INSTRUCTIONS

FOR

INSTALLATION, OPERATION & MAINTENANCE

OF

OIL CIRCUIT BREAKERS

TYPES C4X, C6X, C8X

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These instructions do not attempt to cover all details or variations in equipment or every possible contingency. If further information is desired, or problems arise which are not covered sufficiently for the purchaser's purposes, refer to the manufacturer .

RECEIVING AND UNPACKING:

This apparatus is carefully tested, inspected and packed by workmen experienced in the proper handling and packing of electrical equipment. Immediately upon receipt, an examination should be made for any damage sustained during shipment. If damage or rough handling is evident, a damage claim should be filed at once with the transportation company and the Manufacturer notified promptly.

STORING:

If the apparatus cannot be installed in the proper location immediately, and it is necessary to store the equipment, it should be kept in a clean dry place. It must not be exposed to dirt, to the action of corrosive gases, such as chlorine, or to possible mechanical injury.

Stored apparatus should be thoroughly examined from time to time to see that rust has not started and to ensure good mechanical condition. Particular care should be taken to protect insulating parts, which might absorb moisture. Foreign matter collected on the outside of the cases may find its way inside when the cases are opened and cause trouble in operation.

GENERAL DESCRIPTION

The general construction of the circuit breaker is shown on drawing A12108. Operation of the circuit breaker may be by several types of operating mechanism. These are interchangeable and are bolted to the circuit breaker by four 1/2" studs and nuts and, if fitted, the auxiliary switch connecting link. Reference should be made to the operating mechanism instruction booklet which is supplied with the circuit breaker.

Type CX circuit breakers are all equipped with arc control devices. These consist of a bronze or aluminum alloy top pressure dome and a bottom Pernali pot. As the breaker opens, an arc is drawn between fixed and moving contacts which generates pressure within the arc control device assembly. As the side port in the Pernali pot is uncovered, it vents the gas and sweeps a stream of cool oil across the arc path. After the arc is extinguished the device must refill with fresh oil, therefore it is essential to vent the gas which is trapped in the top pressure dome. For this purpose small holes have been drilled near the top of the dome and these must be kept free and clear of dirt at all times.

Contacts are of the line type (cluster type stationary and poker type moving). They are guided throughout their travel. Opening force is absorbed by oil filled shock absorbers which can be operated safely in air.

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OPERATION:

The roller on the swing link of the operating mechanism gives a "push" to the push nut on the front of the circuit breaker. This is transmitted as a lift motion through two links to the main lifting bar, the three vertical lift rods, and the moving contacts which engaged in the stationary contacts.

GENERAL INSTALLATION:

Breakers on trucks or in frames or cubicles are assembled by the Manufacturer as complete shipping units. For metalclad switchgear, breakers are shipped on their trucks, and directions for their installation are given in Form 66, "Instructions for Installation, Operation and Maintenance for High Tension Metalclad Switchgear". These must be properly observed.

Loose breakers, when mounted by the purchaser must be adequately supported, and electrical clearances maintained. Consider the large mechanical forces associated with short circuit currents. The Manufacturer's recommendations on a specific arrangement are to be followed.

Electrical connections to the circuit breaker bushing terminals must be adequately supported. Check that the circuit breaker bushings are not strained by the connections.

Make sure the terminals have good electrical contacts, and then using packing compound, pack around the terminal ensuring that no air spaces are left and a smooth contour is obtained. Tape the terminals with a good grade electrical tape (scotch tape, varnished cambric tape, etc.,) with the number of layers required for the voltage class.

Low tension control wiring should be well separated from high tension circuits and wherever possible enclosed in grounded duct or conduit. Control wiring of adequate size should be used so that with full operating current flowing through the mechanism the voltage across the terminals will be within the limits specified for the range of control voltages stamped on the nameplate.

The vent connection of the top plate at the rear of the breaker is to be piped to an unconfined area where the gases can safely disperse. If taken outside the building be sure that the exit terminal elbow is directed downwards so that rain and moisture are excluded.

GROUNDING:

Every circuit breaker must be permanently grounded. The ground cable should never be smaller than No. 4/0. A good permanent low resistance ground is essential for safety.

FINAL INSPECTION:

After the circuit breaker has been installed with all mechanical and electrical connections complete, the following inspections and tests should be made.

1. Check that the circuit breaker is properly set up and levelled on its supporting structure.

2. All bolts, nuts, cotter pins, etc., are properly tightened.

3. Lower the tank and check contact engagement and contact travel by referring to the setting dimensions shown on drawing A12108.

4. Wipe out and fill the circuit breaker tank with oil to the level indicated on the tank liner. This level must be closely adhered to. Clean cloths should be used for wiping out the tank and should be of a strong fabric that does not deposit loose fibres. Do not use cotton waste.

5. Replace tank.

6. Inspect all secondary wiring.

7. Operate the breaker electrically at least six times.

ADJUSTMENTS:

The travel of the moving contacts is adjusted by screwing the pushnut on or off its mating shaft. With the circuit breaker open and the operating mechanism tripped, a gap of 1/8" minimum is required between the face of the pushnut and the roller on the end of the mechanism swing link. Do not reduce this gap or damage will result to the operating mechanism.

When the moving contacts are correctly engaged (observe the above limits) the gap from the top edge of the phase bar to the bottom surface of the Formali cross jet pot should be 5/16" ± 1/16". Screwing the pushnut "on" increases this gap and lessens the contact engagement. Screwing the pushnut "off" lessens this gap and increases the contact engagement.

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All other adjustments are made by the manufacturer and locked in position. No changes should be made to them in the field without consulting the manufacturer. Before any dismantling is undertaken, note the relationships and position of parts being undone so that when reassembling the original relationships will be maintained.

MAINTENANCE:

The circuit breaker must be regularly inspected. The frequency of inspection is determined on the basis of number and magnitude of operations. A circuit breaker which has never been called upon to open must be checked at regular intervals to make sure that the trip latch and operating mechanism are free and that connections, nuts, etc., have not been loosened by vibration. The circuit breaker should always be inspected, and if necessary maintained, as soon as possible after it has opened under fault duty.

The maintenance instructions have been written in detail. On inspection it may be found that many of the dismantling and reassembling operations are not necessary. Service conditions only can dictate to what extent they are carried out.

Tank and Top Plate

These should require little attention. After a fault operation the tank and gasket between the tank and the top plate should be examined for any sign of mechanical straining.

Vent

The vent hole at the rear of the circuit breaker should be examined occasionally to check that it is not clogged with dirt.

Tank Linings

Examine for mechanical damage or burning and wipe clean of any carbon deposits. Do not use cotton waste, only firm cloths which do not deposit fibres.

Oil

Check the oil level and condition of oil filtering or replacing if necessary. The oil should be tested at regular intervals and always as soon as possible after fault operation. Note: There are standard procedures and conditions for filling, sampling and testing of oil.

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Lifting Mechanism

This is self-lubricating and needs no adjustment. Links may be removed if necessary by first removing the operating mechanism. (If the breaker is truck mounted, remove the breaker from the truck).

Disconnect the moving contact assembly (refer to this section) from the main lifting arms. Unbolt the cast mechanism housing and withdraw the linkage assembly. Links are removed by withdrawing the parallel pins from the main shaft. The shoulder pin in the push bolt is secured with a grub screw in the rear end of the push bolt. Travel adjustment is given under "Adjustments".

Buffer & Throw Off Spring Assembly

This guides the main lifting cross bar. At the bottom of the assembly is the buffer and at the top of the assembly are the throw off springs. Right and left hand assemblies have to be removed together by removing the 4 OBA screws on each side of the top plate. The throw off spring setting is adjusted to 3-1/4" spring length with the breaker open and 1-5/8" spring length with the breaker closed.

When replacing the assembly be sure that each fastening bolt has a shakeproof washer fitted. The breaker may be operated safely in air.

Fixed Contacts and Arc Control Pots

These are examined by first removing the Pernali cross jet pots. Unscrew the four nuts at the base of the pot with a box spanner. The pot may then be dropped down over the moving contact. Slight burning is removed with a file.

If necessary to remove the fixed contact assembly, first remove the moving contact from the phase bar and remove the Pernali cross jet pot. Slacken the locking disc inside the contact cluster with the locking disc spannor. Unscrew the fixed contact with the fixed contact spanner.

The pressure chamber is removed with the fixed contact. Gas vent holes drilled in the top of the pressure chamber must be kept clear.

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Moving Contact Assembly

The plug type arcing tips are removed by two nylock nuts and bolts. Slight burning can be removed with a file. When replacing, the securing bolts and nuts should be lightly tightened and the circuit breaker then closed so that the arcing tips take up alignment with the fixed contacts. Then fully tighten the securing nuts.

The Pernali lifting bars should be cleaned of contamination or carbon deposits and examined for damage.

If the complete assembly (arcing tips, lifting rod and cross bar) is to be removed, first remove the buffer and throwoff spring assembly, cross jet pots on the centre pole and fixed contacts (refer to these sections). Remove the two pins which connect the cross bar and the split link. The whole assembly can then be withdrawn.

Bushings:

Clean the bushings of contamination or carbon deposits and examine for fractures.

To remove the porcelain bushing, unscrew the four 3/8" BSF nuts which secure the steel bushing clamp. Warm the top plate in the area of the bushing, using a blow torch, so that the bituminous compound which fills the space between the top plate and the bushing becomes soft enough to allow the withdrawal of the bushing.

It is advisable that only one bushing at a time be removed to help realignment or replacing. On replacement the porcelain flange should be carefully clamped on the gasket to keep the bushing pole and phase centre 6-1/2" and 4-3/8" respectively.

To remove the conductor stem from the porcelain body, unscrew the locking collar and collar at the top of the bushing. Spanners are provided for these collars.

NOTE: On types C6X and C8X first unscrew the locking disc (spanner provided) in the end of the terminal stem adaptor and unscrew the terminal stem adaptor. Proceed with the locking collar and collar as above.

The top ends of the bushings should be cleaned and given a thin smear of high quality petroleum jelly.

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SPARES:

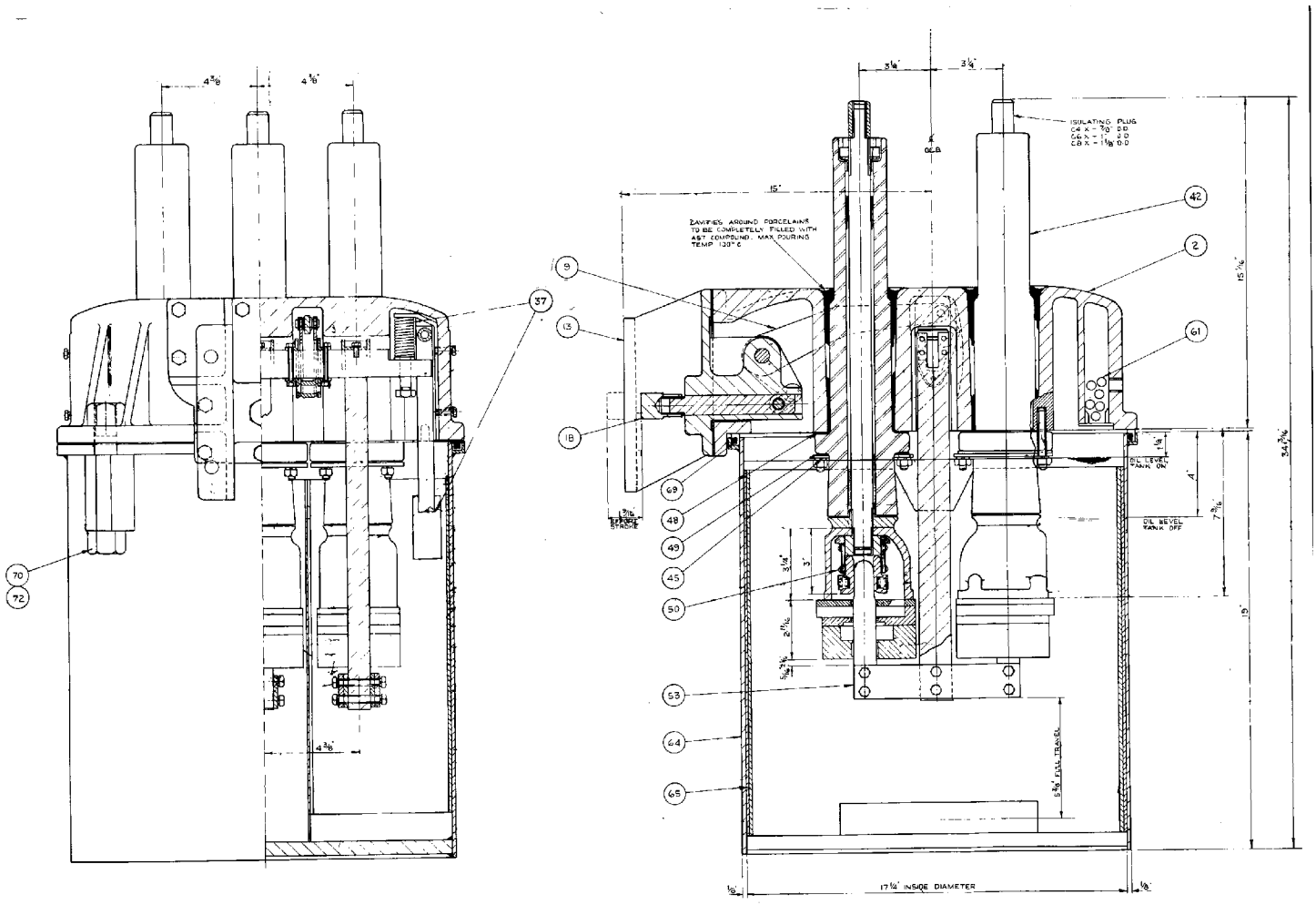
It is recommended that sufficient spare parts be carried in stock to enable the prompt replacement of any worn, broken or damaged parts. When continuous operation is a primary consideration, more renewal parts should be carried. The amount kept in stock will depend on the size, location and frequency of operation of the switchgear.

The following are typical items:-

Set of fixed contacts
Set of moving contacts
Cross jet pot Pernali section
Cross jet pot pressure chamber
Lifting rods
Bushings
Tank gasket
Tank liners

TOOLS:

Tank bolt spanner
Bushing locking collar spanner
Bushing collar
Fixed contact locking disc spanner
Fixed contact spanner
Locking disc terminal stem spanner (C6X and C8X only)


4 3/8"
4 1/8"
37
70
72
4 3/8"
3 1/4"
3 1/4"
ISULATING PLUG
C4 X - 7/8" OD
C6 X - 1" OD
C8 X - 1 1/8" OD
15"
CAVITIES AROUND PORCELAINS TO BE COMPLETELY FILLED WITH AST COMPOUND - MAX POURING TEMP 130° C
42
2
61
9
13
18
69
48
49
45
50
53
64
65
OIL LEVEL TANK ON
OIL BEVEL TANK OFF
3 1/16"
3"
2 15/16"
5 3/16" DIA. TRAVEL
15 1/4"
34 3/16"
15"
1/8"
17 1/4" INSIDE DIAMETER
1/8"