

Outdoor Porcelain Clad Vacuum Circuit Breaker - 11kV & 33 kV

EVE-1225/ EVE-3625



EASUN REYROLLE

Operation & Maintenance Instruction Manual

Introduction

The EASUN type outdoor unit is of the fully weatherproof outdoor porcelain clad type and is for use on 12kV/36kV systems. The circuit breaker housing is supported on a steel frame for plinth mounting.

The circuit breaker is fixed and access to linkage is possible from sides and underneath through the bolted covers. The Circuit Breaker and Operating Mechanisms are described in this manual.

Current transformers & Voltage transformers can be mounted on the integral steel structure, as optional, of the breaker.

The Circuit Breaker and Operating Mechanisms together with its ancillary equipment is accessible within the weather proof front chamber. Provision for controlling the circuit breaker with Remote, Control and Relay Panel through control circuit is provided.

Weatherproof outdoor mechanism chamber is mounted at the middle of the structure with door which is hinged to swing outwards, thereby giving access to control terminals. Entry of control cables is through the plate situated at the bottom of the chamber.

2. Despatch

Units are despatched on an individual basis or in quantity (as units). Each unit is supplied with spring charging handle.

3. Installation

3.1 Lifting –

Slings must be carried out from all four lifting points provided. For method of lifting refer to Fig.8

3.2 Foundations

The type EVE 1225 is free standing, requiring accuracy of foundation only as far as is necessary from an appearance point of view. It is recommended that the floor be flat and level to within 3 mm in 1 metre.

3.3 Erection Procedure

Unit should be erected in the following manner:

- i. Lift unit on to correct position and lower on to plinth pedestal over fixing holes.
- ii. Remove lifting shackles.
- iii. Secure units to floor, using grounding bolts.

3.4 Earth Bar

Ensure earth connections are fitted connecting all the busing bases, structure and all joints between bar sections are securely bolted together. Connections to the station earth should have a cross section not less than that of the Earth Connection Bar.

4 Commissioning

4.1 General Checks :

All necessary adjustments have been made and the unit tested electrically and mechanically before despatch. Do not disturb factory setting.

4.2 Wiring

Unit wiring is identified by numbered ferrules. The wiring should be checked in accordance with the wiring diagram.

4.3 Housing:

Check that all insulation parts busings etc, are clean and dry. Always use a chamois leather or equivalent cloth. Never use a material which will deposit loose fibres.

4.4 Electrical Testing :

i. Low Voltage Circuits :

Test the secondary wiring with a 500 to 1000 volt 'Megger' after looping the ends together at some convenient point such as a terminal board. The value of the insulation resistance per unit should be in the region of 2 mega ohms.

ii. High Voltage Circuits :

The unit shall be earthed and isolated from other equipment. All insulation shall be clean and dry. Apply high voltage tests after erection but before the cables are connected. Using a 1000 volt or if available, a 2,500 volt 'Megger', measure the insulation resistance to earth of each phase in turn with the other two phases Earthed. If the insulation resistance readings are appreciably less than 100 mega ohms, an inspection for an insulation fault should be made before proceeding with the H.V. Tests.

If the 'Megger' readings are satisfactory, apply high voltage tests in a similar manner to the 'Megger' tests and in accordance with the appropriate IS standards.

4.5 Painting

To prevent rusting, touch up with paint any parts of the switch gear that may have been scratched or defaced during erection.

5 Unit Setting Instructions

Should the need arise to change on interrupter, care must be taken when making the reconnection, to ensure that there is no stems, either laterally or by way of torque. Refer setting instruction given separately in this manual.

6. Emission of X-rays

When high test voltages are applied to vacuum interrupters, small amounts of x-rays may be emitted.

With the breaker chamber completely closed and provided all personnel are at a minimum distance of 3 metres, test voltages up to and including 28kV r.m.s. for 12kV & 70 kV r.m.s. for 36kV may be safely applied to an interrupter. The interrupter is considered satisfactory if it successfully withstands the above test.

CIRCUIT BREAKER

7. General Description

The circuit breaker consists of mechanism chamber in the middle of structure, a drive linkage assembly between two steel side plates and above these side plates bushings containing drive link and interrupter are mounted.

8. Maintenance

- a. Check that all fixings and fasteners are secure in drive linkage and mechanism fixing once in a year. All pins and working surface on the drive linkage assembly to be lubricated with a good quality gear oil containing a high pressure additive (SAE80 or 90)
- b. We would recommend that routine checks are carried out at the following intervals or as necessitated by adverse environmental conditions:
 - i. For industrial systems at two yearly intervals or after 1000 operations whichever is sooner.
 - ii. For distribution systems once in four years.

9 Inspection

Ensure that the interrupter insulation, support insulation drive links are clean and dry.

Before returning the circuit breaker to service, check that the interrupters have a satisfactory degree of insulation 28kV/1 minute

10 Maintenance And Access

10.1 Access cover to circuit breaker linkage

Before opening access cover, isolate unit from supply and if possible earth both sides. Access cover may now be removed. Before closing access cover, ensure that entry of vermin has been prevented.

10.2 Lubrication (refer Sl. No. 17)

All hinges, catches etc., should be lightly lubricated with a good quality machine oil at intervals 2 years. Care must be taken when lubricating that extraneous oil does not get onto the insulation surface.

10.3 Main Connections

Check that all fittings for internal electrical connections are tight. Ensure that all insulation is clean

10.4 Electrical Details

- i. Continuity of closing and tripping circuits :
Check circuits during routing test. Examine coils to ensure that the insulation and connections are sound.
- ii. Insulation :
Check insulation resistance
- iii. Closing & Tripping Batteries :
Ensure that batteries at site, are free from faults and are fully charged.

11 Operation of Mechanism (Fig & 4 – 1236kV)

The operation of the control mechanism can be understood by observing the control mechanism as follows :

a. Circuit Breaker open and springs free

It is the position of the circuit breaker at the shipment and in the instant immediately following every C-O cycle.

b. Loading of closing springs

You can get the closing springs loaded by rotating the cam (32), which is linked to the spur gear (12). The rotation is carried out manually or automatically by the motor (15), in both cases you must act on the spur gear (12) by means of a system of ratchet gears. The spur gear (12) is linked to the loading cam (32), whose profile, developing on roller (46), compresses the closing springs (33). At the end of the stroke the loading cam frees itself from the roller and stops owing to the action of the lever (17).

The same lever (17) de-energises the motor and, at the same time, lifts the system of ratchet gears (14), preventing spur gear (12) from moving forward. The hook (42) maintains the closing springs in their position.

c. Circuit breaker closing

To close the circuit breaker release the hook (42) using either the control handle (2) or the closing control coil (11). Through the dragging hook (34) the closing springs (33) transmit their energy to the lever (47) and its shaft. The latter, acting on lever (61), closes the circuit breaker and, at the same time, loads the opening springs. The position of circuit breaker closed and opening springs loaded is ensured by the hook (36).

At the end of the stroke the profile of the dragging hook (34) hits against the stop (49) and disengages itself from the lever (47); the control mechanism is now ready to carry out the next opening operation.

d. Loading the closing springs with circuit breaker closed.

At the end of closing operation, it is possible to load the closing springs, as described under point (b).

e. Circuit Breaker Tripping

In order to trip the circuit breaker dis-engage the opening hook (36) by means of control handle (2) or of trip coil (38)

12. Detail of Operating Mechanism Transmission (Fig.5-12kv)

The mechanism broaching lever (1) is connected to Tie rod (4) and to Tripping spring assly (3) through lever (2). The Tie rod (4) is connected to ratio link (5) being designed for transmitting more power from less closing force which is being operated from the Pivot (6). An ultimately connected to the main shaft (8) which is located in the main transmission chamber assly (9) through Tie rod (7). Normally these transmission linkages needs no checking as the same are calibrated in factory.

In closing operation, the mechanism force will be transmitted to the main shaft assembly through the above ratio linkages and in turn the bell crank (10) connected in main shaft will push the contact spring, insulated drive rods and moving portion of interrupter upto the point of contact touching. After the contact touch, the main shaft moves continuously towards the end of the stroke, further compressing the contact springs, upto the level to give enough contact pressure. During the closing movement, the opening spring compressed. When the mechanism is tripped, the initial opening acceleration is provided by the contact spring and the opening spring together until the point of contact separation is reached, after which the drive is maintained by the opening spring along the full stroke.

13. Procedure For Replacement of Vacuum Interrupter (12 Kv & 36 Kv)

Please ensure that the measurement is to be taken in the breaker closed condition. Interrupter needs replacement when contacts are eroded by 3 mm. This erosion can be monitored by recording gap shown in Fig. 7 periodically.

The circuit breakers are set for life in works to the appropriate setting instructions and should not be disturbed unnecessarily.

Before gaining access to the circuit breaker refer to the unit operation and maintenance manual for recommendations on how to carry out this procedure safely. Once correctly set, it should not be necessary to alter the circuit breaker settings for the life of the interrupter contacts. As the contacts wear, the gap thus * shown in Fig. 7 decreases.

The contact spring gives sufficient pressure for the full 3 mm wear of the interrupter contacts.

14. Details For Replacement of Interrupters (Fig. 1 & 7 – 12 Kv)

In Fig.7 Loosening the lock nut (1), (2) and remove the Pin (3) and take out the whole contact spring stem assembly (4).

In Fig.1 remove the base plate (21) by loosening the relevant bolts & nuts. Take out the entire pole assembly from the chamber top and keep it in the levelled surface in inverted position. Remove the adaptor chamber (15). Remove the bottom insulator cemented assembly (3). Unscrew the stem (16) and remove the pins (22) and keep the insulating rod (10) separately. Remove the 4 nuts (1A) to free lamination (7) from the middle pad. Dismantle the top insulator cemented assembly (3) and middle pad. (2) At this stage, the interruptor (4) will be visible for easy access. Remove the lock nut (1B) at the moving contact block (6) and take out the stem along with relevant lamination (7), turn buckle (8) and the clevis (9) undisturbed. Proceed with the interrupter replacement, by removing the clamping block (19) and the block assembly (5) from the top pad (1). Unscrew the allen screw (1C) from the top contact block (5) and remove the block by loosening the screws (1D) and take out the disc washer (2A). For reassembling with the new interruptor, do reverse operation as stated above.

After assembling of interruptor and the pole, please ensure the dimension shown in Fig.7 thus marked 'A' to be maintained (5mm)

Please ensure that inadvertent force rotation is prevented while holding the moving contact of vacuum interrupter on the above process.

15. Detail of operating Mechanism Transmission (Fig.6-36 Kv)

The mechanism broaching lever (1) is connected to Tie Rod (4) and the tied rod is connected to Ratio link (5) being designed for transmitting more power from less closing force which is being operated from the pivot (6) and ultimately connected to the main shaft (8) which is located in the main transmission chamber assembly (9) through Tie Rod (7). Normally these transmission linkages needs no checking as the same are calibrated in factory.

In closing operation, the mechanism force will be transmitted to the main shaft assembly through the above ratio linkages and in turn the bell crank (10) connected in main shaft will push the contact spring, insulated drive rods and moving portion of interrupter upto the level to give enough contact pressure. During the closing movement, the opening spring, compressed in the Tripping Spring Assembly (3) which is connected to the main shaft through lever (2) and bell crank (11) when the mechanism is tripped, the initial opening acceleration is provided by the contact spring and the opening spring together until the point of contact separation is reached after which the drive is maintained by the opening spring along the full stroke.

16. Details For Replacement of Interrupters (Fig 2 & 7 – 36 Kv)

In Fig.7, Loosening the lock nut (1), (2) and remove the pin (3) and take out the whole contact spring stem assembly (4).

In Fig.2, remove the pole assembly by loosening the relevant bolts & nuts. Take out the entire pole assembly from the chamber top and keep it in the levelled surface in inverted position. Remove the base plate (16) by loosening the relevant bolts from the pole assembly. Remove the bottom insulator cemented assembly (4). Unscrew the stem (12) and remove the pins (17) and keep the insulating rod (11) separately. Remove the 4 nuts (1A) to free lamination from the middle pad. Dismantle the top insulator cemented assembly (3) and middle pad (2). At this stage, the interruptor (6) will be visible for easy access.

By loosening the lock nut (1E), Remove the moving contact guide (9) and the connecting block (10). By loosening the lock nut (1B) at the moving contact block (7), remove it from the assembly with lamination undisturbed.

Proceed with the interrupter replacement by removing the to contact block (5) from the top pad (1) by loosening the screws (1D). Unscrew the Allen Screw (1C) from the contact block. For re-assembling with the new interrupter, do reverse operation as stated above.

After assembling of interrupter and the pole, please ensure that the dimension shown in Fig.7 thus marked 'A' to be maintained.

Please ensure that inadvertant force rotation is prevented while holding the moving contact of vacuum interrupter on the above process.

17. Recommended Maintenance Plan

a. General	1. Wiping off dust etc., on mechanism, interrupter and insulation.	Regular and after 2 years OR 2000 operations whichever is earlier.
	2. Checks for security of fixings & fasteners	After 2 years/OR 2000 operations whichever is earlier
	3. Check for loose/corroded terminals and damages of coils.	- do -
b. Mechanism & Drive Linkage	1. Lubrication of pins/sliding surfaces	- do -
c. Switch carriage	1. Greasing jackscrew and racking box nut	- do -
d. Operation	1. Checks on Mech. & Elect. Operation, closing/tripping Coil settings.	- do -
e. Vacuum interrupter	1. Check snatch gap in closed condition is earlier.	4 years OR 4000 operations, whichever

NOTE : 1. For lubrication oil, use good quality gear oil containing high pressure additive (SAE 80 or 90)
2. For lubrication grease, use Royal Molten MTS 2000 or its equivalent.

18. PRECAUTIONS

- Please study contents of this manual fully before unpacking the equipment.
- Electricity is friendly when treated with care.
- The medium voltage switch gear described in this manual handle voltages of the order of 12 kV when live. Hence great care is needed.
- Please comply fully with the supply utility regulations when energising or de-energising the equipment.
- Please do not operate equipment without prior knowledge and training about this equipment.
- Please do not overlook or defeat safety features provided in order to avoid likely dangerous/fatal situations.

- Please avoid hazardous practices. Especially when live potential is being handled during testing / commissioning.

19. DO'S AND DON'TS

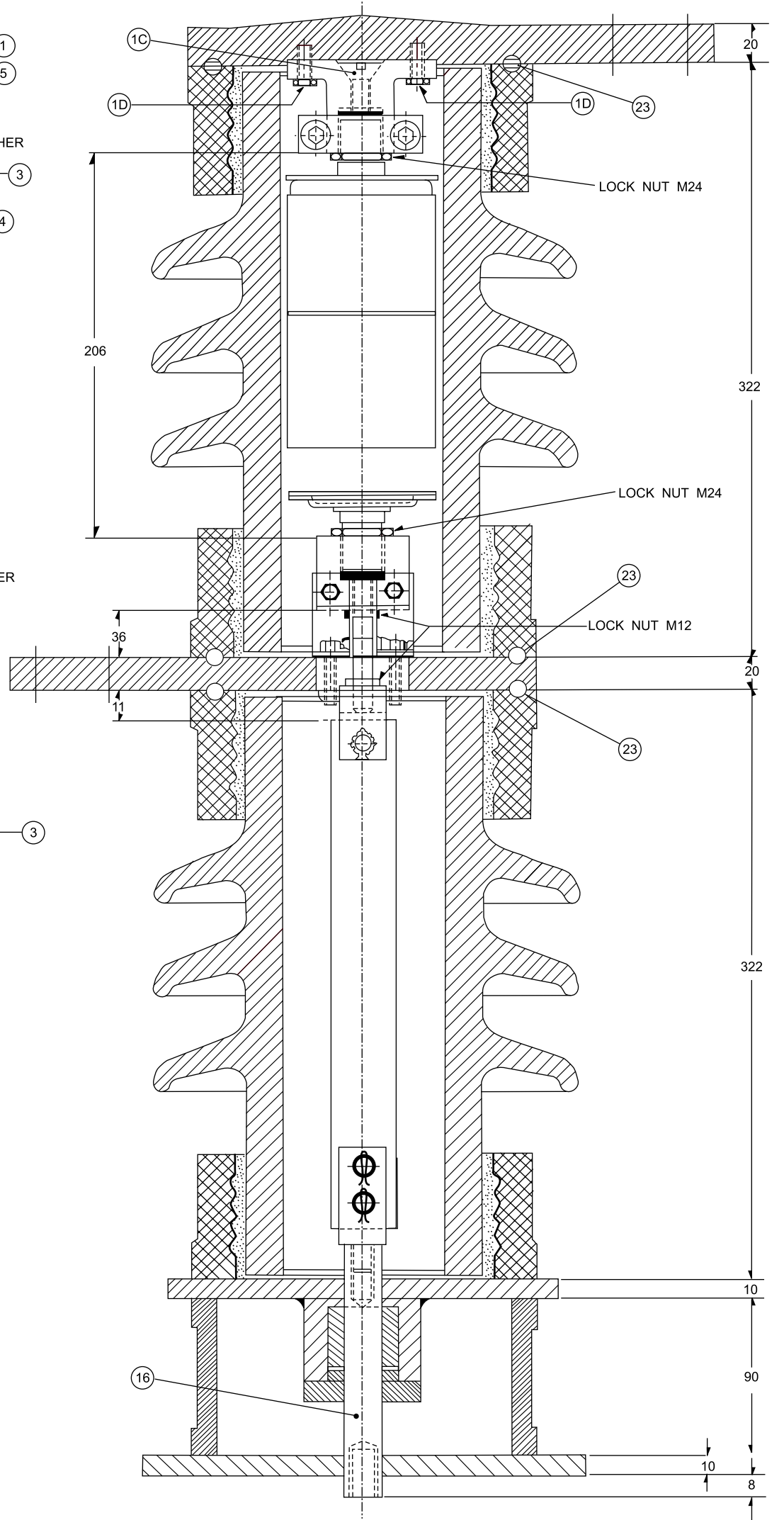
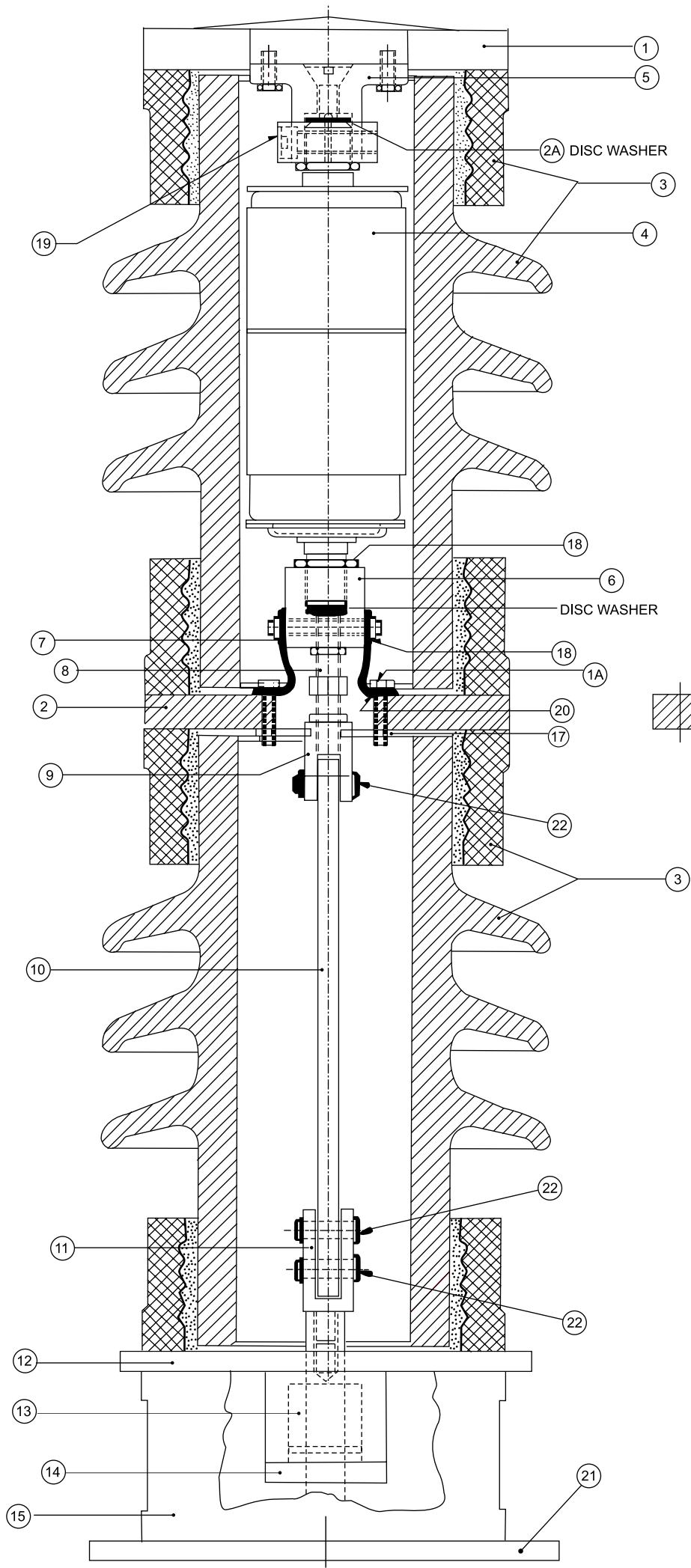
Do select the interlocking castel key position.

Do keep a safe distance of 2 metres min. from the interrupters while performing the H.V. Test.

Do check the breaker insulators are free from foreign materials.

Do ensure spare spring charge be kept in the mechanism for proper latching in case of manual charging.

Do not discard the safety interlock and the safety link.

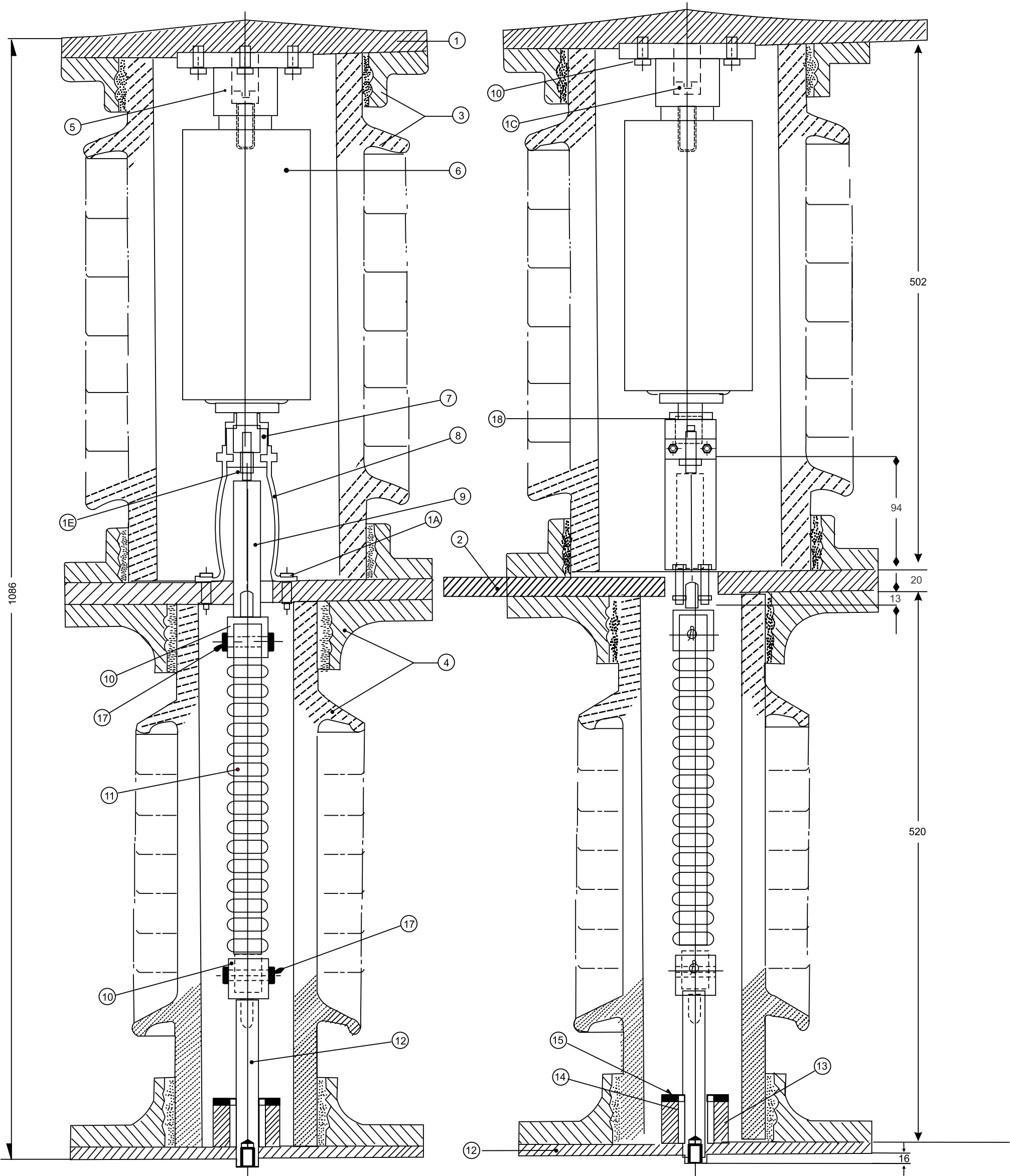


PART No.	DESCRIPTION
1	TREMINAL PAD TAP
2	TERMINAL PAD BOTTOM
3	SUPORT BUSHING ASSY.
4	VACUUM INTERRUPTER
5	TOP CONTACT BLOCK
6	MOVING CONTACT BLOCK
7	FLEXIBLE LAMINATION
8	TURN BUKLE
9	LEVIS
10	INSULATED CONNECTING ROD
11	CLEWIS
12	GUIDE PLATE
13	BUSH
14	GUIDE PLATE CUP
15	ADAPTOR FLANGE
16	MOVING SHAFT

PART No.	DESCRIPTION
17	MOVING CONTACT GUIDE
18	LAMINATION PAKER
19	TOP CONTACT CLAMPING BLOCK
20	PACKER
21	BASE PLATE
22	PIN
23	'O' BING

NOTE:

1. IN-BETWEEN PART 12 & 15, GASKET TO BE PROVIDED (Drg. No. 7E 14237)
2. IN-BETWEEN PART 15 & 21, GASKET TO BE PROVIDED. (Drg. No. 7E 14238)
3. IN-BETWEEN PART 21 & ANOPY (Drg. No. 7E 14220) GASKET TO BE PROVIDED. (Drg. No. 7E 14239)



SECTIONAL FRONT VIEW

SECTIONAL SIDE VIEW

PART No.	DESCRIPTION
1	TERMINAL PAD TOP
2	TERMINAL PAD BOTTOM
3	SUPPORT BUSHING ASSY. • TOP
4	SUPPORT BUSHING ASSY. • BOTTOM
5	TOP CONTACT BLOCK
6	VACUUM INTERRUPTER
7	MOVING CONTACT BLOCK
8	FLEXIBLE LAMINATION
9	MOVING CONTACT GUIDE

PART No.	DESCRIPTION
10	CONNECTING BLOCK
11	INSULATED CONNETING ROD
12	GUIDE ROD
13	BUSH
14	BUSH
15	GUIDE LATE CUP
16	BASE PLATE
17	PIN

Fig. 2

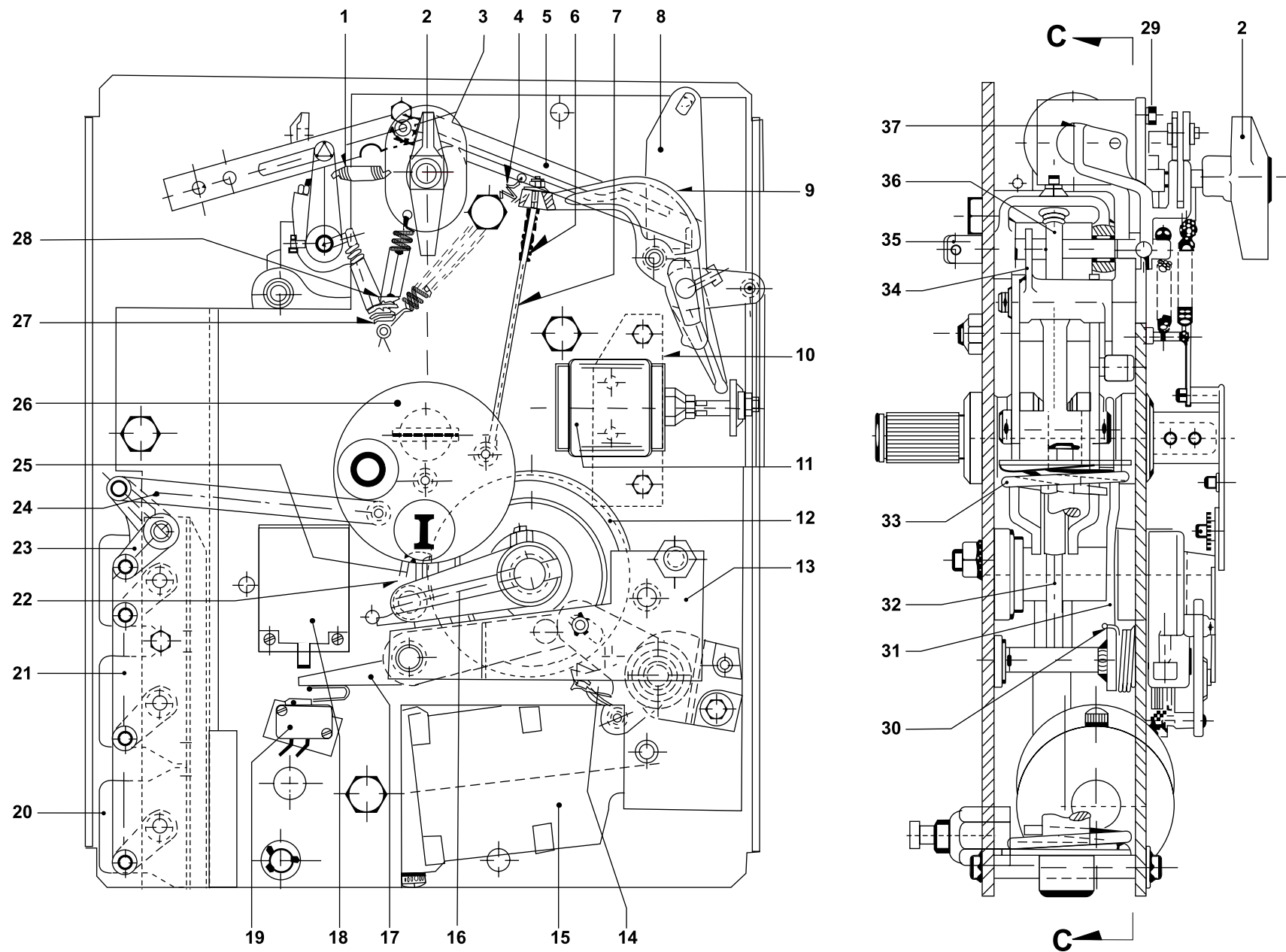


Fig. 3

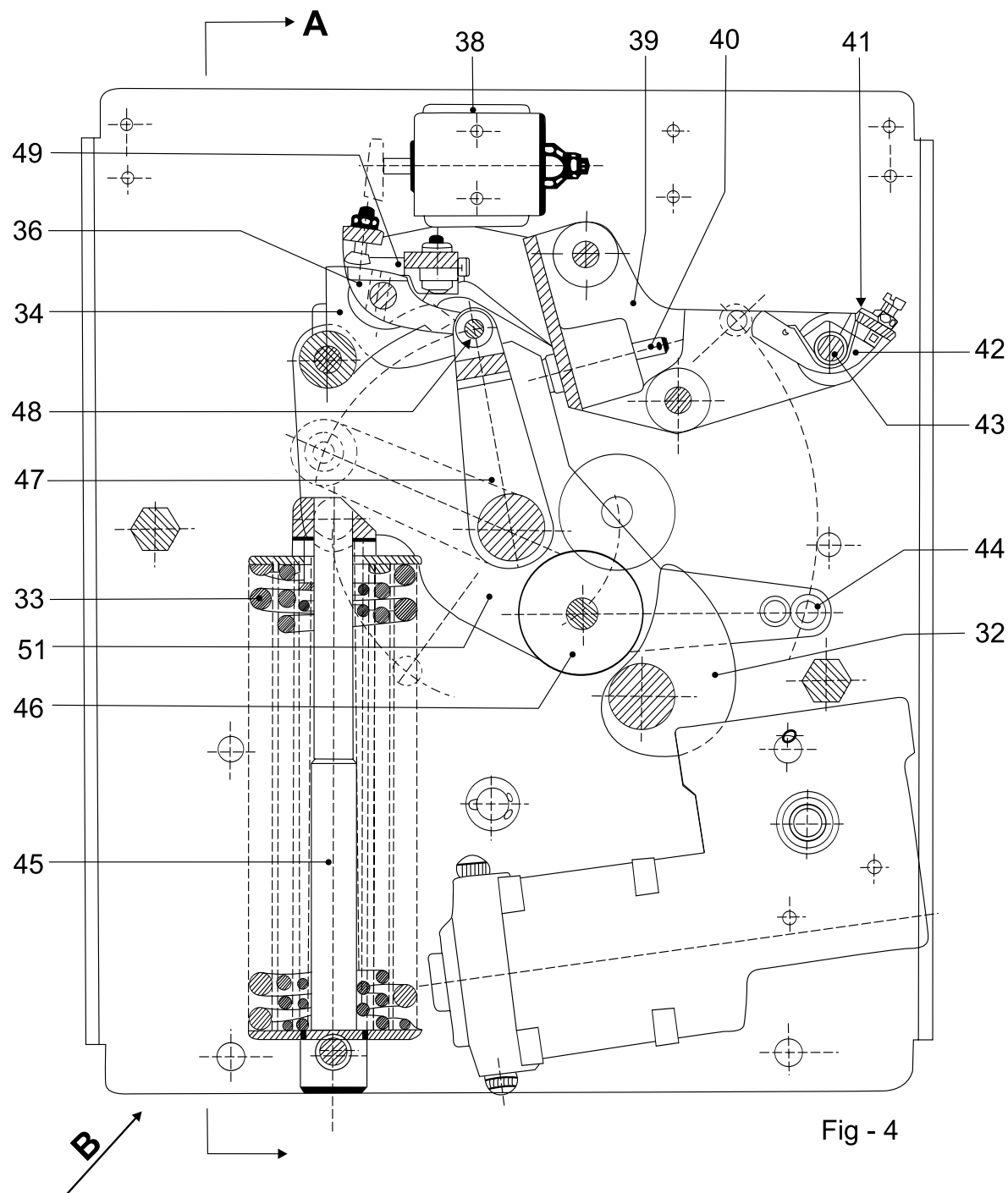
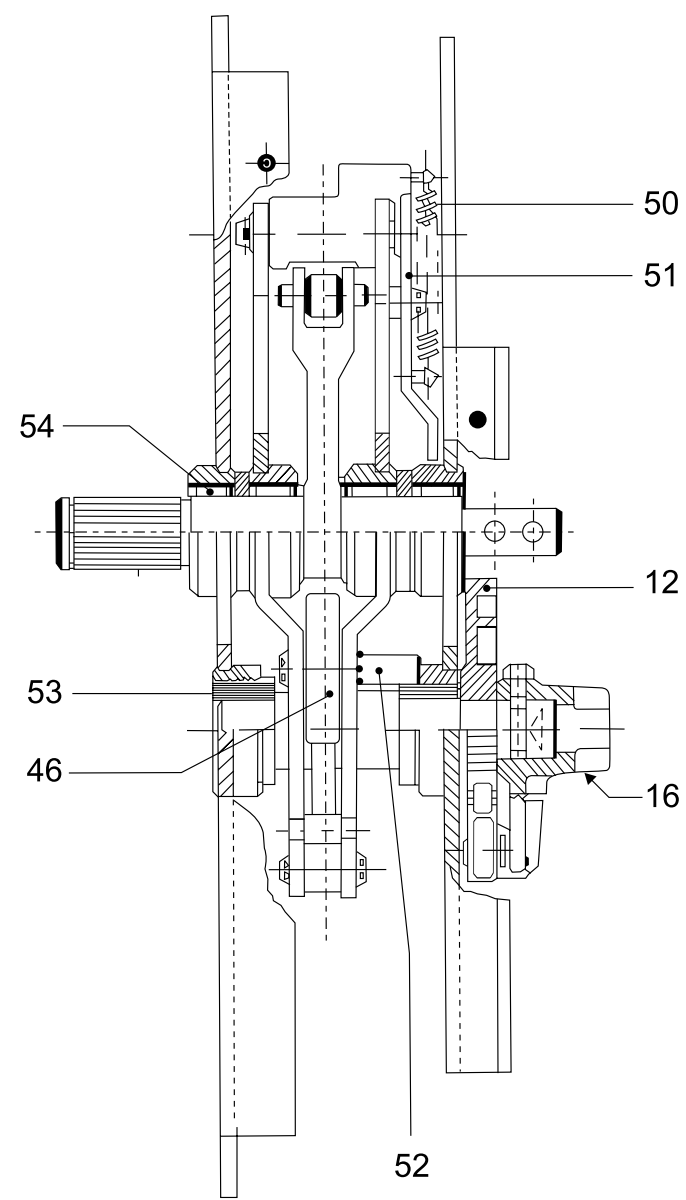
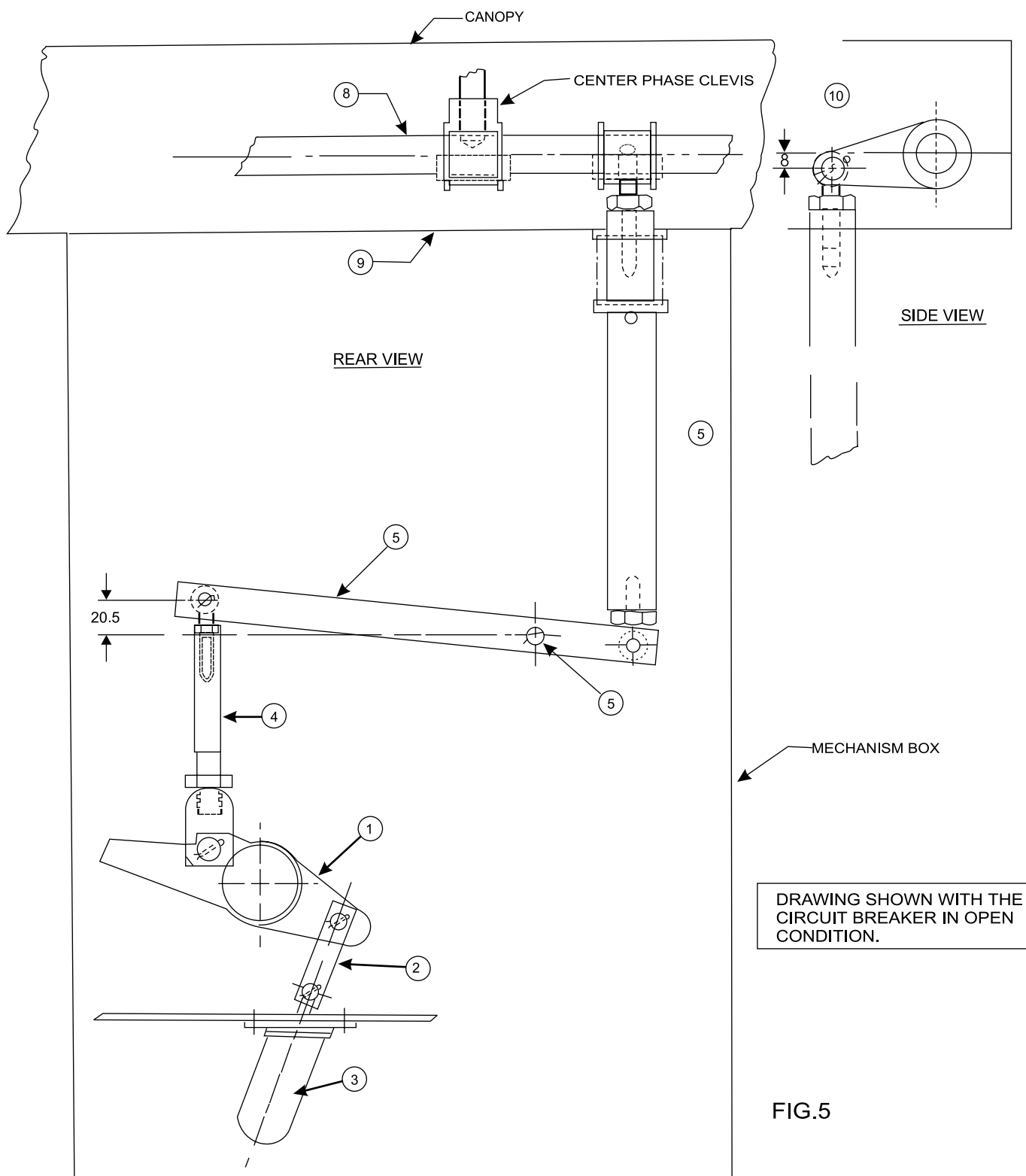


Fig - 4





DRAWING SHOWN WITH THE
CIRCUIT BREAKER IN OPEN
CONDITION.

FIG.5

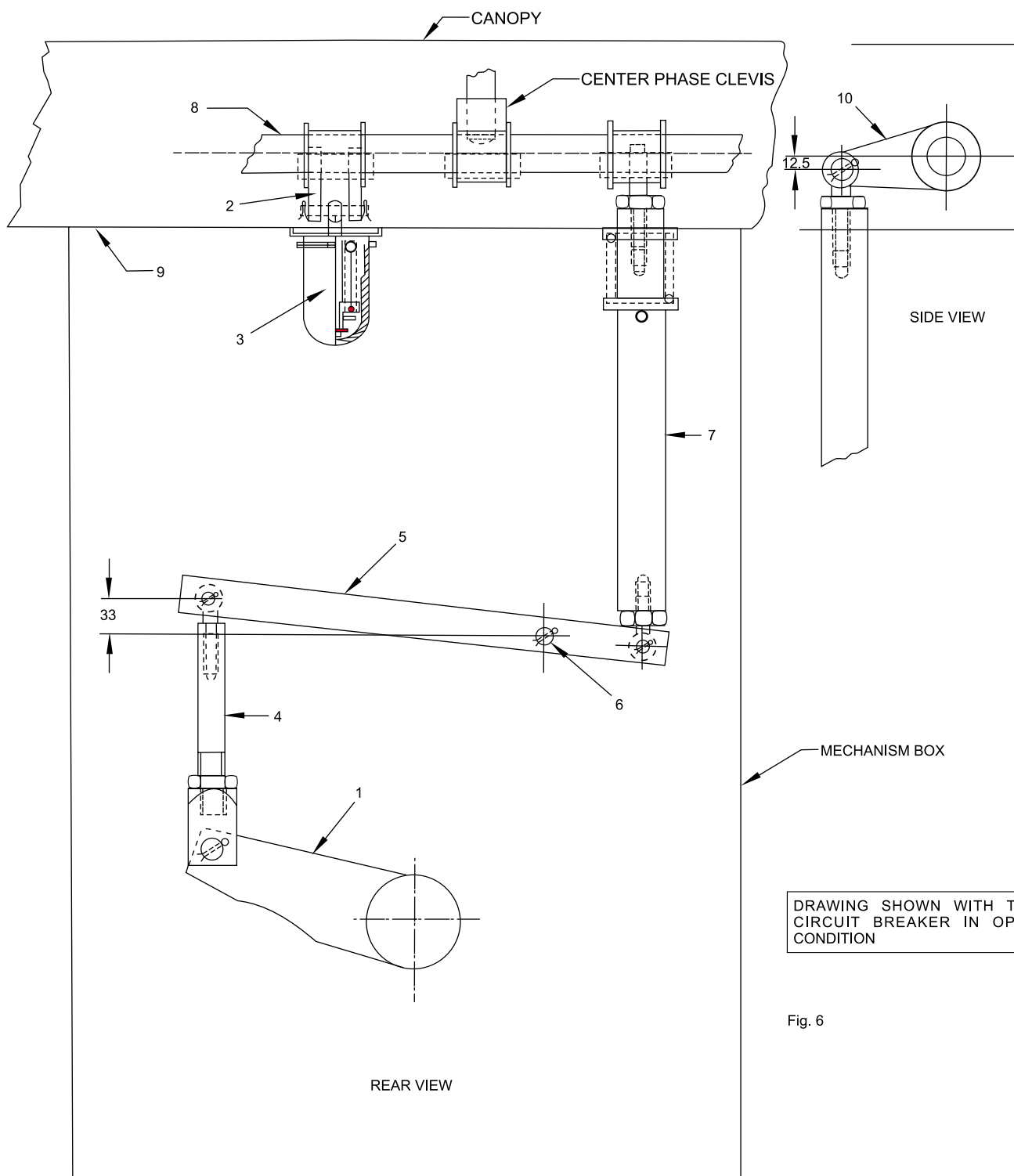
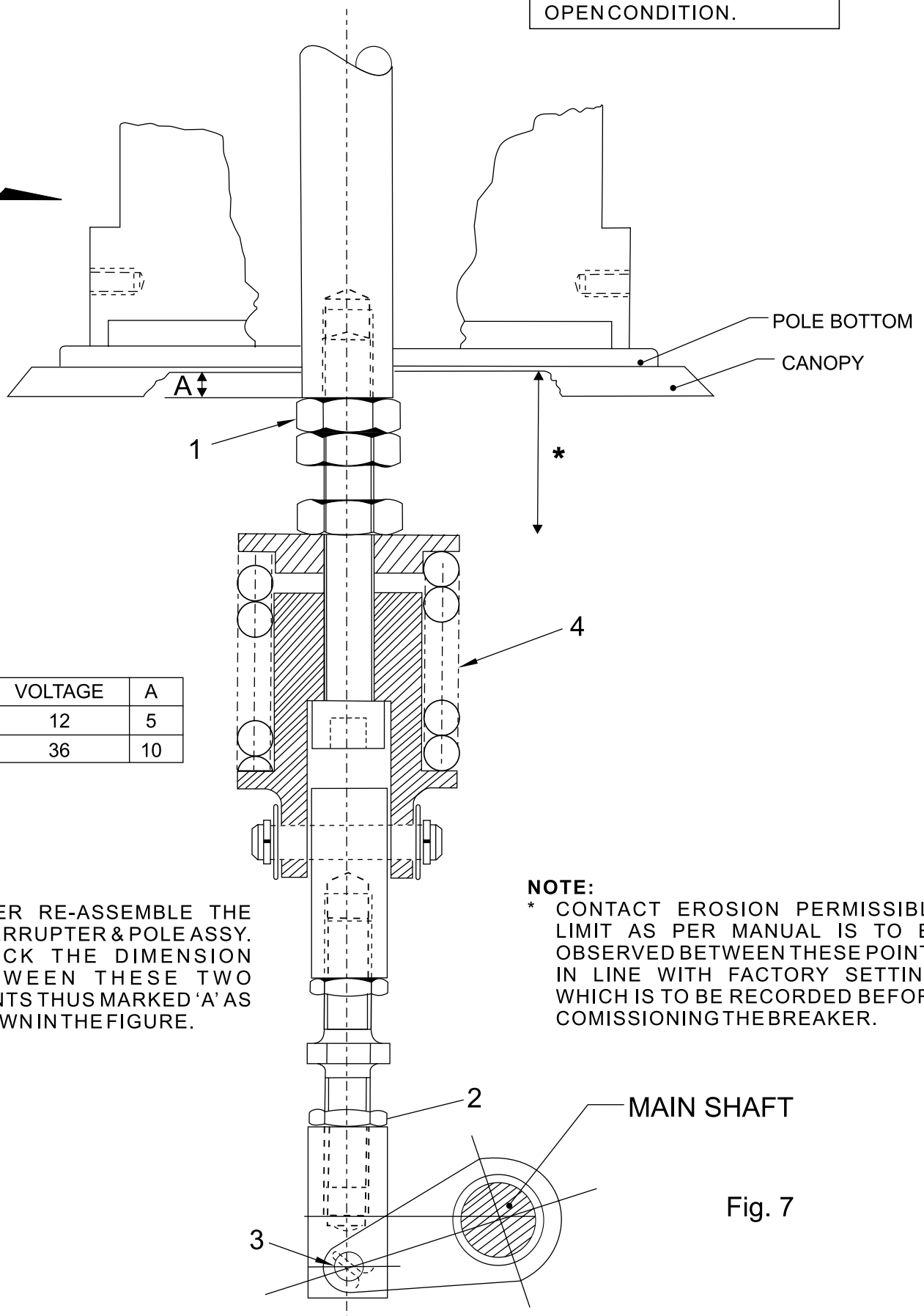


Fig. 6

DRAWING SHOWN WITH
THE CIRCUIT BREAKER IN
OPEN CONDITION.

FRONT



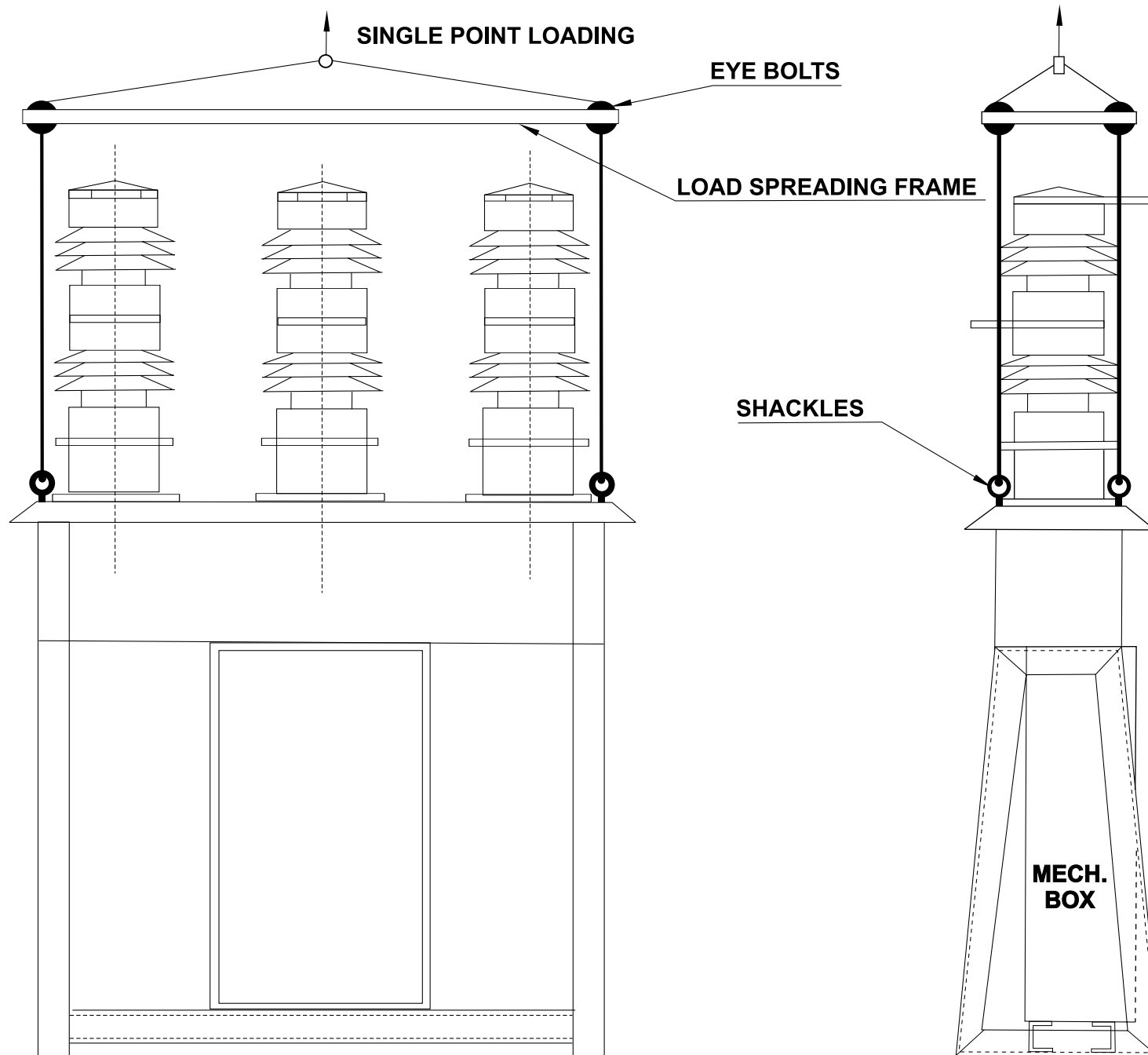
NOTE:

* AFTER RE-ASSEMBLE THE INTERRUPTER & POLE ASSY. CHECK THE DIMENSION BETWEEN THESE TWO POINTS THUS MARKED 'A' AS SHOWN IN THE FIGURE.

NOTE:

* CONTACT EROSION PERMISSIBLE LIMIT AS PER MANUAL IS TO BE OBSERVED BETWEEN THESE POINTS IN LINE WITH FACTORY SETTING, WHICH IS TO BE RECORDED BEFORE COMMISSIONING THE BREAKER.

Fig. 7



METHOD OF LIFTING THE UNIT

Fig. 8

The policy of Easun Reyrolle is one of continuous improvement and development. The company therefore reserves the right to supply equipment which may differ slightly from described and illustrated in this publication.

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