MAINTENANCE INSTRUCTION
M.I. 3700

Service Department
ELECTRO-MOTIVE DIVISION
GENERAL MOTORS CORPORATION
March, 2002

MAINTENANCE INSTRUCTION FOR THE THIRD RAIL CABINET (TRC)

SAFETY PRECAUTIONS

Before starting any work or opening the panels at the Third Rail Cabinet (TRC) please refer to the safety precautions of the DM30AC. The 3 line filter capacitors and the differential current transducer store full 3rd rail voltage levels if not discharged properly. Do not work on the TRC before reading and applying the safety precautions outlined in the document "Safety Precautions for DM30AC".

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1.0 THIRD RAIL CABINET

!! WARNING !!

The 3 line filter capacitors and the differential current transducer store full 3rd rail voltage levels if not discharged properly. Do not work on the TRC before reading and applying the safety precautions outlined in the document "Safety Precautions for DM30AC".

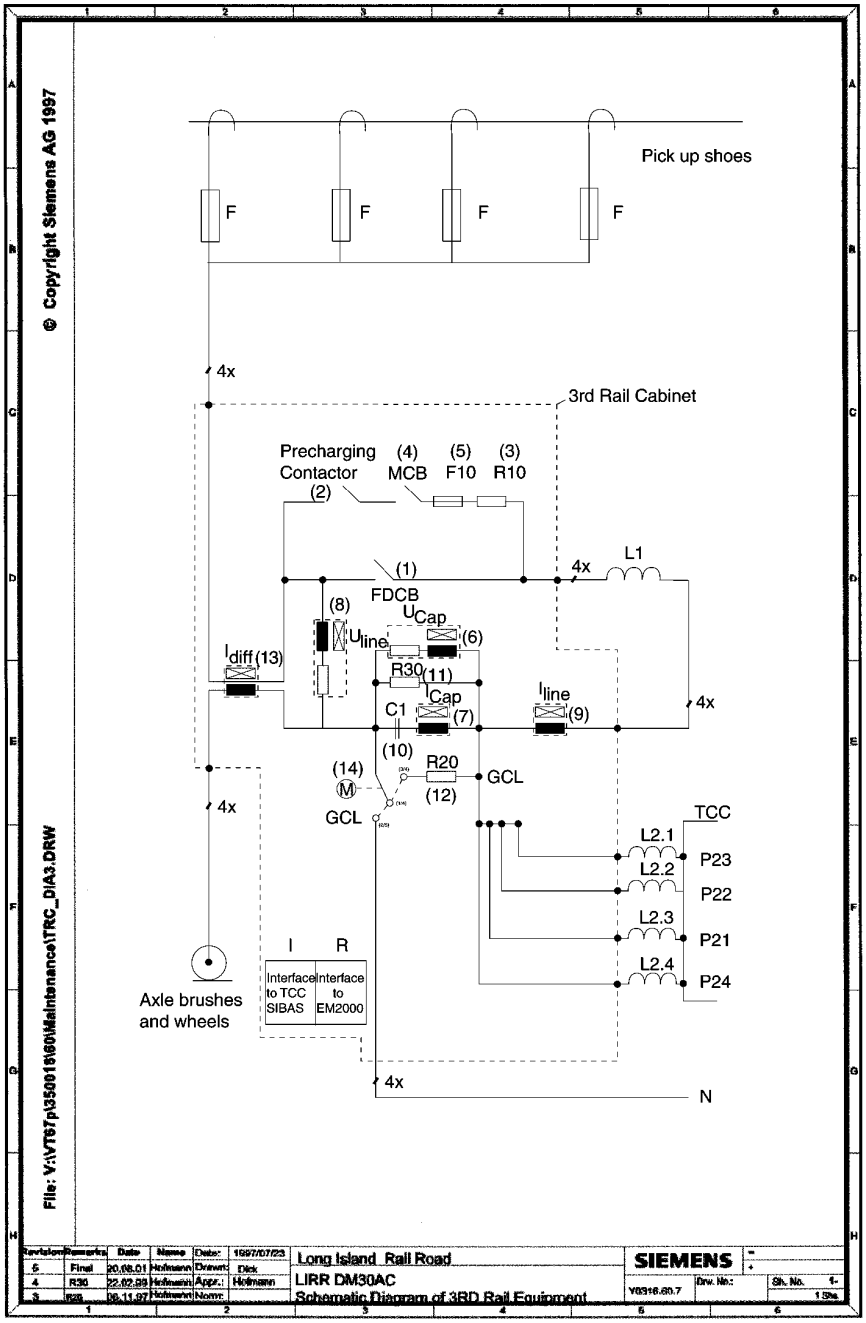

Figure 1 TRC Schematic Drawing

1.1 LIST OF MAIN COMPONENTS

No.	Circuit diagram	Component	Qty	EMD Part Number	Siemens Part Number
1	-Q1 -R1 -F100 -K101 -K102	Fast DC circuit breaker Resistor for economy circuit Automatic circuit breaker Aux. Relays	1 1 1 2	400 833 47 400 833 53 400 833 45 400 833 51	VT 400 383 010 VT 400 383 020 VT 400 383 030 VT 400 383 040
2	-K10	Precharging contactor	1	400 833 47	VT 400 383 050
3	-R10	Precharging resistor	4	400 833 54	VT 400 383 110
4	-Q10	Motor Circuit Breaker	1	400 833 49	VT 400 383 070
5	-F10	Fuse	1	400 834 01	VT 400 383 080
6	-U4	Transducer Filter Capacitor Voltage	1	400 833 78	VT 400 383 130
7	-U3	Transducer Filter Capacitor Current	1	400 833 16	VT 400 383 140
8	-U5	Transducer Line Voltage	1	400 833 78	VT 400 383 130
9	-U2	Transducer Line Current	1	400 833 77	VT 400 383 150
10	-C1.1... -C1.3	3rd Rail Filter Capacitors	3	400 833 89	VT 400 383 100
11	-R20.1... -R20.3	Discharging Resistor	3	400 833 54	VT 400 383 110
12	-R30	Discharge Bleeder Resistor	2		VT 400 383 115
13	-U1	Differential Current transducer (CD4000)	1	400 76 226	Refer to EMD's Maintenance Instruction Manual
14	-Q2	Ground Connection Link, GCL Motor module Switch module	1	 845 3176 4004 6484	Refer to EMD's Maintenance Instruction Manual

Table 1 List of Main Components (Refer to Figure 2)

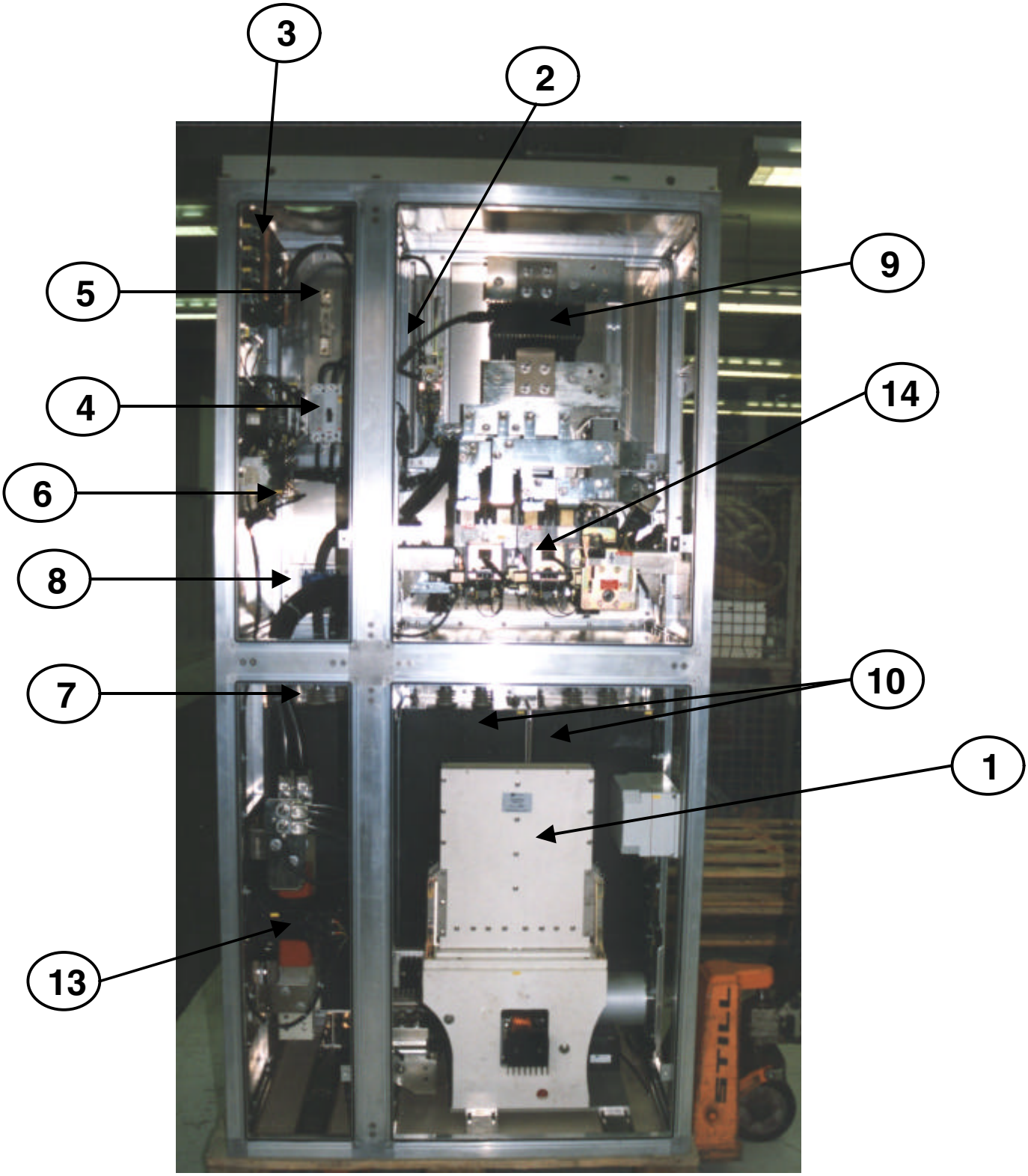

Figure 2 Front View of TRC

2.0 SERVICE WORK

Item	What has to be done?	Interval	Remark
Cabinet			
TRC Covers	Check for missing bolts and correct application Check that cover grounding wires are intact and connected from cover to TRC body	Every 90 days	
Sealing of TRC	Check sealing for damages and correct application; apply grease to the sealings	Every 6 months	Replace if necessary
TRC power cabling	Check if all cable tie wraps are still okay Check for traces of extraordinary heat	Every 5 years	
Components			
Precharge Fuse	Verify that the spare fuse holder holds an intact fuse		
Fast DC CB			Refer to FDCB Manual section 3
Arc chute chamber area	Check for traces of extraordinary heat, burn or spark overs	Every 90 days	
Contacts, Pole, Anti-spark plates and outer horn	Visual and detailed inspection	Every year	Depends on number of cut outs

Table 2 List of Service Activities

NOTE

Due to similarities between the AC traction TCC and the TRC, Refer to the TCC service information as indicated in this M.I.

2.1 HOW TO CHECK THE TRC

Check the whole appearance of the cabinet with regards to:

- severe pollution, especially on the insulation with regard to dust, moisture, water, mud, traces of fire(soot), smoke, corrosion
- traces of overheated devices
- traces of arcing and flash-overs
- defective or loose mechanical connections
- for visible damages on components
- other mechanical defects or modifications

Check for deformation or visible damages, especially at:

- busbars
- power terminal connections
- loose cables or damaged cable ties

2.2 HOW TO CLEAN THE TRC

Refer to TCC Manual.

2.3 CLEANING THE OUTER SURFACE OF TRC

Refer to TCC Manual.

NOTE

The TRC is made of Aluminum and special cleaning agents have to be used to prevent the cabinet from corroding.

2.4 CHECK OF CONNECTIONS AND WIRING

Refer to TCC Manual.

3.0 MAINTENANCE OF FAST DC CIRCUIT BREAKER

ATTENTION
DANGER : HIGH VOLTAGE

- **Never touch the circuit-breaker before the high voltage circuit is neutralized and the protection like earthing of the plant is installed.**
- **The following controls require the use of low voltage (DC) electrical supply. Follow the safety requirements in force to carry out these operations.**
- **For carrying out the following controls, keep the hands away from moving parts during the opening and closing operation of the circuit-breaker. Non-compliance with these precautions may cause serious injury.**

3.1 REQUIRED TOOLS

Wrenches	8, 10, 13 and 17 mm
Drive out pins	∅ 4 and 6 mm
Allen key	3, 4, 5, 6 and 8 mm
Ratchet wrench with sockets	8, 9, 10 and 13 mm
Flat head screwdriver	Nº 4 and 6 mm
Pozidrive screwdriver	Nº 1
Flat long nose pliers	60 mm
Set of feeler gauges	0,05 to 2 mm
Electric horn	
Dry cloth	
Knife or scraper	

Grease	Litéa 806-12	(Aseol Bern)
or	Molycote Longterm	W2 (Dow Corning)
Lithium soap grease and mineral oil with the following characteristics :	Temperature for use :	-25 ºC to 110 ºC
	Consistency	NGLI = 2
	Penetrability	265 to 295

Grease for stainless steel hardware	Litoplex 1043 (Aseol Bern)

Cleaning agents	**DENATURED ALCOHOL :** **No other solvents allowed** A solution of liquid soap in water may be used on polyester or polyamide parts on condition these parts are stripped down for this work and dried before reassembly.

3.2 WEAR CAUSED BY THE ARC

3.2.1 FREQUENCY OF INSPECTIONS

To be determined according to the equipment by the number of cutouts or time elapsed.

Visual inspection	Every six months	
Detailed inspection (measuring dim. W)	At least once or a year	After every 250 overload cutouts (value of current higher than the tripping threshold Ids) After every 500 manual cut-outs (value of the current less than the tripping threshold Ids)

3.2.2 CRITERIA FOR REPLACING PARTS

Parts No	Parts to be replaced	Replacement criteria
1120 1115 1116	Moving contact* Fixed contact piece*	When dimension W reaches $3^{\pm 0.5}$ mm
1192 1193	Pole*	(* These parts should be changed simultaneously)
1196	Anti-spark plates	When the traces of local burns reach a depth equal to half the original thickness (12 mm)
5806	Outer horn	When their cross-section reaches half the original cross-section (20 x 4 mm)

3.2.3 OPERATIONS TO BE CARRIED OUT

The circuit-breaker contacts must be checked and maintained with special care. Any soot deposit should be wiped away with a dry rag. If large beads form, scrape them off with a metal brush.

WARNING

Never use a file on the contacts. Greasing of the contacts is also strictly prohibited.

3.2.3.1 Contact Wear

The main contacts, i.e. the moving and the fixed contact, may wear by as much as 10 mm. Experience has shown that even with continuous service such wear occurs only after several years' operation. It causes a reduction in contact pressure, while at the same time the stroke of the closing device increases by 5 mm.

When dimension "W" becomes $3^{\pm 0.5}$ mm, the main contacts must be replaced.

3.2.3.2 Taking Down The Arc Chute (5800)

1. Fully unscrew the fixing screws (5818) and lugs (5825) of the arc chute on the circuit-breaker (Executions S and TD). (See Figure 3)
2. For stationary construction, loosen the connection flanges (5180) above the horns (5806/5810) of the arc chute and at the ends of the upper plate (1770/1771) and turn them through 90°.
3. Swing the arc chute on the side of the circuit-breaker and inspect the various worn parts (See paragraph 3.2.2).

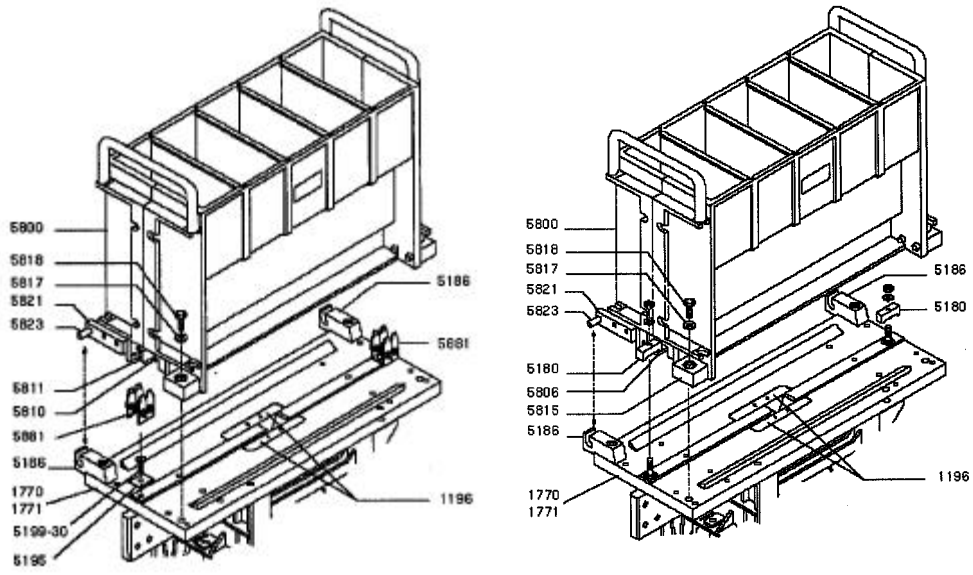

Figure 3 Arc chute on circuit breaker

3.2.3.3 Visual Inspection

(See Figure 4)

Visually inspect of the condition of:

- the moving contact (1120), the fixed contact piece (1115/1116);
- the pole (1192/1193);
- the anti-spark plates (1196);
- the inlet of the arc chute, the outer horns (5806/5810) and the baffles (5805).

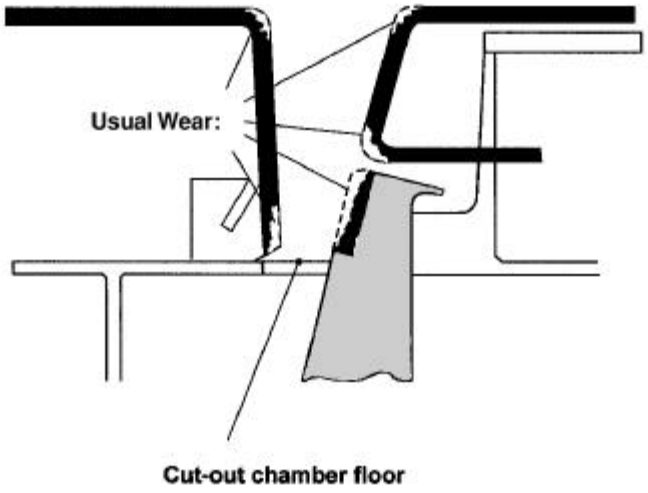

Figure 4 Material losses on contacts

3.2.3.4 Detailed Inspection

(See paragraph 3.2.2 for replacement criteria)

Measuring dimension “W”.

1. Dimension “W” is checked with the circuit-breaker closed on bush (337) projecting from the cover (324) (See Figure 4).
2. Clean using a dry cloth and a dust collector :
   - the arc chute inlet.
   - the anti-spark plates (1196), the upper plate (1770/1771) and the frame (1701) at the position named floor of the cut-out chamber.

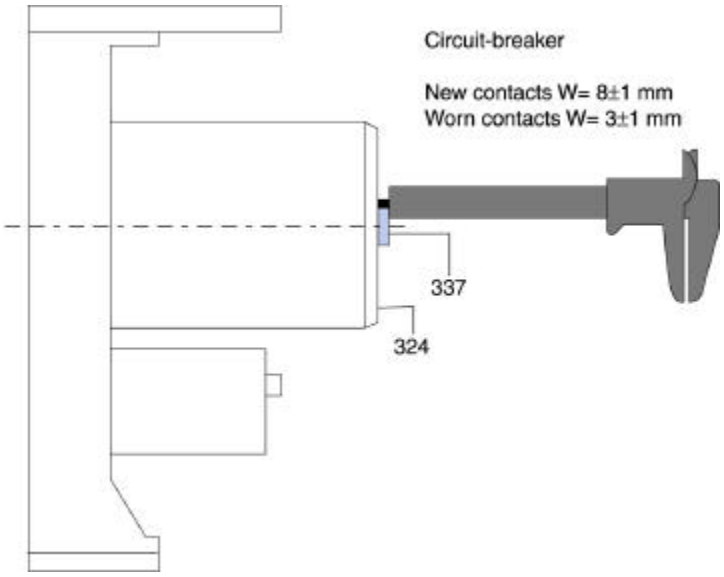

Figure 5 How to determine dimension "W"

As an alternative; measure contact wear with a manual inspection closing device (350). (See Figure 6 & Figure 7)

CAUTION
The circuit-breaker must be switched off and the earthing protection installed.

1. Take down the arc chute (5800)
2. Take out an anti-spark plate (1196)
3. Close the circuit-breaker with the aid of the manual closing device (350)
4. Using a flexible graduated rule, measure the distance between the base of the fixed contact plate and the horn of the moving contact.

When the dimension measured reaches 38 ±0.5 mm, it is necessary to change the main contacts (See paragraph 3.2.2).

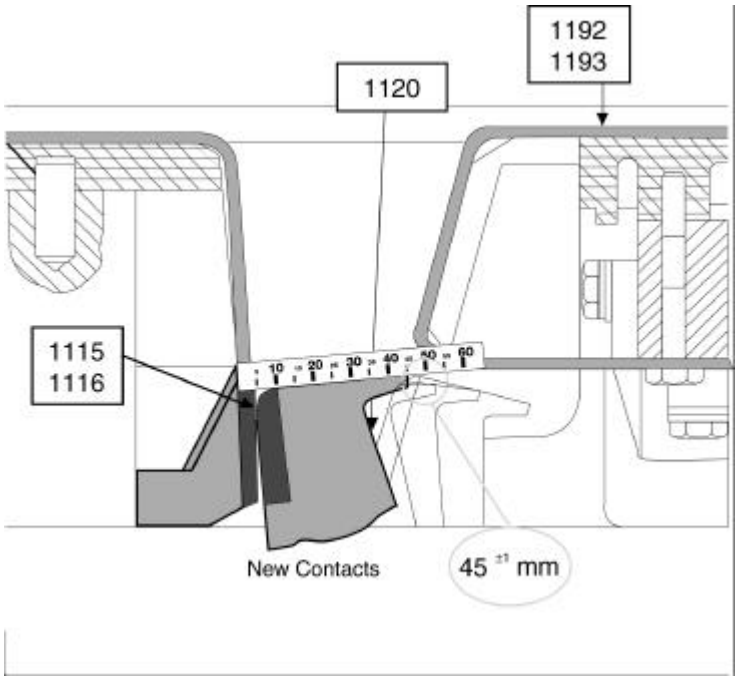

Figure 6 Circuit-breaker manually closed measurement of new contacts

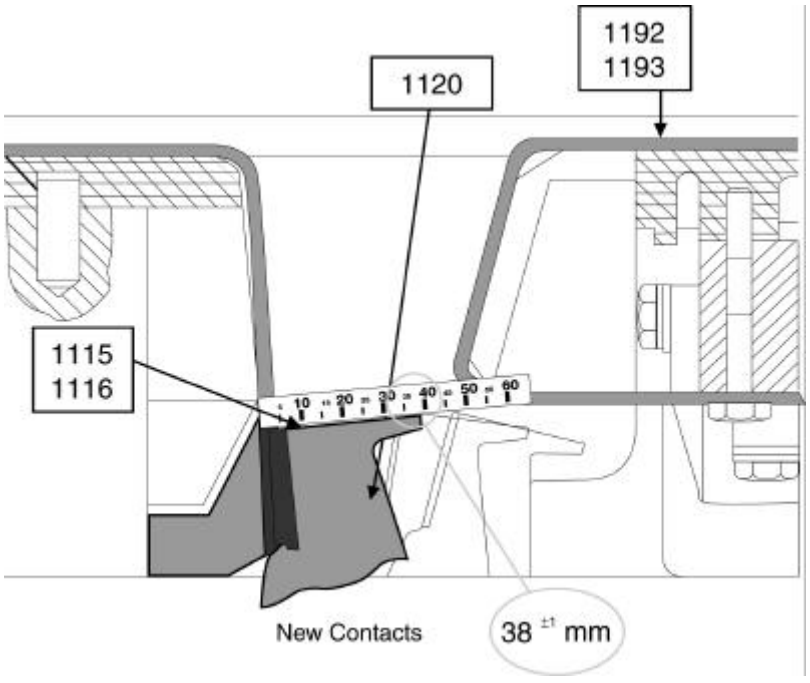

Figure 7 Circuit-breaker manually closed measurement of worn contacts

3.2.3.5 Anti-Spark Plate Checking

Check the state of the anti-spark plates (1196) whenever the circuit-breaker has been subject to particular over-current or short circuit conditions.

To perform this checking, after taking down the arc chute, remove the anti-spark plates (1196) from the circuit-breaker and clean them using a dry rag and dust collector.

If these plates exhibit cracks or excessively deep burning (more than half the original thickness of 12 mm) they must be replaced.

3.2.3.6 Checking The Arc Chute

When replacing the main contacts or during periodic inspections, the arc chute has to be inspected in detail.

The inspection of the arc chute inlet gives a good idea of the general condition of this part.

As long as the horns (5806/5808) have not been worn by more than half their cross-section, the arc chute continues to be serviceable.

Refer to paragraph 3.4.6 for replacement of parts of the arc chute. Wear of the mechanical components

3.3 WEAR OF THE MECHANICAL COMPONENTS

3.3.1 FREQUENCY OF INSPECTIONS

Visual inspection: every six months
Detailed inspection: at least once a year

3.3.2 CRITERIA FOR REPLACING PARTS

Replace the parts specified below according to the number of cycles shown (number of cycles counted or estimated).

Item	Designation of components	Number of cycles (every.....…….cycles)	
1330	Fork assembly	25'000	
334	Restoring spring	-	50'000
370	Closing moving core	-	50'000
710	Pusher assembly	-	50'000
720	Damper	-	50'000
1123	Catch	25’000	
324-AC	*Cover AC*	-	50’000
127-AC	*Spring AC*	-	50’000
1200	Tripping device to be replaced completely or returned to Sécheron SA for repair	Criterion : Every 10,000 trippings or every 10 years at a rate of 3 trippings per day.	

Table 3 Replacement Parts Per Cycle

3.3.3 OPERATIONS TO BE CARRIED OUT

3.3.3.1 Visual Inspection

Visual check that all components like screws, nuts, clips etc., are there.

3.3.3.2 Detailed Inspection

- Visual check that all components like screws, nuts, clips etc., are there.
- Check that screws and nuts are tight in accordance with the tightening torque specified below :
- Grease the fork assembly (1330) and catch (1123) at the ratchets using a brush.

Standard torques for greased A4-80 stainless steel screws		
Reference according to unit drawing	Torque	Margin
M5	5.4 Nm	
M6	9 Nm	
M8	22 Nm	± 10 %
M10	44 Nm	
M8 special	18 Nm	

Table 4 Torque Reference

3.4 OVERHAUL

3.4.1 REPLACEMENT OF THE MAIN COMPONENTS

Take down the arc chute. (See paragraph 3.2.3.2)

Remove the anti-spark plates (1196).

3.4.1.1 Removal

Removal of the fixed contact. (See Figure 8)

3.4.1.1.1 Stationary Operation (S)

1. Remove the flange (5180) then the low M8 nut and the spring washer holding the fixed contact piece (1115/1116).
2. Lift up the end of the fixed contact piece until it is free from the threaded rod.

3.4.1.1.2 Vehicle Operation (TD)

1. Unhook the clamps (5181) then remove the clamp plate bracket fixing screw (5195).
2. Simultaneously unscrew the two nuts inserted in the upper connecting bar (1105) in order to release the fixed contact (1115/1116) entirely. Withdraw the contact upwards.

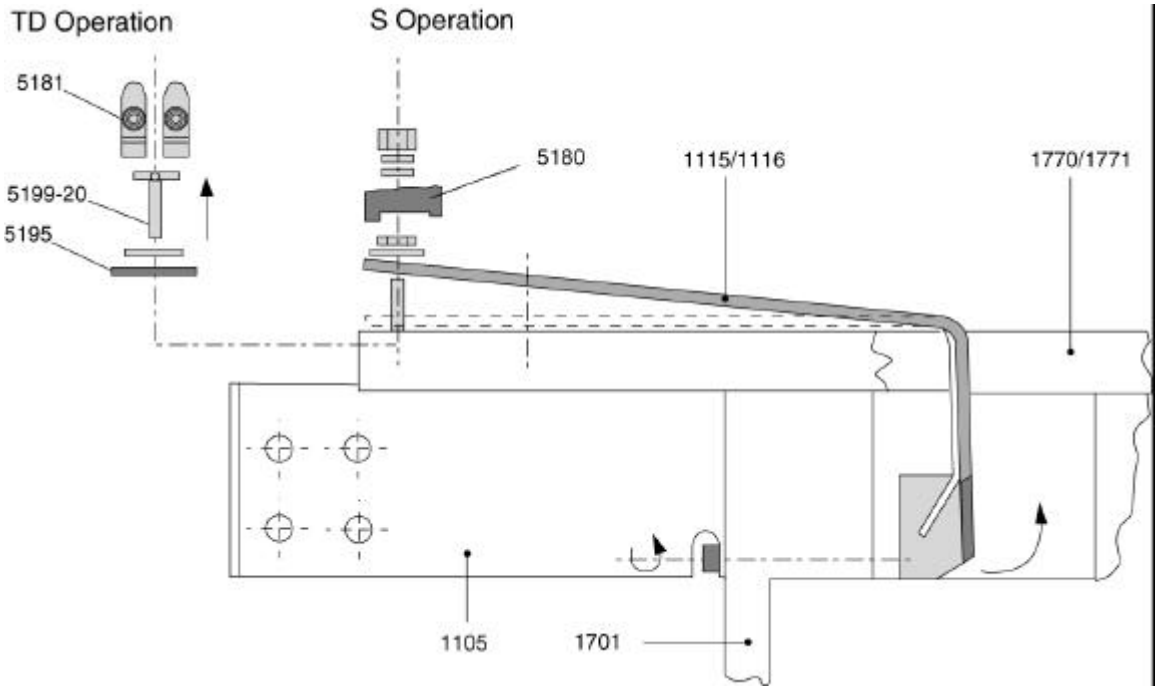

Figure 8 Removing the fixed contact piece

3.4.1.2 Removing The Pole

(See Figure 9)

3.4.1.2.1 Stationary Operation (S)

1. Remove the flange (5180) then the low M8 nut and the spring washer holding the pole.

3.4.1.2.2 Mobile Operation (TD)

1. Unhook the clamps (5181) then remove the clamp plate bracket fixing screw (5195).
2. Entirely remove the two horns (1191).
3. Release the flange (5180) under the connecting plate (1190).
4. Insert the pole (1192/1193) with blow-out core (1194) by pushing it towards the fixed part and then pull it upwards.
5. Separate the pole (1192/1193) from the blow-out core (1194) by sliding them apart.

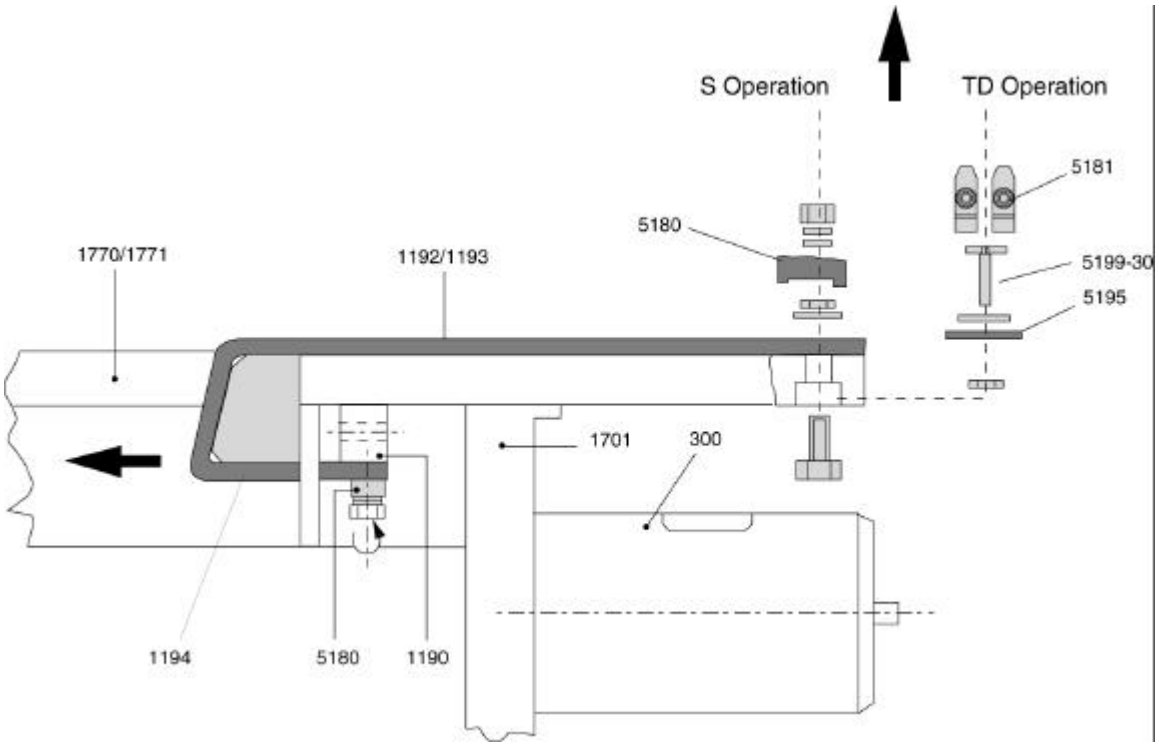

Figure 9 Removing the pole

3.4.1.3 Removing The Moving Contact

(See Figure 10)

1. Remove the both wide coolers (1150).
2. Remove the both CU inserts (1152).
3. Dismantle the flexible connections (1121) which are attached to the lower connecting bar (1130), and remove the contact blade with catches.
4. Dismantle the catches (1123) with the pins and threaded nut rod by taking away one of the two nuts.
5. Remove the two Allen screws (M4 x 22) which serve as a stop for the springs (1340) on the moving contact blade (1120).
6. Withdraw the end of the pusher (710) from its seat on the contact blade (1120).

3.4.1.3.1 Anti-Sticking Option

1. Remove the screws (125-AC) with the both sleeves (126-AC) and springs (127-AC)
2. Push out the pin of the contact blade (1122) or *(1122-AC)*.
3. Withdraw the contact blade (1120) through the top plate (1770/1771) from above.

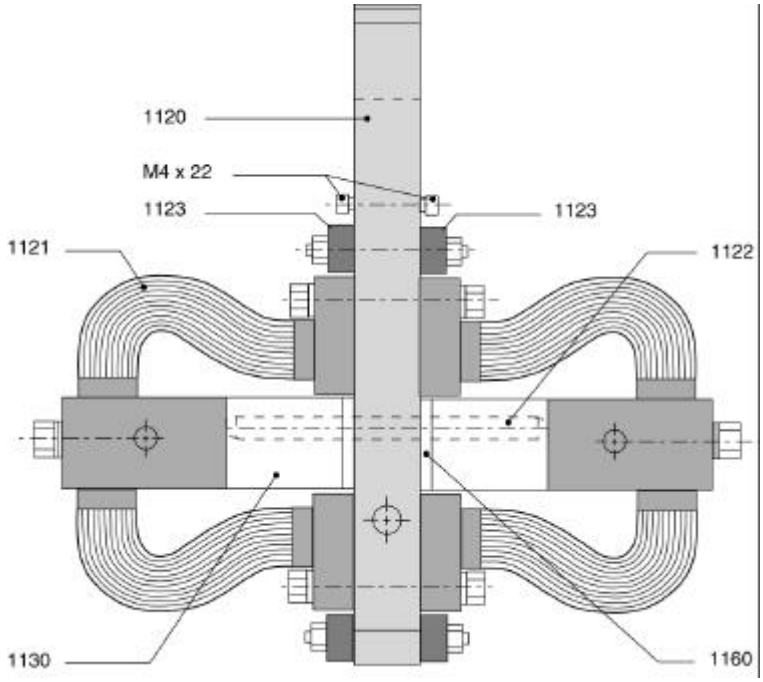

Figure 10 Moving contact

3.4.1.4 Refitting

Fitting the moving contact

1. Insert the new contact blade (1120) through the top plate (1770, 1771) between the two pawls of the fork (1330) and secure it in the lower connecting bar (1130).
2. Enter the pin (1122) or (1222-AC).

3.4.1.4.1 Anti-sticking Option

1. Mount the screws (125-AC) with the both sleeves (126-AC) and springs (127-AC), and tighten them.
2. Insert the end of the pusher (710) in its seat on the moving contact blade (1120).
3. Screw the two new catches (1123) onto the contact blade (1120) and tighten.
4. Screw the two small stop-screws (1340) onto the contact blade (1120).
5. Assemble the two flexible connections (1121) on the contact blade (1120) and then to the lower connecting bar (1130).
6. Mount the both CU inserts (1152)
7. Mount the both wide coolers (1150)

3.4.1.5 Fitting The Pole

1. Insert the blow-out core (1194) in the new pole (1192/1193).
2. Bring this assembly to its place in the circuit-breaker and hold it against the rib of the frame (1701).
3. Secure the flange (5180) under the connecting plate (1190).
4. Fit the two blower horns (1191) on the connecting plate (1190) and then on the flexible connections (1121).

3.4.1.5.1 Stationary operation (S)

1. Place the hexagon M8 screw with its head under the end of the upper plate (1170/1171), and screw down the horn of the pole (1192/1193) with the low M8 nut and spring washer.
2. Place the flange (5180) then the washers and M8 nut.

3.4.1.5.2 Mobile operation (TD)

1. Fix the horn of the pole (1192/1193) and the clamp bracket plate (5195) to the end of the upper plate (1770/1771) with the aid of the flat head screw, spring washer and low M8 nut.
2. Carefully place the two clamps (5181) on the clamp bracket plate (5195).

3.4.1.6 Fitting The Fixed Contact

1. Check the condition of the faces at the point of contact between the fixed part (1105) and the new contact piece (1115/1116). These should be flat, smooth and clean.
2. Bring in the contact piece (1115/1116) and place it against the fixed part (1105).

3.4.1.6.1 Stationary operation (S)

1. Raise the end of the horn by about three centimeters.
2. Tighten both nuts inserted in the upper connecting bar (1105) simultaneously and lock them.
   a) Bend the horn of the fixed contact piece (1115,1116) towards the top plate (1770,1771).
   b) Tighten the horn of the fixed contact piece using the low M8 nut with spring washer.
   c) Place the flange (5180), then the washer and nut.

3.4.1.6.2 Mobile operation (TD)

1. Tighten both nuts inserted in the upper connecting bar (1105) simultaneously and lock them.
   a) Fix the horn of the fixed contact piece (1115/1116) and the clamp bracket plate (5195) to the end of the upper plate (1770/1771) with the aid of the flat head screw, spring washer and low M8 nut.
   b) Carefully place the two clamps (5181) on the clamp bracket plate (5195).
   c) Place the anti-spark plates (1196) in their seat on the circuit-breaker.

3.4.2 REPLACEMENT OF THE CLOSING DEVICE

(See Figure 11)

3.4.2.1 Replacement Of The Complete Device

A) Removal

1. Remove both wires from terminals C and D of the device.
2. Remove both fixing screws M6 of earth connection (1705) on the closing device housing.
3. Unscrew the three M8 screws and remove the complete device.

B) Refitting

1. Introduce the device. Pay attention that the fork is turned to its good side and that it is seated properly on the catch (1123) of the moving contact (1120).
2. Keeping the device in place, screw the three M8 nuts without forgetting the washers.
3. Lift the fork (1330) by hand and check that it remains properly in place when being released.
4. Check the X and Y clearances and adjust them if necessary (See setting of clearances paragraph 3.4.7).
5. Connect the two wires to terminals C and D of the coil of the closing device.
6. Connect the earth connection (1705) by means of two screws M6.

3.4.2.2 Replacement Of The Fork Unit (1330)

A) Removal

1. Put down the closing device (See paragraph 3.4.2.1).
2. Remove a circlip (332).
3. Remove the pin (331).

B) Refitting

The fork unit is supplied with its pin, therefore:

1. Remove a circlip and subsequently the pin.
2. Lock the fork on the closing rod (the alignment does not matter).
3. Fit the complete device on the circuit-breaker (See paragraph 3.4.2.1).

3.4.2.3 Replacement Of The Moving Core Assembly.

Put down the closing device (300) and remove the fork (See paragraph 3.4.2.1).

A) Removal

1. Take away the cover (324) or *(324-AC)*.

ATTENTION
Do not change the position of the flange (323) (write a mark with pen).

2. Remove the moving core assembly (370)

B) Refitting

1. Introduce the moving core assembly (370) into the closing device (300).
2. Refit the cover (324) taking care that the flange (323) is not shifted and lock the 4 M6 hexagon head cap screws of the cover (324 or 324-C).

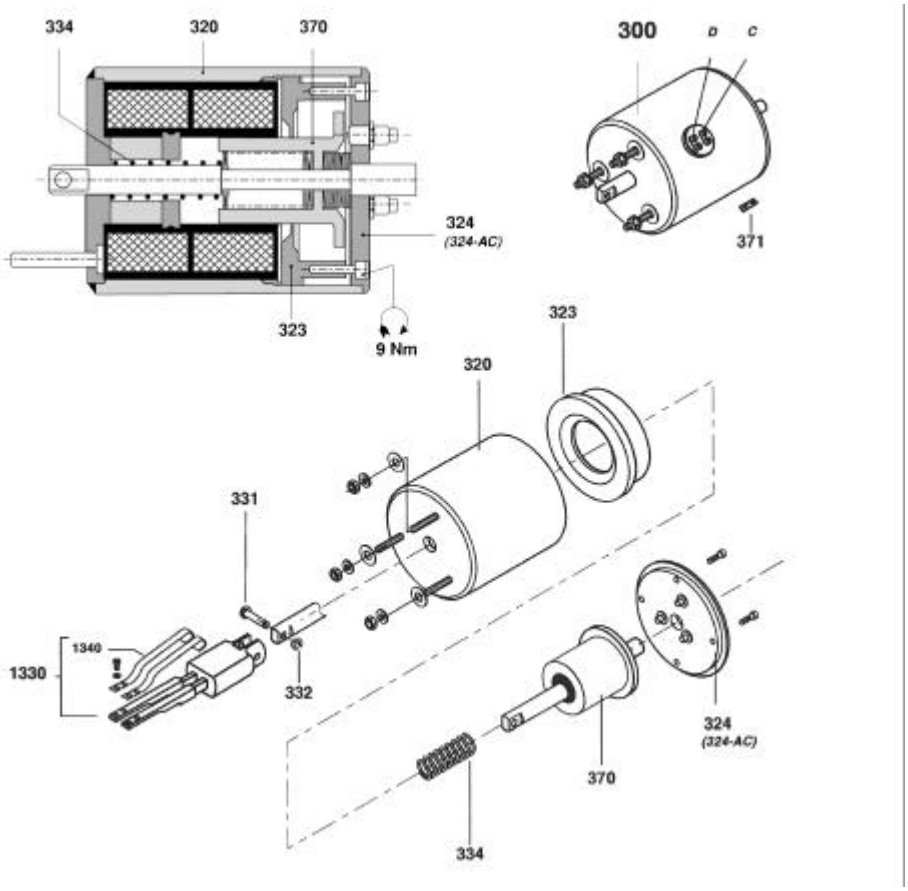

Figure 11 Replacement of the closing device

3.4.2.4 Manual Closing Device For Inspection Purposes (350) Fitted On The Closing Device (300)

(See Figure 11)

A) Removal

1. Remove the 4 M6 hexagon cap screws which ensure the flange connection (353) and locking of the cover (352).
2. Caution: do not turn the flange (323)
3. Remove the complete manual closing device (350).
4. Take away the cylinder (355) and cover (352).

B) Refitting

1. Place the cover (352) on the coil body (320).
2. Hold the cover (352) and introduce the cylinder (355) with its spring (363) and place the manual closing device (350).
3. Lock the whole with the 4 M6 hexagon head cap screws without shifting the position of the flange (323): hold the cover (352) firmly in this position and turn the manual closing device (350) until the pivot (351) can be operated vertically from top to bottom.
4. Tighten the 4 M6 hexagon head cap screws.

3.4.3 REPLACEMENT OF AUXILIARY CONTACTS (420)

A) Removal

1. Dismantle the housing of the auxiliary contacts (400).
2. Remove the transparent cover (430).
3. Remove the first switch (420), then the first insulation (431) and continue until you find the defective switch.
4. Mark and dismantle the 3 or 4 terminal connectors (type 5U or 50-5S) and replace the defective switch.

B) Refitting

1. In the case of cabling type 5U (3 wires - reversing contacts), restore the connection (432) on the old switch (420) and then refit it on the new switch.
2. Introduce switches (420) and insulation (431).
3. Check the switching of the 5 switches by manually actuating the pallet.
4. Slide the cover (430) back on.
5. Refit the housing of the auxiliary contacts (400).
6. Do not forget the earthing screw (706).

3.4.4 REPLACEMENT OF THE PUSHER (710) OR DAMPER (720)

Remove the wiring of the auxiliary contacts (400) then :

A) Pusher (710)

1. Remove the end of the pusher (710) from its seat on the moving contact (1120).
2. Push the swivel element (715) from its seat on the frame (1701).
3. Remove the pusher (710).
   For the replacement criteria see paragraph 3.2.2
4. Introduce the pusher (710) into the frame (1701).
5. Engage the end of the pusher (710) into its seat on the moving contact (1120).
6. Check that the swivel joint support (715) is on the bottom proper of its seat in the frame (1701).
7. Adjust clearance Z: see adjustment of clearances, paragraph 3.4.7.3
8. Reconnect the wiring of the auxiliary contacts (400) without forgetting the earthing screw (706).

B) Damper (720)

1. Remove the sleeve (721) with the damper (720) from the frame (1701).
2. Take the damper (720) away from its sleeve (721).
   For the replacement criteria see paragraph 3.2.2.2.
   If traces of oil are noticed on the damper (720) or on the bottom of the frame (1701), the damper (720) should be replaced.
3. Introduce the new damper (720) into its sleeve (721).
4. Hold the unit (720-721) by the hand and fit it into the frame (1701), compressing the piston of the damper (720) with the thumb.
5. Push the unit (720-721) to the bottom in the frame, and close the circuit-breaker if necessary.
6. Reconnect the wiring of the auxiliary contacts (400) without forgetting to connect the earthing screw (706).

3.4.5 REPLACEMENT OF THE DIRECT TRIPPING DEVICE (1200)

(See Figure 16 and Figure 17)

A) Removal

1. Remove the blade with catch (1120): see paragraph 3.4.1.1
2. Remove the damper (720) with its sleeve (721): see paragraph 3.4.4 and withdraw the pusher assembly (710).
3. Remove the two inserts (1160) located on the lower connecting bar (1130) in the groove of the blade.

4. Remove the two fixing screws of the lower connecting bar (1130) and then the latter.
5. Remove the two M8 x 90 fixing screws of the tripping device (1200) and put down the latter.

B) Refitting

1. On the new tripping device fit the nut (1223) and counter nut without locking them.
2. Fix the tripping device (1200) by means of the two M8 x 90 screws on the frame (1701).
3. Introduce the lower connecting bar (1130) through the frame (1701) and the tripping device (1200): the pin of the blade shall be situated above the three M8 threads; fix it on the frame (1701).
4. Place the two inserts (1160) and introduce the pin of the blade (1122) to center them, lock the fixing screws and remove the pin of the blade (1122).
5. Refit the blade (1120): see paragraph 3.4.1.4
6. Introduce the pusher 710) into the frame (1701) and then the blade (1120).
7. Fit the damper (720) and its insulating sleeve (721) in the frame (1701).
8. The blade (1120) shall be situated in the center of the groove of the frame (1701) and in front of the fixed contact (1116): if necessary unlock the lower connecting bar (1130) and correct the alignment and relock, then the 2 fixing screws of the lower connecting bar (1130).

   Close the breaker and adjust clearance Y: see clearance adjustment paragraph 3.4.7.

NOTE

When replacing the direct tripping device (1200), it is necessary to calibrate the circuit-breaker in order to determine the new equivalencies between closing current and adjusting scale.

3.4.6 REPLACEMENT OF ARC CHUTE PARTS

(See Figure 3)

3.4.6.1 Replacement Of Deionizing Plates And Baffles (5805)

A) The arc chute (5800) is placed upright on a bench:

1. Loosen the connecting screws of the arc resisting plates (5801) 6 M8 hexagon x 35 screws (5807) with M8 nuts (5808) and washers (5809). Unscrew several turns the connecting screws from the top of the arc resisting plates (5801).
2. Open out the tops of the arc resisting plates (5801) about 8 mm in a "V".
3. Withdraw the baffles (5805) and deionizing plates one by one (5802-5803-5804).

B) Refitting

1. Introduce the baffles (5805) and deionizing plates(5802-5803-5804) one by one replacing the excessively worn parts (wear > original thickness).
2. Close up the arc resisting plates (5801) and tighten the 6 M8 hexagon x 35 connecting screws (5807) with M8 nuts (5808) and washers (5809).

3.4.6.2 Replacement Of Horns (5806/5810)

A) The arc chute (5800) is placed flat (lying down) on a bench.

1. Loosen the screw from the lower part of the arc chute and separate the lower part from the arc resisting plates (5801).
2. Withdraw the horns (5806/5810).
3. Replace the excessively worn horns (see 3.2.1.4).
4. Fit the new horns (5806/5810).
5. Close up lower parts of the arc resisting plates (5801).
6. Tighten the lower connecting screws (5807) by hand.
7. Place the arc chute upright.
8. Tighten the connecting screws (5807).

3.4.7 CHECKING AND ADJUSTMENT OF CLEARANCES

3.4.7.1 Clearance X = 1,5 $^{0/+0.5}$ mm

Reading taken with the circuit-breaker tripped. (See Figure 12)

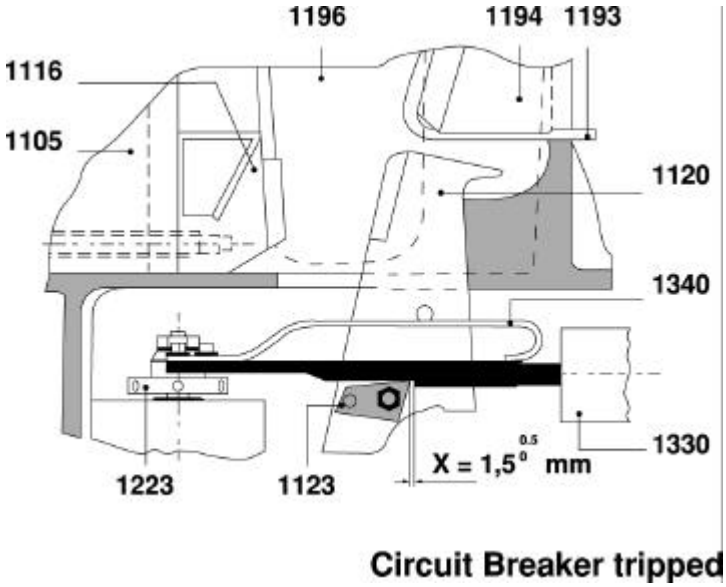

Figure 12 Clearance X

Checking can easily be done by means of a depth gauge, measuring the extent to which the sleeve (337) projects from the closing device.

The difference between the values measured "at rest" and with "eliminated clearance" corresponds to the clearance X (See Figure 13).

Clearance X may also be checked by means of a feeler gauge between the fork (13300) and one or other of the two catches (1123).

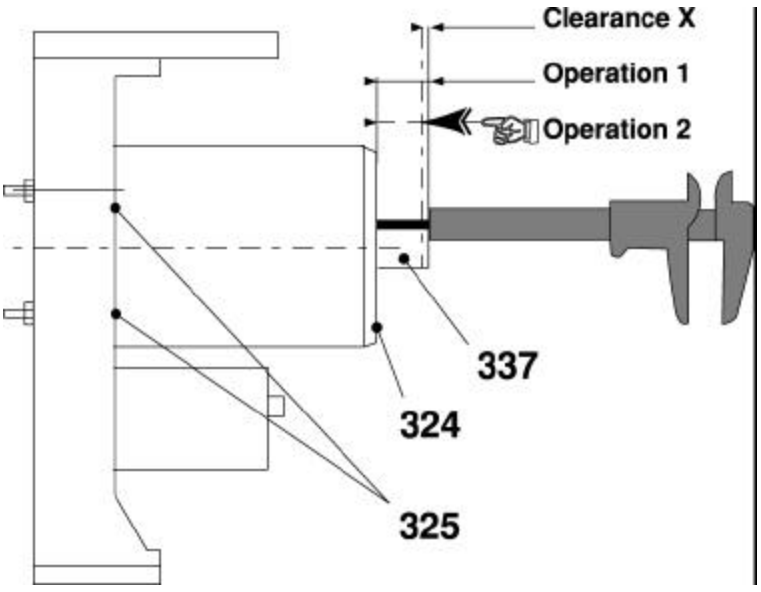

Figure 13 Checking Clearence X

Adjustment: By adding or removing shims (325) on the three bolts of the closing device, until a proper clearance is obtained (See Figure 8).

3.4.7.2 Clearance Y = 2 $^{\pm 0.25}$ mm

Reading is taken with the circuit-breaker closed.

Checking is done by means of a feeler gauge with the circuit-breaker closed.

To carry out the adjustment, release the nut (1223) and lock-nut, then lock them after adjusting the position of the nut (1223).

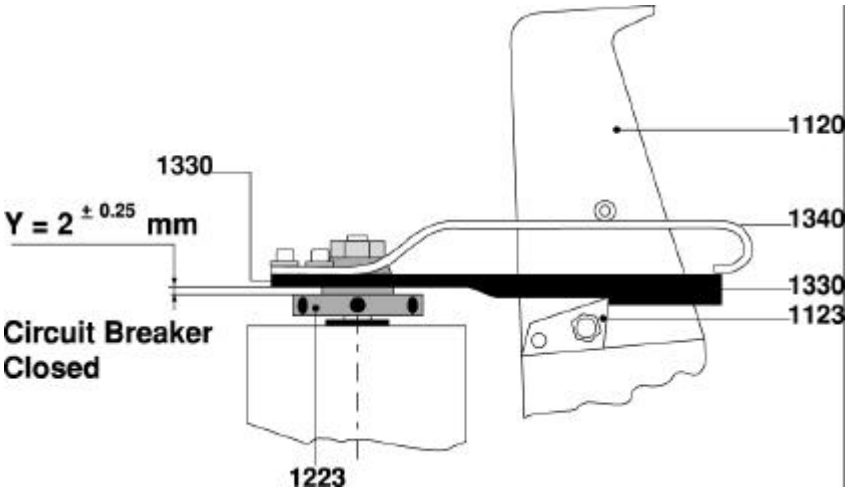

Figure 14 Clearance Y

3.4.7.3 Clearance Z = 1.6 $^{\pm 0.2}$ mm

Reading is taken with the circuit-breaker tripped.

To carry out this adjustment:

1. Remove the transparent cover (430).
2. Check clearance Z by means of a feeler gauge.
3. Release the cap nut (714) from the standard M6 nut and secure it again in the correct position.

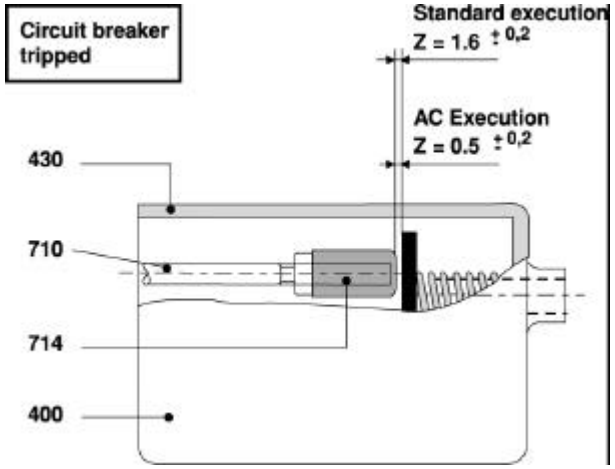

Figure 15 Clearence Z

3.4.7.4 Operating Clearance Of Indirect And Manual Tripping Devices

(See Figure 16 and Figure 17)

A) Type B1 24 (250)

1. The value is checked by means of a feeler gauge between the fork unit (1330) and the plate (1255).
2. Unlock the two screws which connect the plate (255) to the auxiliary contacts (261); raise or lower the plate (255), then relock the 2 screws.

B) Type B1 4 (1250)

1. The value is checked by means of a feeler gauge between the fork unit (1330) and the plate (1255).
2. Unlock the two screws which connect the plate (1255) to the cover (1257); raise or lower the plate (1255), then relock the screws.

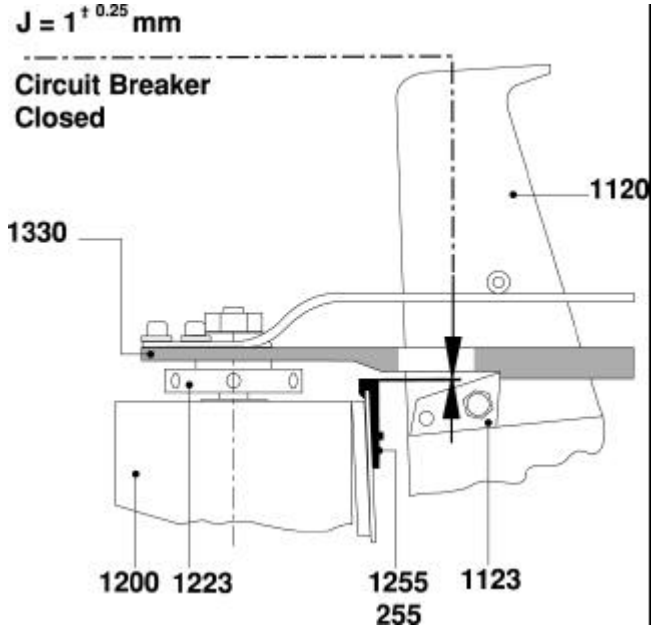

Figure 16 Clearance J = 1 ± 0.25 mm reading taken with the circuit-breaker closed

C) Type m3 (1270)

1. The value is checked by means of a feeler gauge between the fork unit (1330) and the lever plate (1279) on the side of the nut (1223).

Adjustment

1. Unlock the M6 screw by pinching the lever (1275) on the pin (1274-1273).
2. Rotate the unit pins - plate - lever (1274-1279-1273) until the proper clearance is obtained.
3. Relock the M6 screw of the lever (1275).

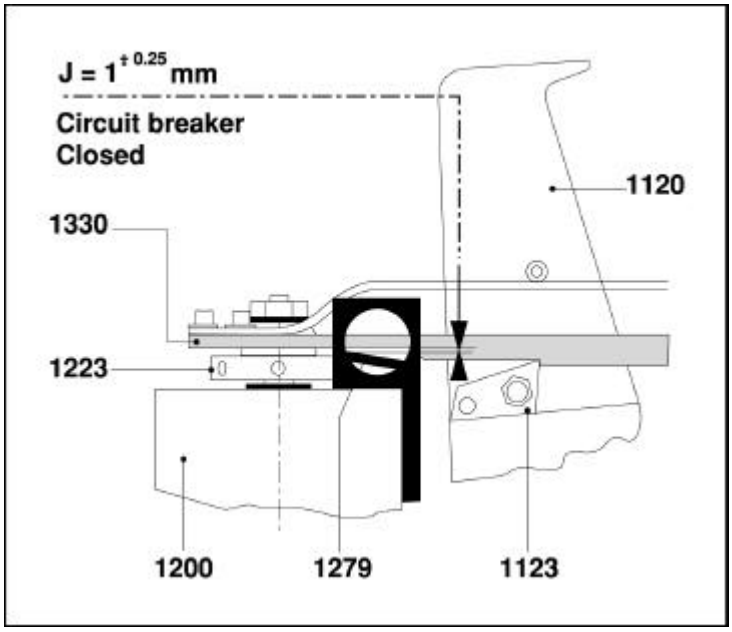

Figure 17 Clearance J = 1 ± 0.25 mm reading taken with the circuit-breaker closed

D) Type BIM5 (1280)

The value J = 1 ± 0,25 is checked by means of a feeler gauge between the fork unit (1330) and the lever plate (1279) on the side of the nut (1223).

Adjustment

1. Unlock the M6 screws of the lever(1287) which pinch the the left hand shaft (1282).
2. Rotate the Unit shaft-Lever plate (1282-1279-1284) until the proper clearance is obtained.
3. Relock the M6 screws of the lever (1287).

E) Type BIM6 (1290)

The value J = 1 $^{\pm 0,25}$ is checked by means of a feeler gauge between the fork unit (1330) and the lever plate (1279) on the side of the nut (1223).

Adjustment

1. Unlock the M6 screws of the lever(1287) which pinch the the left hand shaft (1274).
2. Rotate the Unit shaft-Lever plate (1273-1279-1274) until the proper clearance is obtained.
3. Relock the M6 screws of the lever (1287).

NOTE

When the adjustment of these different tripping devices has been carried out, close and open the circuit breaker several times in order to check that the adjustment made is correct and does not interfere with movement of the fork (1330) as well as with its hooking on the catches (1123).

3.5 CLOSING DEVICES TROUBLE - SHOOTING

3.5.1 TYPE M CLOSING DEVICE

DEFECT	CAUSE	REMEDY
A The device does not maintain its closing position.	-Closing current too low < I min.	-Check the power of the alternating source. -Charge the batteries.
	-Closing pulse too short < 0.5 s.	-Modify the delay of the pulse (at drop-out).
	-Gap too large.	-Reduce the gap : see procedure a).
B The device does not return to rest after an opening by Imax (direct or indirect tripping).	-Tripping pulse too short < 0.5 s.	-Modify the delay of the pulse (at drop-out).
	-No coincidence between : •Gap of the device. •Tripping current. (I < Imin. or I > Imax.)	-Introduce or verify : (see the type diagram). 1. Values of the tripping resistor: Rs. 2. Values of the parallel resistor: introduce Rp if not available. 3. Condition of the gap : - Initial setting not to be interfered with. - Dismantled or improperly set: adjust the gap according to procedure c).

3.5.2 TYPE E CLOSING DEVICE

DEFECT	CAUSE	REMEDY
A The device does not maintain its closing position.	- Closing current too low < I min.	-Check the power of the alternating source. -Charge the batteries.
	- Closing pulse too short < 0.5 s.	-Modify the delay of the pulse (at drop-out).
	- Series connection of the holding resistor : 1. without overlapping. 2. not available.	-Verify and modify : 1. Delay. 2. Relaying.
B The device does not return to rest after an opening by Imax (direct or indirect tripping).	- Holding current too low < I hold min.	- Verify and adjust holding resistor.
	- Gap too large	- Reduce the gap : see procedure a).
	- Residual current in the closing coil I • 0.	- Modify the circuit so that I = 0.
	- Gap too small.	- Increase the gap: see procedure b). If the device is dismantled or improperly set: adjust the rated gap according to procedure c).

3.5.3 ADJUSTMENTS

A) Procedure for reducing the gap

1. Mark with a pen the position of the cover (324) in relation to the body of the coil (320).
2. Unlock the four M6 hexagon socket screws on the cover (324).
3. Turn the cover (324) 50 mm to the left.
4. Lock the four hexagon socket screws.
5. Carry out 3 closing tests :
   - If the adjustment described above is nor sufficient, repeat operations 1 to 4 until a proper result is reached.
   - If the adjustment is satisfactory, carry out the following test :
     1. Close the circuit-breaker.
     2. Disengage the fork (1330).
     3. Transmit the order “off” to the closing device; if it does not return to rest, see defect:

        B for type M or
        D for type E

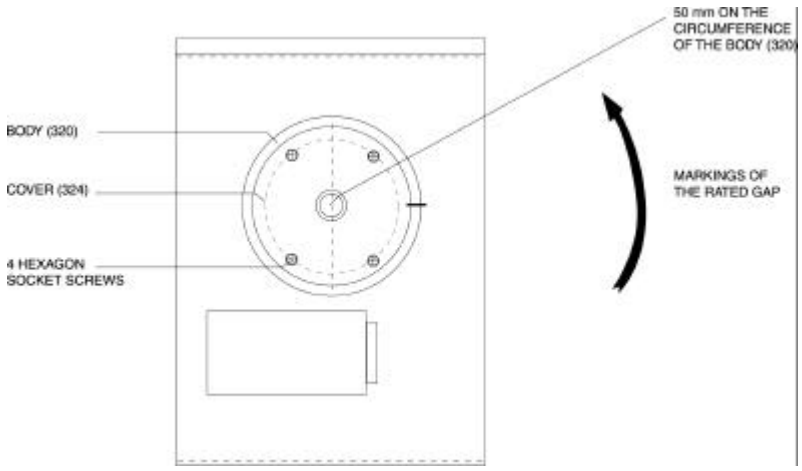

Figure 18 Reducing the gap

B) Procedure for reducing the gap

1. Mark with a pen the position of the cover (324) in relation to the body of the coil (320).
2. Unlock the four M6 hexagon socket screws on the cover (324).
3. Turn the cover (324) 50 mm to the left.
4. Lock the four hexagon socket screws.
5. Carry out 3 closing tests :
   - If the adjustment described above is nor sufficient, repeat operations 1 to 4 until a proper result is reached.
   - If the adjustment is satisfactory, carry out the following test: close the circuit-breaker.
   - If the closing device dose not remain in the closed position, see defect:

     A for type M or
     C for type E

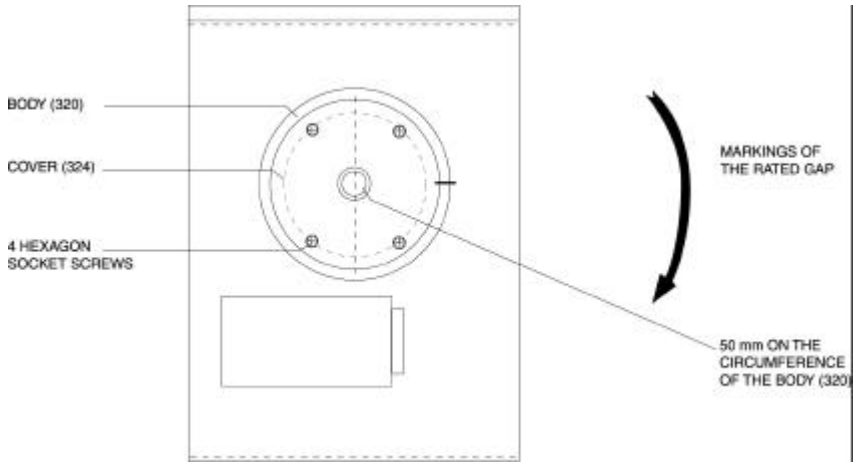

Figure 19 Increasing the gap

C) Procedure for adjusting the gap

(See Figure 8)

1. Remove the closing device (300) from the circuit-breaker and place it on a bench.
2. Dismantle the fork (1330).
3. Remove the four M6 hexagon socket screws on the cover (324) and take away the latter.
4. Screw the flange (323) in again until the following dimensions are obtained :
   - E = 10 ±0.1 mm for type E (electric hold)
   - E=8.9 ±0.1 mm for type M (magnetic hold)
5. Mark the new point corresponding to the rated gap on the body (320).

CAUTION **DO NOT TURN THE FLANGE (323)**

6. Put back the cover (324) and lock the four hex. socket screws (9 Nm).
7. Extend on the cover (324) the marking on the body of the coil (320) corresponding to the rated gap and reflecting the position of the flange (323).
8. Fit the fork (1330) on the closing device (300).
9. Refit the assembly on the circuit-breaker.

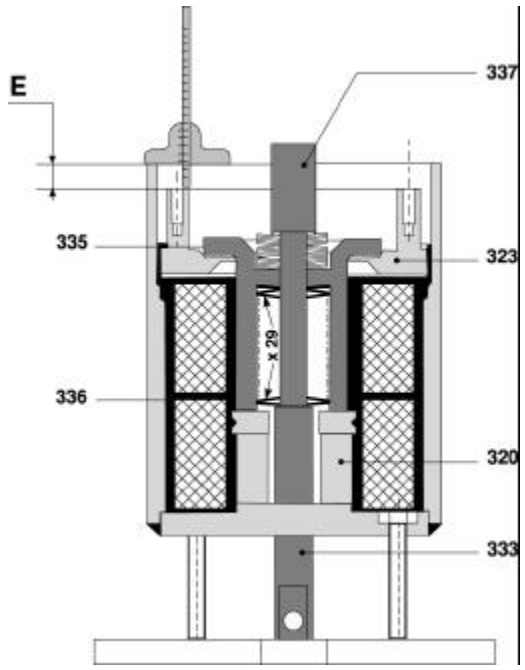

Figure 20 Adjusting the gap

3.5.4 PERFORMANCE CHECK

See the trouble shooting sheets for type M or E, if one of the functions is not carried out during the test.

1. Close the circuit-breaker and check :
   - closing current
   - holding current (type E).

2. Trip the circuit-breaker by order “Off” and check :
   - tripping current (type M).

3. Close the circuit-breaker, disengage the fork (1330), give the order “Off” to the closing device (300) and check :
   - return of the fork (1330) to rest.

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Electro-Motive Division of General Motors Corporation
La Grange, Illinois 60525 USA
Telephone: 708-387-6000
WebSite:

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