Low voltage electrical distribution

EasyPact CVS 100-630 A

Circuit breakers and switch-disconnectors

User manual

04/2015

Schneider Electric

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information that is contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

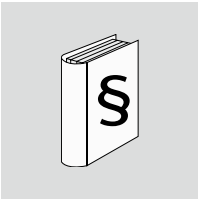
When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

Table of Contents

Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

NOTICE

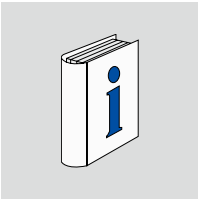
NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book



At a Glance

Document Scope

The aim of this manual is to provide users, installers and maintenance personnel with the technical information needed to operate EasyPact CVS circuit breakers and switches in compliance with the IEC standards.

Validity Note

This document applies to EasyPact CVS circuit breakers.

Related Documents

Title of Documentation	Reference Number
EasyPact CVS 100-630 A - Catalogue	LVED210011EN

You can download these technical publications and other technical information from our website at www.schneider-electric.com.

Description of the EasyPact CVS Circuit Breaker

1

Aim of This Chapter

This chapter describes the different types of EasyPact CVS circuit breaker.

What Is in This Chapter?

This chapter contains the following sections:

1.1 Quick Overview of Your Circuit Breaker

Aim

This section briefly describes:
- The EasyPact CVS circuit breaker functions
- Where to find the information and performance relating to your circuit breaker
- How to carry out the main operations on your circuit breaker

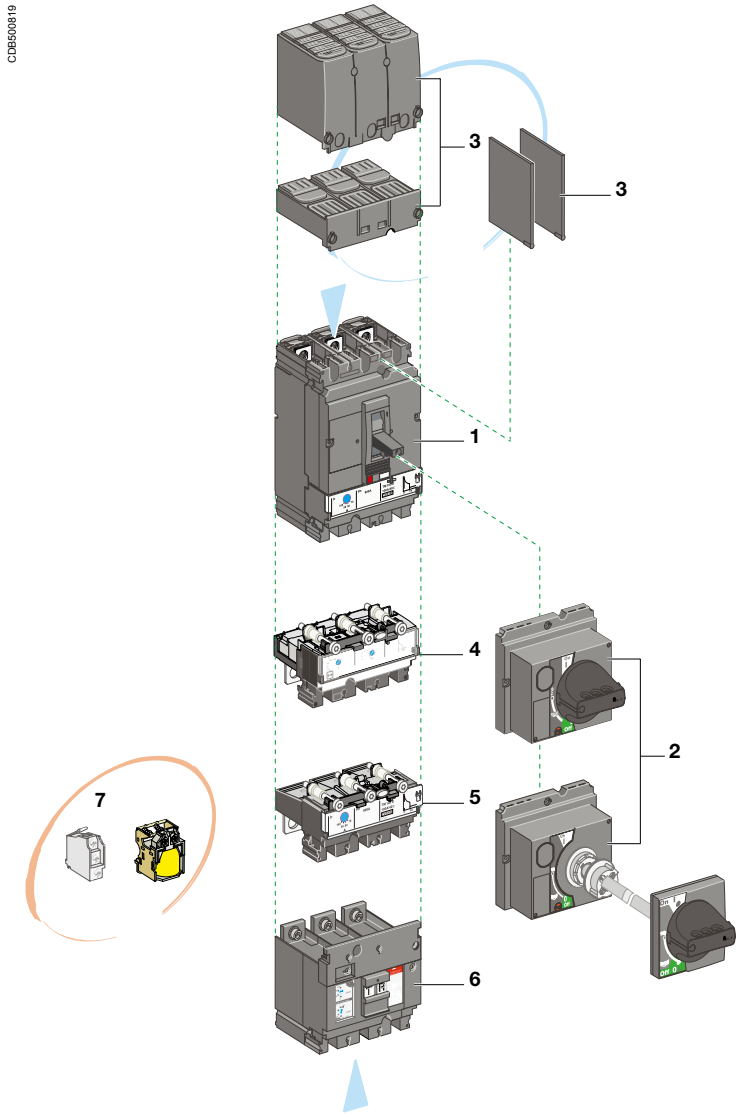
What Is in This Section?

This section contains the following topics:

The Main EasyPact CVS Circuit Breaker Functions

Choice of Numerous Functions that can be Adapted on Site

The design of EasyPact CVS circuit breakers offers a wide choice of functions. They are very easy to use. These functions can be adapted on site.

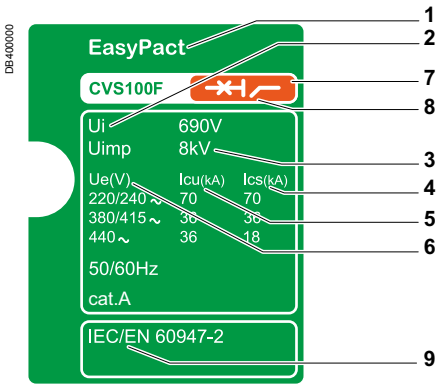


1 Toggle switch
2 Rotary handles
3 Associated equipment
4 Electronic trip units
5 TM-D thermal-magnetic trip unit
6 Vigi earth leakage protection module
7 Control auxiliaries

Identification of EasyPact CVS Circuit Breakers

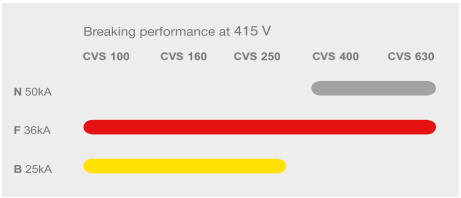
Characteristics of the EasyPact CVS Circuit Breaker Case

The case characteristics are indicated on the rating plate on the front of the circuit breakers. The rating plate type depends on the breaking performances:



Standardised characteristics indicated on the rating plate:

1 Type of device: frame size and breaking capacity class
2 Ui: rated insulation voltage.
3 Uimp: rated impulse withstand voltage.
4 Ics: service breaking capacity.
5 Icu: ultimate breaking capacity for various values of the rated operational voltage Ue
6 Ue: operational voltage.
7 Colour label indicating the breaking capacity class.



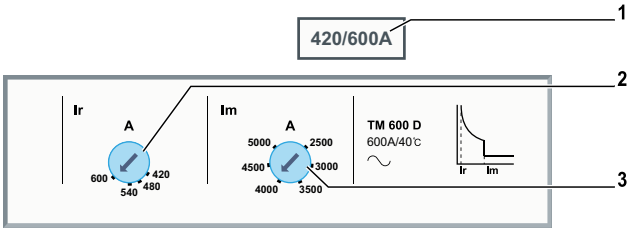
8 Suitable for Isolation symbol.
9 Reference standard.

Note: when the circuit breaker is equipped with an extended rotary handle, the door must be opened to access the rating plate.

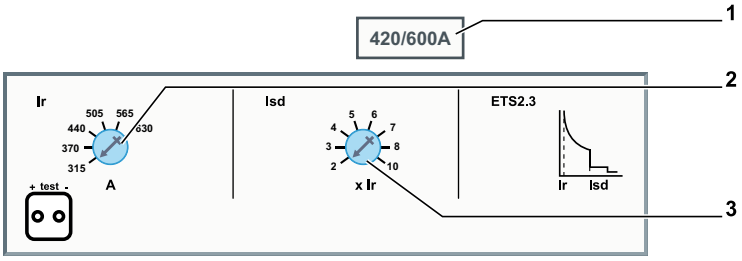
Setting the Circuit Breaker Trip Unit

The dial positions on the front of the trip unit indicate the circuit breaker pick-up settings.

- TM-D Thermal-Magnetic Trip Unit



- ETS 2.3 Trip Unit



1. Trip unit adjustment range: Minimum setting/maximum setting = trip unit rating In
2. Overload protection setting (where applicable)
3. Short-circuit protection setting (where applicable)

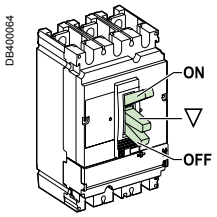
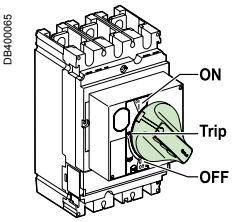
Using the Performance and Settings Data

The circuit breaker performance and settings must satisfy the performance and settings required by the installation diagram (see Startup, page 78).

Operating the Switchgear When Energized

Position of the Actuator

The position of the actuator indicates the state of the circuit breaker:

Toggle switch	Rotary handle
	

- I (ON): Circuit breaker closed
  This position is obtained manually.
- O (OFF): Circuit breaker open
  This position is obtained manually.
- ▼, Trip or Tripped: Circuit breaker tripped
  This position is obtained by the protection (trip unit or trip auxiliaries) as well as by the push to trip button and the maintenance interface.

Remote Indication

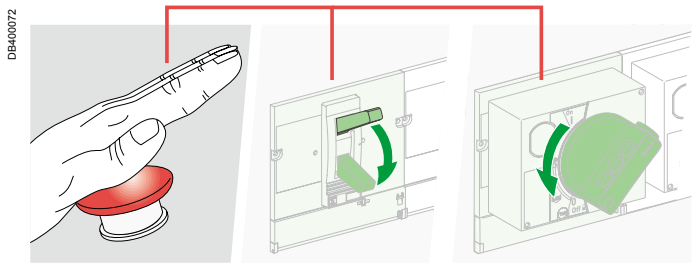
Information is available remotely:

- Via indication contacts

These indication auxiliaries can be installed on site.

Remote Electrical Stop Command

The remote electrical stop command can be given by electrical control auxiliaries regardless of the control type in use.



To obtain a remote electrical stop command, use:

- an MX shunt release, or
- an MN undervoltage release, or
- an MN undervoltage release with time-delay unit (the time-delay unit overcomes the problem of microcuts).

For more details on the electrical control auxiliaries, see Control Auxiliaries, page 58.

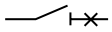
NOTE: It is advisable to test operation of the remote electrical stop commands at regular intervals (every 6 months).

De-Energizing the Switchgear

Isolation Capacity of EasyPact CVS Circuit Breakers

EasyPact CVS circuit breakers offer positive contact indication and are suitable for isolation in accordance with standards IEC 60947-1 and 2: the O (OFF) position of the actuator is sufficient to isolate the circuit breaker concerned.

Circuit breakers capable of isolation are indicated by the following marking on the rating plate:



To confirm this suitability, standards IEC 60947-1 and 2 require particularly stringent shock withstand tests.

EasyPact CVS circuit breakers can be locked in the O (OFF) position: this enables work to be carried out with the power off in accordance with installation rules. The circuit breaker can only be locked in the open position if the circuit breaker is in the O (OFF) position, whatever type of control is in use.

NOTE: Locking a EasyPact CVS circuit breaker in the open position is sufficient to isolate the circuit breaker.

The locking devices depend on the type of actuator:
- For circuit breakers with toggle switch, see How to Lock Your Circuit Breaker, page 22
- For circuit breakers with rotary handle, see How to Lock Your Circuit Breaker (With Direct Rotary Handle), page 27 and How to Lock Your Circuit Breaker (With Extended Rotary Handle), page 31

Maintenance and Servicing Work on the Installation

Maintenance and servicing work on an installation requires the installation to be de-energized. In the event of partial de-energization of the installation, the installation and safety rules require the feed on which work is to be carried out to be clearly labeled and isolated.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- This equipment must be installed and serviced by qualified electrical personnel.
- Disconnect all power sources before performing maintenance inspections.
  Assume that all circuits are live until they are completely de-energized, tested, grounded and tagged.
  Consider all sources of power, including the possibility of backfeeding and control power.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

Maintenance and Servicing Work on the Installation

⚠ CAUTION

RISK OF CLOSING ON ELECTRICAL FAULT
Do not close the circuit breaker again without first inspecting and, if necessary, repairing the downstream electrical equipment.
Failure to follow these instructions can result in injury or equipment damage.

The fact that a protection has tripped does not remedy the cause of the fault on the downstream electrical equipment.

The table below describes the procedure to be followed after a fault trip:

Step	Action
1	Isolate the feed (see Maintenance and Servicing Work on the Installation, page 16) before inspecting the downstream electrical equipment.
2	Look for the cause of the fault.
3	Inspect and, if necessary, repair the downstream equipment.
4	Inspect the equipment (retightening of connections, etc.) in the event of a short-circuit trip.
5	Close the circuit breaker again.

For more information on troubleshooting and restarting following a fault, see What to do in the Event of a Trip, page 133.

Checking, Testing and Setting the EasyPact CVS Circuit Breaker

Checking

Settings can be checked without the need for any particular precautions. However, it is recommended that they be carried out by a qualified person.

Testing

When testing EasyPact CVS circuit breaker trip mechanisms, the necessary precautions must be taken:
- Not to disrupt operations
- Not to trip inappropriate alarms or actions

⚠ CAUTION

RISK OF NUISANCE TRIPPING
Only qualified persons are authorized to carry out protection tests.
Failure to follow these instructions can result in injury or equipment damage.

For example, tripping the circuit breaker via the push to trip button can lead to fault indications or corrective actions (such as switching to a replacement power source) if the indications are not dealt with correctly.

Setting

Modifying settings requires a thorough knowledge of the installation characteristics and safety rules.

⚠ CAUTION

RISK OF NO TRIPPING OR NUISANCE TRIPPING
Only qualified persons are authorized to modify the protection parameters.
Failure to follow these instructions can result in injury or equipment damage.

1.2 Your Manually-Operated Circuit Breaker (With Toggle Switch)

Aim

This section describes the controls, indications and locking mechanisms accessible on the front of your EasyPact CVS circuit breaker.

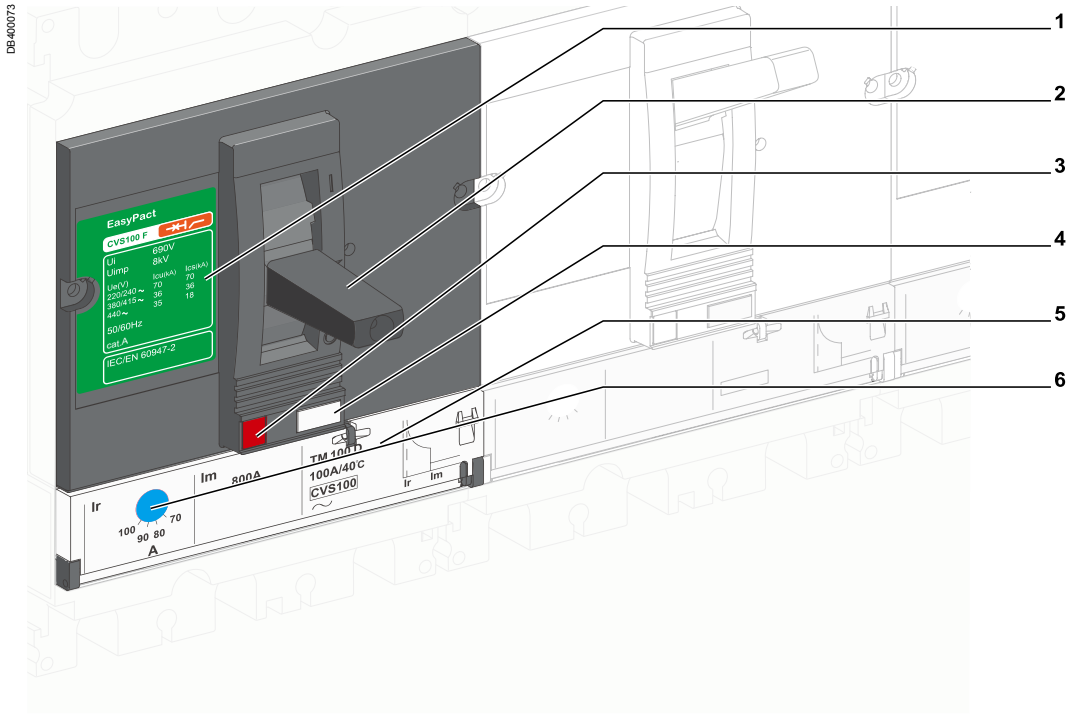
What Is in This Section?

This section contains the following topics:

Where to Find the Controls and Information on Your Circuit Breaker

Presentation of the Front Face

The controls, operation indicators and settings can be accessed directly on the front of your circuit breaker.

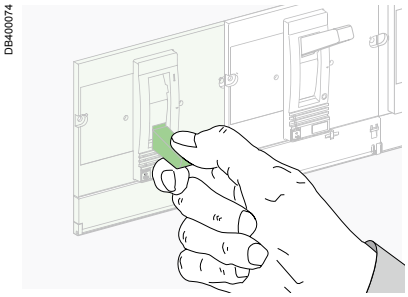


1 Rating plate
2 Toggle switch for setting, opening and closing
3 Push to trip button
4 Trip unit setting range
5 Trip unit
6 Trip unit adjustment dials

For more information on trip units, see Description of Trip Units, page 63.

How to Open, Close and Reset Your Circuit Breaker

Opening and Closing Locally



- To close the circuit breaker, move the toggle switch from the O (OFF) position to the I (ON) position.
- To open the circuit breaker, move the toggle switch from the I (ON) position to the O (OFF) position.

Resetting after a Trip

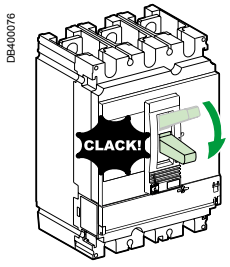
Your circuit breaker has tripped: the toggle switch has moved from the I (ON) position to the ▼ position. The fact that a protection has tripped does not remedy the cause of the fault on the downstream electrical equipment.

⚠ CAUTION

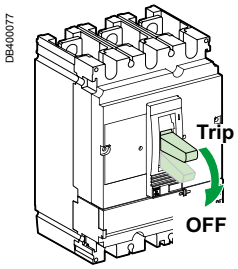
RISK OF CLOSING ON ELECTRICAL FAULT
Do not close the circuit breaker again without first inspecting and, if necessary, repairing the downstream electrical equipment.
Failure to follow these instructions can result in injury or equipment damage.

The table below describes the procedure to be followed after a fault trip:

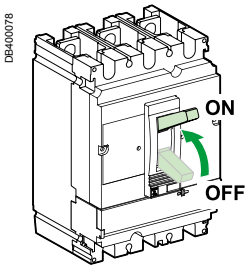
Step	Action	Toggle switch position
1	Isolate the feed (see Maintenance and Servicing Work on the Installation, page 16) before inspecting the downstream electrical equipment.	▼
2	Look for the cause of the fault.	▼
3	Inspect and, if necessary, repair the downstream equipment.	▼
4	Inspect the equipment (retightening of connections, etc.) in the event of a shortcircuit trip.	▼
5	Reset the circuit breaker by moving the toggle switch from the Trip position to the O (OFF) position: the circuit breaker is open.	O (OFF)
6	Reclose the circuit breaker by moving the toggle switch from the O (OFF) position to the I (ON) position: the circuit breaker is closed.	I (ON)



Circuit breaker trip



Resetting the circuit breaker

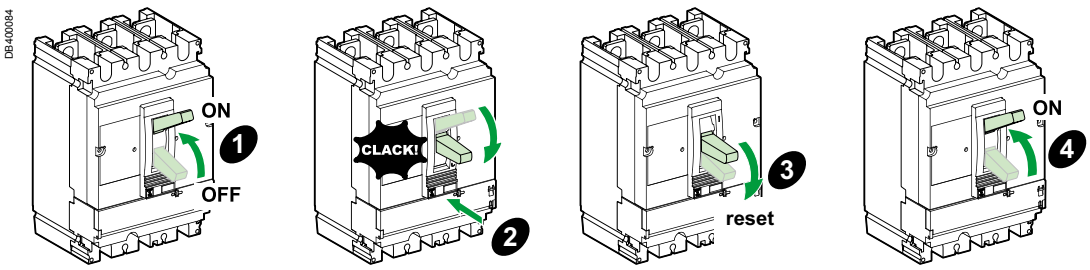


Reclosing the circuit breaker

How to Test Your Circuit Breaker

Press the push to trip Button

The push to trip button checks whether the trip mechanism is working correctly.



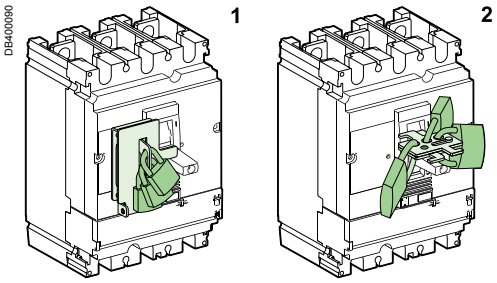
The table below describes the procedure for checking whether the trip mechanism is working correctly by pressing the push to trip button:

Step	Action	Position
1	Close the circuit breaker.	I (ON)
2	Press the push to trip button: the circuit breaker trips.	▼
3	Move the toggle switch to the OFF/Reset position: the circuit breaker is open and reset.	O (OFF)
4	Move the toggle switch to the I (ON) position: the circuit breaker is closed.	I (ON)

How to Lock Your Circuit Breaker

Locking Accessories

Locking accessories are used to lock the toggle switch in the I (ON) or O (OFF) position.



Use up to 3 padlocks (not supplied) 5 to 8 mm in diameter with an accessory that is either part of the case (diagram 1) or detachable (diagram 2).

NOTE: The circuit breaker's protection function is not disabled by locking the toggle switch in the I (ON) position: in the event of a fault, it trips without altering its performance.

When unlocked, the toggle switch moves to the ▼ position. To return the circuit breaker to service, see How to Open, Close and Reset Your Circuit Breaker, page 20.

Lead Sealing Accessories

Lead sealing accessories are used to prevent the following operations:

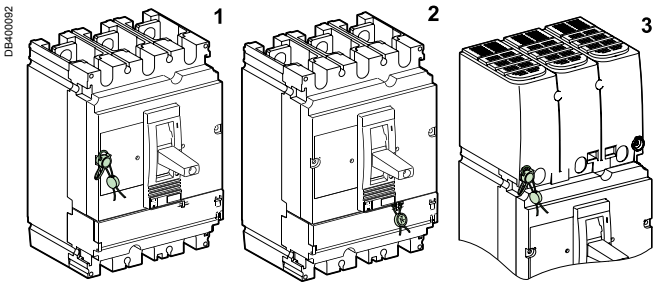


Diagram	Seal	Prohibited operations
1	Escutcheon fixing screw	● Dismantling the escutcheon ● Accessing the auxiliaries ● Dismantling the trip unit
2	Transparent protective cover for the trip units	Altering any settings and accessing the test port
3	Fixing screw for terminal shields	Accessing the power connection (protection against direct contact)

1.3 Your Circuit Breaker With Rotary Handle

Aim

This section introduces the controls, indications and locking mechanisms accessible on your EasyPact CVS circuit breaker.

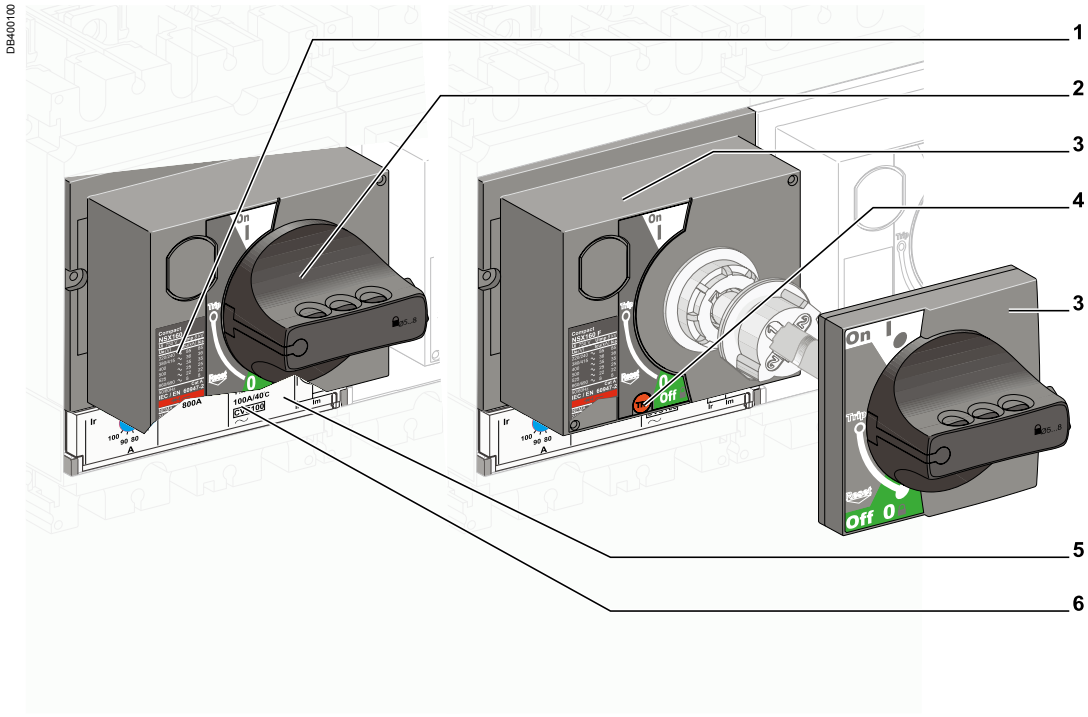
What Is in This Section?

This section contains the following topics:

Where to Find the Controls and Locking Mechanisms on Your Circuit Breaker

Presentation of the Front Face

- The circuit breaker operating controls, operation indicators, settings and locking mechanisms for the direct rotary handle can be accessed directly on the front of your circuit breaker.
- In the case of the extended rotary handle:
  - The circuit breaker operating controls can be accessed on the door escutcheon.
  - The operation indicators and settings are only accessible when the door is open.
  - The locking mechanisms can be operated on the case (door open) or on the door escutcheon (door closed).

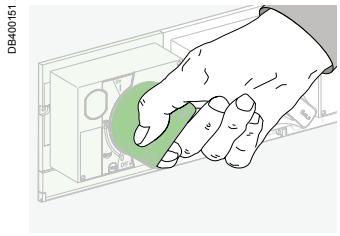


1 Rating plate
2 Direct rotary handle
3 Extended rotary handle
4 Push to trip button
5 Trip unit
6 Trip unit adjusting dials

For more information on trip units, see Description of Trip Units, page 63.

How to Open, Close and Reset Your Circuit Breaker

Opening and Closing Locally



- To close the circuit breaker, turn the rotary handle clockwise from the O (OFF) position to the I (ON) position.
- To open the circuit breaker, turn the rotary handle anticlockwise from the I (ON) position to the O (OFF) position.

Resetting After a Trip

Your circuit breaker has tripped: the rotary handle has moved from the I (ON) position to the Trip/Tripped position.

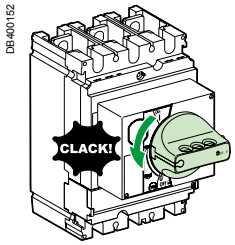
The fact that a protection has tripped does not remedy the cause of the fault on the downstream electrical equipment.

⚠ CAUTION

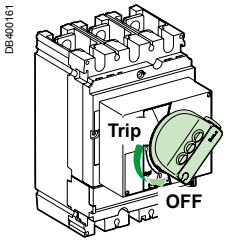
RISK OF CLOSING ON ELECTRICAL FAULT
Do not close the circuit breaker again without first inspecting and, if necessary, repairing the downstream electrical equipment.
Failure to follow these instructions can result in injury or equipment damage.

The table below describes the procedure to be followed after a fault trip:

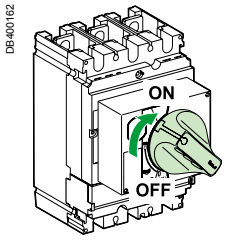
Step	Action	Handle position
1	Isolate the feed (see Maintenance and Servicing Work on the Installation, page 16) before inspecting the downstream electrical equipment.	Trip
2	Look for the cause of the fault.	Trip
3	Inspect and, if necessary, repair the downstream equipment.	Trip
4	Inspect the equipment (retightening of connections, etc.) in the event of a shortcircuit trip.	Trip
5	Reset the circuit breaker by turning the rotary handle anticlockwise from the Trip position to the O (OFF) position: the circuit breaker is open.	O (OFF)
6	Close the circuit breaker again by turning the rotary handle clockwise, from the O (OFF) position to the I (ON) position: the circuit breaker is closed.	I (ON)



Circuit breaker trip



Resetting the circuit breaker

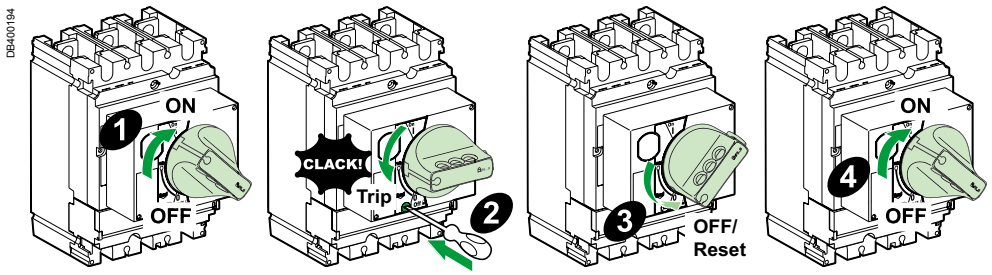


Reclosing the circuit breaker

How to Test Your Circuit Breaker (With Direct Rotary Handle)

Press the push to trip Button

The push to trip button checks whether the trip mechanism is working correctly.

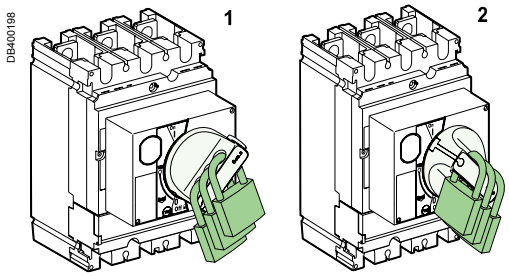


Step	Action	Handle position
1	Close your circuit breaker.	I (ON)
2	Press the push to trip button: the circuit breaker trips and the handle moves to the Trip position.	Trip
3	Turn the rotary handle anticlockwise from the Trip position to the O (OFF/ Reset)) position: the circuit breaker is open and reset.	O (OFF)
4	Turn the rotary handle clockwise from the O (OFF) position to the position I (ON) : the circuit breaker is closed.	I (ON)

How to Lock Your Circuit Breaker (With Direct Rotary Handle)

Locking the Direct Rotary Handle

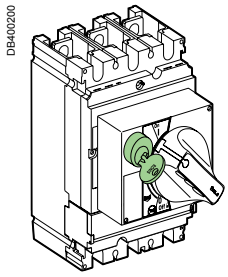
Locking with up to 3 padlocks (not supplied) with shackle diameter 5 to 8 mm



Padlocking is an option:

- As standard, only in the O (OFF) position (diagram 1)
- After modification of the rotary handle during installation, in both the I (ON) (diagram 2) and O (OFF) positions.

Locking with a Profalux or Ronis Key (Optional)



It is possible to use one of the above locks in the I (OFF) position or in the O (OFF) and I (ON) positions (diagram 3) depending on the bolt chosen. The lock can be added on site.

Keylocking can be used at the same time as padlocking.

NOTE: The circuit breaker's protection function is not inhibited by locking the rotary handle in the I (ON) position. In the event of a fault, it trips without affecting its performance.

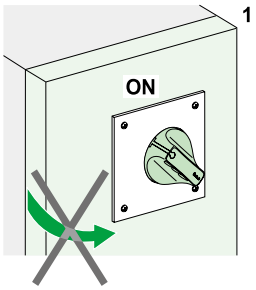
When unlocked, the toggle switch moves to the Trip position. To return the circuit breaker to service, follow the resetting instructions (see Resetting After a Trip, page 25).

Door Locking (MCC Function)

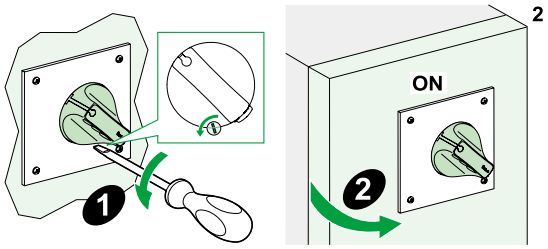
Further options are offered with the direct rotary handle in the MCC function.

Door locking

The direct rotary handle locks the door in the closed position when the circuit breaker is in the I (ON) position (diagram 1).



This lock can be temporarily disabled so that the door can be opened (diagram 2).



⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH
Only qualified persons are authorized to disable the door lock.
Failure to follow these instructions will result in death or serious injury.

Preventing Circuit Breaker Closing When the Door is Open

The door locking device can also prevent moving the direct rotary handle to the I (ON) position when the door is open.

Free door option

The lock can be omitted, but the rotary handle must then be modified (see Quick Reference Guide). In this case, the two functions - door locking and preventing the circuit breaker from being closed when the door is open - are inoperative.

Lead Sealing Accessories

Lead sealing accessories are used to prevent the following operations:

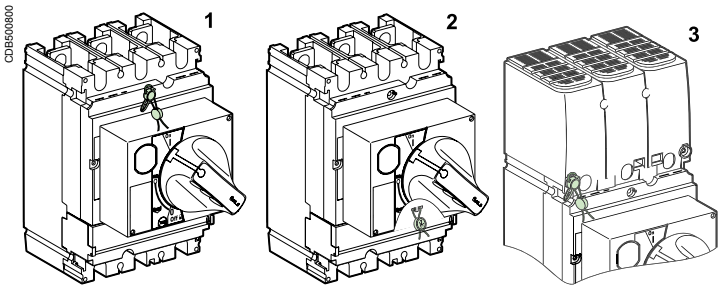


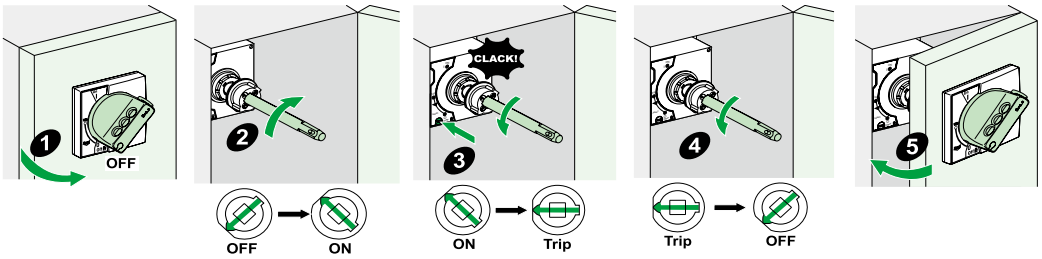
Diagram	Seal	Prohibited operations
1	Escutcheon fixing screw	● Dismantling the escutcheon ● Accessing the auxiliaries ● Dismantling the trip unit
2	Transparent protective cover for the trip units	Altering any settings and accessing the test port.
3	Fixing screw for terminal shields	Accessing the power connection (protection against direct contact)

How to Test Your Circuit Breaker (With Extended Rotary Handle)

Pressing the Push to Trip Button

The push to trip button checks whether the trip mechanism is working correctly.

The push to trip button is not accessible on the front face: the test has to be conducted with the door open.



Step	Action	Position
1	Switch the circuit breaker to the open O (OFF) position. Open the door.	O (OFF)
2	Use a special tool (1) to turn the extension shaft clockwise and switch the circuit breaker to the I (ON) position. The circuit breaker is ready for the test.	I (ON)
3	Press the push to trip button: the circuit breaker trips.	Trip
4	Use a special tool (1) to turn the extension shaft anticlockwise and switch the circuit breaker from the Trip position to the O (OFF) position: the circuit breaker is in the open position.	O (OFF)
5	Close the door	-

(1) The special tool can be:

- A standard rotary handle designed for tests
- A flat wrench, taking care not to damage either the extension shaft (hollow square tube 10 mm x 10 mm) or its surface treatment

How to Lock Your Circuit Breaker (With Extended Rotary Handle)

Locking Functions Offered

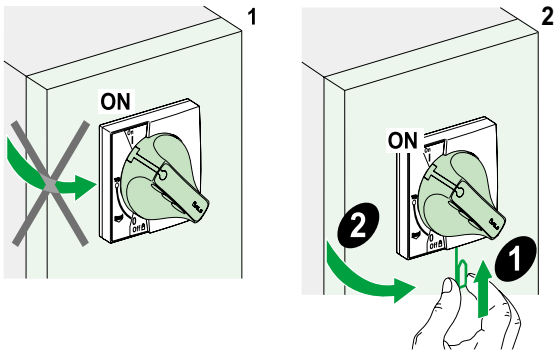
The extended rotary handle offers several locking functions to:

- Prevent the door being opened
- Prevent the rotary handle being operated

Some locking functions can be inhibited on different adaptations.

Locking the Door

The extended rotary handle locks the door in the I (ON) position as standard (diagram 1):



This lock can be temporarily disabled so that the door can be opened (diagram 2).

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH
Only qualified persons are authorized to disable the door lock.
Failure to follow these instructions will result in death or serious injury.

This lock can be omitted, but the extended rotary handle must then be modified (see Quick Reference Guide).

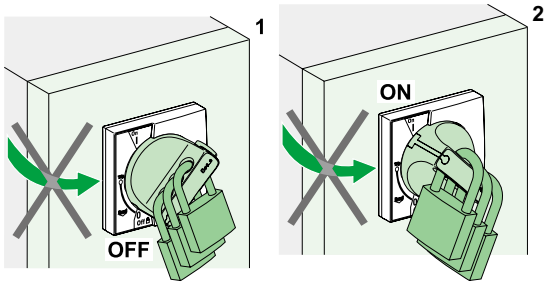
Example:

An application comprises a circuit breaker for a switchboard incoming supply and several load circuit breakers with extended rotary handles installed behind the same door. Locking the door with a single rotary handle (incoming supply circuit breaker) simplifies maintenance work on the switchboard.

Locking the Extended Rotary Handle

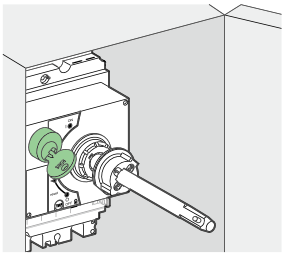
Locking with up to 3 padlocks (not supplied) with shackle diameter 5 to 8 mm

The extended rotary handle can be locked in the I (ON) position or O (OFF) position.



- As standard in the O (OFF) position (diagram 1)
  Padlocking the rotary handle prevents the door being opened. Door locking cannot be inhibited.
- Possible in the two positions I (ON) (diagram 2) and O (OFF), after modification of the rotary handle during installation.
  There is a choice of two options when the rotary handle is locked in the I (ON) position:
  - Standard with door opening locked. Door locking cannot be inhibited.
  - As an option, door stays free: locking the rotary handle does not stop the door being opened.

Locking with a Profalux or Ronis Key (Optional)



The lock is mounted on the case inside the switchboard (diagram 3). It is possible to lock in the O (OFF) position or in both the O (OFF) and I (ON) positions depending on the bolt chosen. The lock can be added on site.

NOTE: The circuit breaker's protection function is not inhibited by locking the rotary handle in the I (ON) position. In the event of a fault, it trips without affecting its performance.

When unlocked, the toggle switch moves to the Trip position. To return the circuit breaker to service, follow the resetting instructions (see Resetting After a Trip, page 25).

Keylocking Procedure

Keylocking can be performed with a circuit breaker in either the O (OFF) position or the I (ON) position.

Step	Action (circuit breaker in the O (OFF) position)	Action (circuit breaker in the I (ON) position)
1	Open the door.	Open the door by disabling the door locking device if necessary.
2	Use the keylock mounted on the case inside the switchboard to lock the rotary handle.	Use the keylock mounted on the case inside the switchboard to lock the rotary handle.
3	Close the door.	Close the door, disabling the door locking device if necessary.

Lead Sealing Accessories

The sealing accessories for circuit breakers with extended rotary handles are identical to those for circuit breakers with standard direct handles (see How to Lock Your Circuit Breaker (With Direct Rotary Handle), page 27).

Equipment Associated With Your Circuit Breaker

2

Aim

This chapter describes the electrical accessories and auxiliaries installed on your EasyPact CVS circuit breaker and/or that you can install on site.

What Is in This Chapter?

This chapter contains the following topics:

Indication Contacts

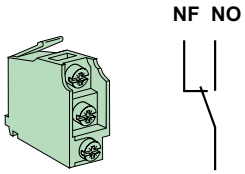
Characteristics of Indication Contacts

The indication contacts are located under the front face of the circuit breaker, or in the rotary handle. They are installed in a compartment which is isolated from the power circuits. There are three types:

- Standard volt-free contact
- Low-level volt-free contact

Standard and Low-Level Volt-Free Contacts

Standard and low-level volt-free contacts are the common point changeover type.



NC Normally Closed contact
NO Normally Open contact

NOTE: A single contact model provides all the OF, SD, SDE and SDV indication functions: the function of the OF, SD and SDE contacts is determined by their position inside the case.

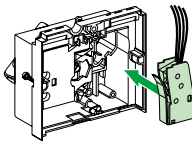
The table below describes the operation of standard and low-level volt-free contacts:

Name	Definition
OF	Changeover: The NO contact is normally open when the circuit breaker is in the O (OFF) position.
SD	Trip indication: This contact indicates that the circuit breaker has tripped due to: ● Long time protection ● Short time protection ● An earth leakage fault detected by the Vigi module ● Operation of the MX or MN voltage releases ● Operation of the push to trip button ● Connecting/Disconnecting the circuit breaker
SDE	Electrical fault indication: This contact indicates that the circuit breaker has tripped on an electrical fault due to: ● Long time protection ● Short time protection ● An earth leakage fault detected by the Vigi module
SDV	Earth leakage fault indication (tripped by Vigi): This contact indicates that the circuit breaker has tripped due to an earth leakage fault detected by the Vigi module.

Control Auxiliaries

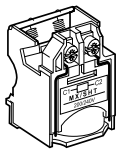
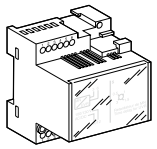
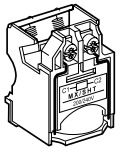
Control and Indication Contacts Installed Outside the Case

Control and indication contacts installed outside the case are contacts for specific applications (see EasyPact CVS Catalog).

CAM contacts 	**Early-operation contacts** These contacts are installed in the rotary handle: ● Early-make contacts (CAF1, CAF2) are actuated before the poles close when a circuit breaker manual command is given. ● The early-break changeover contact (CAO1) is actuated before the poles open when a circuit breaker manual command is given.

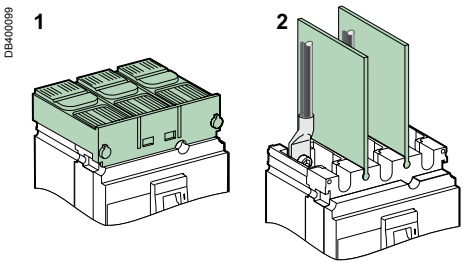
Voltage Releases

Voltage releases are used to trip circuit breakers deliberately by means of an electrical signal. These auxiliaries are installed in the case under the front face. The characteristics of these auxiliaries comply with the recommendations of standard IEC 60 947-2.

MN release 	**Undervoltage release** This release is used to: ● Trip the EasyPact CVS circuit breaker when the supply voltage is less than 0.35 times nominal voltage Un. If the voltage is between 0.35 and 0.7 times the rated voltage Un, opening is possible but not guaranteed. Above 0.7 times the rated voltage Un, opening is impossible. ● Close the circuit breaker again once the voltage reaches 0.85 times the rated voltage. This type of voltage release is used for failsafe emergency stops.
Time-delay unit 	**Time-delay unit for MN release** This auxiliary eliminates nuisance tripping of an undervoltage release due to transient voltage dips lasting < 200 ms. There are 2 types of time-delay unit: adjustable or non-adjustable.
MX release 	**Shunt release** This release causes the EasyPact CVS circuit breaker to open on the appearance of a voltage exceeding 0.7 times the rated voltage.

Other Accessories

Accessories for Safety and Ease of Operation



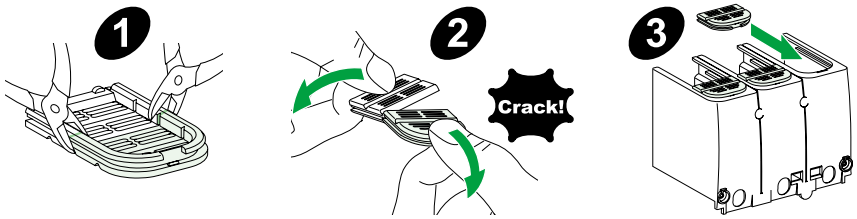
A comprehensive accessories offer is available for your EasyPact CVS circuit breaker; these can be easily installed on site to improve safety and ease of operation:

1 Short or long terminal shields, providing IP40 protection

2 Flexible interphase barriers improving isolation between power connections

For more details on the accessories offer, see the EasyPact CVS Catalog.

Terminal Shields with Precut Grids



1 Cutting a grid

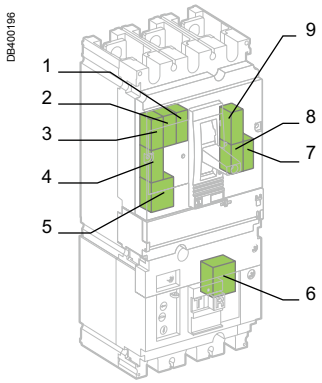
2 Adjusting the size of the grid

3 Inserting the grid in the terminal shield

Terminal shields with precut grids simplify the onsite connection of circuit breakers regardless of the number of conductors to be connected (see Instruction Sheet).

Slots for Control and Indication Auxiliaries on EasyPact CVS 400/630

The table below shows the possible slots for the auxiliary contacts, electronic indication modules and control auxiliaries mounted in the case (for further details see the EasyPact CVS Catalog):

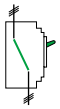
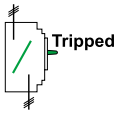


EasyPact CVS 400/630 circuit breakers are equipped with TM-D, MA and electronic trip units.

EasyPact CVS 400/630										
Name	**Slot**									**Comments**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	
Standard remote indication and control auxiliaries										
OF1			■							
OF2		■								All these auxiliaries can be installed regardless of: ● The trip unit type ● The control type (toggle switch, rotary handle mechanism)
OF3	■									
SD									■	
SDE								■		
SDV						■				
Reserved				■						
MN					■					
MX					■					

Operation of the Auxiliary Indication Contacts

The table below shows the position of the indication contacts (or outputs) in relation to the position of the actuator and the main contacts.

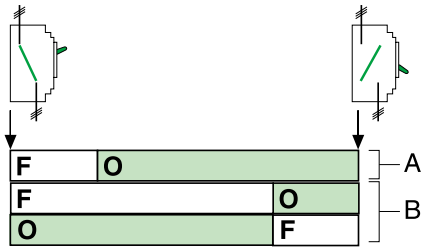
	Position of the actuator and the main contacts							
	 ON	 Tripped by:						 OFF
		MN/MX	PT (1)	Trip unit (2)				
				L	S	I	V	
Name	**Position of indication contacts**							
OF	■							
SD		■	■	■	■	■	■	
SDE				■	■	■	■	
SDV							■	

(1) ● L: Long time protection
(2) ● S: Short time protection
● I: Instantaneous protection
● V: Vigi protection
■ : Contact closed, □ : Early-make output (400 ms)

NOTE: The indication auxiliary (changeover) contacts are represented in the switchboard by the state of the Normally Open (NO) contact.

The state of the NO contact is open:
- For OF contacts, when the circuit breaker is in the O (OFF) position
- For SD, SDE and SDV contacts, when the associated function is not active

Sequence chart of the OF contacts relative to the main contacts

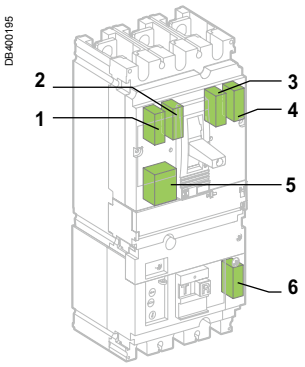


A Main contacts
B Position of OF changeover contacts

Summary Tables of Auxiliaries

Slots for Control and Indication Auxiliaries on EasyPact CVS 100-250

The table below shows the possible slots for the auxiliary contacts, electronic indication modules and control auxiliaries mounted in the case (for further details see the EasyPact CVS Catalog):



The choice of auxiliaries depends on the functions desired. This choice is exclusive: only one auxiliary per slot.

EasyPact CVS 100-250							
Name	**Slot**						**Comments**
	1	**2**	**3**	**4**	**5**	**6**	
Standard remote indication and control auxiliaries							
OF1	■						All these auxiliaries can be installed regardless of: ● The trip unit type ● The control type (toggle switch, rotary handle mechanism)
OF2				■			
SD		■					
SDE			■				
SDV						■	
MN					■		
MX					■		

Description of Trip Units

3

Aim

This chapter describes the adjustment of thermal-magnetic and electronic trip units in the EasyPact CVS range.

What Is in This Chapter?

This chapter contains the following sections:

3.1 Fault Currents and Trip Units

Aim

This section describes the main definitions and characteristics of fault currents.

What Is in This Section?

This section contains the following topics:

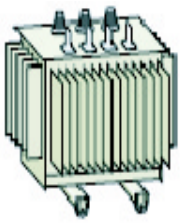
Applications

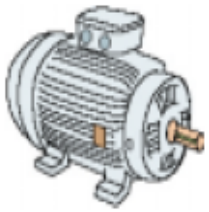
The Two Main Types of Application Requiring Protection

EasyPact CVS circuit breaker trip units offer protection for all applications due to the great flexibility of their settings.

Two types of application are generally taken into consideration:

- Electrical distribution protection
- Special protection for receivers (motors, transformers, etc.) or generators





Fault Currents in Electrical Distribution

The three fault current types that need to be taken into account

There are four types of fault current, divided into two categories:
- The overcurrent category:
  - Overload currents
  - Short-circuit currents
- The ground fault category:
  - Low intensity ground faults

The Overcurrent Category

The main characteristics and associated risks are described below:
- Overload currents:
  These are mainly due to problems with excessive loads on receivers. For example operating too many consumers in a workshop at the same time (lighting, heating, power) can bring about an electrical distribution overload.
  The main risks from overload currents are a gradual deterioration in equipment, or a fire.
- Short-circuit currents:
  These can be due to a deterioration in the plant or within a receiver, for example a short-circuit between two phases in the winding of a motor being operated in severe conditions (vibration, damp and/or corrosive atmosphere).
  The risks associated with short-circuit currents are the instantaneous deterioration of equipment, a fire or even an explosion due to the high energy level at the site of the fault.

The Ground Fault Category

Ground faults can be due to abnormal aging of the plant, of a load or conductors, that have deteriorated in damp conditions.

The intensity of such fault currents depends on the ground connection diagram used. These currents can be:
- Very low in value, i.e. well below the rated feed current in the TT system (these are known as leakage currents or residual ground fault currents)

Whatever the value of ground leakage currents, they present a very grave risk of electrocution or fire.

Protection Against Overcurrents in Electrical Distribution

EasyPact CVS Circuit Breaker Overcurrent Trip Units

EasyPact CVS circuit breaker trip units are designed to handle overcurrents (overload currents and shortcircuit currents) and in certain cases ground fault currents.

- Pick-up adjustments are calculated relative to the downstream circuit to be protected.
- Time delay adjustments are calculated in relation to the protection management (coordination).

NOTE: The protection plan is based on coordination of the protections - and in particular on discrimination. This can be achieved by time delays (time-related discrimination) while complying with ammeterand power-related discrimination rules.

There are two types of trip unit:

- Thermal-magnetic trip units for EasyPact CVS 100-630 circuit breakers
- ETS trip units for EasyPact CVS 400-630 circuit breakers

Standard Settings for Overcurrent Protections

Standard IEC 60947-2 states the trip characteristics at the circuit breaker limits.

The table below summarizes the recommendations of standard IEC 60947-2 for the circuit breaker's protection function:

Long time protection
Long time protection of the inverse time type (with I 2t constant): ● No trip for a current below 105% of Ir ● Trip in less than two hours for a current equal to: ● 120% of Ir for an electronic trip unit ● 130% of Ir for a thermal-magnetic trip unit For a higher fault current, the trip time is inversely proportional to the fault current value.
Short time protection
Short time protection is definite time: ● No trip for a current below 80% of the short time setting ● Trip for a current equal to 120% of the short time setting The trip time is: ● Less than 0.2 s for a short time protection with no time delay ● Equal to the value of the time delay tsd for a protection with time delay
Instantaneous protection
Instantaneous protection is definite time: ● No trip for a current below 80% of the instantaneous setting ● Trip for a current equal to 120% of the instantaneous setting The trip time is less than 0.2 s.

Conductors to be Protected: The Neutral Conductor

The installation rules closely define the type of protection to be used having regard to:

- Potential overcurrents (overloads and short-circuits)
- Conductors to be protected
- Simultaneous cutoff of all conductors including the neutral conductor (multi-pole breaking)

NOTE: All three of the phase conductors must be protected at all times. The neutral conductor (if it is distributed and identical to the phases in size, i.e. full neutral) is normally protected by the phase protection.

Description of the Neutral Protection

The neutral must have specific protection if:
- It is reduced in size compared to the phases
- Nonlinear loads generating third order harmonics and multiples thereof are installed

It may be necessary to cut off the neutral for functional reasons (multiple source diagram) or safety reasons (working with power off).

To summarize, the neutral conductor can be:
- Non-distributed (3P)
- Distributed, not cut off and not protected (3P)
  Distributed, cut off and protected (4P)

EasyPact CVS trip units are suitable for all protection types.

EasyPact CVS	Possibilities	Neutral protection
3P	3P, 3D	None
4P *	4P, 3D	None
	4P, 3D + N/2 **	Half neutral
	4P, 4D	Full neutral
P: Breaking pole, D: Pole protected by the trip unit, N: Neutral protection.		

*: The neutral adjust ability is only for ETS.
**: Only for ETS trip unit.

Protection Against Ground Faults

At a Glance

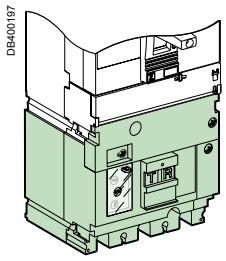
Protection against ground faults is provided by:

- Earth leakage protection in the case of low intensity fault currents (fault current limitation is linked to ground connection diagram TT)

Earth Leakage Protection

The Vigi module, which is external to the trip unit, is specifically designed to provide earth leakage protection. This module can be installed on EasyPact CVS circuit breakers equipped with either a thermalmagnetic trip unit or a electronic trip unit.

Vigi module installed on a EasyPact CVS circuit breaker



Setting the Earth Leakage Protection

Installation standards require or recommend particular sensitivity and trip time values for earth leakage protection:

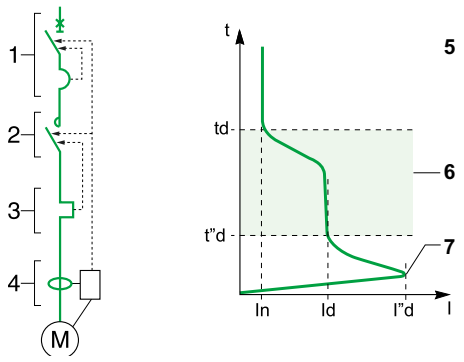
Type of protection	IΔn	Δt	Installation standards
Protection against direct contact	≤ 30 mA	≤ 40 ms (1)	Required
Fire protection	≤ 300 mA or ≤ 500 mA	≤ 40 ms (1)	Required if necessary
Protection against indirect contact	IΔn	≤ 1 s	Lowest possible recommended values of IΔn and Δt (the value of IΔn depends on the ground resistance)
(1) Value of Δt for a fault current ≥ 10 IΔn			

Protection for Motor-Feeders

Structure of a Motor-Feeder

Direct-on-line starting is the most widely used type of motor-feeder.

The direct-on-line starting motor-feeder can comprise up to four different items of switchgear providing one or more functions. It must also incorporate the specific characteristics of the application.



1 Switchgear for short-circuit protection
2 Control gear
3 Switchgear for overload protection
4 Switchgear for ground fault protection
5 Characteristic t = f(I) of an asynchronous D.O.L. starting motor
6 Starting phase
7 Current peak on activation

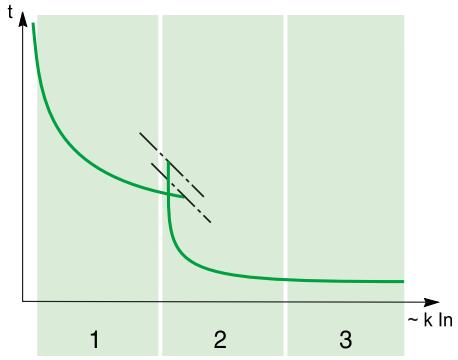
Characteristics Defined by Standard IEC 60947-4-1

A motor-feeder must satisfy the general rules of standard IEC 60947-4-1, in particular the rules concerning the protection of contactors and motor-feeders.

In the matter of protection, this standard defines:
- Coordination of motor-feeder protections
- Thermal relay trip classes
- Insulation coordination

Coordination According to Standard IEC 60947-4-1

Type of coordination are allowed - type 1 coordination
- In type 1 coordination, deterioration of the contactor and relay is accepted under the 2 following conditions:
  - The contactor or starter does not represent a danger to people or installations.
  - The starter can operate correctly when parts have been repaired or replaced.



1 Overload zone Id < 10 In
2 Impedant short-circuit zone 10 In < Id < 50 In
3 Short-circuit zone Id > 50 In

EasyPact CVS Motor Circuit Breakers

EasyPact CVS motor circuit breakers incorporate MA magnetic trip units.

Protection functions by trip unit type

Protection	Trip unit type
	MA
Short-circuits	■

3.2 TM-D, TM-G Thermal-Magnetic and MA Magnetic Trip Units

Aim

This section describes the thermal-magnetic trip units. These trip units are mounted on EasyPact CVS circuit breakers rated 100 A, 160 A, 250 A, 400A and 630A.

What Is in This Section?

This section contains the following topics:

Characteristics of Thermal-Magnetic Trip Units

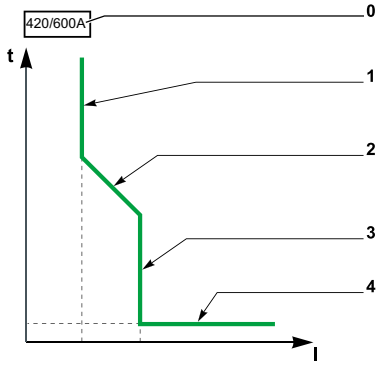
At a Glance

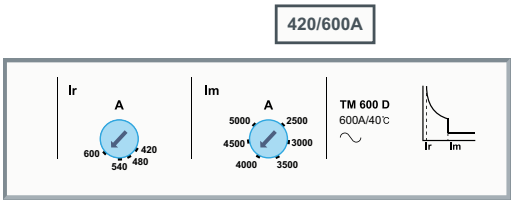
Thermal-magnetic trip units are designed to provide protection for distribution or for specific applications.

Identification	Type of protection
TM-D	Thermal-magnetic trip unit
TM-G	Thermal-magnetic trip unit with low pick-up (for protecting generators, very long feeds)
MA	Magnetic-only trip unit (for protecting motors, transformers, etc.)

Accessible Protections and Settings

The adjustment dials are on the front of the trip units.

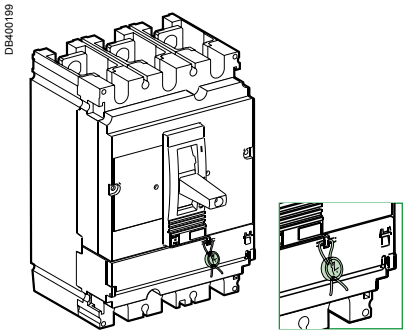




No.	Parameter	Description	Type		
			TM-D	TM-G	MA
0	In	Trip unit setting range: minimum setting/maximum setting = trip unit rating In	□	□	□
1	Ir	Thermal protection pick-up	■	■	-
2	tr	Thermal protection time delay	□	□	-
3	Im	Magnetic protection pick-up	⊠	□	■
4	tm	Magnetic protection time delay	□	□	□
■ : Adjustable, □ : Non-adjustable, ⊠ : Adjustable or non-adjustable according to the trip unit rating, - : Not present					

Sealing the Protection

The transparent cover on thermal-magnetic trip units can be sealed to prevent modification of the protection settings.



TM-D Thermal-Magnetic Trip Unit

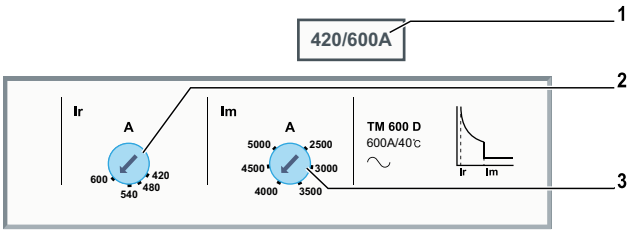
At a Glance

The TM-D thermal-magnetic trip unit is designed to protect conductors in commercial and industrial electrical distribution.

This trip unit exists in three versions - (3P, 3D), (4P, 3D) and (4P, 4D).

Description

The adjustment dials are on the front of the trip unit.

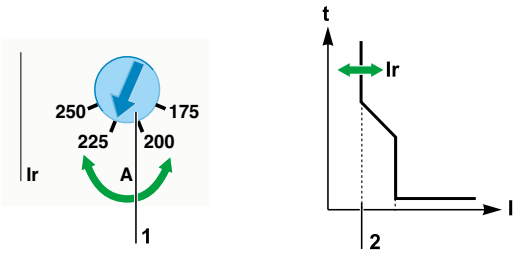


1 Setting range for the TM-D thermal-magnetic trip unit
2 Adjustment dial for the thermal protection pick-up Ir
3 Adjustment dial for the magnetic protection pick-up Im (for TM-D 320/600 only)

Setting the Thermal Protection

The thermal protection pick-up Ir is set by a 4-setting dial.

Turning the thermal protection adjustment dial (1) modifies the trip curve as shown (2).



The table below shows the values of the pick-up Ir (in amperes) for thermal protection (values indicated on the dial) with respect to every trip unit rating, relative to the position of the dial Ir.

	Trip unit rating In (A)															
	16	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**	**320**	**400**	**500**	**600**
Pick-up Ir (A)	11	18	22	28	35	44	56	70	88	112	140	175	225	280	350	420
	13	20	26	32	40	50	64	80	100	128	160	200	255	320	400	480
	14	23	29	36	45	57	72	90	113	144	180	225	290	360	450	540
	16	25	32	40	50	63	80	100	125	160	200	250	320	400	500	600

Setting the Magnetic Protection

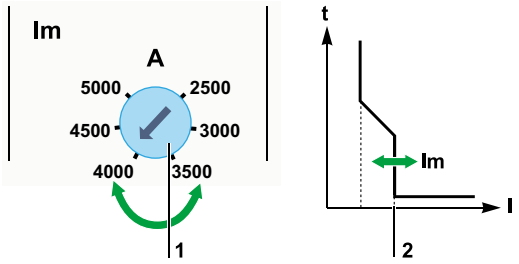
For trip units rated below 320 A, the magnetic protection pick-up cannot be adjusted and equals the value shown below:

	For all case types Trip unit rating In (A)											
	16	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**
Pick-up Im (A)	190	300	400	500	500	500	640	800	1250	1250	2000	2500

The precision range is +/- 20%.

For trip units rated between 320 A and 600 A, the magnetic protection pick-up Im is set using a 6-setting dial.

Turning the magnetic protection adjustment dial (1) modifies the trip curve as shown (2).



The table below shows the values of the pick-up Im (in amperes) for magnetic protection (values indicated on the dial), relative to the position of the Im dial:

	Trip unit rating In (A)			
	320	**400**	**500**	**600**
Pick-up Im (A)	1600	2000	2500	2500
	1920	2400	3000	3000
	2240	2800	3500	3500
	2560	3200	4000	4000
	2880	3600	4500	4500
	3200	4000	5000	5000

The precision range is +/- 20%.

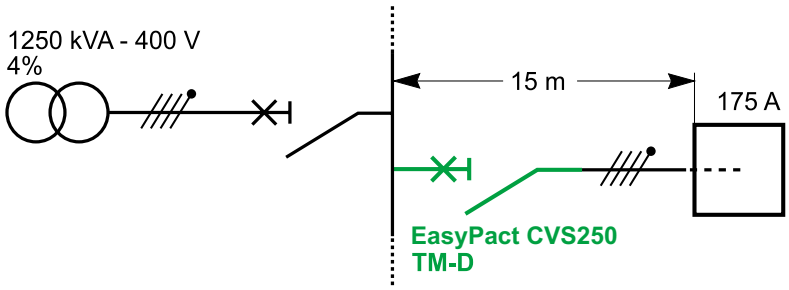
Example of Application

Protection of a feed with the following characteristics:

- Power supplied by a 1,250 kVA transformer - 400 V, 4%
- Protection of a distribution box located 15 m away, the loads on which are mainly for lighting (incandescent bulbs), heating and small machines

The value of the calculated rated current (load consumption) is In = 175 A.

Installation diagram



Calculations performed on the installation in accordance with the regulations can be used to determine the characteristics of the appropriate EasyPact CVS to install (calculations performed using the Ecodial software).

Circuit breaker selection

Installation	Chosen EasyPact CVS	Comments
In = 175 A	EasyPact CVS 250	Determination of case size
Distributed neutral	4P, 3D	Full neutral and linear loads
Isc = 28.5 kA	F	Icu performance can be read from rating plate
Ikmin = 14.0 kA	-	-

Trip unit protection settings

Installation	Chosen trip unit	Comments
In = 175 A	TM-D 200, Ir set to 180	Optimizing the choice
	TM-D 250, Ir set to 175	Necessary if extensions envisaged
Ikmin = 14.0 kA	Im = 2,000 A or 2,500 A	Natural adjustment to the Im protection for distribution, compatible with: ● Inrush currents (no trip) ● Short-circuit protection (trip)

TM-G Thermal-Magnetic Trip Unit

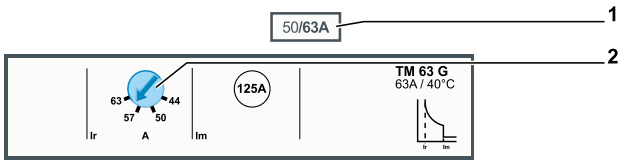
At a Glance

The TM-G thermal-magnetic trip unit has low thermal and magnetic pick-ups. It is designed to protect long conductors and/or distribution systems powered by generators.

There are two versions of this trip unit (3P, 3D), (4P, 3D).

Description

The adjustment dial is on the front of the trip unit.

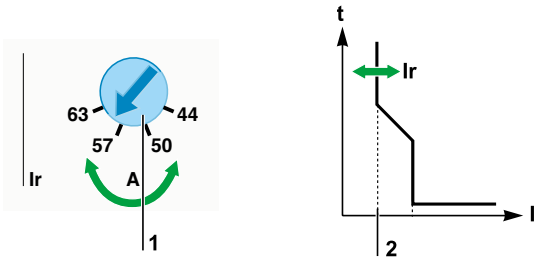


1 Setting range for the TM-G thermal-magnetic trip unit
2 Adjustment dial for the thermal protection pick-up Ir

Setting the Thermal Protection

The thermal protection pick-up Ir is set by a 4-setting dial.

Turning the thermal protection adjustment dial (1) modifies the trip curve as shown (2).



The table below shows the values of the pick-up Ir (in amperes) for thermal protection (values indicated on the dial) with respect to every trip unit rating, relative to the position of the dial Ir.

	Trip unit rating In (A)									
	16	**25**	**40**	**63**	**80**	**100**	**125**	**160**	**200**	**250**
Pick-up Ir (A)	Adjustable in amps from 0.7 to 1 x In									

Setting the Magnetic Protection

The magnetic protection pick-up Im cannot be adjusted and equals the value shown below:

	Trip unit rating In (A)									
	16	**25**	**40**	**63**	**80**	**100**	**125**	**160**	**200**	**250**
Pick-up Im (A)	64	80	80	125	200	320	440	500	600	750

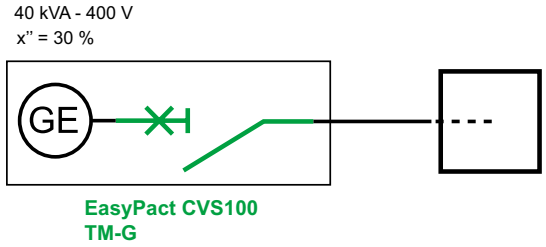
The precision range is +/- 20%.

Example of Application

Protection of an incoming feed with the following characteristics:

- Power supplied by a generator defined by:
  - Generator power 40 kVA - 400 V, giving an operating current of 58 A
  - Subtransient reactance: 30%
- Generator protection. The loads mainly consist of heating and lighting (incandescent bulbs). The neutral is distributed.

Installation diagram



Calculations performed on the installation in accordance with the regulations have determined the characteristics of the appropriate EasyPact CVS to install (calculations performed using the Ecodial software).

Circuit breaker selection

Installation	Chosen EasyPact CVS	Comments
In = 57 A	EasyPact CVS 100	Determination of case size
Distributed neutral	4P, 3D	Full neutral and linear loads
Isc = 0.3 kA	B	Icu performance can be read from rating plate
Ikmin = 0.25 kA	TM-G	Generator protection circuit breaker

Trip unit protection settings

Installation	Chosen trip unit	Comments
In = 57 A	TM-G 63, Ir set to 57	Thermal protection Ir setting
Ikmin = 0.25 kA	Im =125 A	Low pick-up magnetic protection Im cannot be adjusted

MA Magnetic Trip Unit

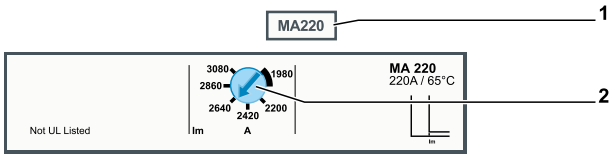
At a Glance

The MA trip unit has a high magnetic pick-up. It is designed to provide motor-feeders with short-circuit protection.

The MA trip unit can be used to create a type 1 coordination motor-feeder.

Description

The adjustment dial is on the front of the trip unit.

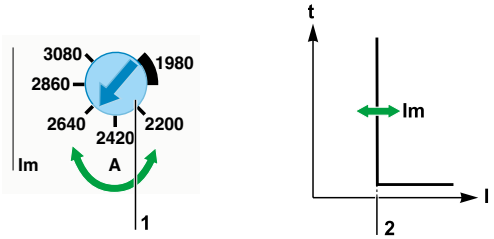


1 MA magnetic trip unit rating
2 Adjustment dial for the magnetic protection pick-up Im

Setting the Magnetic Protection

The magnetic protection pick-up Im is set by:
- A 9-setting dial for 2.5 A to 50 A ratings
- A 6-setting dial for 100 A to 220 A ratings

Turning the magnetic protection adjustment dial (1) modifies the trip curve as shown (2).



The table below shows the values of the pick-up Im (in amperes) for magnetic protection (values indicated on the dial) with respect to every trip unit rating, relative to the position of the dial Im.

	Trip unit rating In (A)									
	2.5	**6.3**	**12.5**	**25**	**50**	**100**	**150**	**220**	**320**	**500**
Pick-up Im (A)	15	38	75	150	300	-	-	-	-	-
	18	44	88	175	350	-	-	-	1920	3000
	20	50	100	200	400	-	-	-	2240	3500
	23	57	113	225	450	900	1350	1980	2560	4000
	25	63	125	250	500	1000	1500	2200	2880	4500
	28	69	138	275	550	1100	1650	2420	3200	5000
	30	76	150	300	600	1200	1800	2640	3520	5500
	33	82	163	325	650	1300	1950	2860	3840	6000
	35	88	175	350	700	1400	2100	3080	4160	6500

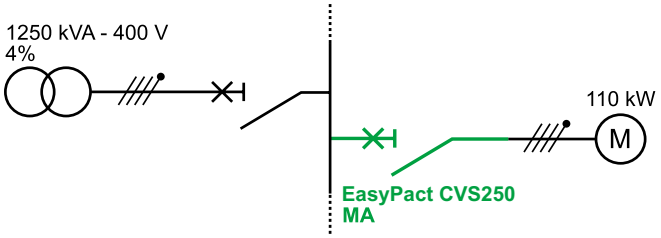
The precision range is +/- 20%.

Example of Application

Protection of a motor-feeder with the following characteristics:

- Power supplied by a 1,250 kVA transformer - 400 V, 4%
- Protection of a motor application defined by:
  - 3-component motor-feeder (circuit breaker, thermal relay, contactor)
  - Direct-on-line starting
  - Motor power 110 kW, i.e. In = 220 A
  - Type 1 coordination

Installation diagram



Calculations performed on the installation in accordance with the regulations can be used to determine the characteristics of the appropriate EasyPact CVS to install (calculations performed using the Ecodial software).

Circuit breaker selection

Installation	Chosen EasyPact CVS	Comments
In = 220 A	EasyPact CVS 250 MA 220	Determination of case size
Isc = 28.5 kA	F	Icu performance can be read from rating plate
Ikmin = 14.8 kA	-	-

Trip unit protection settings

Installation	Chosen trip unit	Comments
Ikmin = 14.8 kA Transient current = 14 In i.e. 2,800 A	Im = 2,860 A	The Isd protection setting is compatible with: ● Transient startup currents ● Short-circuit protection

Vigi Earth Leakage Protection Module

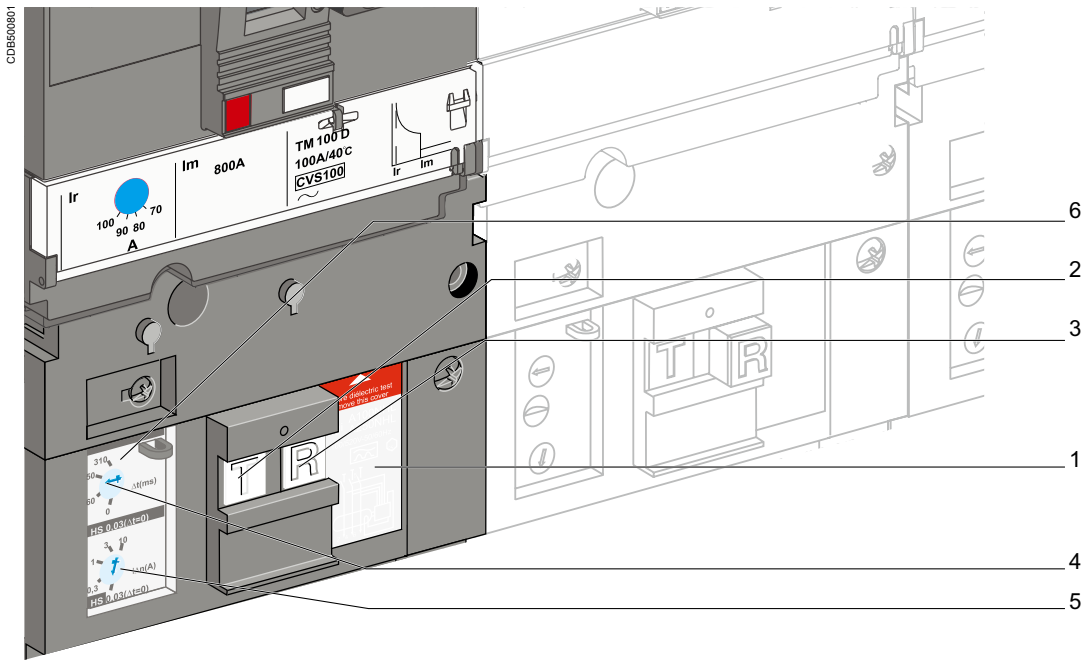
At a Glance

The Vigi earth leakage protection module is designed to provide protection against very low value ground fault currents. In the event of a fault, this earth leakage protection module causes the circuit breaker to trip very rapidly by acting directly on the circuit breaker mechanism.

Earth leakage protection by the Vigi module is provided:
- For the EasyPact CVS 100 to 250 series by adding a Vigi MH module (high sensitivity)
- For the EasyPact CVS 400 and 630 by adding a Vigi MB module (low sensitivity)

Description

The settings and controls are on the front face:



1 Rating plate
2 Test pushbutton
3 Reset pushbutton
4 Intentional delay adjustment dial: Δt
5 Sensitivity pick-up adjustment dial: IΔn
6 Protective cover for settings
7 Protective cover for connections

Installation

The Vigi module is installed below the trip unit. An intermediate terminal shield is needed: this provides protection against direct contact with the connection block downstream of the circuit breaker.

A Vigi module can be installed on all types of circuit breaker:
- With toggle switch
- With rotary handle

A circuit breaker complete with Vigi module can be installed on a mounting plate.

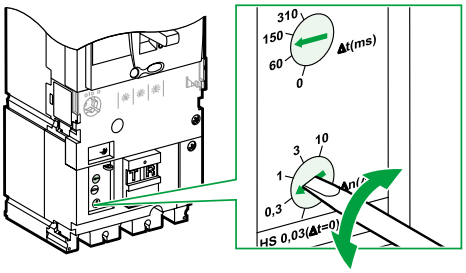
Setting the Earth Leakage Protection

The Vigi module is designed to protect personnel and equipment.

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH
Only qualified persons are authorized to make adjustments to Vigi modules.
Failure to follow these instructions will result in death or serious injury.

The sensitivity IΔn is set by a dial on the front face. The sensitivity value is expressed in amperes.



Setting the Intentional Delay

The intentional delay Δt is set by a dial on the front face. The intentional delay value is expressed in milliseconds.

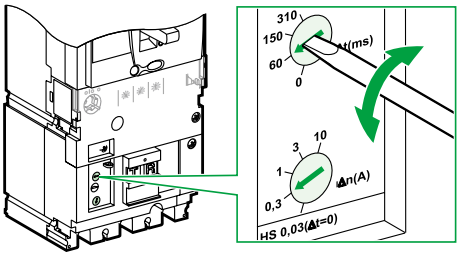


Table of Setting Values

The table below shows the setting values for sensitivity IΔn and intentional delay Δt for each Vigi module type.

Vigi MH module		**Vigi MB module**	
IΔn (A)	**Δt (ms)**	**IΔn (A)**	**Δt (ms)**
0.03	0	0.3	0
0.3	60	1	60
1	150	3	150
3	310	10	310
10	-	30	-

NOTE: For the sensitivity 0.03 A (Vigi MH module), the intentional delay cannot be set by design and tripping is instantaneous (in conformity with IEC 609472 appendix B).

Testing and Resetting

A test pushbutton T can be accessed on the front of the circuit breaker: pressing this button creates a real earth leakage fault that fully tests the device.

NOTE: It is advisable to test that the earth leakage protection works at regular intervals (every 6 months).

Installation standards may require these periodic tests.

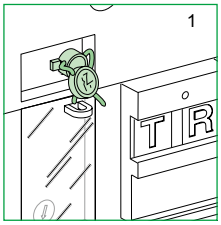
After a ground fault trip, the circuit breaker cannot be closed again until the Vigi module has been reset by pressing the reset pushbutton R.

Insulation and Dielectric Strength Tests

There is a specific procedure for carrying out the insulation and dielectric strength tests on equipment incorporating a Vigi module (see Startup, page 126).

Insulation and Dielectric Strength Tests

Lead sealing accessories are used to prevent the following operations:



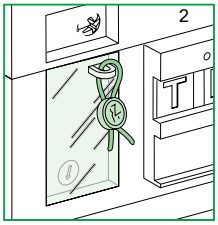


Diagram	Seal	Prohibited operations
1	Vigi module fixing screw	Dismantling the Vigi module
2	Transparent protective cover for the settings	Modification of the Vigi module settings

3.3 ETS Trip Units

Aim

This section describes the electronic trip units. These trip units can be installed on all EasyPact CVS circuit breakers.

What Is in This Section?

This section contains the following topics:

Characteristics of ETS Electronic Trip Units

Thermal Memory

The thermal memory is used to simulate temperature build-up and cooling in conductors caused by current variations, according to a time constant. In the event of an overload, the trip units with a thermal memory memorize the build-up temperature caused by the current. Memorizing the build-up temperature leads to a reduction in the trip time.

All electronic trip units incorporate a thermal memory as standard:

- For ETS 2.3 trip units, the time constant is 15 min.

Test equipment for ETS electronic trip unit

Mini test kit

The mini test kit is a portable unit requiring no external power supply, used to check operation of the electronic trip unit and circuit breaker tripping.
It connects to the test connector on the front of the circuit breaker.
Required power source: five 9 V alkaline batteries (not supplied).

Portable test kit

The portable test kit is used to check all aspects of the protection functions:

- long time protection
- short time protection
- instantaneous protection
- earth-fault protection.

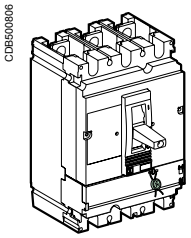
Required power source: 110 or 220 V AC, 50/60 Hz.

Spare test plug and wiring kit

A spare test plug and wiring kit are available for this offer.

Sealing the Protection

The transparent cover on electronic trip units can be sealed to prevent modification of the protection settings and access to the test port.



ETS 2.3 Electronic Trip Unit

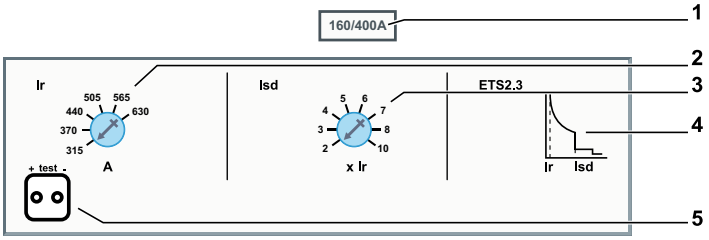
At a Glance

The ETS 2.3 electronic trip unit is designed to protect conductors in commercial and industrial electrical distribution.
This trip unit exists in two versions 3P and 4P.

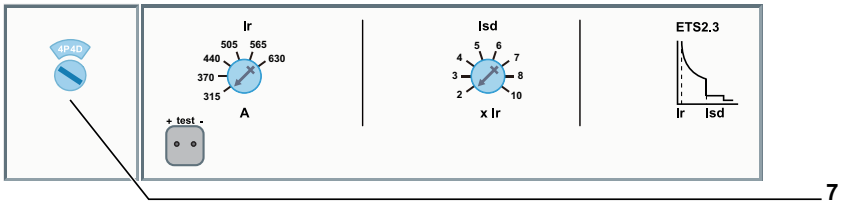
Description

The adjustment dials and indications are on the front face.

- ETS 2.3 3P version



- ETS 2.3 4P version



1 ETS 2.3 electronic trip unit setting range
2 Fine-tuning dial for the long time protection pick-up Ir
3 Adjustment dial for the short time protection pick-up Isd
4 Value of instantaneous protection pick-up Ii
5 Test port
6 Selection dial for setting the neutral protection (4P only)
The trip unit rating In corresponds to the maximum value of the setting range.

Setting the Long Time Protection

The long time protection pick-up Ir is set using one 6-setting dials.

- The adjustment dial can be used to set the pick-up Ir (value displayed in multiples of In on the dial).

Step	Action
1	The Ir setting value is: In(A) x 0.5 to 1.

The time delay tr for long time protection cannot be adjusted.

The table below shows the value of the time delay tr for long time protection (in seconds) according to the overload current (in multiples of Ir):

at 1.5 Ir	at 6 Ir	at 7.2 Ir
tr = 90...180s	tr = 5...7.5s	tr = 3.2...5.0s

Setting the Short Time Protection

The short time protection pick-up Isd is set by a 8-setting dial.

The setting value is expressed in multiples of Ir.

Step	Action
1	Set the long time protection first: the setting pick-up is Ir.
2	Turn the Isd adjustment dial to the value required. The Isd value is adjustable from 2 Ir to 10 Ir.
3	Isd = Isd setting x Ir.

The precision range is +/- 15%.

The time delay tr for short time protection cannot be adjusted:
- Non-trip time: ≤ 40 ms
- Maximum breaking time: 60 ms

Setting the Instantaneous Protection

The pick-up Ii for instantaneous protection cannot be adjusted. The value is fixed to 11xIn.

The table below shows the value of the pick-up Ii for instantaneous protection (in amperes) according to the trip unit rating In:

	Trip unit rating In (A)	
	400	**630**
Pick-up Ii (A)	4400	6930

The precision range is +/- 15%.

The time delay for instantaneous protection cannot be adjusted:
- Non-trip time: 0 ms
- Maximum breaking time: 50 ms.

Setting the Neutral Protection (4P Only)

The neutral selection dial gives a choice of three values for the neutral long time and short time protection pick-ups.

The table below shows the values of the pick-up for neutral long time protection (in multiples of Ir) and neutral short time protection (in multiples of Isd) according to the dial position:

Dial	Dial position	Long time setting value	Short time setting value
	4P 3D	0	0
	4P 3D + N/2	Ir/2	Isd/2
	4P 4D	Ir	Isd

The time delay for the neutral long time and short time protections is the same as that for the phases.

Operating the EasyPact CVS

4

Aim

This chapter sets out the recommendations concerning the startup phase, operating conditions and maintenance of EasyPact CVS circuit breakers. Observing these recommendations will ensure a useful service life for the equipment and the installation.

What Is in This Chapter?

This chapter contains the following topics:

Startup

List of Checks and Inspections

When starting up new equipment, or following lengthy downtime, a general check takes just a few minutes. Such a check will remove all risk of a malfunction due to error or oversight.

NOTE: The switchboard must be powered down before carrying out any checks and tests.

The table below indicates the checks and inspections to be performed according to the event:

	A	B	C	D	E	F
Prior to startup	■	■	■	■	■	■
Periodically during operation, see Regular Preventive Maintenance, page 131.				■	■	■
After carrying out work on the switchboard		■	■	■	■	■
Periodically during lengthy downtime		■		■		■
Following lengthy downtime		■		■	■	■
Following lengthy downtime and modification to the switchboard	■	■	■	■	■	■

A Insulation and dielectric strength tests
B Inspection of the switchboard
C Compliance with the diagram
D Inspection of mechanical equipment
E Mechanical operation
F Check of electronic trip units and Vigi modules

A: Insulation and Dielectric Strength Tests.

Insulation and dielectric strength tests are carried out before the switchboard is delivered. These tests are subject to the currently applicable standards.

⚠ CAUTION

RISK OF EQUIPMENT DAMAGE
Only a trained specialist is authorized to carry out insulation and dielectric strength tests.
Failure to follow these instructions can result in injury or equipment damage.

Dielectric strength tests impose great stress on the equipment and may even destroy it if they are not rigorously performed, and in particular:

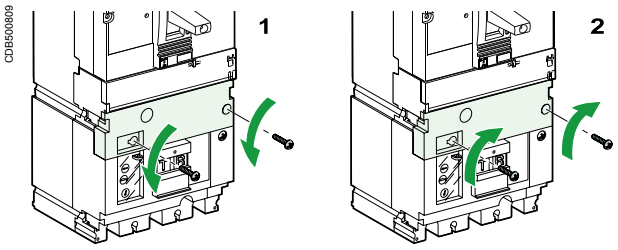
- The value used for the test voltage reduces according to the number of consecutive tests on the same piece of equipment
- It may be necessary to disconnect electronic equipment

A: Insulation and Dielectric Strength Tests on Vigi Modules

Vigi modules are electronic devices which do need to be disconnected before dielectric tests.

⚠ CAUTION

RISK OF EQUIPMENT DAMAGE
Disconnect the protective cover on the front of the Vigi module.
Failure to follow these instructions can result in injury or equipment damage.



Disconnecting Vigi modules (diagram 1):
A Vigi module is disconnected automatically by removing the protective cover for the connections on the front.

Reconnecting Vigi modules (diagram 2):
Following dielectric tests, it is essential to put the protective cover for the connections back in place.

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- This equipment must be installed and serviced by qualified electrical personnel.
- Disconnect all power sources before performing maintenance inspections.
  Assume that all circuits are live until they are completely de-energized, tested, grounded and tagged.
  Consider all sources of power, including the possibility of backfeeding and control power.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

If the cover is not put back in place:
- There is a risk of direct contact with connections
- Protection of people against electrical risks due to a ground fault is no longer guaranteed downstream

B: Inspection of the Switchboard

Check that the circuit breakers are installed:
- In a clean environment where no waste has been left behind from assembling the equipment (wiring, tools, shavings, metallic particles, etc.)
- In a properly ventilated switchboard (unobstructed ventilation grilles)

C: Compliance with the Diagram

Check that the circuit breakers comply with the installation diagram (see Identification of EasyPact CVS Circuit Breakers, page 12):
- Identification of the feeds on the front of the circuit breakers
- Rating and breaking capacity (indications on the rating plate)
- Identification of the trip units (type, rating)
- Presence of additional functions (Vigi earth leakage protection module, rotary handle, control or indication auxiliaries, locking, sealing)
- Protection settings (overload, short-circuit, earth leakage):
- Thermal-magnetic and electronic trip unit: visually check the position of the switches

NOTE: In the case of EasyPact CVS circuit breakers fitted with a Vigi module, check for the presence of the intermediate terminal shield, without which the earth leakage protection will not work (see below).

D: Inspection of Mechanical Equipment

Check the mounting and mechanical strength:
- Of circuit breakers in the switchboard and of power connections
- Of auxiliaries and accessories on the circuit breakers:
  - Rotary handles
  - Installation accessories (terminal shields, escutcheons, etc.)
  - Auxiliary circuit connections

E: Mechanical Operation

Check the circuit breaker mechanical operation (see Description of the EasyPact CVS Circuit Breaker, page 9):
- Opening
- Closing
- Tripping with the push to trip button
- Resetting

F: Operation of Electronic Trip Units and Vigi Modules

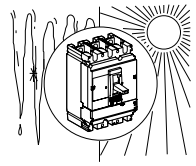
- Vigi modules, by operating test button T on the front (this test checks the whole measurement system and guarantees tripping on earth leakage fault)

Environmental Conditions

Ambient Temperature

The ambient temperature refers to the temperature of the air immediately surrounding the EasyPact CVS circuit breaker.

CDB500810



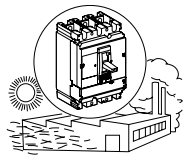
Operating temperature:
- -25°C to +70°C: Normal operating temperature
- -35°C to -25°C: Commissioning possible

Storage temperature:
- -50°C to +85°C: Without electronic trip unit

Extreme Atmospheric Conditions

EasyPact CVS circuit breakers are designed to operate in industrial atmospheres as defined in standard IEC 60947-2 for the highest level of pollution (level 3).

CDB500812



They are also tested for extreme storage conditions according to the following standards:

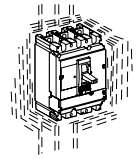
Standard	Title
IEC 60068-2-2	Dry heat, severity level +85°C
IEC 60068-2-1	Dry cold, severity level —55°C
IEC 60068-2-30	Damp heat, cyclic (temperature +55°C, relative humidity 95%)
IEC 60068-2-52	Salt-mist test

To get the very best use from the circuit breakers, it is advisable to install them in properly ventilated switchboards where excessive dust is not a problem.

Extreme Atmospheric Conditions

EasyPact CVS circuit breakers are protected against mechanical or electromagnetic vibration.

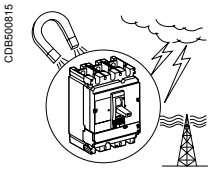
CDB500814



Conformity tests are carried out in accordance with standard IEC 60068-2-6 at the levels of severity required by the merchant shipping regulatory bodies (IACS), namely:
- 2 Hz to 13.2 Hz with an amplitude of +/- 1 mm
- 13.2 Hz to 100 Hz at a constant acceleration of 0.7 g

Electromagnetic Disturbances

EasyPact CVS circuit breakers are designed to be immune to electromagnetic disturbance.



They comply with the requirements of the electromagnetic compatibility (EMC) standard.

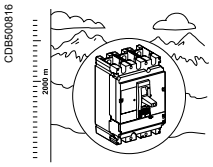
Standard	Title
IEC 60947-2 annexes F and J	Overcurrent protection tests
IEC 60947-2 annexes B and J	Specific tests for earth leakage protection

Compliance with EMC standards is validated by tests for immunity to:
- Overvoltages produced by the operation of electromagnetic switchgear
- Overvoltages produced by atmospheric disturbance passing through the electrical network (for example, lightning)
- The use of apparatus emitting radio waves (radio transmitters, walkie-talkies, radar, etc.)
- Electrostatic discharges produced by the operators themselves

Conformity with EMC standards as described above ensures:
- The EasyPact CVS circuit breaker will operate correctly in a disturbed environment
  - without nuisance tripping
  - in accordance with the trip time
- There will be no disturbance to any type of industrial or commercial environment

Altitude

EasyPact CVS circuit breakers are designed to operate within specification at altitudes of up to 2,000 m.



Above 2,000 m modifying the characteristics of the surrounding air (dielectric strength, cooling capacity) causes derating as follows:

Altitude (m)	< 2,000	3,000	4,000	5,000
Maximum operating voltage (V)	440	400	400	380
Rated thermal current (A) at 40°C	In	0.96 x In	0.93 x In	0.9 x In

Maintaining the EasyPact CVS During Operation

At a Glance

The electrical switchboard and all its equipment continue to age whether they operate or not. This aging process is due mainly to environmental influences and operating conditions.

To ensure that your EasyPact CVS circuit breaker retains the operating and safety characteristics specified in the catalog for the whole of its service life, it is recommended that:

- The device is installed in optimum environmental and operating conditions (described in the table below).
- Routine inspections and regular maintenance are carried out by qualified personnel.

Environmental and Operating Conditions

The environmental conditions previously described (see Environmental Conditions, page 129) refer to harsh operating environments.

The table below describes the optimum environmental and operating conditions:

Environmental and operating factor	Comments
Temperature	Average annual temperature outside the switchboard: < 25°C.
Loading	Loading remains < 80% of In 24 hours a day.
Harmonics	The harmonic current per phase is < 30% of In.
Humidity	The relative humidity is < 70%.
Corrosive atmosphere (SO_2, NH_3, H_2S, Cl_2, NO_2)	The circuit breaker is installed in environmental category 3C1 or 3C2 (IEC 60721-3-3).
Saline environment	The circuit breaker is installed in an environment free of salt mist.
Dust	The dust level is low: the circuit breaker is protected within a switchboard fitted with filters or IP54 ventilated
Vibration	Continuous vibration is < 0.2 g.

The maintenance programs described below apply to these environmental and operating conditions.
Outside these limits circuit breakers are subject to accelerated aging which can quickly lead to malfunctions.

Regular Preventive Maintenance

Maintenance (servicing and inspection) recommendations for each product are made by the technical departments concerned. These operations are intended to maintain the equipment or subassemblies in a satisfactory operational state for their useful service life.

There are three recommended maintenance levels.

The table below indicates maintenance operations and their intervals according to the level:

Level	Maintenance interval	Maintenance operations
Level II	1 year	Visual inspection and functional testing, replacement of faulty accessories
Level III	2 years	As for level II plus servicing operation and subassembly tests
Level IV	5 years	As for level III plus diagnostics and repairs (by Schneider Electric Services)
The intervals stated are for normal environmental and operating conditions.		

Provided all the environmental conditions are more favorable, maintenance intervals can be longer (for example, Level III maintenance can be carried out every 3 years).

If just one of the conditions is more severe, maintenance must be carried out more frequently (for advice contact Schneider Electric Services).

Functions linked specifically to safety require particular intervals.

NOTE: It is advisable to test operation of the remote electrical stop commands and the earth leakage protection (Vigi module) at regular intervals (every 6 months).

Inspection and Servicing Operations Required

Inspection and servicing chiefly consist of checks and inspections D, E and F as defined for the commissioning phase (see Startup, page 126).

	Inspection definition	Level II	Level III	Level IV
D	Visually inspect the circuit breaker general condition: escutcheon, trip unit, case, connections. Check the mounting and mechanical strength: ● Of circuit breakers in the switchboard and of power connections ● Of auxiliaries and accessories on the circuit breakers: ○ Rotary handles ○ Installation accessories (terminal shields, escutcheons, etc.) ○ Auxiliary circuit connections ● Of locks, padlocks and padlock support tabs	Yes	As for level II	As for level III plus measurement of insulation resistance
E	Check the circuit breaker mechanical operation: ● Opening, closing and resetting ● Tripping with the push to trip button ● Tripping by MN/MX control auxiliaries ● Opening, closing, resetting	Yes	As for level II plus check of the closing/ opening times and voltage characteristics (releases)	As for level III
F	● Vigi modules, using the test button T on the front	Yes		As for level III plus check of the trip characteristics by primary injection

For a detailed definition of these operations, contact Schneider Electric Services.

Maintenance Following Short-Circuit Trip

A circuit breaker is tested in severe conditions in accordance with standard IEC 60947-2, to check that it can break a short-circuit current at maximum permissible value 3 times.

After a short-circuit fault, it is necessary to:
- Carefully clean off any traces of black smoke (the particles may be conducting)
- Check the power connections and fine wires
- Operate the circuit breaker several times at no load (at least 5 times)

Cleaning the Circuit Breakers

To avoid dust deposits that can affect the circuit breaker mechanical operation, it is recommended that the circuit breakers be cleaned if necessary when maintenance is carried out.

Non-metallic parts	Always use a dry cloth. Do not use cleaning products.
Metallic parts	Preferably use a dry cloth. If a cleaning product must be used, avoid applying and/or splashing the product onto non-metallic parts.

What to do in the Event of a Trip

Identify the Cause of the Trip

Local and remote indication provides information on the probable cause of a trip.

There are several types of cause:
- Faults on the installation
- Faults due to a malfunction
- Intentional tripping

Trip Following a Fault on the Installation

The control mechanism is positioned on ▼, Trip or Tripped.

Indication		**Probable cause**
TM-D	**ETS**	
SD	SD	Tripped manually by: ● Push to trip test ● Disconnecting the circuit breaker ● MN or MX releases
SD, SDE	SD, SDE	● TM-D: Tripped on electrical fault, cause unknown ● ETS: Tripped on electrical fault, cause unknown
SD, SDE, SDV Button R on Vigi module in the out position	SD, SDE, SDV Button R on Vigi module in the out position	● TM-D: Tripped by earth leakage protection ● ETS: Tripped by earth leakage protection

Maintenance of the Equipment Following Trip on Fault

The fact that the protection has tripped does not remedy the cause of the fault on the downstream equipment.

⚠ CAUTION

RISK OF CLOSING ON ELECTRICAL FAULT
Do not close the circuit breaker again without first inspecting and, if necessary, repairing the downstream electrical equipment.
Failure to follow these instructions can result in injury or equipment damage.

The feed must be isolated before inspecting the electrical equipment downstream of the protection.

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- This equipment must be installed and serviced by qualified electrical personnel.
- Disconnect all power sources before performing maintenance inspections.
  Assume that all circuits are live until they are completely de-energized, tested, grounded and tagged.
  Consider all sources of power, including the possibility of backfeeding and control power.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

Depending on the type of fault, maintenance inspections must be carried out on all or part of the equipment where the fault occurred (see Startup, page 126):
- Minor faults:
  - Tripped by long time protection
  - Tripped by earth leakage protection

Following repairs, checks D, E and F must be carried out.
- Serious or destructive faults:
  - Tripped due to unknown electrical fault
  - Tripped by short time protection

Following repairs, checks A, B, D, E and F must be carried out. The circuit breaker that tripped must be specifically checked (see Maintaining the EasyPact CVS During Operation, page 131) before being returned to service.

NOTE: Checks, tests and inspections must be carried out by qualified personnel.

If restarting is a high priority (for example, a safety installation), the defective part of the installation must be isolated and logged in order to carry out this maintenance.

Malfunction: Repetitive Tripping

The table below shows the checks and/or repairs that have to be carried out in relation to the probable causes of the malfunction indicated, according to the trip unit type:

All trip unit types		
Indication	**Probable cause**	**Checks or repairs**
SD	Supply voltage to the MN undervoltage release is too low or subject to significant variations	Check whether the release is powered by a disturbed supply (for example, a supply powering motors with high power ratings may be disturbed). If so, connect the release to a clean or stable supply.
	Supply voltage to an MX shunt release applied unintentionally	Check that the release connection is correct compared to the installation diagram.
SD, SDE	Operating temperature too high	Check the switchboard ventilation and/or the temperature in the room.
SD, SDE, SDV Button R on Vigi module in the out position	Inappropriate earth leakage protection (Vigi module) setting	Check the value of the natural leakage current. Depending on the results: ● Isolate the equipment with excessive natural leakage current ● Or raise the earth leakage (Vigi module) protection setting, observing the safety rules.

Malfunction: Circuit Breaker Fails to Close

The table below shows the checks and/or repairs that have to be carried out in relation to the probable causes of the malfunction indicated:

All trip unit types		
Indication	**Probable cause**	**Checks or repairs**
Manually-operated circuit breaker		
SD	MX shunt release energized MN undervoltage release not energized	Check that the release connection is correct compared to the installation diagram.
OF	Circuit breaker interlocked	Check the installation and interlock diagram (mechanical or electrical) for both circuit breakers

Appendices

Connection Diagrams

A

Aim

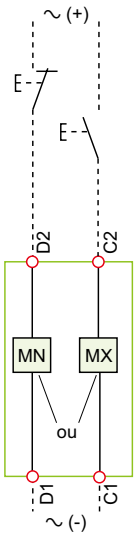
This chapter reproduces the connection diagrams from part D of the EasyPact CVS catalog.

What Is in This Chapter?

This chapter contains the following topics:

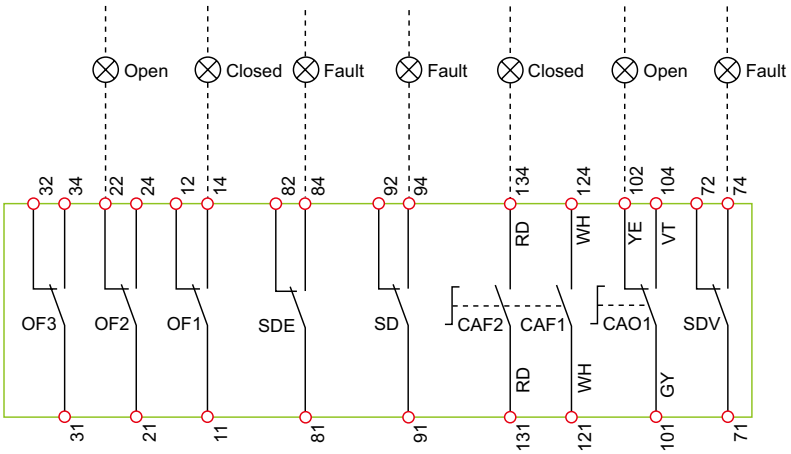
Fixed Devices

Remote operation



Remote operation	
MN:	undervoltage release
or	
MX:	shunt release

Indication contacts



The diagram is shown with circuits deenergised, all devices open, connected and charged and relays in normal position.

Terminals shown in red ○ must be connected by the customer.

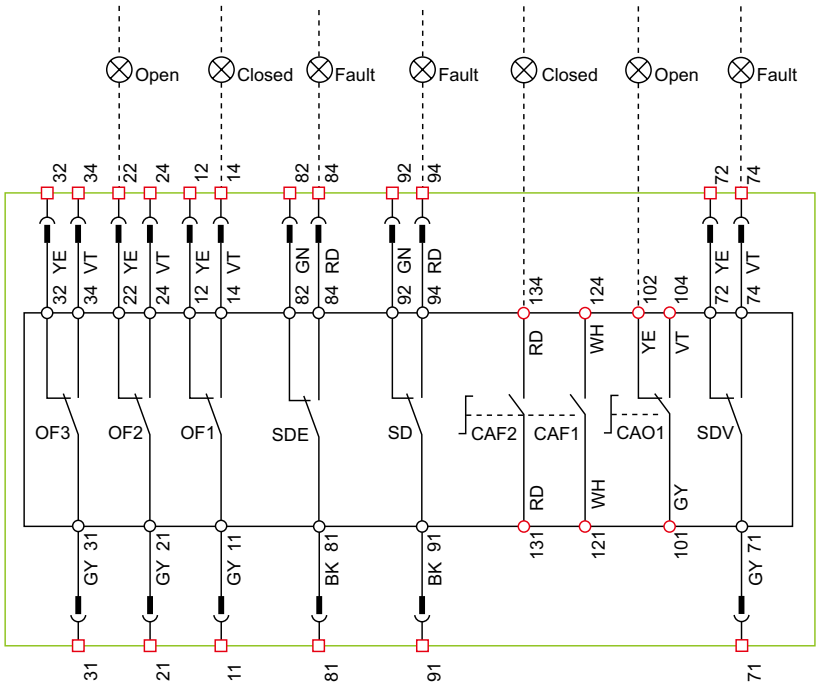
Indication contacts

OF2 / OF1:	device ON/OFF indication contacts
OF3:	device ON/OFF indication contacts (CVS400/630)
SDE:	fault-trip indication contact (short-circuit, overload, ground fault, earth leakage)
SD:	trip-indication contact
CAF2/CAF1:	early-make contact (rotary handle only)
CAO1:	early-break contact (rotary handle only)
SDV:	earth leakage fault trip indication contact (add-on Vigi module)

Colour code for auxiliary wiring

RD:	red	**VT:**	violet
WH:	white	**GY:**	grey
YE:	yellow	**OR:**	orange
BK:	black	**BL:**	blue
GN:	green		

Indication contacts



Colour code for auxiliary wiring

RD:	red	**VT:**	violet
WH:	white	**GY:**	grey
YE:	yellow	**OR:**	orange
BK:	black	**BL:**	blue
GN:	green		

Terminals shown in red □ / ○ must be connected by the customer.

Remote operation

MN:	undervoltage release
or	
MX:	shunt release

Indication contacts

OF2 / OF1:	device ON/OFF indication contacts
OF3:	device ON/OFF indication contacts (CVS400/630)
SDE:	fault-trip indication contact (short-circuit, overload, ground fault, earth leakage)
SD:	trip-indication contact
CAF2/CAF1:	early-make contact (rotary handle only)
CAO1:	early-break contact (rotary handle only)
SDV:	earth leakage fault trip indication contact (add-on Vigi module)

Schneider Electric Industries SAS
35, rue Joseph Monier
CS 30323
F- 92506 Rueil Malmaison Cedex

RCS Nanterre 954 503 439
Capital social 896 313 776
www.schneider-electric.com

This document has been printed on ecological paper

Design: Schneider Electric
Photos: Schneider Electric
Printed:

LVED315011EN

04-2015