mm (inch)



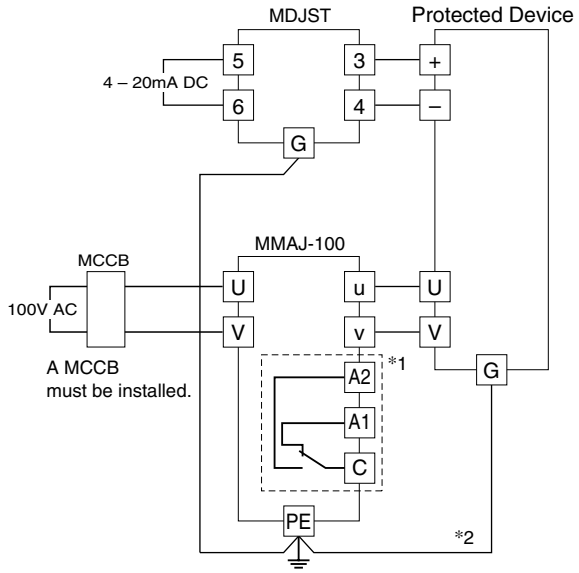
■ MOUNTING REQUIREMENTS unit: mm (inch)



TERMINAL CONNECTIONS

Connect the unit as in the diagram below.

■ CONNECTION DIAGRAM

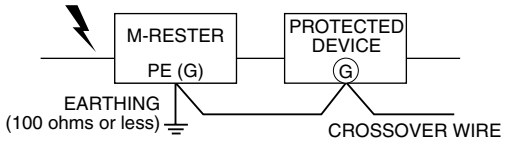


*1. Sections enclosed with broken line are applicable for "alarm output" option.
The schematic shows the relay contact status of a thermal trip or power off.

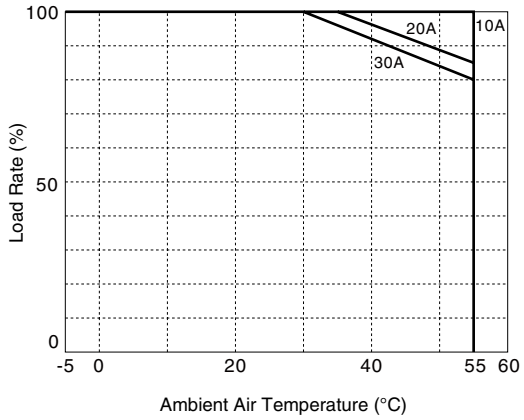
*2. Be sure to make a cross-wire. If the protected device has no earth terminal, earth only the MMAJ.

■ EARTHING

A crossover wire between M-RESTER and earth or the metallic housing of device is required for protection.



DERATING CURVE



WIRING

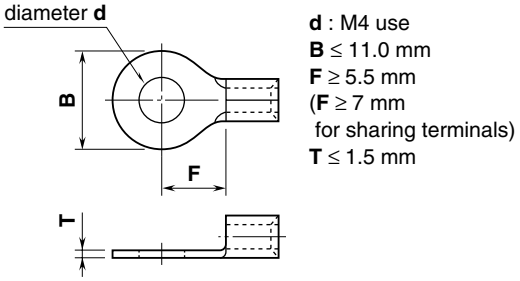
■ LEADWIRES

Conductor cross-section area: 5.5 mm² minimum for U, V and PE lines. However, a local industrial standard requirement for wiring should take precedence.
The wire length should ideally be less than 0.5 meters. Extra long wires should not be bundled in coils, but be cut to the minimum required length.

■ SOLDERLESS TERMINAL

Applicable ring tongue terminal without insulation sleeve is as indicated below. Spade tongue terminal must conform with the ring type size.
In order to ensure IP20 protection (IEC 60529) with a solderless terminal, cover the terminal with a insulation cap to prevent direct touching by a hand.

- **Applicable Solderless Terminal Size**



■ TORQUE

Tighten the screw terminals securely. Maximum allowable torque is of 1.2 N·m.

ALARM OUTPUT

The power supply voltage is continuously applied to the incorporated discharge element (zinc oxide element). Degraded element is automatically separated from the power lines for safety to prevent overheating caused by leakage current. Optional SPDT relay output is available to alert when the thermal breaker has separated the discharge element from the power supply circuit.
If the alarm output should be transmitted remotely via outdoor cables, a surge protector for signal line is required. Choose a circuit breaker with an alarm output. Configure a logical addition sequence so that the alarm trips when both or either of the M-RESTETR or the breaker alarm trips.

■ RELAY SPECIFICATIONS

Alarm output: The SPDT relay trips when the thermal breaker operates and/or power source shutdown.
Rated load: 250V AC @1A (resistive load)
24V DC @1A (resistive load)

OUTPUT TERMINAL	NORMAL	THERMAL BREAKER OPERATING OR POWER OFF
A1 – C	Open	Close
A2 – C	Close	Open

■ CONNECTION

Terminal: Tension clamp
Applicable wire size: 0.33 to 1.5 mm² (6 – 7 mm exposed)

CHECKING

■ WIRING

- Make sure that wiring is done as instructed in the connection diagram.
- Make sure that the Earth terminal is connected to the metallic housing of protected device.
- Make sure that the Earth terminal is connected to earth.

MAINTENANCE

Even lightning in remote locations could induce surges without our knowledge. Regular checking of the surge protector is important to find degradations in early stage, before and after the storm seasons, and whenever you experience a strong lightning storm.
DO NOT attempt checking or replacing the surge protector during a thunderstorm for safety.
Checking procedure is as explained below.

■ MONITOR LED & ALARM

Configure the state of the monitor LED and the alarm output with the power voltage supplied. Replace in case of failure/breakdown.

	MONITOR LED	ALARM OUTPUT	
		A1 – C	A2– C
Normal	ON	Open	Close
Failure/ Power OFF	OFF	Close	Open

■ SIMPLE CHECK

The alarm output or the monitor LED could be broken even with no indication. The steps below explain a simple procedure to check it.
1. Remove all wiring connected to the M-RESTER.
2. Confirm there is no conduction across the terminals indicated below, with a 100/125 V DC insulation tester.

TERMINALS	DUE RESULT
U – PE	≥ 10MΩ
V – PE	

3. Check with a 1000 V DC insulation tester across the terminals indicated below and confirm it discharges.

TERMINALS	DUE RESULT
U – PE	≤ 2MΩ
V – PE	

4. Turn on the power supply with no load and measure the current flowing into the M-RESTER.

MODEL	DUE RESULT
MMAJ-100xxY	≤ 6mA
MMAJ-200xxY	
MMAJ-100xxA	≤ 20mA
MMAJ-200xxA	

If any of the above tests shows negative, replace the M-RESTER.