



Maintenance instructions Circuit breaker

for trained personnel, certified by ConverterTec



(Exemplary illustration)

concycle® - Circuit breaker

Original operation manual

This document is updated regularly.

- Always use the current version of the document.

Document history

ConverterTec document revisions

- The first released version of a document has the revision acronym **A**.
- All further revisions are identified alphabetically from **B** to **Z**.

Revisions

Date	Version	Modification
	A	(Internal document)
26.10.2015	B	Document updated
01.08.2017	B2	Various corrections
18.09.2018	C	Document updated
25.05.2020	D	ConverterTec
29.09.20 20	E	Cover picture, Capture Regrease

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1 Safety

1.1 Classification of the warning notices with relation to actions



DANGER

Imminent danger to life or danger of severe injuries



WARNING

Danger of minor injuries



CAUTION

Danger of material or environmental damages

NOTICE

Information and tips for easy handling of the product or the documentation

1.2 Intended use of the product

Improper use may cause danger for life and limb and damage to the product and other material assets.

The CONCYCLE® circuit breakers are intended for operation in ConverterTec frequency converters.

The intended use includes:

- observing all instructions for the product and all components of the system
- operation of the product without modifications to the product
- operation of the product within the relevant operating limits
- complying with all inspection and maintenance conditions

Any other use than the one described in these instructions or a use beyond the one described herein is regarded as improper use and is prohibited.

The manufacturer is not liable for damage resulting from improper use. Improper use invalidates the warranty of the manufacturer. The risk lies solely with the operator.

1.3 General safety instructions

- ▶ Follow the safety instructions of the operator.
- ▶ Observe national regulations, standards, guidelines and laws.
- ▶ Only use suitable measuring instruments which are approved for the corresponding voltage levels.
- ▶ Only work on the cabinets when they are de-energised and when the wind turbine is not operating.
- ⊗ Never stay alone in the wind turbine.
- ⊗ Do not disassemble, modify or disable any safety devices. Do not remove any protective coverings apart from the protective covering of the circuit breaker.
- ⊗ Do not reconstruct or modify the product.

1.3.1 Danger to life due to electric shock

Touching live components causes danger to life due to electric shock.

Before working on the product, observe the **five safety rules**:

- ▶ Isolate from power supply
- ▶ Protect against reclosing
- ▶ Verify the safe isolation from supply
- ▶ Connect to earth and short circuit
- ▶ Provide neighbouring parts under voltage with barriers

1.3.2 Risk of burning from hot components

During operation, components may heat up.

Before working on the product:

- ▶ Wait until hot components have cooled down.
- ▶ If required, measure the temperature of the components e.g. with an infrared measuring device.

1.4 Behaviour in case of fire

1. Report the fire:
 - Call local emergency number (→ **Information sign emergency number in wind turbine**)
2. Bring yourself to safety:
 - Take along persons at risk
 - Close doors
 - Follow marked escape route
 - Do not use elevators
 - Observe instructions (→ **Escape and rescue plan in the wind turbine**)
3. Try to extinguish the fire.
 - Use the fire extinguisher

1.5 Behaviour in case of accidents

4. Report the accident:
 - Call local emergency number (→ **Information sign emergency number in wind turbine**)
5. Administer first aid:
 - Secure the accident location
 - Care for the injured
 - Observe the operating instructions
6. Take further measures:
 - Instruct ambulance or fire brigade
 - Remove curious bystanders

1.6 Obligations of the operator

The system operator has the following supervisory duties:

- Complementing the general safety information with local requirements
- Provisioning first-aid kit, fire extinguisher and rescue device for height rescue
- Make sure that only qualified personnel works on the product (→ **Chap. 1.7**)
- Make sure that the personnel is trained in height rescue and first aid
- Make sure that all safety devices are always present and in operation
- Regular trainings for the personnel about the following:
 - Observing and using all instructions
 - Intended use of the product
 - Knowledge of all safety devices
 - Complying with legal provisions
 - Observing operating instructions

1.7 Qualification of personnel

Expertise is required for all work on the product. In order to guarantee safety, only a certified experienced professional may work on the product.

The operator has to make sure that the personnel is qualified.

1.7.1 Experienced professional certified by ConverterTec

Experienced professionals are persons who can assess the tasks assigned to them, identify potential hazards, and take appropriate protective measures due to their technical training, knowledge and experience as well as their knowledge of the applicable regulations.

A certified experienced professional must also be trained by ConverterTec and certified for the work at the product.

1.8 Personal protective equipment

The personnel must wear appropriate personal protective equipment adapted to the dangers and working conditions. The protective equipment must protect but not restrain.

The following legal requirements apply for the personal protective equipment.

The personal protective equipment must be worn for all work on the product.

If special work requires additional protective equipment, this protective equipment is listed together with the corresponding work.

2 Information about the documentation

2.1 Display conventions

Describing text

- ▶ Single instruction
 1. First of several instructions with defined order
 2. Second of several instructions with defined order
 - ↳ Reaction of the product
- ⊘ Prohibited action
 - Bullet point, 1st category
 - Bullet point, 2nd category

2.2 Applicable Documents

- ▶ Observe all documents supplied with the system or components of the system, and
 - Documents which are supplied after training and successful certification specifically for the individual person
 - **Installation and operating instructions CONCYCLE® Frequency converter system**

2.3 Keeping the documents

- ▶ Keep these instructions and all documents supplied with the product for further use.

2.4 Validity of the instructions

These instructions are only applicable for:

- ConverterTec fixed circuit breakers
- ConverterTec drawout circuit breakers

2.5 Target groups

These instructions are intended for

- Park operators
- Experienced professionals

In order to guarantee safety, only a certified experienced professional may work on the product.

3 Product description

3.1 Set-up

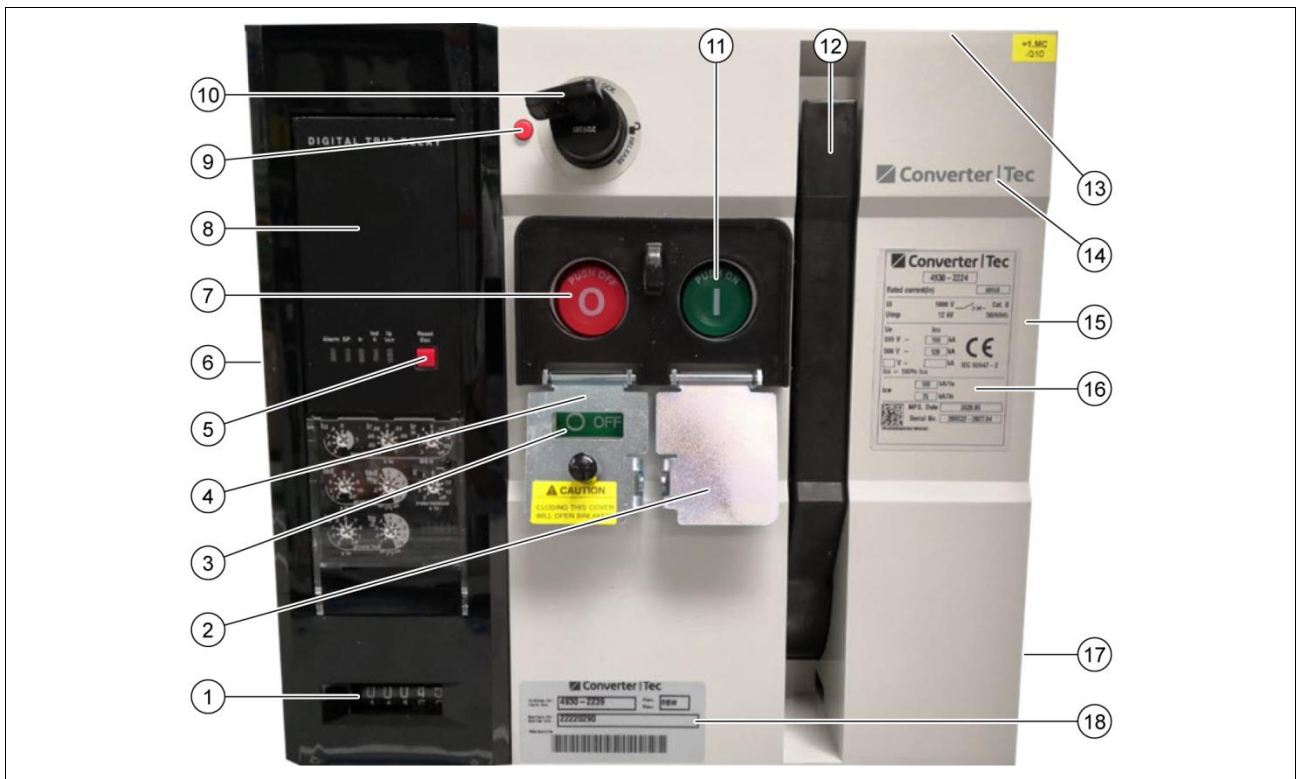


Fig. 3-1 Front view - circuit breaker

- | | |
|---|--|
| 1 Counter | 10 Profalux padlocking system |
| 2 Spring status
(behind mechanical interlocking) | 11 ON button |
| 3 ON/OFF indicator | 12 Charging handle |
| 4 Mechanical interlocking | 13 Arc chambers (upper) |
| 5 Reset button OCR/battery test | 14 Company logo |
| 6 Name plate accessories (left) | 15 Housing |
| 7 OFF button | 16 Name plate with technical data and circuit breaker
serial number |
| 8 Over current relay | 17 Mounting bracket |
| 9 Reset button (mechanical)/tripping indicator | 18 Name plate with ConverterTec serial number and
barcode |

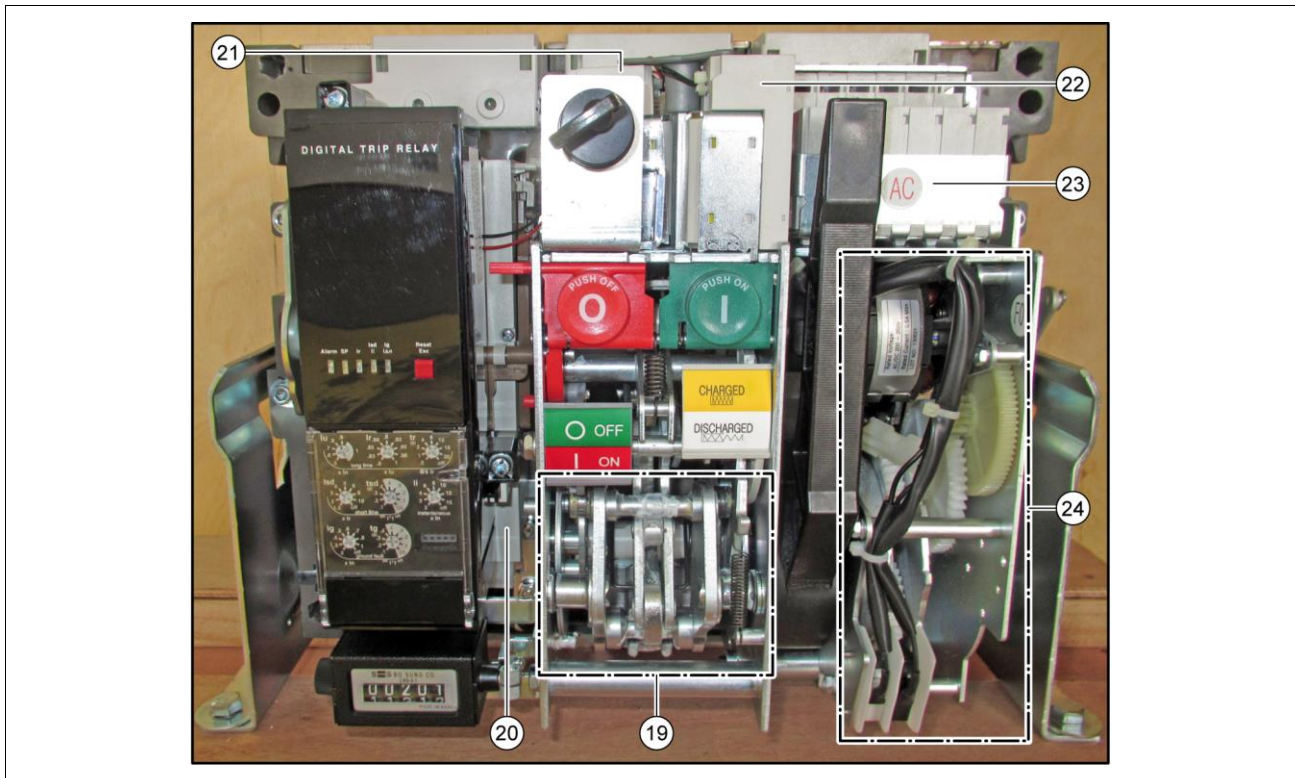


Fig. 3-2 Front view - circuit breaker (open)

- | | | | |
|----|-----------------------------------|----|-------------------------|
| 19 | Charging mechanism | 22 | Closing coil (CC) |
| 20 | Mechanical trip device (MTD) | 23 | Auxiliary contacts (AX) |
| 21 | Undervoltage trip coil (UVT coil) | 24 | Charging motor (M) |

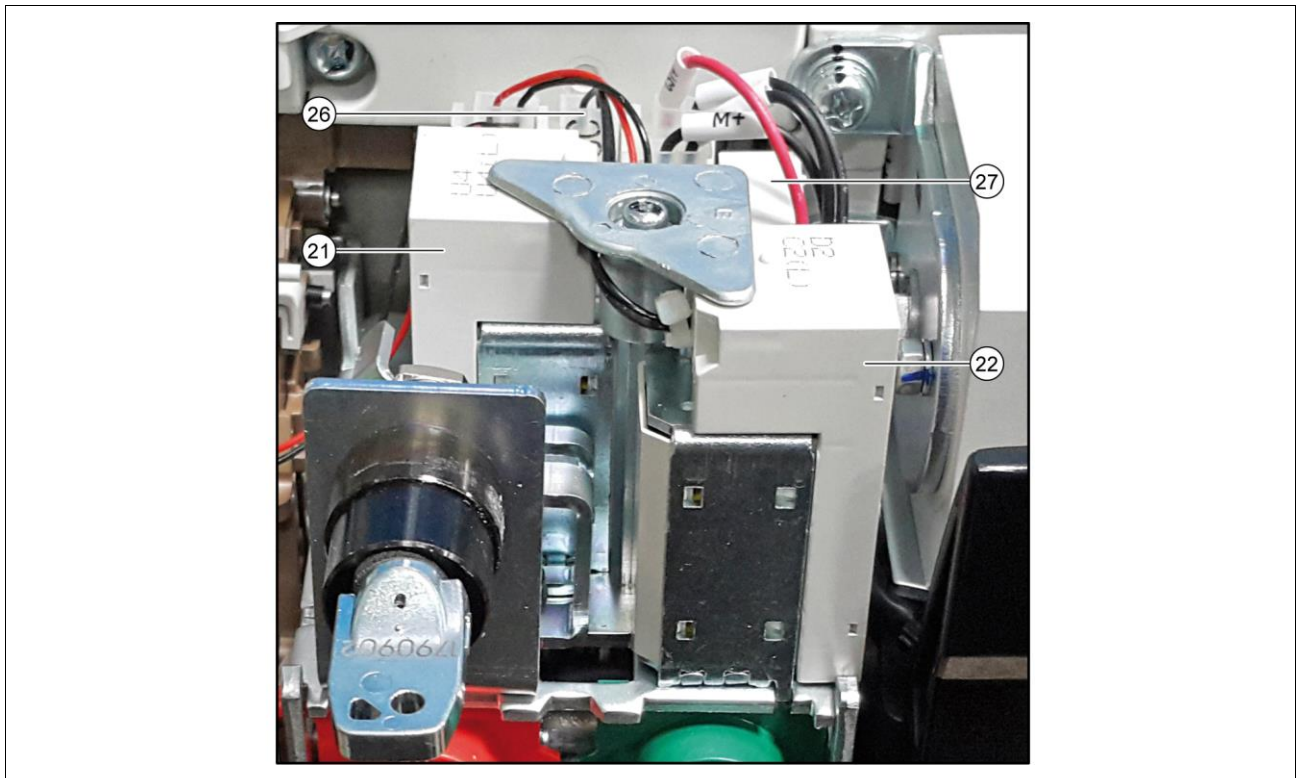


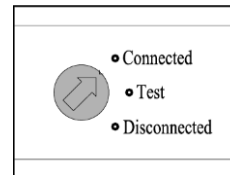
Fig. 3-3 Top view - circuit breaker (open)

- | | | | |
|----|-----------------------------------|----|-----------------------------|
| 21 | Undervoltage trip coil (UVT coil) | 26 | Internal plug connections |
| 22 | Closing coil (CC) | 27 | Ready to close switch (RCS) |

3.2 Operating positions (Drawout circuit breakers)

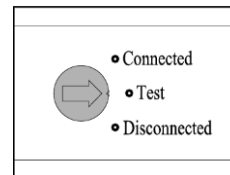
3.2.1 Connected position

- The circuit breaker is retracted.
- The main circuit is connected.
- The drive control circuits are connected.
- The circuit breaker is ready for operation.



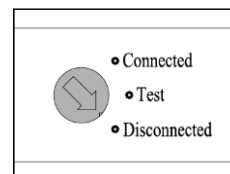
3.2.2 Test position

- The circuit breaker is partially extended.
- The main circuit is disconnected.
- The drive control circuits are connected.
- The electrical control of the circuit breaker can be checked.



3.2.3 Disconnected position

- The circuit breaker is extended.
- The main circuit is disconnected.
- The drive control circuits are disconnected.
- The circuit breaker can be exchanged or maintained mechanically.



3.3 CE marking



The CE marking documents that the products comply with the basic requirements of the relevant regulations.

The declaration of conformity can be accessed at the manufacturer's premises.

4 Maintenance inspections



DANGER

Danger to life due to electric shock

Touching live components causes danger to life due to electric shock.

Before working on the product, observe the **five safety rules**:

- ▶ Isolate from power supply
- ▶ Protect against reclosing
- ▶ Verify the safe isolation from supply
- ▶ Connect to earth and short circuit
- ▶ Provide neighbouring parts under voltage with barriers

4.1 Preparation (Fixed circuit breakers)

1. Stop the wind turbine.
2. Disconnect the frequency converter system from the grid.
3. Disconnect the circuit breaker from the power supply.
4. Verify the safe isolation of the circuit breaker from the power supply.
5. Observe the circuit diagram of the circuit breaker (→ **Chap. 13**).
6. Service the circuit breaker according to the inspections plans (→ **Chap. 4.3, 4.4 and 4.5**).

4.2 Preparation (Drawout circuit breakers)

1. Stop the wind turbine.
2. Disconnect the frequency converter system from the grid.
3. Disconnect the circuit breaker from the power supply.
4. Verify the safe isolation of the circuit breaker from the power supply.
5. Set the circuit breaker to the disconnected position (→ **Chap. 3.2.3**).
6. Draw out the circuit breaker (→ **Chap. 4.2.1**).
7. Observe the circuit diagram of the circuit breaker (→ **Chap. 13**).
8. Service the circuit breaker according to the inspections plans (→ **Chap. 4.3, 4.4 and 4.5**).
9. Draw in the circuit breaker (→ **Chap. 4.2.2**).

4.2.1 Drawing out the circuit breaker

Validity: Drawout circuit breakers

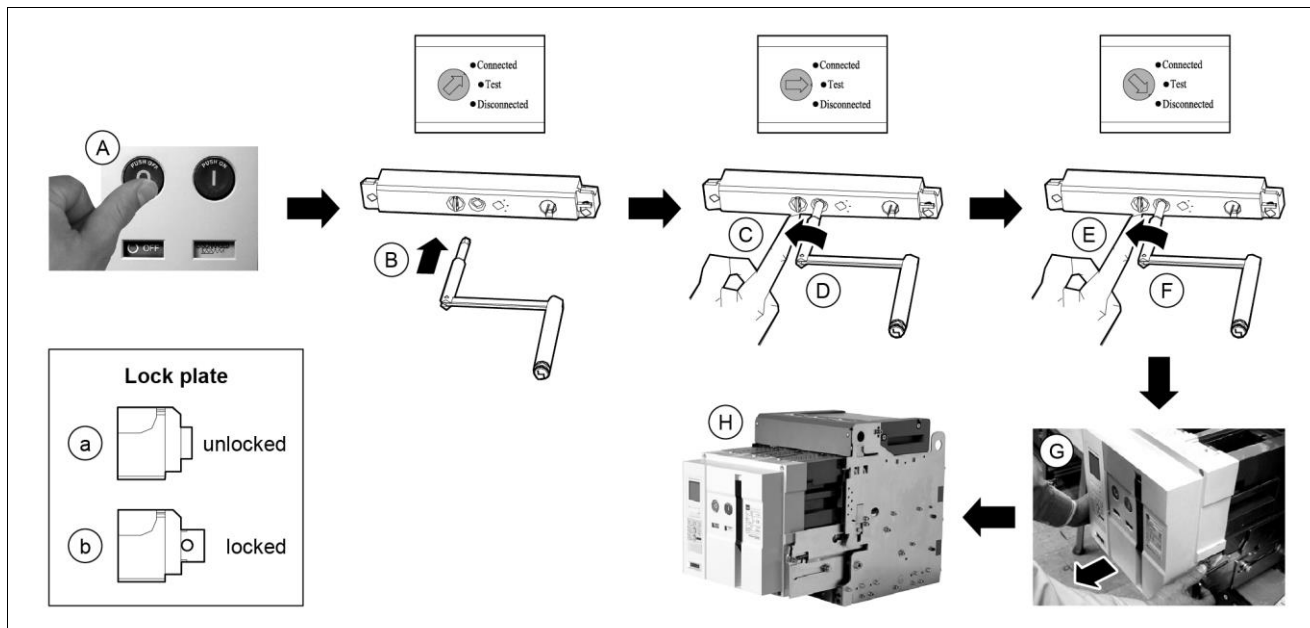


Fig. 4-1 Drawing out the circuit breaker

1. When the circuit breaker is off, hold down the PUSH OFF button (A) and place a rotary handle in the bottom part of the circuit breaker (B).
2. To unlock the position, press the lock plate (C → a).
3. Turn the rotary handle counterclockwise until the Test position is reached (D).
 - ↳ When the circuit breaker reaches the Test position, the lock plate pops out (b) and the position is locked.
4. To unlock the position, press the lock plate again (E → a).
5. Turn the rotary handle counterclockwise again until the Disconnected position is reached (F).
 - ↳ When the circuit breaker reaches the Disconnected position, the lock plate pops out again (b).
 - ↳ The display shows **DISCONNECTED**.
6. Draw the circuit breaker out of the chassis:
 - Remove the rotary handle.
 - Release the locks on the right and left side of the circuit breaker.
 - Draw the circuit breaker out of the chassis (G).
7. Maintain the circuit breaker (H).

4.2.2 Drawing in the circuit breaker

Validity: **Drawout circuit breakers**

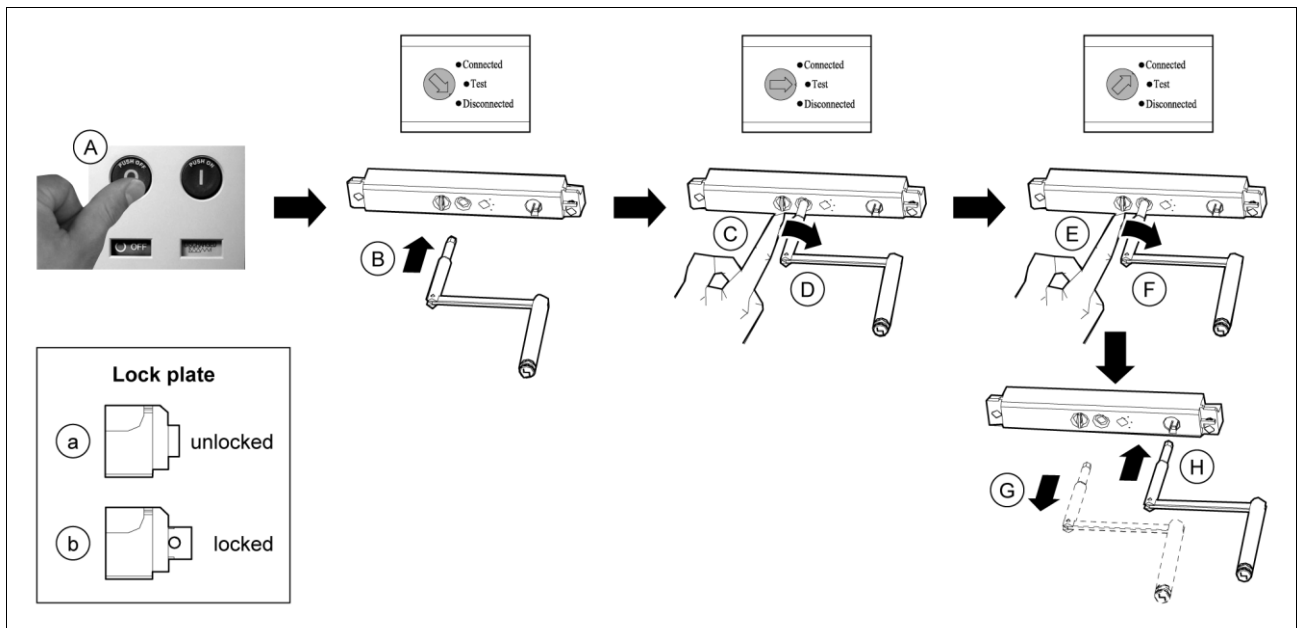


Fig. 4-2 Drawing in the circuit breaker

1. When the circuit breaker is off, hold down the **PUSH OFF** button (A) and place a rotary handle in the bottom part of the circuit breaker (B).
2. To unlock the position, press the lock plate (C → a).
3. Turn the rotary handle clockwise until the **Test** position is reached (D).
 - ↳ When the circuit breaker reaches the **Test** position, the lock plate pops out (b) and the position is locked.
4. To unlock the position, press the lock plate again (E → a).
5. Turn the rotary handle clockwise again until the **Connected** position is reached (F).
 - ↳ When the circuit breaker reaches the **Connected** position, the lock plate pops out again (b).
 - ↳ The display shows **CONNECTED**.
6. Remove the rotary handle (G).
 - ↳ The circuit breaker is installed.
7. Push the rotary handle into its parking position (H).

4.3 Annual maintenance inspections

Maintenance inspection	In case of error ...
General	
▶ Check the general state of the device (housing, connections, over current relay, etc.)	▶ Contact ConverterTec customer service in case of damages.
▶ Check if the housing is installed with mounting screws and if all name plates are present.	▶ If mounting screws or name plates are missing, contact ConverterTec customer service.
▶ Check if the housing is dusty.	▶ If dust is present, clean device with cleaning cloth or vacuum cleaner.
▶ Check if the housing has cracks or changes in colour.	▶ In case of cracks or changes in colour, contact ConverterTec customer service.
▶ Check if the housing exhibits black traces of smoke close to the arc chambers or at the sides.	▶ In case of black traces of smoke, check arc chambers and main contacts (→ Chap. 5 and 6).
Mechanism	
▶ Close, open the device manually and charge the spring several times. ▶ Check the ON/OFF indicator and the spring status.	▶ In case of error, repair fault (→ Chap. 11).
▶ Electrically open and close the device several times. (For closing, the closing coil and the UVT coil must be energised. For opening, the UVT coil must be de-energised.)	▶ In case of error, check auxiliary supply. ▶ If auxiliary supply is OK, repair fault (→ Chap. 11).
▶ Electrical charging of the device. Check for unusual noises while charging.	▶ In case of unusual noises, check charging mechanism and charging motor. ▶ If the error remains, contact ConverterTec customer service.
▶ Check if the main contacts of the device close entirely: Close the device electrically.	▶ If the device reopens (main contacts do not keep closed and ON/OFF indicator displays the state OFF), contact ConverterTec customer service.
▶ Check the number of cycles.	▶ When exceeding the maximal permitted number of cycles → Chap. 14), replace device.
▶ Check the function of the counter.	▶ If the counter is faulty, contact ConverterTec customer service.
Contact chambers (arc chambers and main contacts)	
▶ Check cleanliness of the metal screens of the arc chambers.	▶ If the metal screen in the arc chambers is not clean, remove arc chambers and check contact chambers and main contacts (→ Chap. 5 and 6).
▶ Check mounting of the arc chambers.	▶ If the arc chambers are not mounted adequately, fix arc chambers.

4 Maintenance inspections

Maintenance inspection	In case of error ...
Auxiliary circuits (controls & feedbacks)	
▶ Visually check auxiliary circuits for changes, e.g. brown spots.	▶ If the auxiliary supply exhibits brown spots, contact ConverterTec customer service.
▶ Check secure fitting and visually check wiring of auxiliary circuits.	▶ If the auxiliary circuits are faulty, contact ConverterTec customer service.
Over current relay	
▶ Check the functionality of the internal battery by pressing the reset button OCR. Red LED SP on over current relay is illuminated.	▶ In case of error, contact ConverterTec customer service.
▶ Check the over current relay with the OCR tester (→ Chap. 10) and the function of the alarm contact AL (83-84) (→ Chap. 13).	
Device locking	
▶ Check if the mechanical interlocking works properly (if applicable incl. drawout chassis).	▶ In case of error, contact ConverterTec customer service.
▶ Check if the Profalux padlocking system works properly (if applicable). The Profalux padlocking system can only be locked, if the OFF button is pressed simultaneously.	

4.4 Maintenance inspections every 2 years (or after 250 cycles)

Maintenance inspection	In case of error ...
Mechanism	
► Check the general state of the mechanism for dust, dirt and damages (remove cover).	► In case of dust, dirt or damages, contact ConverterTec customer service.
► Check if the auxiliary supply of the closing coil (plug CC) and the UVT coil (plug UVT) are mounted correctly.	► Engage auxiliary supply correctly, if required.
► Check the state of the springs in the charging mechanism:	► If springs are faulty or missing, contact ConverterTec customer service.
► Check the charging time of the charging motor.	► If the charging time exceeds 5 seconds , repeat check several times. ► If the charging time remains larger than 5 seconds after several repetitions, contact ConverterTec customer service.
Contact chambers (arc chambers and main contacts)	
► Check the state of the arc chambers.	► → Chap. 5.
► Check the state of the main contacts.	► → Chap. 6.

Maintenance inspection	In case of error ...
Auxiliary supply	
▶ Check the following auxiliary contacts of the auxiliary supply with an ohmmeter: • Circuit breaker is open ○ 11-12; 21-22; 31-32: Circuits closed ○ 13-14; 23-24; 33-34: Circuits open ○ 83-84: Circuit open • Circuit breaker is closed ○ 11-12; 21-22; 31-32: Circuits open ○ 13-14; 23-24; 33-34: Circuits closed ○ 83-84: Circuit open • Circuit breaker has tripped ○ 11-12; 21-22; 31-32: Circuits closed ○ 13-14; 23-24; 33-34: Circuits open ○ 83-84: Circuit closed	▶ In case of error, contact ConverterTec customer service.
▶ Check the alarm contact AL (83-84) with an ohmmeter (→ Chap. 13).	▶ If the alarm contact is faulty, contact ConverterTec customer service.
Over current relay	
▶ Check the over current relay with the OCR tester (→ Chap. 10).	▶ In case of error, contact ConverterTec customer service.
Power connections (L1, L2 and L3)	
▶ Visually check the screw connections of the power connections.	▶ For visible damages due to overheating, contact ConverterTec customer service.
Mechanism / Main contacts	
▶ Check the general state of the mechanism for dust, dirt and damages. ▶ If necessary, clean and lubricate the mechanism (→ Chap. 7.1). ▶ If necessary, clean and lubricate the main contacts (→ Chap. 7.2).	▶ In case of dust, dirt or damages, contact ConverterTec customer service.

4.5 Maintenance inspections every 5 years

Maintenance inspection	In case of error ...
Housing	
▶ Check the insulation resistance between the power connections and metal parts of the housing of the device with an ohmmeter (setting U = 500 V DC).	▶ For an insulation resistance of < 100 MΩ, contact ConverterTec customer service.
Power connections (L1, L2 and L3)	
▶ Visually check the screw connections of the power connections.	▶ For visible damages due to overheating, contact ConverterTec customer service.

5 Check arc chambers

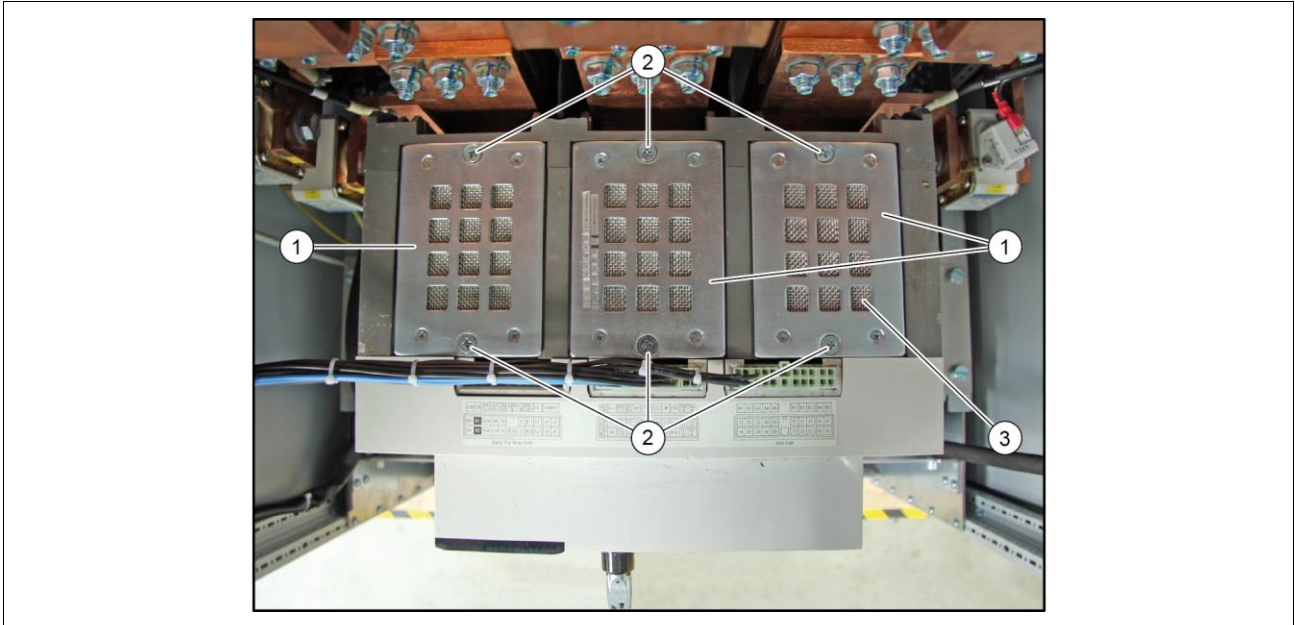


Fig. 5-1 Disassemble arc chambers

- | | | | |
|---|-----------------|---|--------------|
| 1 | Arc chambers | 3 | Metal screen |
| 2 | Mounting screws | | |

1. Remove the mounting screws **(2)** of the arc chambers **(1)**.
2. Pull the arc chambers from the housing.



Fig. 5-2 Interior view – arc chamber

3. Check the arc chambers for mechanical damages.
4. In case of faulty arc chambers, contact ConverterTec customer service.
5. Check if loose objects, e.g. melted metal or broken main contacts are present in the arc chambers.
6. Remove loose objects.
7. Check if the metal screens **(3)** are faulty.
8. In case of faulty metal screens, contact ConverterTec customer service.

6 Check main contacts

1. Disassemble the arc chambers (→ **Chap. 5**).
2. Close circuit breaker.

NOTICE

The circuit breaker can only be closed if the UVT coil is energised.

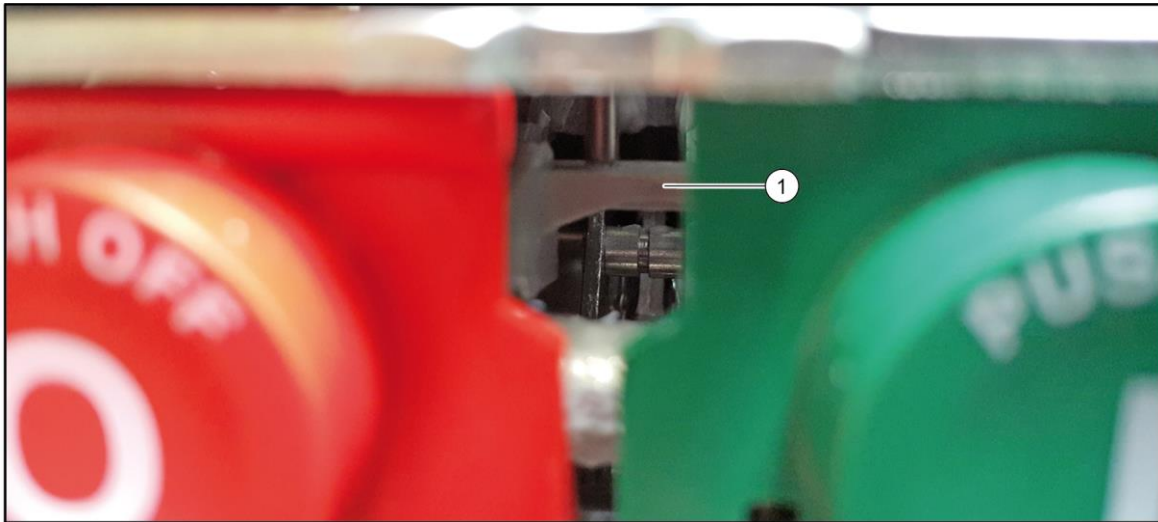


Fig. 6-1 Manual closing of the circuit breaker

- 1 Bridge
3. If the UVT coil is not energised, close the circuit breaker by manually pressing the bridge **(1)** upwards with a screwdriver.

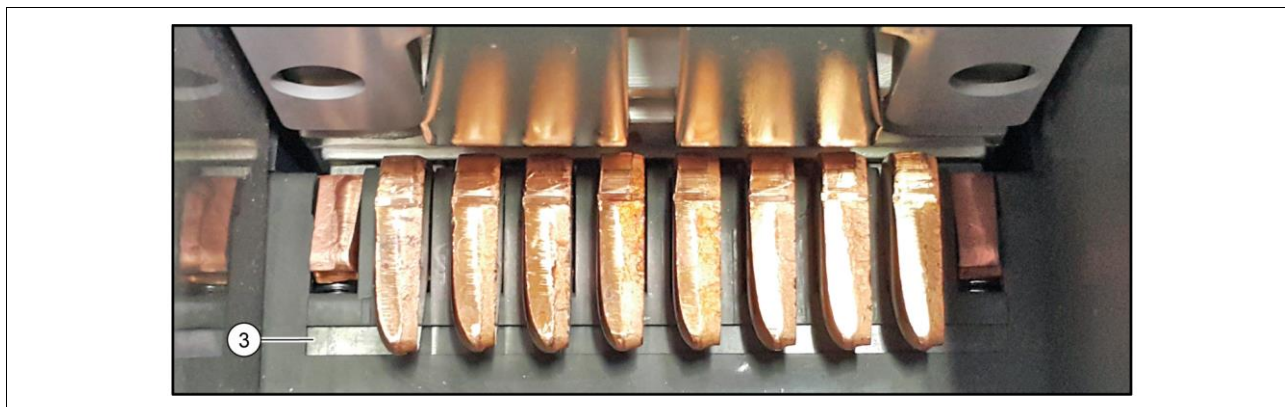


Fig. 6-2 Main contacts

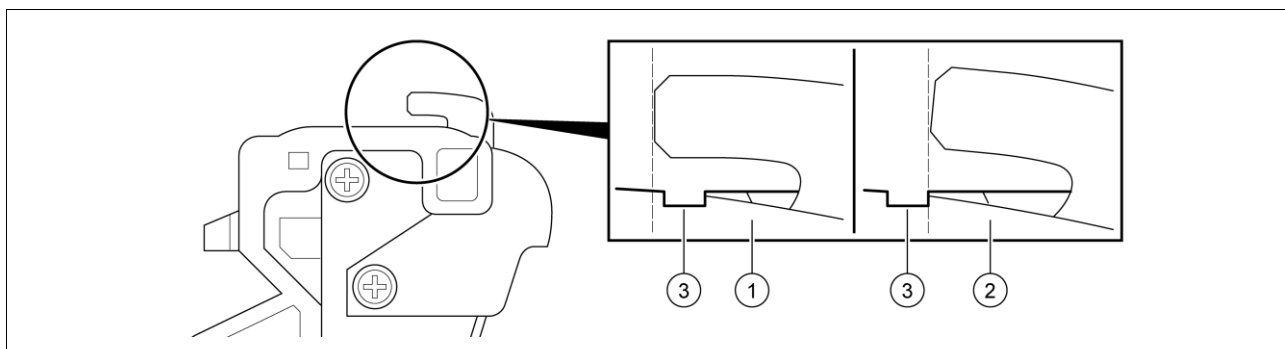


Fig. 6-3 State of the main contacts

- 1 Main contact in good state
- 2 Main contact in bad state

3 Inspection plate



DANGER

Risk of injuries due to main contact

Tripping main contacts can cause dangerous injuries.

- ⊘ Never reach into the main contact chambers with your hands.

4. Visually check the state of the main contacts.
 - Good state **(1)**
 - Bad state **(2)**
5. If the main contacts have deteriorated too much **(2)**, replace the circuit breaker.
6. Check if loose objects, e.g. melted metal or broken main contacts are present in the main contact chambers.
7. Remove loose objects with a suitable tool.

7 Regrease parts of the circuit breaker

Validity: Drawout circuit breakers

7.1 Regrease the mechanism

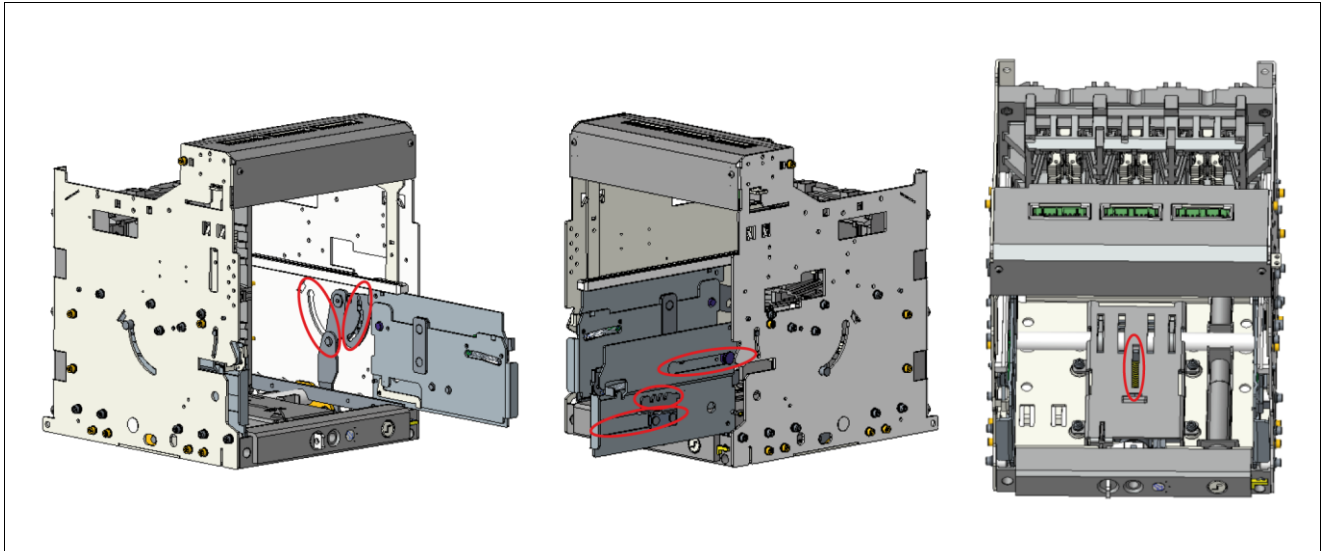


Fig. 7-1 Regreasing the mechanism

- Regrease the shown parts on both sides of the chassis.
 - Grease: Mobilgrease 28 oder Mobiltemp SHC32

7.2 Regrease the lamellar contacts

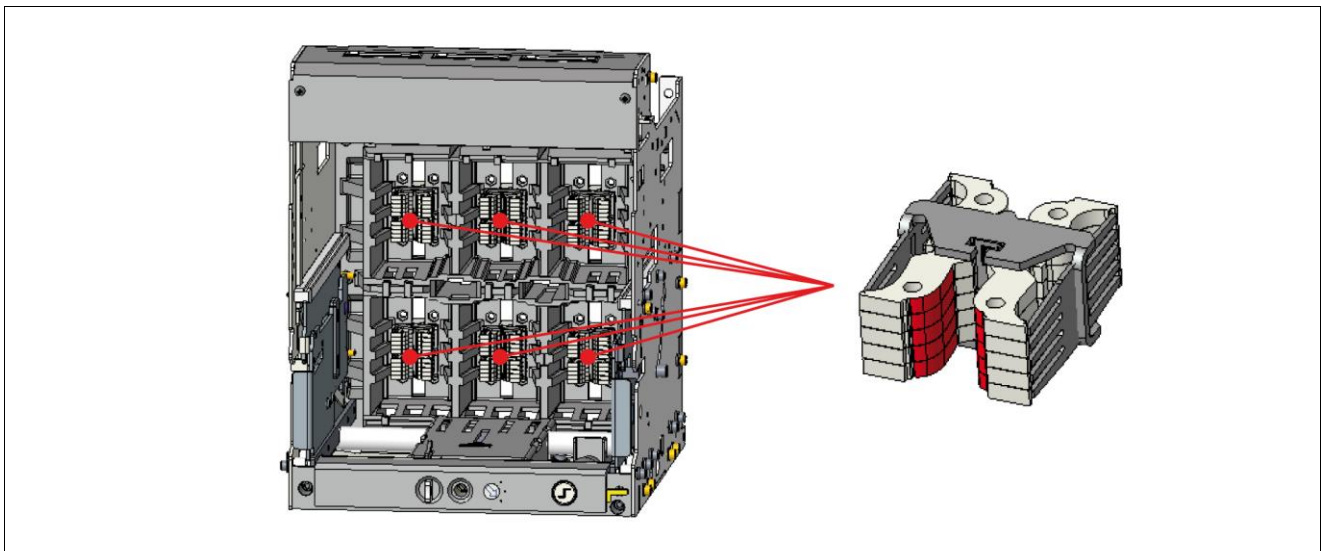


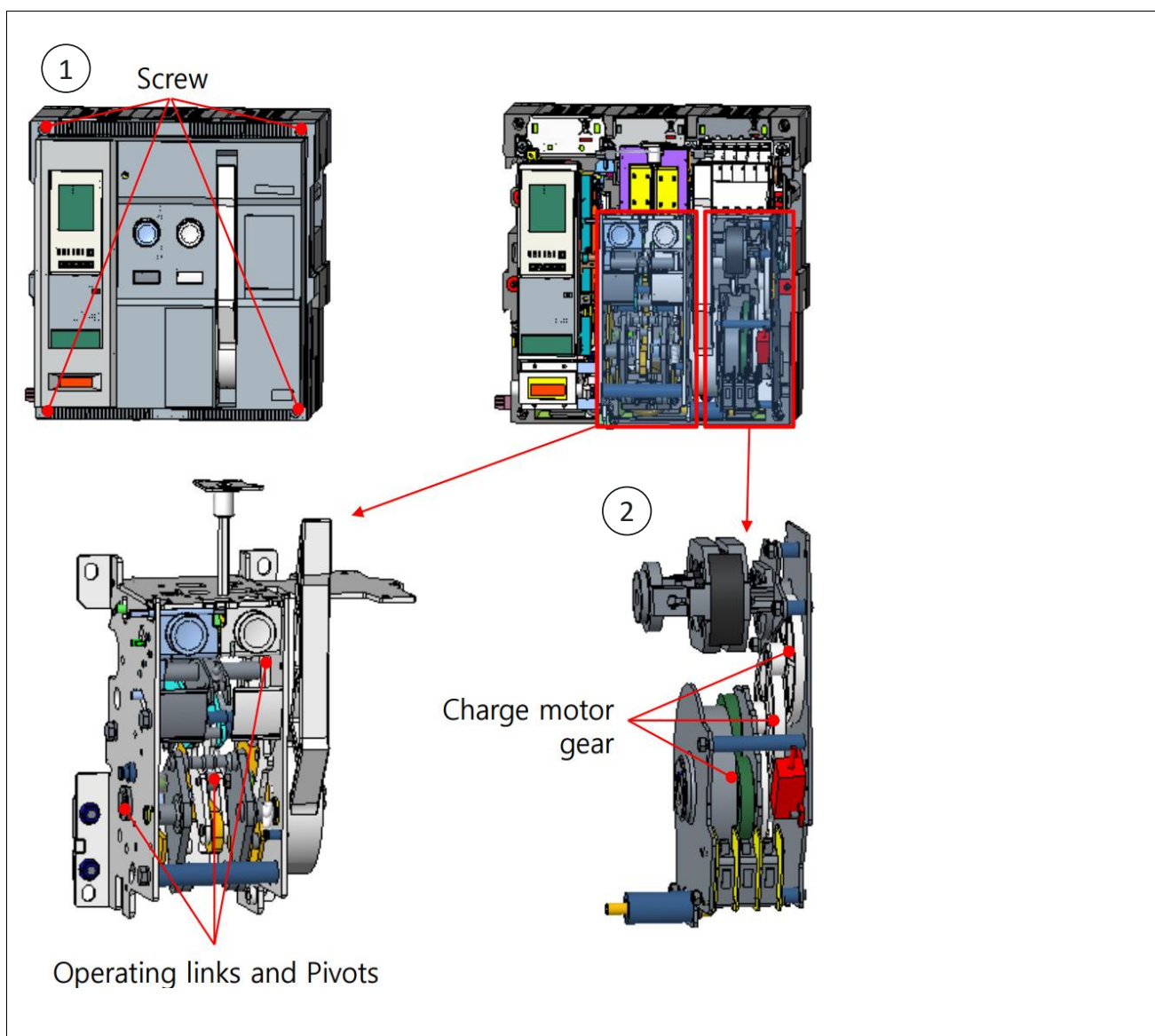
Fig. 7-2 Regreasing the lamellar contacts

- Regrease the shown regrease points.
 - Grease: Mobilgrease 28 or Mobiltemp SHC32

7.3 Regrease the mechanism of circuit breaker

Validity: **Drawout or fixed circuit breakers**

1. Loosen 4 **(1)** screws for removing Front cover
2. Remove old grease
3. Regreas parts **(2)** as below
 - Grease: Mobilgrease 28 or Mobiltemp SHC32



8 OCR tester

8.1 Scope of supply

- OCR tester (item number 1901-1001)
- Storage bag
- Power supply (100-240 V AC)
- Signal cable (2 pieces)

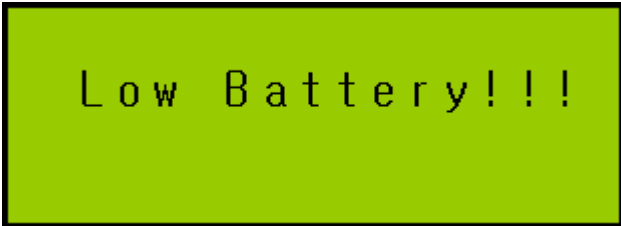
NOTICE

If you power the OCR tester with batteries, the batteries can discharge within a few hours when using the OCR tester intensely.

- Have replacement batteries ready.

8.2 Replace batteries

If the battery voltage of the OCR tester falls below 6 V, the OCR tester will interrupt the test. The display of the OCR tester will display the following message:



Low Battery!!!

Fig. 8-1 Battery voltage too low

1. In order to continue the test, replace the batteries (3• 9V battery).

8.3 Set-up

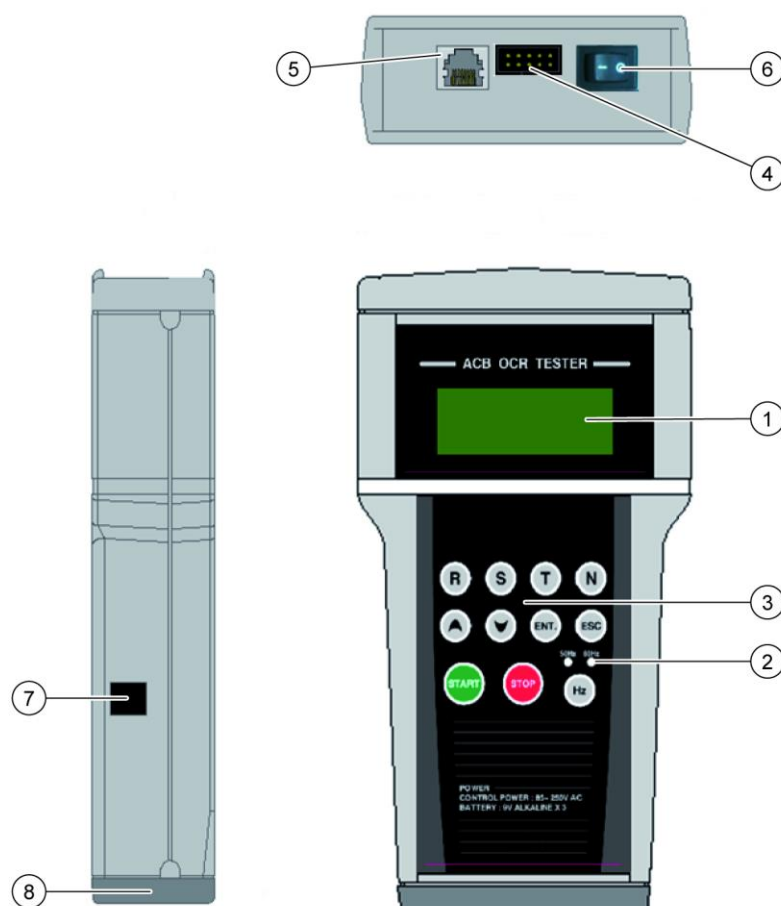


Fig. 8-2 Set-up of the OCR tester

- | | | | |
|---|---------------------|---|--------------------------------|
| 1 | Display | 5 | Connection for software update |
| 2 | Frequency indicator | 6 | On/Off switch |
| 3 | Operating keys | 7 | Connection for power supply |
| 4 | Signal output | 8 | Bottom flap (battery) |



Fig. 8-3 Operating keys of the OCR tester

R	Set phase R	ENT.	Save set value
S	Set phase S	ESC	Switch to main screen
T	Set phase T	START	Start test
N	Set phase N	STOP	Stop test
▲	Increase value	Hz	Change frequency between 50 and 60 Hz
▼	Reduce value		

8.4 Function

The OCR tester is used to check the over current relay of the circuit breaker.

The OCR tester can specify the current amplitude and phase position.

The OCR tester displays

- Moment of tripping
- Type of tripping
- Current amplitude and current phase position at tripping

3. Press any push-button.

- ↳ The mains supply from OCR tester to circuit breaker is enabled.
- ↳ The OCR tester displays the main screen:

```
R ●: 0.00∠0.0    IE
S ●: 0.00∠240.0
T ●: 0.00∠120.0
N  : 0.00∠0.0    In
```

4. Check the circuit breaker with the OCR tester (→ **Chap. 10**).

5. If the test is completed, press ,
until the display of the OCR tester shows the message "PRESS ANY KEY!".

- ↳ The mains supply from OCR tester to circuit breaker is disabled.

6. Turn off the OCR tester with the On/Off switch.

10 Check over current relay with OCR tester

10.1 Long-term test (overload protection L)

1. Record the set parameters of the over current relay.
2. Set the following parameters at the over current relay:

- $I_u = 1$
- $I_r = 1$
- $t_r = 4$
- $I_{sd} = \text{off}$
- $t_{sd} = 0.2 \text{ off}$
- $I_i = \text{off}$
- $I_g = \text{off}$
- $t_g = 0.4 \text{ off}$

3. Choose the frequency with .
↳ The corresponding LED is illuminated.

4. Press .
↳ The OCR tester displays:

OCR Type IEC/UL
: UL Type

5. Press .
↳ The OCR tester displays:

OCR Type IEC/UL
: IEC Type

6. Wait until the OCR tester automatically switches to the main screen (IEC type selected):

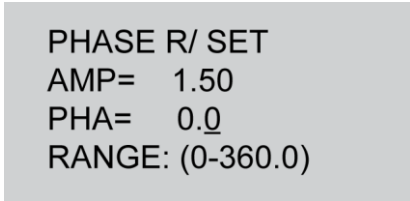
R ●: 0.00∠0.0 **IE**
S ●: 0.00∠240.0
T ●: 0.00∠120.0
N : 0.00∠0.0 In

7. Press  twice.
8. The OCR tester displays:

Current Base
: In

9. Press .

↳ The OCR tester displays:



```
PHASE R/ SET
AMP=  1.50
PHA=  0.0
RANGE: (0-360.0)
```

10. Set the amplitude with ,  and  to **6.00**.

11. Press .

↳ The OCR tester changes to the main screen.

12. Activate the phases R, S and T with ,  and : ● (activated), ○ (disabled).

13. Turn on the circuit breaker.

14. Press .

15. Check if the OCR tester trips the over current relay within the default time of **3.40 ... 4.60** seconds.

↳ In case of correct tripping, the LED **Ir** illuminates on the over current relay:



16. If the over current relay has tripped correctly, press , until the display of the OCR tester shows the message "PRESS ANY KEY!".

↳ The mains supply from OCR tester to circuit breaker is disabled.

17. If the over current relay has not tripped correctly, check the connections, the parameter settings and repeat the test.

18. If the over current relay never trips correctly, contact ConverterTec customer service.

19. Set the parameters of the over current relay which were recorded at the beginning of the test.

10.2 Short-term test (short-time delayed short-circuit protection S)

1. Record the set parameters of the over current relay.
2. Set the following parameters at the over current relay:

- $I_u = 1$
- $I_r = 1$
- $t_r = 4$
- $I_{sd} = 5$
- $t_{sd} = 0.1$ on
- $I_i = \text{off}$
- $I_g = \text{off}$
- $t_g = 0.4$ off

3. Choose the frequency with .

↳ The corresponding LED is illuminated.

4. Press .

↳ The OCR tester displays:

OCR Type IEC/UL
: UL Type

5. Press .

↳ The OCR tester displays:

OCR Type IEC/UL
: IEC Type

6. Wait until the OCR tester automatically switches to the main screen (IEC type selected):

R ●: 0.00∠0.0 
S ●: 0.00∠240.0
T ●: 0.00∠120.0
N : 0.00∠0.0 In

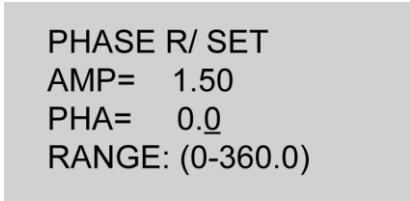
7. Press  twice.

8. The OCR tester displays:

Current Base
: In

9. Press .

↳ The OCR tester displays:



```
PHASE R/ SET
AMP=  1.50
PHA=  0.0
RANGE: (0-360.0)
```

10. Set the amplitude with ,  and  to **5.30**.

11. Press .

↳ The OCR tester changes to the main screen.

12. Activate the phases R, S and T with ,  and : ● (activated), ○ (disabled).

13. Turn on the circuit breaker.

14. Press .

15. Check if the OCR tester trips the over current relay within the default time of **0.29 ... 0.44** seconds.

↳ In case of correct tripping, the LED **Isd, li** illuminates on the over current relay:



16. If the over current relay has tripped correctly, press , until the display of the OCR tester shows the message "PRESS ANY KEY!".

↳ The mains supply from OCR tester to circuit breaker is disabled.

17. If the over current relay has not tripped correctly, check the connections, the parameter settings and repeat the test.

18. If the over current relay never trips correctly, contact ConverterTec customer service.

19. Set the parameters of the over current relay which were recorded at the beginning of the test.

10.3 Instantaneous test (Instantaneous short-circuit protection I)

1. Record the set parameters of the over current relay.
2. Set the following parameters at the over current relay:

- $I_u = 1$
- $I_r = 1$
- $t_r = 4$
- $I_{sd} = \text{off}$
- $t_{sd} = 0.1 \text{ on}$
- $I_i = 10$
- $I_g = \text{off}$
- $t_g = 0.4 \text{ off}$

3. Choose the frequency with  .
↳ The corresponding LED is illuminated.

4. Press  .
↳ The OCR tester displays:

OCR Type IEC/UL
: UL Type

5. Press  .
↳ The OCR tester displays:

OCR Type IEC/UL
: IEC Type

6. Wait until the OCR tester automatically switches to the main screen (IEC type selected):

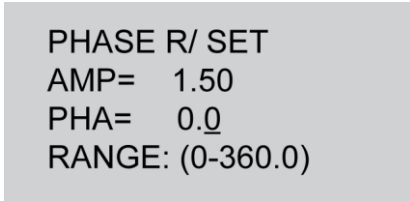
R ●: 0.00∠0.0 
S ●: 0.00∠240.0
T ●: 0.00∠120.0
N : 0.00∠0.0 In

7. Press  twice.
8. The OCR tester displays:

Current Base
: In

9. Press .

↳ The OCR tester displays:



```
PHASE R/ SET
AMP=  1.50
PHA=  0.0
RANGE: (0-360.0)
```

10. Set the amplitude with ,  and  to **10.50**.

11. Press .

↳ The OCR tester changes to the main screen.

12. Activate the phases R, S and T with ,  and : ● (activated), ○ (disabled).

13. Turn on the circuit breaker.

14. Press .

15. Check if the OCR tester trips the over current relay within the default time of **<0.05** seconds.

↳ In case of correct tripping, the LED **Isd**, **li** illuminates on the over current relay:



16. If the over current relay has tripped correctly, press , until the display of the OCR tester shows the message "PRESS ANY KEY!".

↳ The mains supply from OCR tester to circuit breaker is disabled.

17. If the over current relay has not tripped correctly, check the connections, the parameter settings and repeat the test.

18. If the over current relay never trips correctly, contact ConverterTec customer service.

19. Set the parameters of the over current relay which were recorded at the beginning of the test.

10.4 Earth leakage test (earth leakage protection G)

1. Record the set parameters of the over current relay.
2. Set the following parameters at the over current relay:

- $I_u = 1$
- $I_r = 1$
- $t_r = 4$
- $I_{sd} = \text{off}$
- $t_{sd} = 0.1 \text{ on}$
- $I_i = \text{off}$
- $I_g = 1$
- $t_g = 0.4 \text{ on}$

3. Choose the frequency with .

↳ The corresponding LED is illuminated.

4. Press .

↳ The OCR tester displays:

OCR Type IEC/UL
: UL Type

5. Press .

↳ The OCR tester displays:

OCR Type IEC/UL
: IEC Type

6. Wait until the OCR tester automatically switches to the main screen (IEC type selected):

R ●: 0.00∠0.0 **IE**
S ●: 0.00∠240.0
T ●: 0.00∠120.0
N : 0.00∠0.0 In

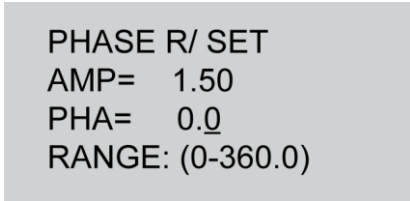
7. Press  twice.

8. The OCR tester displays:

Current Base
: In

9. Press .

↳ The OCR tester displays:



PHASE R/ SET
AMP= 1.50
PHA= 0.0
RANGE: (0-360.0)

10. Set the amplitude with ,  and  to **1.10**.

11. Press .

↳ The OCR tester changes to the main screen.

12. Activate phase R with  and disable the phases S and T with  and  :
● (activated), ○ (disabled).

13. Turn on the circuit breaker.

14. Press .

15. Check if the OCR tester trips the over current relay within the default time of **0.33 ... 0.49** seconds.

↳ In case of correct tripping, the LED **Ig, IΔn** illuminates on the over current relay:



16. If the over current relay has tripped correctly, press , until the display of the OCR tester shows the message "PRESS ANY KEY!".

↳ The mains supply from OCR tester to circuit breaker is disabled.

17. If the over current relay has not tripped correctly, check the connections, the parameter settings and repeat the test.

18. If the over current relay never trips correctly, contact ConverterTec customer service.

19. Set the parameters of the over current relay which were recorded at the beginning of the test.

10.5 Maintain maintenance protocol

Warranty is only granted if a maintenance protocol is filled in correctly, signed and sent to ConverterTec.

1. Fill in the maintenance protocol.
2. Send the maintenance protocol, which is filled in correctly and signed, within two weeks after maintenance to ConverterTec customer service.

11 Troubleshooting

- Observe the circuit diagram of the circuit breaker (→ **Chap. 13**).

Fault	Cause	Troubleshooting
The circuit breaker has tripped unexpectedly (no tripping of the over current relay).	UVT coil is not supplied with sufficient energy or is faulty.	► Check power supply of the UVT coil. ► Check UVT coil. ► If UVT coil is faulty, contact ConverterTec customer service.
The circuit breaker has tripped unexpectedly.	Short-circuit.	► Check circuit breaker (→ Chap. 12).
	Overload current too high when closing the circuit breaker.	► Check load at circuit breaker, analyse data trigger or change settings of the over current relay.
	Rotary switch at over current relay not engaged.	► Engage rotary switch.
Circuit breaker does not open automatically, but can be opened manually.	UVT coil has not opened the circuit breaker.	► Check control loop. ► Check UVT coil. ► If UVT coil is faulty, contact ConverterTec customer service.
	Over current relay is faulty.	► Contact ConverterTec customer service.
The circuit breaker cannot be opened – neither locally nor remotely.	Mechanical error.	► Contact ConverterTec customer service.
	Welded main contacts.	► Contact ConverterTec customer service.

Fault	Cause	Troubleshooting
The circuit breaker cannot be closed – neither locally nor remotely.	Circuit breaker locked in open position with Profalux padlocking system or mechanical interlocking.	► Unlock circuit breaker.
	Circuit breaker is not supplied with energy.	► Check power supply.
	Reset button OCR has not been pressed after tripping circuit breaker.	► Press reset button OCR.
	Spring not loaded.	► Load spring manually or with charging motor. ► Check power supply of the charging motor. ► If the error remains, contact ConverterTec customer service.
	Closing coil is supplied with energy but signal from "ready to close" signalling switch (RCS) is missing.	► Check signalling switch.
	UVT coil is not supplied with energy or is faulty.	► Check power supply of the UVT coil. ► Check UVT coil. ► If UVT coil is faulty, contact ConverterTec customer service.
	Continuous tripping request of the over current relay.	► Contact ConverterTec customer service.
The circuit breaker can be closed locally but not remotely.	Closing coil is not supplied with energy.	► Check voltage of the closing coil ($U_{ref} = 0.75 \dots 1.1 U_n$).
	Closing coil is faulty.	► Contact ConverterTec customer service.
Malfunction of charging motor.	Charging motor is not supplied with energy.	► Check power supply of the charging motor.
		► Check circuit of the charging motor.
		► Check power supply of the charging motor. ► If the error remains, contact ConverterTec customer service.
	Mechanical error.	► Contact ConverterTec customer service.

12 Check circuit breaker after tripping

The circuit breaker signals its tripping with the alarm contact AL (83-84) at the custom control system.

The over current relay displays the type of tripping via an LED.



CAUTION

Damage to property due to faulty circuit breaker

Other components may be damaged by a faulty circuit breaker.

- ⊗ Never operate the frequency converter system with a faulty circuit breaker.
- ▶ Repair or replace a faulty circuit breaker.

1. Disconnect the circuit breaker from the power supply.
2. Determine why the circuit breaker has tripped:
 - Check all connections to the circuit breaker.
 - Check the arc chambers (→ **Chap. 5**).
 - Check the main contacts (→ **Chap. 6**).
 - Check the circuit breaker for further abnormalities. Contact ConverterTec customer service, if required.
3. If you have found the cause for the error,
 - Repair the error.
 - Reassemble the circuit breaker (do NOT connect to power supply yet).
 - Close circuit breaker.
 - Service the circuit breaker (→ **Chap. 4**).
 - Reconnect the circuit breaker to power supply.
4. If you haven't found the cause for the error, replace the circuit breaker.

13 Circuit diagram

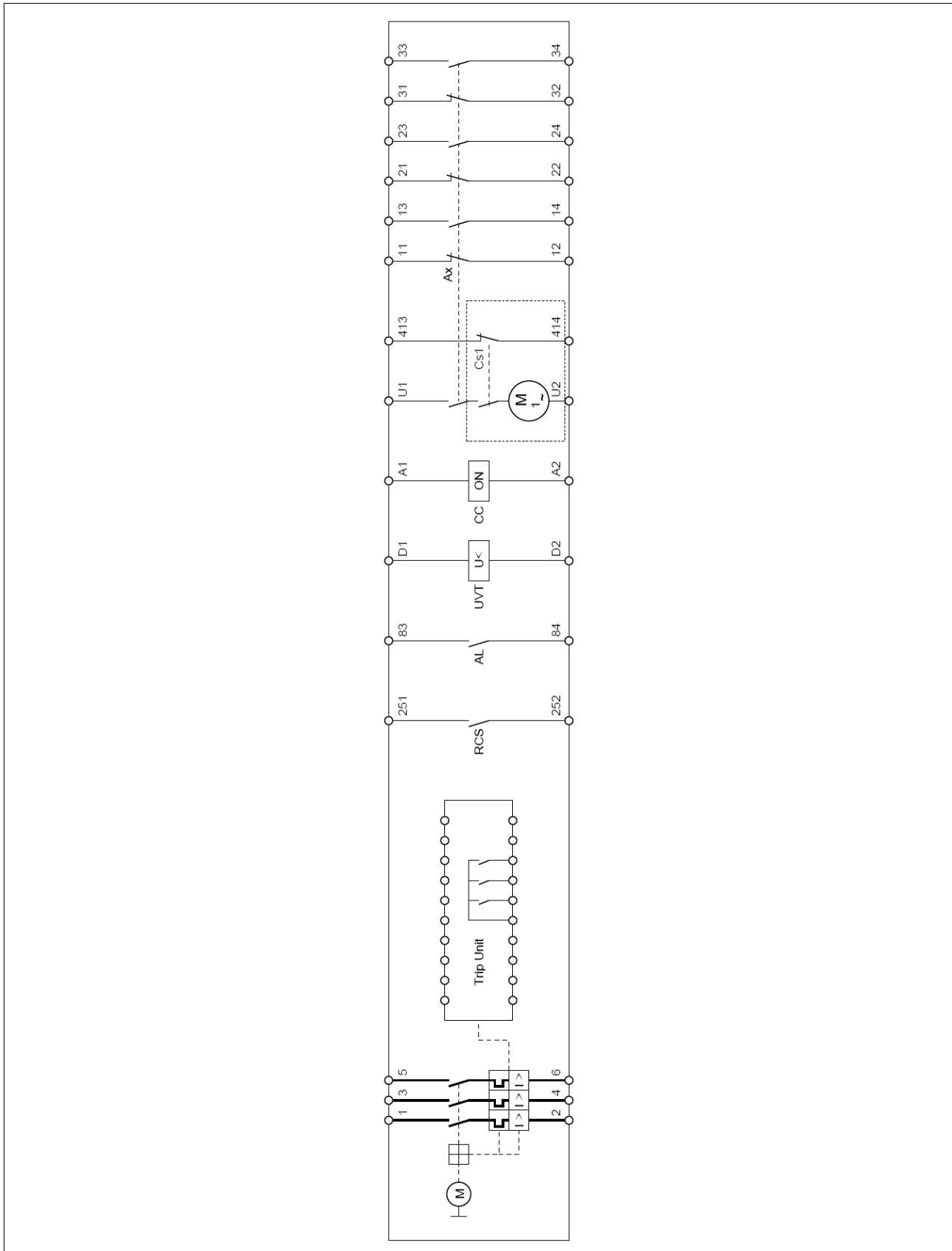


Fig. 13-1 Circuit diagram circuit breaker

14 Life cycle

Circuit breaker			Cycles		
			Main contacts	Charging motor	Closing coil/ UVT coil
Fixed CB	1733-1258	3200 A	10000	10000	10000
	KP-48327	4000 A			
	4930-2239				
Drawout CB	KP-48594	5000 A			
	KP-48630				



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