MERLIN GERIN

molded case circuit breaker 100A

mastering electrical power

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Compact CE circuit breaker table of contents

Compact CE circuit breaker introduction

standard compliance

CE circuit breakers are built in accordance with Underwriters Laboratories standard UL 489 and CSA C22-2 no.5. The circuit breaker and its accessories, except when noted, are listed under UL files E107820, E107821, E107822 and E116305.

additional tests

In addition to standard tests, CE circuit breakers meet UL 489 and CSA C22-2 no.5 optional requirements (high available fault current).

compliance with international standards

In addition to UL489 and CSA C22-2 no.5 the Compact CE has been designed to comply also with the international standard IEC 157-1 as well as with the major standards :

- british BS 4752,
- german VDE 660,
- french NF C63-120,
- australian AS 2184.

Compact circuit breakers have been approved for marine application by American Bureau of Shipping, Bureau Veritas, Lloyd's Register of Shipping, Registro Italiano Navale, Germanische Lloyd's and Det Norske Veritas.

CE type	ampere rating (A) @ 40°C	no. poles	rated voltage (V) AC 60Hz	UL listed - CSA approved interrupting ratings RMS Sym. Amps 120V	240V	277V	480V	600V
standard interrupting rating circuit breakers								
CE 104N	15-100	1	277	42,000		14,000		
(not CSA)		2	480Y/277		65,000		18,000	
		3	480		65,000		18,000	
CE 106N	15-100	3	600Y/347		65,000		35,000	10,000
high interrupting rating circuit breakers								
CE 106H	15-100	3	600Y/347		100,000		42,000	14,000
current limiting circuit breakers								
CE 106L	15-100	3	600		150,000		100,000	42,000

interrupting ratings

Compact circuit breakers are listed for 3 levels of interrupting capabilities

- 35,000 Amps at 480V for the standard circuit breaker
- 42,000 Amps at 480V for the high interrupting circuit breaker
- 100,000 Amps at 480V for the current limiting circuit breaker.

Time current curves :
pages 6-7-8-9-10-11-12-13

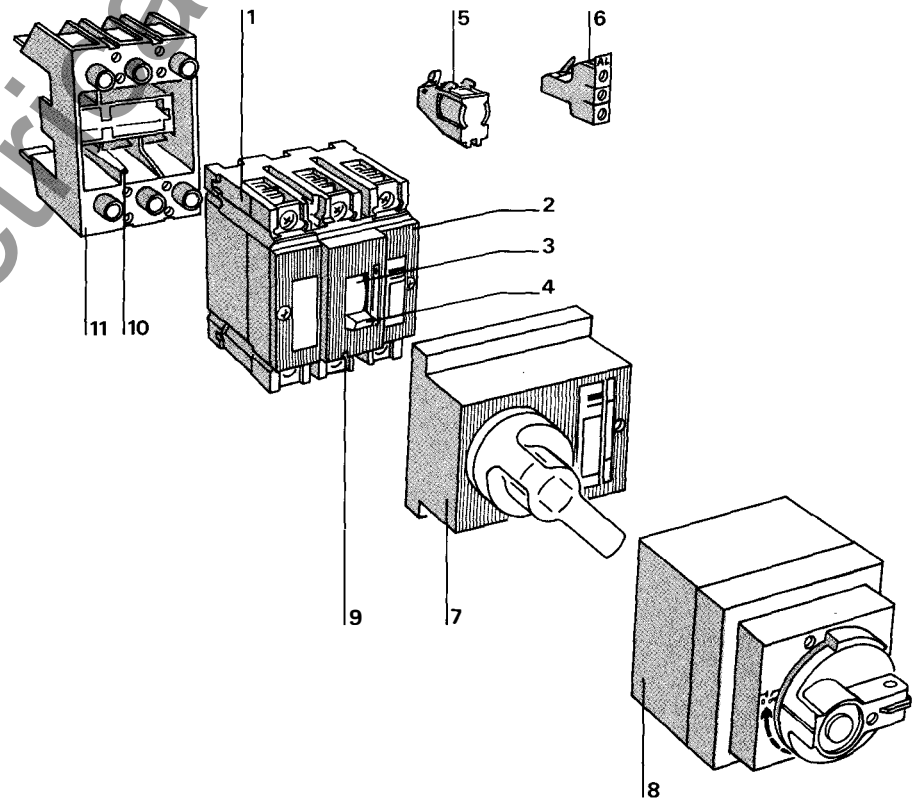
ratings

11 ratings from 15 to 100 Amperes

ampere ratings (A)	1, 2-pole	3-pole
CE 104 - CE 106		
15	■	■
20	■	■
30	■	■
40	■	■
45		■
50	■	■
60	■	■
70	■	■
80		■
90	■	■
100	■	■

description

1 three-pole high strength glass polyester casing
2 front accessory cover (accessory terminals located on left and right hand side behind this cover)
3 quick-make/quick break mechanism
4 handle with three positions : ON-TRIPPED-OFF
5 shunt trip or undervoltage trip devices
6 auxiliary and alarm switches
7 rotary operating handle
8 motor operator
9 push-to-trip button
10 plug-in disconnecting interlock
11 plug-in assembly

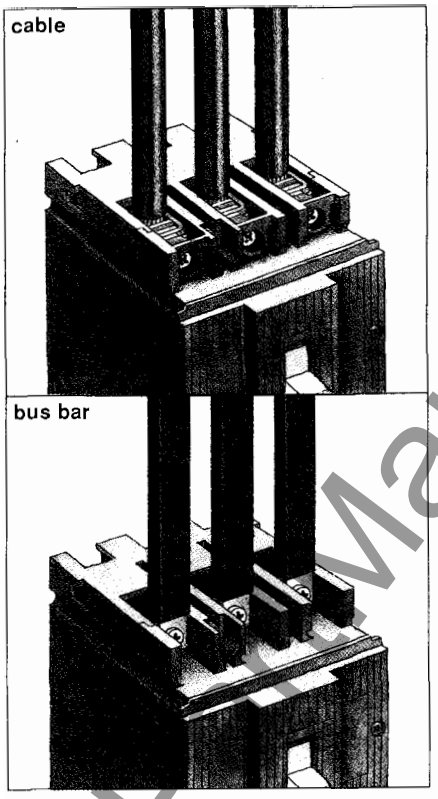


Compact CE circuit breaker advantages

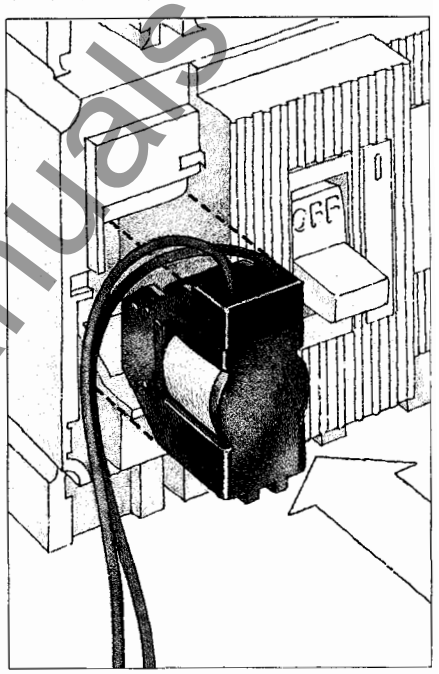
easy installation

CE circuit breakers have been designed to simplify mounting in panels and to increase safety of operations.

Connection
Pressure terminals are suitable for copper and aluminium cables.
The body of the connector may be used as a nut for the connection of bus bars.



Easy access to internal accessories
They are located behind a front accessory cover. Removing this cover gives no direct access to live parts. Internal accessories are field installable.



reinforced insulation

Two insulation barriers separate the front face of the circuit breaker from the main contacts. This reinforced insulation allows safe operation and installation of the electrical auxiliaries. The compartment in which they are installed is independant from the compartment of the main contacts.

integral partitioning

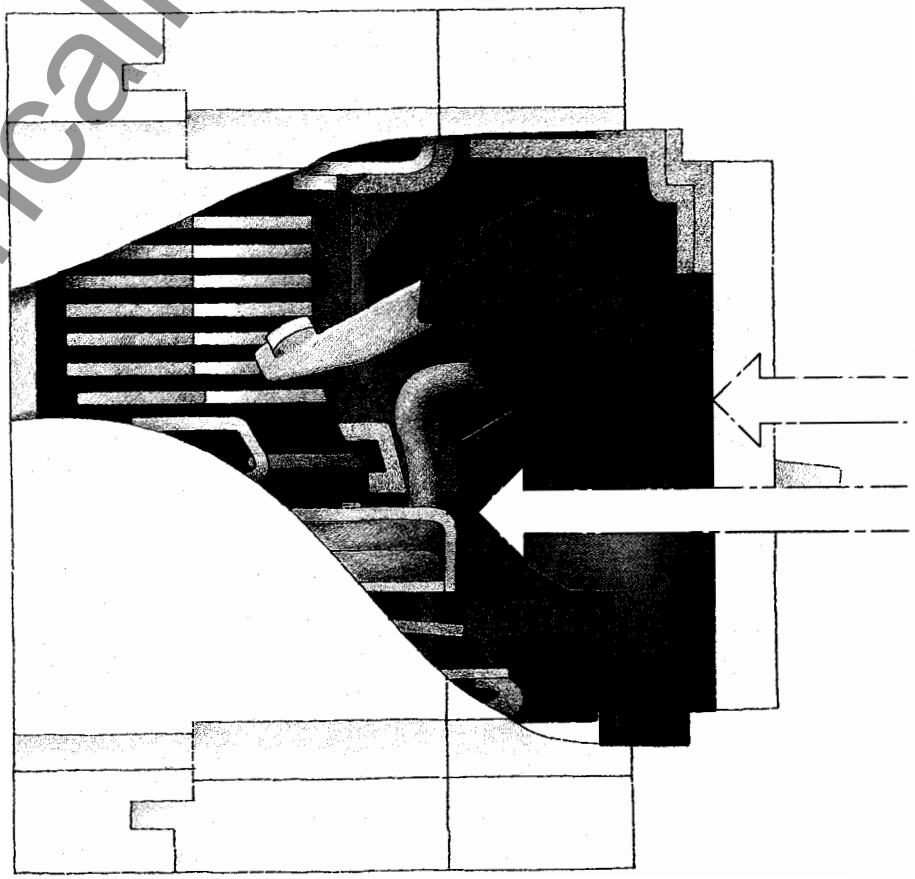
Once the front cover has been removed, to give access to the auxiliary compartments, the main circuits remain fully insulated. Furthermore, interphase partitioning allows full insulation between each pole even if the front cover has been removed.

isolation function

The operating handle is representative of the position of the main contacts. The OFF position can be reached only when the main contacts are fully opened.

plug-in disconnecting interlock

As a safety feature, in the event of disconnecting a closed breaker, a mechanical interlock will trip the breaker before the separation of the main disconnects (40 to 100A).



Compact CE circuit breaker description

CE circuit breakers exist in two different physical sizes, one for the standard and high interrupting type, and another one for the current limiting type.

standard and high interrupting rating circuit breakers

CE molded case circuit breakers are designed to connect a load to an electrical supply and to provide thermal and magnetic tripping under overcurrent conditions.
They consist of :
- a high strength polyester frame
- stationary and moving contacts
- arc chutes
- quick-make/quick-break and trip mechanism
- a trip unit including bimetal and electromagnet elements.

current limiting circuit breakers

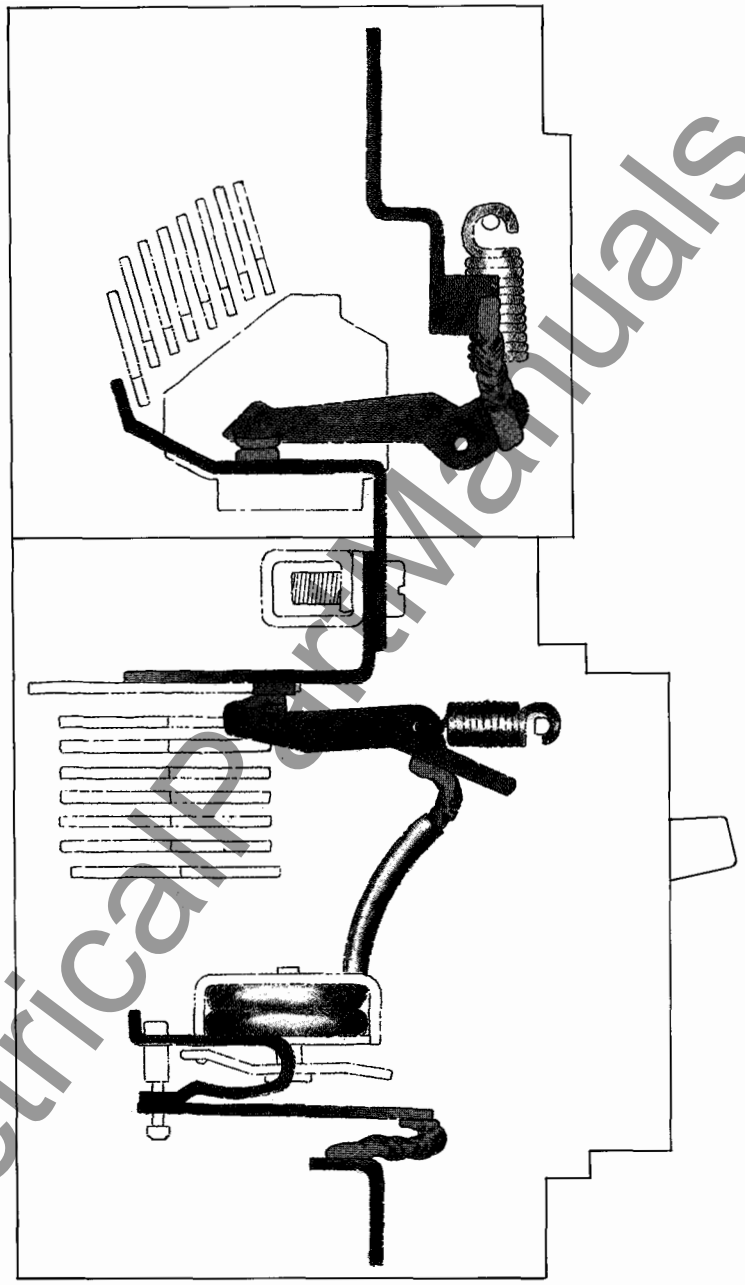
A series association of the basic circuit breaker, including the arrangements described above, and a limiting compartment equipped with an original system enables outstanding performances to be obtained.
- very high interrupting capability
- specialization of the devices according to the current to be interrupted :
  - the basic circuit breaker interrupts currents of up to 3,000 Amperes,
  - over 3,000 Amperes, both devices operate simultaneously. This mutual assistance noticeably reduces contact wear.

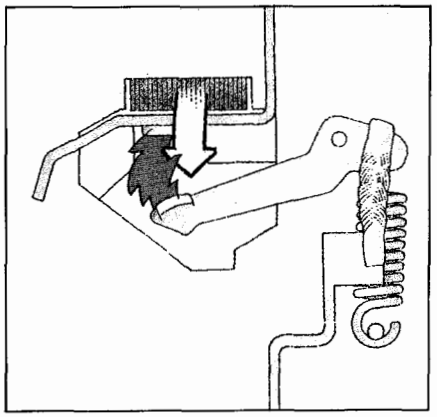
These performances are obtained by combination of the following techniques in the current limiting block :
- contact repulsion
- generation of local overpressure
- magnetic field enhancement

Contact repulsion. Electrodynamic forces are generated by the current flowing in parallel conductors. The moving contact is blown off by those repulsive forces, which appear on a short circuit current.

Generation of local overpressure, by placing gas generating material near the arc roots. In the event of thermal shocks, gas is given off, which due to the combined effect of blast and pressure, contributes to elongate the arc.

Magnetic field enhancement
Stationary contacts are surrounded by U-shaped steel plates. A magnetic force is generated and propels the arc into the arc chute.



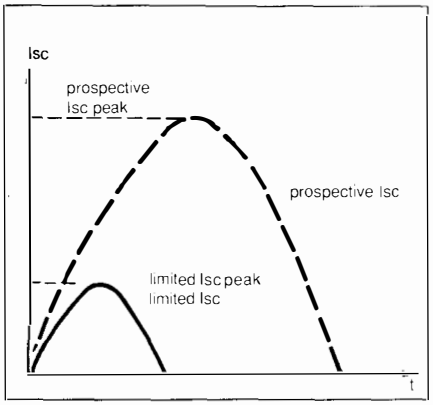


Ip and I²t curves

The limitation capability of a circuit breaker is that characteristic whereby only a current less than the prospective fault current is allowed to flow under short-circuit conditions.
This is illustrated by limitation curves which give :

■ **the limited peak let-through current** in relation to the RMS sym. value of the prospective short-circuit current (the short-circuit current that would flow continuously in the absence of protective equipment) ;

■ **the limited let-through energy** (thermal stress) in relation to the RMS sym. value of the prospective short-circuit current.

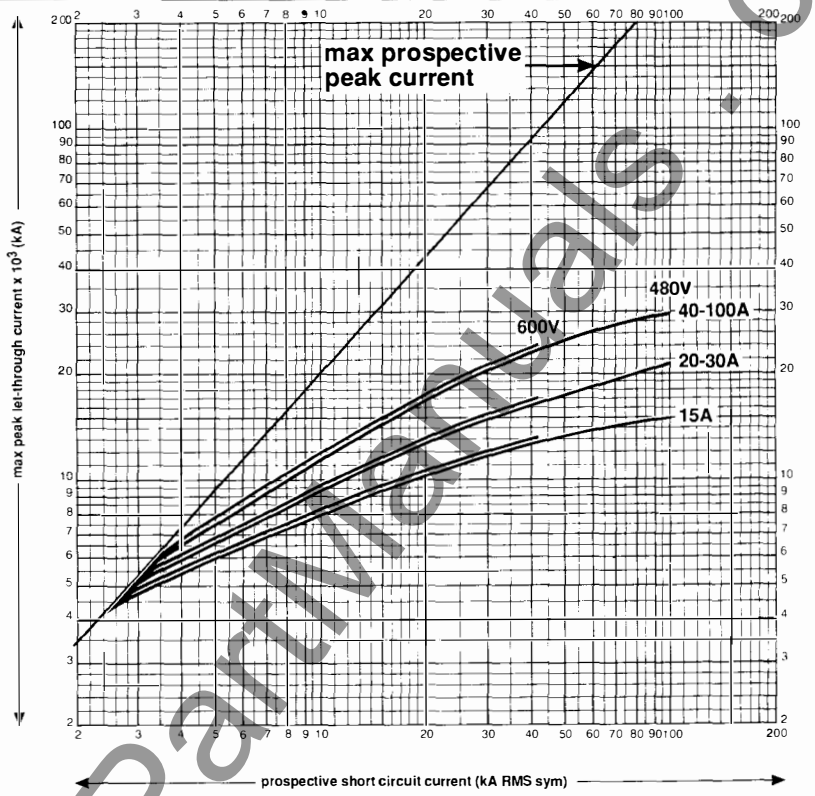


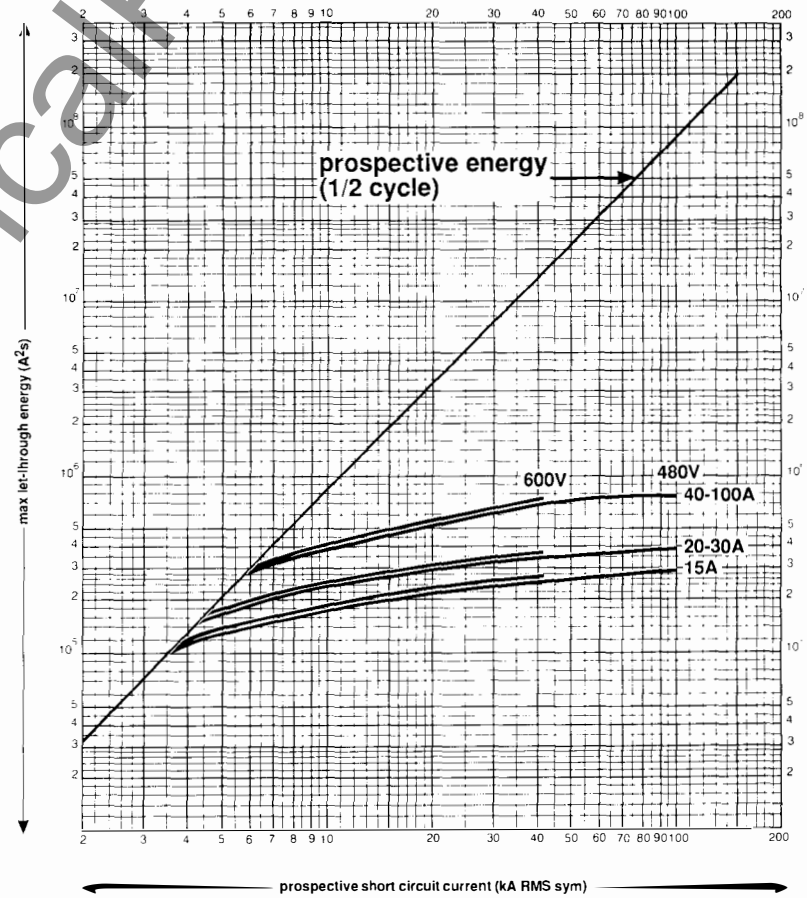
Installation of current limiting circuit breakers offers several advantages :

Better protection
Current limiting circuit breakers considerably reduce the undesirable effects of short-circuit currents in an installation.

Reduced mechanical effects
Electrodynamic forces are reduced, thus electrical contacts are less likely to be deformed or broken.

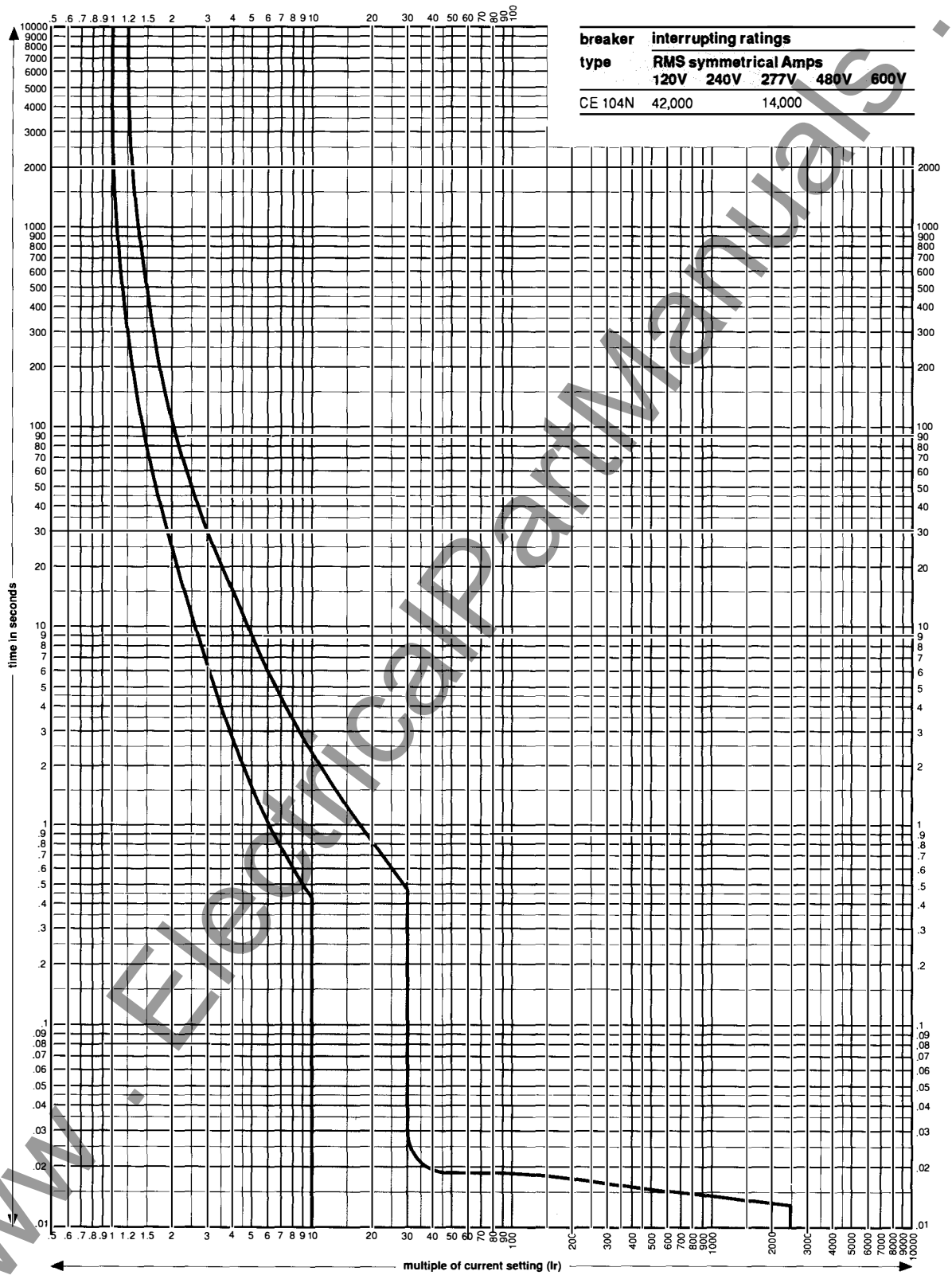
Reduced electromagnetic effects
Measuring equipment situated near an electrical circuit is less affected.





Compact CE circuit breaker time current curves

15-30 Amp., 1-pole circuit breaker

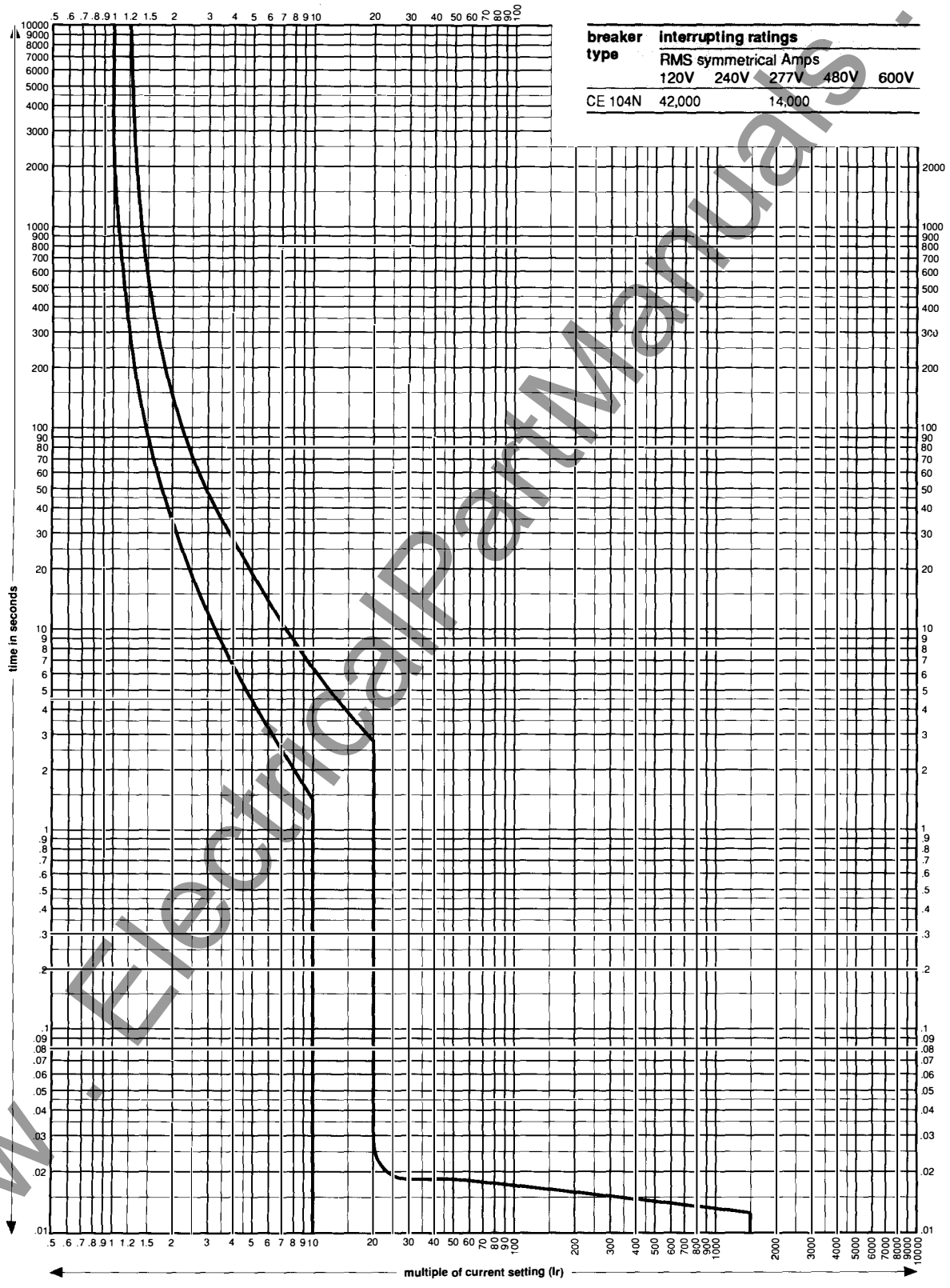


breaker type	interrupting ratings RMS symmetrical Amps 120V	240V	277V	480V	600V
CE 104N	42,000		14,000		

Compact CE circuit breaker time current curves

40-60 Amp., 1-pole circuit breaker

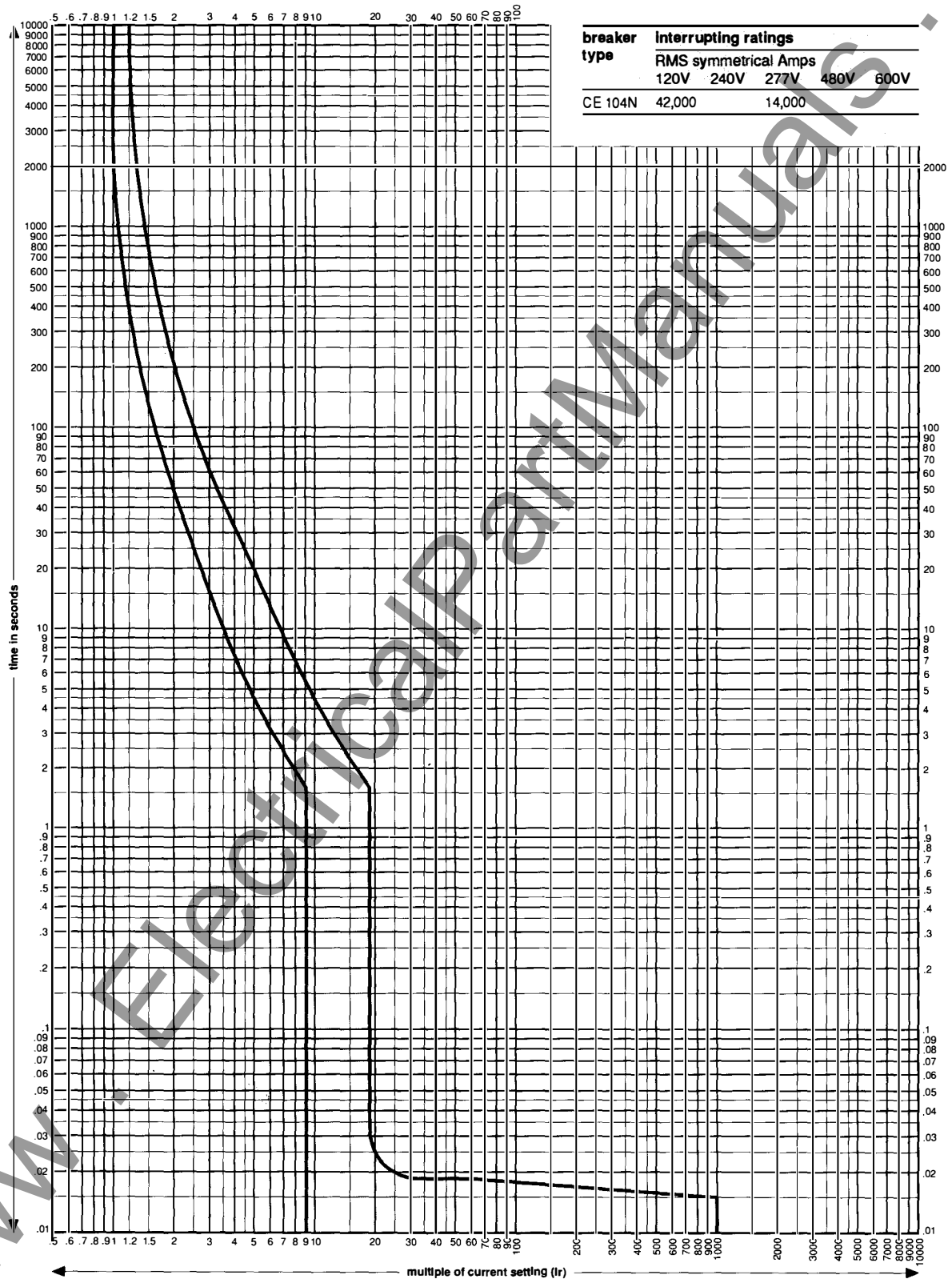
breaker type	interrupting ratings RMS symmetrical Amps				
	120V	240V	277V	480V	600V
CE 104N	42,000		14,000		



Compact CE circuit breaker time current curves

70-100 Amp., 1-pole circuit breaker

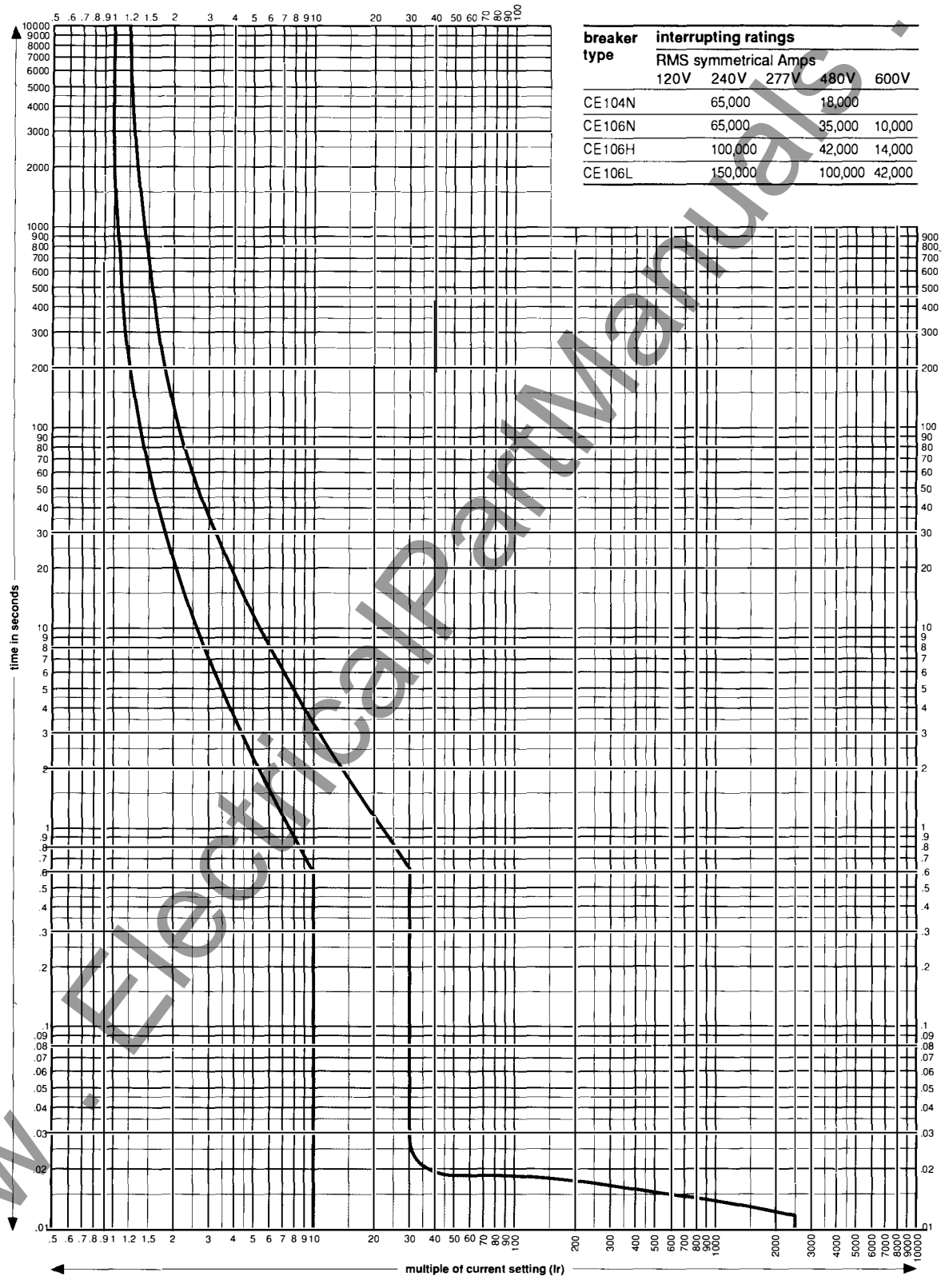
breaker type	interrupting ratings RMS symmetrical Amps				
	120V	240V	277V	480V	600V
CE 104N	42,000		14,000		



Compact CE circuit breaker time current curves

15-30 Amp., 2 and 3-pole circuit breaker

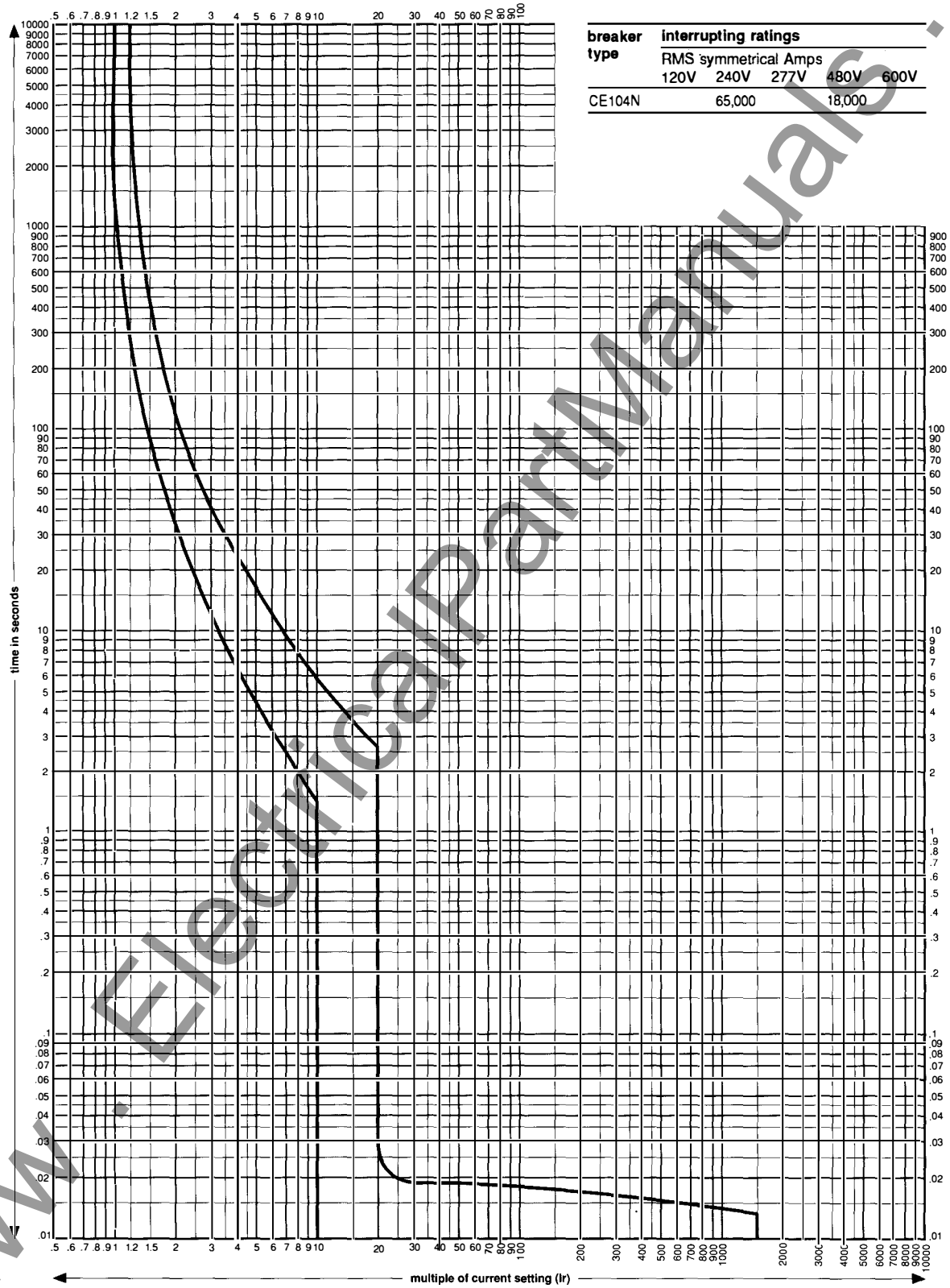
breaker type	interrupting ratings RMS symmetrical Amps				
	120V	240V	277V	480V	600V
CE104N		65,000		18,000	
CE106N		65,000		35,000	10,000
CE106H		100,000		42,000	14,000
CE106L		150,000		100,000	42,000



Compact CE circuit breaker time current curves

40-60 Amp., 2-pole circuit breaker

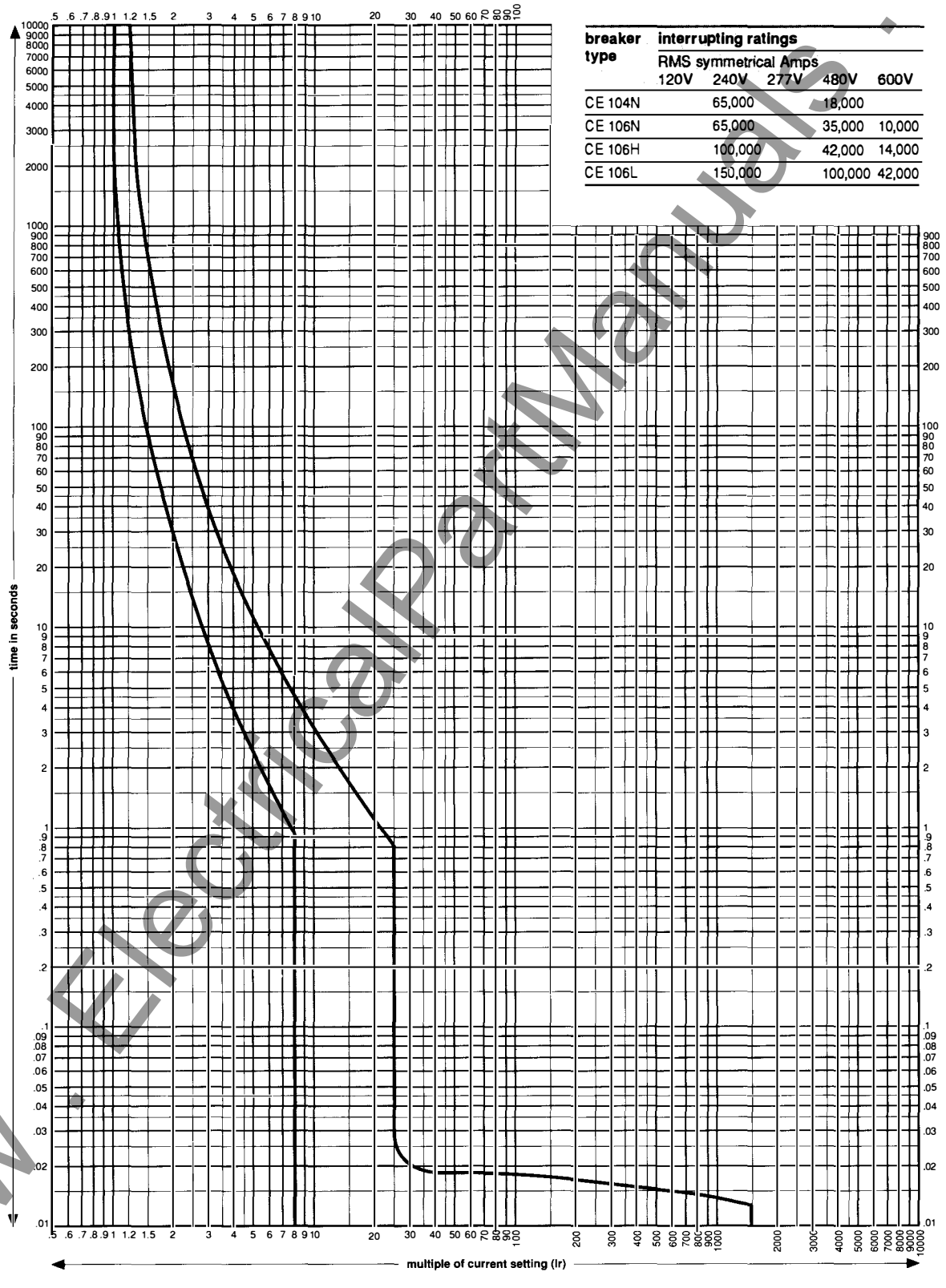
breaker type	interrupting ratings RMS symmetrical Amps				
	120V	240V	277V	480V	600V
CE104N		65,000		18,000	



Compact CE circuit breaker time current curves

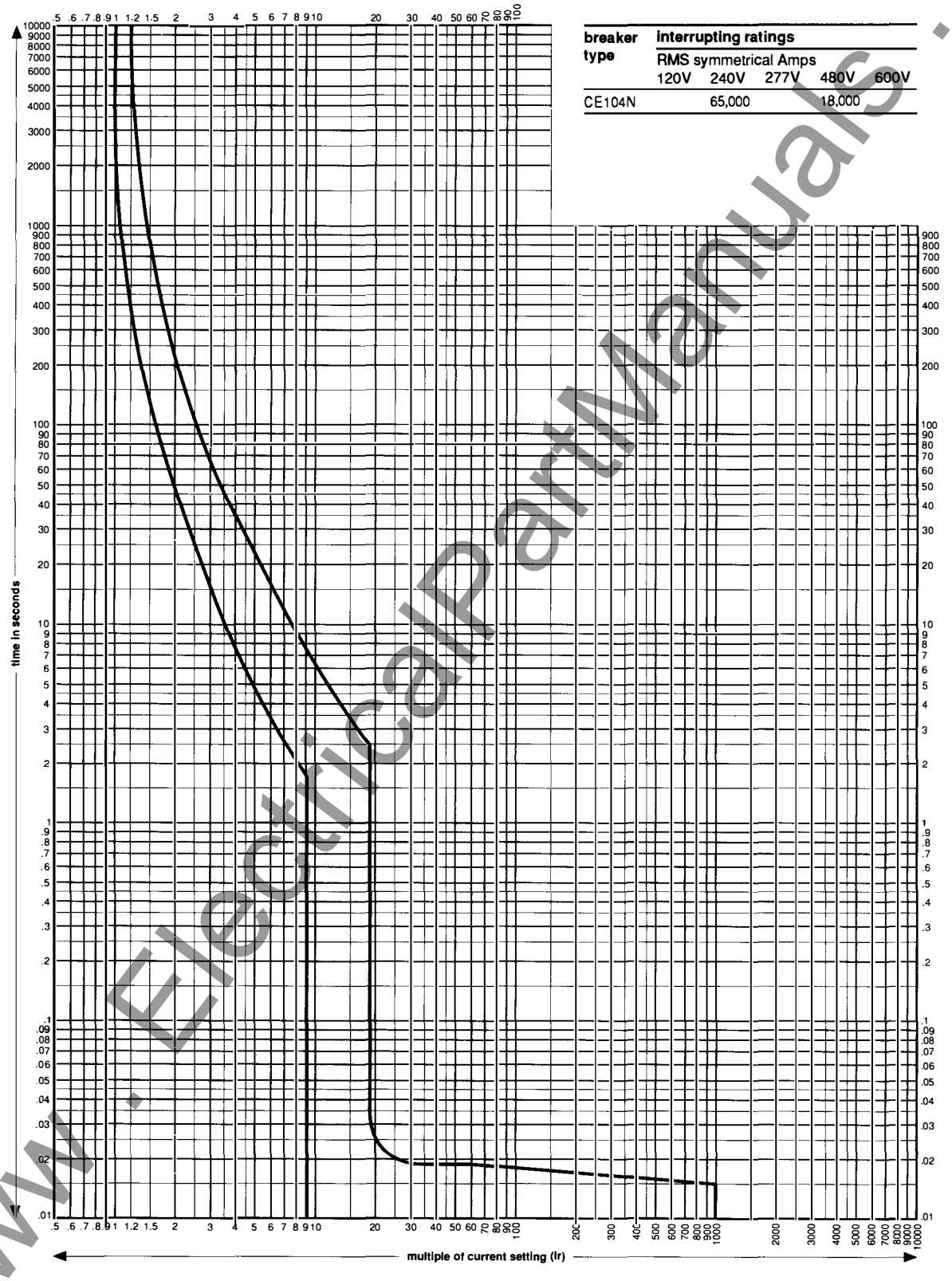
40-60 Amp., 3-pole circuit breaker

breaker type	interrupting ratings RMS symmetrical Amps				
	120V	240V	277V	480V	600V
CE 104N		65,000		18,000	
CE 106N		65,000		35,000	10,000
CE 106H		100,000		42,000	14,000
CE 106L		150,000		100,000	42,000



Compact CE circuit breaker time current curves

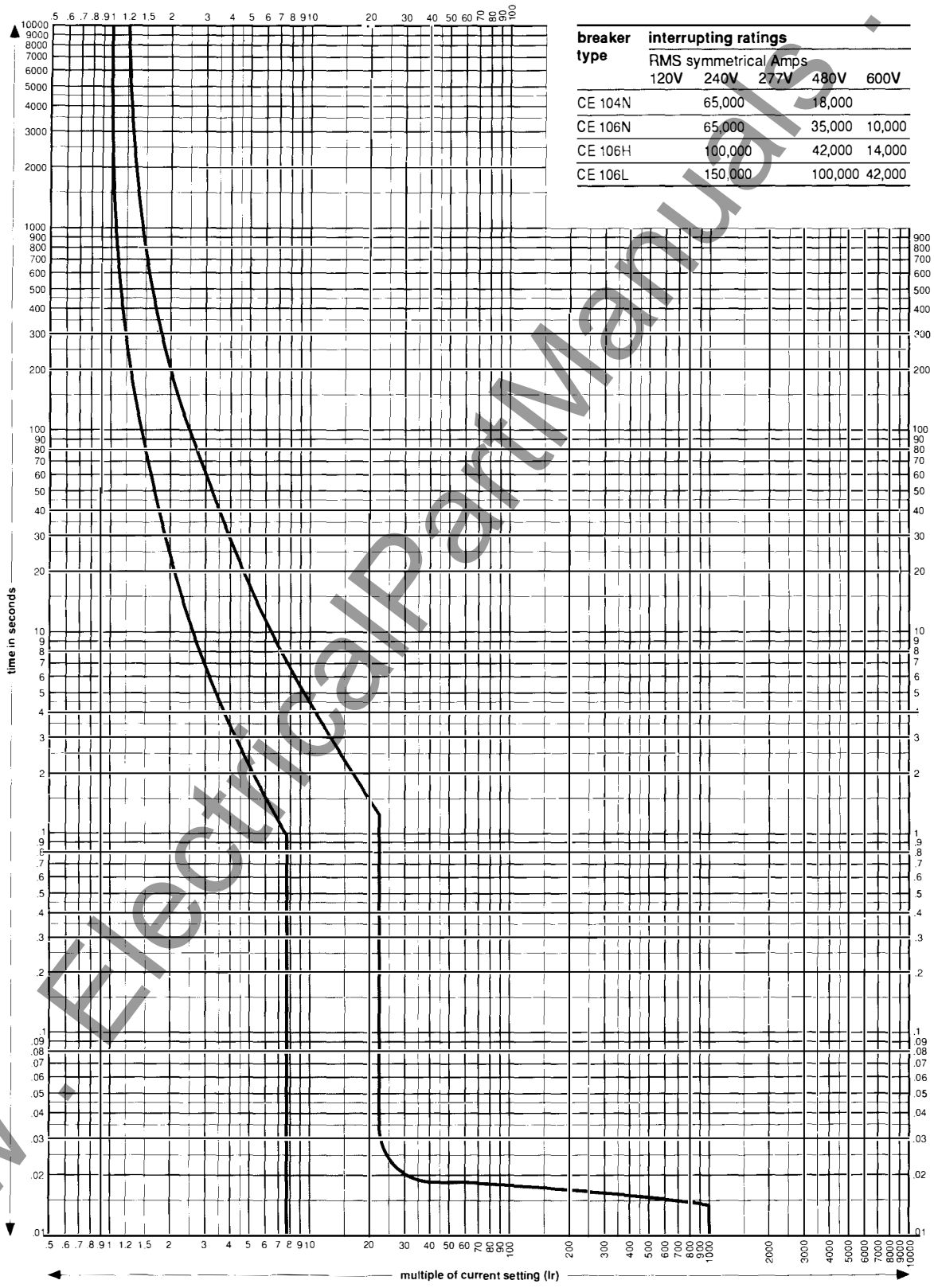
70-100 Amp., 2-pole circuit breaker



breaker type	interrupting ratings RMS symmetrical Amps				
	120V	240V	277V	480V	600V
CE104N		65,000		18,000	

Compact CE circuit breaker time current curves

70-100 Amp., 3-pole circuit breaker



breaker type	interrupting ratings RMS symmetrical Amps				
	120V	240V	277V	480V	600V
CE 104N		65,000		18,000	
CE 106N		65,000		35,000	10,000
CE 106H		100,000		42,000	14,000
CE 106L		150,000		100,000	42,000

motor operator

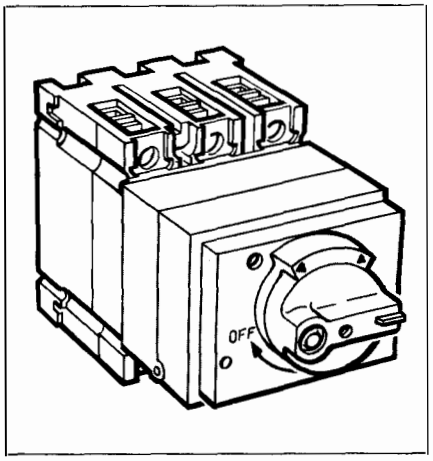
The motor operator remotely operates the circuit breaker and provides a handle to manually operate it as well.
ON, TRIPPED and OFF positions are clearly indicated by the operating handle and the trip indicator.
Provision for padlocking is provided as standard to lock the handle in the OFF position.
When locked manual or remote closing is impossible.
Interlock switches electrically disconnect the motor operator when the readily accessible selector on the front panel is turned for local operation or padlocking and when the complete mechanism is opened for connecting internal accessories (shunt trip, undervoltage trip device, auxiliary switches or the motor operator)

Under fault conditions the trip indicator will indicate the tripped position of the breaker.
Depending on the wiring, resetting can be done locally, remotely or automatically (see wiring diagrams).
(Field installable).

voltage (V)		catalog number
60Hz	120	**39855**
	240	**39856**
DC	24	**39858**
	48	**39859**
	125	**39860**

① **caution** : control diagram shall be designed to interlock remote on and off orders
C1 limit switch
CV locking switch, opens when the selector is turned to "manual" :
- for local operation
- for padlocking
- for connection

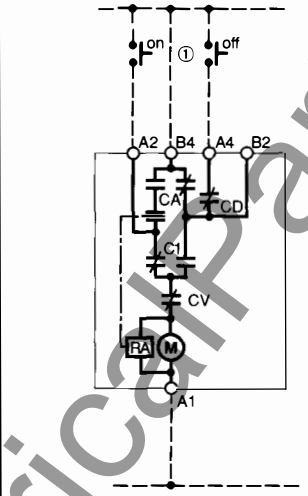
CD built-in alarm switch, operates when breaker trips by an electrical fault or opening coils
CA self feeding switch
CS electrical interlock switch delivered with automatic source changeover, operates when operator handle indicates the off position
M motor
RA self feeding relay



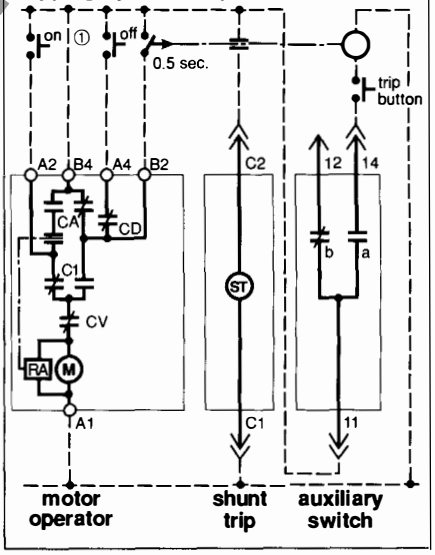
rated voltage (V)	inrush current (A)	fuse amps (A)
60 Hz		
120	5	2
240	2.5	1
DC		
24	15	10
48	7	5
125	3	2

Operating voltage : 85-110 % of rated voltage
Max. operation frequency : 4 per minute
Closing time : 500 ms
Opening time : 300 ms
Minimum operating order : 100 ms
Endurances : 10,000 mechanical O.C. cycles.

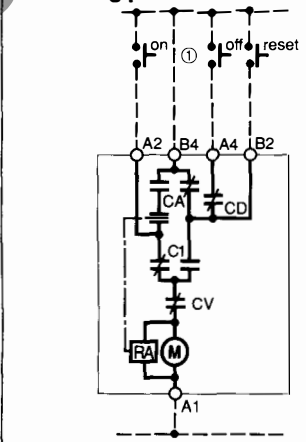
standard scheme (manual resetting)



automatic resetting after tripping by shunt trip



remote resetting using a resetting push button



caution : in case of tripping due to overcurrent, the fault must be cleared before any attempt of resetting.

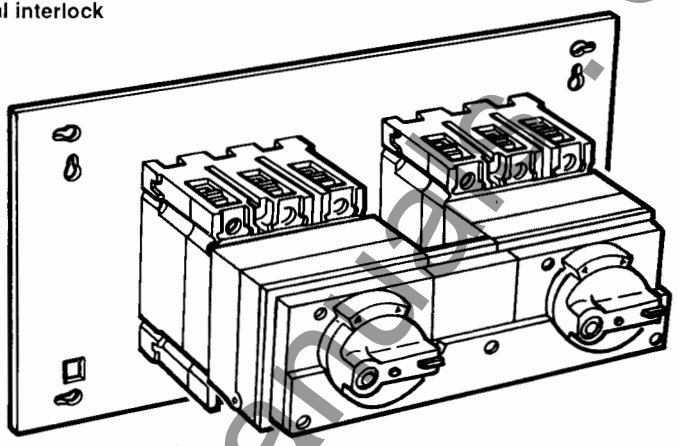
mechanical interlock

Mounted on the two operators, the interlock prevents the two breakers from being simultaneously closed. Breakers can be both or individually opened.
Complete assembly comprises :
- a back plate
- two circuit breakers or switches
- two standard motor operators
- a mechanical interlock

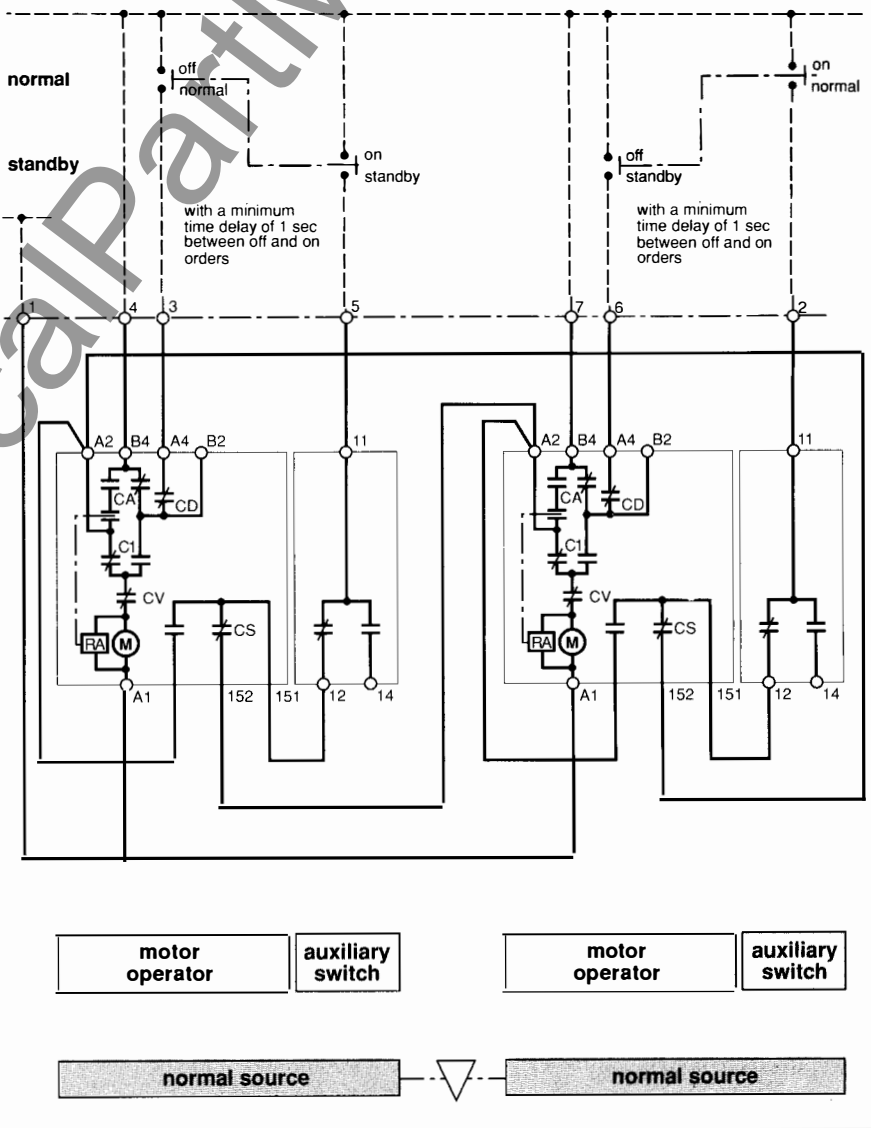
In addition to the mechanical interlock, an electrical interlock is mandatory between the two operators.
Factory mounted
switching time : 0.9 sec.
number of switching operations : 10,000

catalog number	**39815**

mechanical interlock



electrical interlock



rotary operating handle

Three versions are available :

■ **directly mounted**

This handle is directly mounted on the circuit breaker. It accomodates as standard up to three padlocks to lock the handle in the OFF position. However, a knockout tab can be removed to allow the locking of the handle in the ON position. Due to the trip free mechanism padlocking in such a position will not prevent the circuit breaker from tripping under overcurrent conditions. The handle will continue to indicate ON.
Padlock shackle diameter : 1/4 to 5/16.

Note :
A mechanical interlock (cat. no. **44826**) links two rotary handles and constitutes a manual source changeover. This device is only available for direct rotary handles. Simultaneous closing of the two breakers is prevented but simultaeous opening is possible. The breakers are normally fixed on a panel or on rails.

catalog number	**39980**

■ **door-mounted type**

The handle is removable and can be fitted on a door-mounted mechanism. A 16" long shaft extension is supplied and can be cut to a suitable length. A cutting and drilling jig is provided.
The mechanism has the same functions as the directly mounted type and provides door interlocking preventing the door from being opened when the breaker is closed.
The handle mechanism can be used in NEMA 3R and 12 enclosure applications.

Note :
Door interlock can be disabled or defeated by turning the defeating screw located on the front face.
It accomodates as standard up to three padlocks to lock the handle in the OFF or ON (by removing a knockout) position.
Padlocking is possible only if the coupling of the extension shaft and the door mounted mechanism is correct.

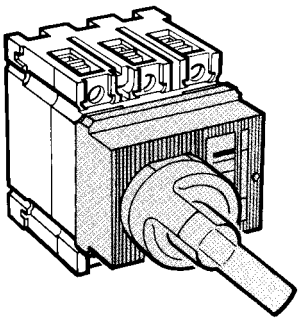
catalog number	**39980 + 42897**

■ **MCC type**

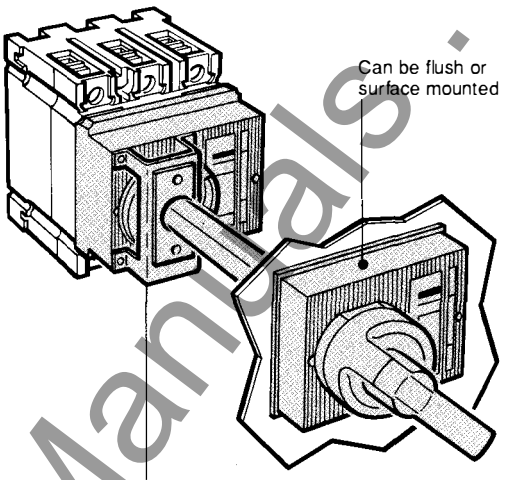
The MCC type is designed for Compact CE and CF used in Motor Control Centers.
It comes as a single part and allows to operate the breaker through door preventing:
■ the door from being opened when the breaker is closed
■ the breaker from being closed when the door is opened
The handle can be locked in OFF position by one to three padlocks.
Padlock shackle diameter : 1/4 to 5/16.
Level of protection : NEMA type1

catalog number	**39979**

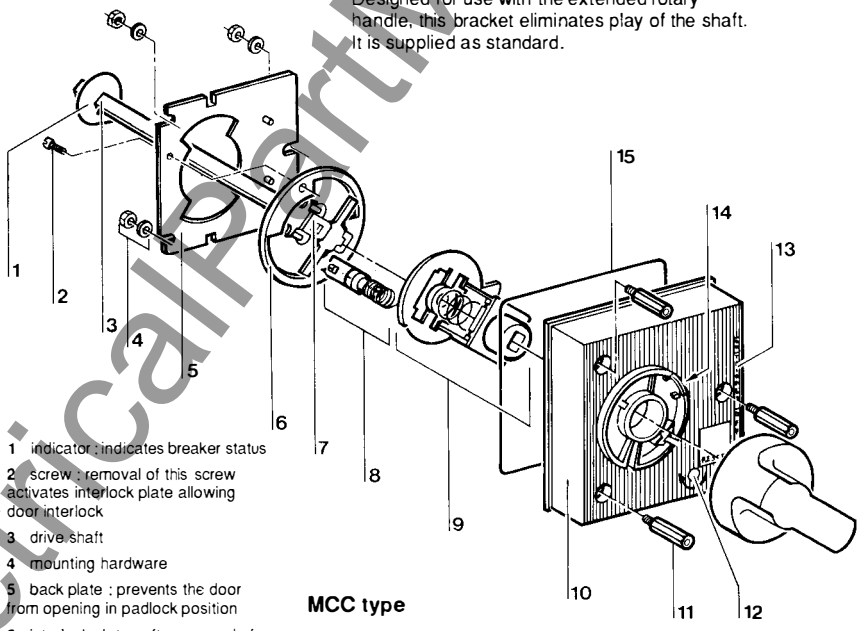
directly mounted type



door-mounted type



Designed for use with the extended rotary handle, this bracket eliminates play of the shaft. It is supplied as standard.



1 indicator : indicates breaker status

2 screw : removal of this screw activates interlock plate allowing door interlock

3 drive shaft

4 mounting hardware

5 back plate : prevents the door from opening in padlock position

6 interlock plate : after removal of screw (2), plate rotates to activate door interlocking function

7 male coupler

8 interlock defeat : allows the operator to defeat the door interlock and open the door when the breaker is in the ON position (to be used in emergency only)

9 female coupler assembly :
- connects with main coupler
- insures that the door is closed before breaker operation and padlocking
- ensures proper operating handle position

10 cover

11 mounting hardware

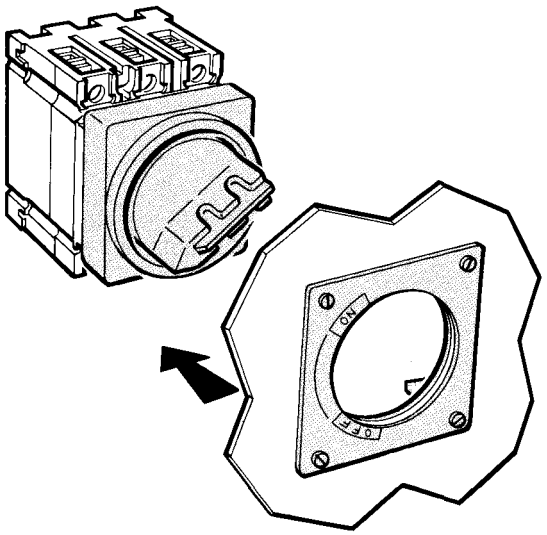
12 interlock defeat access

13 position indications

14 breakable tab : provides optional padlocking for ON position

15 rubber gasket

MCC type

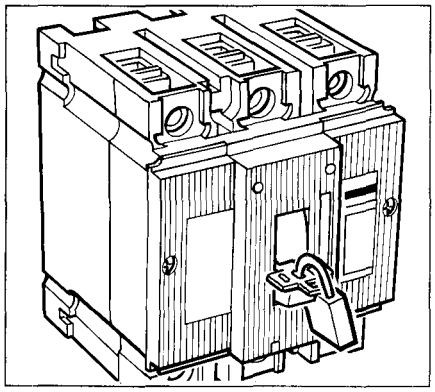


Compact CE circuit breaker accessories

padlock adaptator

A padlock adaptator is available to padlock the circuit breaker in the OFF position. It is similar to the one used on CF,CJ and CK type.
The adaptator accomodates up to 3 padlocks. Padlock shackle diameter : 1/4 to 5/16.

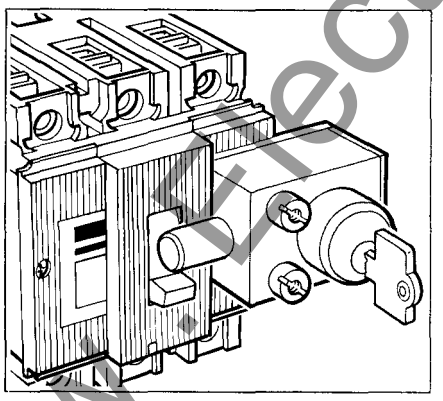
catalog number	44936



Kirk key lock

A Kirk key lock is used to lock the circuit breaker in the OFF position.
The deadbolt of the lock prevents the circuit breaker handle from being moved. The key is removable when the deadbolt is extended. It is provided as standard mounted on the right-pole position but can be mounted on request on the left pole position. Mounting screws can be sealed. The assembly comprises mounting plate and screws. It doesn't include Kirk key lock and wire seal. Installable on CE, CF, CJ and CK frame (not UL listed - not CSA).

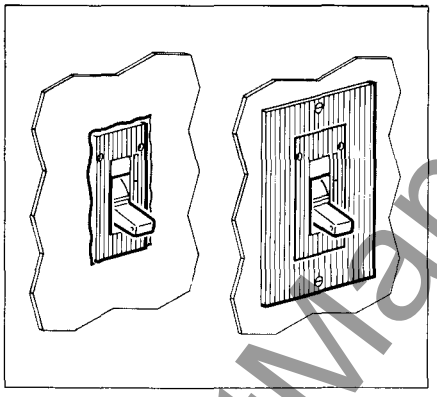
catalog number	35636



door escutcheon

A door escutcheon provides better appearance of the door cutout. It is fixed to the door with two screws.

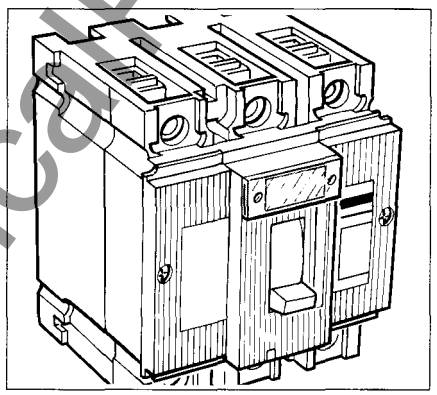
catalog number	42977



label holder

A label holder can be clipped onto the front cover. It permits an easy circuit breaker identification. It comes in pack of ten.

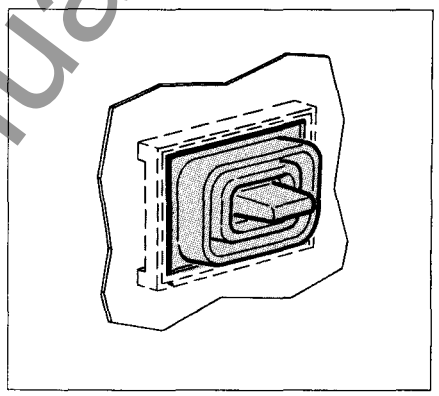
catalog number	42976



boot

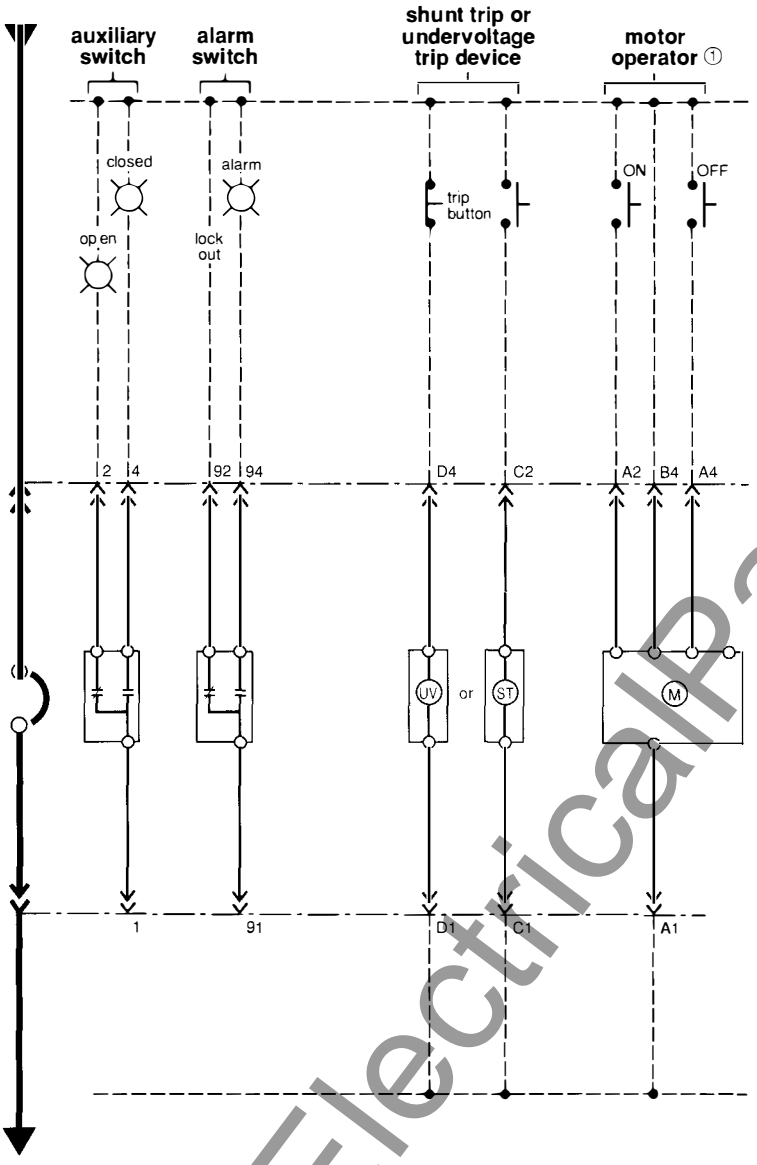
The boot provides a light seal when a breaker is used behind a panel or door with cutout. The square part fits over the breaker cover and the middle provides a rubber cover for the toggle, improving protection to NEMA 3R.

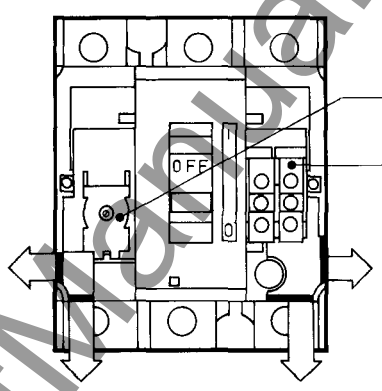
catalog number	42896



Compact CE circuit breaker wiring diagrams

auxiliary switches	remote operation	location of terminals





shunt trip
code C1-C2
undervoltage trip
code D1-D4

auxiliary switch
code 1.2.4
alarm switch
code 91.92.94

⇨ possible wire exits

knock-outs. Break only these required dipending of the desired direction of wiring.

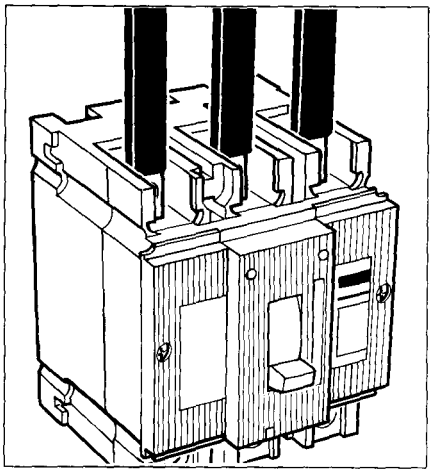
① see page 16 for other wiring diagrams

Note : contacts are shown with the breaker in the open and reset position.

Compact CE circuit breaker main connections

CE circuit breakers may be connected with bus bars or cables on both line and load sides without additional accessories.
Breakers are provided as standard with cable lugs but connection can be easily changed to bus bars.
Complete instructions are provided with the breaker.

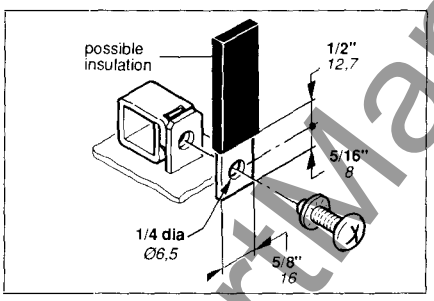
front connection



with bus bar

CE circuit breaker can be connected with copper or aluminium bus bars.

Tightening
The bus bars shall be secured with the screws and Belleville washers provided.
Tightening torque is 50 lb-in.



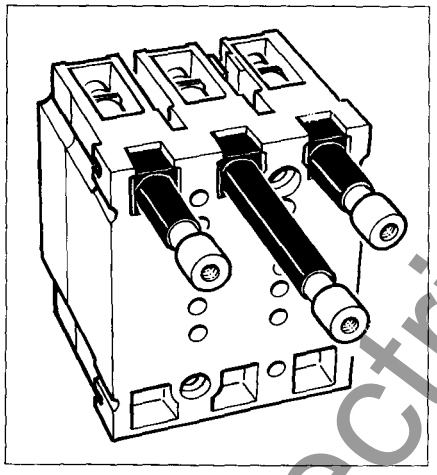
with cables

Cables can be connected by pressure type terminals with a range of :
- 15-30A : 14 AWG to 10 AWG Cu
- 40-100A : 8 AWG to 1 AWG Cu or 8 AWG to 1/0 AWG Al.

Cable strip length : 3/4"

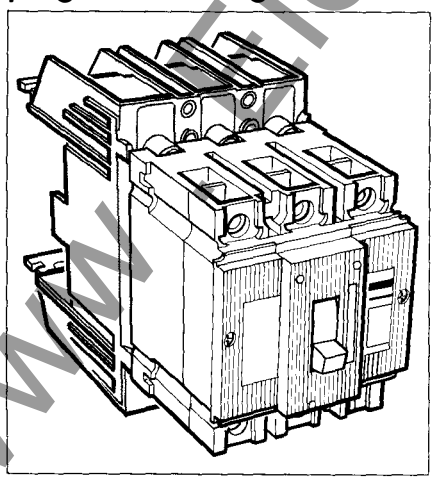
Torques :
14 to 10 AWG : 35 lb.in.
8 AWG : 40 lb.in.
6 to 4 AWG : 45 lb.in.
3 to 1/0 AWG : 50 lb.in.

rear connection



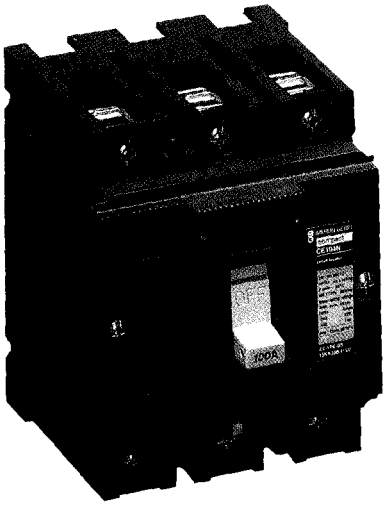
Rear bus bar connections are used for switchboard mounting.

plug-in mounting



When the breaker is in the connected position, the primary voltage is fed through the breaker by means of multiple finger disconnects. As a safety feature, in the event of disconnecting a closed breaker, a mechanical interlock will trip the breaker before the separation of the main disconnects (40 to 100A).
UL listed under file E116305, CSA approved.

Compact CE switch



construction

CE molded case switch is designed identically to CE molded case circuit breaker, except that it is not equipped with bimetal and electromagnet elements.
They are all listed under UL file E107822, CE 106NA is CSA approved.

Caution :
Molded case switches does not provide overcurrent protection.
Molded case switch can be protected by a CE circuit breaker.

ratings

	max rating	when protected by Merlin Gerin CB's :			
CE 104NA 1-pole	**100A**	CE 104N	CE 106N	CE 106N	CE 106L
suitable for use on a circuit	at 120V	42,000	65,000	100,000	150,000
(max. RMS sym. amps)	at 277V	14,000	35,000	42,000	100,000
CE 104NA 2-pole	**100A**	CE 104N			
suitable for use on a circuit	at 240V	65,000	65,000	100,000	150,000
(max. RMS sym. amps)	at 480V	18,000	35,000	42,000	100,000
CE 106NA 3-pole	**100A**	CE 104N	CE 106N	CE 106H	CE 106L
suitable for use on a circuit	at 240V	65,000	65,000	100,000	150,000
(max. RMS sym. amps)	at 480V	18,000	35,000	42,000	100,000
	at 600V		10,000	14,000	42,000

accessories

The following accessories of the CE circuit breaker may be used with the CE molded case switch.

	page
shunt trip	15
undervoltage trip device	15
1 auxiliary switch	15
1 alarm switch	15
motor operator	16
rotary operating handle	18
padlock adaptator	19
Kirk key interlock	19
door escutcheon	19
label holder	19
boot	19

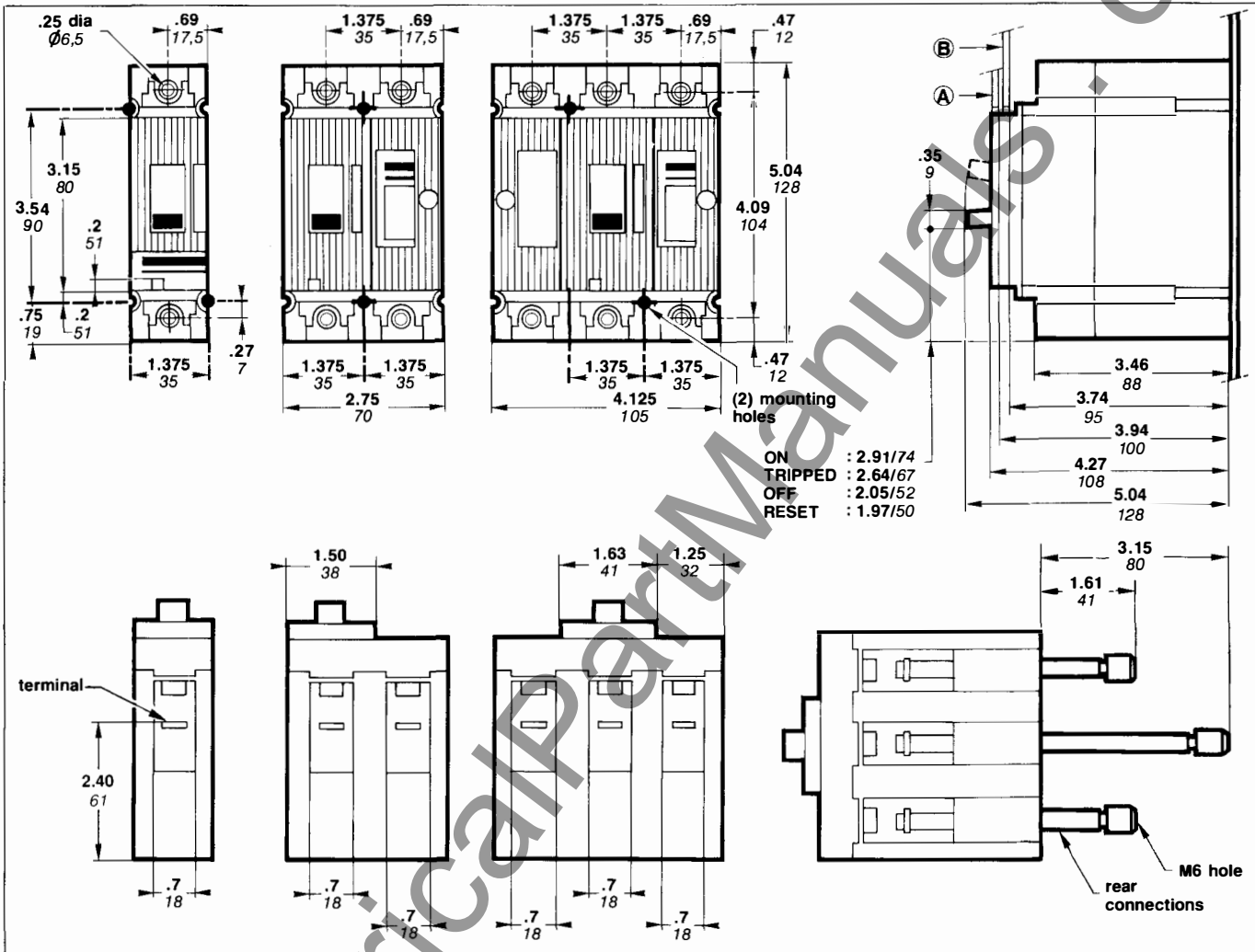
dimensions - installation - connections

Molded case switch dimensions, installation and connection are identical to those of the corresponding circuit breaker.
See page 21 and 23 to 27.

Compact CE circuit breaker dimensions

inch / *mm*

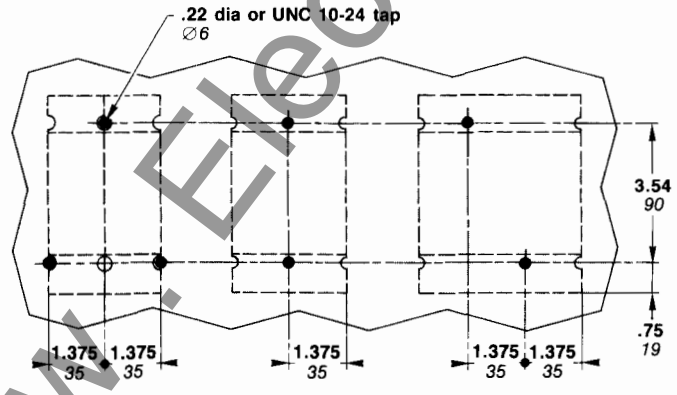
CE 104N - CE 106N - CE 106H
1, 2 and 3-pole,
fixed mounting,
front or rear connection



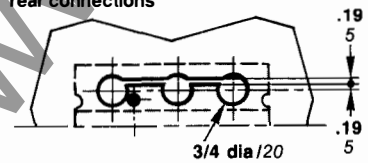
Cutting and drilling for attachement to panel

front connection

2 x 1-pole 2-pole 3-pole

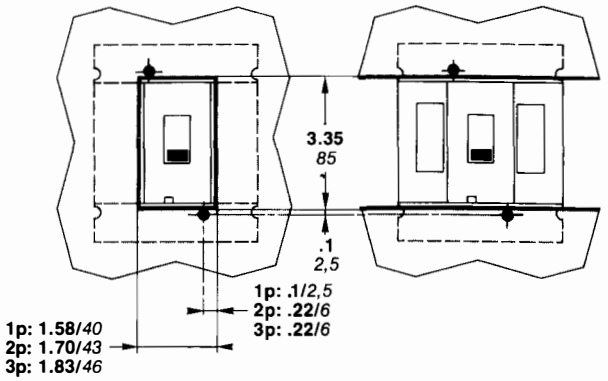


rear connections



Door cutout

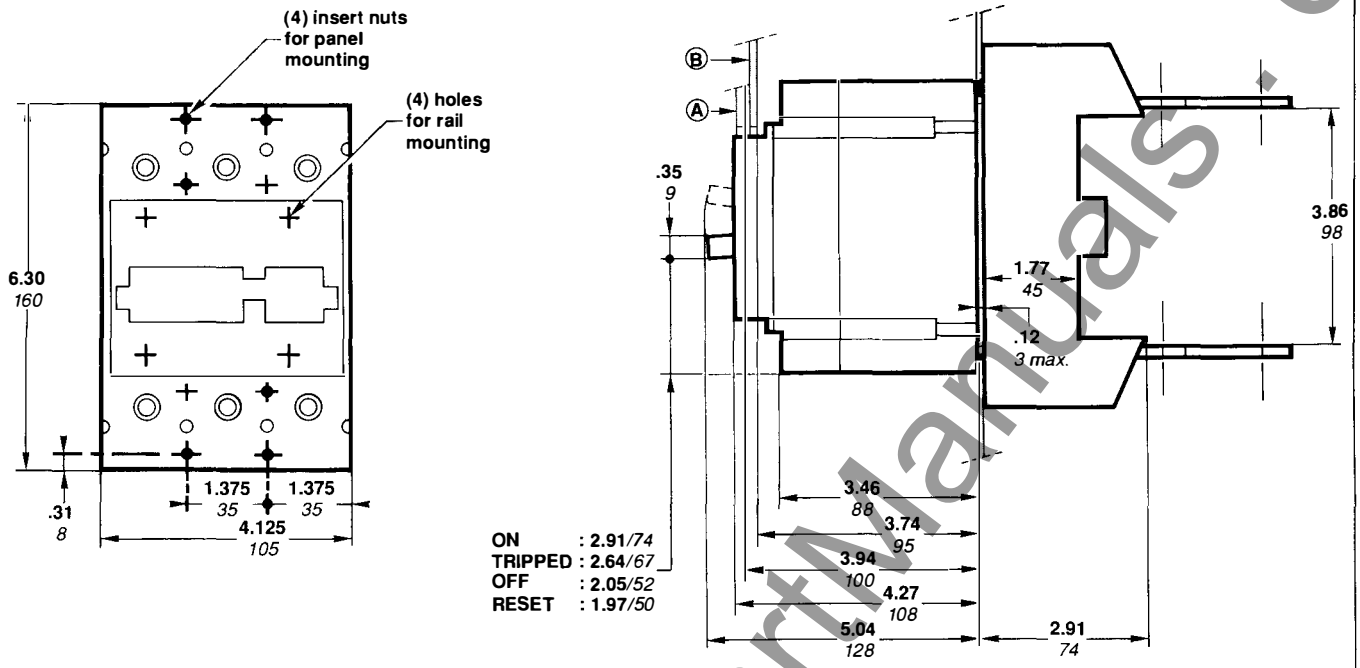
Ⓐ handle Ⓑ handle and nameplate



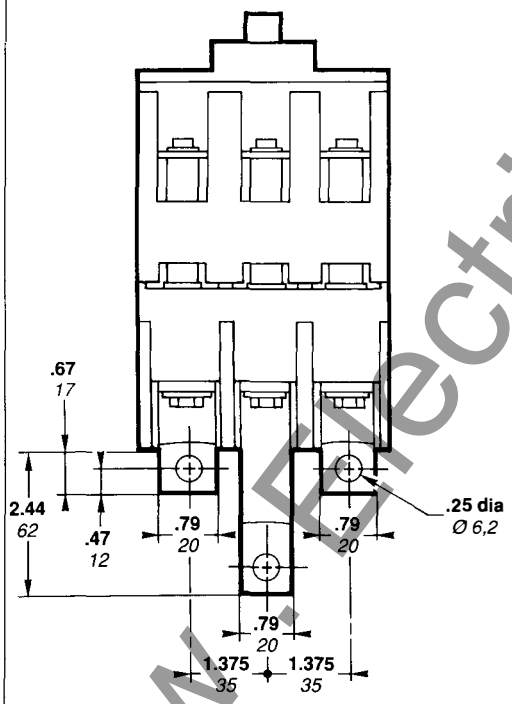
Compact CE circuit breaker dimensions

inch / *mm*

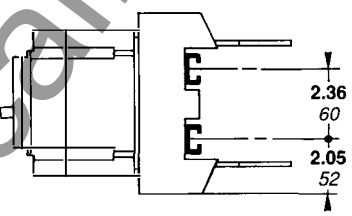
CE 104N - CE 106N - CE 106H
3-pole,
plug-in mounting



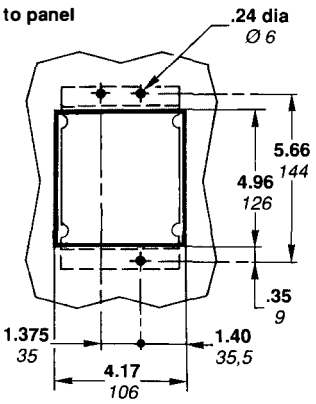
rear connections



Cutting and drilling for attachement
on rails



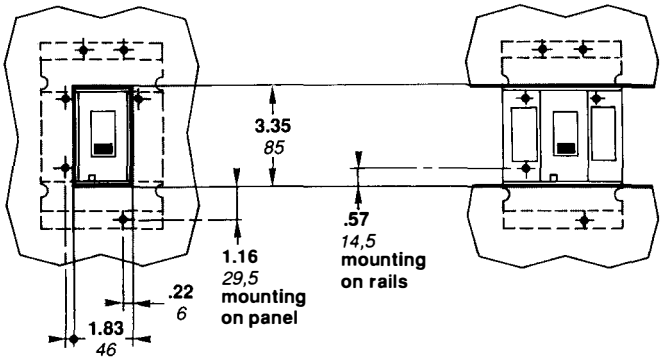
to panel



Door cutout

Ⓐ **handle**

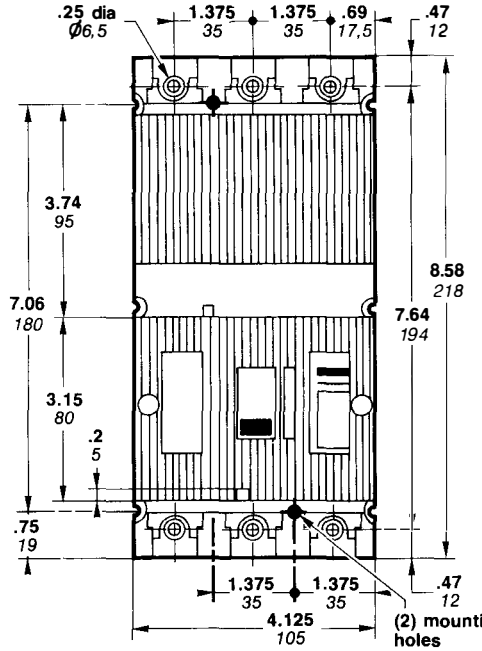
Ⓑ **handle and nameplate**

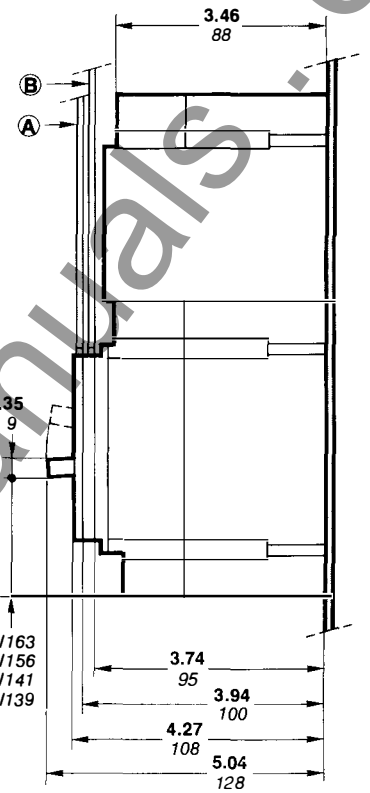


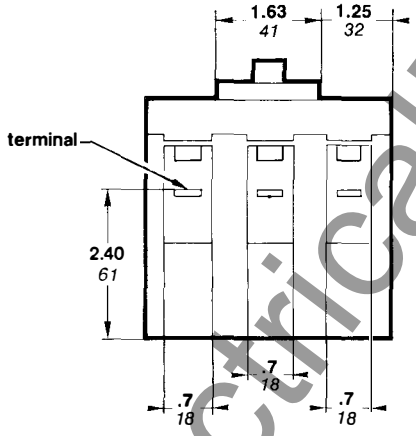
Compact CE circuit breaker dimensions

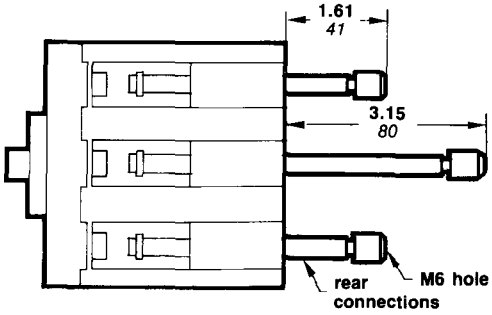
inch / *mm*

CE 106L
fixed mounting,
front or rear connection



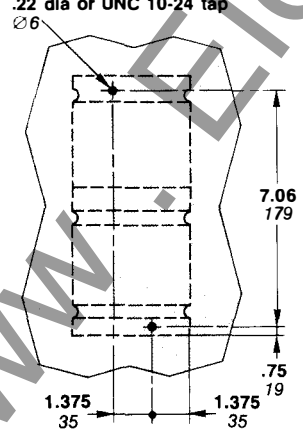




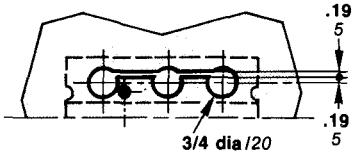


Cutting and drilling for attachement to panel

front connection

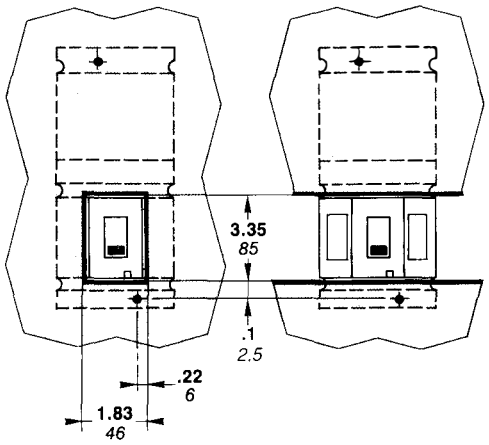


rear connections



Door cutout

Ⓐ handle

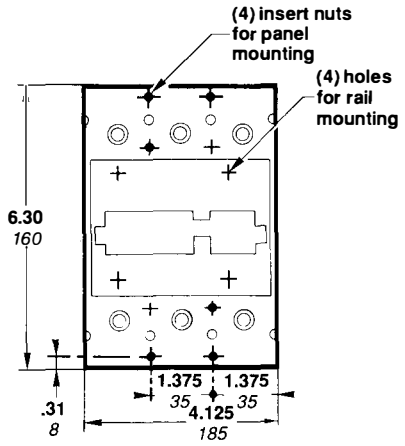


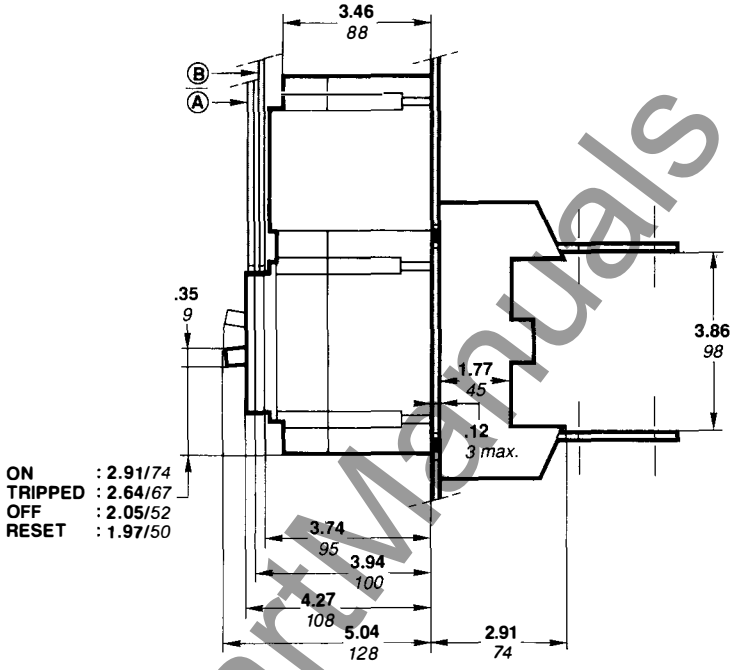
Ⓑ handle and nameplate

Compact CE circuit breaker dimensions

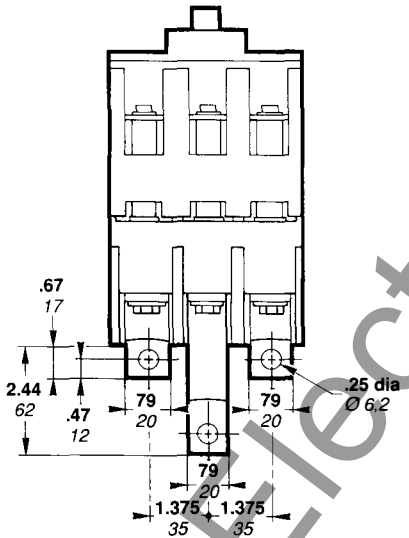
inch / *mm*

CE 106L
plug-in mounting



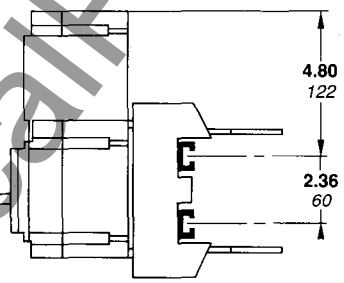


rear connections

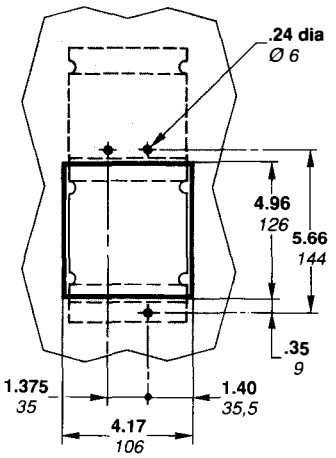


Cutting and drilling for attachement

on rails



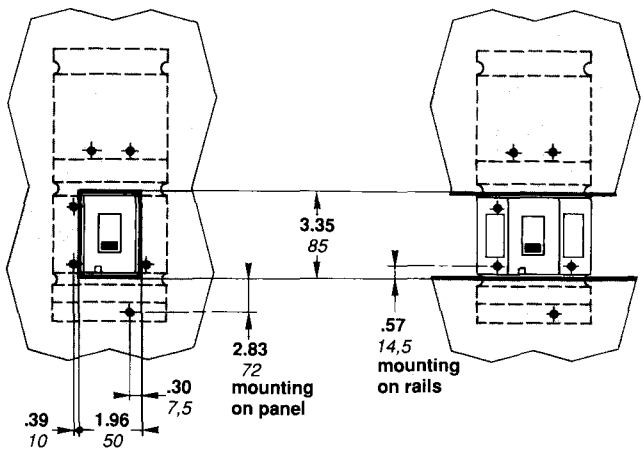
to panel



Door cutout

Ⓐ handle

Ⓑ handle and nameplate



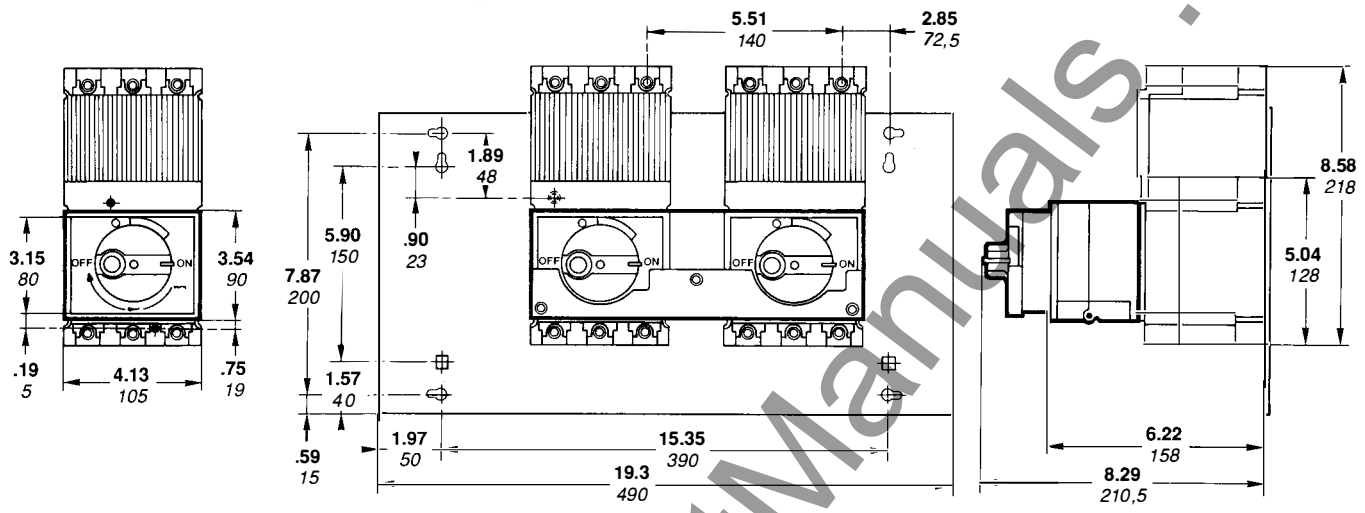
Compact CE circuit breaker dimensions

inch / *mm*

motor operator
rotary operating handle

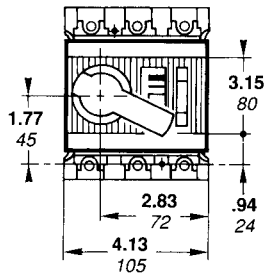
motor operator

with mechanical interlock

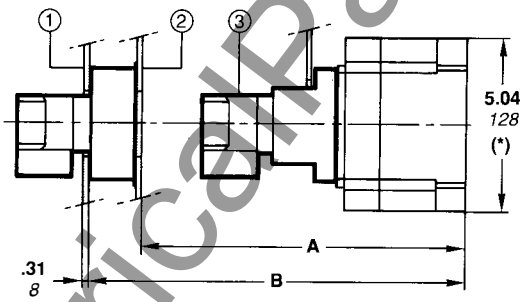


rotary operating handle

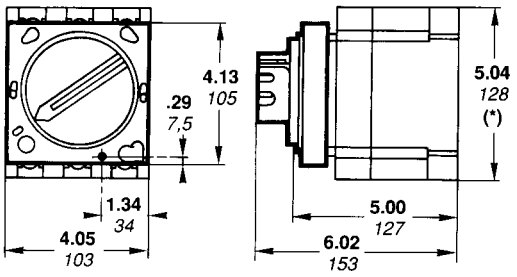
directly mounted



flush / surface / directly mounted



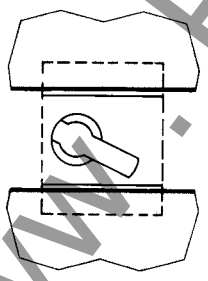
MCC type



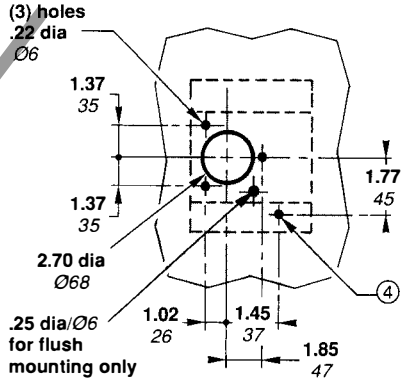
(*) add **3.54** / *90* for current limiting block

door cutout

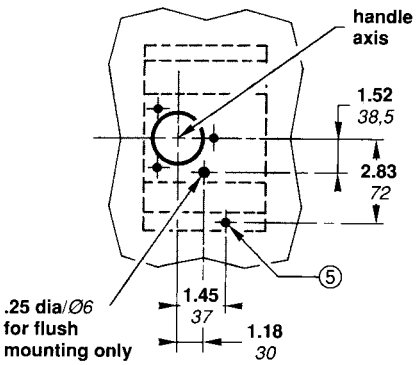
directly mounted
fixed mounting



door mounted
fixed mounting



door mounted
plug-in mounting



dimensions

		N, H, L
surface mounting	A min	9.84/*250*
	A max	19.68/*500*
flush mounting	B min	11.42/*290*
	B max	21.25/*540*

① flush mounted
② surface mounted
③ directly mounted
④ breaker mounting hole
⑤ plug-in mounting hole
Note : shaft can be cut to required length

Compact CE circuit breaker appendix

UL 489 test procedures
(abstract from UL 489 with revisions through April 6th, 1987)

standard tests

For solid state trip breaker, and uncompensated thermal breaker rated 40°C, the test sequences are :

test	sequence X	Y	Z
200% calibration at 25°C (77°F)	■	■	■
135% calibration at 25°C (77°F)	■	■	
calibration of adjust instant trip		■	
overload	■		
tungsten lamp load	①		
100% calibration at 40°C (104°F)	②		
temperature and 100% calibration at 25°C (77°F)	■		
endurance		■	
200% calibration at 25°C (77°F) repeated		■	
135% calibration at 25°C (77°F) repeated		■	
interrupting ability (Y sequence)		■	
interrupting ability (Z sequence)			■
200% trip out at 25°C (77°F)		■	■
dielectric voltage withstand	■	■	■

① Applies only for breakersrated 55 A or less, 125 or 125/250V or less.
② Applies only for thermal breakers rated 40°C.

standard specifications

200% calibration at 25°C
The breaker must trip within time limits which depend on the rating from 3 minutes for a 30A rated breaker, up to 30 minutes over 2000A.

135% calibration at 25°C
The breaker must trip within two hours (for breakers rated more than 50 A).

Calibration of adjustable instantaneous trip
The breaker must trip within the range of 80-120% of the maximum marked tripping current and 75-125% of the minimum marked tripping current.

Overload
■ up to 1600A : fifty operations at 600% of rated current
■ 2000 and 2500A : twenty-five operations at 600 % of rated current
■ 3000 to 6000A : three operations at 600% followed by twenty-five operations at 200 % of rated current.
The power factor shall be from 0.45 to 0.50 lagging.

Temperature
When connected with specified cables or bus bars (see below) and with its rated current, the temperature rises on the breaker and at its terminals does not exceed specified limits.

Examples of specified wires and bus :
■ "75°C" copper wire

rating	number	size
100A	1	1 AWG (60°C)
	or 1	3 AWG
250A	1	250 MCM
400A	2	3/0 AWG
600A	2	350 MCM
800A	3	300 MCM
1000A	3	400 MCM
1200A	4	350 MCM

■ copper bus bar

rating	number	size
1600A	2	1/4 x 3
2000A	2	1/4 x 4
2500A	2	1/4 x 5
	or 4	1/4 x 2
3000A	4	1/4 x 4

(1200A or less : 1000A / in²)

Endurance
The breaker must complete an endurance test :
■ operations at rated current and rated voltage
■ followed by no load operation.
The power factor shall be 0.75 to 0.80 lagging.

Examples:

frame size	number of cycles of operations		
	with current	without current	total
100A	6,000	4,000	10,000
225A	4,000	4,000	8,000
400A	1,000	5,000	6,000
600A	1,000	5,000	6,000
800A	500	3,000	3,500
1200A	500	2,000	2,500
1600A	500	2,000	2,500
2000A	500	2,000	2,500
2500A	500	2,000	2,500
3000A	400	1,100	1,500

Compact CE circuit breaker appendix

UL 489 test procedures
(abstract from UL 489 with revisions through April 6th, 1987)

Interrupting ability (Y sequence)
After endurance tests and calibrations repeated, the breaker completes an opening followed by a close-open operation (O-t-CO), with specified current.

Examples for three pole breakers :

frame rating	RMS Sym. Amps (3-pole O-t-CO)
100A ①	3,000
225A	3,000
400A	5,000
600A	6,000
800A	10,000
1200A	14,000
1600A	20,000
2000A	25,000
3000A	35,000

① Above 250V.

Interrupting ability (Z sequence)
A 3-pole breaker rated 240, 480 or 600V have to complete an opening operation and a close-open operation (O-t-CO) on each pole, at rated voltage, followed by an opening operation (O) using all the three poles for the frame sizes up to 1200A, an additional close-open operation on the three poles is required).

Examples for three pole breaker :

frame rating	RMS Sym. Amps		
	each pole	common	
	O-t-CO	O	O-t-CO
100 to 800A	8,660	10,000	
1000 to 1200A	12,120	14,000	
1600A	14,000		20,000
2000A	14,000		25,000
3000A	25,000		35,000

Dielectric
After tests, the breaker must withstand for one minute a voltage of 1000V plus twice the rated voltage between :
- line and load terminals
- terminals of opposite polarity
- live parts and the overall enclosure.

Optional tests :
■ high available fault current
Breakers having passed all the standard tests may have the UL label applied at higher values than the standard.
Test sequence is as follow :
- 200 % calibration
- interrupting capacity . an opening operation followed by a close open operation (O-t-CO) on all poles are performed on the circuit breaker.

The power factor over 20000A shall be 0.15 to 0.2 lagging.
- trip out at 250%
- dielectric at twice the rated test voltage.

■ 100% rated
Breakers having passed all the standard tests may have the UL label applied to use the circuit breaker in an enclosure, when carrying 100% of its maximum rating.
The circuit breaker is submitted to additional temperature tests performed as in Standard tests, except that the breaker is installed in an enclosure. The dimensions and possible ventilations shall be recorded and shall be marked on the breaker.

tests on accessories

Shunt trip and undervoltage trip
These devices are submitted to temperature, overvoltage, operation, endurance and dielectric tests.
■ overvoltage test
It checks that the device is capable of withstanding 110% of its rated voltage continuously without injury (this test does not apply to a shunt trip with an "a" contact connected in series).
■ operation
The shunt trip must operate at 75% of its rated voltage (except that shunt trip devices for use with ground fault protection shall operate at 55%).
The undervoltage trip must trip the breaker when the voltage is between 35 and 70% of its rated voltage and shall seal (i.e.: the breaker cannot be turned on ON position) when the voltage is at 85% or more of its rated voltage.
■ endurance
The device must be capable of performing successfully for 10% of the number of "with current" operations of the breaker.

Auxiliary and alarm switches
Auxiliary and alarm switches must be submitted to temperature, overload, endurance and dielectric tests.
■ overload test
The test consists of fifty operations making and breaking 150% of rated current at rated voltage, with a 75-80% power factor in AC and non inuductive load in DC.
■ endurance
The switch must make and break its rated current at rated voltage, with a 75-80% power factor in AC, and non inductive load in DC for 100% of the number of operations "with current" for auxiliary switches, and 10% of this number for alarm switches.

Motor operator
The motor operator shall perform the number of "without current" operations indicated for the breaker endurance tests.
The first 25 operations shall be conducted at 85% of the motor operator voltage rating.
The breaker is to be tripped during these tests.
The next 25 operations shall be conducted at 110% of the motor operator voltage rating.
The balance shall be completed at rated voltage without tripping the breaker.

recommended inspection intervals

Merlin Gerin circuit breakers are designed to be maintenance-free. However, all equipment with moving parts requires periodic inspection to ensure optimum performance and reliability. We recommend that the circuit breakers be routinely inspected six months after installation, followed by annual inspection. Intervals can vary depending on your particular experience.

inspection of terminals

■ connections to circuit breaker terminals could be inspected. If there is discoloration due to overheating, the joint should be dissassembled and the surface cleaned before reinstallation. It is essential that electrical connections be made carefully in order to prevent overheating.
■ check for terminal tightness.

cleaning

Remove the dust and dirt that have accumulated on the circuit breaker surface and terminals.

mechanical checks

Even over long periods circuit breakers are not often required to operate on overload or short-circuit conditions. Therefore it is essential to operate the breaker periodically.
To trip the breaker, push the push-to-trip button.

insulation resistance tests

When breakers are subjected to severe operating conditions, insulation resistance test should be performed as indicated in NEMA standard publication no AB2-1980. An insulation resistance test is used to determine the quality of the insulation between phases and phase to ground. The resistance test is made with a DC voltage higher than the rated voltage, to determine the actual resistance of the insulation. The most common method employs a "megger" type instrument. A 1000V instrument will provide a more reliable test because it is capable of detecting tracking on insulated surfaces. Resistance values below 1 megohm are unsafe and should be investigated. An insulation test should be made :
■ between line and load terminals of individual poles with the circuit breaker contacts open.
■ between adjacent poles and from poles to the metallic supporting structure with the circuit breaker contacts closed. The latter test may be done with the circuit breaker in place after the line and load conductors have been removed, or with the circuit breaker bolted to a metallic base which simulates the in-service mounting.

electrical tests

These tests require equipment for conducting pole resistance, overcurrent and instantaneous tripping, in accordance with NEMA standard publication no AB2. They are not within the scope of normal field operation.

Important
All tests must be made on circuit breakers which have been de-energized, and disconnected so as to prevent accidental contact with live parts.

Caution
Since molded case circuit breakers contain factory-sealed and calibrated elements, it is essential that the seal be not broken and the circuit breaker be not tampered with.
Molded-case circuit breakers should not be field adjusted or repaired. In the case of malfunction, the circuit breaker should be replaced or repaired at the Merlin Gerin factory, or by an authorized representative.

Compact CE circuit breaker appendix

molded case circuit breaker

In addition to UL 489 and CSA C22- 2 standard CE breakers comply with IEC 157-1 standard as per table below :

CE type 3-pole	ampere rating (A)	interrupting ratings UL 489 - CSA C22-2 RMS Sym. Amps 240V	480V	600V	IEC 157-1 240V	415V	660V
standard circuit breakers							
CE 104N	100	65,000	18,000		65,000	25,000	8,000
CE 106N	100	65,000	35,000	10,000	65,000	35,000	8,000
high interrupting circuit breakers							
CE 106H	100	100,000	42,000	14,000	100,000	42,000	10,000
current limiting circuit breakers							
CE 106L	100	150,000	100,000	42,000	150,000	100,000	35,000

molded case switch

CE type 3-pole	ampere rating (A)	short circuit withstand RMS Sym. Amps at 380/415 V	when protected by Merlin Gerin C.B's
CE 106NA	100	25,000	CE 104N
		35,000	CE 106N
		42,000	CE 106H
		100,000	CE 106L

shunt trip

rated voltage (V)			
UL 489 listed		IEC 157-1	
60Hz	120	50/60Hz	110-127
	240		220-240
	480		380-415
DC	24	DC	24
	48		48
	125		125

undervoltage trip device

rated voltage (V)			
UL 489 listed		IEC 157-1	
DC	24	DC	24
	48		48
	125		125

motor operator

rated voltage (V)				
UL 489 listed		IEC 157-1	50Hz	60Hz
60Hz	120		110	120
	240		210	240
DC	24	DC	24	
	48		48	
	125		125	

auxiliary switches, alarm switch,

IEC 157-1 characteristics are the same as those indicated in page 15 .

circuit breakers for compliance with other world standards

Where compliance with IEC standards is required, Merlin Gerin offers a versatile range (not UL listed) of CE circuit breakers to meet your specific need.
Units include two, three or four poles, three levels of interrupting capabilities up to 660V.
An extensive range of accessories complements the product line.
For further information, please contact your Merlin Gerin representative.

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