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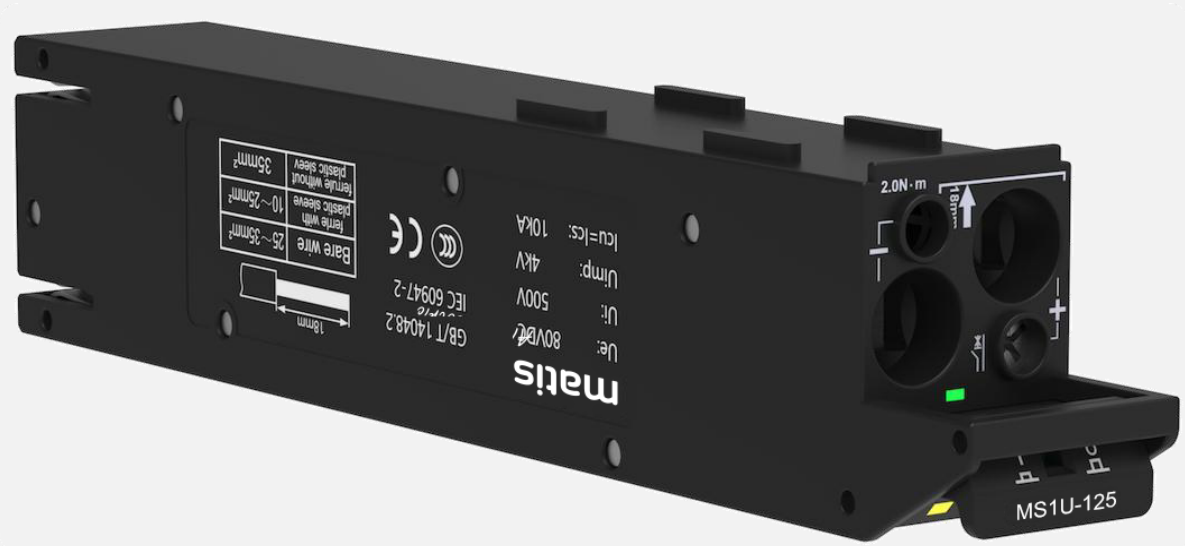

MS1U-125 SERIES

"1U" Smart HM Circuit Breaker

CATALOG

Shanghai Matis Electric Co.Ltd.

Add: Room 318-320, No.83,West Huanhu Road, Pudong, Shanghai, China 201306

Email: info@matismart.com

Http: www.matismart.cn

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Circuit Protection Introduction

Any electrical or electronic equipment that is designed without including circuit protection is an accident waiting to happen. Under normal operating conditions, this may not appear to be a problem. However, normal operating conditions are not always guaranteed. Under strained or heavy use, a motor and/or another load-generating component within the equipment will draw additional current from the power source; when this happens, the equipment's wires and/or components will overheat and may ultimately burn up. Also, power surges and short circuits in unprotected equipment can cause extensive damage to the equipment and to the conductors leading to the equipment.

In addition to protecting the equipment, the entire electrical system including the control switches,wires, and power source must be protected from faults. A circuit protection device should be employed at any point where a conductor size changes. Many electronic circuits and components like transformers have a lower overload withstand threshold level than conductors such as wires and cables. These components require circuit protection devices featuring very fast overload sensing and opening capabilities.

Specifying a circuit protection device for an application is not a difficult task, but it will require some thought. If electrical and electronic equipment is designed with over-specified circuit protection devices they will be vulnerable to the damaging effects of power surges and the catastrophic results of a fire; while using under-specified circuit protection devices will result in nuisance tripping.

Before specifying a circuit protection device, equipment designers should evaluate the load characteristics during equipment startup and at normal operation. Many types of equipment will produce startup inrush current, or surges. In these cases, circuit breakers with the appropriate time delay should be selected. The time delay specified should slightly exceed the duration of the surge.

Before specifying a circuit protection device, an equipment designer should also consider the following:

- Applied voltage rating (AC or DC)
- Single phase, multi-phase/number of poles
- Applicable national electric codes and safety regulatory agency standards
- Interrupting (short circuit) capacity
- Mounting requirements and position/enclosure size constraints

The short circuit capacity of a circuit protection device should be greater than the circuit's available short circuit fault current. Available short circuit current is the maximum RMS current that would be present if all the conductors were to be connected directly to the fault location. In reality, this is not the case. The actual short circuit current is much less than the available short circuit current. The actual short circuit current is reduced due to the combined impedance of the conductors, the size of the transformer and other current restricting components within the circuit.

The application's environmental conditions must be considered when selecting the proper circuit protection device. Excessive temperature, humidity, severe vibration and shock can cause adverse performance characteristics in many types of circuit protection devices. For instance, a fuse element is less reliable when it is hot than when it is cold.

The mounting position of a hydraulic-magnetic circuit breaker is critical to its performance. A standard hydraulic-magnetic circuit breaker should be mounted on a vertical panel as gravity will influence the "must hold" and "must trip" calibration. It is possible to specify the breaker for use in other mounting positions,however, special factory calibration will be required to prevent adverse performance characteristics.

Available

Matis Electric offers three types of circuit protection devices: thermal circuit protectors, hydraulic-magnetic circuit protectors/breakers and equipment leakage circuit breakers. This catalog features hydraulic-magnetic circuit protection products. For details related to our thermal and ground fault circuit protection product lines, please visit our website.

Thermal circuit protectors utilize a bimetallic strip electrically in series with the circuit. The heat generated by the current during an overload deforms the bimetallic strip and trips the breaker. Thermal protectors have a significant advantage over fuses in that they can be reset after tripping. They can also be used as the main ON/OFF switch for the equipment being protected. However, thermal breakers have some disadvantages. They are, in effect, “heat sensing” devices, and can be adversely affected by changes in ambient temperature. When operating in a cold environment, they will trip at a higher current level. When operating in a hot environment, they will “nuisance trip” at a lower current level resulting in unwanted equipment shut downs.

Hydraulic-magnetic circuit protectors/breakers provide highly precise, reliable and cost effective solutions to most design problems. They have the advantages of thermal breakers but none of their disadvantages. The hydraulic-magnetic circuit breaker is considered to be temperature stable and thus is not appreciably affected by changes in ambient temperature. It’s over-current sensing mechanism reacts only to changes of current in the circuit being protected. It has no “warm-up” period to slow down its response to overload. It has no “cool-down” period after overload before it can be reset. The characteristics of a hydraulic-magnetic circuit breaker can be tailored in four separate areas: the desired circuit; the trip point (in amperes); the time delay (in seconds); and the inrush handling capacity of the breaker. These factors can be varied with relatively little impact on the short circuit capability of the breaker. Typically, hydraulic-magnetic circuit breakers are available with a choice of three different trip time delay curves: slow, medium and long. These choices provide the designer with a high level of design flexibility when matching the breakers trip time delay curves to other circuit protection devices in a cascade, or discriminating circuit. In addition, special high-inrush constructions are available for equipment with severe inrush characteristics.

Equipment leakage circuit breakers function as hydraulic-magnetic circuit breakers, offering customized overload and short circuit protection. In addition, they sense and guard against faults to ground using innovative electronics technologies. With the exception of small amounts of leakage, the current returning to the power supply will be equal to the current leaving the power supply. If the difference between the current leaving and returning through the earth leakage circuit breaker exceeds the leakage sensitivity setting, the breaker trips and it’s LED illuminates. The LED gives a clear indication that the trip occurred as a result of leakage to ground. This protection helps prevent serious equipment damage and fire.

Matis Electric’ Hydraulic-Magnetic Circuit Breakers

Matis Electric’ hydraulic/magnetic circuit breakers are current sensing devices employing a time proven hydraulic magnetic design. Their precision mechanisms are temperature stable and are not adversely affected by temperature changes in their operating environment. As such, derating considerations due to temperature variations are not normally required, and heat-induced nuisance tripping is avoided.

Features

• A trip-free mechanism, a safety feature, makes it impossible to manually hold the contacts closed during overcurrent or fault conditions.
• Worldwide safety agency approvals are available.
• Current ratings to 700 Amps and rated voltages to 600 VAC are available.
• A common trip linkage between all poles, another safety feature, ensures that an overload in one pole will trip all adjacent poles.
• Industry standard dimensions, mounting and current ratings provide maximum application versatility.
• Series trip, mid-trip and switch only (with or without auxiliary switch), remote shutdown, shunt trip, relay trip and dual coil circuit options are offered.
• Handle actuators, solid color rocker actuators,
illuminated rocker actuators and the exclusive Visi Rocker® two-color rocker actuators, allow design flexibility and contemporary panel styling.
• 35mm DIN Rail back panel mounting available for world market applications.

Magnetic circuit breakers protect wiring, motors, generators, transformers, solid state systems, computers, telecommunications systems, micro–processors, peripheral and printing devices, office machines, machine tools, medical and dental equipment, instrumentation, vending machines, industrial automation and packaging systems, process control systems, lamps, ballasts, storage batteries, linear and switching power supplies, as well as marine control panels and numerous other applications. Generally, wherever precise and reliable circuit protection is required, a magnetic circuit breaker is specified.

Typical Applications

What Makes a Hydraulic Magnetic Breaker Trip

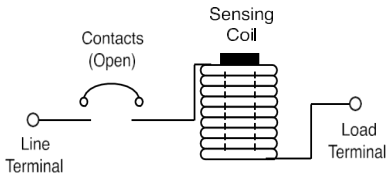


Figure 1 (Circuit Structure)

The most common magnetic circuit breaker configuration is called “Series Trip”. It consists of a current sensing coil connected in series with a set of contacts. (Fig. 1)

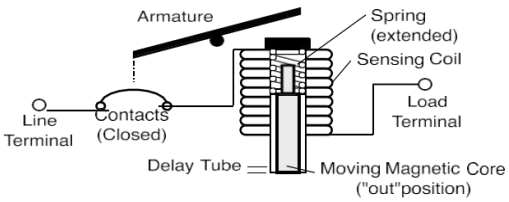


Figure 2 (Rated Current or Less)

Inside the coil is a non-magnetic delay tube, housing a springbiased, moving, magnetic core. An armature links the contacts to the coil mechanism, which functions as an electro magnet. When the contacts are open, there is no current flow through the circuit breaker, and no electro-magnetic energy is developed by the coil. When the contacts are closed, current flow begins. (Fig. 2)

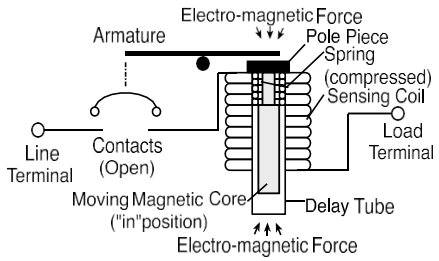


Figure 3 (Moderate Overload with Induced Delay)

As the normal operating or “rated” current flows through the sensing coil, a magnetic field is created around that coil. When the current flow increases, the strength of the magnetic field increases, drawing the spring-biased, movable, magnetic core toward the pole piece. As the core moves inward, the efficiency of the magnetic circuit is increased, creating an even greater electro-magnetic force. When
the core is fully “in”, maximum electro-magnetic force is attained, the armature is attracted to the pole piece, unlatching a trip mechanism, thereby opening the contacts. (Fig. 3)

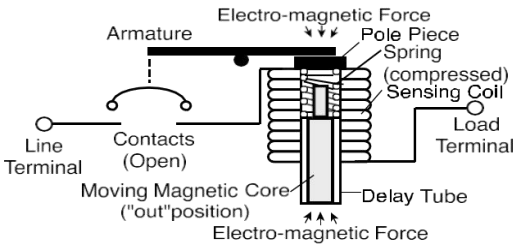


Figure 4 (Short Circuit Condition - No Induced Delay)

Under short circuit conditions, the resultant increase in electromagnetic energy is so rapid, that the armature is attracted without core movement, allowing the breaker to trip without an induced delay. This is called “instantaneous trip”. It is a safety feature which results in a very fast trip response when most needed. (Fig. 4)

How Various Time Delays are Obtained

Generally speaking, the trip time of a time delay magnetic circuit breaker is directly related to the length of time it takes for the moving metal core to move to the fully “in” position. If the delay tube is filled with air, the core will move rather quickly, and the breaker will trip quickly. This is characteristic of the Ultrashort Delay Curves #A2 and #D2. Solid state devices,which cannot tolerate even short periods of current overload, should use Instantaneous Curves #A1 and #D1. These curves have no intentional time delay. When the delay tube is filled with a light viscosity (temperature stable) fluid, the core’s travel to the full “in” position will be intentionally delayed. This results in the slightly longer Medium Delays #A3 and H4, which are used for general purpose applications. When a heavy viscosity fluid is used, the result will be a very long delay, such as Delay Curve #A5. These curves are commonly used in motor applications to minimize the potential for nuisance tripping during lengthy motor start-ups. By use of magnetic “shunt” plates within the magnetic circuit, it is possible to divert magnetic flux resulting in higher “inrush withstanding capability” (or high inrush delays).
These delays disregard short duration, high pulse surges (typically 8ms or less and up to 25x rated current), characteristic of transformers, switching power supplies and capacitive loads. Delay Curves #H3, #H4, and #H5, are available for these applications. Hydraulic delay protectors have the added advantage of tripping slightly sooner when operating in higher temperature conditions and slightly longer when cold. This characteristic mirrors the protection needs in most applications. Note that the current required to trip the breaker does not change, just the time delay for tripping.

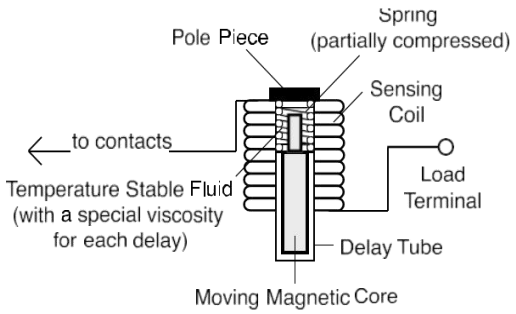


Figure 5 (Rated Current or Less)

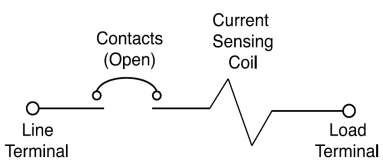
Available Circuit Options

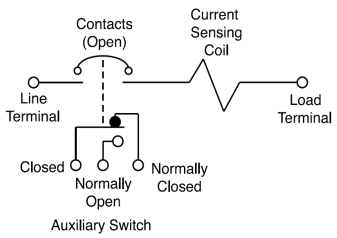
Series Trip

Inside the coil is a non-magnetic delay tube, housing a springbiased, moving, magnetic core. An armature links the contacts to the coil mechanism, which functions as an electro magnet. When the contacts are open, there is no current flow through the circuit breaker, and no electro-magnetic energy is developed by the coil. When the contacts are closed, current flow begins. (Fig. 2)

Series Trip with Auxiliary Switch

Inside the coil is a non-magnetic delay tube, housing a springbiased, moving, magnetic core. An armature links the contacts to the coil mechanism, which functions as an electro magnet. When the contacts are open, there is no current flow through the circuit breaker, and no electro-magnetic energy is developed by the coil. When the contacts are closed, current flow begins. (Fig. 2)



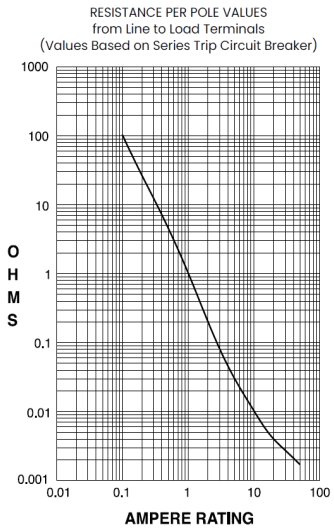


Tech Specs

Electrical	
Maximum Voltage	250 VAC 50/60 Hz, 80 VDC (See Rating Tables.)
Current Ratings	Standard current coils: 6.0, 10.0 16.0, 20.0, 25.0, 32.0, 50.0 or 63.0 amps. Other ratings available - see Ordering Scheme.
Impulse Withstand Voltage (Uimp)	4000V
Remote Automatic Switching Time	1.5s/Cycle
Insulation Resistance	Minimum of 100 Megohms at 500 VDC.
Dielectric Strength	UL, CSA 1500V, 50/60 Hz for one minute between all electrically isolated terminals. M-Series Circuit Breakers comply with the 8mm spacing and 3750 V 50/60Hz dielectric requirements from hazardous voltage to operator accessible surfaces, per Publications IEC 380, 435, 950,EN 60950 and VDE 0805.
Resistance, Impedance	Values from Line to Load Terminal - based on Series Trip Circuit Breaker.
Endurance	5,000 ON-OFF operations@ 6 per minute with rated Current and Voltage.

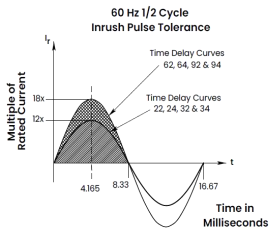
Mechanical	
Endurance	7,000 ON-OFF operations
Trip Free	All M-Series Circuit Breakers will trip on overload, even when actuator is forcibly held in the ON position.
Trip Indication	The actuator moves positively to the OFF position when an overload causes the circuit breaker to trip. And the indicator turned to "Green".

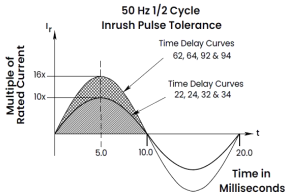
Physical	
Number of Poles	1
Internal Circuit Config.	Series with or without Auxiliary Switch. Switch Only with or without Auxiliary Switch.
Weight	Approximately 150 grams/pole (Approximately 1.07 ounces/pole)
Standard Colors	See Ordering Scheme



CURRENT (AMPS)	TOLERANCE (%)
0.10 - 20.0	± 25
20.1 - 63.0	± 35

Pulse Tolerance Curves





Environmental

Designed in accordance with requirements of specification MIL PRF-55629 & MIL-STD-202G as follows:

Shock	Withstands 100 Gs, 6ms, sawtooth while carrying rated current per Method 213, Cond. I.Instantaneous curves tested at 80% of rated current.
Vibration	Withstands 0.060" excursion from 10-55 Hz, and 10 Gs 55-500 Hz, at rated current per Method 204C, Test Condition A. Instantaneous curves tested at 80% of rated current.
Moisture Resistance	Method 106D, i.e., ten 24-hour cycles @ + 25°C to +65°C, 80- 98% RH.
Salt Spray	Method 101, Condition A (90-95% RH @ 5% NaCl Solution, 96 hrs)..
Thermal Shock	Method 107D, Condition A (Five cycles @ -55°C to +25°C to +85°C to +25°C).
Operating Temperature	-40° C to +85° C
Chemical Resistance	Only the outside surfaces of the case and the handles may be cleaned with detergents or alcohol. Organic (hydrocarbon based) solvents are not recommended because they attack plastics. Caution should be taken when solvents are used to clean and remove flux from terminals. Lubricants should not be introduced into the handle/ bushing openings

Tech Specs

Capacity Reduction Coefficient Table

Altitude ≥ 2000m MS1U-125 Circuit Breaker Capacity Reduction Coefficient Table					
Altitude	Working Current	Power Frequency Withstand Voltage	Impulse Withstand Voltage	Short Circuit Capacity	Electrical Life
2000	In	1	1	1	1
3000	0.99 In	0.89	0.89	0.83	0.83
4000	0.96 In	0.8	0.8	0.71	0.71
5000	0.94 In	0.73	0.73	0.63	0.63

Tables

Table A: Lists UL Recognized,CSA Accepted and TUV and VDE Certified configurations and performance capabilities as a Component Supplementary Protector.

Component Supplementary Protectors												
Circuit Configuration	Voltage			Current Rating		Poles Breaking	Short Circuit Capacity (Amps)				Application Codes	
	Max Rating	Frequency	Phase	Full Load Amps	General Purpose Amps		CCC		TUV / CCC			
							Icu	Ics	Icu	Ics	UL	CSA
Series	80	---	1	70 - 125	70 - 125	1 or 2	10000	7500	10000	7500	/	/
	125			70 - 125	70 - 125	1	10000	7500	10000	7500	/	/
	250	50/60		70 - 125	70 - 125	1 or 2	10000	7500	10000	7500	/	/

Agency Approvals

◇ **UL 1077**	Component Recognition Program as Protectors, Supplementary (Guide CN/QVNU2, File E310998)
◇ **UL 489**	Molded Case Circuit Breaker (Guide CN/DIVQ, File E360508)
◇ **CSA Accepted**	Component Supplementary Protector (File 047848 0 000) CSA Standard C22.2
◇ **TUV Certified**	EN60947-2, Under License No.R 50544750 0001
◇ **CCC Certified**	GB/T 14048.2, Under License No.V-14201-DC212893

Ordering Scheme *(Sample Part Number)*

MS1U-125	—	1	A	D4	—	D	63	—						—	T
1		2	3	4		5	6		7	8	9	10	11		12

1. SERIES

MS1U-125

2. NUMBER OF POLES

1: One

3. Control Unit

A: Control Unit Inside Structure

B: Control Unit Outside Structure

4. FREQUENCY & DELAY

A3: AC Short

D3: DC Short

A4: AC Medium

D4: DC Medium

A5: AC Long

D5: DC Long

5. RATED VOLTAGE

N: 250V AC

D: 80V DC

6. CURRENT RATING (AMPERES)

70A ~ 125A

7. MOUNTING INSERTS & BODY COLOR

None

** Snap into the 1U box*

** Color is Black*

8. TERMINAL

None

** Input (Line Side): Suitable for 2mm thickness busbar*

** Output (Load Side): Spring Clamp Structure*

9. ACTUATOR

None

** Push-Pull Actuator*

10. ACTUATOR COLOR & LEGEND

Actuator Color	I - O	ON-OFF	Dual	Legend Color
White	**A**	**B**	**1**	Black
Black	**None**	**D**	**2**	White
Red	**F**	**G**	**3**	White
Green	**H**	**J**	**4**	White
Blue	**K**	**L**	**5**	White
Yellow	**M**	**N**	**6**	Black
Gray	**P**	**Q**	**7**	Black
Orange	**R**	**S**	**8**	Black

Amps Mark / Legend

None: With Amps Mark

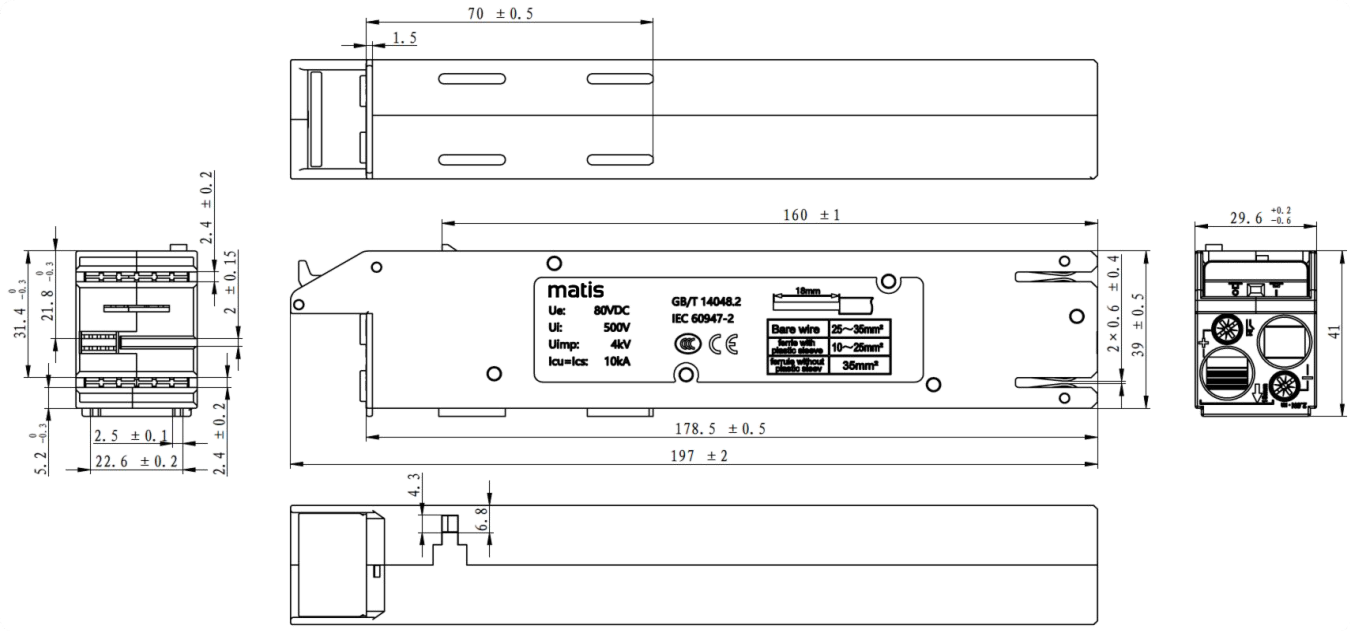
11. LEGEND DICRETION

None

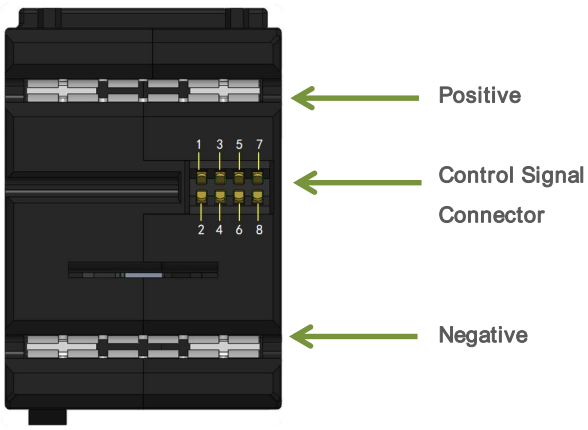
12. AGENCY APPROVAL

T: CCC Certified GB/T 14048.2 & CE Mark IEC EN 60947-2

Dimensional Specs



Control Signal Connector



Item	Control Unit
1	DC48V+ Power Source Input
2	DC48V- Power Source Input
3	(Reserve)
4	(Reserve)
5	Group Address Pin
6	Intra-Group Address Pin
7	RS485+
8	RS485-

LED Indication Instruction

Item	LED Status	Circuit Breaker Status
1	Red - Steady on	Power On
2	Green - Steady on	Power Off
3	Red - Slow flash	The alarm or fault protection is triggered.
4	Red - Quick flash	One-click function status
5	Green - Slow flash	Guide mode: just been powered on or entered for other reasons
6	Green - Quick flash	Software upgrade

Function Description

1. Measure

Voltage: Measuring range is 0~80VDC, Accuracy is 0.5 level

Current: Measuring range is 0~63A, Accuracy is 1% level

Power: Measuring range is 0~10KW, Accuracy is 1.5% level

Electric Energy: Measuring range is 0~700000KWH, Accuracy is 2% level;

Contact Temperature: Measuring range is -40℃ ~ +200℃, Error 2℃;

Internal Temperature: Measuring range is -40℃ ~ +200℃, Error 2℃;

Switching: Status and Switching times

2. Protection

Over and Under Voltage: Disconnect when the main circuit voltage is lower than 40V for 10 seconds. When the voltage returns to 42V for 10S, the circuit breaker automatically recovers. When the voltage of the main circuit is higher than 75V for 10S, the circuit breaker will be disconnected. When the voltage is lower than 68V for 10seconds, the circuit breaker will automatically recover.

Overload: Must hold more than 2h at 105% rated current; Must trip less than 2h at 130% rated current. When the load current is greater than the set current, the alarm information needs to be uploaded.

Curve: The default is medium delay (D4).

Current Limiting: If the main circuit current of the circuit breaker is greater than the overcurrent threshold and the duration reaches the set overcurrent disconnect delay time, the circuit breaker is disconnected.
If the disconnection time reaches the interval for overcurrent disconnection and recovery, and the recovery times are smaller than the set times, the system automatically tries to recover

3. Address Recognition

By detecting the voltage of signal pin 5 and 6, the host computer automatically recognizes its own address, and communicates with the switch through this address. The value ranges from 1 to 127.

4. Authentication

Only after authorization, the product can automatically close, and the authorization status will return to zero after power failure;

5. Anti-Misoperation

Can not be closed manually or automatically if not inserted in place; Cannot be inserted in closed state

6. Alarm

Trip: When the circuit breaker current limit is disconnected, a trip alarm will be generated and the trip alarm will be uploaded.

Contact Overtemperature Alarm: If the circuit breaker terminal temperature exceeds 120 ° C, an overtemperature alarm is generated and uploaded.

Internal Overtemperature Alarm: When the internal temperature of the circuit breaker exceeds 120 ° C, the internal overtemperature alarm of the circuit breaker is generated and uploaded.

Low-Voltage Power-Off: When the undervoltage is disconnected, the low-voltage power-off alarm is generated and uploaded. The low-voltage power-off alarm is cleared after the overvoltage recovers.

Circuit Breaker Off: When the remote control circuit breaker on the upper computer is powered off successfully, an alarm is generated for circuit breaker off, and the alarm is uploaded. Manually power on the PC or remotely power on the PC to clear the alarm.

Failure of Closing and Opening: the upper computer controls the closing or opening of the circuit breaker. If the circuit breaker fails to execute, the alarm information will be uploaded.

Controller Fault: If the hardware self-check fails, the alarm information is uploaded.

7. Control

The circuit breaker can be opened or closed by controlling the upper computer

8. Count Fault Opening

Count the number of switching times caused by overload and short circuit, and save power failure

9. Power-Off Policy

Can set the parameters based on the voltage, time, and power energy.

10. Alarm Setting

Set alarm according to current, voltage, temperature, switch and other information

11. Parameter Setting

Parameters such as power-off voltage and recovery voltage can be set.

Signal and communication

※ RS485, baud rate 9600, character format adopts no check bit, 8 data bit, 1 stop bit asynchronous serial communication format, data response time < 200ms (Data response time refers to the time between the host computer sending the last byte of the query packet and receiving the first valid byte of the switch module response).

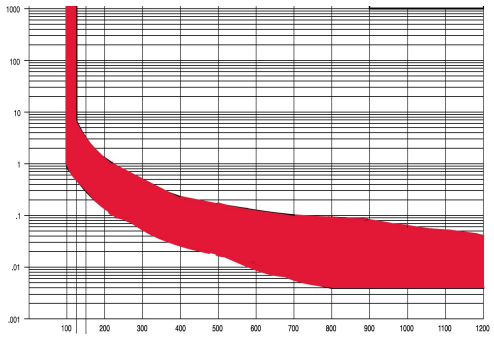
※ Using RS485/Modbus protocol Remote Terminal Unit (RTU) mode, each byte is 2 hexadecimal numbers, the valid data range is 0~9, A~F.

※ Refer to MS1U-125 -MODBUS Protocol for communication protocols.

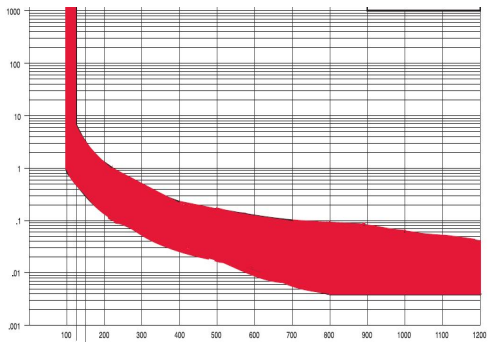
Time Delay

MS1U-125 SERIES TIME DISPLAY VALUES										
	PERCENT OF RATED CURRENT									
	Delay	100%	130%	150%	200%	400%	600%	800%	1000%	1200%
TRIP TIME (s)	D3	No Trip	.500-6.50	.300-3.00	.130-1.20	.031-.220	.011-.120	.004-.090	.004-.060	.004-.040
	D4	No Trip	2.00-60.0	1.20-40.0	.600-20.0	.150-3.00	.030-1.30	.004-.600	.004-.100	.004-.100
	D5	No Trip	45.0-345	20.0-150	9.00-60.0	1.40-11.4	.150-5.80	.009-3.70	.005-1.70	.005-.500
	A3	No Trip	.700-12.0	.350-4.00	.100 Max	.027-.220	.008-.130	.004-.090	.004-.045	.004-.040
	A4	No Trip	10.0-120	6.00-60.0	.100 - 2.00	.200-3.00	.020-2.00	.013-.850	.013-.050	.005-.040
	A5	No Trip	50.0-700	32.0-350	1.00 - 15.0	1.50-15.0	.500-7.00	.020-3.00	.006-2.00	.005-.100

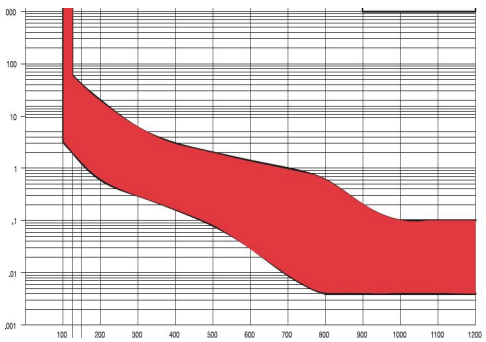
DC SHORT DELAY (D3)



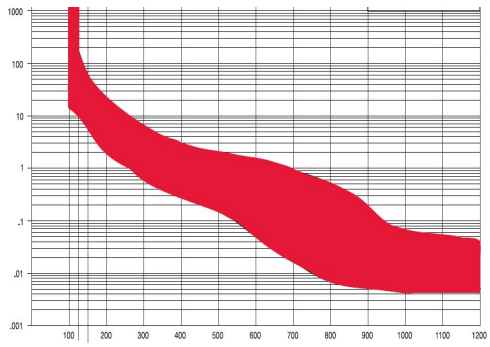
AC 50/60Hz SHORT DELAY (A3)



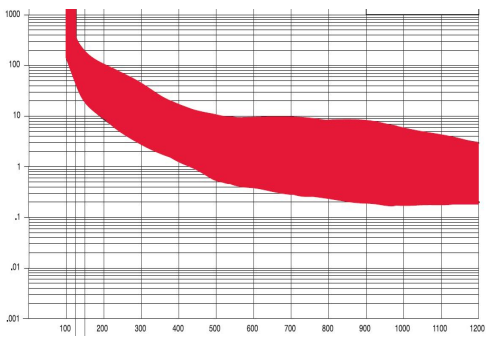
DC MEDIUM DELAY (D4)



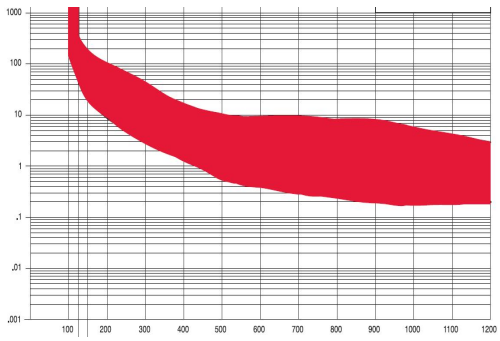
AC 50/60Hz MEDIUM DELAY (A4)



DC LONG DELAY (D5)



AC 50/60Hz LONG DELAY (A5)



Shanghai Matis Electric Co.Ltd

Room 318-320, No.83,West Huanhu Road,

Pudong, Shanghai, China 201306

T: +86 21 6050 3668/+86 18621879631

E: info@matismart.com

Technology Creates the Future

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AIoT Electric

MS1U-63 SERIES

"1U" Smart HM Circuit Breaker

CATALOG

Shanghai Matis Electric Co.Ltd.

Add: Room 318-320, No.83,West Huanhu Road, Pudong, Shanghai, China 201306

Email: info@matismart.com

Http: www.matismart.cn

CONTENTS

Circuit Protection Introduction

Any electrical or electronic equipment that is designed without including circuit protection is an accident waiting to happen. Under normal operating conditions, this may not appear to be a problem. However, normal operating conditions are not always guaranteed. Under strained or heavy use, a motor and/or another load-generating component within the equipment will draw additional current from the power source; when this happens, the equipment's wires and/or components will overheat and may ultimately burn up. Also, power surges and short circuits in unprotected equipment can cause extensive damage to the equipment and to the conductors leading to the equipment.

In addition to protecting the equipment, the entire electrical system including the control switches,wires, and power source must be protected from faults. A circuit protection device should be employed at any point where a conductor size changes. Many electronic circuits and components like transformers have a lower overload withstand threshold level than conductors such as wires and cables. These components require circuit protection devices featuring very fast overload sensing and opening capabilities.

Specifying a circuit protection device for an application is not a difficult task, but it will require some thought. If electrical and electronic equipment is designed with over-specified circuit protection devices they will be vulnerable to the damaging effects of power surges and the catastrophic results of a fire; while using under-specified circuit protection devices will result in nuisance tripping.

Before specifying a circuit protection device, equipment designers should evaluate the load characteristics during equipment startup and at normal operation. Many types of equipment will produce startup inrush current, or surges. In these cases, circuit breakers with the appropriate time delay should be selected. The time delay specified should slightly exceed the duration of the surge.

Before specifying a circuit protection device, an equipment designer should also consider the following:

- Applied voltage rating (AC or DC)
- Single phase, multi-phase/number of poles
- Applicable national electric codes and safety regulatory agency standards
- Interrupting (short circuit) capacity
- Mounting requirements and position/enclosure size constraints

The short circuit capacity of a circuit protection device should be greater than the circuit's available short circuit fault current. Available short circuit current is the maximum RMS current that would be present if all the conductors were to be connected directly to the fault location. In reality, this is not the case. The actual short circuit current is much less than the available short circuit current. The actual short circuit current is reduced due to the combined impedance of the conductors, the size of the transformer and other current restricting components within the circuit.

The application's environmental conditions must be considered when selecting the proper circuit protection device. Excessive temperature, humidity, severe vibration and shock can cause adverse performance characteristics in many types of circuit protection devices. For instance, a fuse element is less reliable when it is hot than when it is cold.

The mounting position of a hydraulic-magnetic circuit breaker is critical to its performance. A standard hydraulic-magnetic circuit breaker should be mounted on a vertical panel as gravity will influence the "must hold" and "must trip" calibration. It is possible to specify the breaker for use in other mounting positions,however, special factory calibration will be required to prevent adverse performance characteristics.

Available

Matis Electric offers three types of circuit protection devices: thermal circuit protectors, hydraulic-magnetic circuit protectors/breakers and equipment leakage circuit breakers. This catalog features hydraulic-magnetic circuit protection products. For details related to our thermal and ground fault circuit protection product lines, please visit our website.

Thermal circuit protectors utilize a bimetallic strip electrically in series with the circuit. The heat generated by the current during an overload deforms the bimetallic strip and trips the breaker. Thermal protectors have a significant advantage over fuses in that they can be reset after tripping. They can also be used as the main ON/OFF switch for the equipment being protected. However, thermal breakers have some disadvantages. They are, in effect, “heat sensing” devices, and can be adversely affected by changes in ambient temperature. When operating in a cold environment, they will trip at a higher current level. When operating in a hot environment, they will “nuisance trip” at a lower current level resulting in unwanted equipment shut downs.

Hydraulic-magnetic circuit protectors/breakers provide highly precise, reliable and cost effective solutions to most design problems. They have the advantages of thermal breakers but none of their disadvantages. The hydraulic-magnetic circuit breaker is considered to be temperature stable and thus is not appreciably affected by changes in ambient temperature. It’s over-current sensing mechanism reacts only to changes of current in the circuit being protected. It has no “warm-up” period to slow down its response to overload. It has no “cool-down” period after overload before it can be reset. The characteristics of a hydraulic-magnetic circuit breaker can be tailored in four separate areas: the desired circuit; the trip point (in amperes); the time delay (in seconds); and the inrush handling capacity of the breaker. These factors can be varied with relatively little impact on the short circuit capability of the breaker. Typically, hydraulic-magnetic circuit breakers are available with a choice of three different trip time delay curves: slow, medium and long. These choices provide the designer with a high level of design flexibility when matching the breakers trip time delay curves to other circuit protection devices in a cascade, or discriminating circuit. In addition, special high-inrush constructions are available for equipment with severe inrush characteristics.

Equipment leakage circuit breakers function as hydraulic-magnetic circuit breakers, offering customized overload and short circuit protection. In addition, they sense and guard against faults to ground using innovative electronics technologies. With the exception of small amounts of leakage, the current returning to the power supply will be equal to the current leaving the power supply. If the difference between the current leaving and returning through the earth leakage circuit breaker exceeds the leakage sensitivity setting, the breaker trips and it’s LED illuminates. The LED gives a clear indication that the trip occurred as a result of leakage to ground. This protection helps prevent serious equipment damage and fire.

Matis Electric’ Hydraulic-Magnetic Circuit Breakers

Matis Electric’ hydraulic/magnetic circuit breakers are current sensing devices employing a time proven hydraulic magnetic design. Their precision mechanisms are temperature stable and are not adversely affected by temperature changes in their operating environment. As such, derating considerations due to temperature variations are not normally required, and heat-induced nuisance tripping is avoided.

Features

• A trip-free mechanism, a safety feature, makes it impossible to manually hold the contacts closed during overcurrent or fault conditions.
• Worldwide safety agency approvals are available.
• Current ratings to 700 Amps and rated voltages to 600 VAC are available.
• A common trip linkage between all poles, another safety feature, ensures that an overload in one pole will trip all adjacent poles.
• Industry standard dimensions, mounting and current ratings provide maximum application versatility.
• Series trip, mid-trip and switch only (with or without auxiliary switch), remote shutdown, shunt trip, relay trip and dual coil circuit options are offered.
• Handle actuators, solid color rocker actuators,
illuminated rocker actuators and the exclusive Visi Rocker® two-color rocker actuators, allow design flexibility and contemporary panel styling.
• 35mm DIN Rail back panel mounting available for world market applications.

Magnetic circuit breakers protect wiring, motors, generators, transformers, solid state systems, computers, telecommunications systems, micro–processors, peripheral and printing devices, office machines, machine tools, medical and dental equipment, instrumentation, vending machines, industrial automation and packaging systems, process control systems, lamps, ballasts, storage batteries, linear and switching power supplies, as well as marine control panels and numerous other applications. Generally, wherever precise and reliable circuit protection is required, a magnetic circuit breaker is specified.

Typical Applications

What Makes a Hydraulic Magnetic Breaker Trip

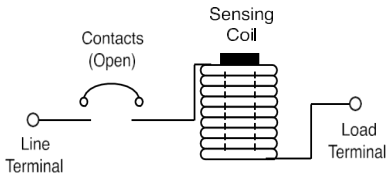


Figure 1 (Circuit Structure)

The most common magnetic circuit breaker configuration is called “Series Trip”. It consists of a current sensing coil connected in series with a set of contacts. (Fig. 1)

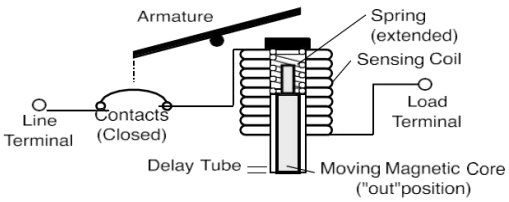


Figure 2 (Rated Current or Less)

Inside the coil is a non-magnetic delay tube, housing a springbiased, moving, magnetic core. An armature links the contacts to the coil mechanism, which functions as an electro magnet. When the contacts are open, there is no current flow through the circuit breaker, and no electro-magnetic energy is developed by the coil. When the contacts are closed, current flow begins. (Fig. 2)

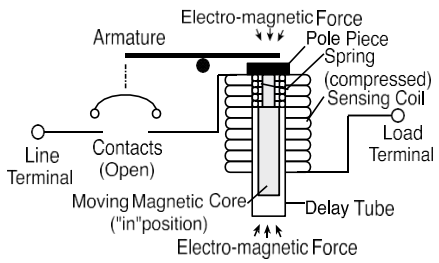


Figure 3 (Moderate Overload with Induced Delay)

As the normal operating or “rated” current flows through the sensing coil, a magnetic field is created around that coil. When the current flow increases, the strength of the magnetic field increases, drawing the spring-biased, movable, magnetic core toward the pole piece. As the core moves inward, the efficiency of the magnetic circuit is increased, creating an even greater electro-magnetic force. When
the core is fully “in”, maximum electro-magnetic force is attained, the armature is attracted to the pole piece, unlatching a trip mechanism, thereby opening the contacts. (Fig. 3)

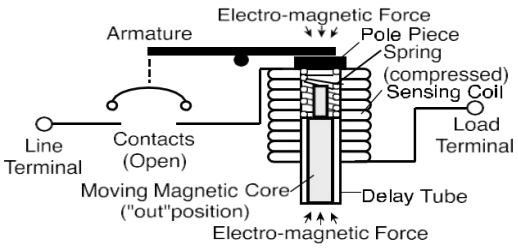


Figure 4 (Short Circuit Condition - No Induced Delay)

Under short circuit conditions, the resultant increase in electromagnetic energy is so rapid, that the armature is attracted without core movement, allowing the breaker to trip without an induced delay. This is called “instantaneous trip”. It is a safety feature which results in a very fast trip response when most needed. (Fig. 4)

How Various Time Delays are Obtained

Generally speaking, the trip time of a time delay magnetic circuit breaker is directly related to the length of time it takes for the moving metal core to move to the fully “in” position. If the delay tube is filled with air, the core will move rather quickly, and the breaker will trip quickly. This is characteristic of the Ultrashort Delay Curves #A2 and #D2. Solid state devices,which cannot tolerate even short periods of current overload, should use Instantaneous Curves #A1 and #D1. These curves have no intentional time delay. When the delay tube is filled with a light viscosity (temperature stable) fluid, the core’s travel to the full “in” position will be intentionally delayed. This results in the slightly longer Medium Delays #A3 and H4, which are used for general purpose applications. When a heavy viscosity fluid is used, the result will be a very long delay, such as Delay Curve #A5. These curves are commonly used in motor applications to minimize the potential for nuisance tripping during lengthy motor start-ups. By use of magnetic “shunt” plates within the magnetic circuit, it is possible to divert magnetic flux resulting in higher “inrush withstanding capability” (or high inrush delays).
These delays disregard short duration, high pulse surges (typically 8ms or less and up to 25x rated current), characteristic of transformers, switching power supplies and capacitive loads. Delay Curves #H3, #H4, and #H5, are available for these applications. Hydraulic delay protectors have the added advantage of tripping slightly sooner when operating in higher temperature conditions and slightly longer when cold. This characteristic mirrors the protection needs in most applications. Note that the current required to trip the breaker does not change, just the time delay for tripping.

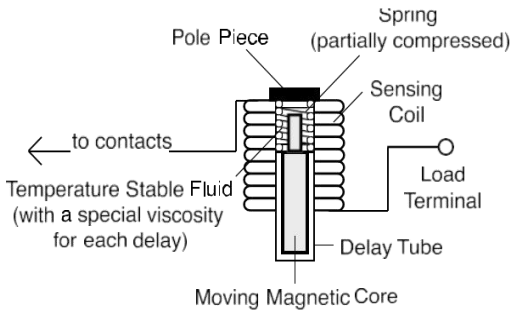


Figure 5 (Rated Current or Less)

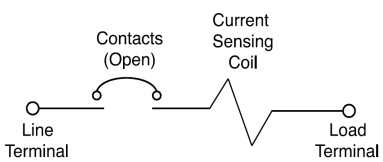
Available Circuit Options

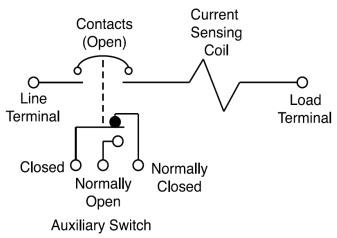
Series Trip

Inside the coil is a non-magnetic delay tube, housing a springbiased, moving, magnetic core. An armature links the contacts to the coil mechanism, which functions as an electro magnet. When the contacts are open, there is no current flow through the circuit breaker, and no electro-magnetic energy is developed by the coil. When the contacts are closed, current flow begins. (Fig. 2)

Series Trip with Auxiliary Switch

Inside the coil is a non-magnetic delay tube, housing a springbiased, moving, magnetic core. An armature links the contacts to the coil mechanism, which functions as an electro magnet. When the contacts are open, there is no current flow through the circuit breaker, and no electro-magnetic energy is developed by the coil. When the contacts are closed, current flow begins. (Fig. 2)



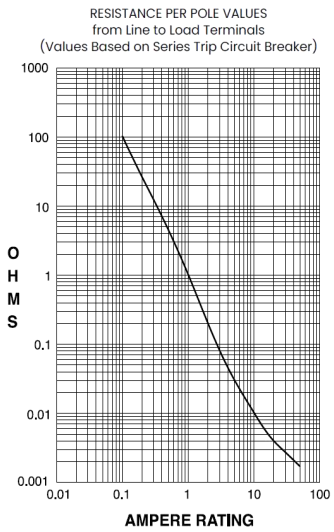


Tech Specs

Electrical	
Maximum Voltage	250 VAC 50/60 Hz, 80 VDC (See Rating Tables.)
Current Ratings	Standard current coils: 6.0, 10.0 16.0, 20.0, 25.0, 32.0, 50.0 or 63.0 amps. Other ratings available - see Ordering Scheme.
Impulse Withstand Voltage (Uimp)	4000V
Remote Automatic Switching Time	1.5s/Cycle
Insulation Resistance	Minimum of 100 Megohms at 500 VDC.
Dielectric Strength	UL, CSA 1500V, 50/60 Hz for one minute between all electrically isolated terminals. M-Series Circuit Breakers comply with the 8mm spacing and 3750 V 50/60Hz dielectric requirements from hazardous voltage to operator accessible surfaces, per Publications IEC 380, 435, 950,EN 60950 and VDE 0805.
Resistance, Impedance	Values from Line to Load Terminal - based on Series Trip Circuit Breaker.
Endurance	5,000 ON-OFF operations@ 6 per minute with rated Current and Voltage.

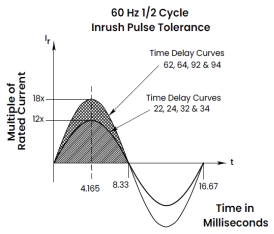
Mechanical	
Endurance	7,000 ON-OFF operations
Trip Free	All M-Series Circuit Breakers will trip on overload, even when actuator is forcibly held in the ON position.
Trip Indication	The actuator moves positively to the OFF position when an overload causes the circuit breaker to trip. And the indicator turned to "Green".

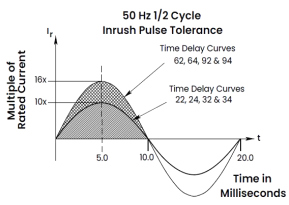
Physical	
Number of Poles	1
Internal Circuit Config.	Series with or without Auxiliary Switch. Switch Only with or without Auxiliary Switch.
Weight	Approximately 150 grams/pole (Approximately 1.07 ounces/pole)
Standard Colors	See Ordering Scheme



CURRENT (AMPS)	TOLERANCE (%)
0.10 - 20.0	± 25
20.1 - 63.0	± 35

Pulse Tolerance Curves





Environmental

Designed in accordance with requirements of specification MIL PRF-55629 & MIL-STD-202G as follows:

Shock	Withstands 100 Gs, 6ms, sawtooth while carrying rated current per Method 213, Cond. I.Instantaneous curves tested at 80% of rated current.
Vibration	Withstands 0.060" excursion from 10-55 Hz, and 10 Gs 55-500 Hz, at rated current per Method 204C, Test Condition A. Instantaneous curves tested at 80% of rated current.
Moisture Resistance	Method 106D, i.e., ten 24-hour cycles @ + 25°C to +65°C, 80- 98% RH.
Salt Spray	Method 101, Condition A (90-95% RH @ 5% NaCl Solution, 96 hrs)..
Thermal Shock	Method 107D, Condition A (Five cycles @ -55°C to +25°C to +85°C to +25°C).
Operating Temperature	-40° C to +85° C
Chemical Resistance	Only the outside surfaces of the case and the handles may be cleaned with detergents or alcohol. Organic (hydrocarbon based) solvents are not recommended because they attack plastics. Caution should be taken when solvents are used to clean and remove flux from terminals. Lubricants should not be introduced into the handle/ bushing openings

Tech Specs

Capacity Reduction Coefficient Table

Altitude ≥ 2000m MS1U-63 Circuit Breaker Capacity Reduction Coefficient Table					
Altitude	Working Current	Power Frequency Withstand Voltage	Impulse Withstand Voltage	Short Circuit Capacity	Electrical Life
2000	In	1	1	1	1
3000	0.99 In	0.89	0.89	0.83	0.83
4000	0.96 In	0.8	0.8	0.71	0.71
5000	0.94 In	0.73	0.73	0.63	0.63

Tables

Table A: Lists UL Recognized,CSA Accepted and TUV and VDE Certified configurations and performance capabilities as a Component Supplementary Protector.

Component Supplementary Protectors												
Circuit Configuration	Voltage			Current Rating		Poles Breaking	Short Circuit Capacity (Amps)				Application Codes	
							CCC		TUV / CCC			
	Max Rating	Frequency	Phase	Full Load Amps	General Purpose Amps		Icu	Ics	Icu	Ics	UL	CSA
Series	80	---	1	1 - 63	1 - 63	1 or 2	10000	7500	10000	7500	/	/
	125			1 - 63	1 - 63	1	10000	7500	10000	7500	/	/
	250	50/60		1 - 63	1 - 63	1 or 2	10000	7500	10000	7500	/	/

Agency Approvals

◇ **UL 1077**	Component Recognition Program as Protectors, Supplementary (Guide CN/QVNU2, File E310998)
◇ **UL 489**	Molded Case Circuit Breaker (Guide CN/DIVQ, File E360508)
◇ **CSA Accepted**	Component Supplementary Protector (File 047848 0 000) CSA Standard C22.2
◇ **TUV Certified**	EN60947-2, Under License No.R 50544750 0001
◇ **CCC Certified**	GB/T 14048.2, Under License No.V-14201-DC212893

Ordering Scheme *(Sample Part Number)*

MS1U-63	—	1	A	D4	—	D	63	—						—	T
1		2	3	4		5	6		7	8	9	10	11		12

1. SERIES

MS1U-63

2. NUMBER OF POLES

1: One

3. Control Unit

A: Control Unit Inside Structure

B: Control Unit Outside Structure

4. FREQUENCY & DELAY

A3: AC Short

D3: DC Short

A4: AC Medium

D4: DC Medium

A5: AC Long

D5: DC Long

5. RATED VOLTAGE

N: 250V AC

D: 80V DC

6. CURRENT RATING (AMPERES)

0.5A ~ 63A

7. MOUNTING INSERTS & BODY COLOR

None

** Snap into the 1U box*

** Color is Black*

8. TERMINAL

None

** Input (Line Side): Suitable for 2mm thickness busbar*

** Output (Load Side): Spring Clamp Structure*

9. ACTUATOR

None

** Push-Pull Actuator*

10. ACTUATOR COLOR & LEGEND

Actuator Color	I - O	ON-OFF	Dual	Legend Color
White	**A**	**B**	**1**	Black
Black	**None**	**D**	**2**	White
Red	**F**	**G**	**3**	White
Green	**H**	**J**	**4**	White
Blue	**K**	**L**	**5**	White
Yellow	**M**	**N**	**6**	Black
Gray	**P**	**Q**	**7**	Black
Orange	**R**	**S**	**8**	Black

Amps Mark / Legend

None: With Amps Mark

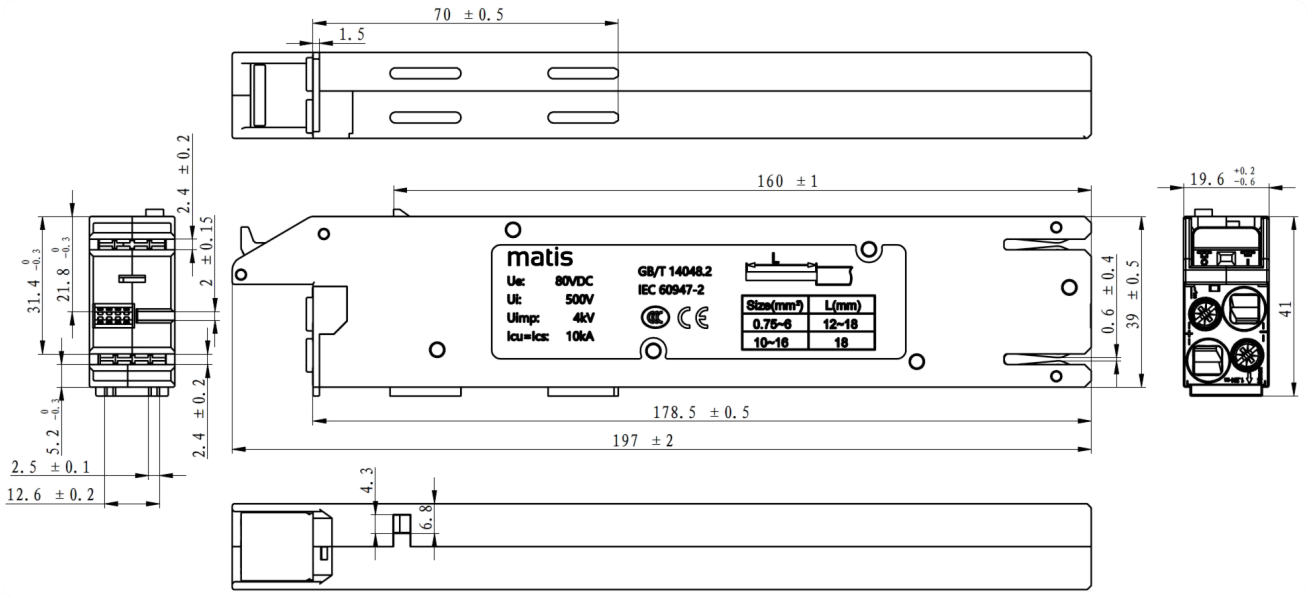
11. LEGEND DICRETION

None

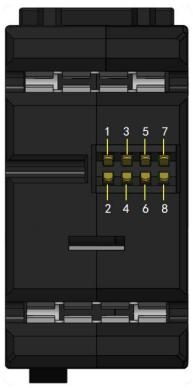
12. AGENCY APPROVAL

T: CCC Certified GB/T 14048.2 & CE Mark IEC EN 60947-2

Dimensional Specs



Control Signal Connector



Positive

Control Signal Connector

Negative

Item	Control Unit
1	DC48V+ Power Source Input
2	DC48V- Power Source Input
3	(Reserve)
4	(Reserve)
5	Group Address Pin
6	Intra-Group Address Pin
7	RS485+
8	RS485-

LED Indication Instruction

Item	LED Status	Circuit Breaker Status
1	Red - Steady on	Power On
2	Green - Steady on	Power Off
3	Red - Slow flash	The alarm or fault protection is triggered.
4	Red - Quick flash	One-click function status
5	Green - Slow flash	Guide mode: just been powered on or entered for other reasons
6	Green - Quick flash	Software upgrade

Function Description

1. Measure

Voltage: Measuring range is 0~80VDC, Accuracy is 0.5 level

Current: Measuring range is 0~63A, Accuracy is 1% level

Power: Measuring range is 0~10KW, Accuracy is 1.5% level

Electric Energy: Measuring range is 0~700000KWH, Accuracy is 2% level;

Contact Temperature: Measuring range is -40℃ ~ +200℃, Error 2℃;

Internal Temperature: Measuring range is -40℃ ~ +200℃, Error 2℃;

Switching: Status and Switching times

2. Protection

Over and Under Voltage: Disconnect when the main circuit voltage is lower than 40V for 10 seconds. When the voltage returns to 42V for 10S, the circuit breaker automatically recovers. When the voltage of the main circuit is higher than 75V for 10S, the circuit breaker will be disconnected. When the voltage is lower than 68V for 10seconds, the circuit breaker will automatically recover.

Overload: Must hold more than 2h at 105% rated current; Must trip less than 2h at 130% rated current. When the load current is greater than the set current, the alarm information needs to be uploaded.

Curve: The default is medium delay (D4).

Current Limiting: If the main circuit current of the circuit breaker is greater than the overcurrent threshold and the duration reaches the set overcurrent disconnect delay time, the circuit breaker is disconnected.
If the disconnection time reaches the interval for overcurrent disconnection and recovery, and the recovery times are smaller than the set times, the system automatically tries to recover

3. Address Recognition

By detecting the voltage of signal pin 5 and 6, the host computer automatically recognizes its own address, and communicates with the switch through this address. The value ranges from 1 to 127.

4. Authentication

Only after authorization, the product can automatically close, and the authorization status will return to zero after power failure;

5. Anti-Misoperation

Can not be closed manually or automatically if not inserted in place; Cannot be inserted in closed state

6. Alarm

Trip: When the circuit breaker current limit is disconnected, a trip alarm will be generated and the trip alarm will be uploaded.

Contact Overtemperature Alarm: If the circuit breaker terminal temperature exceeds 120 ° C, an overtemperature alarm is generated and uploaded.

Internal Overtemperature Alarm: When the internal temperature of the circuit breaker exceeds 120 ° C, the internal overtemperature alarm of the circuit breaker is generated and uploaded.

Low-Voltage Power-Off: When the undervoltage is disconnected, the low-voltage power-off alarm is generated and uploaded. The low-voltage power-off alarm is cleared after the overvoltage recovers.

Circuit Breaker Off: When the remote control circuit breaker on the upper computer is powered off successfully, an alarm is generated for circuit breaker off, and the alarm is uploaded. Manually power on the PC or remotely power on the PC to clear the alarm.

Failure of Closing and Opening: the upper computer controls the closing or opening of the circuit breaker. If the circuit breaker fails to execute, the alarm information will be uploaded.

Controller Fault: If the hardware self-check fails, the alarm information is uploaded.

7. Control

The circuit breaker can be opened or closed by controlling the upper computer

8. Count Fault Opening

Count the number of switching times caused by overload and short circuit, and save power failure

9. Power-Off Policy

Can set the parameters based on the voltage, time, and power energy.

10. Alarm Setting

Set alarm according to current, voltage, temperature, switch and other information

11. Parameter Setting

Parameters such as power-off voltage and recovery voltage can be set.

Signal and communication

※ RS485, baud rate 9600, character format adopts no check bit, 8 data bit, 1 stop bit asynchronous serial communication format, data response time < 200ms (Data response time refers to the time between the host computer sending the last byte of the query packet and receiving the first valid byte of the switch module response).

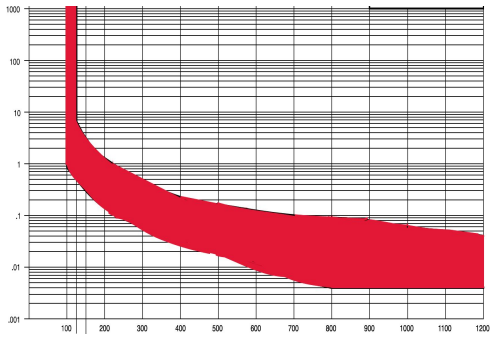
※ Using RS485/Modbus protocol Remote Terminal Unit (RTU) mode, each byte is 2 hexadecimal numbers, the valid data range is 0~9, A~F.

※ Refer to MS1U-63-MODBUS Protocol for communication protocols.

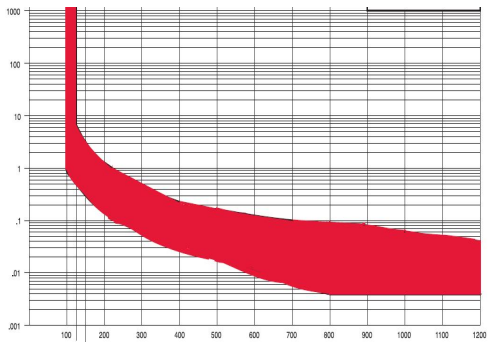
Time Delay

MS1U-63 SERIES TIME DISPLAY VALUES										
	PERCENT OF RATED CURRENT									
	Delay	100%	130%	150%	200%	400%	600%	800%	1000%	1200%
TRIP TIME (s)	D3	No Trip	.500-6.50	.300-3.00	.130-1.20	.031-.220	.011-.120	.004-.090	.004-.060	.004-.040
	D4	No Trip	2.00-60.0	1.20-40.0	.600-20.0	.150-3.00	.030-1.30	.004-.600	.004-.100	.004-.100
	D5	No Trip	45.0-345	20.0-150	9.00-60.0	1.40-11.4	.150-5.80	.009-3.70	.005-1.70	.005-.500
	A3	No Trip	.700-12.0	.350-4.00	.100 Max	.027-.220	.008-.130	.004-.090	.004-.045	.004-.040
	A4	No Trip	10.0-120	6.00-60.0	.100 - 2.00	.200-3.00	.020-2.00	.013-.850	.013-.050	.005-.040
	A5	No Trip	50.0-700	32.0-350	1.00 - 15.0	1.50-15.0	.500-7.00	.020-3.00	.006-2.00	.005-.100

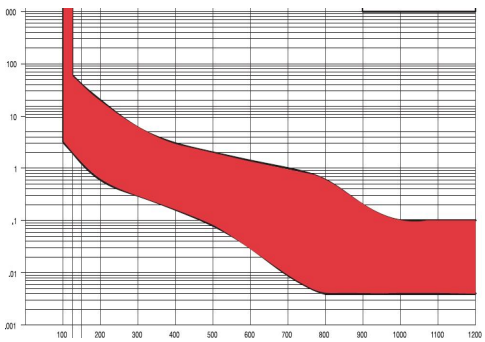
DC SHORT DELAY (D3)



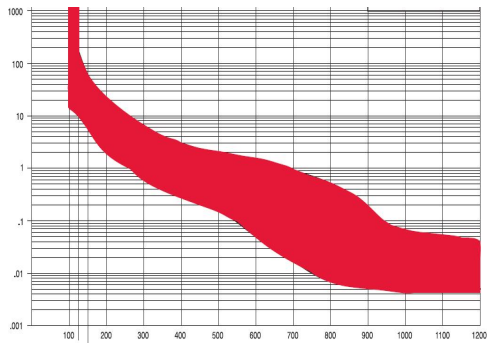
AC 50/60Hz SHORT DELAY (A3)



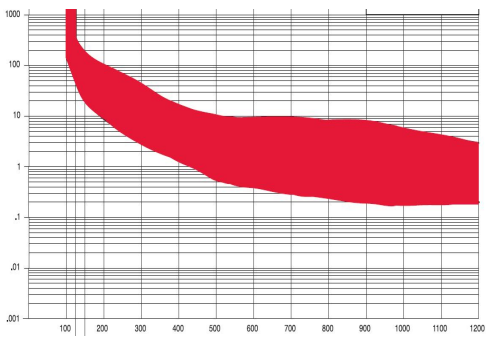
DC MEDIUM DELAY (D4)



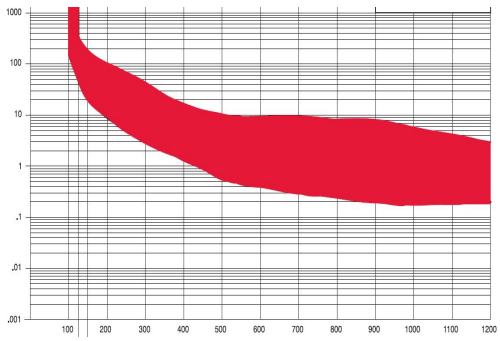
AC 50/60Hz MEDIUM DELAY (A4)



DC LONG DELAY (D5)



AC 50/60Hz LONG DELAY (A5)



Shanghai Matis Electric Co.Ltd

Room 318-320, No.83,West Huanhu Road,

Pudong, Shanghai, China 201306

T: +86 21 6050 3668/+86 18621879631

E: info@matismart.com