## 2.3 Control unit replacement (CCU)

### 2.3.1 Safe torque off function STO

Safe operation of **the STO must be verified** after any changes and maintenance work related to the safety function (circuit boards, wiring, components, settings, etc.). The acceptance test procedure is described in section 2.3.2. **More on STO and the *Acceptance test procedure* can be found in the ACX580 User's Manual.**

The drive supports the Safe torque off function according to standards EN 61800-5- 2:2007; EN ISO 13849-1:2008, IEC 61508, IEC 61511:2004 and EN 62061:2005. The function also corresponds to prevention of unexpected start-up of EN 1037.

The Safe torque off function disables the control voltage of the power semiconductors of the drive output stage, thus preventing the inverter from generating the voltage required to rotate the motor. By using this function, short-time operations (like cleaning) and/or maintenance work on non-electrical parts of the machinery can be performed without switching off the power supply of the drive.

**WARNING!** The Safe torque off function does not disconnect the voltage of the main and auxiliary circuits from the drive. Therefore maintenance work on electrical parts of the drive or the motor can only be carried out after isolating the drive from the main supply.

**WARNING!** (With permanent magnet motors only) In case of a multiple IGBT power semiconductor failure, the drive system can produce an alignment torque which maximally rotates the motor shaft by 180/*p* degrees regardless of the activation of the Safe torque off function. *p* denotes the number of pole pairs.

**Notes**:

- If a running drive is stopped by using the Safe torque off function, the drive will cut off the motor supply voltage and the motor will coast to a stop. If this causes danger or is not otherwise acceptable, stop the drive and machinery using the appropriate stop mode before activating the Safe torque off function.
- The Safe torque off function overrides all other functions of the drive unit.
- The Safe torque off function is ineffective against deliberate sabotage or misuse.
- The Safe torque off function has been designed to reduce the recognized hazardous conditions. In spite of this, it is not always possible to eliminate all potential hazards. The assembler of the machine must inform the final user about the residual risks.

### 2.3.2 Acceptance test procedure

The acceptance test of the safety function must be carried out by an authorized person with expertise and knowledge of the safety function. The test must be documented and signed by the authorized person. An authorized person is an individual with authorization from the machine builder or end user to carry out, report and sign off the safety function validation / acceptance testing on behalf of the machine builder or end user.

Signed acceptance test reports must be stored in the logbook of the machine. The report shall include documentation of start-up activities and test results, references to failure reports and resolution of failures. Any new acceptance tests performed due to changes or maintenance shall be logged into the logbook.

| **Action** | ☒ |
|---|---|
| Ensure that the drive can be run and stopped freely during start-up. | ☐ |
| Stop the drive (if running), switch the input power off and isolate the drive from the power line by a disconnector. | ☐ |
| Check the Safe torque off circuit connections against the wiring diagram. | ☐ |
| Close the disconnector and switch the power on. | ☐ |
| Test the operation of the STO function when the motor is stopped.<br>• Give a stop command for the drive (if running) and wait until the motor shaft is at a standstill.<br>Ensure that the drive operates as follows:<br>• Open the STO circuit. The drive generates an indication if one is defined for the ‘stopped’ state in parameter *31.22 STO indication run/stop*. For description of the warning, see ACX580 User’s Manual.<br>• Give a start command to verify that the STO function blocks the drive’s operation. The drive displays a warning. The motor should not start.<br>• Close the STO circuit.<br>• Reset any active faults. Restart the drive and check that the motor runs normally. | ☐ |
| Test the operation of the STO function when the motor is running.<br>• Start the drive and ensure the motor is running.<br>• Open the STO circuit. The motor should stop. The drive generates an indication if one is defined for the ‘running’ state in parameter *31.22 STO indication run/stop*. For description of the warning, see ACX580 User’s Manual.<br>• Reset any active faults and try to start the drive.<br>• Ensure that the motor stays at a standstill and the drive operates as described above in testing the operation when the motor is stopped.<br>• Close the STO circuit.<br>• Reset any active faults. Restart the drive and check that the motor runs normally. | ☐ |
| Document and sign the acceptance test report which verifies that the safety function is safe and accepted for operation. | ☐ |

### 2.3.3 Removing CCON-11 / CCON-23 from its assembly mechanics

In case there is a need to remove the control board from its assembly mechanics, operate as follows:

a. Lift the EIA/RS-485 module off, assist with a flathead screwdriver. Remove jumpers
b. Release the locking clamps and lift the board from its assembly plate. Pay attention to terminals and jumpers
c. Disconnect control panel cable
d. Replace CCON, connect control panel cable. Pay attention to the connectors and jumpers when installing CCON to its assembly mechanics

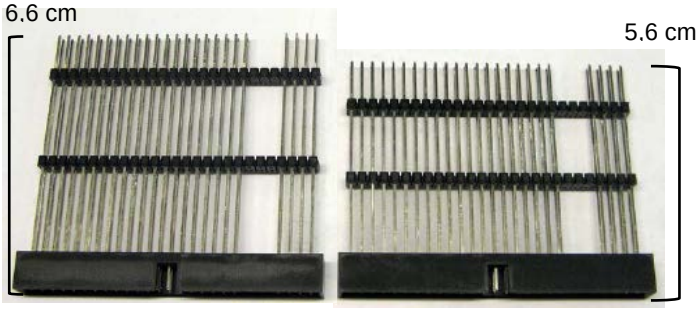
### 2.3.4 Removing CCON-12 from its assembly mechanics

In case there is a need to remove the control board from its assembly mechanics, operate as follows:

a. Release the locking clamps and lift the board from its assembly plate. Pay attention to terminals and jumpers
b. Replace CCON. Pay attention to the connectors and jumpers when installing CCON to its assembly mechanics

### 2.3.5 Rigid connectors for different frame sizes

A rigid connector is attached to the CCU-11 or CCU-23 unit but the length of the connector varies for different frame sizes:




| Ordering code | Length | Frames |
|---|---|---|
| 3AXD50000010956 | 6,6 cm / 2.36'' | Old R0-R2 |
| 3AXD50000010957 | 5,6 cm / 1.97'' | R3-R5 |

*Table 1: Rigid connector sizes*

New Models of the ACX580-01 use

| Ordering code | Frames |
|---|---|
| 3AXD50000150540 | New R1, R2 |

### 2.3.6 Frames R0-R1, CCU-11 or CCU-23 replacement

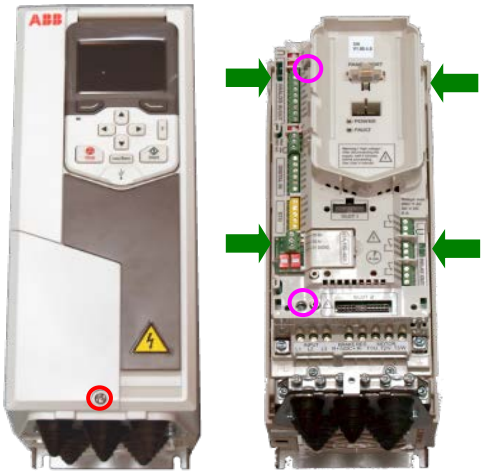
**Types:**

- ACX580-01-02A6-4
- ACX580-01-03A3-4
- ACX580-01-04A0-4
- ACX580-01-05A6-4
- ACX580-01-07A2-4
- ACX580-01-09A4-4
- ACX580-01-12A6-4

- ACX580-01-04A6-2
- ACX580-01-04A7-2
- ACX580-01-06A6-2
- ACX580-01-06A7-2
- ACX580-01-07A5-2
- ACX580-01-07A6-2
- ACX580-01-10A6-2
- ACX580-01-012A-2
- ACX580-01-017A-2
- ACX580-01-018A-2

- ACX580-01-02A1-4
- ACX580-01-02A7-4
- ACX580-01-03A0-4
- ACX580-01-03A4-4
- ACX580-01-03A5-4
- ACX580-01-04A1-4
- ACX580-01-04A8-4
- ACX580-01-05A7-4
- ACX580-01-06A0-4
- ACX580-01-07A3-4
- ACX580-01-07A6-4
- ACX580-01-09A9-4
- ACX580-01-012A-4
- ACX580-01-12A7-4

1. **Remove front cover**
   a. Remove control panel
   b. Open one mounting screw with a crosshead screwdriver
   c. Lift the front cover from the bottom and simultaneously push it upwards



2. **Replace CCU-11 or CCU-23 unit**
   a. Remove two fixing screws (M3x10)
   b. Loosen the locking clamps and pull the CCU unit off. Use a flathead screwdriver to assist. Pay attention to the rigid connector in the upper right corner (under the CCU unit)
   c. Attach the rigid connector to the new CCU. Ensure that it is properly connected before re-installing the CCU. Rigid connector sizes for different frames are listed in page 29.

3. **Install components in reverse order**

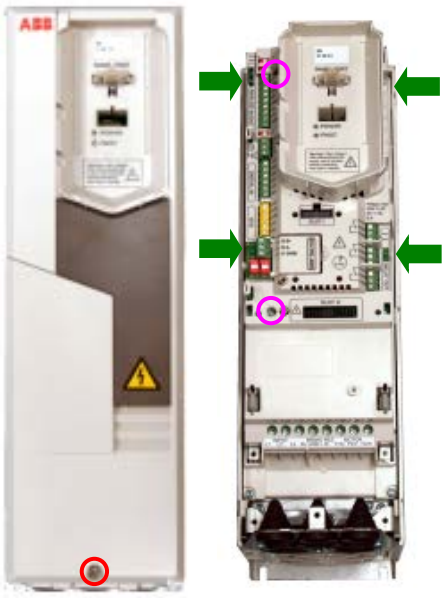
Use tightening torque 0,5 Nm (0.37 lbf-ft) for CCU screws.
When re-installing the front cover, ensure that the cover border sits properly.

### 2.3.7 Frame R2, CCU-11 or CCU-23 replacement

**Types:**

- ACX580-01-017A-4
- ACX580-01-025A-4

- ACX580-01-024A-2
- ACX580-01-025A-2
- ACX580-01-031A-2
- ACX580-01-032A-2
- ACX580-01-014A-4
- ACX580-01-018A-4
- ACX580-01-023A-4
- ACX580-01-026A-4
- ACX580-01-02A7-6
- ACX580-01-03A9-6
- ACX580-01-06A1-6
- ACX580-01-09A0-6
- ACX580-01-011A-6
- ACX580-01-017A-6



4. **Remove front cover**
   a. Remove control panel
   b. Open one mounting screw with a crosshead screwdriver
   c. Push the front cover slightly upwards and lift it off

5. **Replace CCU-11 or CCU-23 unit**
   a. Remove two fixing screws (M3x10)
   b. Loosen the locking clamps and pull the CCU unit off. Use a flathead screwdriver to assist. Pay attention to the rigid connector in the upper right corner (under the CCU unit)
   c. Attach the rigid connector to the new CCU. Ensure that it is properly connected before re-installing the CCU. Rigid connector sizes for different frames are listed in page 29.

6. **Install components in reverse order**

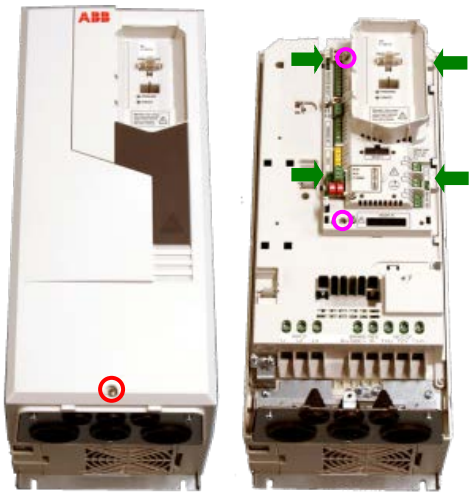
Use tightening torque 0,5 Nm (0.37 lbf-ft) for CCU screws

### 2.3.8 Frame R3, CCU-11 or CCU-23 replacement

- **Types:**
- ACX580-01-032A-4
- ACX580-01-038A-4
- ACX580-01-045A-4

- ACX580-01-046A-2
- ACX580-01-047A-2
- ACX580-01-059A-2
- ACX580-01-060A-2
- ACX580-01-027A-4
- ACX580-01-033A-4
- ACX580-01-034A-4
- ACX580-01-039A-4
- ACX580-01-044A-4
- ACX580-01-046A-4
- ACX580-01-022A-6
- ACX580-01-027A-6
- ACX580-01-032A-6

1. **Remove front cover**
   a. Remove control panel
   b. Open one mounting screw with a crosshead screwdriver
   c. Push the front cover slightly upwards and lift it off



2. **Replace CCU-11 or CCU-23 unit**
   a. Remove two fixing screws (M3x10)
   b. Loosen the locking clamps and pull the CCU unit off. Use a flathead screwdriver to assist. Pay attention to the rigid connector in the upper right corner (under the CCU unit)
   c. Attach the rigid connector to the new CCU. Ensure that it is properly connected before re-installing the CCU. Rigid connector sizes for different frames are listed in page 29.

3. **Install components in reverse order**

Use tightening torque 0,5 Nm (0.37 lbf-ft) for CCU screws

### 2.3.9 Frame R4 IP21, CCU-11 or CCU-23 replacement

**Types:**

- ACX580-01-062A-4
- ACX580-01-073A-4

- ACX580-01-088A-2
- ACX580-01-089A-2
- ACX580-01-114A-2
- ACX580-01-115A-2
- ACX580-01-078A-4
- ACX580-01-096A-4
- ACX580-01-041A-6
- ACX580-01-052A-6
- ACX580-01-062A-6
- ACX580-01-077A-6

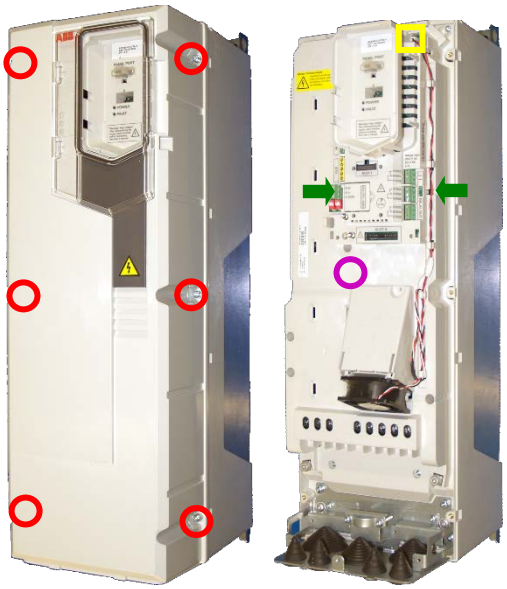
1. **Remove front cover**
   a. Remove control panel
   b. Open one mounting screw with a crosshead screwdriver
   c. Push the front cover slightly upwards and lift it off

2. **Replace CCU-11 or CCU-23 unit**
   a. Remove two fixing screws (M3x10)
   b. Loosen the locking clamps and pull the CCU unit off. Use a flathead screwdriver to assist. Pay attention to the rigid connector in the upper right corner (under the CCU unit)
   c. Attach the rigid connector to the new CCU. Ensure that it is properly connected before re-installing the CCU. Rigid connector sizes for different frames are listed in page 29.

3. **Install components in reverse order**

Use tightening torque 0,5 Nm (0.37 lbf-ft) for CCU screws

## 2.3.10 Frame R4 IP55, CCU-11 or CCU-23 replacement



**Types:**

- ACX580-01-062A-4+B056
- ACX580-01-073A-4+B056

- ACX580-01-088A-2+B056
- ACX580-01-089A-2+B056
- ACX580-01-114A-2+B056
- ACX580-01-115A-2+B056
- ACX580-01-078A-4+B056
- ACX580-01-096A-4+B056
- ACX580-01-041A-6+B056
- ACX580-01-052A-6+B056
- ACX580-01-062A-6+B056
- ACX580-01-077A-6+B056

1. **Remove front cover**
   a. Remove control panel
   b. Open six mounting screws with a screwdriver
   c. Push the front cover slightly upwards and lift it off

2. **Replace CCU-11 or CCU-23 unit**
   a. Remove fan connector
   b. Remove two fixing screws (M3x10)
   c. Loosen the locking clamps and pull the CCU unit off. Use a flathead screwdriver to assist. Pay attention to the rigid connector in the upper right corner (under the CCU unit)
   d. Attach the rigid connector to the new CCU. Ensure that it is properly connected before re-installing the CCU. Rigid connector sizes for different frames are listed in page 29.

3. **Install components in reverse order**

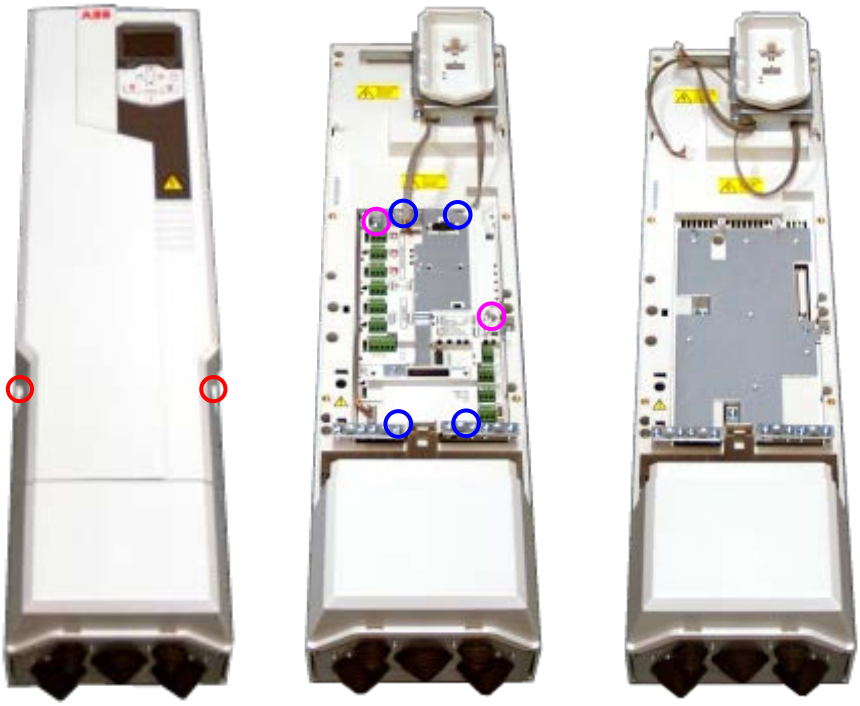
Use tightening torque 0,5 Nm (0.37 lbf-ft) for CCU screws

## 2.3.11 Frame R5v1, CCU-12 replacement

**Types:**

- ACX580-01-061A-4
- ACX580-01-072A-4
- ACX580-01-087A-4

1. **Remove front cover**
   a. Remove control panel
   b. Open two mounting screws with a torxhead screwdriver
   c. Remove the front cover



2. **Replace CCU-12 unit**
   a. Disconnect wires from CCU
   b. Remove fixing screws (2pcs of M4x8 and 4pcs of 4x12 PT)

3. **Install components in reverse order**

Use tightening torque 1,2 Nm (0.89 lbf-ft) for CCU screws

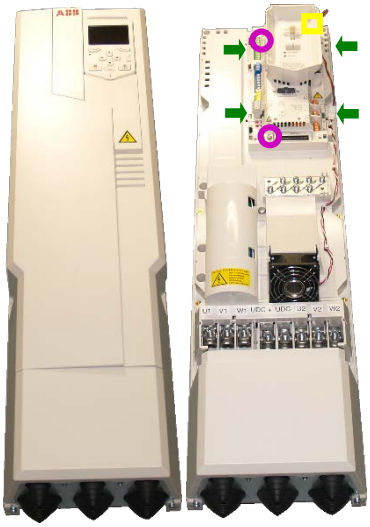
## 2.3.12 Frame R5v2, CCU-11 or CCU-23 replacement

**Types:**

- ACX580-01-106A-4

- ACX580-01-088A-2
- ACX580-01-089A-2
- ACX580-01-114A-2
- ACX580-01-115A-2
- ACX580-01-078A-4
- ACX580-01-096A-4
- ACX580-01-041A-6
- ACX580-01-052A-6
- ACX580-01-062A-6
- ACX580-01-077A-6

1. **Remove front cover**
   a. Remove control panel
   b. Open one mounting screw with a crosshead screwdriver
   c. Push the front cover slightly upwards and lift it off



2. **Replace CCU-11 or CCU-23 unit**
   a. Remove two fixing screws (M3x10)
   b. Loosen the locking clamps and pull the CCU unit off. Use a flathead screwdriver to assist. Pay attention to the rigid connector in the upper right corner (under the CCU unit)
   c. Attach the rigid connector to the new CCU. Ensure that it is properly connected before re-installing the CCU. Rigid connector sizes for different frames are listed in page 29.

3. **Install components in reverse order**

Use tightening torque 0,5 Nm (0.37 lbf-ft) for CCU screws