AEG

M-PACT Air Circuit Breaker
User Manual

1 Safety Notes

Attention! Important tips

Warnings

The equipment mentioned in this manual will be connected to a high-voltage power supply during operation. When circuit breaker breaks the high current, especially short-circuit current, may produce high-temperature ionized dangerous gases.

Only qualified personnel are allowed to install, operate, debug, and maintain this equipment under relevant safety requirements.

The circuit breaker must be equipped and installed in a cabinet or panel that is suitable and fully considered for safety clearance (see Section 3.5.1 for details).

Danger

Hazard classification

The following important information in this document is intended as a warning or requirement for potential hazards. Readers should pay attention to the information in the operating instructions program.

Please read all instructions carefully and familiarize yourself with the individual units before installing,operating, commissioning, and maintaining this equipment.

Failure to follow the instructions may result in damage to the product

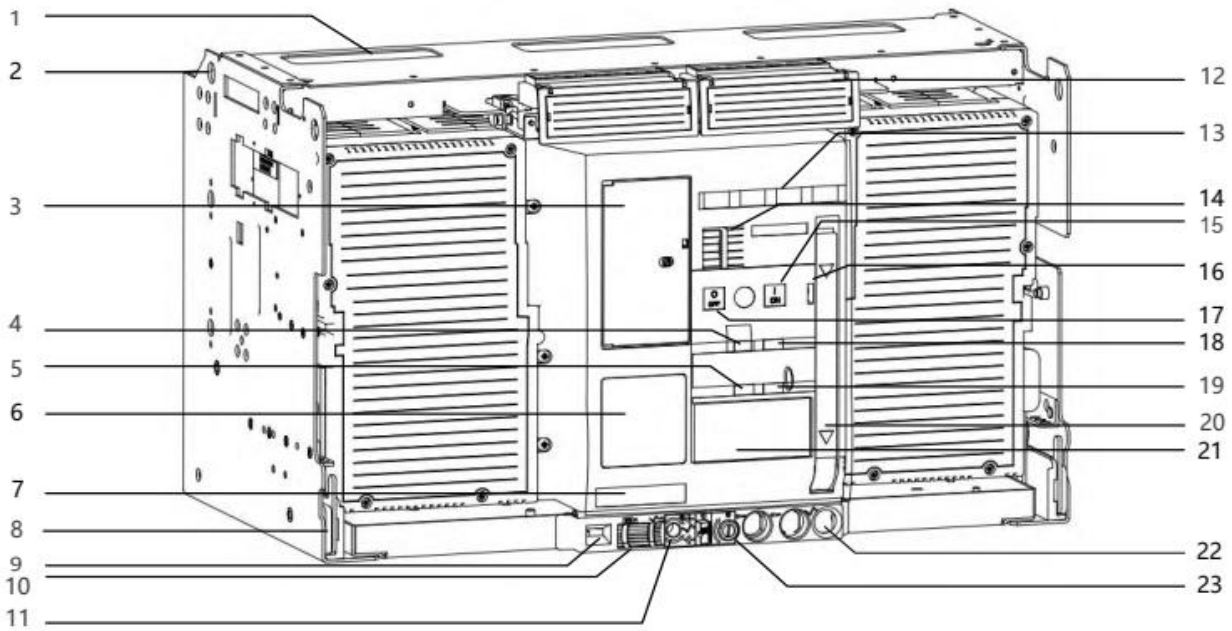
This manual is used to help customers use this device, keep it for future use.

Failure to meet the above requirements may result in property damage or injury.

Please read and save this manual for future reference.

2 Circuit breaker Overview

M-PACT



1. Arc Extinguishing Chamber
2. Breaker hoisting hole
3. Mpro Intelligent control unit
4. Prepare closing indicate
5. Operate counter
6. Opening position key lock
7. Order code
8. Breaker withdraw handle
9. Breaker position indication
10. Breaker locking device
11. Swing handle operating hole
12. Secondary terminal
13. Accessory indicating window
14 .Breaker padlock device
15. Manual closing button
16. Closing spring energy storage release
17. Manual opening button
18. Switch status indicator (ON/OFF)
19. Indicator of spring energy storage status
20. Manual energy storage handle
21. Circuit breaker nameplate tag
22. Shake handle storage hole
23. Set Shake handle into the unlocking device

2.1 Brief Description

Option Checklist

Each circuit breaker comes with an option checklist that lists the characteristics and accessories included in the circuit breaker, drawer, and control unit (if ordered)

Product serial number

When communicating with us about the equipment on site, please state the serial number. Each circuit breaker has a unique serial number, which can be obtained from the circuit breaker at two locations:

- The top of the retractable lift frame
- Left side of front panel (viewed from front)

Providing product serial numbers helps with after-sales service.

Basic Product information
M-PACT air circuit breaker design complies with UL and IEC standards. This manual is dedicated to designs that meet with GB/T 14048 and lEC/EN 60947 standards. lf you need other standards please contact us.

This device is designed for distribution gird with avoltage not exceeding AC 1150V. lt can be used in conjunction with AEG molded case circuit breakers to achieve selective protection.

This device is a 3 pole or 4 pole product with 3 frame levels and a rated current range of 5000-6400A .

MPACT circuit breakers can be equipped with one of three control units according to different requirements such as protection and measurement.

MPACT can also choose non-automatic (load switch) type products (No control unit). Both circuit breakers and load switches can be selected as 3 pole or 4 pole, fixed or drawer products.

2.2 Product Features

Rated short-time withstand current (Icw)
Max 100kA for 1 second

Rated Short circuit Breaking capacity(Icu)
Ue=690V, 100kA
Ue=415V, 150kA
Ue=1150V, 65kA

Rated current (In)
The equipment in the working environment temperature of up to 50°c, with 100% of the rated current without reducing capacity.

Power side connection
M-PACT devices can be connected to the power supply from the top or bottom wiring.

Energy storage Device
M-PACT circuit breakers can use either manual or electric energy storage operating device. Manual energy storage can be operated with a handle, and if electric energy storage is required. a spring-loaded energy storage motor with indicating contacts can be installed. The closing time of the device is less than 5 and a half cycles.
The closing and breaking action can be started remotely or started by the button on the front panel. The "breaking - closing-breaking" cycle can be completed without energy storage. The circuit breaker operating device is a free tripping device and has designed of anti-false tripping system.

Accessories and control unit
Accessories to all circuit breakers fall into the following two types:
Factory installed accessories or control units.
Accessories or control units that can be installed on site, with the necessary connectors and fixed hardware.

Coil and Release
M-PACT breaker equipment can be equipped with up to 3 coils, The combination method can be found in Chapter 7.14 of the accessories:
- Closing coils(CC)can be remotely closing;
- Shunt trip device (ST)can be remotely opening;
- Under-voltage release device(UVR) can achieve under-voltage protection; if you need delay,you can use the external under-voltage time delay module (TDM), the delay time is 0-3s adjustable;

Alarm bell alarming contact
A transfer contact is installed in the circuit breaker to indicate the trip fault (control unit) of the circuit breaker.
The circuit breaker can be reset manually or automatically on the interface on the front of the control unit, and the alarm bell alarming contact only permanently changes position when the control unit is in manual mode. When an alarm occurs, the user can check the tripping reason of the circuit breaker through the control unit (tripping reason and tripping record)

The energy storage spring. Prepare closing indicating contact
Circuit breakers equipped with electrical energy storage can be equipped with one or two indicating contacts. The first spring energy storage indicating contact indicates the state of the energy storage spring and is standard for energy storage motors. It is equipped with standard motor operating devices.
The second is a prepare closing indicating contact, optionally used to replace the spring energy storage contact.

The contacts only operate under the following conditions:
- Circuit breaker is off
-The closing spring is stored

Circuit breaker/main contact status
The front panel displays the OPEN/CLOSE (open/close) ON/OFF (connect/disconnect) indication.

Connection mode
The connection device can be used to change the standard connection mode (horizontal rear terminal) of a fixed circuit breaker to a front connection or a vertical rear connection or a front connection. Connection terminals are available as spare parts.

Auxiliary contacts
Frame 3:
Power type, 4NO+4NC (standard configuration)
Power type, 8NO+8NC
Power type, 4NO+4NC+ Signal type, 4NO+4NC

Interlock
Standard interlock features

Drawer type circuit breaker
The withdraw and equipment moving parts are equipped with interlocking devices to prevent the circuit breaker closing. Except in the TEST and —●— (connect) positions, the device will also break the main contact before the moving part leaves or approaches the —●— (connect) position.

When the main contact of the circuit breaker is closed, the second interlocking device can prevent the device from inserting the rocking handle into the frame hole.

Circuit breaker status indication

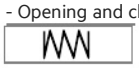
Standard instructions include the following:

- Circuit breaker main contact status indication

O OFF (Breaking)

I ON (Closing)

- Opening and closing spring energy storage state

 (Stored)

 (Not stored)

- Drawer type circuit breaker drawer position indication

 (Connect)

TEST (test)

 (Disconnect)

The circuit breaker also includes an auxiliary contact indicating the status of the main contact

Rocker operating device

A rocker device that can operate the circuit breaker directly from the cabinet door. It can safely break/pull out the circuit breaker for operating, testing, etc., without open the cabinet door, and the operator will not contact with live parts during the processing.

Padlock device

M-PACT air circuit breaker is equipped with several padlock devices, fixed and drawer circuit breakers can be hung 3-8mm padlock, can lock the circuit breaker in the OFF (opening) position, prevent non-relevant personnel from misclosing operation.

In the frame 3, the drawer type circuit breaker has 3 padlocks, which can use up to three 3-8mm padlocks

Panel push button padlock device

To prevent unauthorized personnel from operating the ON (closing) and OFF (opening) buttons on the circuit breaker panel, a cover plate can be installed on the circuit breaker panel to lock the opening and closing button, and a 3-8mm padlock can be used

Key locking device

In frame 3, there are multiple kits available for key locks, and both the breaker and drawer can be equipped with these devices to lock the device in the OFF (opening) position

The drawer position indicates the contacts

Optional drawer device that can indicate the status of the circuit breaker either locally or remotely CONNECTED， TEST， DISCONNECTED. (Assemblies containing 3 or 6 unipolar change-over contacts can be used)

Lift the handcart and adapter

Optional device for moving circuit breakers. Standard type units add-on adapters are available for moving frame 3 circuit breakers

IP54 cover

Each M-PACT circuit breaker is fitted with a flanged frame to provide IP40 panel protection for the circuit breaker, with an additional cover to provide IP54 protection

Operating counter

A mechanical counter mounted on the circuit breaker body to record the number of complete circuit breaker closing operations

Mechanical interlocking device

A set for securing or pulling out M-PACT circuit breakers that can interlock 2(Section 10.11)

Or 3 (Section 10.12) drawer or fixed circuit breakers.

Each unit consists of 2 parts: a factory installed interlock and two or more single usable cable.

- Breaker not locked/interlocked in opening position

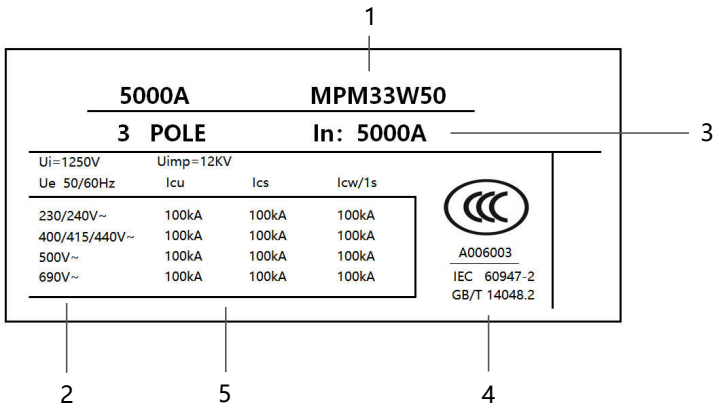
- No unexecuted closing commands

-No unexecuted opening commands

2.3 Storage

Store circuit breaker and drawer in original package with a clean, dry place.

2.4 Label Data Overview



1. Product series
2. insulation voltage
3. rated voltage
4. Short-circuit breaking capability
5. circuit breaker type
6. Rated current and applicable environment
7. Product certification and implementation standard
8. Date and place of production

2.5 Installation and maintenance tools

Name and purpose of the tool:

- Row tongs

Used to remove row contacts for inspection, and install row contacts

- Screwdriver (8mm, straight type)

For turning the rack mechanism hole baffle drive

- Allen wrench (5mm)

Used to remove arc extinguisher hood for inspection and maintenance. It is used to remove or adjust the fixed and mobile arc extinguishing contacts

- Allen wrench (4mm)

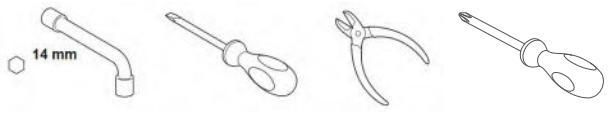
For removing motor operator mounting screws

- Metric clearance gauge

Used to check arc extinguishing contact clearance

- Screwdriver kit

For removing mechanical and electronic assembly mounting screws for connecting wiring to auxiliary contact terminal block, mounting screws before panel removal.



2.6 Product Specifications

2.6.1 Environmental conditions

peculiarity	content	Parameters/execution criteria
temperature	Operating temperature	-20°C to +70°C
	Storage temperature	-40 ° C to +70° C
other	20% ~ 95% rh	
	cold	GB/T 2423.1 Environmental test for electrical and electronic products-Part 2: Low temperature test
	Dry heat	GB/T 2423.2 Environmental test for electrical and electronic products-Part 2: High temperature test
	Damp and hot	GB/T 2423.3 Environmental tests for electrical and electronic products-Part 2: Constant damp heat test
	Salt spray	GB/T 2423.17 Environmental tests for electrical and electronic products-Part 2: salt spray test
	Temperature change	GB/T 2423.22 Electrical and electronic products environmental test Part 2: high and low temperature test
	Hygrothermal cycle	GB/T 2423.4 Environmental test for electrical and electronic products-Part 2: Alternating humidity and heat test
Vibration	Random vibration and sinusoidal vibration	The maximum size is 1G, and the X, Y, and Z directions are 50-500Hz
Electromagnetic compatibility		According to Appendix F of GB/T 14048.2
Mold resistance		According to ASTM G2
noise		< 30 db
Durability (number of movements)	Closing coil, shunt release	20000 times
	Energy storage motor, undervoltage release device	12,500 times

M-PACT Technical data

Breaking capacity code			M	L
Rated current	In	A	5000-6400	5000-6400
Number of poles			3P, 4P	3P, 4P
Rated insulation voltage	Ui	V	1250	1250
Rated impulse withstand voltage	Uimp	kV	12	12
Rated voltage	Ue	V	AC415/690	AC415/690
Usage category			B	B
Isolation			Yes	Yes
Rating of 4th pole			100%	100%
Rated short-circuit				
Rated ultimate short-circuit(Icu)	AC415V	kA	100	150
	AC690V	kA	100	100
Service breaking capacity(Ics)	AC415V	kA	100	150
	AC690V	kA	100	100
Rated short time withstand current(Icw/1s)	AC415V	kA	100	100
	AC690V	kA	100	100
Rated short time withstand current(Icw/3s)	AC415V	kA	85	85
	AC690V	kA	85	85
Rated short-circuit making capacity(Icm)	AC415V	kA	220	330
	AC690V	kA	220	220
Mpro control units				
	Type A		□	□
	Type P		□	□
				□
No protection			□	□
Operation performance				
Mechanical	with maintenance	times	20000	20000
	without maintenance	times	12500	12500
Electrical (at rated current)				
	5000A	times	8000	8000
	6400A	times	6000	6000
Open time		ms	≤30	≤30
Close time		ms	≤60	≤60
Installation				
Fixed				
Dimensions	Hight	mm	442	442
	width 3P	mm	736	736
	width 4P	mm	966	966
	Depth	mm	355	355
Terminal adaptors	Rear horizontal		■	■
	Rear vertical (1)		□	□
Weight	3P	kg	141	141
	4P	kg	153	153
Withdrawable				
Dimensions	Hight	mm	443	443
	width 3P	mm	743	743
	width 4P	mm	943	943
	Depth	mm	522	522
Terminal adaptors	Rear horizontal(2)		■	■
Weight	3P	kg	291	291
	4P	kg	313	313

Note: ■For standard configuration, □ Optional configuration;

(1) Vertical rear connection requires additional connection options. For 6400A, it is recommended to use vertical connection.

(2) The rear T-shaped terminal can be flipped, which is suitable for both horizontal and vertical connection schemes. For 6400A, it is recommended to use vertical connection

2.6.3 Capacity Reduction Feature

Power loss and capacity reduction at ambient temperatures greater than 50 ° C

Standard

The standards for low-voltage switchgear are defined by EN60439-1, EN 50298 and IEC 60890. There is a definition of
the method of calculating the temperature rise in the low-voltage switchgear.
Its calculation is mainly based on the power consumption and installation mode of the equipment, it is necessary to calculate the total power consumption of the equipment, cables and busbars, then thus calculate the temperature rise in the switch cabinet. For ordinary applications, the temperature rise in the switchgear is required to be no more than 50K.

Use

The manufacturer of the low-voltage switch cabinet can calculate the temperature rise in the cabinet according to the power consumption of the equipment in the cabinet, and the temperature rise depends on the type of the cabinet,ventilation conditions, and installation position and form of the cabinet.

M-PACT Circuit breaker

M-PACT circuit breakers are designed to ensure the minimum power loss per pole and to provide the highest possible available rated current value in the switch cabinet. The following table lists the loss of power per pole and rated current of the circuit breaker at different temperatures. This table is based on the fact that the circuit breaker's connecting bus is connected vertically at the rear. See Section 3.5 for the cross-sectional area and contact area of the recommended bus connection.

Circuit breaker frame type	Frame	In (A)	Power consumption per pole (W)	Ambient temperature				
				≤50℃	55℃	60℃	65℃	70℃
				The maximum allowable current of the vertical connection behind the fixed circuit breaker				
M-PACT	3	5000	163	5000	5000	5000	4900	4800
M-PACT	3	6400	266	6400	6300	6200	6100	6000
				The maximum allowable current of the vertical connection behind the pull-out circuit breaker				
M-PACT	3	5000	260	5000	5000	5000	4900	4800
M-PACT	3	6400	426	6400	6300	6200	6100	6000

2.6.4 Circuit Breaker Connection Options

- Fixed installation of M-PACT circuit breaker

Frame level	Back entrance horizontal		The back entrance is vertical		Front entrance	
	Bus connection		Bus connection		Bus connection	
	Remark	Rated value	Remark	Rated value	Remark	Rated value
Frame 3	Standard	3200-500A	Optional	5000A		
			Standard	6400A		

- Drawer installation of M-PACT circuit breakers

Frame level	Unified rear entrance bus connection (horizontal)		Unified rear entrance bus connection (vertical)		Front entrance bus connection	
	Remark	Rated value	Remark	Rated value	Remark	Rated value
Frame 3	A draw rack is available	3200-5000A	A draw rack is available	3200-6400A	/	/

(1) Vertical rear wiring requires additional connection options. The vertical wiring is recommended for the frame 3@6400A

(2) The rear T terminal can be flipped, suitable for rear horizontal and vertical wiring scenarios. The vertical wiring is recommended for the frame 3@6400A

2.6.5 Standard

All industry labels referenced in this form are newest at the time of sale.

Standard number	Name
GB/T 14048.1	General rules for low voltage switchgear and control equipment
GB/T 14048.2	Low-voltage switchgear and control equipment - Part 2: Circuit breakers
GB/T 14048.5	Low-voltage switchgear and control equipment - Part 5: Control circuit appliances and switching elements
GB/T 14048.3	Low-voltage switchgear and control equipment - Part 3: Switches, isolators, isolators and fuse combinations
GB/T 2423.1	Environmental testing of electrical and electronic products-Part 2: Low temperature test
GB/T 2423.2	Environmental tests for electrical and electronic products-Part 2: High temperature tests
GB/T 2423.3	Environmental tests for electrical and electronic products-Part 2: Constant damp heat test
GB/T 2423.10	Environmental tests for electrical and electronic products-Part 2: Vibration
GB/T 2423.17	Environmental testing for electrical and electronic products-Part 2: salt spray test
GB/T 2423.22	Environmental test for electrical and electronic products Part 2: High and low temperature test
GB/T 2423.5	Environmental testing of electrical and electronic products-Part 2: Impact testing
GB/T 2423.6	Environmental testing of electrical and electronic products-Part 2: Crash test
GB/T 2423.4	Environmental testing for electrical and electronic products-Part 2: Alternating humidity and heat test
GB/T 2423.7	Environmental tests for electrical and electronic products-Part 2: Falling and overturning

2.7 Product Selection

2.7.1 Selection Guide

MP
Product
M-PACT ACB

M		
Break capacity		
M	100kA	Frame3
L	150kA	Frame3

3	
Poles	
3	3Poles
4	4Poles

3	
Frame	
3	Frame3

W	
Installation	
W	Withdrawable
F	Fixed

50	
Rated current	
50	5000A
64	6400A

MproA13
Control units
MproA13
MproA16
MproP13H
MproP16H
No protection[1)]

NOTE:

1) When not selecting a control unit，provide No protection breaker(with isolation function)
2) Break capacity, Icu=100%Ics

Mpro control unit

Unit type	Code	functions
A	MproA13	LSI protection, current measurement, Optional communication
	MproA16	LSIG protection, current measurement, Optional communication
P	MproP13H	LSI protection, current, voltage, power, frequency measurement, and optional communication
	MproP16H	LSIG protection, current, voltage, power, frequency measurement, and optional communication

Selection examples

Require: Rated current 5000A，3 Poles，Withdrawable，short current brake capacity=100kA，LSI protection，current measurement

Type: MPM33W50A13

2.7.2 Main Parameter Specification

Frame	Breaking code	Rated current	Rated voltage	Icu	Ics	Icw
Frame 3	M	5000-6400A	AC415V	100kA	100kA	100kA
			AC690V	100kA	100kA	100kA
	L	5000-6400A	AC415V	150kA	150kA	100kA
			AC690V	100kA	100kA	100kA
			AC1150V	65kA	65kA	65kA

Standard configuration

Withdrawable

- Breaker and Cassette
- Control unit
- Energy storage motor, closing coil, shunt coil
- Auxiliary contact, 4NO+4NC
- Control unit power supply, 220V AC / 24V DC
- Standard door frame
- Rear T-shaped or L-shaped terminal blocks

Fixed

- Breaker
- Protection unit
- Energy storage motor, closing coil, shunt coil
- auxiliary contact, 4NO+4NC
- Protection unit power supply, 220V AC / 24V DC
- Standard door frame

Withdrawable breaker

Breaking code	Frame	Rated current	3 poles	4 poles	+	Control unit
M AC 415/690V Icu=Ics=100kA Icw=100kA	3	5000	MPM33W50	MPM43W50		MproA13
		6400	MPM33W64	MPM43W64		MproA16
						MproP13H
						MproP16H
L AC 415V Icu=Ics=150kA Icw=100kA	3	5000	MPL33W50	MPL43W50		No protection
		6400	MPL33W64	MPL43W64		

Fixed breaker

Breaking code	Frame	Rated current	3 poles	4 poles	+	Control unit
M AC 415/690V Icu=Ics=100kA Icw=100kA	3	5000	MPM33F50	MPM43F50		MproA13
		6400	MPM33F50	MPM43F50		MproA16
						MproP13H
						MproP16H
L AC 415V Icu=Ics=150kA Icw=100kA	3	5000	MPL33F50	MPL43F50		No protection
		6400	MPL33F64	MPL43F64		

3 Circuit breaker installation

Be careful

- Ensure that the circuit breaker and its accessories do not exceed the specified rating
- The circuit breaker must not collide with hard surfaces during handling
- Do not drag or slide the circuit breaker on hard or rough surface

Install the equipment in a dry, dust-free, and non corrosive environment, and the environmental conditions must comply with the requirements of IEC60947 and GB/T 14048 and/or the conditions specified in this manual.

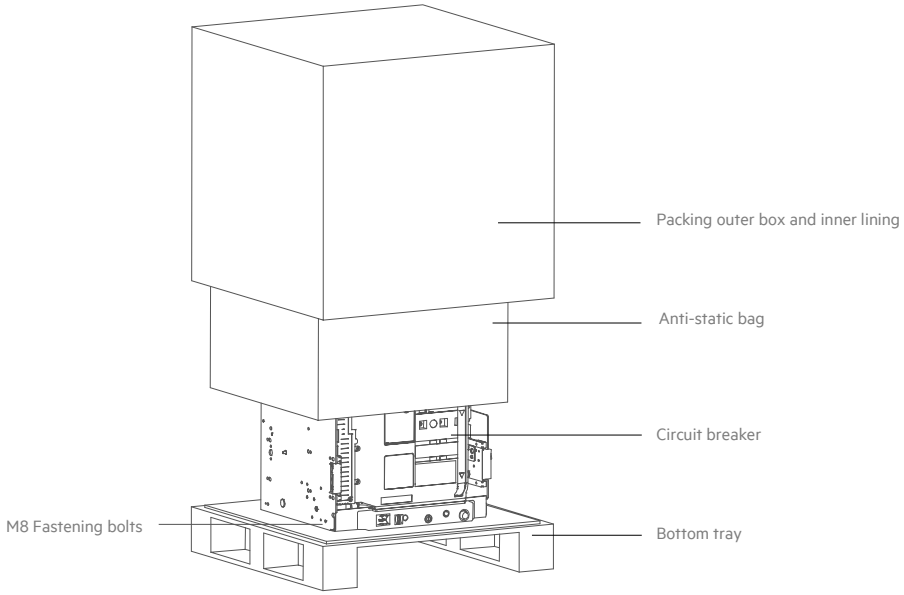
If the installation environment of the device does not meet the requirements of this manual, please contact the nearest office.

Failure to follow the instructions may result in damage to the product

3.1 Unpack the circuit breake

Before opening, it is highly recommended to inspect the shipping container and note any damage that occurred during transportation or handling. If damaged equipment is found, contact the hauler to provide the order number, shipping data, and all relevant information prior to processing.

- Unbind the strapping tape and carefully remove the top cover of the packing case/pallet.
- Remove other packing materials and related documents.
- Locate and remove the installation and operation manual. Save the manual for later use and reference. Check the manual is in the desired language. If not, contact the nearest office
- check the packing box for components such as attachment, connecting pads, and other hardware that are not installed in some cases.
- Devices are usually bolted to the bottom of the packing case/tray. Loosen and remove these bolts to remove the circuit breaker from the packing case/tray.



3.2 Lift and transport

Warnings

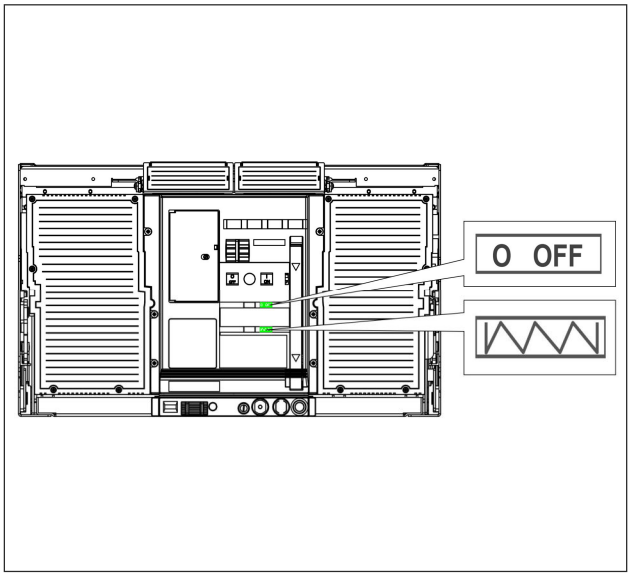
Make sure the circuit breaker is in the trip position, the operating indicator is shown as OFF(off), and the mechanical spring energy storage is fully released.

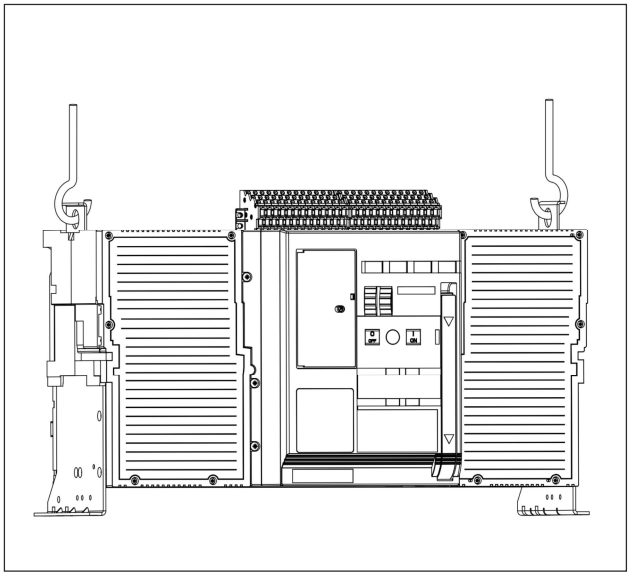
When lifting, do not touch the breaker isolation contact.

When lifting, please wear safety equipment and ensure that the lifting equipment meets the lifting capacity of the corresponding weight of the circuit breaker. For details about the weight parameters of the circuit breaker, see 2.6.2 Technical Data.

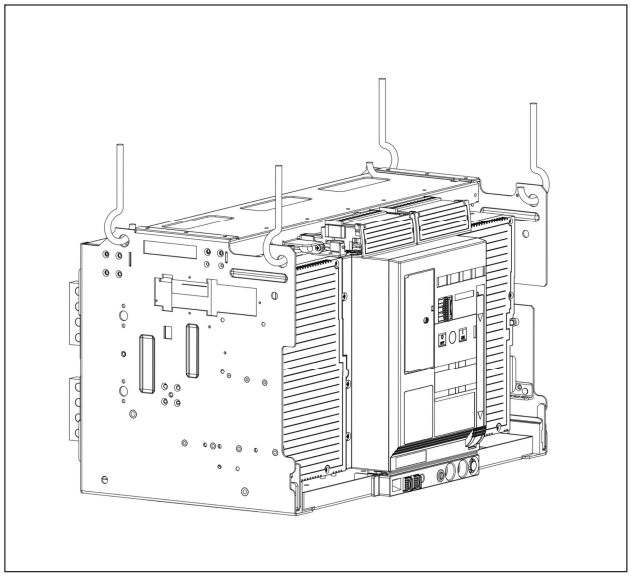
Use the lifting cart and adapter (optional device) for moving the circuit breaker.
The standard type device is for moving frame 1 and 2 circuit breakers, and the adapter is for moving frame 3 circuit breakers.

Frame 1/2/3 stationary and withdraw-type partial circuit breakers with retractable lifting lugs on each side , can be used to carry the circuit breaker.





Fixed circuit breaker hoisting indication

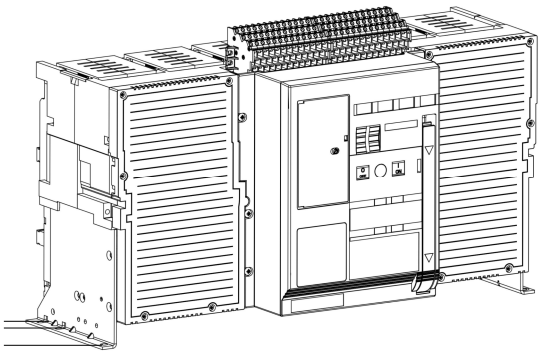


Draw out type circuit breaker hoisting signal

3.3 Fixed circuit breaker installation

-Ensure there is sufficient clearance above the circuit breaker to remove the arc extinguishing cover and inspect the arc extinguishing contacts.

-Use 6 M8 bolts with a torque of 25N · m to secure the circuit breaker to a suitable bracket structure.



Mounting hole

3.4 Take out and install the circuit breaker

3.4.2 Take out and install the circuit breaker, M-PACT

- Take out the circuit breaker from the draw rack

- Preparation

- Neutral pole current transformer

When using a ground lead current transformer (with a backup ground fault device)the ground lead current transformer will disconnect the circuit when the breaker is taken out from the drawer. In some cases, the current may remain in the ground device, creating a high induced voltage on the secondary terminal of the current transformer.

In these cases, make sure that a circuit breaker position switch is installed on the drawer so that the secondary terminal of the current transformer shorts out when the circuit breaker is taken out.

- Motor energy storage

If a motorized spring energy storage unit is installed, adjust the circuit breaker to the off position, then close the circuit breaker so that it trips to release the closed spring's energy storage.

Otherwise the motor will automatically re-store energy for the spring.

-Remove all padlocks from the rocker panel

- Make sure the cabinet/panel doors are closed

To operate:

1 Take out the shake handle from the storage location

2 Take out the torsion bar from inside the handle and extend the handle

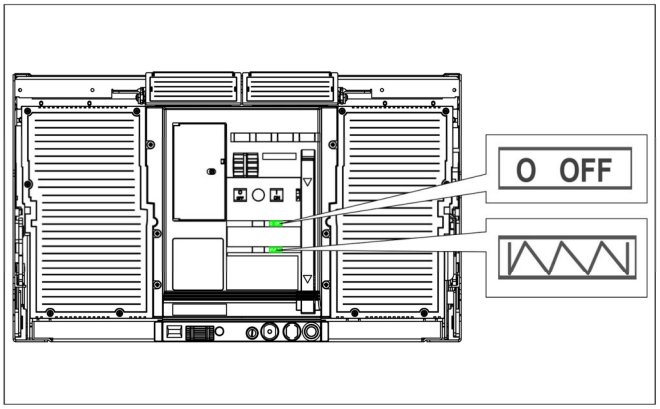
3. Insert the flat-head screwdriver and turn it 90° to open the lever hole baffle , see the picture below Move to TEST (test) and finally move to the DISCONNECTED(disconnect) position.

Note:When the rocker handle is located in the shaft of the rocker , the circuit breaker cannot operate at any position between CONNECTED (connected) and DISCONNECTED(disconnected) to remove the handle, the swing lever baffle will automatically reset.

Warnings

Make sure the circuit breaker is in the trip position, the operating indicator is shown as OFF (off), and the mechanical spring energy storage has been fully released.

Do not touch the breaker isolation contact when lifting.

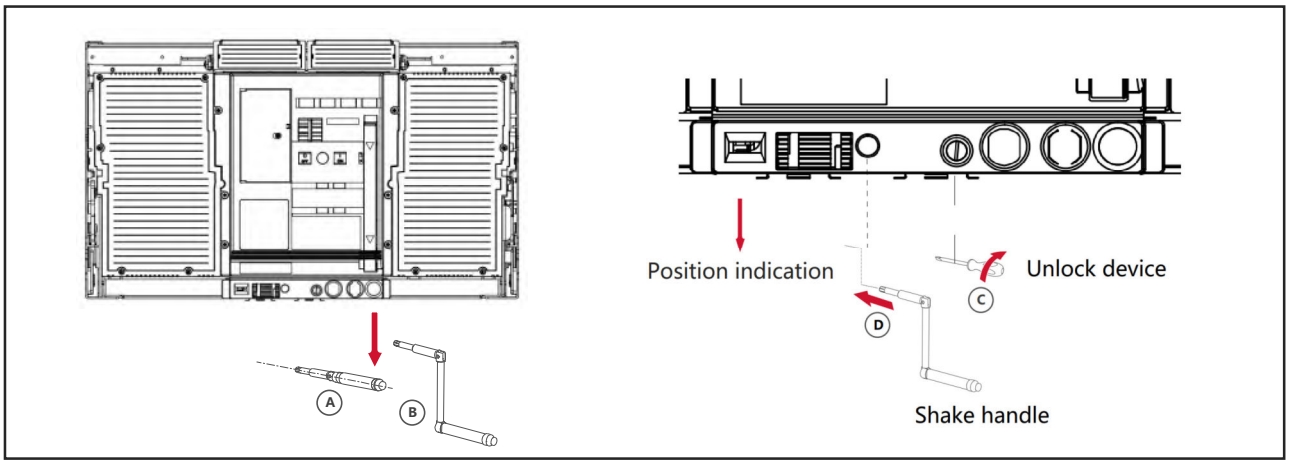


5. Continue turning the shake handle counterclockwise from the DISCONNECTED(disconnecting) position until you reach the front baffle.

Note: Before taking out from the DISCONNECTED (disconnected) position,make sure the energy storage of the closed spring is fully released (the snap energy storage indicator reads "not stored").

6. The circuit breaker is in the maintenance position at this time.

The cabinet/panel door can be opened in this position and the lifting tool can be connected to the lifting hook, which can be pulled from the top of the left and right sides of the circuit breaker.



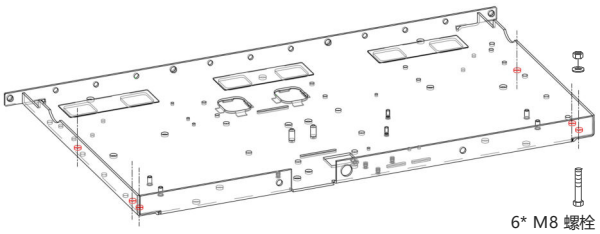
Position of the circuit breaker in the drawer	Main disconnect device	Auxiliary disconnecting device	Circuit breaker function	position of the circuit breaker door
CONNECTED	engage	engage	The circuit breaker can be operated mechanically or electrically, ready for work	Off
TEST	separate	engage	The circuit breaker can be operated mechanically or electrically Circuit breakers and control circuit operation can be tested and verified	Off
DISCONNECTED	separate	separate	The circuit breaker can only be operated mechanically. The circuit breaker cannot be taken out from the circuit breaker compartment	Off
WITHDRAWN	separate	separate	The circuit breaker can only be operated mechanically. The circuit breaker can be taken out from the circuit breaker compartment	On

- Installation of circuit breaker

Withdrawable circuit breakers are usually delivered in the form of mounting to a drawer.

1. Follow the procedure described in 3.4.2 to take out the circuit breaker from the drawer.

2. Fix the drawer to the switchboard as required. The drawer can be lifted by hand, but if using a lifting cart or other lifting device, use all 4 lifting holes located on the front and back of the drawer.



3. Fix the drawer in place and connect the lead-in and lead-out cables/busbars. Make sure there is minimal deviation/stress at the back of the drawer when connecting the busbar.

4. Install the drawer onto the front and back with 4 M8 bolts and a torque of 25 Nm On the installation point.

5. Check the mounting:

- Make sure the drawer base is flat and the frame is square.
- Make sure the safety flapper can move freely after the mounting bolts are fully tightened.

Carefully:

Prepare:

-Take out the padlock from the draw-out bracket slide rail.

-Take out all other padlocks from the rack.

-Unlock all draw-out key locks.

1. Carefully place the circuit breaker onto the fully extended draw-out bracket slide rail to ensure the roller is correct mesh.

2. Take out the lifting tool connected to the device.

3. Apply pressure to the panel (top areas on both sides), push the circuit breaker into the bracket, and straighten it, Until it cannot be moved.

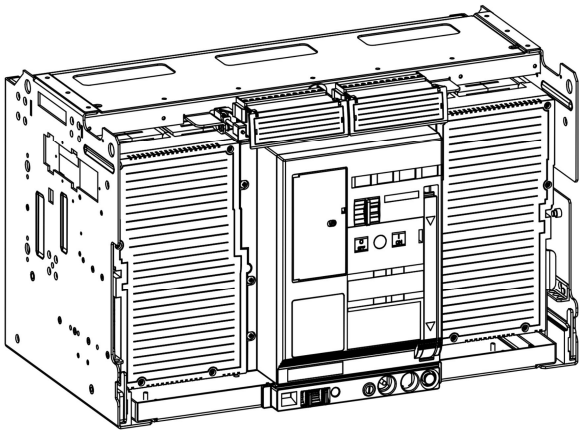
4. Close the mechanism/panel door.

5. Prepare the rack and handle according to the above instructions (steps 1 to 4 in 3.4.2), and insert the handle inside the hole.

6. Rotate the handle clockwise to move the circuit breaker into the drawer. Can be moved from the disconnected position move to the testing position, then move to the connection position, such as the position indicator.

7. Take out the shaking handle and place it in the storage position.

The circuit breaker is now ready to operate.



3.5 Safe distance and main circuit connection

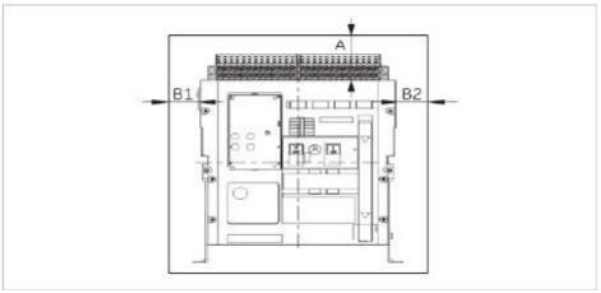
3.5.1 The Clearance

Modern circuit breakers are usually designed to break very high short-circuit fault currents for a very limited period of time. When the circuit breaker breaks this fault, it will egress arc gas and a small number of conducting particles.

M-PACT low-voltage circuit breakers are designed to minimize ejections, but still need to consider the requirements of minimum electrical installation gaps on the front and side of the installation space.

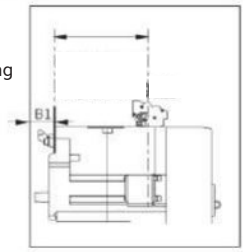
For fixed circuit breakers, it is necessary to move out of the interrupter chamber of the circuit breaker for maintenance. Therefore, the minimum installation space on the side as shown in the picture on the right is required.

Minimum mounting space for the front of the fixed/withdrawable type



Minimum mounting space on fixed side

Minimum 180mm, used for removing the arc extinguishing chamber



Minimum installation electrical clearance for fixed circuit breakers		
	Metal separator	Insulating partition
A(1)	160	160
B1	30	30
B2	30	30

Minimum installation electrical clearance for draw-out circuit breakers		
	Metal separator	Insulating partition
A	0	0
B1	30	30
B2	30	30

(1) This minimum size requirement ensures that the arc extinguishing chamber can be removed from the site

M-PACT of AC1140V and above for wind power application instructions:

1) For wind power generation application and AC1140V and above voltage , the low-voltage switchgear or compact substation where the circuit breaker is located needs to be separated according to the type 4b of " GB7251.12-2013 Low-voltage switchgear and control equipment(Part2 Complete power switch and control equipment)";

2) For wind power generation application and AC1140V and above voltage, an inter phase partition must be installed in the circuit breaker or isolation switch;

3) For wind power generation application and AC1140V and above voltage, the copper bar connected to the circuit breaker in the switch cabinet needs to be equipped with heat shrink sleeve;

4) Frequency below 50Hz application conditions, will reduce the short-circuit breaking capacity of the circuit breaker;

Transport

Frame 1/2/3 fixed circuit breaker and withdrawable moving part are equipped with retractable lug on each side for carrying circuit breaker.

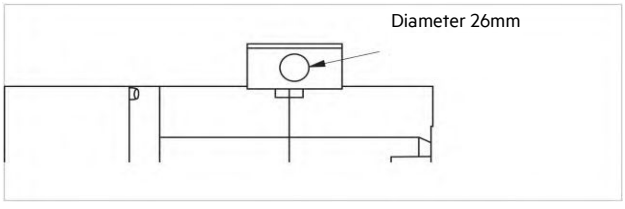
There are four reinforced Φ20 lifting holes on the front and rear sides of the draw-out base for carrying the base.

Recommended cross-sectional area for a main busbar connection

The chart on the right lists the recommended cross-sectional area of a busbar connected to the corresponding circuit breaker. See Section 2.6.3 for the available rated current (temperature drop capacity) for the cross-sectional area of this connection bus.

Frame type 3

Sides of Fixed/withdrawable type



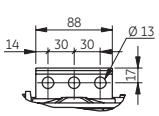
In(A)	MEX Frame type	busbar cross-section
In (A)	**ME09 Frame type**	**busbar cross-section**
5000	Frame 3	5 x 120 x 10 or 6 x 100 x 10
6400	Frame 3	7 x 120 x 10 or 8 x 100 x 10
		1 x 50 x 10 or) x 5 or 0 x 5
1000	MEX1, MEX2	1 x 60 x 10 or 2 x 60 x 5
1250	MEX1, MEX2	2 x 40 x 10 or 2 x 80 x 5
1600	MEX1, MEX2	2 x 50 x 10 or 2 x 100 x 5
2000	MEX1, MEX2	3 x 50 x 10 or 3 x 100 x 5
2500	MEX1, MEX2	4 x 50 x 10 or 4 x 100 x 5
3200	MEX2, MEX3	4 x 100 x 10
4000	MEX2	4 x 100 x 10 Plus 1 x 100 x 5
4000	MEX3	4 x 100 x 10
5000	MEX3	5 x 120 x 10 or 6 x 100 x 10
6400	MEX3	7 x 120 x 10 or 8 x 100 x 10

Note: When the frame 3@6400A are used for horizontal wiring, it is recommended to increase the section of connected copper bar, or strengthen heat dissipation measures, or reduce capacity

3.5.2 The Size of Busbar

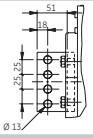
Frame 3

Fixed type
5000-6400A Rear horizontal

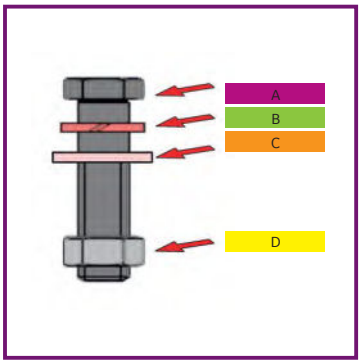


50-60 Nm	
A	3x M12x60/80 - 8.8
B	6x M12
C	6x M12
D	3x M12 - 8.8

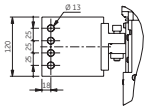
Drawout type (2)
5000A Rear horizontal
or 5000-6400A Rear vertical



50-60 Nm	
A	3x M12x60/80 - 8.8
B	6x M12
C	6x M12
D	3x M12 - 8.8



Fixed type
5000-6400A Rear vertical



50-60 Nm	
A	4x M12x60/90 - 8.8
B	8x M12
C	8x M12
D	4x M12 - 8.8

(1) For frame 3@6400A, when applied to horizontal wiring, it is recommended to increase the section of connecting copper bar, or strengthen heat dissipation measures, or reduce capacity

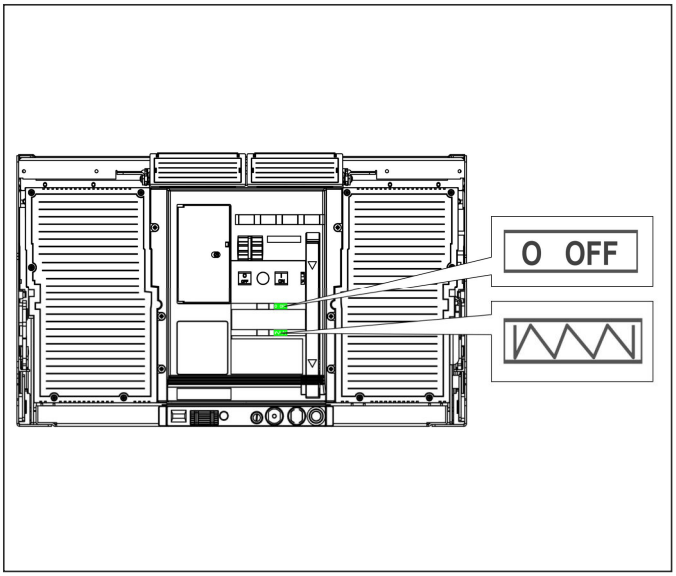
(2) For withdrawable frame 3, each pole inlet and outlet line has 2 wiring bars.

4 Circuit breaker operation

4.1 MainSpring Energy Storage

Note:
1 energy storage cycle can provide enough energy for the O-C-O (disconnect-close-disconnect) operation.

Make sure that the switch is in the off state and the energy storage is in the release state before operation, as shown in the picture on the right.



The unit can only operate properly when the device is mounted on a horizontal surface and fixed to the bottom or when the device is mounted on a vertical surface and fixed to the bottom or back. (Use a mounting rack)

Energy storage of device (manual)

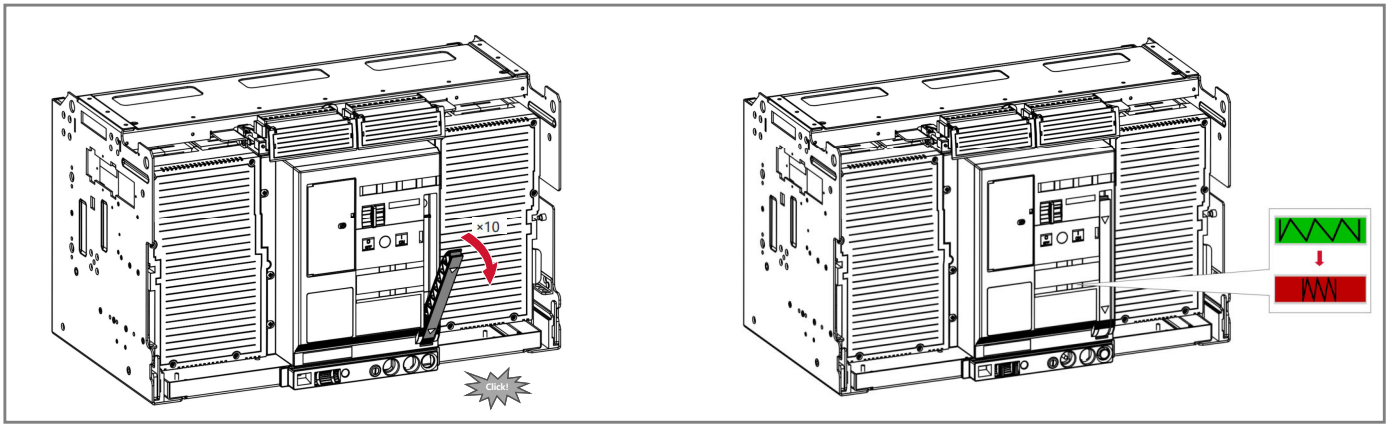
- Unfold the handle as indicated in the picture on the right;

- Turn or press down the handle;

- Return the handle to its original position, and a clicking sound can be clearly heard to indicate that the operation is complete;

- Repeat the above operation procedure 10 times to make the spring fully-stored energy.

The display status changes from green to RED (red) at this point.



Energy storage of equipment (electric)

The optional spring energy storage unit (motor) will automatically store energy for the spring directly after the closing operation (refer to Section 7.4 for detailed parameters).

This operation will take about 2 seconds.

Table 4.1 Operation sequence of the energy storage unit

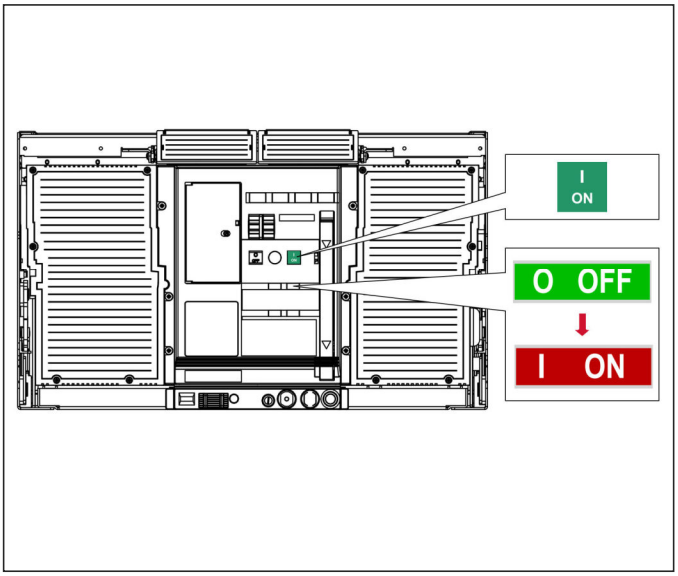
ON/OFF	Main circuit breaker contact status	Energy storage spring indicator	Energy storage spring state	Next is the admissible operating function
OFF	disconnect	Unstored energy	Unstored energy	The closing spring can store energy
OFF	disconnect	Stored energy	Complete energy storage	The contact can be closed
ON	Switching on	Unstored energy	Unstored energy	The contacts can be opened or closed, and the spring can store energy
ON	Switching on	Stored energy	Complete energy storage	Contacts can be disconnected
ON	Switching on	Energy storage in progress	Partial energy storage	Complete energy storage
ON	disconnect	Energy storage in progress	Partial energy storage	Complete energy storage

4.2 The Circuit Breaker Closing Operation

The circuit breaker can be closed when the following conditions are met:

- The OFF button is not pressed
- The control unit is installed
- The reset button of control unit is not prominent on the front panel
- There is no unresolved ON (closing) command
- Undervoltage release unit is energized (if installed)
- Local key locks or internal/external breaker interlocks are not set to prevent the users from starting the device
- The swing handle of drawer is not inserted
- Circuit breaker is not positioned between at (connect)、 TEST (test) and(disconnect)

If the above conditions are not met, the device will not be able to close.



Closing equipment

Up to 4 different methods (A-C) can be used to close the circuit breaker:

A. Manually close the circuit breaker

Press the "ON" (closing) button on the circuit breaker panel.

B. Remote electric closing

When using an electric energy storage device, the circuit breaker can be started using a standard closing coil. The closing coil must be energized through the secondary terminal (see Section 7.2.1 for details).

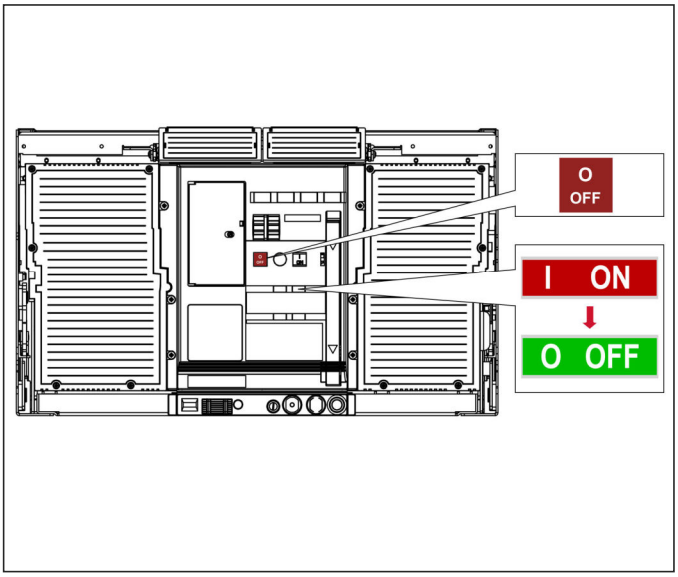
C. Close the coil through the communication bus

In the presence of electric energy storage devices and communication coils, the circuit breaker can be activated through the communication bus provided on the Mprocontrol unit type device. The coil must be connected to a separate power source.

Note:
If an electric energy storage motor is installed, the spring will automatically store energy when the closing operation starts.

4.3 The Circuit Breaker Opening Operation

Note: If it is a circuit breaker device, the device will automatically trip in the event of a circuit fault that exceeds the set value of the protection device. (Control unit)



The circuit breaker can be disconnected in a number of ways:

- Manually

Use the switch button "OFF" to disconnect the circuit breaker.

- Shunt trip device

1 or 2 shunt trips can be installed to disconnect the circuit breaker. When using this method,the shunt trip must be energized through the secondary loop (terminal) (see section 7.2.2 for details).

- Undervoltage release unit

1 or 2 undervoltage release devices may be installed to disconnect the circuit breaker if its supply voltage falls below a certain value (see section 7.2.3 for details).

4.4 Drawer Position Explain

Table 4.2 Operation position of the drawer

Position of the circuit breaker in the drawer		Primary break position	Auxiliary disconnecting device	Circuit breaker function	position of the circuit breaker door
	(Connect)	engage	engage	The circuit breaker can be operated mechanically or electrically, ready for work	Off
Test	(Test)	separate	engage	The circuit breaker can be operated mechanically or electrically Circuit breakers and control circuit operation can be tested and verified	Off
	(disconnect)	separate	separate	The circuit breaker can only be operated mechanically The circuit breaker cannot be removed from the circuit breaker compartment	Off
WITHDRAWN	(withdrawn)	separate	separate	The circuit breaker can only be operated mechanically The circuit breaker can be removed from the circuit breaker compartment	open

5 Mpro Intelligent control unit

Warnings

Prevent incorrect handling

Make sure to dispose of the battery properly according to all applicable rules.

Warnings

Only qualified personnel are allowed to install, operate, and maintain all electrical equipment.
Qualified personnel are those who have skills and knowledge related to the construction and operation of electrical equipment and its installation, and have received safety training to identify and avoid associated hazards.

Caution

Avoid injury from moving parts when handling circuit breakers.

Danger

When checking or replacing, make sure the circuit breaker is in the trip position. The operating indicator is shown as OFF (off), and the spring energy storage has been fully released.

5.1 Introduction

The Mpro control unit is an electronic device connected to a circuit breaker. This device monitors the circuit breaker's phase current, neutral current, and/or voltage, and disconnects the breaker in the event of overcurrent or voltage-related conditions.

The unit also has relay-protection function, advanced measurement, diagnostic function and communication function.

The panel is equipped with a user interface to adjust the parameters of the control unit.

Use environment

Table 5.1 Conditions of use environment

environment	argument	remark
Operating temperature	-20℃~ +70℃	The average value within 24 hours must not exceed +35℃
Storage temperature	-25℃~ + 70℃	
Relative humidity	The monthly average maximum relative humidity in the wettest month of the installation site shall not exceed 90%, and the monthly average minimum temperature in that month shall not exceed +25 ℃	Allow condensation on the surface of the product due to temperature changes.
Pollution level	Level 3	When assembled with circuit breakers
Install	III	When assembled with circuit breakers

5.2 Description of control unit

5.2.1 Appearance

The control unit has an LCD display. The panel is shown on the right.
The language is usually set to Chinese, English can be selected.

5.2.2 Panel Introduction

1.Display screen

Backlight color:

- White: Normal

- Blinking red: A fault is detected, the trip device is about to trip, and the signal will return.

- Red: A fault is detected, the trip of the trip device is complete, and the fault data is displayed.

2.Operation button

Use these 5 buttons to access the measurement, protection, maintenance and system setting interface of the control unit.

- UP: Scroll up to increase the value.

- DOWN (down) : Scroll down to decrease the value.

- RIGHT (to the right) : Next function/return

- LEFT: Previous function/return

-ENTER (OK) : Save or set to memory.

3.Battery, USB port

Battery: 2/3A type, 3.6V; USB: Micro-USB

4.Indicator

- Blinking green: Normal

- Blinking yellow: A fault is detected, the trip device is about to trip, and the signal will return.

- Blinking red: A fault is detected, the trip of the trip device has completed, and fault data is displayed.
Press Enter, and the screen returns to normal. Press the reset button, and if there are no other faults, the circuit breaker will work normally.

5.Reset button

- Turn the reset button to Manual:

When the circuit breaker automatically trips due to a fault, the reset button pops out automatically, in order to re-close the circuit breaker, you must press the reset button on the panel. The reset button does not pop out when manually opening the circuit breaker.

- Turn the reset button to Auto:

When the circuit breaker automatically trips due to a fault, the reset button will not automatically pop out.

5.3 Function of control unit

Function menu

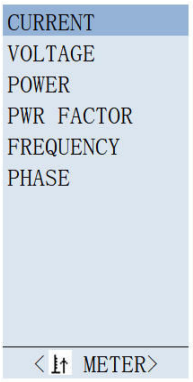
On the control unit, press the left button to light up the screen, by pressing "Left"

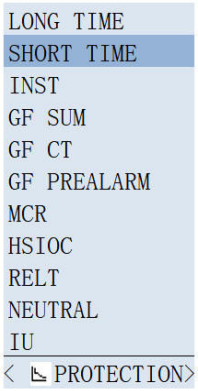
And right button can enter the corresponding protection menu, measurement menu, maintenance record menu, system setting menu and other interfaces to complete all function settings and parameter view.

Measurement

You can select the meter function by pressing "Left" and "Right" on the display screen. Press "Confirm" to enter the different electrical parameters options, press "Up" and "Down" to read and observe the load current, voltage, apparent, active power, reactive power and other electrical parameters, and all current and voltage are based on true RMS measurement.

MPACT full range of circuit breaker control units provide ammeter function, Mpro-P type provide other complete electrical parameter measurement function. Ammeter and electrical parameter measurement function requires internal power supply, external battery pack, grid power to supply to the control unit. The complete electrical parameter measurement function requires an external 3-phase voltage transformer and transmitter.



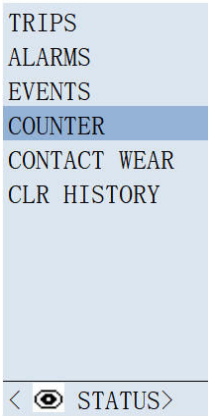


Protection

M-PACT full series circuit breaker control unit can provide overload long delay (Ir), overload long delay curve adjustable (tr), Short circuit delay protection (Isd, tsd) and short circuit instantaneous protection (Ii) are adjustable. Depending on the customer's choice Model, the control unit also has other advanced protection features: ground fault, over and under voltage, phase sequence, current imbalance, power, frequency.The specific functional details of rate, input/output relays, area interlocking, waveform capture, etc., will be described in detail in this chapter.

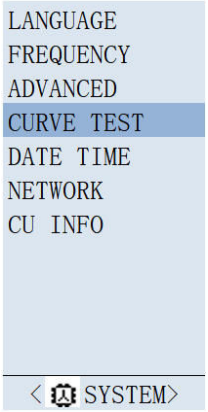
Maintenance record

On the display screen, press the left button and right button to select the Maintenance Record menu. Press to confirm Key to view the corresponding record. Can view fault records, alarm records, event records,operation times and other data. This function requires an external 24VDc power supply to ensure continuous operation of the control unit and complete records of events.



System Setup

Select the "System Settings" function through the display and press "Left" and " Right" button. This menu allows you to set the language, time, etc. of the control unit.



5.3.1 Basic protection Functions

		MproA13	MproA16	MproP13H	MproP16H	Default
Display	LCD	●	●	●	●	
	Touch key	-	-	-	-	
	langue，Chinese/English	●	●	●	●	chinese
	Trip reset auto/manual	●	●	●	●	
Overload protection, Ir	Select from 0.2-1In，step 1A	●	●	●	●	1xIn
	Trip time form 0.5-24s，step 0.1s	●	●	●	●	4s
	State setting，Close/Trip	●	●	●	●	Trip
Short circuit delay protection, Isd	Select from 1.5-10Ir，step 1A	●	●	●	●	1.5xIn
	Trip time Tsd (I^2T ON) form 0.1-0.4s step 0.1s	●	●	●	●	
	Trip time Tsd (I^2T OFF) form 0.1-0.4s step 0.1s	●	●	●	●	0.1s
Instantaneous protection, Ii	State setting，Close/Trip	●	●	●	●	Trip
	Select from 2-15In，step 1A	●	●	●	●	2xIn
Ground protection,Ig	State setting，Close/Trip/alarm	-	●	-	●	Close
	Select from 0.2-1In，step 1A	-	●	-	●	0.2xIn
	Trip time Tsd (I^2T ON) form 0.1-0.4s step 0.1s	-	●	-	●	0.1s
	Trip time Tsd (I^2T OFF) form 0.1-0.4s step 0.1s	-	●	-	●	0.1s
Ground CT protection	State setting，Close/Trip/alarm	-	●	-	●	Close
	Select from 0.2-1In，step 1A	-	●	-	●	0.2xIn
	Trip time Tsd (I^2T ON) form 0.1-0.4s step 0.1s	-	●	-	●	0.1s
	Trip time Tsd (I^2T OFF) form 0.1-0.4s step 0.1s	-	●	-	●	0.1s
Ground fault warning	State setting，Close/GFSUM/GFCT	-	●	-	●	Close
	Select from 120-1200A，step 1A	-	●	-	●	200A
	Pre-alarm time from 1-10s，step 0.1s	-	●	-	●	10
	Return value select from120-1200A，step 1A	-	●	-	●	120A
	Return time form 1-10s，step 0.1s	-	●	-	●	10
Neutral protection	State setting，Close/Trip	○	○	○	○	Trip
	Neutral phase value，OFF or 50%-160%	○	○	○	○	100%
MCR and HSIOC protection	MCR protection mode，trip	●	●	●	●	Trip
	MCR value，30In/Icw	●	●	●	●	30In
	HSIOC protection mode，trip	●	●	●	●	Trip
	HSIOC value，30In/Icw	●	●	●	●	30In
	No tripping time，>20ms	●	●	●	●	
	Longest tripping time，≤80ms	●	●	●	●	
Reduced Instantaneous (RELT)	State setting，Close/Trip	●	●	●	●	Close
	Select from 2-15In，step 1A	●	●	●	●	10In
	No tripping time，>20ms	●	●	●	●	
	Longest tripping time，≤80ms	●	●	●	●	

● : Standard; - : No this function

5.3.2 Advanced Protection Functions

		MproA13	MproA16	MproP13H	MproP16H	Default
Overvoltage and undervoltage protection	State setting，Close/Trip/alarm	-	-	●	●	Close
	Select from 20V～1500V，step 1V	-	-	●	●	280V
	Time from 0.1~300s，step 1s	-	-	●	●	10s
	Return value，20V～1500V，step 1V	-	-	●	●	360V
	Return time from 0.1~300s，step 1s	-	-	●	●	10s
Voltage unbalance protection	State setting，Close/Trip/alarm	-	-	●	●	Close
	Select from 2%~90%，step 1%	-	-	●	●	20%
	Time from 0.1~300s，step 1s	-	-	●	●	10s
	Return value from 2%~90%，step 1%	-	-	●	●	10%
	Return time from 0.1~300s，step 1s	-	-	●	●	10s
Under frequency protection	State setting，Close/Trip/alarm	-	-	●	●	Close
	Select from 40-70Hz，step 0.5Hz	-	-	●	●	45
	Time from 0.1~300s，step 1s	-	-	●	●	10s
	Return value from 40-70Hz，step 0.5Hz	-	-	●	●	49
	Return time from 0.1~300s，step 1s	-	-	●	●	10s
Over frequency protection	State setting，Close/Trip/alarm	-	-	●	●	Close
	Select from 40-70Hz，step 0.5Hz	-	-	●	●	55
	Time from 0.1~300s，step 1s	-	-	●	●	10s
	Return value from 40-70Hz，step 0.5Hz	-	-	●	●	51
	Return time from 0.1~300s，step 1s	-	-	●	●	10s
Reverse power protection	State setting，Close/Trip/alarm	-	-	●	●	Close
	Select from 50-5000kW，step 10kW	-	-	●	●	55
	Time from 0.1~300s，step 1s	-	-	●	●	10s
	Return value from 50-5000kW，step 10kW	-	-	●	●	51
	Return time from 0.1~300s，step 1s	-	-	●	●	10s
Phase sequence protection	State setting，Close/Trip/alarm	●	●	●	●	Close
	Select: a-b-c/a-c-b	●	●	●	●	a-b-c
Others	Interlock protection	●	●	●	●	
	Communication [1)]	○	○	○	○	
	Power supply, DC 24V	●	●	●	●	
	Test module	○	○	○	○	

● : Standard; - : No this function

Measurement and maintains

		MproA13	MproA16	MproP13H	MproP16H	Default
Measurement	Current (Ia, Ib, Ic, In, Ig, IgCT)	●	●	●	●	
	Voltage (Ua, Ub, Uc, Uab, Uac, Ubc)	-	-	●	●	
	Energy Total Real (kW·h)	-	-	-	-	
	Active power (L1, L2, L3) (kW)	-	-	●	●	
	Reactive power (L1, L2, L3) (kVar)	-	-	●	●	
	Apparent power (L1, L2, L3) (kVA)	-	-	●	●	
	Factor (L1, L2, L3)	-	-	●	●	
	Frequency	-	-	●	●	
	Phase position	-	-	●	●	
	Waveform capture					
Maintains record	Failure record	●	●	●	●	
	Alarm record	●	●	●	●	
	Events record	●	●	●	●	
	Operate times	●	●	●	●	
	contact wear	●	●	●	●	

● : Standard; - : No this function

5.4 Input/Output relay

5.4.1 Input relay

We provide 2 relay input functions. Each relay input can select OFF/TRIP/RELT (1 of 3), as detailed in the table below.

DI	Functions	Instructions
Type selection	OFF	Off
	TRIP	After there is an input signal the circuit breaker outputs a trip pulse to the flux coil
	RELT	Enable RELT Settings when there is an input signal. (RELT must be set to Remote)

5.4.2 Output relay

Provide 4 relay output functions. The first group is automatically assigned to the circuit breaker closing, the second group is automatically assigned to the circuit breaker opening.
EVENT/ALARM /TRIP can be selected for each relay output (one of three). There are multiple options in the lower menu for each function, as shown in the following table.

DO	Functions	Instructions
Options	EVENT	Action event
		Lower menu: NONE (no output)/remote-off (REMOTE switching)/remote-on (REMOTE switching) /RELTON (double short circuit protection)
	ALARM	Send the alarm command, the circuit breaker receives the alarm
		Lower menu: ALL (all) /SELF-TEST (self-test) /CONT (electrical contact life) /PS (phase sequence) /OF (over frequency protection) /UF (under frequency protection) /RP (reverse power protection) NU (voltage imbalance protection) /OV (over voltage protection) /UV (under voltage protection) /IU (Current imbalance protection) /N-ST (N-phase short circuit delay protection) /N-LT (N-phase overload long delay protection) /GFCT (ground leakage protection) /GFSUM (ground fault protection) /GA (ground alarm) /LT (overload long delay protection) /NONE (no output)
	TRIP	The output command is issued, the circuit breaker receives the trip pulse, and the magnetic trip is made
		ALL (All) /PS (phase sequence) /OF (over frequency protection) /UF (underfrequency protection) /RP (reverse power protection) /NU (voltage unbalance protection) /OV (overvoltage protection) /UV (undervoltage protection) /IU (current unbalance protection) /N-I (N-phase short-circuit instantaneous protection) /N-ST (N Phase short circuit delay protection)/ N-LT (N-phase overload long delay protection)/ RELT (Double short circuit protection)/HSIOC (Limited short circuit instantaneous protection)/ MCR (closed short circuit protection)/ GF CT (ground leakage protection)/ GF SUM(ground fault protection)/ I (Short circuit instantaneous protection) /ST (Short circuit delay protection) /LT (overload long delay protection) /NONE(no output)

5.5 Protection feature

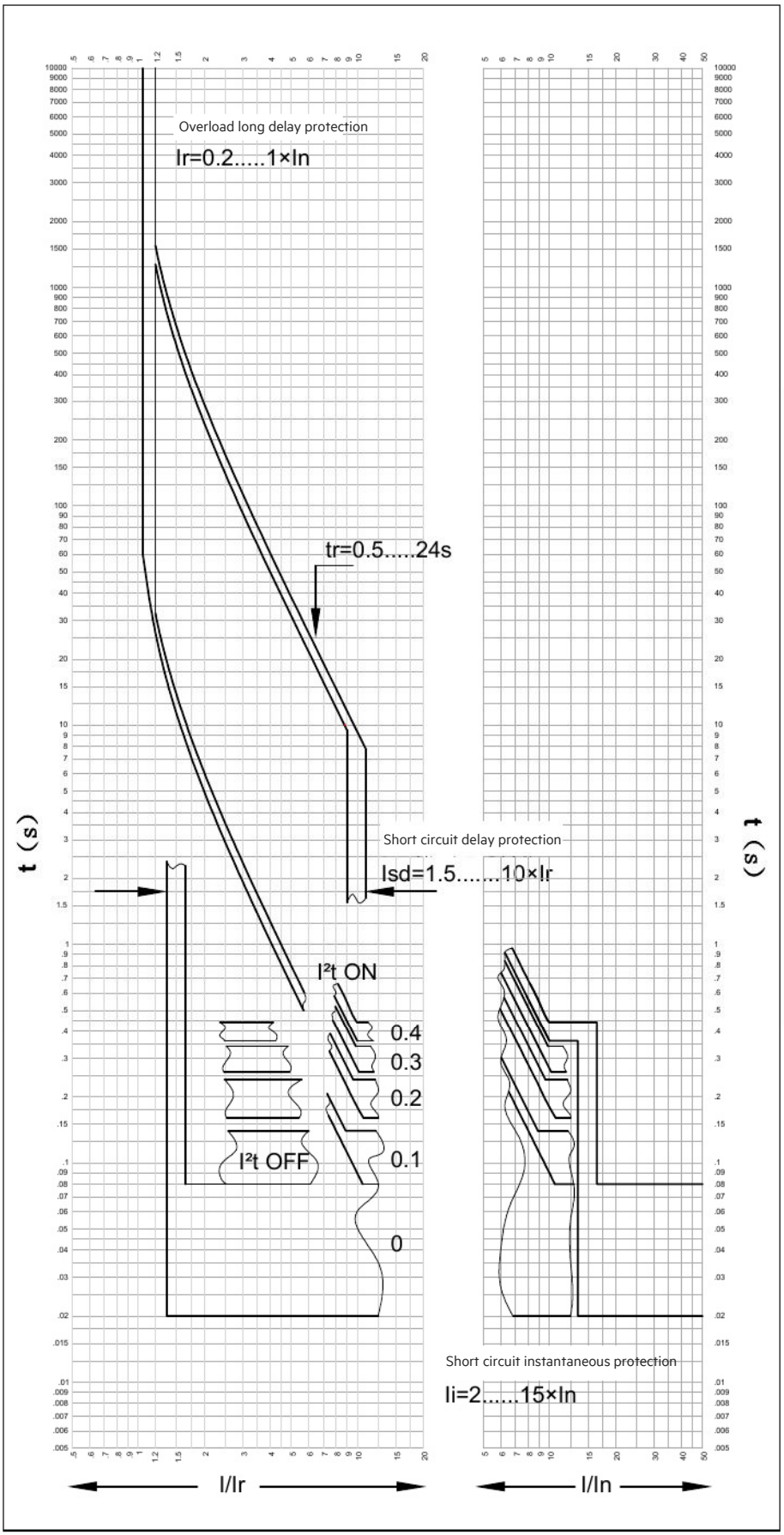
5.5.1 Tripping Feature Curve (LSI)

- Three-stage Protection (LSI)

Rated current (In):

5000A, 6400A

Frequency: 50/60Hz



5.5.2 Tripping Feature Curve (G)

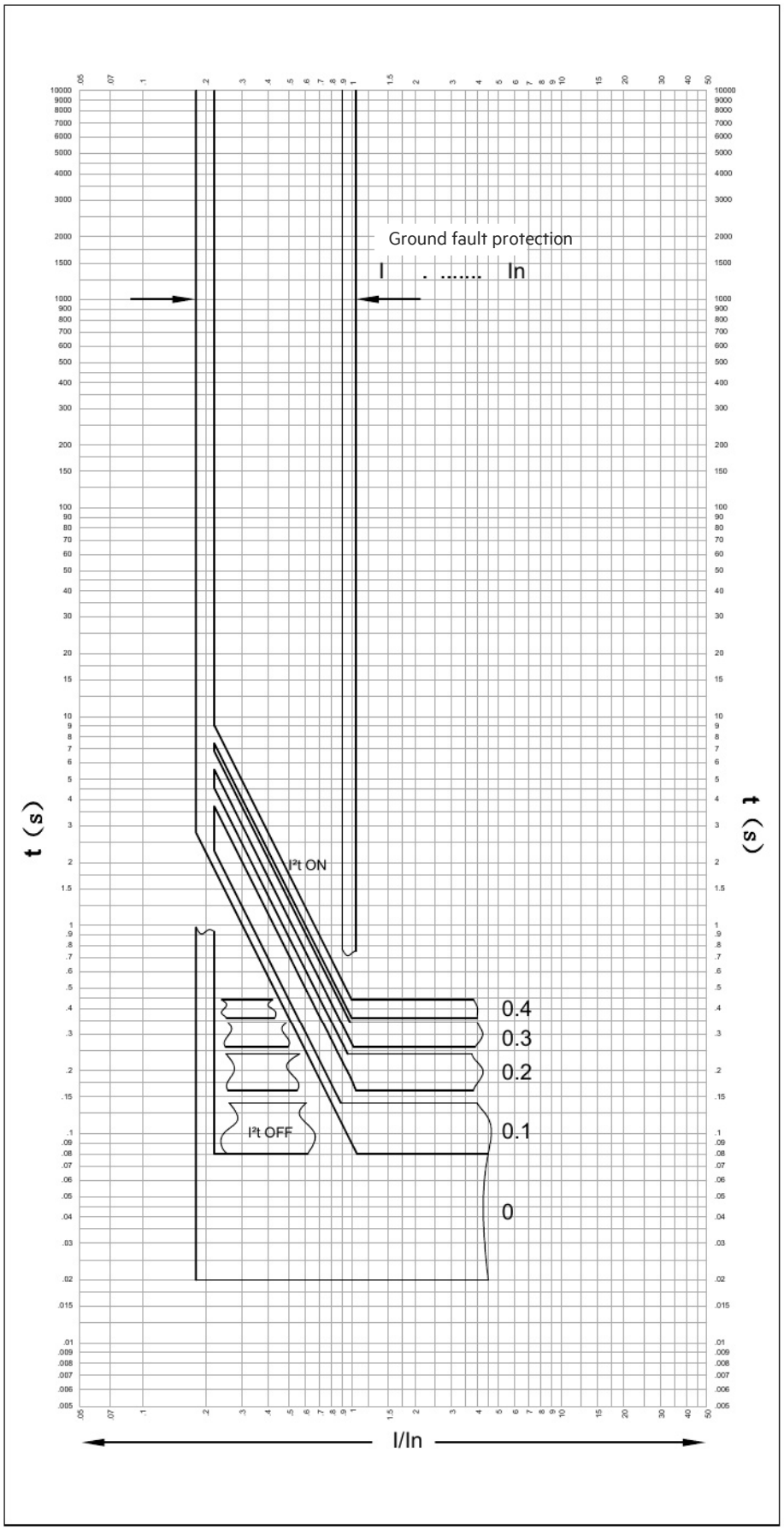
- Ground protection (G)

Rated current (In):

5000A, 6400A

Frequency:

50/60 Hz



5.5.3 Overload long delay protection

The overload long delay protection is based on the actual RMS current of each phase and neutral line.

Set the overload long delay protection value

Overload long delay protection is set to:

-Ir: overload long delay trip current setting.

-tr: overload long delay trip time setting, under 6Ir

Settings	Unit	Range	Step size	Factory setting
Ir	A	(0.2~1) x In	1A	1 x In
tr	S	0.5~24	0.1	4

Overload long delay protection feature

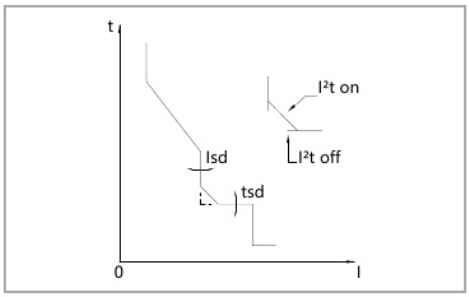
T= 35.15625/(N^2-0.84375)*tr,
N=I/Ir,
tr=0.5-24, step size 0.1
Protection features:
I< 1.05 ×Ir: no trip
I > 1.2 x Ir: Tripping

Tr overload Long delay protection, The time delay is applicable to cold conditions for phase current or neutral current equal to 6xIr. When the current is greater than Isd or Ii, the trip time acts according to the short delay and instantaneous protection time. Long delay minimum trip time 500ms

Tr(@6×Ir)	0.5s	1s	2s	4s	8s	12s	16s	20s	24s
1.5 × Ir	12.5s	25s	50s	100s	200s	300s	400s	500s	600s
6×Ir	0.5s	1s	2s	4s	8s	12s	16s	20s	24s
7.2×Ir	0.34s	0.69s	1.38s	2.76s	5.52s	8.3s	11s	13.8s	16.6s

5.5.4 Short circuit short-delay protection

Short-circuit short-delay protection is phase-based on true RMS current, up to 15 harmonics.



Short circuit short-delay protection is used to prevent equipment from experiencing phase to phase short circuits and phase to ground short circuits, with complete selectivity. It includes two features: fixed time limit and inverse time limit, depending on the state of the I²t setting.

Set the short-circuit short-delay protection value

Short-circuit short-delay trip protection accuracy: ±10%
The running time of the short delay protection depends on the tsd time delay. They apply to I²T ON or OFF.

Settings	Unit	Range	Step size	Factory setting
Isd	A	(1.5~10) x Ir, OFF	1A	1.5 x Ir
Tsd (I²T ON)	s	0.1 ~ 0.4	0.1	-
Tsd (I²T OFF)	s	0 ~ 0.4	0.1	0.1

Short circuit short-delay protection feature

I²T ON tripping curves (I < 10 Ir),

T = (10 /N) ^ 2 * tsd,

N = I/Ir,

tsd= 0. 1, 0. 2, 0. 3, 0. 4

accuracy: + / - 10%

Characteristic	Current multiple (I/Isd)	Set a trip time
Inactive characteristic	<0.9	non-trip
Action characteristic	>1.1	Trip
Action delay	≥1.1	See table below

I²t ON Trip time (I≥10Ir)

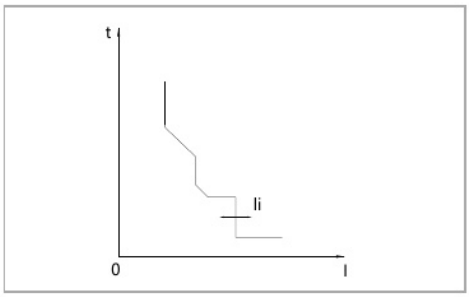
Tsd	0.1s	0.2s	0.3s	0.4s
Inactive time	>80ms	>160ms	>260ms	>360ms
Maximum trip time	<140ms	<240ms	<340ms	<440ms

I²t OFF Trip time

Tsd	0s	0.1s	0.2s	0.3s	0.4s
Inactive time	>20ms	>80ms	>160ms	>260ms	>360ms
Maximum trip time	<80ms	<140ms	<240ms	<340ms	<440ms

5.5.5 Short circuit instantaneous protection

Instantaneous protection prevents short circuits between phase line and neutral line, and between phase line and ground. The protection operates with a fixed time limit characteristic.When the set current is exceeded, the product will trip without any other time delay.



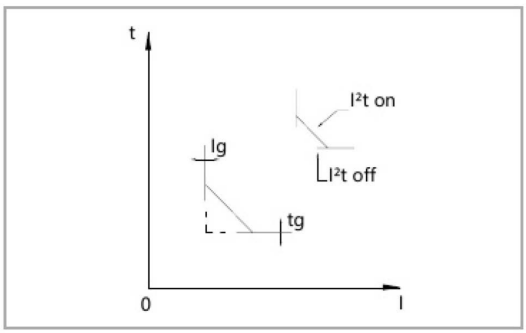
Set the short circuit instantaneous protection value

Settings	Unit	Range	Step size	Factory setting
Ii state	-	Close/trip	-	trip
Ii state	A	(2-15) x In	1A	2.0xIn

Short-circuit instantaneous protection characteristics

I< 0.9 x Ii: no-trip
I > 1.1 x Ii: trip

character	Unit	
No trip time	ms	> 20
Maximum trip time	ms	≤80



5.5.6 Grounding Protection (Optional)

Ground fault protection is based on the true effective current of the phase, which can reach up to 15 harmonics Wave.

Ground fault protection prevents phase-to-ground line failure and is suitable for TN-S(three-phase five-wire system) systems, but also for other ground systems.

The ground fault current is calculated or measured according to the circuit breaker configuration, as shown in the following table.

Method of calculating ground fault protection

Circuit breaker configuration	Ig（ground fault current）
3P	Ig=IA+IB+IC
4P	Ig=IA+IB+IC+IN
3P+N(T)	Ig=IA+IB+IC+IN(ENCT)
3P/4P(W)	Ig=IW

Switch and setting for grounding fault protection

Settings	Unit	Range	Step size	Factory setting	precision
Ig status	-	Close/trip	-	Off	
Ig set	A	Ig=（0.2-1）In	1A	0.2In	±10%

Ground fault protection characteristics

The operating time of ground fault protection depends on the tg time delay. They apply to I²T ON or OFF.

tg	0s	0.1s	0.2s	0.3s	0.4s	factory settings
I²T ON	-	0.1s	0.2s	0.3s	0.4s	0.1
I²T OFF	0s	0.1s	0.2s	0.3s	0.4s	0.1

I²t ON trip time (I<In)
T=(1/N)^2*tg,
N=I/In,
tg = 0.1, 0.2, 0.3, 0.4

Protection characteristics:
I< 0.9 ×Ig: no trip
I > 1.1 x Ig: trip

I²t ON Trip time (I≥In)

tg	0.1s	0.2s	0.3s	0.4s
Inactive time	> 80ms	> 160ms	> 260ms	> 360ms
Maximum trip time	< 140ms	< 240ms	< 340ms	< 440ms

I²t OFF Trip time

tg	0	0.1s	0.2s	0.3s	0.4s
Inactive time	> 20ms	> 80ms	> 160ms	> 260ms	> 360ms
Maximum trip time	< 80ms	< 140ms	< 240ms	< 340ms	< 440ms

5.5.7 Ground Fault CT Protection (optional)

Applicable to leakage faults caused by equipment insulation damage or human contact with exposed conductive parts.The leakage trip value I Δ n is directly expressed in amps, and no connection with the rated current of the circuit breaker. The method of taking the signal is zero sequence sampling mode, and a rectangular transformer is needed; This sampling precision is high sensitivity, suitable for small current protection.

Settings	Unit	Range	step size	Factory settings	precision
Ig enabled	-	Close/trip	-	off	
Ig threshold	A	Ig=(0.2-1)In	1A	0.2 In	±10%

The operating time of earthling fault protection depends on the tg time delay. They apply to I²T ON or OFF.

tg	0s	0.1s	0.2s	0.3s	0.4s	Factory setting
2T ON	-	0.1s	0.2s	0.3s	0.4s	0.1
2T OFF	Os	0.1s	0.2s	0.3s	0.4s	0.1

I²t ON trip time (I<In); T=(1/N)^2*tg,
N=I/In,; Tg = 0.1, 0.2, 0.3, 0.4

- **I²t ON Trip time (I≥In)**

tg	0.1s	0.2s	0.3s	0.4s
no trip time	> 80ms	> 160ms	> 260ms	> 360ms
maximum trip time	< 140ms	< 240ms	< 340ms	< 440ms

- **I²t OFF Trip time.**

tg	0	0.1s	0.2s	0.3s	0.4s
no trip time	> 20ms	> 80ms	> 160ms	> 260ms	> 360ms
maximum trip time	< 80ms	< 140ms	< 240ms	< 340ms	< 440ms

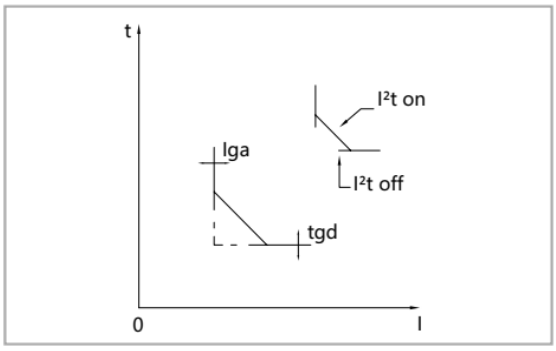
Protection features:

· I< 0.9 x Ig: non-trip

· I > 1.1 x Ig: trip

5.5.8 Grounding fault early warning (Optional)

The Grounding alarm function and the Grounding protection function are independent of each other, exist at the same time, and have their own independent parameters. The alarm function works in the same way as the grounding fault protection, using the same sensor, curve and protection time. The grounding fault alarm is based on the sum of the current of each phase line and neutral line or the external transformer, the current ground loop current transformer is connected to the control unit through the module. Power is supplied via internal CT without external power supply.



Ground fault warning Settings

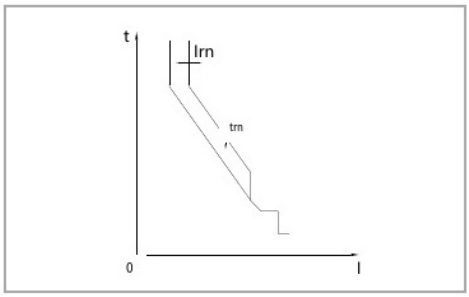
Settings	Units	Range	Step Size	Factory Settings	Precision
Ground forecast alarm mode	-	Off,GFSUM,GFCT	-	Close	
Ground with alarm action value	A	120-1200A	1A	200A	Plus or minus 10%
Grounded forecast alarm time	s	1-10	0.1s	10	>400ms:+10% ≤400ms: see I²t OFF short delay trip time
Ground forecast alarm return value	A	120-1200A	1A	120A	Plus or minus 10%
Grounded forecast alarm return time	S	1-10	0.1s	10	>400ms:+10% ≤400ms: see I²t OFF short delay trip time

Protection features:

I < 0.9 x Ig: non-trip
I > 1.1 x Ig: trip

5.5.9 Neutral line protection (optional)

In practical applications, the cable and current characteristics used by the neutral line (N phase) are different from other three phases. Different protection needs to be implemented for the neutral according to different applications. When the neutral line is thin, the semi-fixed value method can be used to protect; When the neutral line is the same as others,it can be protected by the method of full fixed value. When the harmonics in the power grid are heavy, the method of 1.6 times fixed value protection can be used for protection. The setting of neutral line protection is only for long delay protection, and other protection settings are set for in-phase line protection.



This section describes the neutral line protection corresponding to the breaker type

Serial number	Circuit breaker	Neutral line protection
1	3PT-3 pole circuit breaker	-
2	3P+N- Three pole circuit breaker + external neutral line RC	Closed, 50%, 100%, 160%
3	4PT- quadrupole circuit breaker	Off,50%, 100%, 160%

Neutral line protection (N phase protection) Settings

Settings	Units	Range	Factory Settings
N Phase Protection mode	-	Close/trip	Trip
N phase action value	A	50% - 160%.	100%

5.5.10 MCR and HSIOC protection

MCR protection is a closing short circuit protection for the circuit breaker itself; When the fault current exceeds the limit, MCR protection protects the circuit breaker's ability to make connections, preventing the switch from being damaged due to current exceeding the limit of the circuit breaker's ability to make connections. The protection is activated at the moment the circuit breaker is closed (within 120ms); HSIOC protection protects the maximum carrying capacity of the circuit breaker, preventing the switch from carrying current exceeding the level limit breaking capacity, and takes effect 120ms after closing.

MCR and HSIOC protection parameter Settings

Settings	Units	Range	Factory Settings
MCR Protected mode	-	Trip/Close	Trip
MCR action value	A	30In or short-time tolerance	30In

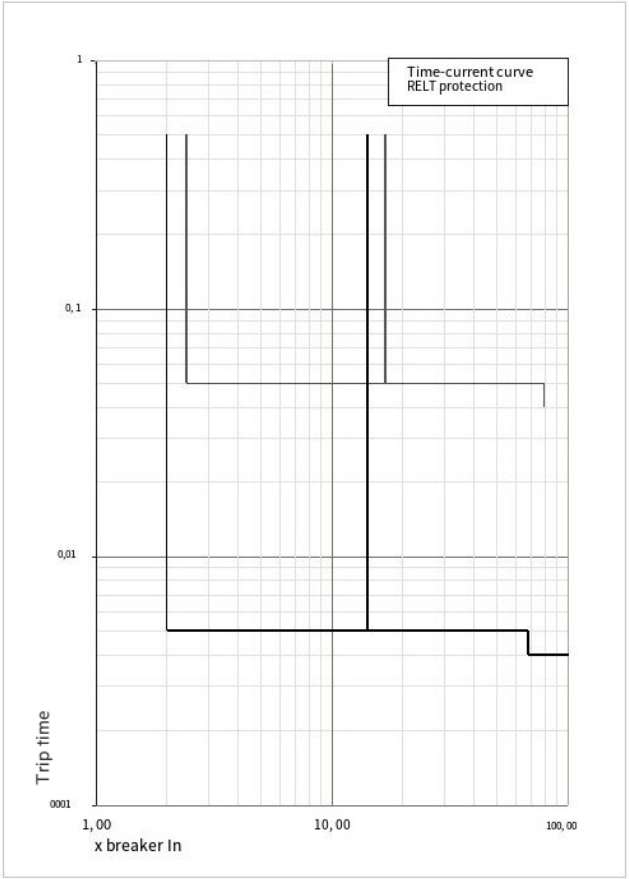
Settings	Units	Range	Factory Settings
HSIOC Protected mode	-	Trip/Close	Trip
HSIOC action value	A	30In or short endurance	30In

MCR and HSIOC protect action characteristics

peculiarity	Units	
No trip time	ms	> 20
Maximum trip time	ms	< 80

5.5.11 Dual Short Circuit Protection(RELT)

Dual short circuit protection is the dual protection parameter set by the Mpro control unit against transient short circuits. So that the short circuit protection can be adjusted when the circuit breaker is supplied by two sources with significantly different short circuit currents. For example, if the circuit breaker is supplied by a grid or a generator, it will trip without other time delay when the set current is exceeded. It can be triggered automatically via menu or remote input.



RELT protection setting parameters

Settings	Units	Range	Step Size	Factory Settings
RELT Enabled	-	Off/Trip	-	Off
RELT threshold	A	(2~15) In	1A	10In

Trip time

peculiarity	Units	
No trip time	ms	> 20
Maximum trip time	ms	< 80

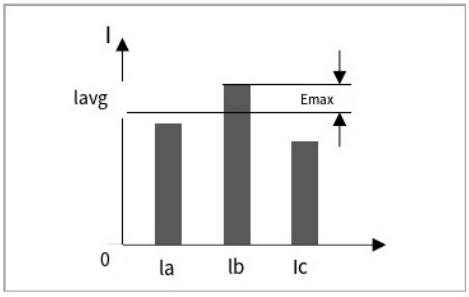
Double short circuit protection features:

· I < 0.9 X I RELT: Non-Trip

· I > 1.1 X I RELT: Trip

5.5.12 Unbalanced current protection (optional)

Unbalanced current protection protects the off-phase and three-phase unbalanced current. The protection action is based on the unbalanced rate between the three-phase current. When the execution mode is alarm, the action principle is the same as earthling protection.



Calculation method of unbalanced rate:

$$Iunbal = \frac{|Emax|}{Iavg} \times 100\%$$

Iavg: Ia, Ib, Ic three-phase current true valid value（RMS）average:

$$Iavg = \frac{Ia + Ib + Ic}{3}$$

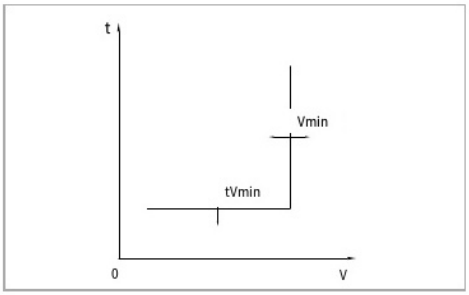
Emax: is the maximum difference between each phase current and Iavg.

Unbalanced Current protection setting

Settings	Units	Range	Step Size	Factory Settings	Precision
Current imbalance mode	-	Off/Trip/alarm	-	Off	-
Current imbalance action value	%	2% ~ 90%	1%	20%	Plus or minus 10%
Current imbalance time	s	0.1~300s	0.1s	10s	>400ms: ±10% <400ms: see I2t OFF short delay trip time
Current imbalance Return value	%	2% ~ 90%	1%	2%	Plus or minus 10%
Current imbalance return time	s	0.1~300s	0.1s	10s	>400ms: ±10% <400ms: see I2t OFF short delay trip time

5.5.13 Under-voltage protection (optional)

The control unit measures the true RMS value of the primary loop voltage, when the three phase-phase voltages (line voltage) or phase-neutral line (phase voltage) are less than the set value, that is, when the maximum value of the three voltages is less than the undervoltage protection set value, the undervoltage protection action ; When the maximum value of the three line voltages is greater than the return value, the alarm action is returned. Powered by external 24V power supply.

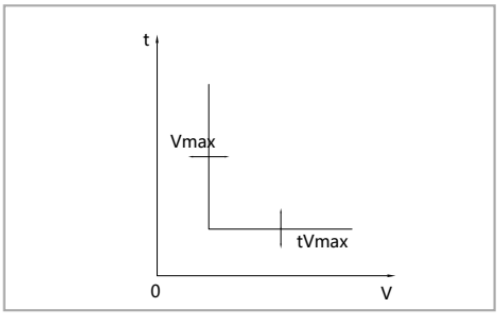


Under-voltage protection settings

Settings	Units	Range	Step Size	Factory Settings	Precision
Undervoltage protection mode	-	Off/trip/alarm	-	Off	-
Undervoltage protection action value	V	20V~1500V	1V	280V	Plus or minus 10%
Undervoltage protection time	s	0.1~300s	0.1s	10s	>400ms: ±10% ≤400ms: see I2t OFF Short delay trip time
Undervoltage protection return value	%	20V~1500V	1V	360V	Plus or minus 10%
Undervoltage protection return time	s	0.1~300s	0.1s	10s	>400ms: ±10% ≤400ms: see I2t OFF Short delay trip time

5.5.14 Over-voltage protection (optional)

The controller measures the true RMS value of the primary loop voltage. When the three phase-phase voltages (line voltage) or phase-neutral lines (phase voltage) are all greater than the set value, the minimum value of the three voltages is greater than the set value of the over-voltage protection action;When the minimum value of the three voltages is less than the return value,the alarm action is returned.



When the minimum line voltage is greater than the action threshold, start the alarm or trip delay,when the action delay time to send an alarm or trip signal, over -voltage fault DO action; When the execution mode is alarm, after the alarm action, when the minimum line voltage is less than the return threshold, start the return delay, when the return delay time to remove the alarm,overvoltage fault DO return.

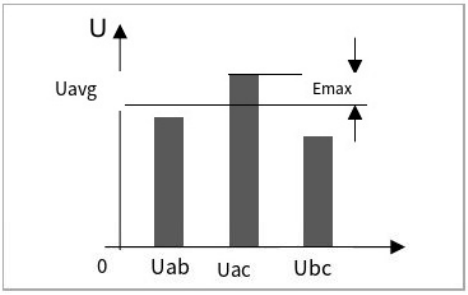
Power via external 24V supply.

Over-voltage protection settings

Settings	Units	Range	Step Size	Factory Settings	Precision
Overvoltage protection mode	-	Close/trip/alarm	-	Off	-
Overvoltage protection action value	V	20V~ 1500V	1V	460V	Plus or minus 10%
Overvoltage protection time	s	0.1~300s	0.1s	10s	>400ms: ±10% <400ms: see I2t OFF Short delay trip time
Overvoltage protection return value	%	20V ~ 1500V	1V	440V	Plus or minus 10%
Overvoltage protection return time	s	0.1~300s	0.1s	10s	>400ms: ±10% s400ms: See I2t OFF Short delay trip time

5.5.15 Unbalanced voltage protection (optional)

The protection action is based on the unbalance rate between the voltages of the three lines. Its action principle is the same as over-voltage protection.



Calculation method of unbalanced rate:

$$Uunbal = \frac{|Emax|}{Uavg} \times 100\%$$

In the formula Uavg: the average value of true valid value (RMS) in three-phase line voltage

$$Uavg = \frac{Uab + Uac + Ubc}{3}$$

Emax: The maximum difference between each line voltage and the mean value

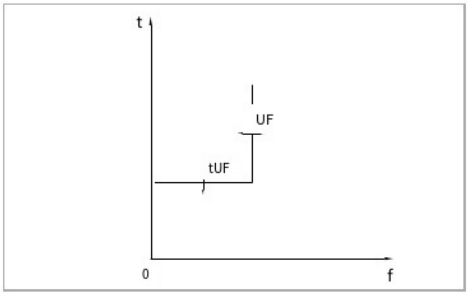
Unbalanced voltage protection settings

Settings	Units	Range	Step Size	Factory Settings	Precision
Voltage unbalance protection mode	-	Off/Trip/alarm	-	Off	-
Voltage unbalance protection action value	%	2% ~ 90%	1%	20%	Plus or minus 10%
Voltage unbalance protection time	s	0.1~300s	0.1s	10s	>400ms: ±10% <400ms: see I2t OFF Short delay trip time
Voltage unbalance protection Return value	%	2% ~ 90%	1%	10%	Plus or minus 10%
Voltage unbalance protection return time	s	0.1~300s	0.1s	10s	>400ms: ±10% ≤400ms: see I2t OFF short delay trip time

5.5.16 Under-frequency protection (optional)

The controller detects the frequency of the system voltage and can protect high or low frequency. The action principle and action characteristics of over-frequency and under-frequency protection are the same as over-voltage and under-voltage protection.

Power via external 24V supply.



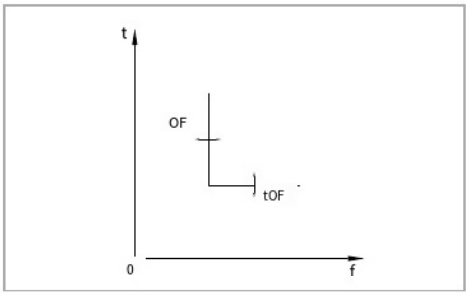
Under-frequency protection settings

Settings	Units	Range	Step Size	Factory Settings	Precision
Underfrequency protection mode	-	Off/Trip/alarm	-	Off	-
Underfrequency protection action value	Hz	40 ~ 70	0.1Hz	45	Plus or minus 10%
Underfrequency protection time	s	0.1~300s	0.1s	10s	>400ms: ±10% <400ms: I2t OFF Short delay trip time
Underfrequency protection Return value	Hz	40 ~ 70	0.1 Hz	49	Plus or minus 10%
Underfrequency protection return time	s	0.1~300s	0.1s	10s	>400ms: ±10% ≤400ms: See I2t OFF short delay trip time

5.5.17 Over frequency protection (optional)

The controller detects the frequency of the system voltage and can protect high or low frequency. The action principle and action characteristics of over-frequency and under-frequency protection are the same as over-voltage and under-voltage protection.

Power via external 24V supply.



Over-frequency protection settings

Settings	Units	Range	Step Size	Factory Settings	Precision
Overfrequency protection mode	-	Off/Trip/alarm	-	Off	-
Overfrequency protection action value	Hz	40 ~ 70	0.1 Hz	55	Plus or minus 10%
Overfrequency protection time	s	0.1~300s	0.1s	10s	>400ms: ±10% <400ms: see I2t OFF Short delay trip time
Overfrequency protection Return value	Hz	40 ~ 70	0.1 Hz	51	Plus or minus 10%
Overfrequency protection return time	s	0.1~300s	0.1s	10s	>400ms: ±10% <400ms: see I2t OFF short delay trip time

5.5.18 Reverse power protection (optional)

Reverse power protection, also called inverse active power protection, takes the sum of the active power of the three phases. When the power flow direction is opposite to the user-set power direction and greater than the set value, the protection starts. The power direction and the power inlet direction are set in the "Meter setting" menu phase, and must be consistent with the actual application situation. Its action principle is the same as over voltage protection. Power via external 24V supply.

Reverse power protection Settings

Settings	Units	Range	Step Size	Factory Settings	Precision
Reverse power protection mode	-	Off/Trip/alarm	-	Off	-
Reverse power protection action value	kW	50 ~ 5000	10	55	Plus or minus 10%
Reverse power protection time	s	1~300s	0.1s	10s	>400ms: ±10% s400ms: see l2t OFF short delay trip time
Reverse power protection return value	kW	50~ 5000	10	51	Plus or minus 10%
Reverse power protection return time	s	1~300s	0.1s	10s	>400ms: ±10% <400ms: see l2t OFF short delay trip time

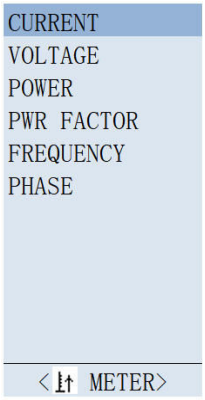
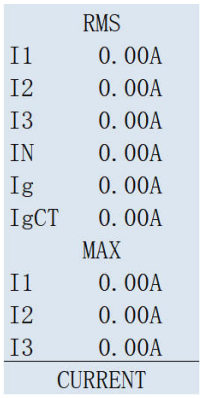
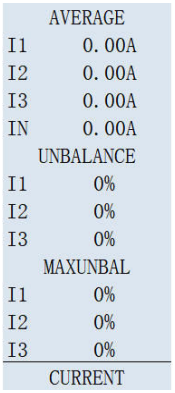
5.5.19 Phase sequence protection (optional)

The phase sequence detection is taken from the primary voltage. When the phase sequence is detected and the starting value is set in the same direction, the protection action is instantaneous. This function automatically exits when there is no phase or multiphase voltage.

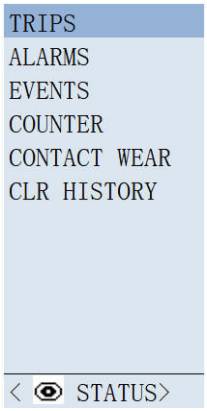
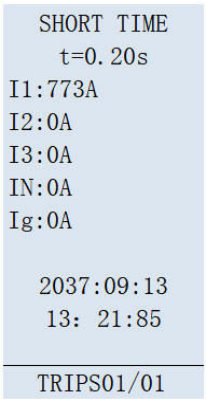
Phase sequence protection Settings

Settings	Units	Range	Step Size	Factory Settings	Precision
Phase sequence protection mode	-	Close/trip/alarm	-	Off	-
Phase sequence protection action value	-	a-b-c/a-c-b	-	a-b-c	

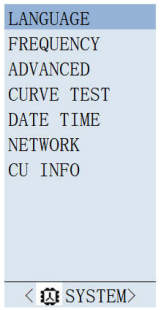
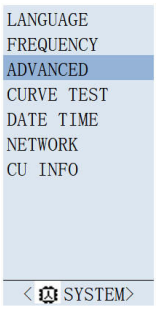
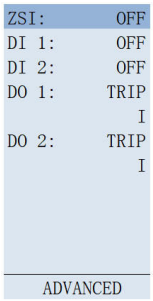
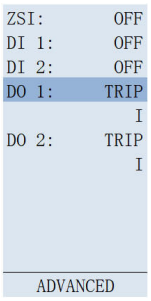
5.6 Electrical parameter viewing

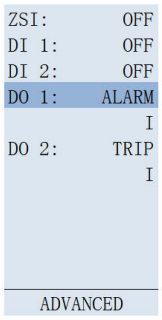
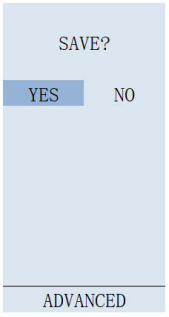
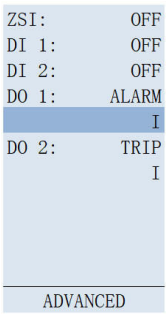
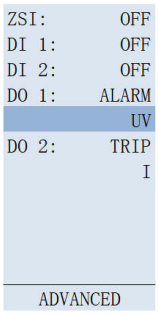
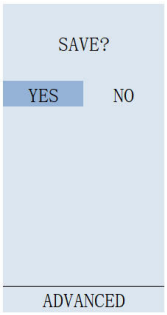
step	1	2	3	4
operation	Press  Light up the screen	Press  Switch to the measurement menu	Press  Open the Measurement menu	Press  View relevant data
example				

maintenance record

Step	1	2	3
operation	Press  Light up the screen	Press  Switch to the measurement menu	Press  View relevant data
example			

5.7 Relay function setting

1	2	3	4	5
Press the ← key to light the screen	Press ← → to find the System Settings menu	Press ↓ to switch to advanced Settings	Press ↵ Open the current menu	Press ↓ select DO1, and press Confirm. The data flashes,enters the editable state
				

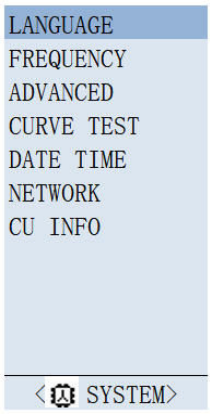
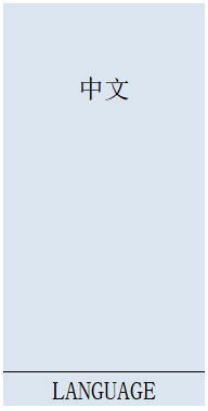
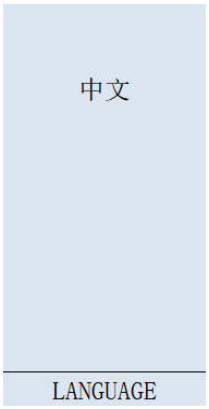
6	7	8	9	10
Press ↓ to select DO1 Press ↓ ↑ select ALARM	Press OK to enter the save screen Press ← switch to yes an press OK to save the changes	Press ↓ and select I	Press ↵ Confirm Data blinks, enter editable state, select UV	Press ↵ to enter the save screen, Press ← switch to yes and press ↵ to save the changes
				

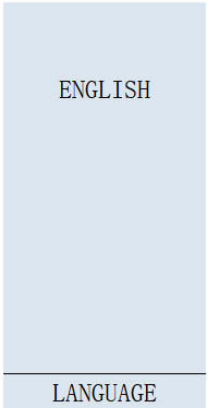
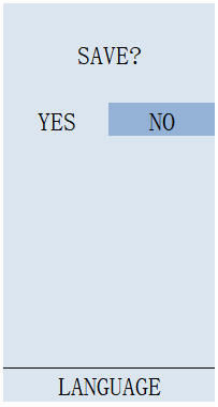
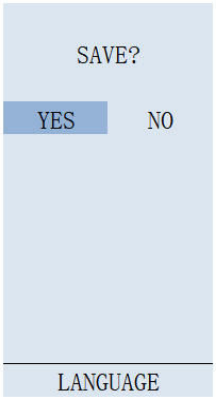
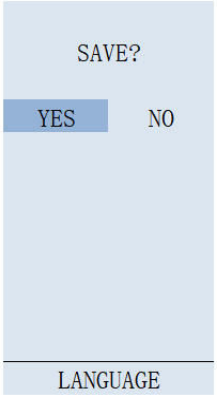
5.8 Protection setting operation

Step	1	2	3	4
operation	Press ← Light up the screen	Press ← → Switch to the Protection menu	Press ↓ Selective short delay	Press ↵ The short delay menu opens
example		LONG TIME SHORT TIME INST GF SUM GF CT GF PREALARM MCR HSIOC RELT NEUTRAL IU < PROTECTION>	LONG TIME SHORT TIME INST GF SUM GF CT GF PREALARM MCR HSIOC RELT NEUTRAL IU < PROTECTION>	MODE TRIP Ir(A) 3200 Isd(*Ir) 1.5 Isd(A) 4800 tsd(ms) 100 I2t OFF SHORT TIME

5	6	7	8	9
Press ↓ Multiple selection parameter Press ↵ If the data blinks, you can enter the editing state	Press ↑ Select a multiple of 2.0	Press ↵ Go to the save screen	Press ← Select "Yes"	Press ↵ Save the modified parameter
MODE TRIP Ir(A) 3200 Isd(*Ir) 1.5 Isd(A) 4800 tsd(ms) 100 I2t OFF SHORT TIME	MODE TRIP Ir(A) 3200 Isd(*Ir) 2.0 Isd(A) 4800 tsd(ms) 100 I2t OFF SHORT TIME	SAVE? YES NO SHORT TIME	SAVE? YES NO SHORT TIME	MODE TRIP Ir(A) 3200 Isd(*Ir) 2.0 Isd(A) 6400 tsd(ms) 100 I2t OFF SHORT TIME

5.9 Modify system Setting

Step	1	2	3	4
operation	Press  Light up the screen	Press  Switch to the system Settings menu	Press  Open the language Settings menu	Press  You can enter the editing state
example				

5	6	7	8
Press  Select the desired language	Press  Go to the save screen	Press  Select "Yes"	Press  save successfully
			

6 Safety locks and interlocking devices

 warning

Only qualified personnel are allowed to install, operate, and

maintain all electrical equipment

 warning

Before safely locking and interlocking devices, ensure that the circuit breaker is tripped,

indicated as OFF, and the main spring energy storage is fully released.

 Be careful

When moving the circuit breaker, avoid injuries caused by moving parts.

 Be careful

Ensure that the circuit breaker and its accessories do not exceed the specified rating.

A wide range of locking and interlocking accessories are available.

6.1 Circuit breaker panel safety lock

6.1.1 Circuit breaker drawer position padlock A

The standard frame 3 circuit breaker is equipped with a circuit breaker safety padlock device, which allows users to install a padlock to lock the circuit breaker when the circuit breaker contacts break. When the padlock is installed in place, it can prevent all attempts to close the circuit breaker (either electrically or manually). The circuit breaker padlock device allows the use of up to three padlocks with buckle sizes ranging from 3 to 8mm.

If you want to mesh the device and install a padlock:

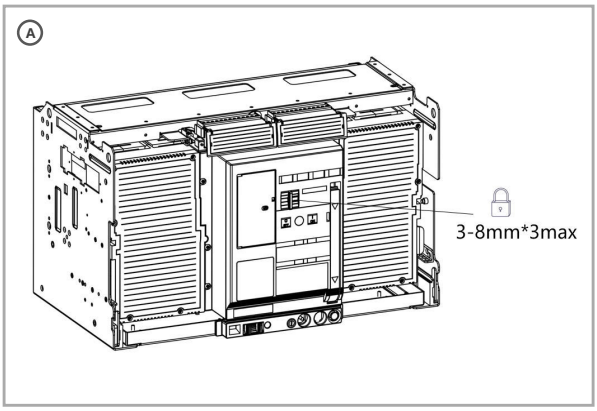
1. Push the breaker OFF button until the padlock rod begins to move and protrude slightly from the breaker panel;

2. Pull out the padlock lever and fully deploy it;

3. Insert the padlock into the rod hole;

If you want to open the locking device, remove the padlock directly and push the padlock rod back to flush with the circuit breaker panel;

The circuit breaker can be operated normally now.



6.1.2 Circuit breaker security key lock B

An optional feature, up to 4 locking devices can be installed on the frame 1/2/3 type circuit breaker panel, each locking device can lock the circuit breaker when the circuit breaker contacts break. When the lock is installed in place, it can prevent all attempts to close the circuit breaker (either electrically or manually). The circuit breaker key lock device is provided together with two attachments installed in factory.

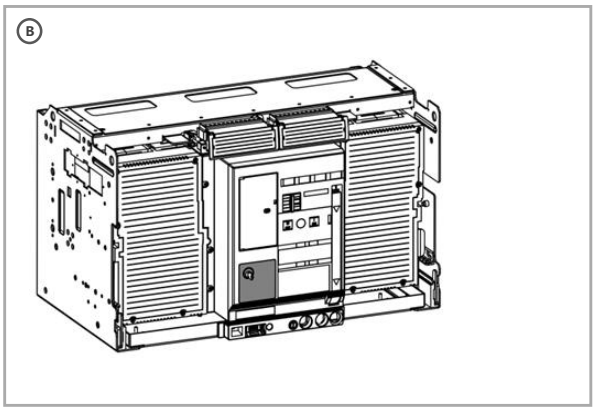
If you want to mesh the device and lock the circuit breaker:

1 .Push the b reaker OFF button until the padlock rod begins to move and protrude slightly from the breaker panel**;** (Figure 3.1);

2. Rotate the key counterclockwise and remove it.

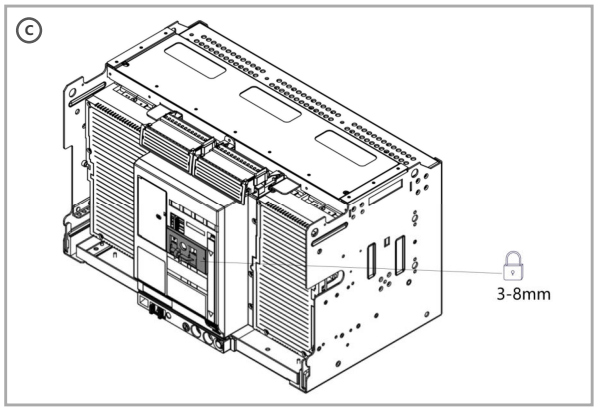
If you want to open the locking device, then reinsert the key and rotate it clockwise; After that, make sure the padlock rod is flush with the circuit breaker panel;

The circuit breaker can be operated normally now.



6.1.3 Opening and Closing button padlock C

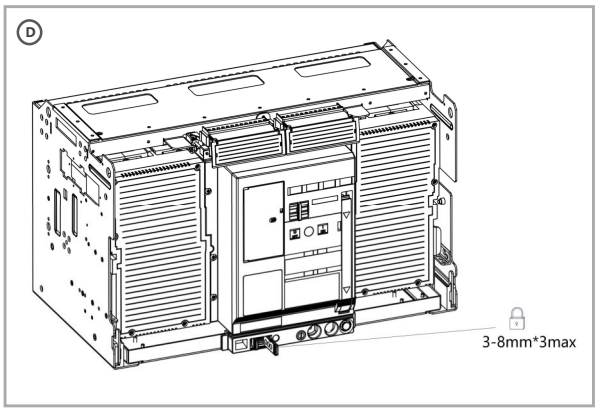
An optional feature that allows users to install a padlock that denies unauthorized access to ON and OFF located on the circuit breaker panel; The button padlock device allows the use of a maximum of one padlock with a buckle size of 3 to 8mm; You can select one or two buttons for padlock locking by moving a single transparent window up or down and accessing one or two locking rod holes.



6.1.4 Standard drawer circuit breaker interlock D

The withdraw and equipment moving parts are equipped with interlocking devices toprevent the circuit breaker closing. Except in the TEST and (connect) positions,the device will also break the main contact before the moving part leaves or approaches the —●— (connect) position.

When the main contact of the circuit breaker is closed, the second —●— interlocking device can prevent the device from inserting the rocking handle into the frame hole.



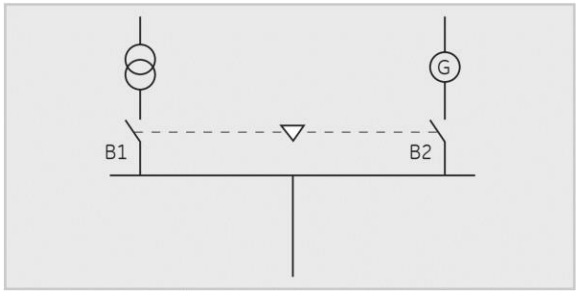
6.2 Mechanical interlocking

The device is divided into two parts, mounted on the fixed circuit breaker and the drawout circuit breaker side mechanism, this part can only be pre-installed in the factory. Flexible steel cables that can be installed on site are available in lengths of 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, and 4.0 meters.

Any kind of interlock logic can be realized on different forms of circuit breakers, fixed/ withdrawable, different circuit breaker poles, different rated current circuit breakers can be realized between 2 or 3 circuit breakers.

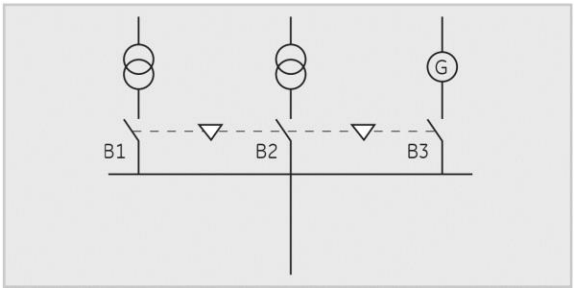
Interlock between two circuit breakers

Interlock type A, only one circuit breaker is allowed to close at the same time between two circuit breakers (B1 or B2). Each circuit breaker requires A type A interlocking mechanism installed in the factory and requires two flexible steel cables.



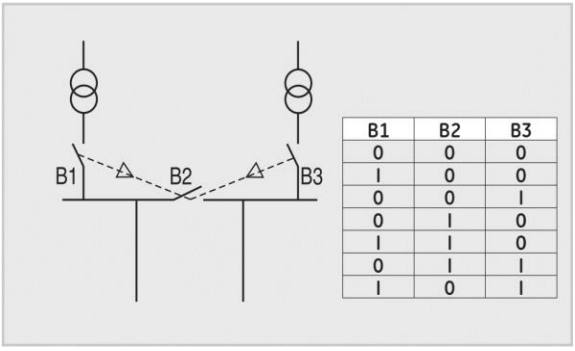
Interlock type B between three circuit breakers

Interlock type B, only one of the three circuit breakers is allowed to close at the same time (B1, B2, or B3). Each circuit breaker requires factory installation of a B-type interlock mechanism and six flexible steel cables.



Interlock type C between three circuit breakers

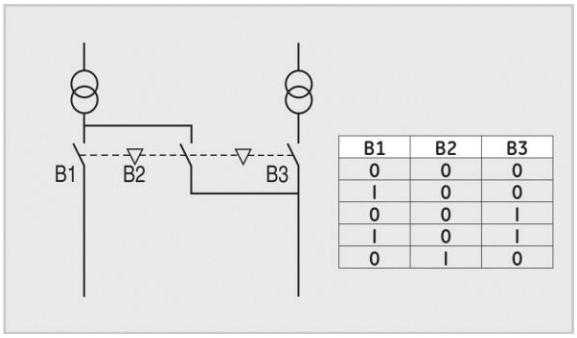
Interlock type C, only one or two of the three circuit breakers are allowed to close at the same time (see diagram). Each circuit breaker requires a C-type interlocking mechanism installed in the factory and requires six flexible steel cables.



B1	B2	B3
0	0	0
I	0	0
0	0	I
0	I	0
I	I	0
0	I	I
I	0	I

Interlock type D between three circuit breakers

Interlock type D, only one or two of the three circuit breakers are allowed to close at the same time (see diagram). Circuit breakers B.1, B.3 need to be installed in the factory type A interlocking mechanism, circuit breakers B.2 need to be installed in the factory type D interlocking mechanism, need four flexible steel cables.



B1	B2	B3
0	0	0
I	0	0
0	0	I
I	0	I
0	I	0

7 Accessories

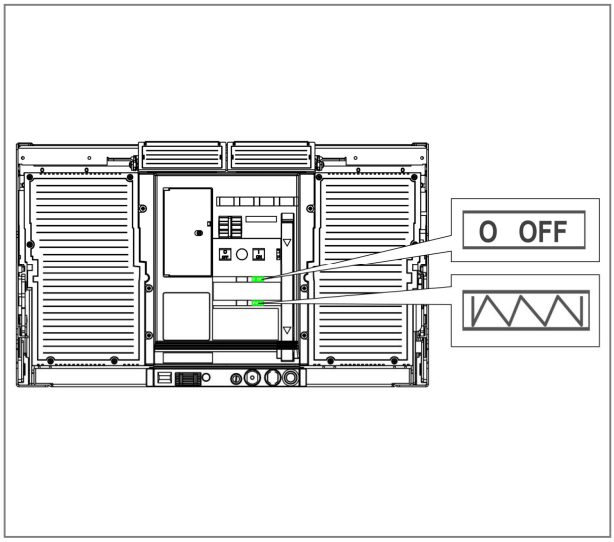
warning

Ensure that only qualified personnel install, operate, repair and maintain all electrical equipment. Avoid injuries caused by moving parts when moving circuit breakers.

When conditions permit, use a cable/bus lockable grounding device (optional) to provide additional safety during system maintenance.

Danger

Before installing accessories, ensure that the circuit breaker has tripped, the status is indicated as OFF, and the main spring energy storage has been fully released.



7.1 Instructions

General specification

M-PACT series circuit breakers can be equipped with various types of accessories, most accessories can be factory installed and field installed. The various accessories that can be installed in the field are designed with ease of installation in mind and are 'click fit' or require a minimum number of fasteners.

content

This section begins with a pictorial overview of available accessories and is then divided into sections covering internally mounted accessories, devices and sensors.

Caution: Ensure that the circuit breaker and its accessories are used within the specified rating to avoid damage to the circuit breaker and accessories. When taking out circuit breakers from the drawer, use a specially specified circuit breaker trolley (optional accessory).

7.2 Coil and Trip

In order to install one or more releases or coils, the front cover of the circuit breaker must be removed and then reinstalled in its original position

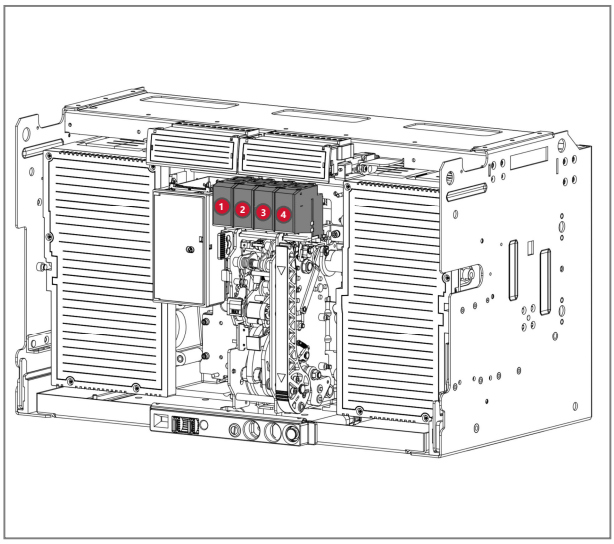


Figure 7-1

Remove the panel/front cover from the circuit breaker

1 Remove the padlock if it is fitted. Switch the circuit breaker to OFF (opening);

2. As shown in Figure A, use a screwdriver to loosen the screw. As shown in Figure B, press down on the manual energy storage handle

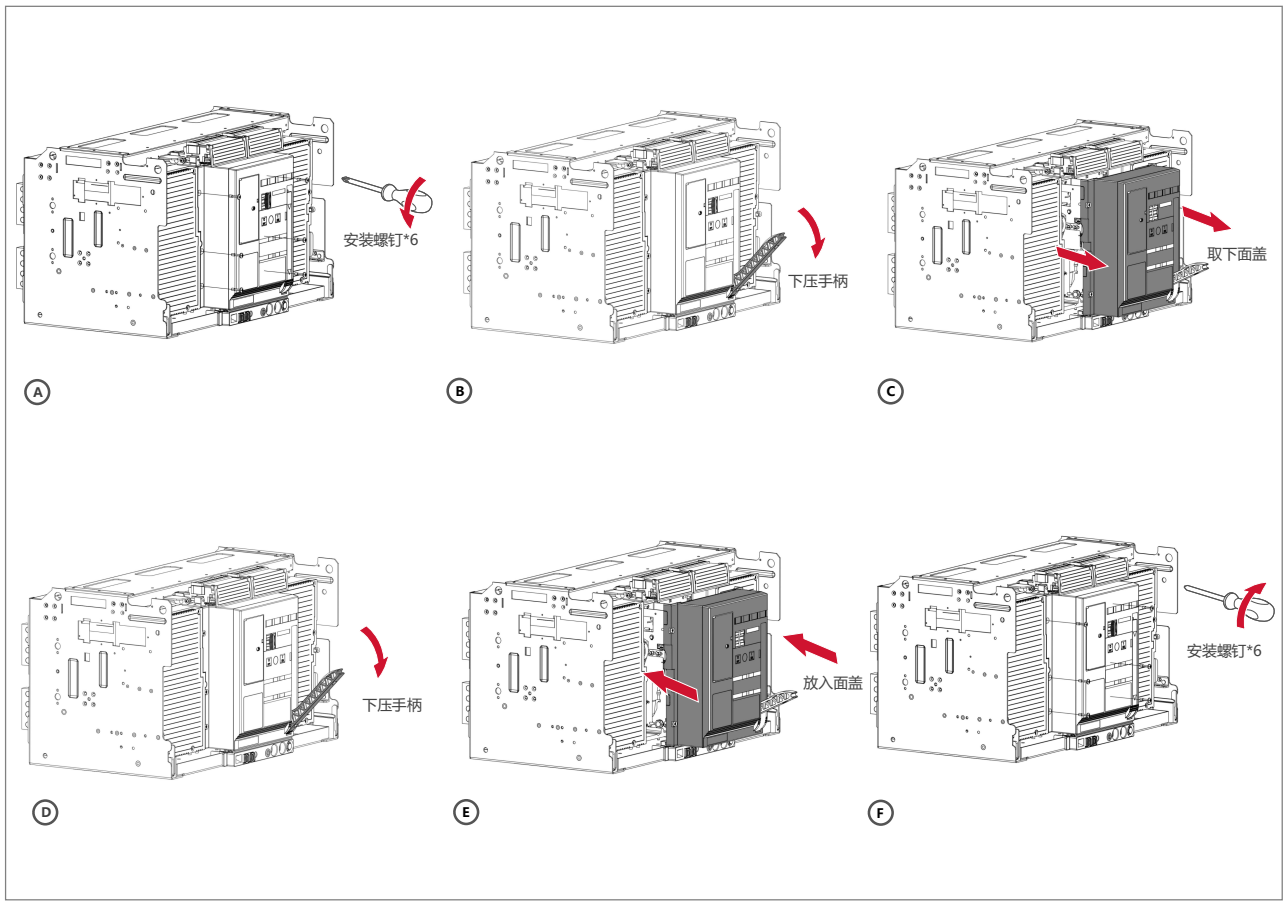
3. As shown in Figure C, slide the front cover over the handle and remove it.

Install the panel/front cover to the circuit breaker

1. As shown in Figure D, turn the energy storage handle down, slide the front cover over the handle according to Figure E to equip it on the frame.
2. Make sure the panel is properly aligned with the circuit breaker's trip device and padlock.
3. As shown in Figure F, use a screwdriver to secure the 6 mounting screws of the panel to the frame. The maximum torque used is 3N·m.

Tips:

After removing the breaker cover, all release/coils are installed and assembled into separate locations through the front of the breaker. The possible combinations/maximum combinations can be found in section 7.13.



7.2.1 Closing the coil

The closing coil (CC) releases energy stored in the spring energy storage mechanism when energized. It is used to remotely close the circuit breaker and ensure that the main contact of the circuit breaker closes quickly.

Closing coils can be provided at any time, just like factory installed devices or devices with a wide voltage range that can be easily assembled on site.

Installation of closing coils

1. The circuit breaker should be safely isolated and fully switched to the off position;

2. Remove the panel according to the instructions;

3. As shown in Figure 7-1, the closing coil is installed at the third position on the top plate of the mechanical device.

4. Tilt the coil forward as shown in Figure A, and fasten the front hook into the top support plate of the mechanical device as shown in Figure B;

5. Tilt the coil backward, as shown in Figure C, until the rear hook is fastened into the slot on the top support plate of the mechanical device as shown in Figure D;

6. After installing the closing coil on the top plate of the mechanical device, connect the input line assembly plug to the position A9-A10 marked on the secondary disconnection device;

7. Ensure that the connector is secure and the plug is inserted into the correct terminal;

8. Assemble the panel according to the instructions.

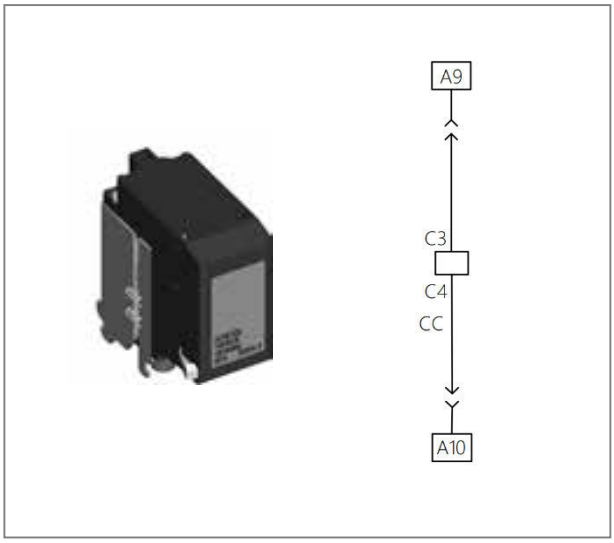
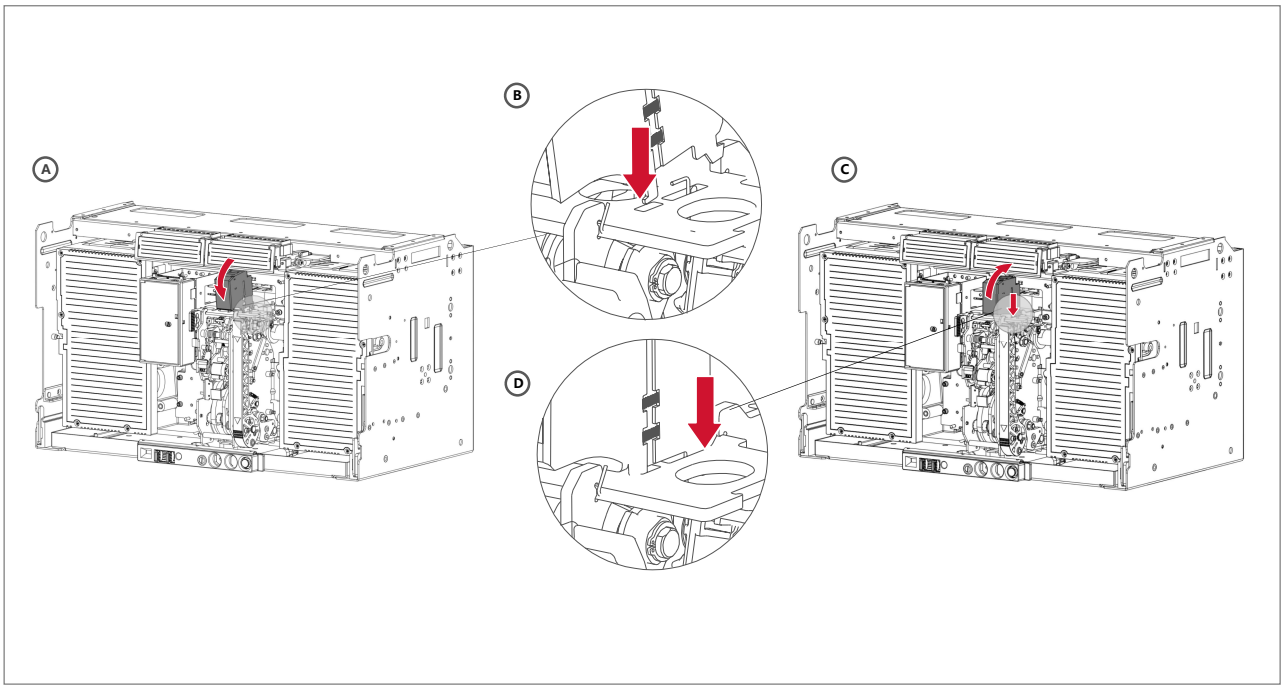


Table 7.1 Rated working value of closing coil

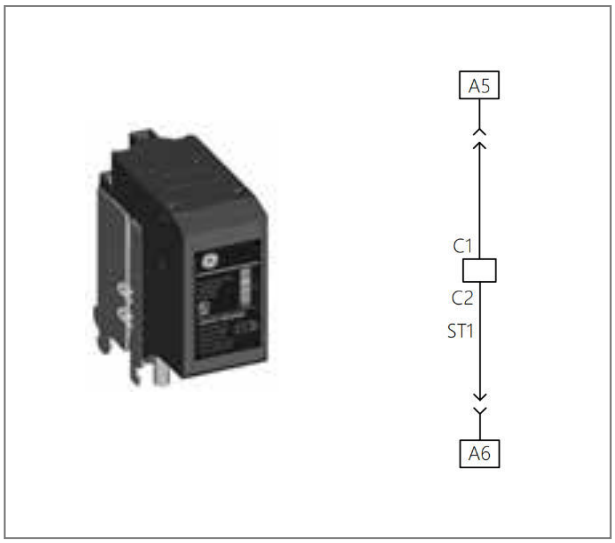
voltage classes	operating voltage range	type
24V DC	21-26 VDC	GCCN024D
110-130V AC/DC	94-143 VDC / VAC	GCCN120
220-240V AC/DC	187-254 VDC / VAC	GCCN240
250-277V AC	213-275 VAC	GCCN277
380-415V AC	323-456 VAC	GCCN400A



7.2.2 Shunt trip

Energizing the shunt trip (ST) through a field or remote input can activate the circuit breaker device immediately, ensuring a quick disconnect operation.
When the circuit breaker is disconnected, the auxiliary contacts ensure that the release is disconnected.
Shunt trips are readily available, as are factory-installed units or easily assembled on-site units with a wide voltage range.

Note: This accessories is a "voltage on/no closing" device that can be used for interlocking circuit breakers. Circuit breaker cannot be closed as long as the trip is powered on (electric/manual)



Installation of shunt trip device

1. Remove the panel according to the instructions.

2. The shunt release is installed at the first or fourth position of the top plate of the mechanical device;

3. Tilt the coil forward and snap the front hook into the top support plate of the mechanism, as shown in Figure A. Tilt the device backwards, as shown in Figure B, until the rear hook snaps into the slot on the top support plate of the mechanism, as shown in Figure C;

4. After the shunt release is mounted on the top plate of the mechanism, connect the input line assembly plug to the A5/A6 or A12/A13 marked on the secondary disconnection device;

5. Ensure that the connector is secure and the plug is inserted into the correct terminal;

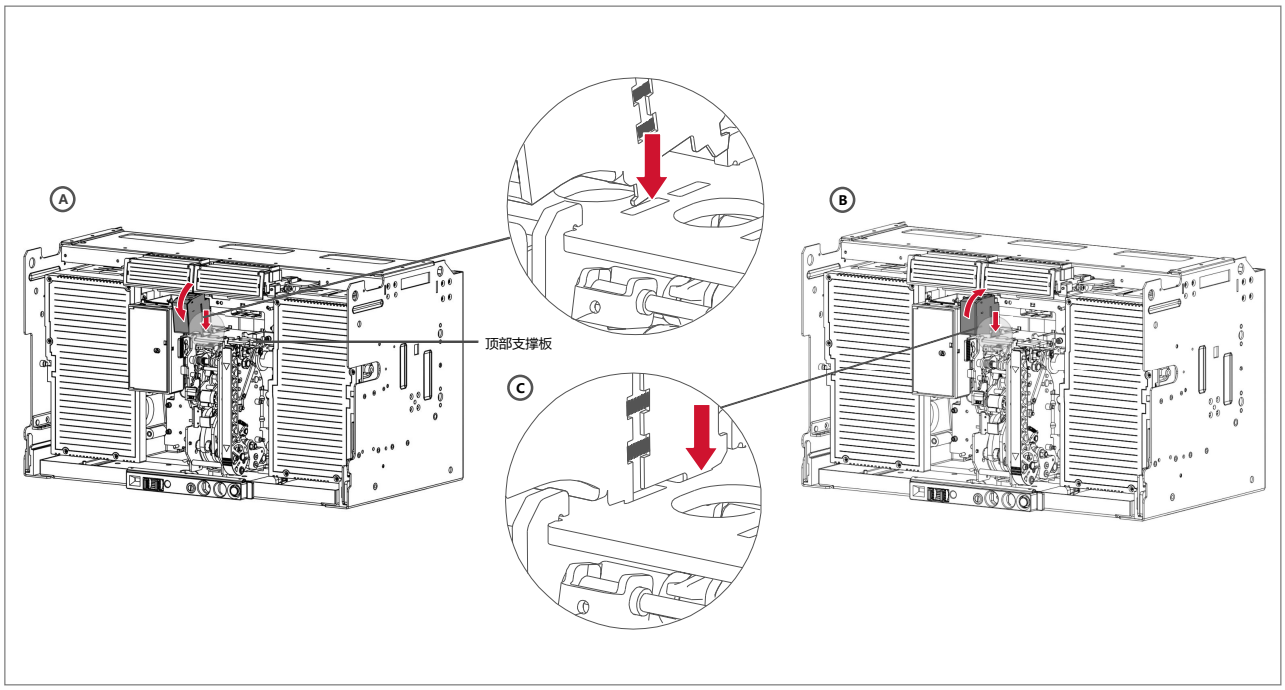
6. Assemble the panel according to the instructions.

Shunt trip operating characteristics

- Working cycle: 2 times per minute
- Power: 350VA
- Steady state: 50VA

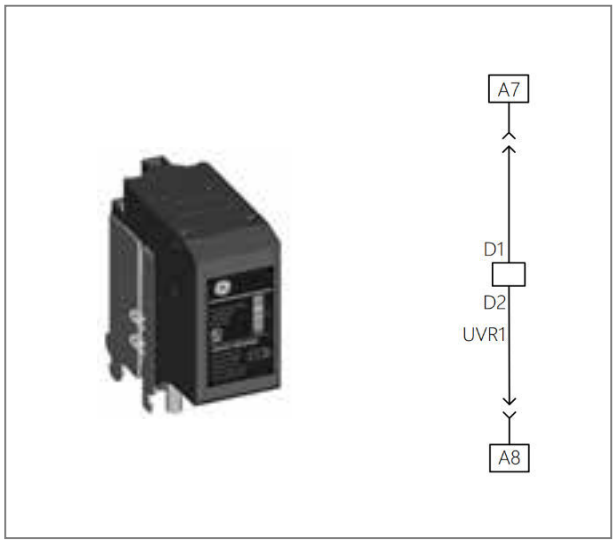
Table 7.2 shunt trip device specifications

control voltage	operating voltage range	Type
24V DC	21-26 VDC	GSTR024D
110-130V AC/DC	94-143 VDC / VAC	GSTR120
220-240V AC/DC	187-264 VDC / VAC	GSTR240
250-277V AC	213-275 VDC / VAC	GSTR277
380-415V AC	323-456 VAC	GSTR400A



7.2.3 Under-voltage trip

An under-voltage release (UVR) device activates a circuit breaker trip when the line voltage drops below a specified threshold, a device designed to disconnect the circuit breaker and prevent it from closing when the system voltage does not fall below the corresponding rating. M-PACThas a short delay device to prevent unexpected tripping during short power outages.



Note: This accessories is a "no voltage/no closing" device that can be used for interlocking circuit breakers. The circuit breaker cannot be closed (either manually or electrically) unless the undervoltage release is energized above the required threshold.

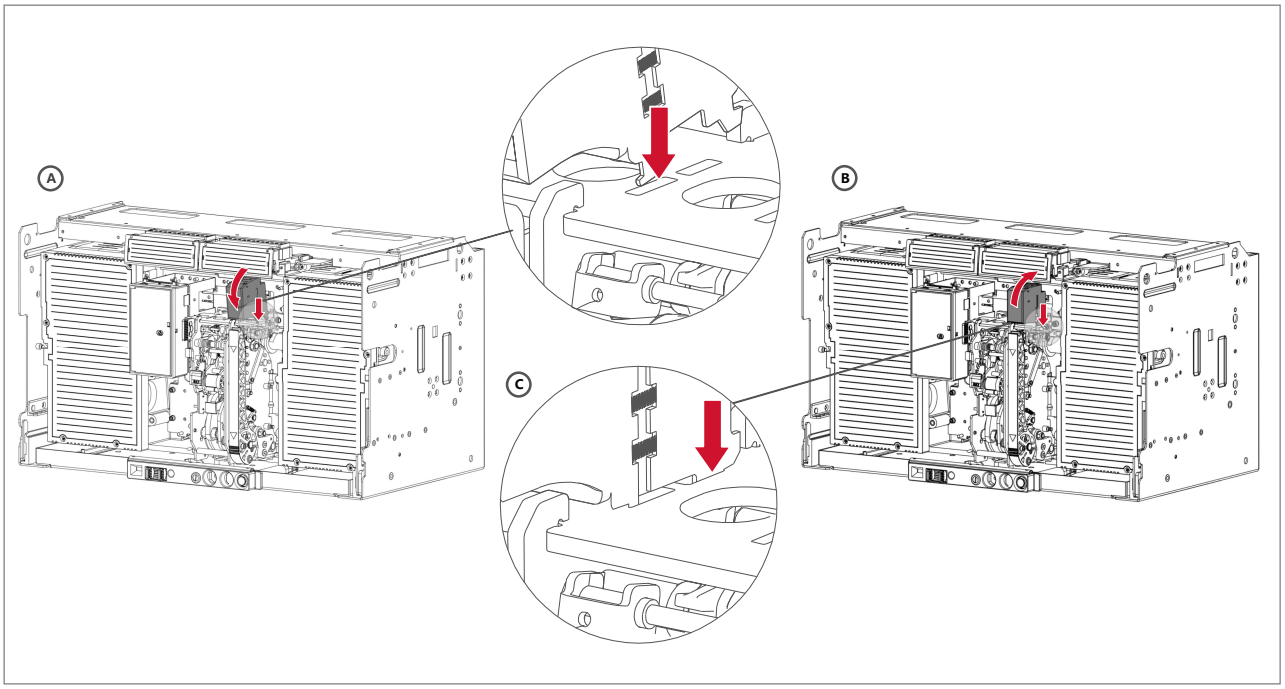
Installation of undervoltage release

1. Follow the instructions to remove the cover;
2. Accessories are installed in the second or fourth position of the top plate of the mechanical device;
3. Tilt the coil forward and fasten the front hook into the top support plate of the mechanism, as shown in Figure A.
4. Tilt the coil back, as shown in Figure B, until the rear hook snaps into the slot on the top support plate of the mechanism.
5. After the undervoltage release is mounted on the top plate of the mechanism, connect the input line assembly plug to the position A7/A8 or A12/A13 marked on the secondary disconnection device.
6. Ensure that the connector is secure and plugged into the correct terminal.
7. Assemble the panel according to the instructions.

- Working cycle: 2 times per minute
- Surge Power: 50VA(AC) 350W (DC)
- Steady state: 60VA (AC)50W (DC)

Table 7.3 Specifications of the undervoltage trip device

control voltage	operating voltage range	Tpye
24V DC	21-26 VDC	GUVT024D
110-130V AC/DC	94-143 VDC / VAC	GUVT120
220-240V AC/DC	187-264 VDC / VAC	GUVT240
250-277V AC	213-275 VDC / VAC	GUVT277
380- 415V AC	323-456 VAC	GUVT400A



7.2.4 Remotely reset coil

The remote reset coil (RRC) is used to reset the circuit breaker remotely. When the remote reset coil is powered on, the remote reset mechanism inside the drive control unit installation bracket is used to achieve the reset function of the control unit.

If you need to reset the circuit breaker remotely, you can turn the panel. The selection button is set to manual reset, and the remote reset coil is equipped to realize the function of circuit breaker trip reset.

This device can be pre-installed in the factory, and the coil is a snap design, and the installation procedure is as follows:

Shunt trip operating characteristics

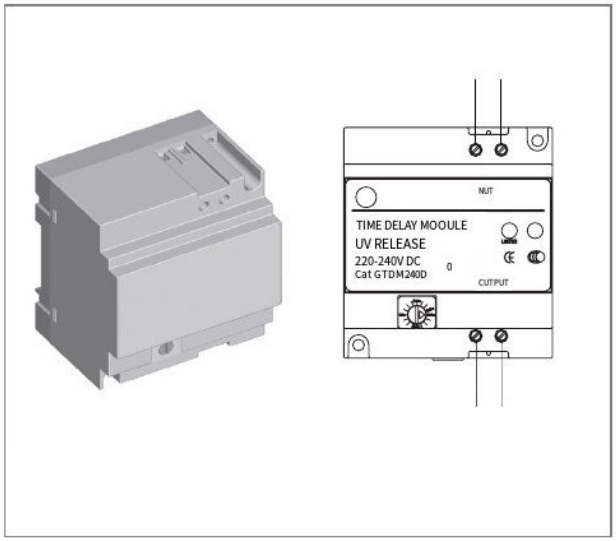
- Power: 350VA
- Steady state: 50VA

Table 7.4 Specifications of remote reset coils

control voltage	operating voltage range	Tpye
24 VDC	21-26 VDC	GRRC024D
110-130 VDC/VAC	94-143 VDC / VAC	GRRC110
220-240 VDC / VAC	187-264 VDC / VAC	GRRC230

7.3 Under-voltage time delay module

The under-voltage time delay module (TDM) is located outside the circuit breaker and can be mounted on a 35mm DIN rail or using screws to fit the holes (see Section 10.9 for details).



The use of the under-voltage release time delay module

- Must be used in conjunction with the UVR accessories installed in the circuit breaker
- TDM (time delay module) is a independent accessories
- The voltage ratings of the TDM and the UVR must be equal
- When an undervoltage fault occurs, the TDM will adjust the control voltage of the circuit breaker UVR within zero to three seconds. The voltage level supplied during the delay period is sufficient to keep the circuit breaker UVR(undervoltage release) energized
-When the delay time expires, the TDM will apply 0% of the rated voltage to the circuit breaker UVR accessory. The circuit breaker UVR will respond to undervoltage conditions and trip the circuit breaker
-The knob located at the front of the device allows users to adjust the delay time
-The scale is only marked as Min. and Max
-The adjustment value varies between 0s (minimum) and 3s (maximum)
-When the line voltage drops by 50% of its nominal value, the built-in delay time of the standard undervoltage release accessory is 50 milliseconds.

The total NON REACTION time is the time set on the TDM module plus the time set on the standard UVR release

Control voltage	Operating voltage range	Model number
110-130V DC	94-143 VDC	GTDM120D
220-240V DC	187-254 VDC	GTDM240D
110-130V AC	94-143 VAC	
220-240V AC	187-254 VAC	
250-277V AC	213-275 VAC	
380-415V AC	323-456 VAC	GTDM400A

The operating characteristics of the undervoltage release

- Working cycle: 2 times per minute
- Delay range: 0-3s
- Power: 350VA(AC); 350W (DC)
- Steady state: 60VA (AC); 50W (DC)

7.4 Energy storage motor

In order to charge the energy storage mechanical device electrically, a motor energy storage mechanical device is provided in the equipment. This design allows for factory or on-site installation and can be used for all M-PACT circuit breakers. Easy assembly with three bolts.

When the circuit breaker is disconnected, the mechanical device automatically stores energy to the spring and allows the circuit breaker to close immediately if necessary. High speed energy storage ensures that the spring can fully store energy within four seconds.

The "spring energy storage" contact indicates the device status through remote control.

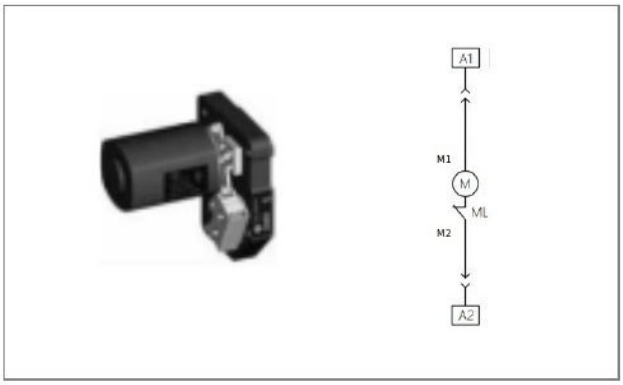


Table 7.6 Energy Storage Motor Specifications (Frame 1)

Voltage level	Operating voltage range	Model number
24-30V DC	21-26V DC	GM01024D
110-130V DC	94-143V DC	GM01110D
220V DC	213-250V DC	GM01220D
110-130V AC	187-264V AC	GM01120A
220-250V AC	213-275V AC	GMO1240A
380-415V AC	323-456V AC	GM01400A

Table 7.7 Energy storage Motor Specifications (Frame 3)

Voltage level	Operating voltage range	Model number
24-30V DC	21-26V DC	
110-130V DC	94-143V	
220V DC	DC213-250V DC	
110-130V AC	187-264V AC	
220-250V AC	213-275V AC	
380-415V AC	323-456V AC	GMO2400A

7.5 Ready to close indicator contacts

Circuit breakers equipped with electrical energy storage mechanical devices can also be equipped with ready to close indicator contacts (RTC), In most cases, this type of contact will replace the standard "Spring Energy Storage Contact" (SAC).

The ready to close indicator contacts will only operate when the following conditions are met:

->The circuit breaker is disconnected.

->The closing spring has stored energy.

->The circuit breaker is not locked/the interlocking device is in an unlocked state.

->There are no unexecuted closing commands.

->There are no unexecuted opening commands

The contacts come with a 1NO configuration and are available in both 'Signal Rated' and 'Power Rated' contact forms, which are optional.

All forms can be connected through a circuit breaker secondary disconnection device. Here, this device will replace If using 'Signal Rated' instead of 'Spring Energy Storage Contact', and by connecting the "trip device" row plug to this contact, the "spring energy storage contact" can be connected keep in the original position. The 'ready to close indicator contacts' cannot be installed on site.

The instructions provided here are only for maintenance guidance.

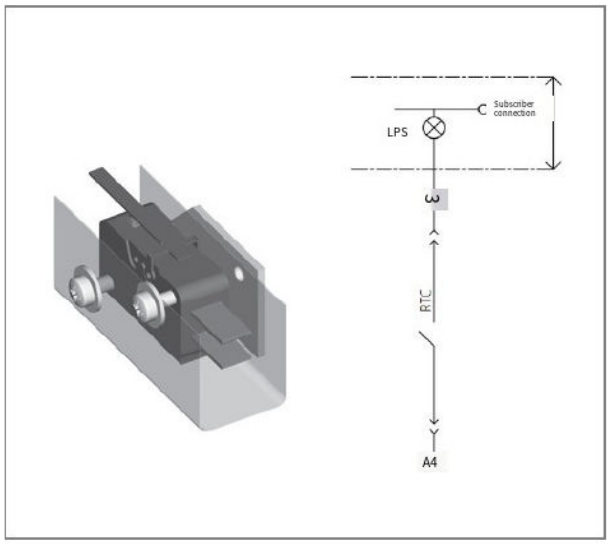


Table 7.8 Specifications of ready-to-close indicating contacts

Contact type	Model number	
	Signal type	Power type
1NO	GRTC2	GRTC1
1NC	GRTC5	GRTC4

7.6 Auxiliary contact

The auxiliary contact is designed to indicate the position of the main contact of the air circuit breaker. Each M-PACT device is equipped with a standard component consisting of 4 normally open (NO) contacts and 4 normally closed (NC) contacts, which operate simultaneously with the main contacts of the circuit breaker.

By replacing the standard auxiliary contact block, other components that can be used to increase the number of available contacts can also be used.

Auxiliary contact blocks:

Frame 1/2/3

-- Power type contacts 4NO and 4NC

-- Power type contacts 8NO and 8NC

-- Power contacts 4NO and 4NC and signal contacts 4NO and 4NC

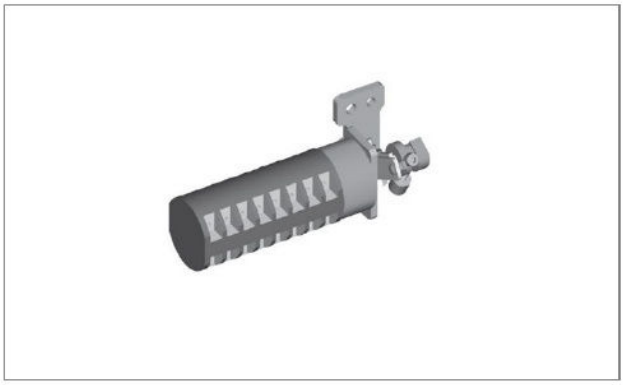


Table 7.9 Auxiliary contact specifications

Contact type	Specifications	Model number
Power type contacts	4NO and 4NC	XAUX4
Power type contact	8NO and 8NC	GAUX6
Power type + Signal type contacts	4NO and 4NC+ 4NO and 4NC	GAUX8

7.7 Alarm contact

The conversion contact installed in the circuit breaker is used to indicate the fault trip of the circuit breaker (control unit). When an air circuit breaker trips due to overcurrent, shunt release or undervoltage release operation, or any other reason, an alarm switch contact can be used to indicate this situation.

The device is provided in the form of factory installed components. The contact can only be used when the circuit breaker is adjusted to "Manual Reset".

The circuit breaker can be manually or automatically reset on the front interface of the control unit. The alarm contact of the alarm bell will only permanently change position when the control unit is in manual mode. The control unit enables users to view the cause of circuit breaker tripping (tripping cause and event record).

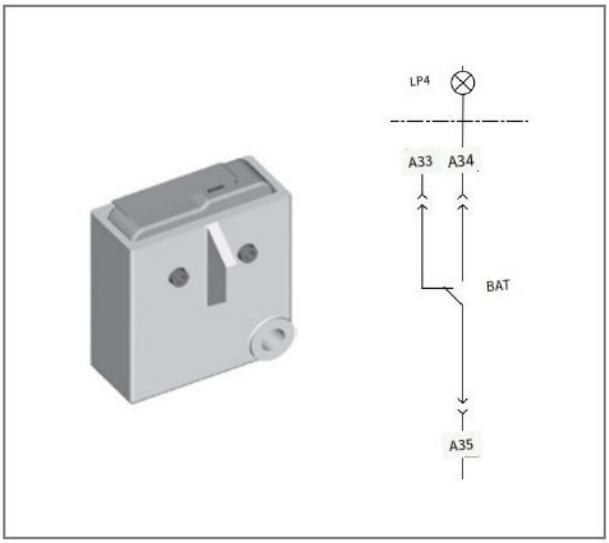
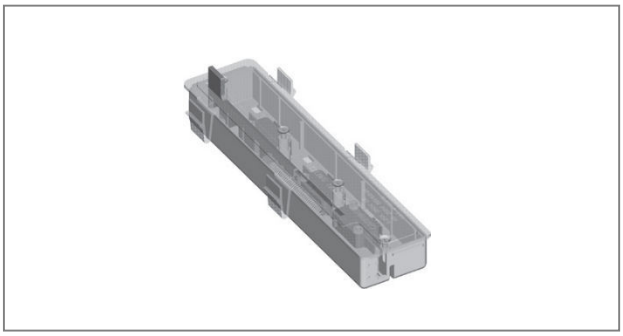


Table 7.10 Contact specifications

Contact type	Specifications	Model number
Power type contacts	1NO	GBAT1
Signal type contact	1 N O	GBATS1

7.8 Indicator contacts for drawer position

The withdrawable circuit breaker is equipped with a drawer for installation and connection.
The circuit breaker can be inserted into the drawer in moving parts mode and can be moved to one of three positions by using the swing handle: connect, test, disconnect or draw.
If you want to indicate the location of the M-PACTcircuit breaker in the drawer, you need position indicating contacts for connection, test,and disconnect positions.
The disconnect position is displayed only when the isolation distance between the contacts on the power circuit and the auxiliary circuit is at a minimum. The device is provided in two assembly forms with one or two sets of switching contacts at each position.
The draw position of the withdrawable circuit breaker indicates the contacts, which are provided as factory-installed components or devices that can be installed in the field.



Brief description:
-Three configurations are available
- The unit is equipped with 2 meters of wire, each wire coded according to the ferrule at the end.
- When the circuit breaker is completely withdrawn or removed, the device indicates DISCONNECTED.

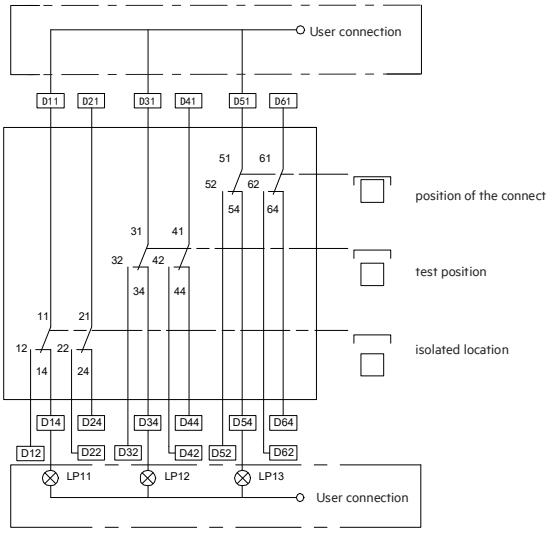


Table 7.11 The position of the drawer indicates the rated working value of the contacts

Contact type	type
	Frame 3
1 set of transfer contacts, power type	GCPS1
2 sets of transfer contacts, power type	GCPS2
2 sets of switching contacts, Power type + signal type	GCPSA

User external indication section
LP11: The circuit breaker is isolated.
LP12: the circuit breaker is tested.
LP13: The circuit breaker is connected

7.9 Operating Counter

Optional components include operating counters with set screws. This device is installed inside the circuit breaker device and will indicate and count each energy storage operation of the circuit breaker device. Pre-installed in factory after order.
Note: The "operation counter" cannot be reset (reset).

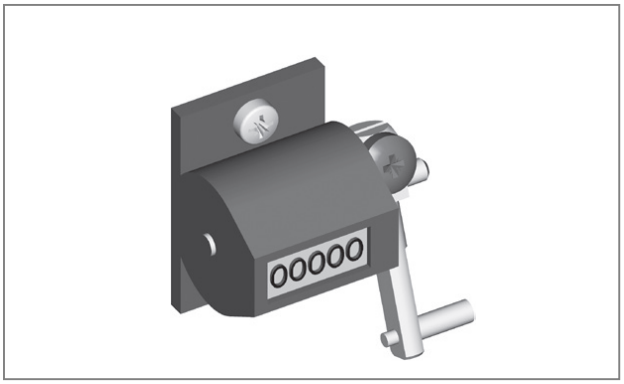


Table 7.12 Types

function	type	Order code
Record the number of opening and closing times	GMCN	408035

7.10 Neutral line current Sensor

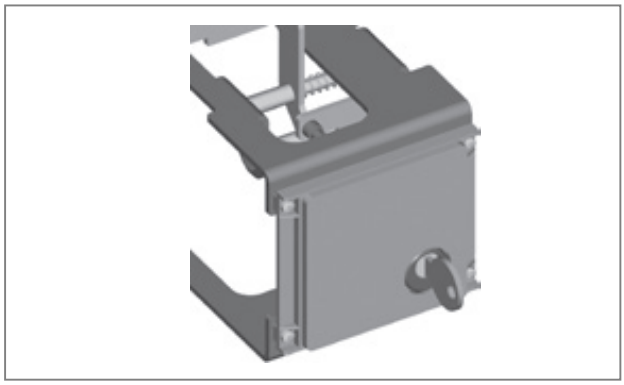
If a M-PACT device with a 3-pole configuration is used in a 4-wire network, a fourth sensor (Rogowski coil) needs to be installed in the neutral device.
As explained elsewhere in the User Manual, the sensor must also be connected to the Tripping Device input.
The unit comes with three fibreglass mounting brackets for use with multiple standard neutral bus configurations, two harness ties and 2-meter twisted pair connection leads.
The maximum length of the maximum lead is 10 m.

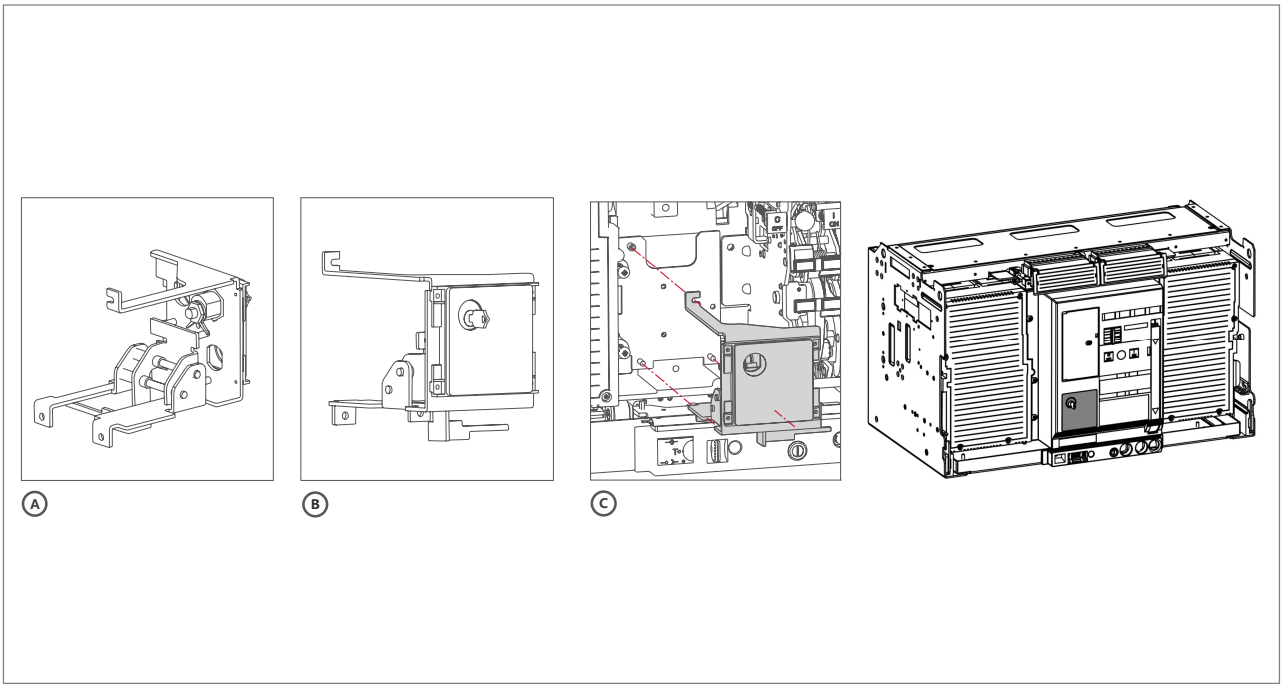
7.11 Breaker opening position key lock

Frame 3 circuit breakers can be fitted with one of two devices. Once the device is installed, one of the five key locks can be used to lock the device in the disconnect position.
Including lock core and key, the user needs to choose the model ccording to the type of lock core.

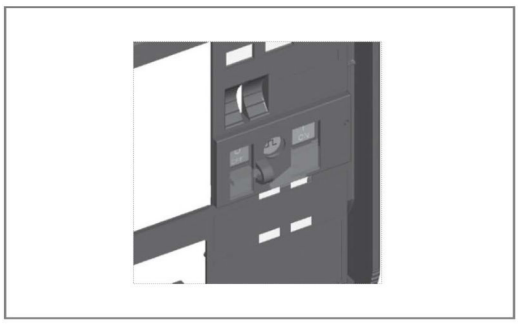
Table 7.13 Unlocking position Key lock type

function	type	ordering code
A lock	PT32412	X407970
B lock	PT33221	X407971
C lock	PT12123	X407972
D lock	PT32312	X407973
E lock	PT22131	X407974





7.12 Button padlock device



All M-PACTdevices can be fitted with a padlock device. This padlock device, when fitted to the circuit breaker panel, can be used to lock the ' ON' or 'OFF' buttons with the padlock, or to lock both buttons together. This padlock is only available in the form of accessory that can be installed on site and prevents unauthorized use of the specified buttons.

Installation of the button padlock device

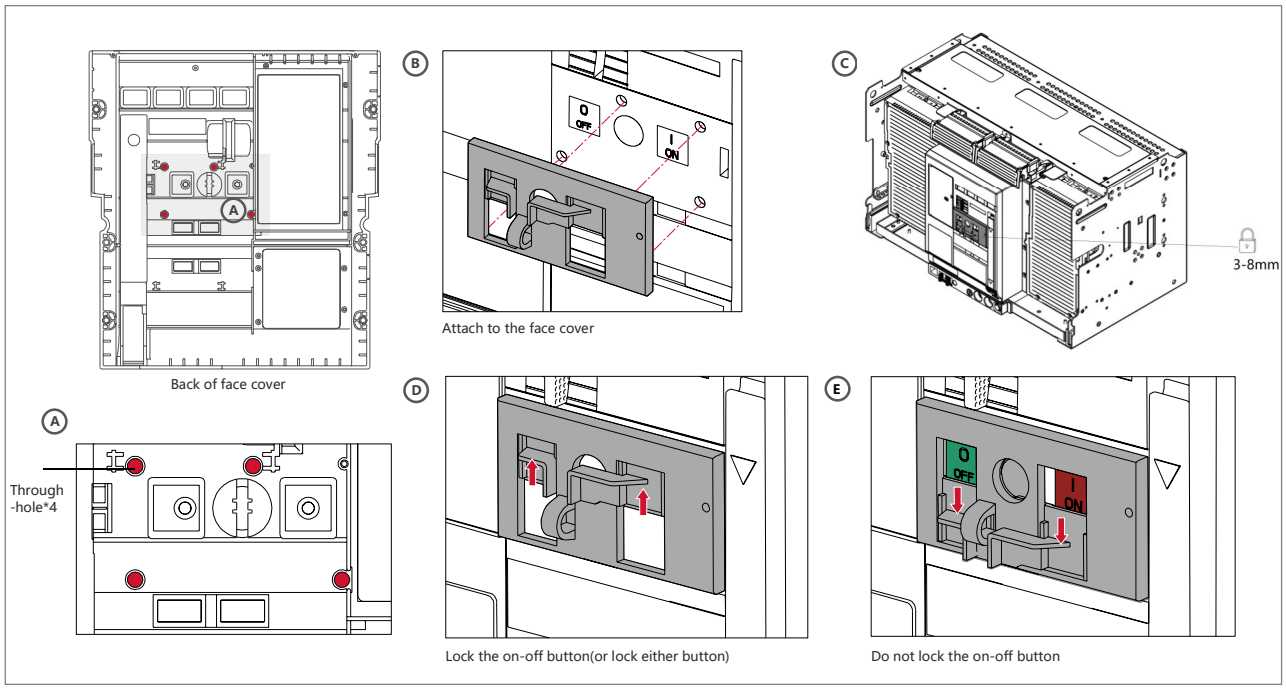
1. Remove circuit breaker panel/front cover according to the instructions;
2. As shown in Figure A, carefully remove the plastic material from the knock-out opening;
3. Install the device on the circuit breaker cover as shown in Figure B;
4 Replace the circuit breaker panel/front cover as instructed elsewhere in this section.

Operations

Slide one or both of the appropriate windows over the button as shown in figure C and install the padlock with a 3-8 mm diameter buckle as shown in figure D.

Table 7.14 Rated working value of the drawer position indicator contact

Features (Frame 3)	Type	Order code
Switch button padlock device	GPBD	408040



7.13 Combination and Quantity of Internal Accessories

Field installable M-PACT internal accessories, possible combinations and maximum number of installations

Energy storage motor	closing coil	Undervoltage trip coil *	shunt trip coil	Power type auxiliary contact NO + NC	Signal type auxiliary contact NO + NC	Alarm contact	Circuit breaker ready to close indicating contact	Energy storage spring indicating contact	Withdrawable circuit breaker position indicating contact	Button padlock for cover
1	1	2	1	8	0	1	1	0	2	1
1	1	1	2	8	0	1	1	0	2	1
1	1	1	0	8	0	1	1	0	2	1
1	1	0	1	8	0	1	1	0	2	1
1	1	2	1	8	0	1	0	1	2	1
1	1	1	2	8	0	1	0	1	2	1
1	1	1	0	8	0	1	0	1	2	1
1	1	0	1	8	0	1	0	1	2	1
1	1	2	1	4	4	1	1	0	2	1
1	1	1	2	4	4	1	1	0	2	1
1	1	1	0	4	4	1	1	0	2	1
1	1	0	1	4	4	1	1	0	2	1
1	1	2	1	4	4	1	0	1	2	1
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1	1	0	1	4	4	1	0	1	2	1
1	1	2	1	4	0	2	0	1	2	1
1	1	1	2	4	0	2	0	1	2	1
1	1	1	0	4	0	2	0	1	2	1
1	1	0	1	4	0	2	0	1	2	1

*TDM type (Undervoltage delay trip) is installed on the outside of the circuit breaker by the customer

(1) The energy storage spring indicating contact is provided at the same time as the energy storage motor
(2) Please contact your local office if necessary

8 Maintenance, Testing, and Troubleshooting

warning

Ensure that only qualified personnel install, operate, repair and maintain all electrical equipment. Avoid injuries caused by moving parts when moving circuit breakers.

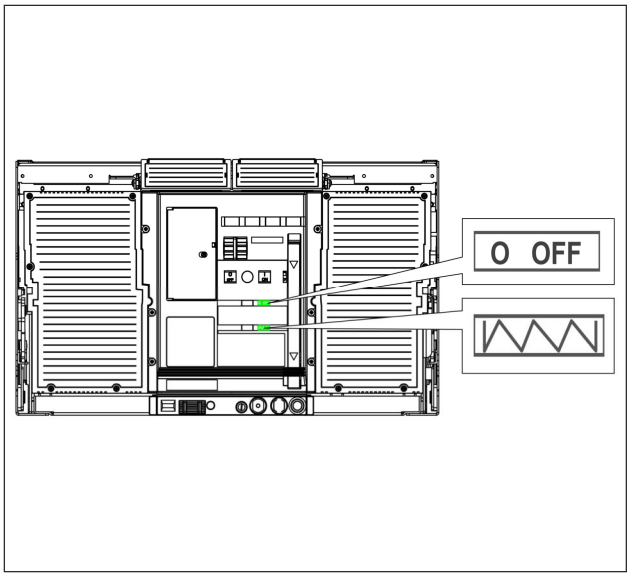
When conditions permit, use a cable/bus lockable grounding device (optional) to provide additional safety during system maintenance.

Danger

Before installing accessories, ensure that the circuit breaker has tripped and the status indicates OFF. The main spring energy storage has been fully released.

Warning

Do not lubricate auxiliary switches, signal switches, coils, motors and secondary disconnect devices. Failure to follow the instructions will result in product damage.



8.1 Maintenance

8.1.1 Progressing Check

- Normal working conditions:

Annually, or
After a short circuit failure trip,

or
after repeated high current overload failures.

- Dusty/polluted environment:

every six months,

or

After a short circuit failure trip,
or after repeated high current overload failures.

8.1.2 Cleaning procedures

1 Check exterior surfaces for dust/dirt.

2 Clean with compressed air and a dry cloth.

8.1.3 Check main mechanical device of

- Check the circuit breaker for ON (closing) and OFF (opening) action
both manually and remotely, if appropriate.

- Check trip action by undervoltage release (if installed).

- Check that all indicators are functioning properly.

- If an operating counter is installed, check the number of operations according to the circuit breaker specifications.

8.1.4 Check the drawer

- Make sure there are no chips in the drawer base.

8.1.5 Check for contact wear

- If installed: check the contact wear indicator

8.1.6 Check isolation contact (withdrawable)

1. Take out the circuit breaker from the drawer frame and place the
circuit breaker on a surface suitable for work.

2. Check the rear row contacts for signs of overheating and wear.

3. Remove the row contacts using special row tongs.

4. Clean isolated contacts and terminals with a soft and clean cloth to
remove any old grease or dirt.

5 Apply a thin layer of grease.

8.1.7 Check the power busbar

1. Check the insulation parts for cracks.
2. Clean dust/dirt with a dry cloth;
3. Tighten screws/nuts with correct torque;
4. Check terminal joints for signs of overheating and oxidation.

8.1.8 Lubrication

Make sure all metal and metal friction surfaces are kept lubricated:

1. Remove old lubricants and dirt;
2. Apply Molecote 4700;
3. Wipe off excessive lubricant.

8.2 Tests

Control unit tests:

1. Use the control unit test box (optional accessory) to test the breaker operation based on the selected protection settings.

2. When the control unit is tripped by the test box, continuously check the mechanical tripping alarm device (if installed).

3.If installed: continually check installed units with or without external sensors and/or connected ground fault protection.

8.3 Troubleshooting

8.3.1 Breaker Troubleshooting Guide

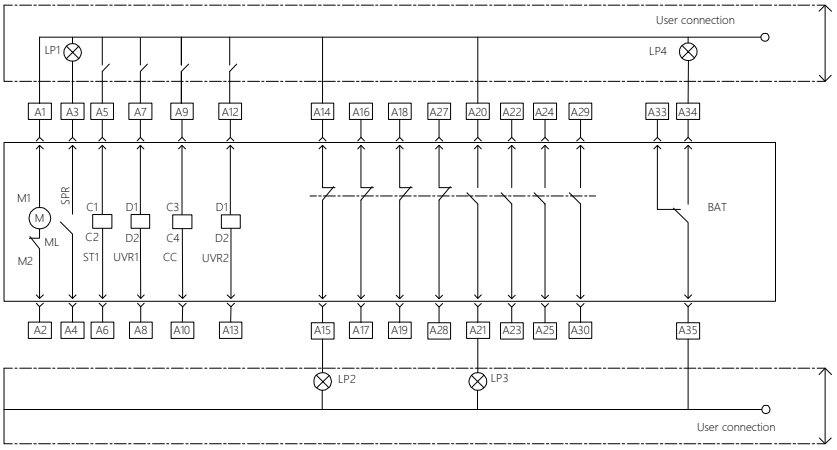
list	Fault name	possible reasons	solution
1	The circuit breaker does not close	The circuit breaker is between the (Connect), TEST, (test), and (disconnect) positions. -The control unit is not reset, -an undervoltage release is installed but not energized, - an interlock is installed -inserted the crank handle	Swing the circuit breaker to the (Connect), TEST(test) or (disconnect) position, remove the swing handle and close the breaker - Press the orange button on the control unit and close the circuit breaker. - Energize the undervoltage release and close the circuit breaker - Remove the interlock - Remove handle and close circuit breaker - Check the operating diagram (Section 1.4) and trip the relevant circuit breakers
2	Disconnect the circuit breaker immediately after closing	- The control unit set an incorrect value -The remote Rogowski coil is incorrectly installed	- Ensure that protection limit Settings are appropriate for system load. Make sure the input is set to no signal normally closed trip - Reposition the coil
3	The energy storage motor cannot store energy automatically	- Ensure that the motor actuator is installed	-- Install the motor actuator
4	The closing coil or undervoltage release does not work	Ensure the correct polarity of the secondary isolation contact connections	-- Refer to the wiring diagram (see section 1.3)
5	The circuit breaker cannot be shaken into the rack	- Ensure that the circuit breaker is fully pushed from the maintenance position to (disconnect) position - Roll drive is not in (off) position	-Push the circuit breaker into the off position, -Ensuring that the shake drive is in the (off) position
6	Unable to insert swing handle	- The key lock is installed	- Reset the misinserted function
7	Circuit breaker does not enter (disconnect) position	- Incorrect insertion function Settings are incorrect - The circuit breaker is incorrect for a given rack	- Make sure the circuit breaker fits the drawer

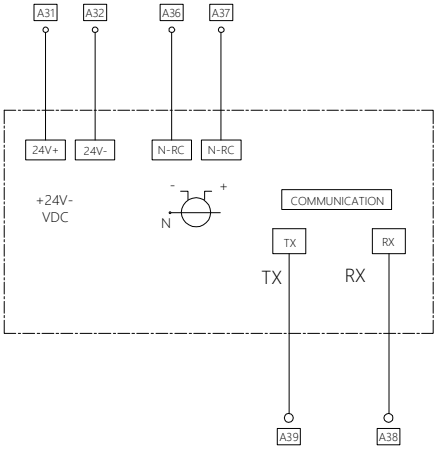
8.3.2 Control Unit Troubleshooting Guide

list	fault description	possible reasons	elimination methods
1	If no external power supply is available, the display is not displayed after you press the left key.	Lithium battery is dead or passivated	change the battery
2	Switch display red screen, can not be eliminated	After the trip, the confirm key is not pressed to reset.	Go back to the main page and press the Confirm button to reset
			If the confirmation button cannot be restored, power on the control unit again or contact the manufacturer
3	The control unit is not displayed	No external 24V input	Any one of the four reasons can light up the display of the control unit
		The single-phase load current is lower than 20% of the rated current	
		The USB port is not powered	
		Lithium battery low or passivation	
4	USB no communication	The USB device is not plugged in	Check whether the USB port is reliably connected
		Communication parameters setting error	Check whether the communication setting is "19200,8,N,1"
		The computer driver is not installed	Check whether the computer has automatically identified the device, which is the CH340 device by default. Windows 10 and above computers will automatically recognize
5	The current reading is inaccurate	The current ratio is set incorrectly	Contact the manufacturer to check the ratio Settings
6	The voltage reading is inaccurate	The voltage ratio is set incorrectly	Contact the manufacturer to check the ratio Settings

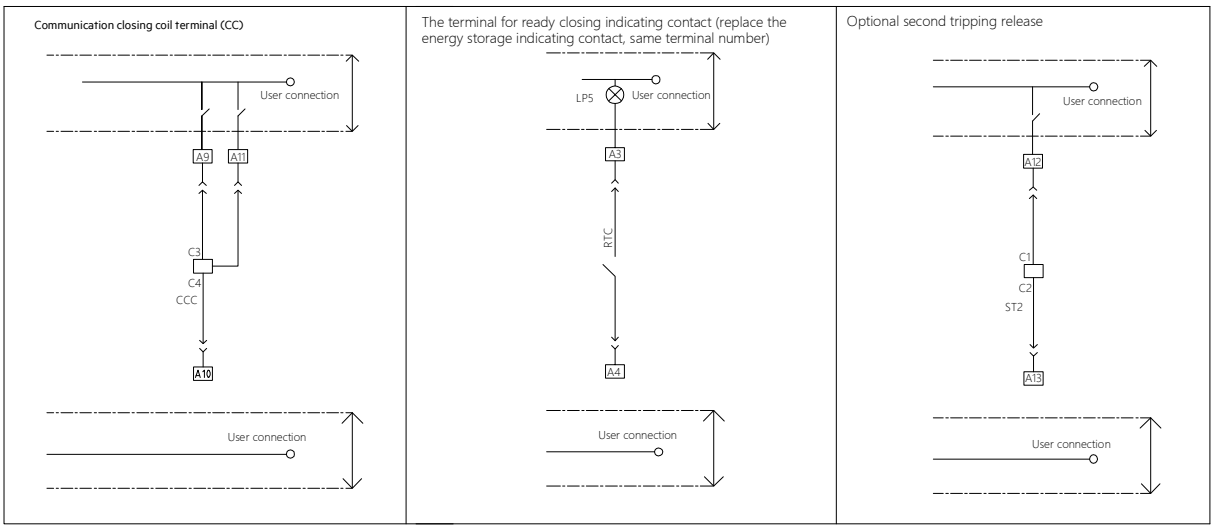
9 Secondary wiring diagram

9.1 Standard Wiring Diagram of Terminal A





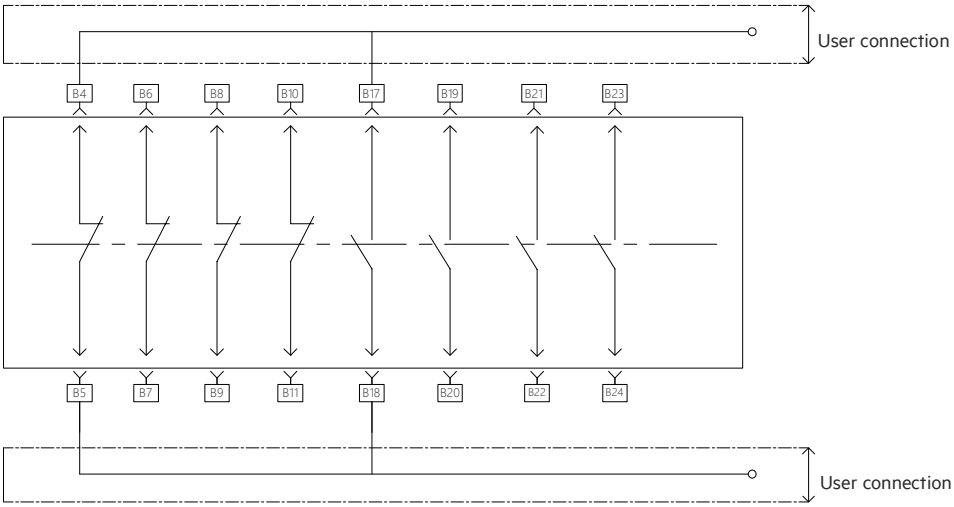
9.2 Optional Wiring Diagram of Terminal A

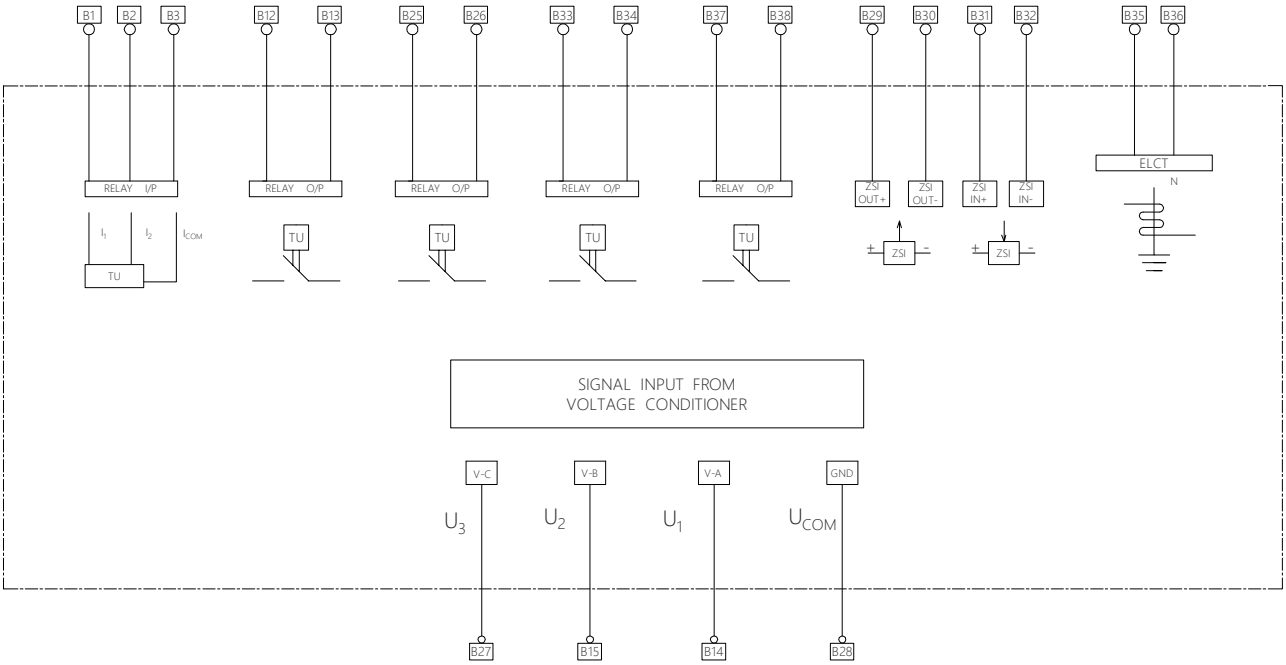


Symbol description:

CC: closing coil	CCC: communication closing coil
ST: shunt release	24V+/24V- : External auxiliary power module of the control unit
UVR: undervoltage release	N-RC: External Rogowski coil for neutral wire
SPR: spring energy storage	RXD: Communication port
RTC: ready to close	TXD: Communication port
M: energy storage motor	A14-A19, A27-A28: Auxiliary switch, normally closed contact
BAT: alarm switch	A20-A25, A29-A30: Auxiliary switch, normally open contact

9.3 Standard Wiring Diagram of Terminal Block B





Symbol description:

ELCT: Enter the ground point CT

RELAY O/P: RELAY output terminal

RELAY I/P: Relay input terminal

V-A/V-B/V-C: Voltage transmitter input

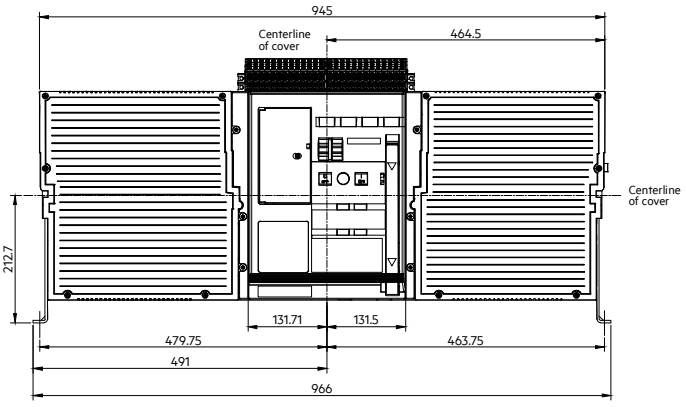
GND: Voltage grounded

ZSI OUT: Zone interlock protection Output terminal
ZSI OUT: Zone interlock protection Input terminal
B4-B11: Auxiliary switch normally closed contact
B17-B24: Auxiliary switch normally open contact

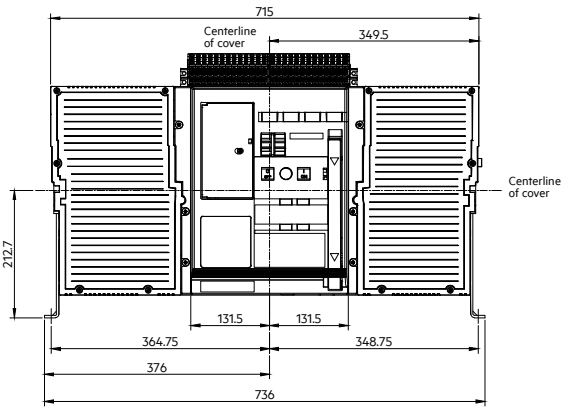
10 Dimensions

10.1 Frame3， Fixed type

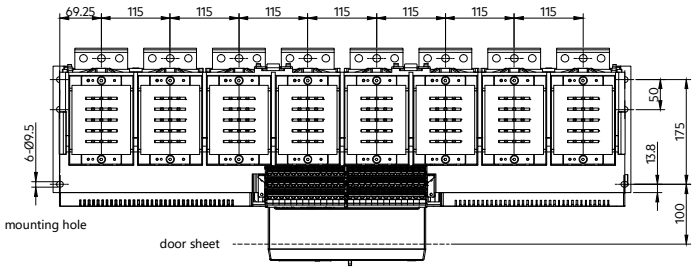
4P,front view



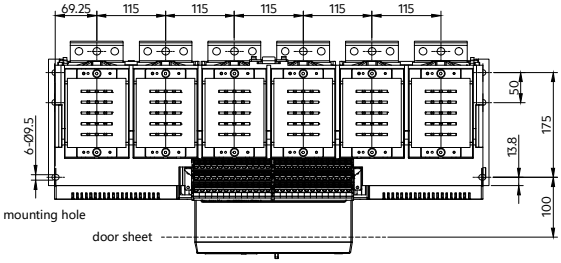
3P,front view



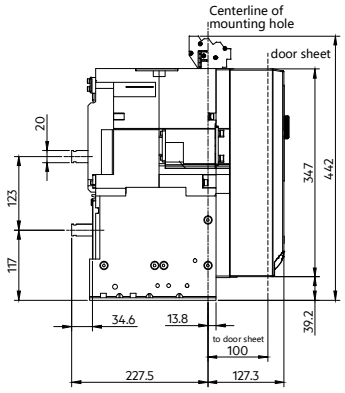
4P, Top view



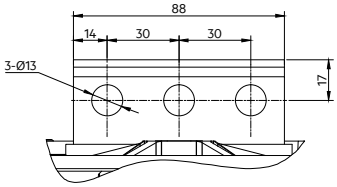
3P, Top view



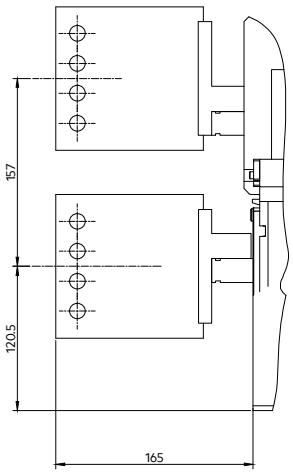
Side view

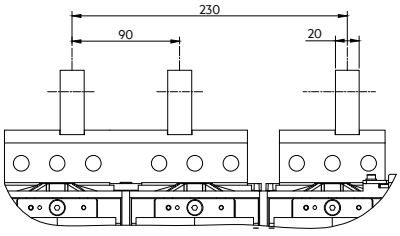


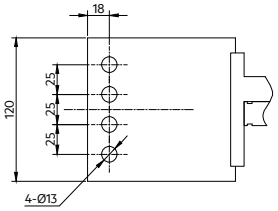
Rear horizontal connection standard busbar, maximum connection up to 5000A



Rear vertical connection standard busbar, maximum connection up to 6400A





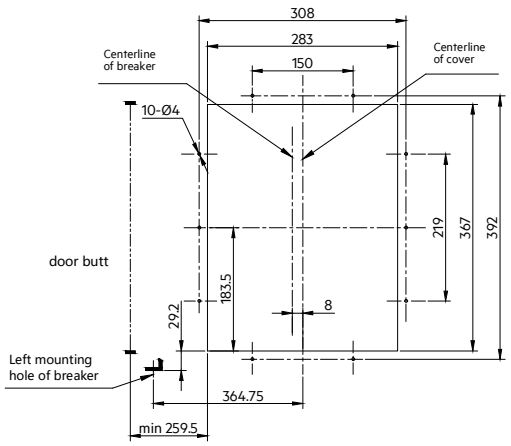


Note: When using M-PACT 6400A for horizontal connection, it is recommended to increase the cross-sectional area of the connecting copper bar, strengthen heat dissipation measures, or reduce the capacity for use.

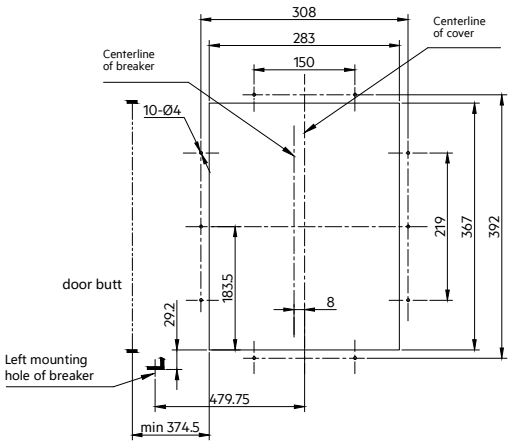
-Continuing from the previous page-

ME09 Fixed, Cutting size of door sheet

3P, Cutting size of door sheet

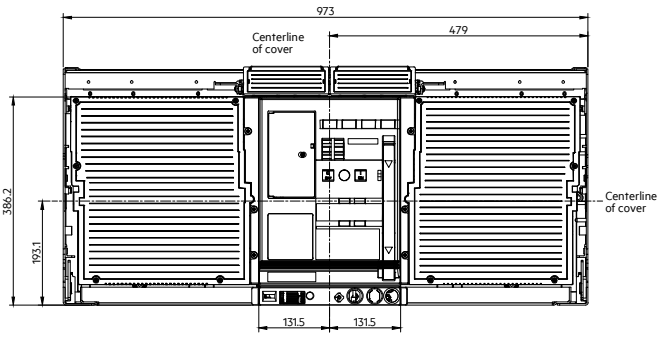


4P, Cutting size of door sheet

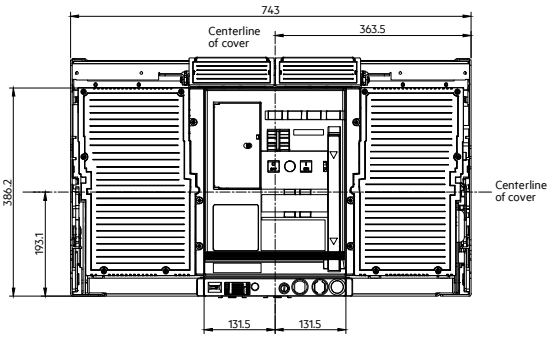


10.2 Frame3，Withdrawable

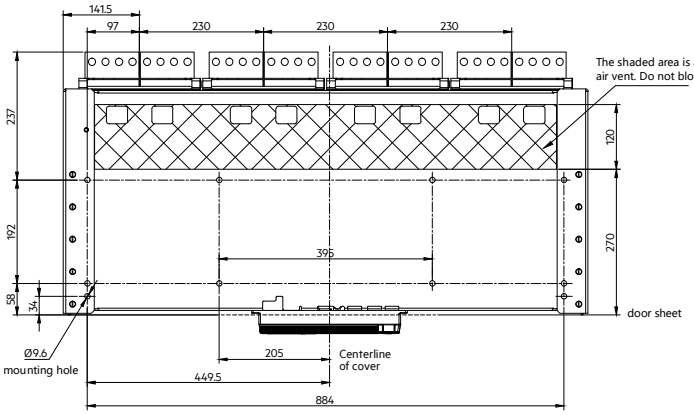
4P,front view



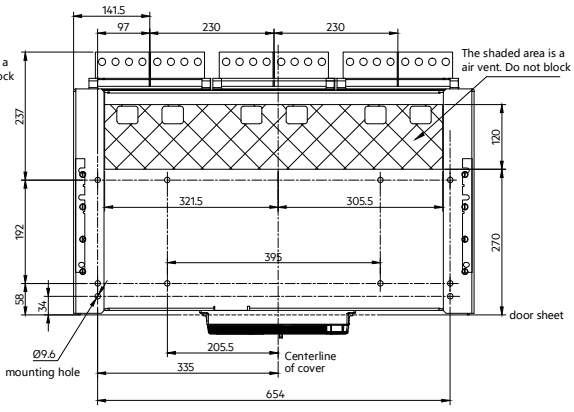
3P,front view



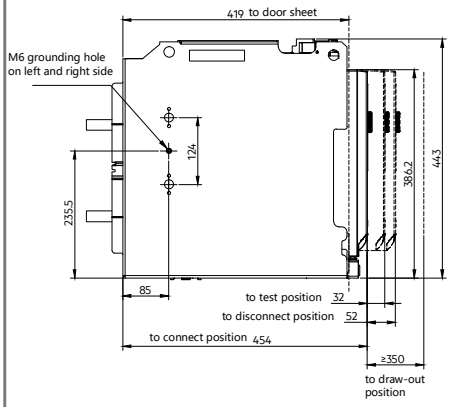
4P, Top view for Horizontal connection



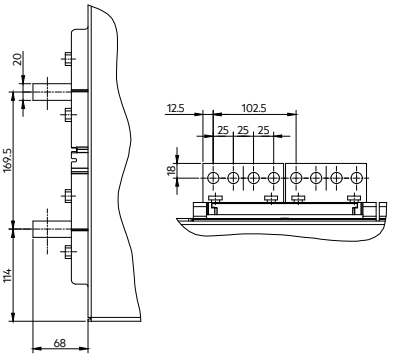
3P, Top view for Horizontal connection



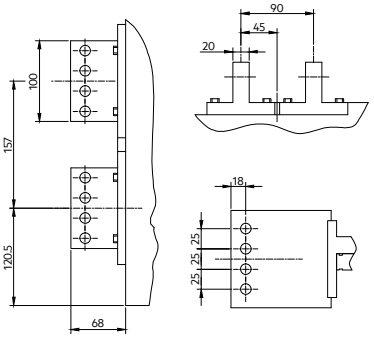
Side view



Rear horizontal connection standard busbar, maximum connection up to 5000A



Rear vertical connection standard busbar, maximum connection up to 6400A



Note: When using M-PACT 6400A for horizontal connection, it is recommended to increase the cross-sectional area of the connecting copper bar, strengthen heat dissipation measures, or reduce the capacity for use.

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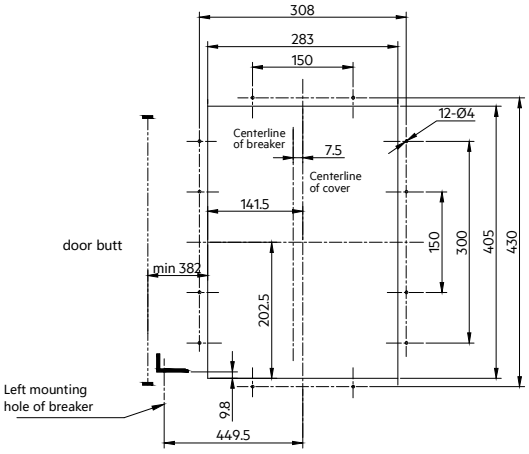
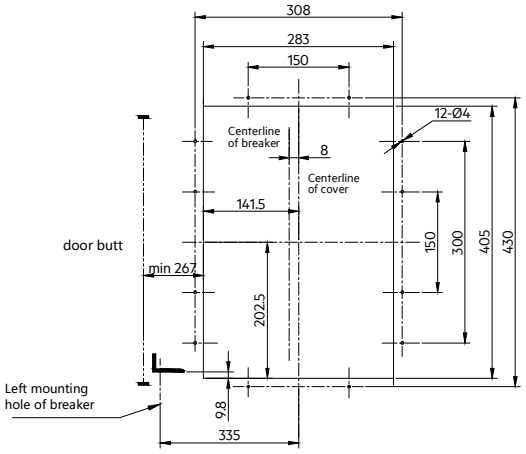
M-PACT Withdrawable, Cutting size of door sheet

4P, Cutting size of door sheet

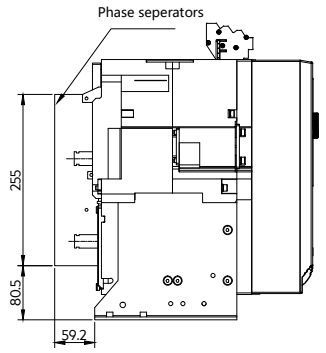


3P, Cutting size of door sheet

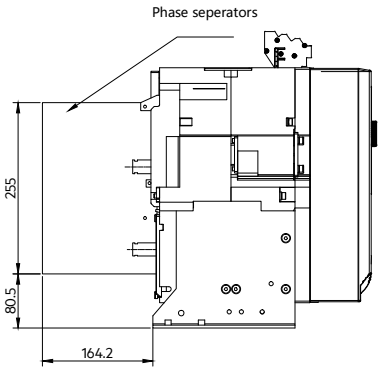


10.3 Phase seperators

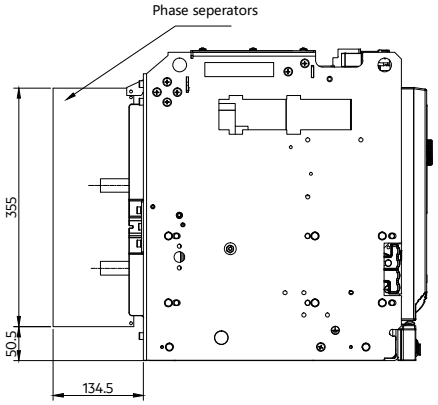
ME09 , Frame3 Fixed, size of standard Phase seperators



ME09, Frame3 Fixed, size of extended Phase seperators

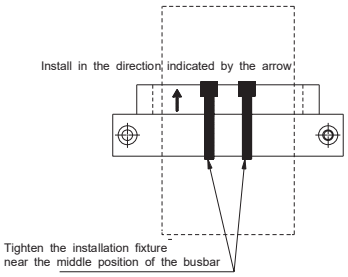


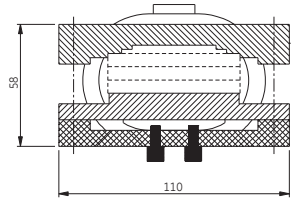
ME09 , Withdrawable, size of standard Phase seperators



10.4 Rogowski coil, current transformer, door interlock mechanism, wall mounted installation accessories

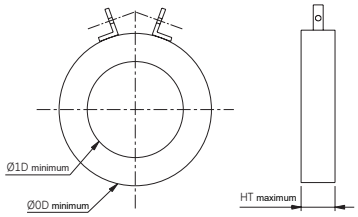
External Rogowski coil





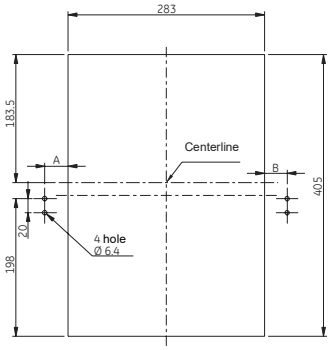
Note: Install 2 coils when the current exceeds 4000A

External current transformer



Rated current	1D	0D	HT
5000A	85	198	58
6400A	85	210	65

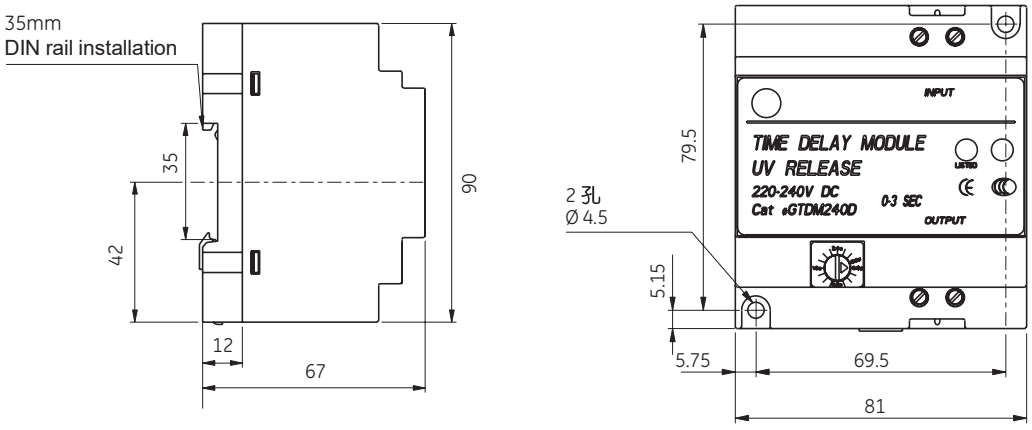
Door interlock device



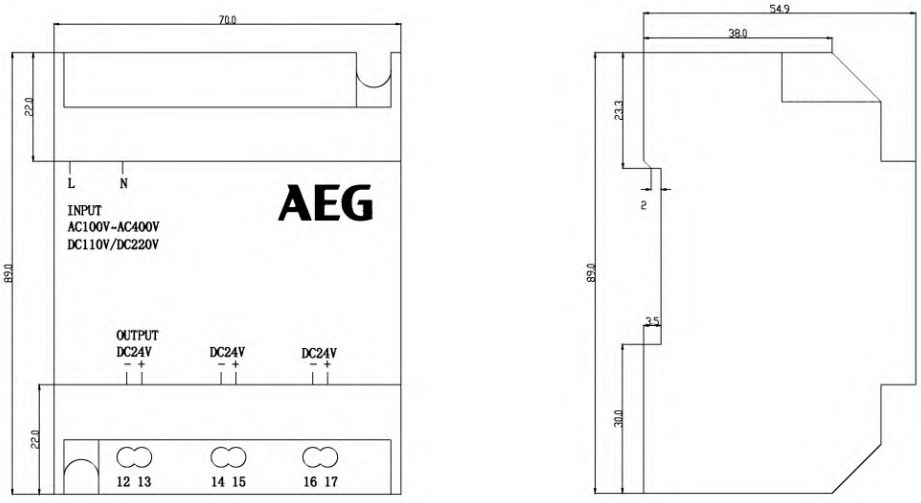
Frame	A	B
F3-3P	240.5	225.5
F3-4P	355.5	340.5

10.5 Under-voltage delay module, Power supply module

UVR Delay Module

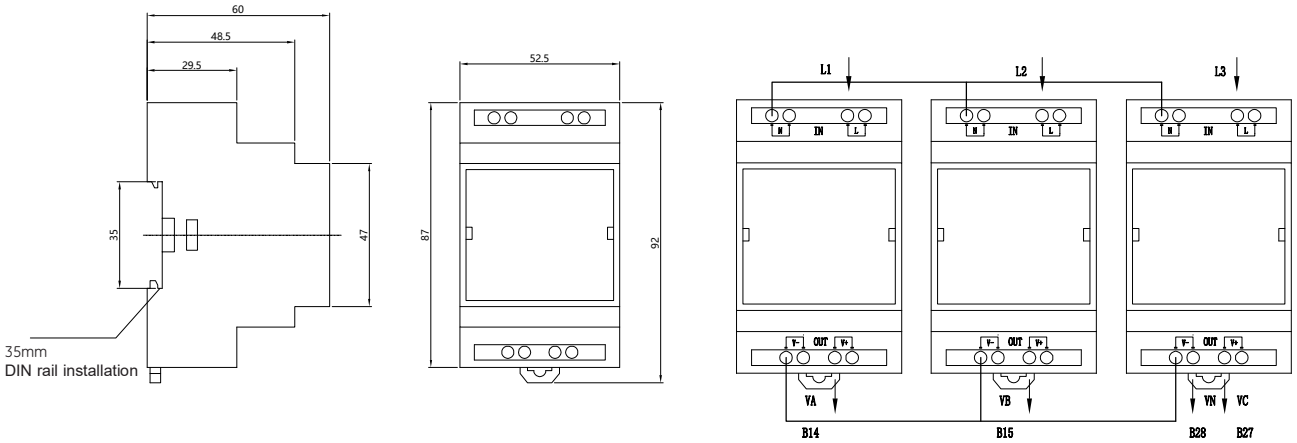


24V external power module



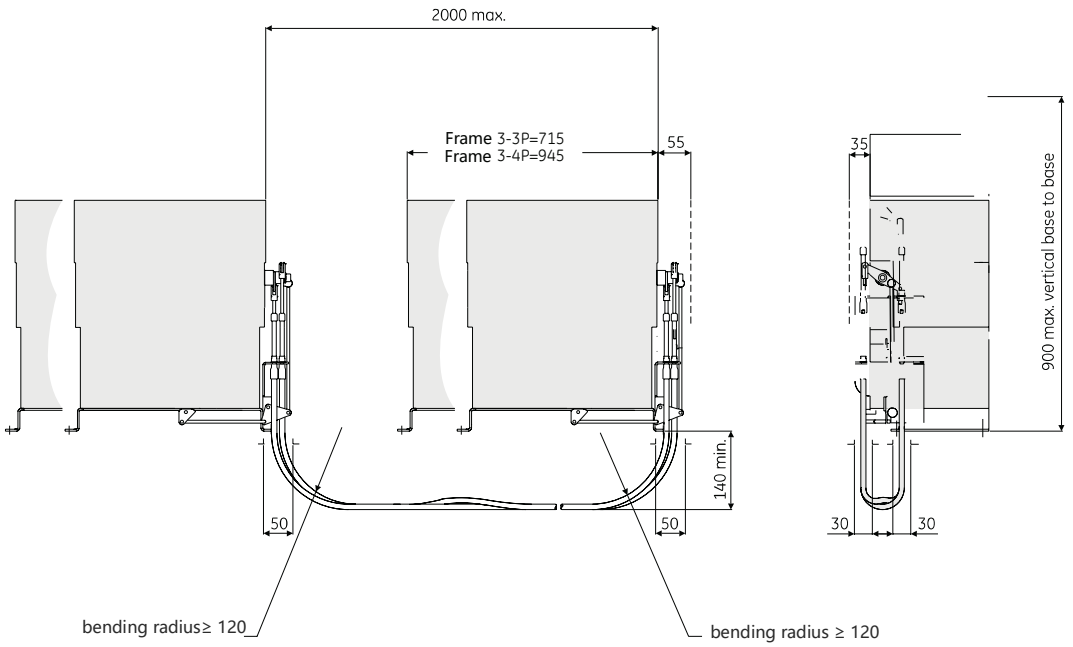
10.6 Voltage measurement module

400/690/800V system

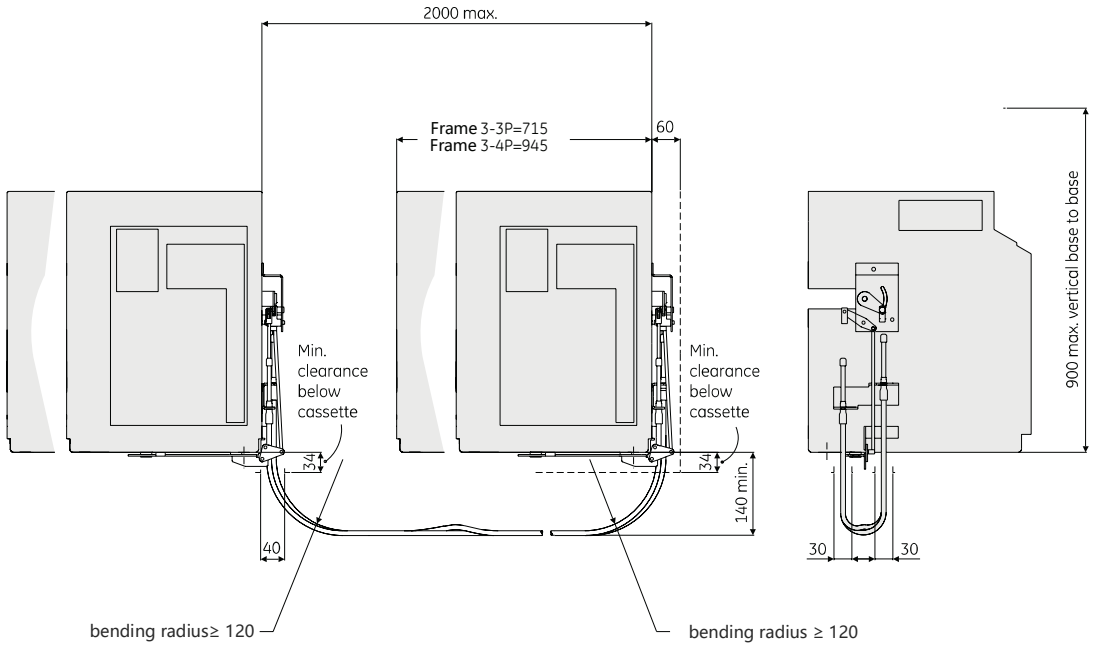


10.7 2-way mechanical interlocking mechanism

2-way mechanical interlocking mechanism, fixed, front/rear connection

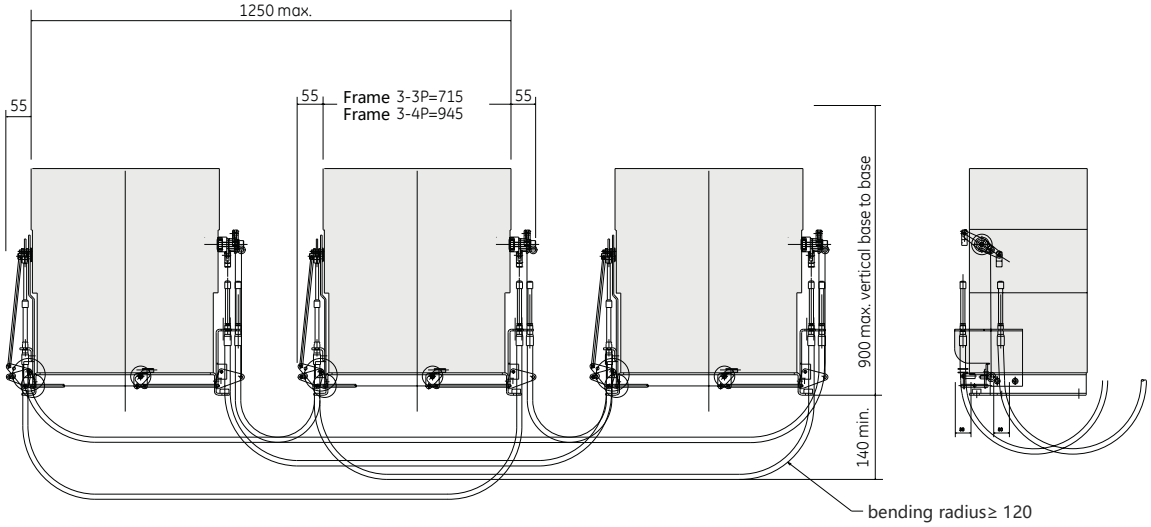


2-way mechanical interlocking mechanism, withdrawable, front/rear connection

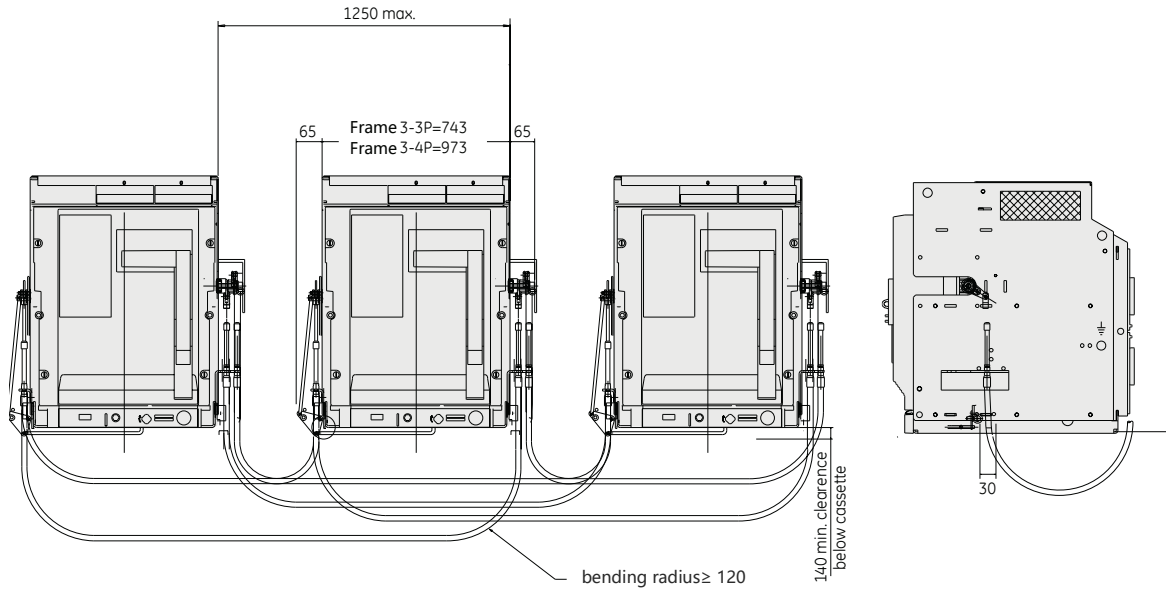


10.8 3-way mechanical interlocking mechanism

3-way mechanical interlocking mechanism, fixed, front/rear connection



3-way mechanical interlocking mechanism, withdrawable, front/rear connection



AEG

Official Website： www.aeg-imc.com
Hotline： 400-820-5234

This User manual may be subjected to revision without prior notice.
Version No.： AENULVAC24V1