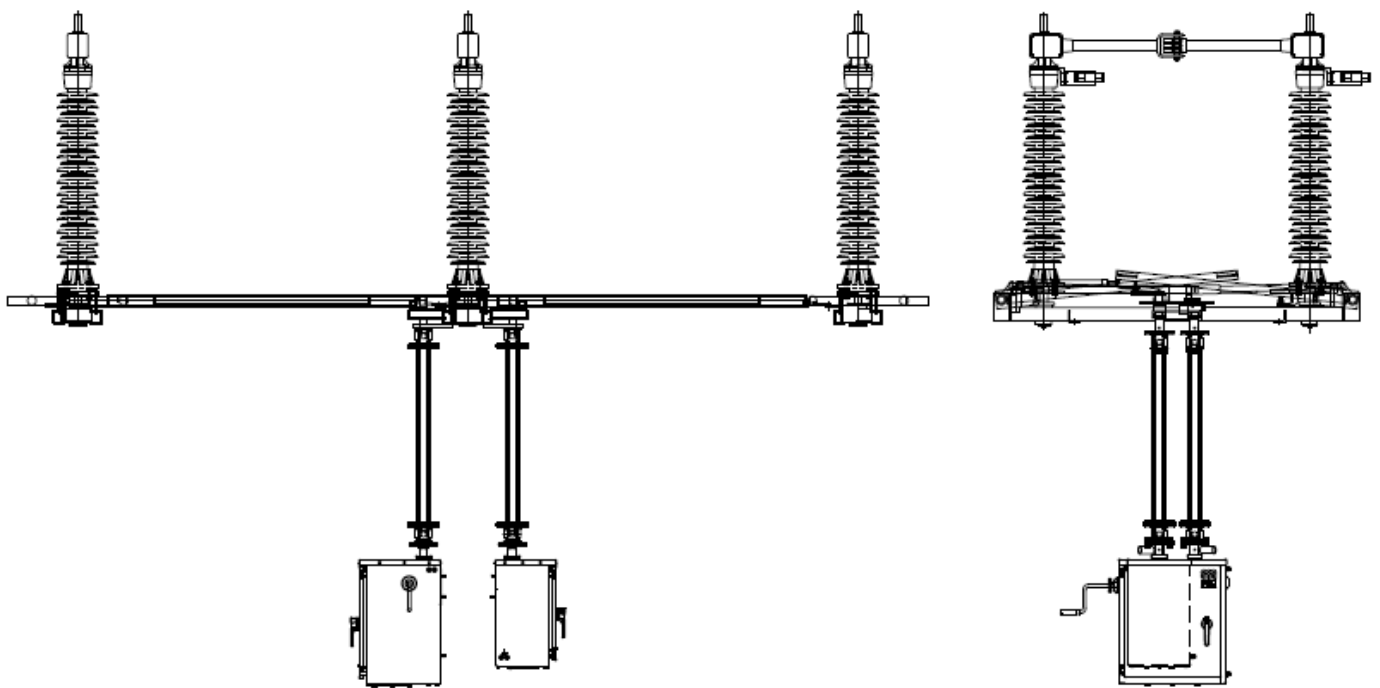


INSTALLATION, OPERATION & MAINTENANCE MANUAL



123kV CENTRE BREAK DISCONNECTOR (Earth switch parallel to base arrangement)

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1. Introduction:

The purpose of this handbook is:

- to give a general information about the equipment, through a detailed description of its main components.
- to serve as a guide for proper storage & for erection and commissioning.
- to recommend periodical maintenance operation.

Strict adherence to the instructions specified in this handbook will ensure the high performance & reliability which the disconnecter is designed for.

For a better understanding of the text, the components of the disconnecter which are referred to are characterized by a code put between brackets.

2. General description:

RC-WDE, WSE & WOE disconnectors are outdoor, two-column centre break rotary disconnectors.

RC disconnector (see Figure A) consists of supporting base (1), on which two rotating supports are mounted (2); two post insulators (3), bolted to the rotating supports, carry, at their top, the swivel arms (4-5), each provided with a contact, “male” (6) or “female” (7), and with the terminal stud (8).

Note: The dimensions & size of the disconnector shown in the figure is dependent on the voltage & current rating and accordingly certain variations in detail may be there. However the general layout, assembly & contents of this document are valid for all ratings.

During the operation, both arms turn through 90° in the horizontal plane, while the terminals remain stationary (when connected to the H.V. circuit).

Base can be equipped with earthing switches, with the same rated short-circuit withstand capability as the main disconnector.

The earthing switch is of Free Entry Earth Switch (FEE) type (see Figure B).

When operated, the earth switch (1) moves 80 degrees upwards, thereby ensuring the female fixed contact (2) completely encompasses by the male moving contact (3).

Depending on customer requirements earth switch can be provided on each side of a pole. Accordingly they are termed as disconnector with single earth & disconnector with double earth.

Both disconnector and earthing switch can be motor or manually operated.

Centre-break disconnectors of the type described in this handbook are identified as follows: (1) - (2) - (3) - (4) - (5)

- (1) = RC-WOE, for disconnector without earthing switches
- (2) = RC-WSE, for disconnector with single earthing switches
- (3) = RC-WDE, for disconnector with double earthing switches
- (4) = rated voltage (kV)
- (5) = rated normal current (A)

FIGURE A

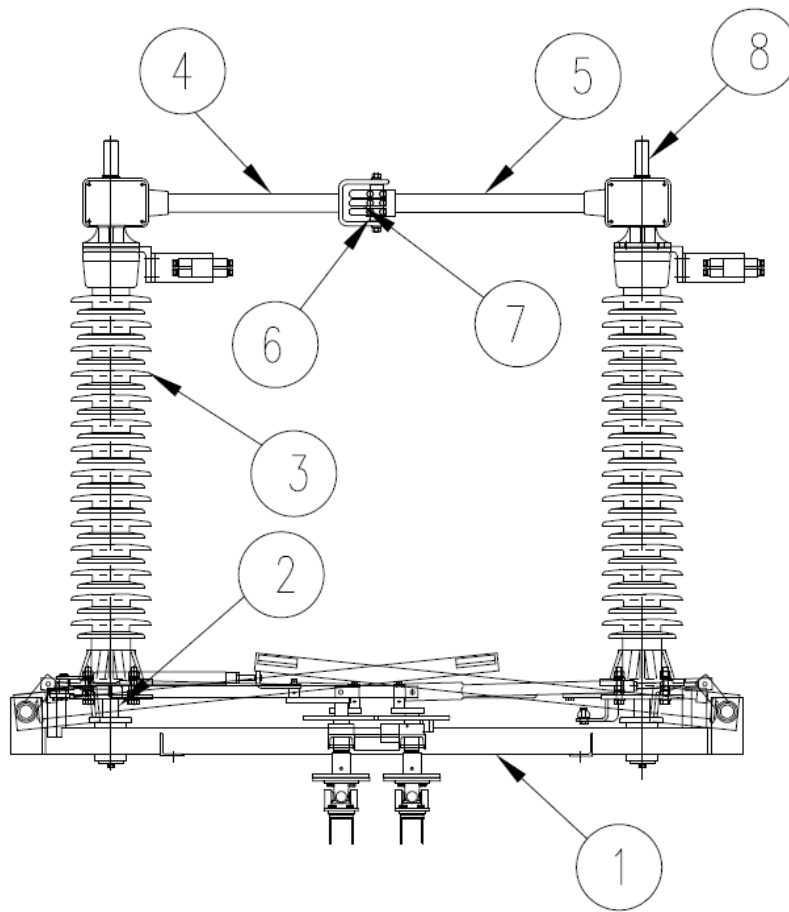
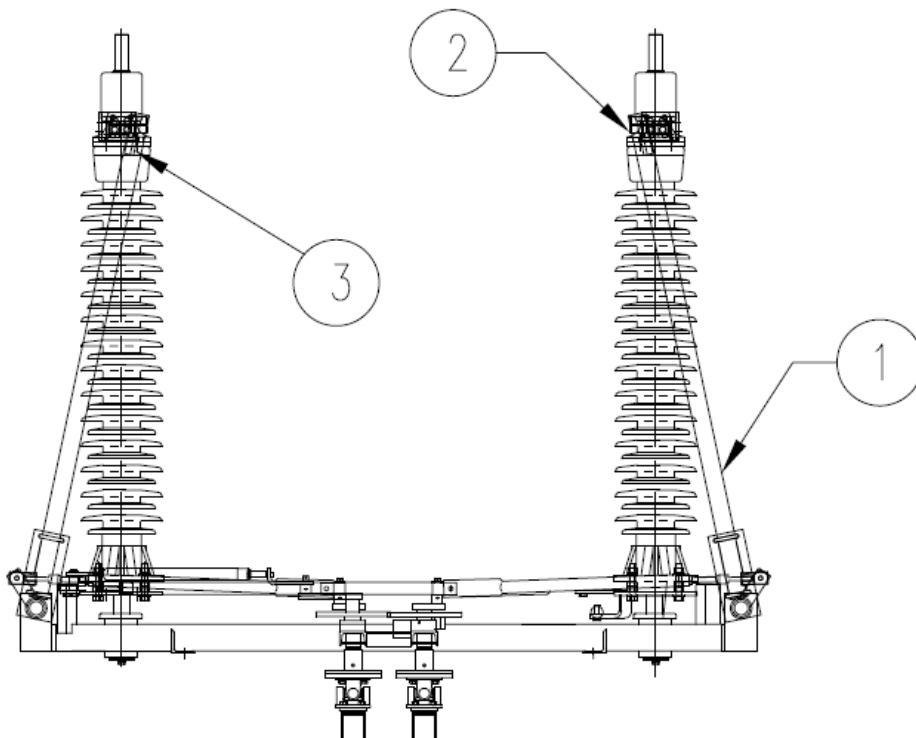


FIGURE B



Basic Design:

Item No.	Item Description	Remarks
1	Disconnecter base – drive end	Galvanized steel channel section having provision for bearing shaft, drive coupling arrangement for main/earth.
2	Disconnecter base – non drive end	Galvanized steel channel section having provision for bearing shaft.
3	Support insulator	Solid core (Optional Item).
4	Male blade assembly	Aluminum tube welded to aluminum housing. Silver plated copper contact bolted at the end of tube. Positive current transfer through silver plated copper contact fingers.
5	Female blade assembly	Aluminum tube welded to aluminum housing. Silver plated copper contact fingers bolted at the end of tube. Positive current transfer through silver plated copper contact fingers.
6	Terminals	Tinned copper tube/rod.
7	Earth switch	Aluminum tube fitted with silver plated copper special section at one end and tin plated copper flexible for grounding /earthing.
8	Earth fixed contact	Silver plated copper fingers fitted to an Aluminum casting.
9	Interlock assembly	Provided in case of disconnector with single/double earth. Galvanized steel items.
10	Down pipe – Main and Earth	Galvanized steel pipe.
11	Operating drive – Main & Earth	Motor operated or manual. Painted steel cabinet, provision for gear box and electrical items.

Scope of Supply:

The disconnect and earth switch consist of the following main components.

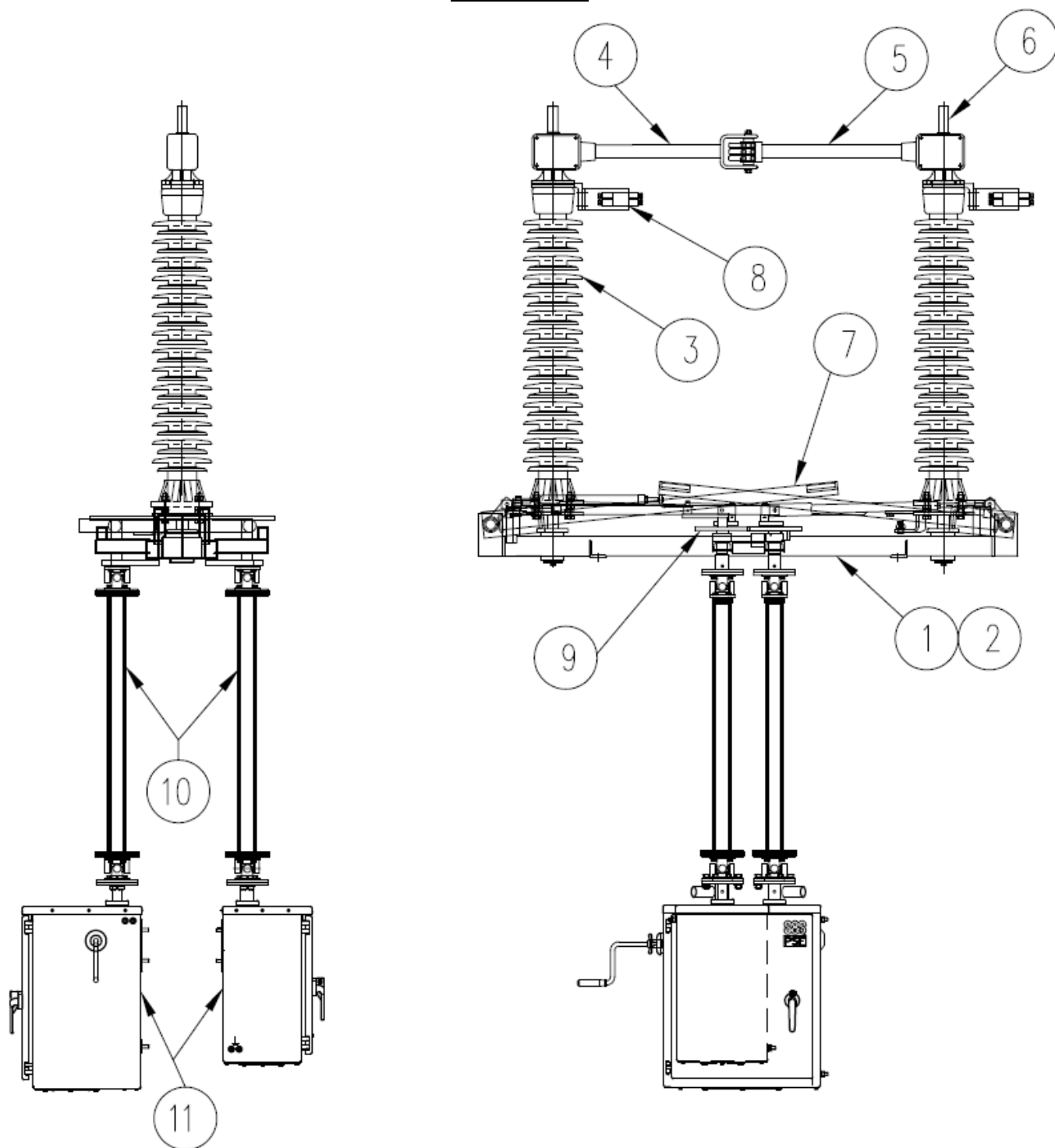
Disconnect

- Base assembly drive end and non drive end.
- Support insulators (Optional).
- Male blade assembly.
- Female blade assembly.
- Tandem pipe (Phase to Phase coupling pipes) in case of three pole arrangement.
- Down operating Pipe.
- Drive mechanism.
- Terminal connector (Optional).
- Support structure (Optional).

Earth Switch

- Earth Blade with flexible connector.
- Earth Fixed Contact.
- Tandem Pipe (Phase to Phase coupling pipes) in case of three pole arrangement.
- Down operating pipe.
- Drive mechanism.

FIGURE C



Component description

Main components of a disconnector type RC are described in this chapter.

A.Supporting bases

The base consists of a hot-dip-galvanized steel channel (1), on which are provided:

- Four (2) holes for fixing the base channel to the supporting structure
- The mechanical limit stop of the disconnector in “closed” position (3) and another limit stop in “open” position (4) for Disconnectors. (See figure. D)
- Two rotating supports (5).

Each base is provided with the hole for M12 grounding bolt (6) (a clamp, fit for the grounding conductor, can be provided on request).

B.Post Insulators

When supplied, post insulators (7) will be in compliance with Customers' requirements.

C.Main circuits

The main circuit of base consists of two arms, male (3) and female (4), each made of Aluminium tubes (Hamper) at whose ends the contacts are bolted(1 – 2): at one end are the “main” contacts, which open and close during operation. At the other end are the “hinged” contacts, which slide over the connector stem (6) during opening & closing. These contacts, whose number and size vary according to the current rating, are made of copper with a flash of silver coating; if “silver-to-silver” contacts are required, by the design or by the Customer’s specification, the thickness of the silver layer on the contact surfaces is suitably increased. Contact springs and assembling bolts are made of stainless steel.

Each arm includes a terminal, which, according to the rated current, is “cylindrical type” (6), made of tinned copper.

When built-in earthing switch is provided (RC-WSE & RC-WDE Disconnectors), its fixed contacts (2) (See figure E) have to be bolted between the top flange of the insulator and the fixed end of the male/female hamper.

FIGURE D

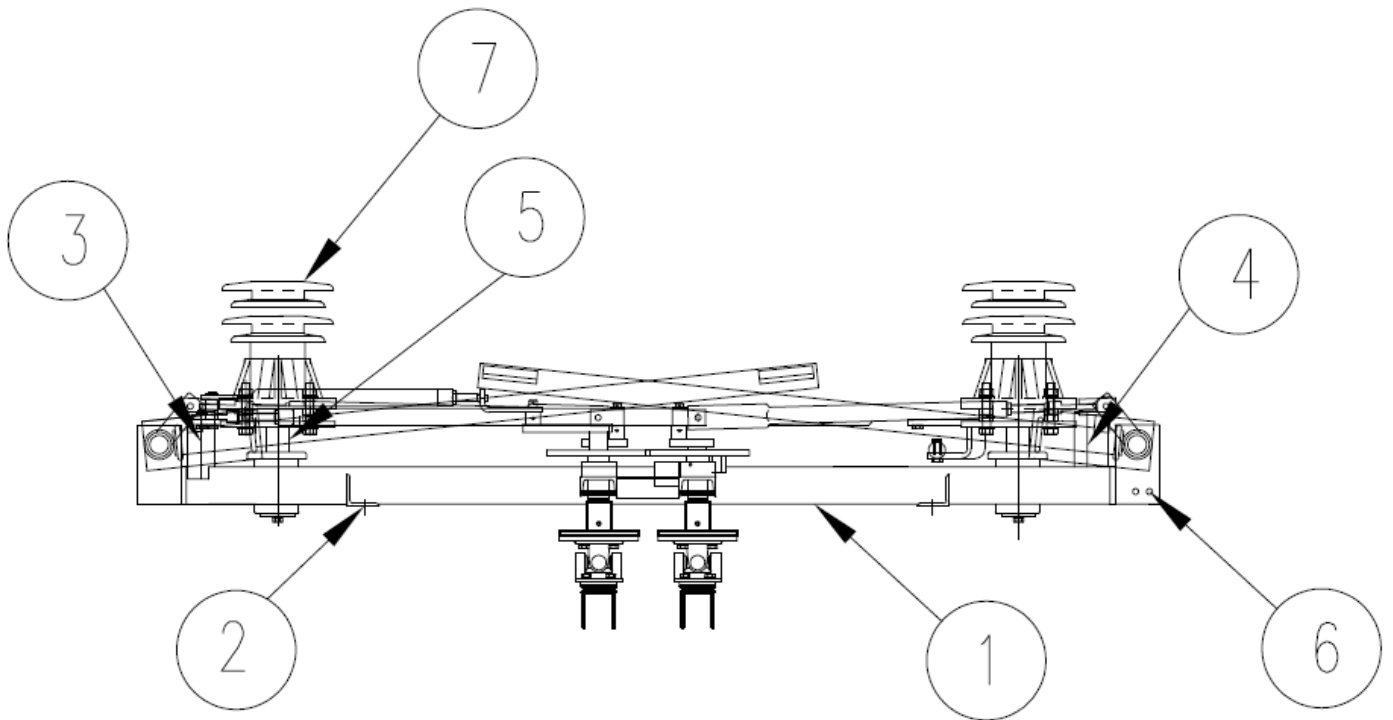
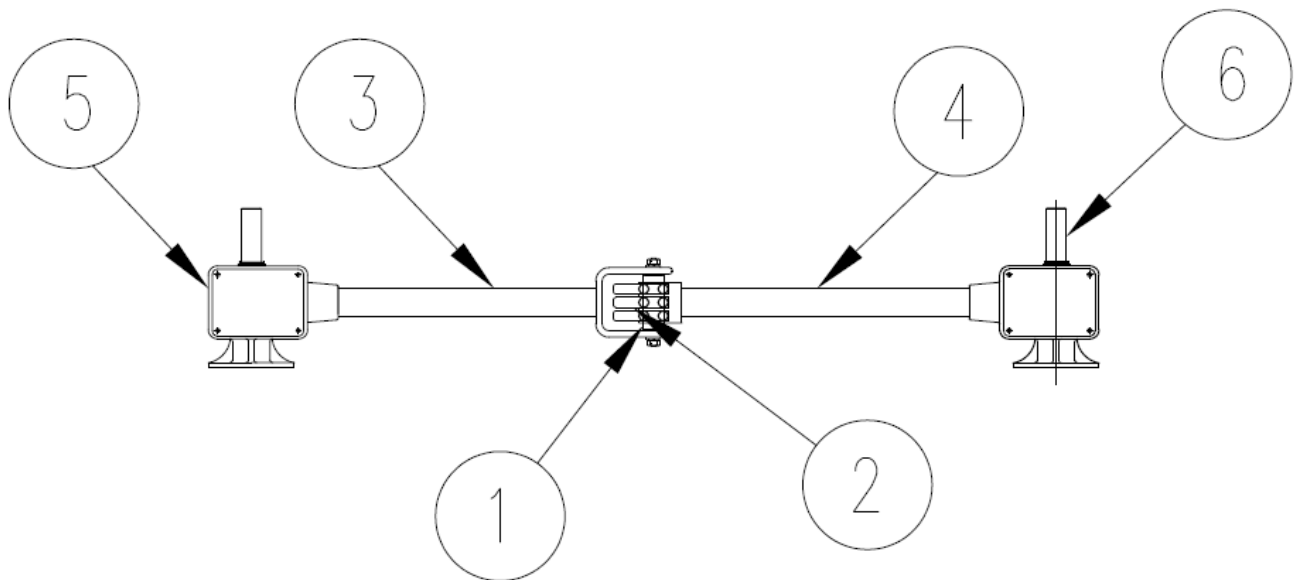


FIGURE E



D. Earth switch

Earthing switch of “FEE” type, consists of an Aluminium tube, with the moving contact, (male (1)), bolted at its upper end. (The fixed contact (2), as previously said, is bolted to the main circuit). (See figure. F)
Both fixed and moving contacts are made of copper.

The lower end of the arm is provided with flexible tinned copper connector (3) (number and size according to the short-circuit withstand capability) for the connection to the earthing switch base (4).

There is a **mechanical limit stop (5), for the “open” position.**

E. Tandem pipe & Down operating pipe

The tandem pipe & down operating pipe consists of a tube made of hot-dip galvanized steel, suitably linked to each other in order to transmit the movement from the operating mechanism to the main circuits. The links between the various components are generally made through steel bolts.

F. Operating mechanism

The operating mechanism is provided inside an IP55 grade box made of Aluminium/Mild steel/Stainless steel. The provision for Local/Manual/Remote (L/M/R) operation is also provided inside the box. The down operating pipe is connected to the operating mechanism through flange connections using Vernier hole methodology. Suitable handle is also provided for manual handling purpose (See figure G & figure H).

FIGURE F

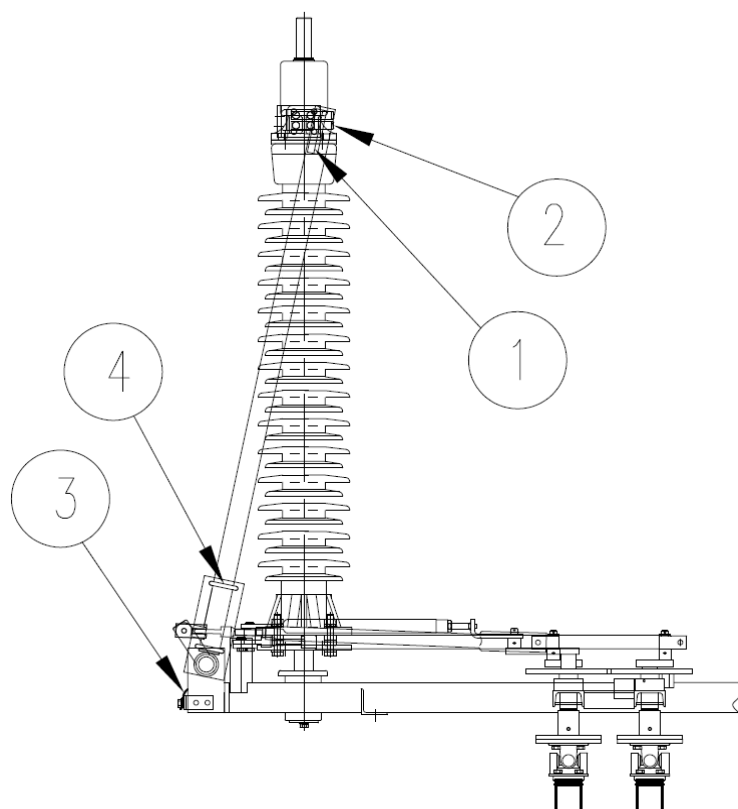


FIGURE G

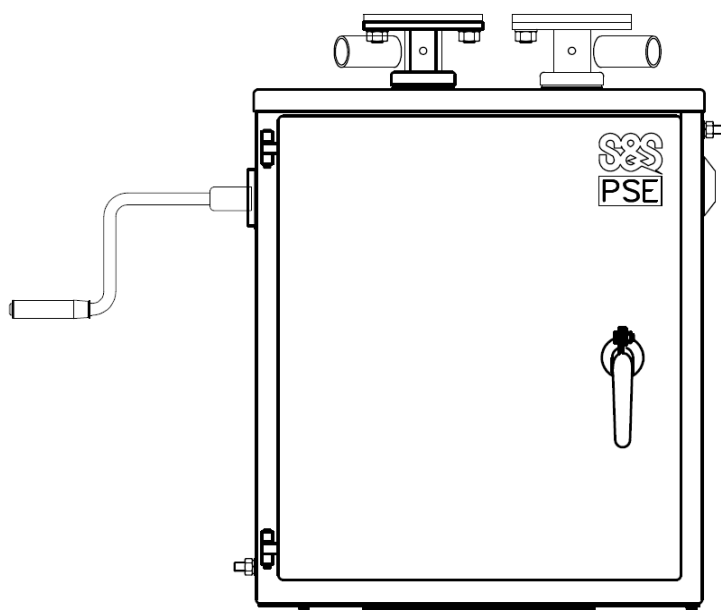
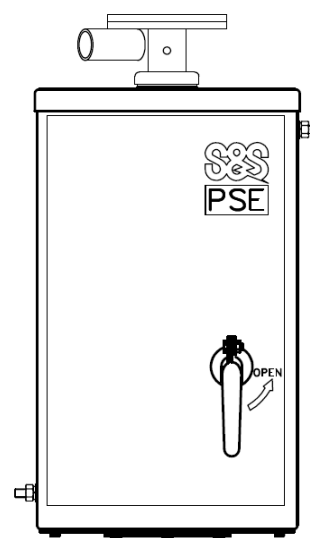


FIGURE H



3. Receiving, handling and Storage:

Shipping:

The Disconnecter and earth switches are shipped in cases/crates. After unpacking check all supplied items against the packing list provided. In case of shortage/damage kindly inform the shipping/forwarding agency immediately along with relevant details & photos of the same. Also inform the concerned contact personnel of S&S PSE.

Storage:

In case of inappropriate storage of disconnecter /earth switches, there is a risk of ingress of water. For this reason, Disconnecter parts and operating mechanisms **must always be stored in Elevated position.**

It is advisable to leave all assemblies in packed condition until the start of Erection.

Caution:

In case of longer storage period and or damp atmosphere, there may be undesired formation of condensation in the operating mechanisms. In this case operating mechanisms are to be removed from packing and electrical heating is to be provided & continued till complete removal of condensation is ensured. The operating mechanism shall be allowed to cool down to ambient temperature/safe handling temperature, prior to assembly.

4. Installation:

- Bases
- Insulators
- Hampers
- Earth switch
- Earth Fixed Contact
- Drive Box – Main and earth
- Down pipe
- Tandem pipe Main and earth.
- Terminal connectors

Erection of Base:

Before erection of base ensure the following

- Identify the base drive & non drive end.
- Remove the base fixing hardware from bases and keep it in proper place.
- Ensure availability of crane/fork lift.
- Ensure proper slinging (see figure. J) to avoid damage during erection.

Erection

- Identify the drive end base and place in the proper position on top of the structure. Fix the hardware; do not tighten fully.
- Place the other two bases on top of the structure in the proper position. Fix the hardware; do not tighten fully.
- Check with spirit level on top of bearing shaft (see figure. I) and give shims if required on the leg of the bases.
- Check the diagonal distances.
- Tighten all the bolts. After complete tightening once again check with spirit level.

FIGURE I

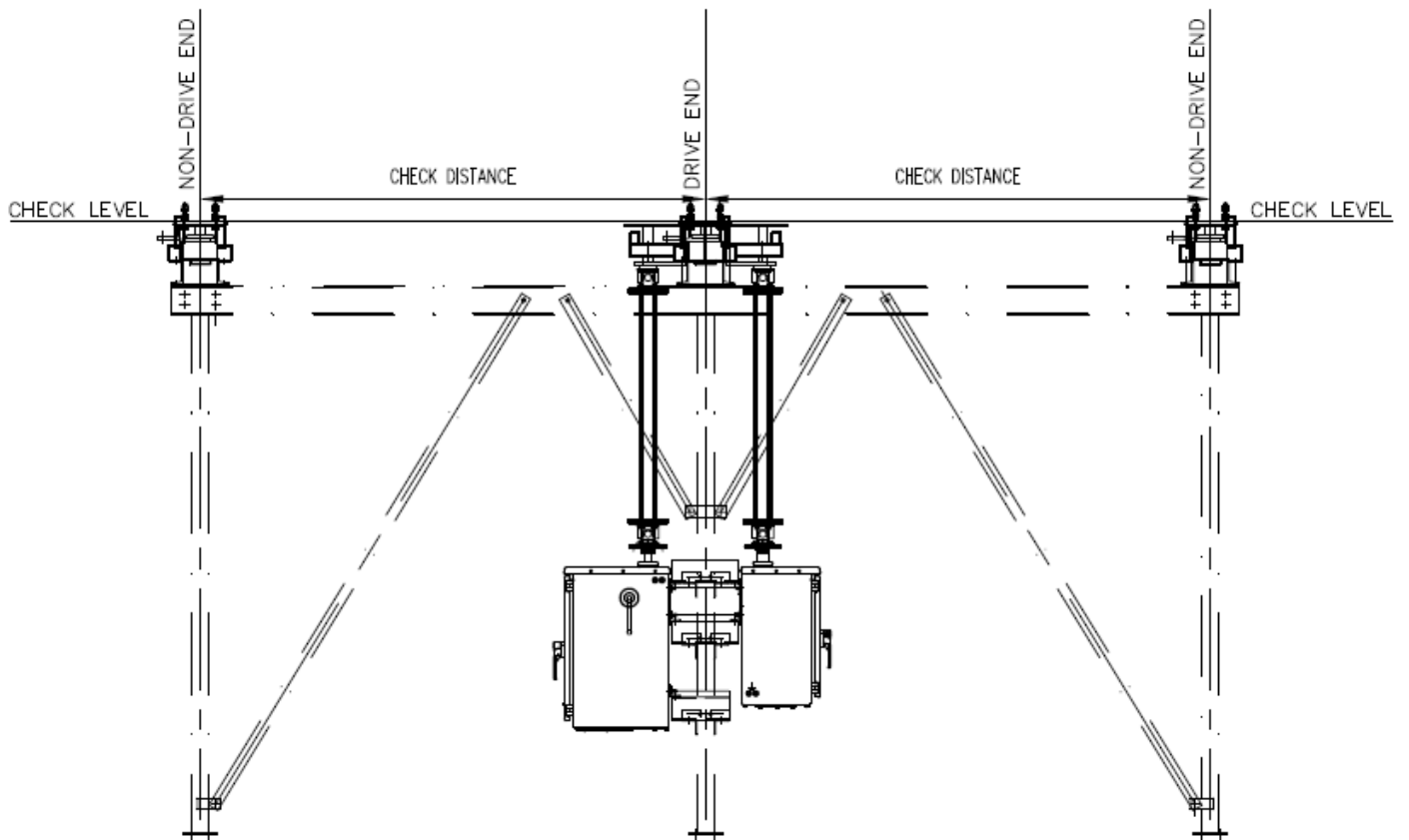
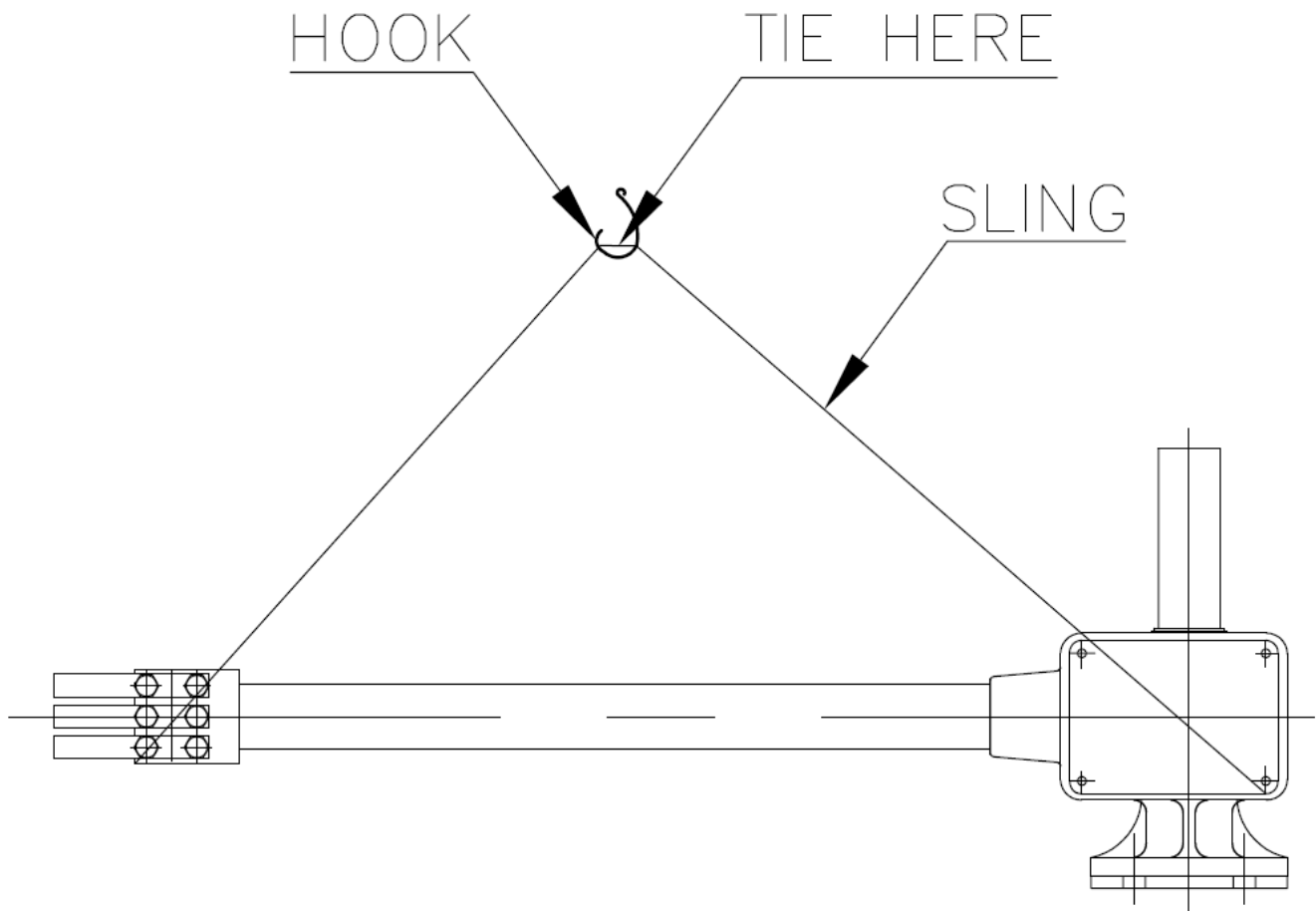


FIGURE J



Erection of Insulator:

Before Start of erection ensure the following

- Clean the insulator thoroughly.
- Keep the fixing hardware in respective places.
- Identify the Insulator and keep item in respective position.

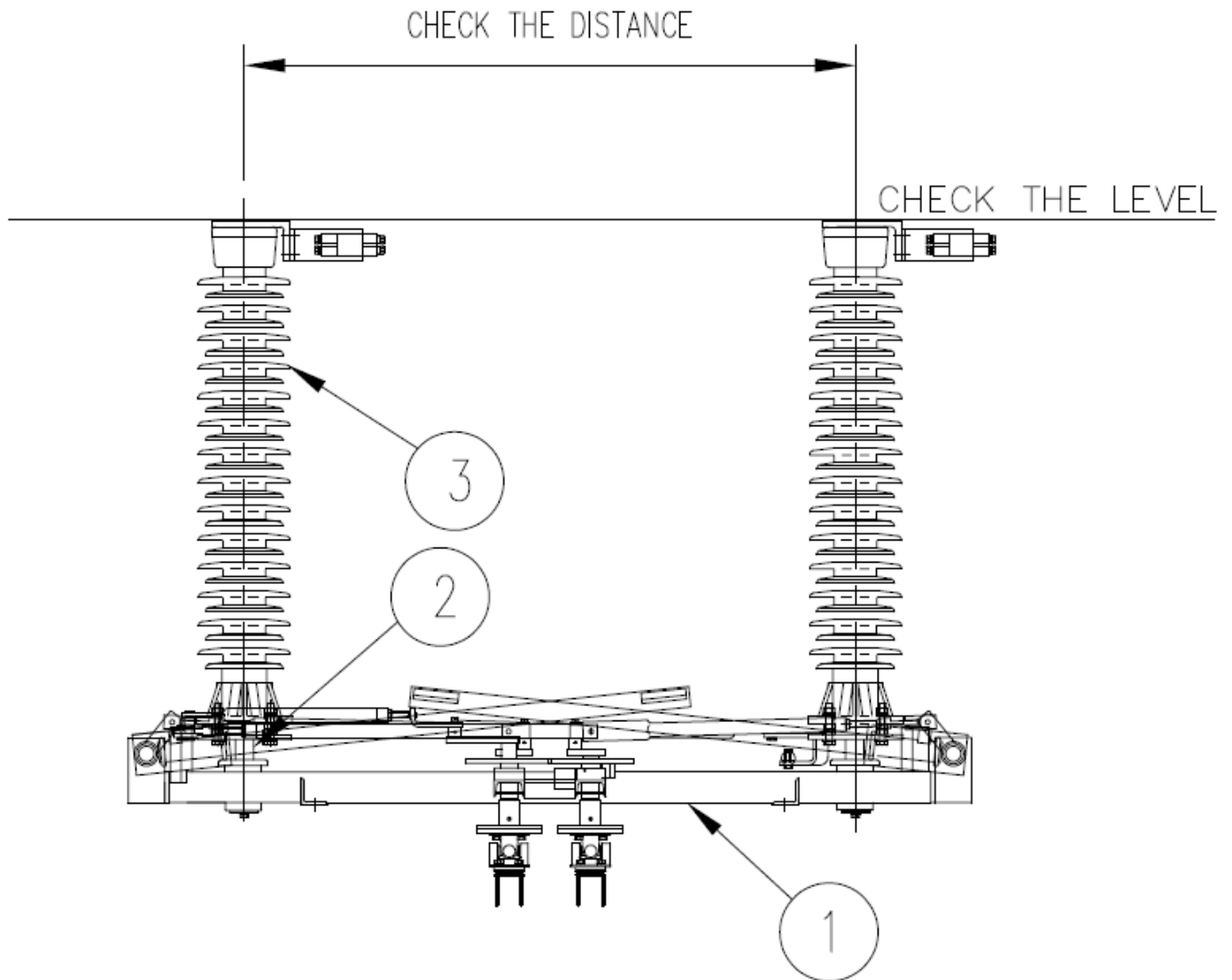
Erection

- Lift the insulator using nylon rope or and place it over the top flange of the bases and fix the bolts; do not tighten fully.
- Check with spirit level in two directions as shown in the figure. K and, give shims if required.
- Check the inter pole dimension as per the drawing and, align as shown, if required.
- Tighten the bolts fully.
- Once again check with spirit level in two directions as shown.

Erection of earth fixed contact/dummy adapter:

- Fix the earth fixed contact/dummy adapter on to the provision given between the top of the insulator and the male / female hamper (refer figure C).
- Repeat the above procedure on the other two poles.

FIGURE K



Erection of Hamper:

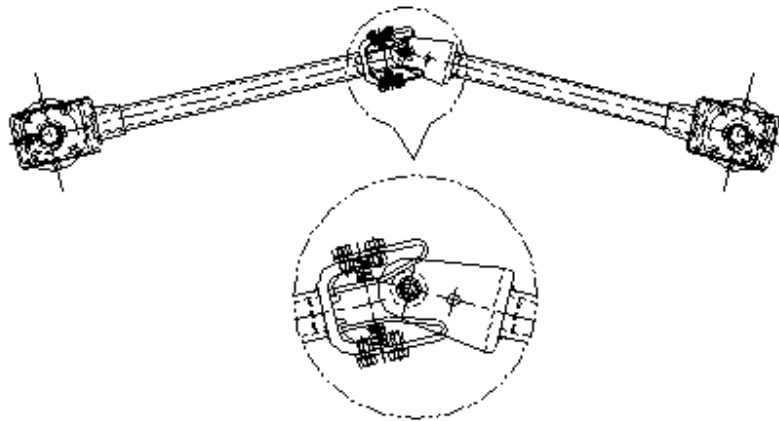
Before erection ensure the following

- Identify the Male and Female hamper.
- Keep the fixing hardware.
- Keep the earth fixing adaptor in case of disconnector with earth.

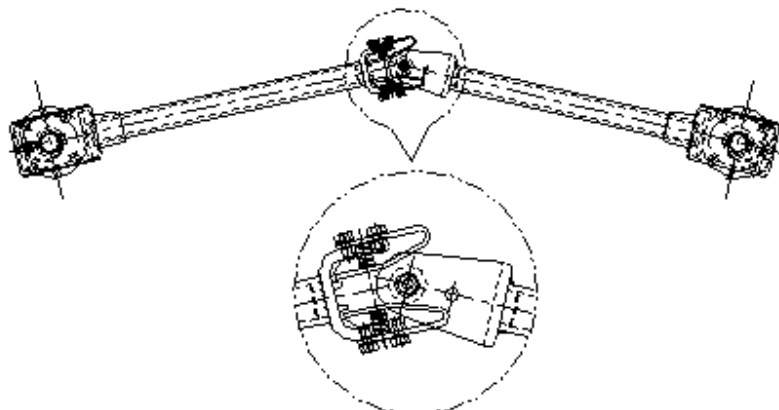
Erection

- Lift the male or female hamper with proper sling as shown in the figure J and position in the respective place as per the approved general arrangement drawing. Fix the hardware; do not tighten fully.
- In case of disconnector with single/double earth switch ensure that the dummy/earth adaptors are in the respective side as per the approved drawing.
- In case of disconnector without earth switch no dummy/earth adaptors are provided.
- As shown in the figure L bring the male and female hamper to close position and check free entry of male contact to female contact.
- Check the male contact position with respect to fingers (refer figure. L); if required, align either male blade or female blade with shims.
- Check the above operation atleast 5 times and ensure free entry of each blade.
- Repeat the above procedure on the other two poles.

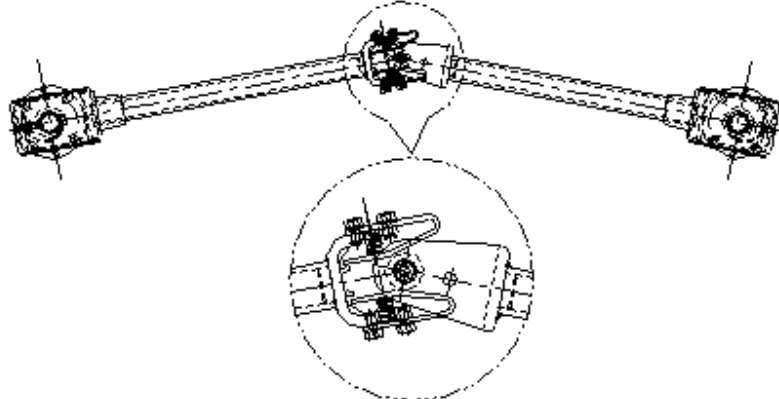
FIGURE L



1. FEMALE HAMPER CLOSING FORWARD



2. MALE HAMPER CLOSING FORWARD

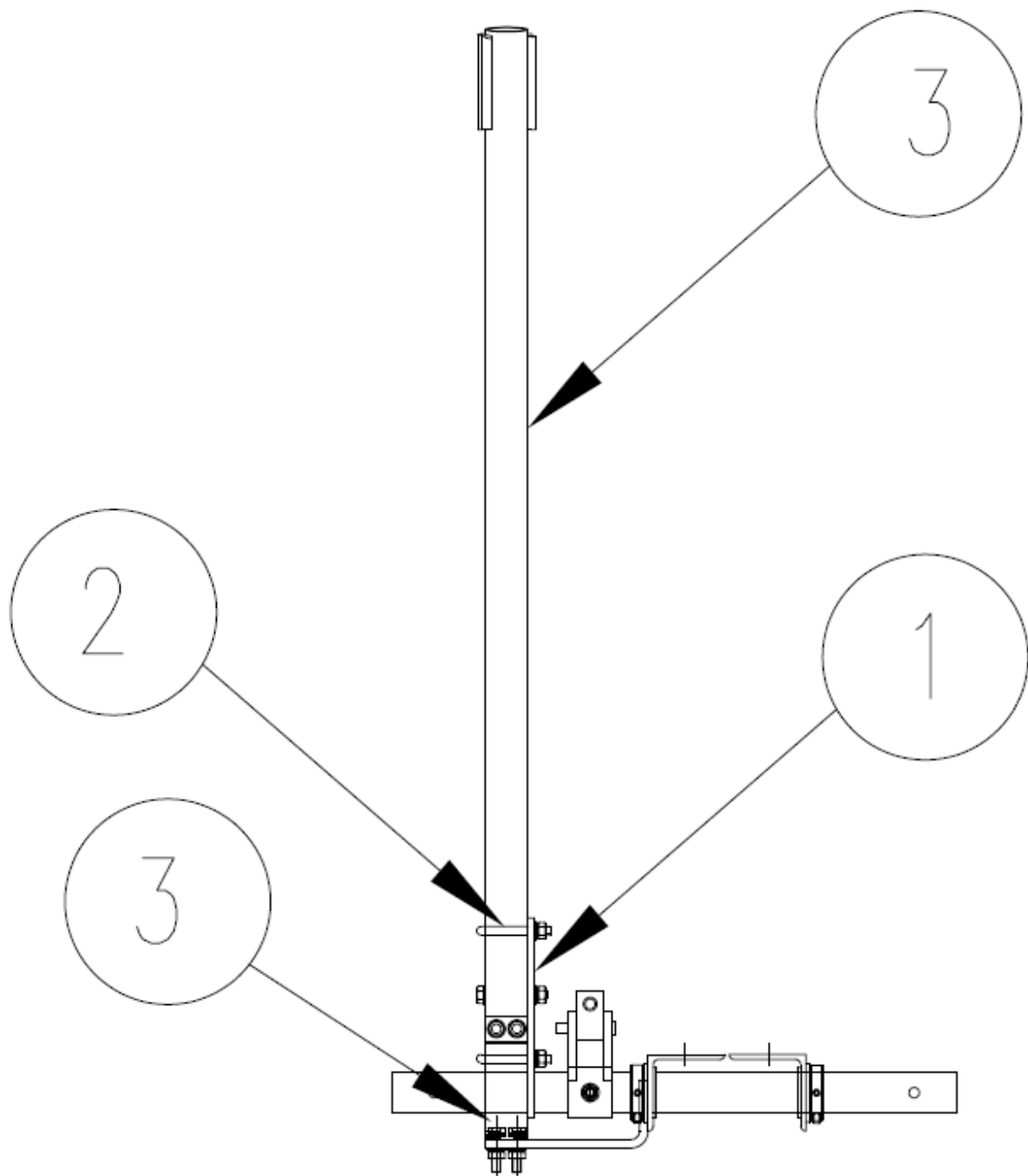


3. BOTH MALE AND FEMALE HAMPER ARE UNIFORM

Erection of earth switch:

- Identify the drive & non-drive earth switch.
- Earth tube fixing brackets (1) are mounted to the bases at factory itself.
- Remove the 'U' clamp (2) and centre bolt from the bracket.
- Fix the earth blade with flexible connector (3) in position and fix the centre bolt.
- Fix the 'U' clamp and tighten all bolts and nuts (See figure M).
- Fix the earth strip (Which is connected to flexible connector) to the base.
- Move the earth blade to close position manually, check the position and if required, align the earth fixed contact through the slots provided on the bracket.
- Repeat the above procedure on the other two poles.

FIGURE M



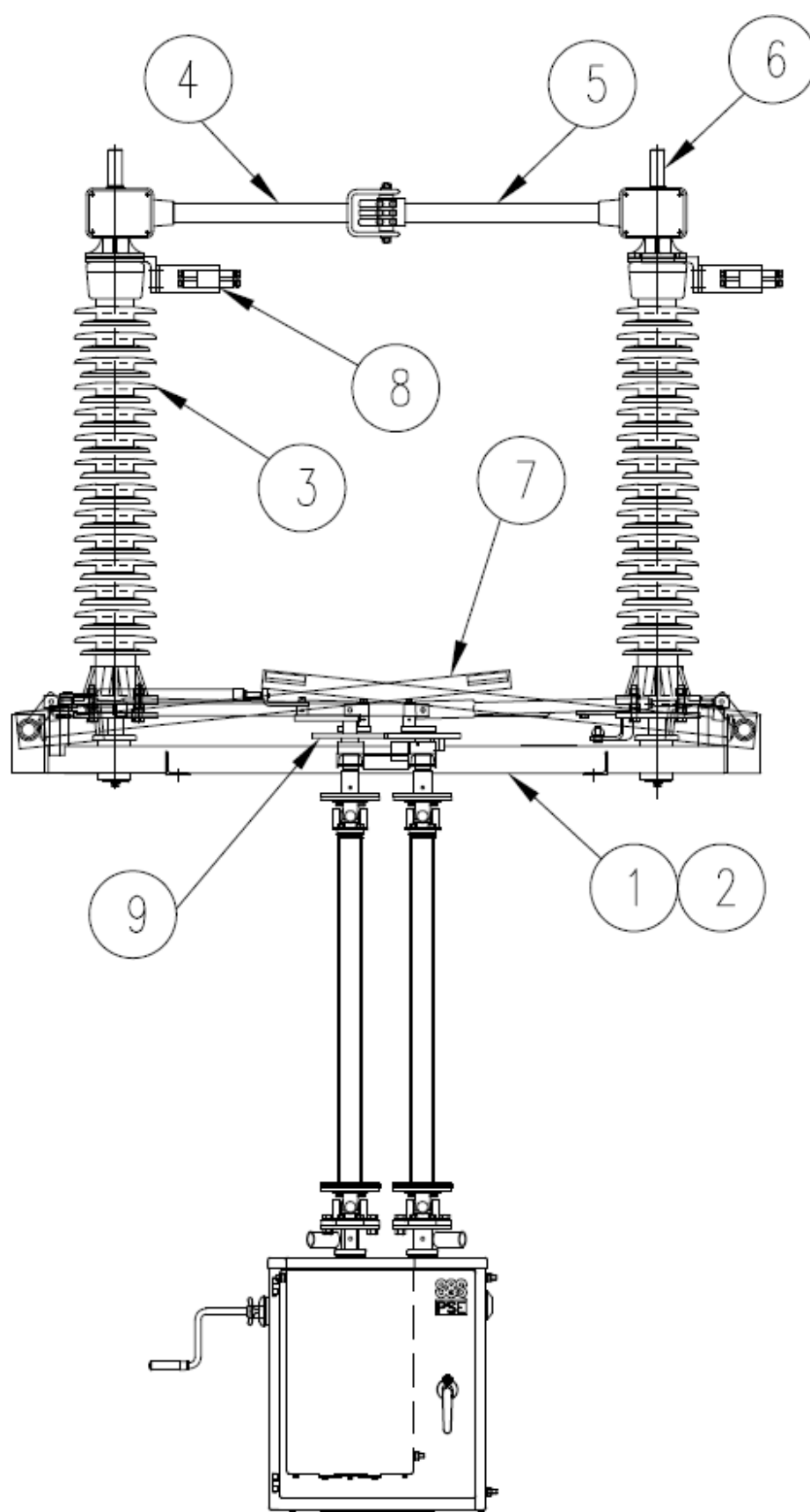
Erection of Drive box:

- Identify the box.
- Lift the drive box by fork lift and fix it in to the provision given in the structure.
- Put a plumb from the tee bar as shown in the figure and adjust the drive box with respect to the plumb.
- Tighten all bolts.
- After completing the erection, remove the scratch guard sticker completely from the outer surface of the drive box.

Erection of down pipe:

- Identify the main and earth down pipe.
- Keep the disconnecter and drive box in open position.
- Fix the tee bar end of the down operating pipe to the provision available on the drive end base (as shown in figure N).
- Use the packer plates to make any minor adjustments to the length of the down operating pipe (Minimum 3 plates to maximum 5 plates).
- Now fix the other end of down operating pipe to drive box flange using the principle of vernier hole alignment (Only two holes will be aligned).
- Tighten all bolts.
- Operate the pole manually and ensure open/close label is in proper position.

FIGURE N



Erection of Tandem pipe:

For Main

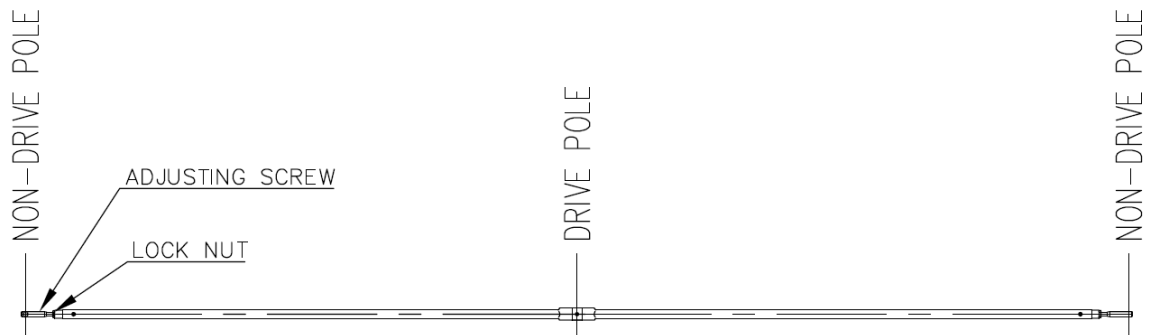
- Remove the connecting pin from the lever and keep it separately.
- Keep the drive pole disconnector in closed position.
- Keep the second pole in closed position. Connect the tandem pipe (Phase coupling pipe). If required extend or shorten by adjusting the screw rod.
- Likewise, with the drive pole & second pole in closed condition, keep the third pole also in closed condition and connect the tandem pipe between the second & the third pole.
- Operate the disconnector manually and ensure it opens and closes properly. If not, then adjust the tandem pipe length.
- Ensure all split pins are secured properly.

For Earth

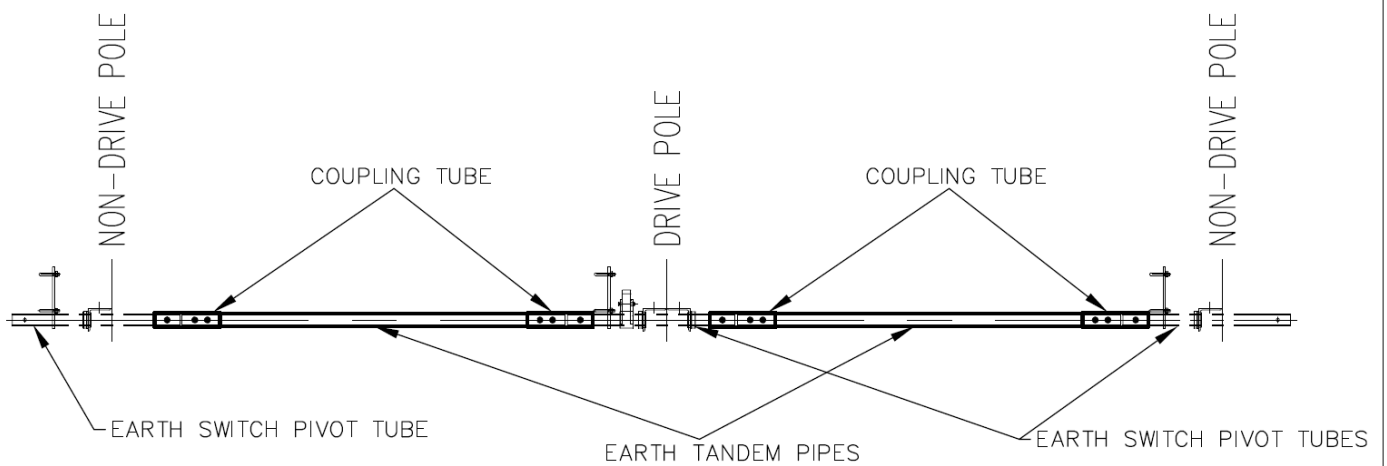
- Remove the end hardware (M12X90 bolt) from the coupling tube which is connected with tandem pipe and keep it separately.
- Keep the drive pole earth switch in open position.
- Keep the second pole in open position. Connect the coupling tube with earth switch pivot tube (as shown in figure O) & fix the hardware (M12X90 bolt).
- Likewise, with the drive pole & second pole in open condition, keep the third pole also in open condition and connect the tandem pipe between the second & the third pole.
- Operate the earth switch manually and ensure it opens and closes properly.
- Ensure all hardware is secured properly.

FIGURE O

ASSEMBLY OF TANDEM PIPE (MAIN SWITCH)



ASSEMBLY OF TANDEM PIPE (EARTH SWITCH)



5. Commissioning & Maintenance

Commissioning of Disconnecter:

- Carry out test operation manually; ensure satisfactory engagement of contacts for all three poles. If necessary, align the contacts as given in page no: 17.
- Operate the disconnecter by power. Ensure proper open/close operation. Ensure limit switch / auxiliary switch settings are proper.

Commissioning of Earth Switch:

- Carry out test operation manually, Ensure symmetrical engagement of contacts.
- In case of motor operated earth switch, operate the earth switch by power. Ensure proper open/close operation.

Maintenance:

Warning (Don't):

Working on high-voltage is very dangerous; hence follow substation and other standards safety rules.

Don't use emery paper for cleaning the contacts.

Don't try to operate the Earth switch when Disconnecter is in closed condition.

Do:

- Ensure disconnection of circuits before doing maintenance activity.
- Do proper earthing of the circuit.
- Stay clear of adjacent live parts; wherever possible, earth the adjacent live parts.
- Use proper tools.

We recommend the following inspection intervals

- Normal ambient condition: After every 5 years or after every 1000 operations (Close/open cycle).
- Extreme ambient conditions i.e. Climate (tropical) and heavy contamination (dust, salt, rust and sulphur): After every 2 years or after every 500 operations (Close/open cycle).

Tools and tackles:

Apart from standard tools, the following are required

- Brass wire brush for cleaning of Copper surfaces.
- Steel wire brush for cleaning for Aluminum and steel surfaces.
- Contact grease (Petroleum jelly).
- Cold cleaning agent for Silver plated surfaces.
- Lint – free cloth.
- Bolted or sliding contact surfaces that conduct current have an effect on the electrical resistance of the current path. Dirty or oxidized contact surfaces increase the electrical resistance. This will result in damage to main contacts.

Hence the following procedure shall be strictly adhered to:

Bolted Contact Surfaces: Aluminum

- Grease lightly.
- With steel wire brush, remove oxide film fully (Do not use emery paper).
- Wipe off contaminated grease immediately using lint – free cloth.
- Re-apply grease again (Immediately after cleaning with lint –free cloth).
- Bolt together treated surfaces and grease joints.

Silver plated contact surfaces.

- Clean with cold cleaning agent (do not destroy silver surfaces).
- Grease immediately.
- Bolt together treated surfaces and grease joints.

Silver plated contact surfaces (Sliding)

- Clean with cold cleaning agent (do not destroy silver surfaces).
- Grease immediately.

The following operations must be carried out during inspection

Disconnecter:

- Clean contact area (Male and Female contacts). Check for any damage; if required, change the contacts.
- Apply grease on contact surfaces.
- Clean the insulators. Check for any damage; if required, change.
- Check all bolted connections.
- Carry out three or four test operations manually.
- Reconnect the power supplies and control voltage.
- Carry out three or four test operations electrically.
- For drive mechanism refer separate manual provided for drives.

Free Entry Earth Switch:

- Clean contact area (Male and Female contacts). Check for any damage; if required, change the contacts.
- Apply grease on contact surfaces.
- Check the earthing connections between earth blade and disconnector base; if required, replace.
- Check all bolted connections.
- Carry out three or four test operations manually.
- Reconnect the power supplies and control voltage.
- Carry out three or four test operations electrically (in case of power operated).
- For drive mechanism refer separate manual provided for drives.

6. Spares:

- Contact Fingers – 6 No's/ pole.
- Male Contact – 1 No/pole.
- Contact grease.
- Current Transfer flexible with Stem 2 No's/pole.

7. Long term storage instructions:

General Instruction (For all materials):

Ground clearance:

All materials, including operating mechanisms, should be kept at a minimum of 600 mm (two feet) height from the ground level using pallets or cement concrete bed, to avoid water entry during rainy season. However, the water level rise at the respective site / storage locations shall be considered for fixing the ground clearance (but shall not be less than 600 mm).

I. Operating mechanisms:

The primary consideration in case of long term storage of operating mechanism is the temperature and relative humidity level of the storage location. This should be maintained as closely as possible to the standard reference atmospheric conditions.

Upon unloading from the container / truck, kindly follow the steps specified below, to ensure proper storage and preservation of operating mechanisms, for long term storage:

During normal seasons (without rain / snow):

- Take out the operating mechanisms from the wooden cases.
- Remove the polythene cover / bubble wrap sheet carefully.
- Check the operating mechanisms visually for any damages.
- Clean all the outer surfaces.
- Open the door and remove the desiccants (Silica gel pack) fitted inside the box.
- Place five fresh bag indicator type desiccant packs (each 100 grams) of fresh silica gel granules (preservatives).
- Close the door.
- Do not cover or wrap the operating mechanism (so that better breathing is provided during long term storage).
- In case of longer periods of storage, replace the silica gel once in 3 months and close the door. (Note: The three month period is indicative only. Kindly check with the supplier of silica gel for time period of usage and time after when it has to be replaced).
- Ensure that the silica gels used are the fresh ones removed from the air tight container (before placing them inside the operating mechanism boxes).
- Keep all the drive mechanisms in a dust free environment.
- If dust is unavoidable then ensure complete cleaning at least once in a month.
- In addition carry out periodical checks for any abnormal dust accumulation and clean accordingly.

- Ensure that the entire storage area is temperature controlled (to ensure better storage and condition of the equipment).
- The optimum temperature is 20 Deg C and Relative Humidity is 45% (Values to be checked using combined humidity and temperature indicators placed throughout the warehouse / storage area and should be visible for close monitoring).

During monsoon seasons (with rain / snow):

- All points given above shall be followed.
- In addition, during rainy season, anti condensation heaters to be kept “ON” and suitable electrical protection to trip the electrical circuit to be provided in case of any short circuit.
- Foam adhesive backed strip with volatile corrosion inhibitors also to be pasted along the inner surfaces of the operating mechanism in place of silica gels.
- Inspect all operating mechanism boxes for integrity of the painted surfaces once in a month.

II. Other contacts and steel materials:

- Clean all the contact surfaces thoroughly with a lint-free cloth.
- Protect all contact surfaces with a thin layer of petroleum gel.
- Cover all contacts and Aluminium arms with polythene sheets / covers.
- Ensure that the inside surfaces of the polythene coverings are pasted with foam based adhesive strip.
- Provide volatile corrosion inhibitors sheets and paste them along the inner surfaces.
- Kindly repeat the above steps once in every three months.

Galvanised steel items: These are to be wrapped / covered with waterproof / dust proof covering and sufficient bags of silica gels to be placed in various places inside the covering. Once in 3 months all materials to be cleaned and replaced with silica gel bags.