

Saudi Electricity Company



الشركة السعودية للكهرباء

SEC DISTRIBUTION MATERIALS SPECIFICATION

37-SDMS-01, Rev. 02

DATE: 13-11-2007G

37-SDMS-01

REV. 02

SPECIFICATIONS

FOR

**LOW VOLTAGE MOLDED CASE CIRCUIT BREAKERS
FOR SERVICE CONNECTIONS**

**This specification is property of SEC and
subject to change or modification without any notice**



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**1.0 SCOPE:**

This specification describes the minimum technical requirements for design, material, manufacture, testing and performance of Molded Case Circuit Breakers (MCCB) for indoor or outdoor installation in an enclosure and intended to be used for Service Connections in the Low Voltage System of Saudi Electricity Company (SEC).

2.0 CROSS REFERENCE:

This Specification shall be read in conjunction with SEC Specification No. 01-SDMS-01 (latest revision) titled "General Requirements for all Equipments/Materials". This general Specification shall form part of this Specification.

This Specification shall also be read in conjunction with SEC Purchase Order as applicable.

3.0 APPLICABLE CODES & STANDARDS:

The latest revision of the following codes and standards shall be applicable to the equipment/material covered by this Specification. In case of any deviation, the manufacturer/vendor may propose equipment/material conforming to alternate codes or standards. However, the provision of SEC Standards shall supercede the provisions of these standards in case of any difference.

- 3.1 IEC 60947-1 Low Voltage Switchgear and Control gear General Rules.
- 3.2 IEC 60947-2 Low Voltage Switchgear and Control gear for Circuit Breakers.
- 3.3 ASTM B633 Electro-deposited Coatings of Zinc on Iron and Steel.

4.0 SERVICE CONDITIONS:

- 4.1 The MCCBs shall be suitable for operation under the Service Conditions as per the latest revision of SEC General Specification No. 01-SDMS-01.
- 4.2 Fittings and attachments of MCCBs shall be capable of withstanding the effects of direct solar radiation at their installed locations. The temperature of surfaces exposed to direct solar radiation shall be regarded as 75°C, plus the effect of any internal heating.



5.0 SYSTEM CONDITIONS:

The MCCBs shall be suitable for installation in a system with the parameters as given in table-1 below:

Table - 1

System Condition	SYSTEM
	Low Voltage
Frequency	60 Hz.
Configuration	3-Phase - 4-Wire
Voltage	220/127 \pm 5% 380/220 \pm 5%
Neutral	Solidly Grounded

However for detailed system conditions refer to the latest revision of SEC general Specification No. 01-SDMS-01.

6.0 DESIGN & CONSTRUCTION REQUIREMENTS:

6.1 General:

- 6.1.1 Molded Case Circuit Breaker shall be three pole and it shall contain case, thermal and magnetic releases, arc suppression devices, operating handle, lock, terminal covers, and an arrangement for three (3) incoming and three (3) outgoing terminals as specified in this Specification.
- 6.1.2 Thermal interaction shall not unduly affect the performance of any component.
- 6.1.3 All bolted electrical joints shall be secured by means of corrosion proof steel nuts and bolts. All bolts, nuts and washers shall be plated to type II of ASTM B633.

6.2 Casing:

- 6.2.1 Casing shall be molded from a strong heat resistant resin.



6.3 Terminals:

6.3.1 Terminals shall be made of tinned copper.

6.3.2 Incoming supply terminals shall be at the bottom and outgoing load terminals shall be at the top as viewed from the front as per Figures No. SEC/MCCB-01, -02, -03, -04.

6.3.3 Incoming terminals

The incoming terminals shall be suitable for both copper and aluminum conductors of sizes given for the following different ratings.

6.3.3.1 For MCCB up to 150 Amps, terminals shall be suitable for copper conductor up to 35mm² without the use of cable lugs.

6.3.3.2 For MCCB rated 200 Amps, terminals shall be suitable for copper conductor up to 120mm² without the use of cable lugs.

6.3.3.3 For MCCBs rated 300, 400, 500, 630, 800 Amps, terminals shall be suitable for copper/aluminum conductor up to 300mm² with the use of cable lugs for which dimensions are given in spec. No. 12-SDMS-02.

6.3.3.4 For MCCB rated 300, 400, 500, 630, 800 Amps, spreader terminals shall be used to increase the pole pitch and to make provision for connection of two cables on these terminals with cable lugs. Lugs shall be supplied by SEC. Bolts and nuts to be supplied by the manufacturer.

6.3.4 Outgoing terminals

6.3.4.1 Outgoing terminals shall be the same as the incoming terminals up to 200 Amps MCCB rating.

6.3.4.2 For 300 and 400 Amps rated MCCB, outgoing terminals shall be box type for direct connection without the use of cable lugs and suitable for copper conductors up to 185 and 240 mm².

6.3.4.3 For 500, 630 and 800 Amps rated MCCBs, outgoing terminals shall be suitable for direct connection of tinned copper busbar by mean of bolts and nuts.

**6.4 Terminal Cover:**

6.4.1 Circuit breakers shall be provided with self fitting knock out type terminal covers for incoming and outgoing terminals with built-in separators. There should be facilities for sealing these covers using wire/lead seals.

6.4.2 For circuit breakers 800 Amps incoming terminals shall be provided with built-in separators without terminal covers.

6.5 Operating Mechanism:

6.5.1 Circuit breakers shall be manually operated by a toggle type single handle which shall operate all poles simultaneously to close or trip the breaker. Circuit breakers 500, 630 and 800 Amps shall be provided with extended handle.

A thermal and magnetic automatic trip and a quick make quick break mechanism which is mechanically trip free shall be provided. This shall include thermal overload trip elements and magnetic short circuit non-adjustable trip elements.

6.5.2 The circuit breakers position identifications, that is, "ON"- "TRIPPED"- "OFF", shall be indicated by the handle position on top, center and bottom respectively for a vertical mounted breaker. The "ON" and "OFF" positions, at top and bottom of the handle position respectively, shall be engraved/indelible marked "ON" and "OFF". All the positions shall be clearly visible from the front.

6.5.3 A cylindrical mechanical lock shall be fitted to the right or left side of the operating handle of the MCCB to lock the mechanism in an "OFF" position. The lock shall be operable from the front of the MCCB. This lock shall be suitable for standard key common to all SEC MCCBs.

The lock positions shall be marked as "LOCKED" and "UNLOCKED".

6.6 Contacts:

The contacts shall be fitted with arc suppression devices. The contacts shall be constructed such that all the poles close, trip, and open simultaneously for a fault on any pole.

6.7 Mounting Screws:

Each MCCB shall be equipped with brass or corrosion proof steel bolts of sufficient length for mounting the breaker on un-threaded 3 mm thick steel sheets, polyester sheets or steel rails. The size of bolts shall be M4. For circuit breakers rated more than 400 Amps a suitable size of bolts shall be used for mounting.



6.8 Releases:

The MCCBs shall be equipped with fixed setting thermal and magnetic releases up to 400 Amps. MCCB with electronic releases may be accepted as optional for 500, 630 and 800 Amps.

6.9 Maintenance:

The MCCBs shall not require any routine maintenance.

6.10 Dimensions:

The maximum overall dimensions of the MCCB shall be as given in table (2) below

Table - 2

Capacity	Width (mm)	Length (mm)		Depth (mm)
		Without Terminal cover	With Terminal covers	
Up to 200 Amps	110	165	210	140
300 Amps & 400 Amps	140	260	400	140
500 Amps & 630 Amps	210	300	500	175
800 Amps	210	330	500	205

7.0 ELECTRICAL REQUIREMENTS:

7.1 Continuous Current Rating:

Continuous current ratings at 55°C shall be as follows:

- 1) 30 Amps
- 2) 60 Amps
- 3) 100 Amps
- 4) 150 Amps
- 5) 200 Amps



- 6) 300 Amps
- 7) 400 Amps
- 8) 500 Amps
- 9) 630 Amps
- 10) 800 Amps

7.2 Performance Characteristics:

The breaker shall conform the following requirements:

7.2.1 Rated insulation voltage U_i : 750 Volts, AC.

7.2.2 Rated impulse withstands voltage: U_{ipm} : 8 kV.

7.2.3 The minimum interrupting capacity of MCCB shall be:

7.2.3.1 Up to 400 Amps 25 KA symmetrical at 220/127 volts and 65 KA for MCCB from 500 Amps to 800 Amps.

7.2.3.2 Up to 400 Amps 20 KA symmetrical at 380/220 volts and 40 KA for MCCB from 500 Amps to 800 Amps.

7.2.4 Number of poles: 3

8.0 MARKING:

8.1 Rated current shall be marked with indelible ink or engraved on the operating handle or at suitable location which can be visible from the front through breaker window of the meter box.

8.2 Each breaker shall have a clear name plate engraved or printed with indelible ink/paint with the following information:

8.2.1 SEC item number

8.2.2 Rated current at 55°C ambient temperature

8.2.3 Rated voltage

8.2.4 Rated frequency

8.2.5 Breaking capacity at 220 and 380 volts



8.2.6 Calibration temperature of 55°C

8.2.7 IEC 60947-2

8.2.8 Manufacturer name and reference number

8.2.9 Serial number

8.2.10 Year of manufacture

8.2.11 Country of origin

8.2.12 SEC purchase order number

8.2.13 Vendor name

8.2.14 Reference to SEC specification

8.2.15 SEC Monogram

9.0 **TESTING:**

The circuit breaker shall be tested as per IEC 60947-2 and test report certificate shall be provided with the quotation for review and acceptance by SEC.

SEC may carryout testing at their lab. by selecting random sample as 10% of any batch delivered to the SEC stores. The batch will be assumed as rejected if more than (3) three breakers are found faulty.

9.1 **Type (Design) Test:**

Test report shall include the following type tests:

9.1.1 Short circuit breaking / making capacities.

9.1.2 Temperature rise.

9.1.3 Over load performance.

9.1.4 Short-time withstand current

9.1.5 Dielectric properties.

9.1.6 Tripping limits and characteristics.



9.1.7 Operational performance capability.

9.2 **Routine (Production) Test:**

All routine (production) tests prescribed in the relevant IEC 60947-2 standard shall be performed on all units. Test report shall be provided prior to delivery of the circuit breaker to SEC.

9.3 **Inspection:**

SEC may decide to witness the tests at factory during manufacturing of items covered under this specification. Accordingly the supplier shall give SEC adequate notice of manufacturing and testing schedules.

10.0 PACKING & SHIPPING:

The packing shall be as per 01-SDMS-01, in addition to the following:

10.1 Each MCCB and its accessories shall be separately packed as a complete unit/assembly and shall be delivered ready for services.

10.2 Packing shall be protected against damage during shipment and handling to installation site.

10.3 Packing openings shall be closed to prevent entry of dust, dirt and other foreign matters.

10.4 Packing shall be marked with following:

10.4.1 Manufacturer's name

10.4.2 Country of origin

10.4.3 SEC item number

10.4.4 SEC purchase order number

10.4.5 Weight in kilogram

10.5 Suppliers shall contact Materials Management Department for additional packing, handling and shipment instructions, as applicable.



10.6 A minimum of one (1) key per 500 MCCBs (or as stated in the purchase order) shall be supplied along with the delivery in a separate weather-proof carton and marked with SEC No. according to 01-SDMS-01.

11.0 GUARANTEE:

11.1 The manufacturer shall guarantee the MCCB against all defects arising out of faulty design or workmanship, or defective material for a period of one (1) year from the date of commissioning or two (2) years from the date of delivery. SEC certificates for date of commissioning shall be accepted.

11.2 If no exceptions are taken to this specification and no list of deviation is submitted, it shall be deemed that in every respect the offered MCCB conforms to this specification. SEC interpretation of this specification shall be accepted.

12.0 SUBMITTALS:

12.1 Submittals required with Tender:

12.1.1 The supplier shall complete and return one copy of the attached technical data schedule for each MCCB type being offered.

12.1.2 A detailed dimensional drawing is required for each size of breaker offered.

12.1.3 Breaker time/current characteristics curves for thermal overload elements are required for each breaker rating offered.

12.1.4 Copies of type test certificates.

12.1.5 Catalogue for all components used with catalogue numbers marked clearly.

12.2 Submittals required following Award of Contract:

The following submittals shall be provided by the supplier following the award of contract.

12.2.1 Details of manufacturing and test schedules.

12.2.2 Factory test reports.



13.0 TECHNICAL DATA SCHEDULE
MOLDED CASE CIRCUIT BREAKERS
 (Sheet 1 of 4)

SEC Enquiry Number: ----- Item Number: -----

SEC REF.	DESCRIPTION	SEC SPECIFIED VALUES	VENDOR PROPOSED VALUES
6.0	DESIGN AND CONSTRUCTION REQUIREMENTS		
6.1	General		
	Rated Current		
	Operation Voltage	220/127 ± 5% 380/220 ± 5%	
	Electrical Joints (Bolts, Nuts, Washers)	Plated as Type II of ASTM B633	
6.2	Casing		
	Material	Resin	
	Temperature Index	55° C.	
6.3	Terminals		
	For MCCB upto 150 Amps	Suitable for connection of conductor upto 35mm ² without cable lugs	
	For 200 Amps MCCB	Suitable for connection of conductor upto 120mm ² without cable lugs	
	For 300, 400, 500, 630 and 800 Amps MCCBs	Suitable for connection of cable upto 300mm ² with cable lugs	
	Material	Tinned copper	
	Covers	Provided	



13.0 TECHNICAL DATA SCHEDULE
MOLDED CASE CIRCUIT BREAKERS
 (Sheet 2 of 4)

SEC Enquiry Number: ----- Item Number: -----

SEC REF.	DESCRIPTION	SEC SPECIFIED VALUES	VENDOR PROPOSED VALUES
6.8	Releases		
	Thermal	Rated current	
	Magnetic		
6.10	Dimensions		
	Capacity	(Length x Width x Depth) mm	
	Upto 200 Amps	165 x 110 x 140 mm max.	
	300 Amps & 400 Amps	260 x 140 x 140 mm max.	
	500 Amps & 630 Amps	300 x 210 x 175 mm max.	
	800 Amps	330 x 210 x 205 mm max.	
7.0	ELECTRICAL REQUIREMENTS		
	Rated insulation voltage Ui	750 Volts, AC	
	Rated impulse withstand Voltage Uipm (Sea level)	8 kV	
	Rated breaking capacity Icu (Max. assumed fault current)		
	At 380 / 220 Volts, AC, up to 400 A	20 KA	
	At 380 / 220 Volts, AC, for 500, 630 and 800 A	65 KA	
	At 220 / 127 Volts, AC, up to 400 A	25 KA	
	At 220 / 127 Volts, AC, for 500, 630 and 800 A	40 KA	
	Rated breaking capacity Ics (during operation, % of Icu)	100% Icu	
	Rated making capacity		
	Number of poles	3	



13.0

TECHNICAL DATA SCHEDULE
MOLDED CASE CIRCUIT BREAKERS
 (Sheet 3 of 4)

SEC Enquiry Number: ----- Item Number: -----

SEC REF.	DESCRIPTION	SEC SPECIFIED VALUES	VENDOR PROPOSED VALUES
9.0	TESTING		
	Type tests report Available or not?	Short circuit breaking capacities	
		Temperature rise	
		Dielectric properties	
		Over load performance	
		Tripping limits and Characteristics	
		Operational performances capability	
		Short time withstand current	



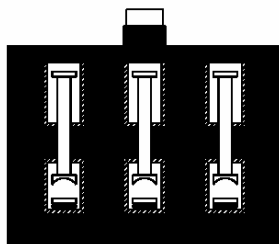
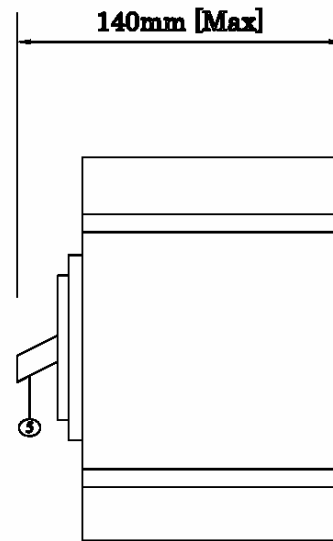
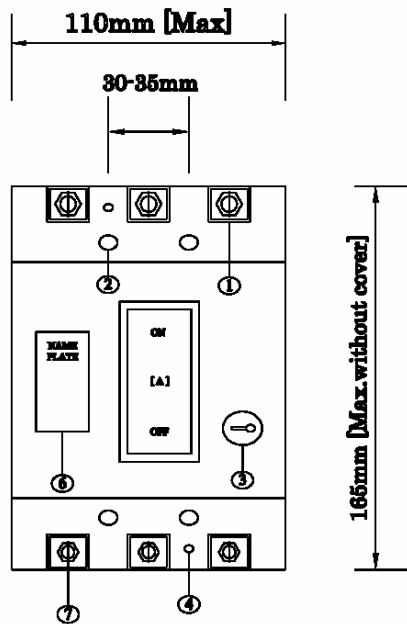
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TECHNICAL DATA SCHEDULE
MOLDED CASE CIRCUIT BREAKERS
 (Sheet 4 of 4)

SEC Enquiry Number: ----- Item Number: -----

- A) ADDITIONAL TECHNICAL INFORMATION OR FEATURES SPECIFIED BY SEC.
- B) ADDITIONAL SUPPLEMENTARY DATA OR FEATURES PROPOSED BY VENDOR / SUPPLIER.
- C) OTHER PARTICULARS TO BE FILLED UP BY VENDOR / SUPPLIER.

Address	Manufacturer of Equipment	Vendor / Supplier
Name of Company		
Location & Office Address		
Authorized Name & Signature		
Date:		
Official Seal/Stamp		

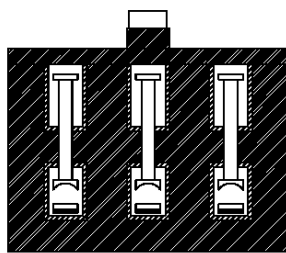
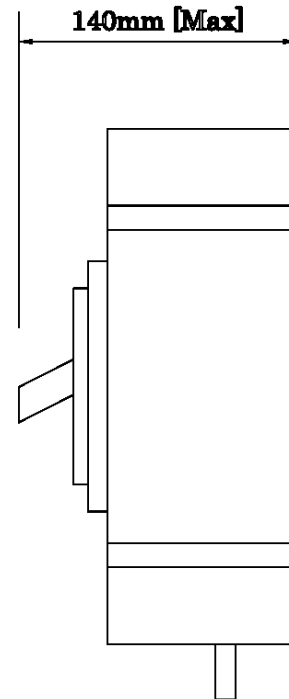
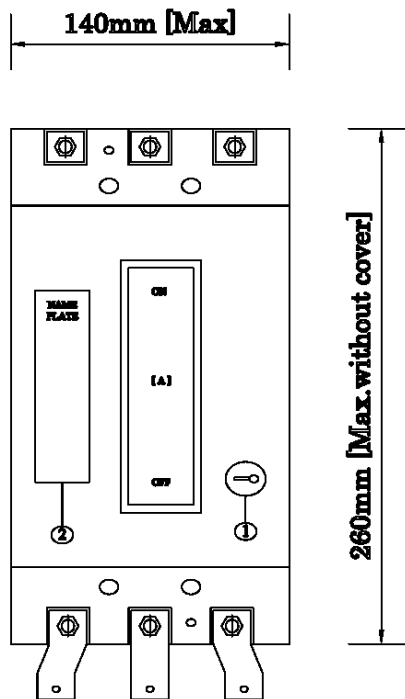


INCOMING & OUTGOING TERMINAL

- 1 - CABLE TERMINAL
- 2 - MOUNTING HOLES
- 3 - LOCK LOCATION
REFER TO CLAUSES 6.1.3 OF THIS SPECIFICATION
- 4 - THREADED BOLT FOR COVER
- 5 - OPERATING HANDLE
- 6 - NAME PLATE CAN BE ON RIGHT OR LEFT SIDE
- 7 - TERMINAL SCREW, SLOTTED OR SOCKET HEXAGONAL HEAD

**NOTE : THIS DRAWING IS AN INDICATION ONLY
REAL SHAPE CAN VAREY ACCORDING TO
THE TYPE TESTED AND SEC APPROVED DESIGN**

الشركة السعودية للكهرباء Saudi Electricity Co.	
TITLE MOLDED CASE CIRCUIT BREAKER UP TO 200 AMP	
DRAWING NO.	SEC/MCCB-01
SCALE	DATE

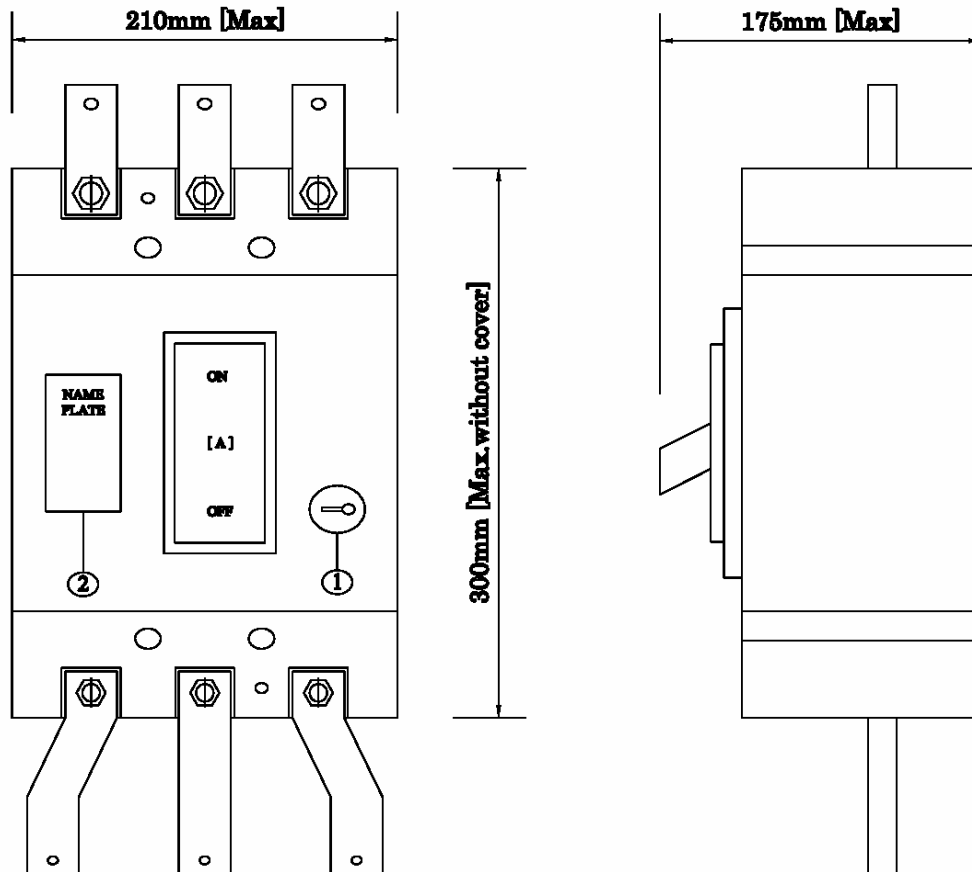


OUTGOING TERMINAL

- 1 - LOCK LOCATION
REFER TO CLAUSES 5.3 OF THIS SPECIFICATION
- 2 - NAME PLATE CAN BE ON RIGHT OR LEFT SIDE

**NOTE : THIS DRAWING IS AN INDICATION ONLY
REAL SHAPE CAN VARY ACCORDING TO
THE TYPE TESTED AND SEC APPROVED DESIGN**

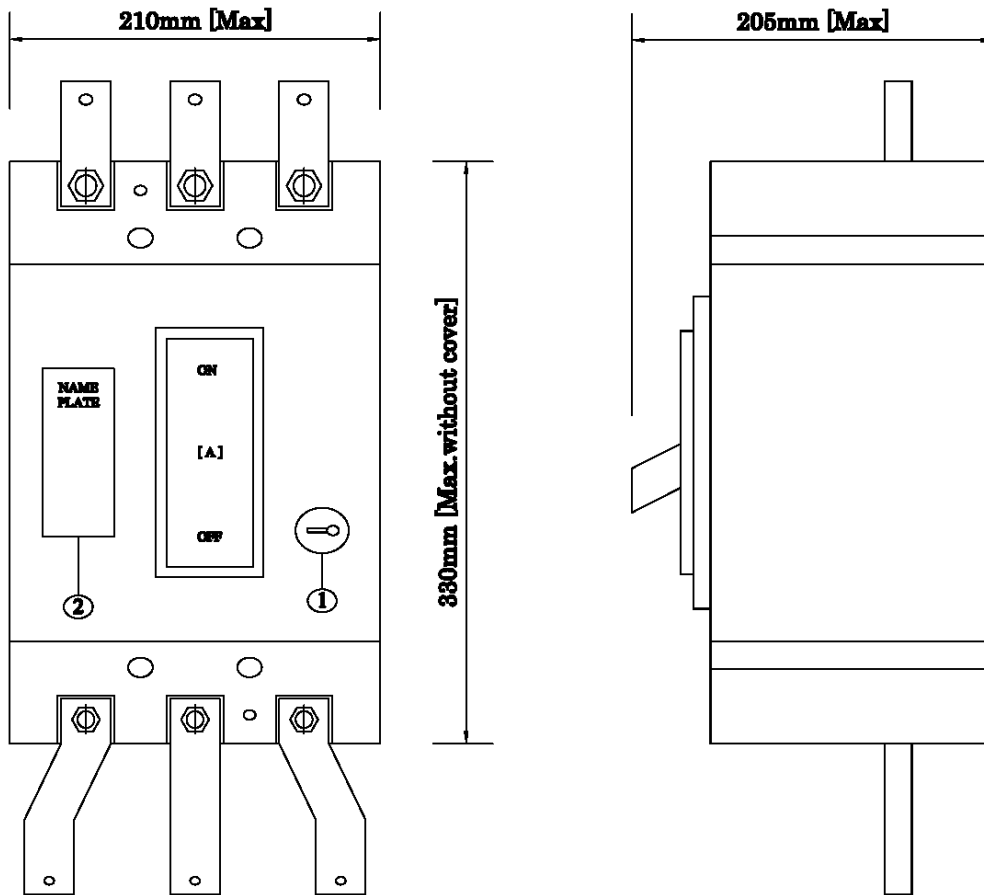
الشركة السعودية للكهرباء Saudi Electricity Co.		
TITLE MOLDED CASE CIRCUIT BREAKER 300 & 400 AMP		
DRAWING NO.	SEC/MCCB-02	SCALE
		DATE



- 1 - LOCK LOCATION REFER TO CLAUSES 6.6.3 OF THIS SPECIFICATION
- 2 - NAME PLATE CAN BE ON RIGHT OR LEFT SIDE

NOTE : THIS DRAWING IS AN INDICATION ONLY
REAL SHAPE CAN VARY ACCORDING TO
THE TYPE TESTED AND SEC APPROVED DESIGN

الشركة السعودية للكهرباء Saudi Electricity Co.		
TITLE MOLDED CASE CIRCUIT BREAKER 500 & 630 AMP		
DRAWING NO.	SCALE	DATE
SEC/MCCB-05		



- 1 - LOCK LOCATION
REFER TO CLAUSES 6.3 OF THIS
SPECIFICATION
- 2 - NAME PLATE CAN BE ON
RIGHT OR LEFT SIDE

**NOTE : THIS DRAWING IS AN INDICATION ONLY
REAL SHAPE CAN VARY ACCORDING TO
THE TYPE TESTED AND SEC APPROVED DESIGN**

الشركة السعودية للكهرباء Saudi Electricity Co.					
TITLE MOLDED CASE CIRCUIT BREAKER 800 AMP					
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