ACS880-1007LC liquid cooling unit
User's manual

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Introduction to the manual

Contents of this chapter
This chapter contains general information of the manual, a list of related manuals, and a list of terms and abbreviations.

Applicability
This manual applies to the ACS880-1007LC cooling units. The control program firmware version is 2.81.0.0 or later.

Safety instructions

WARNING!
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

Depending on the drive type, you can find the safety instructions either in the drive hardware manual (single drives), or in the separate safety instructions manual (multidrives cabinets and modules).

If you are not a qualified electrician, do not do installation or maintenance work.

Target audience
This manual is intended for people who plan the installation, install, start up, use and service the cooling unit. Read the manual before working on the unit. You are expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols.
Categorization by option code

The information which only concerns certain optional selection is marked with the option code in brackets. For example (option +E205). The options included in the unit are visible on the type designation label. The type designation key in the manual describes the meaning of the option codes.

Use of component designations

Some device names in the manual include the item designation in brackets, for example [Q20], to make it possible to identify the components in the circuit diagrams of the drive.

Terms and abbreviations

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control unit</td>
<td>Control board built in a housing (often rail-mountable)</td>
</tr>
<tr>
<td>Drive</td>
<td>Frequency converter for controlling AC motors</td>
</tr>
<tr>
<td>Frame, frame size</td>
<td>Physical size of the drive or power module</td>
</tr>
<tr>
<td>Inverter module</td>
<td>Inverter bridge, related components and drive DC link capacitors enclosed in a metal frame or enclosure. Intended for cabinet installation.</td>
</tr>
<tr>
<td>Inverter unit</td>
<td>Inverter module(s) under control of one control board, and related components. One inverter unit typically controls one motor.</td>
</tr>
<tr>
<td>LCU</td>
<td>Liquid cooling unit</td>
</tr>
<tr>
<td>PE</td>
<td>Protective earth (ground)</td>
</tr>
<tr>
<td>PI</td>
<td>Proportional-integral</td>
</tr>
<tr>
<td>Power module</td>
<td>Common term for drive module, inverter module, supply module, brake chopper module etc.</td>
</tr>
<tr>
<td>Supply module</td>
<td>Rectifier bridge and related components enclosed in a metal frame or enclosure. Intended for cabinet installation.</td>
</tr>
<tr>
<td>Supply unit</td>
<td>Supply module(s) under control of one control board, and related components.</td>
</tr>
<tr>
<td>ZCU</td>
<td>Type of control unit</td>
</tr>
</tbody>
</table>

Related manuals

- **Related single drive manuals**
  Single drive manuals: See the appropriate drive hardware manual.

- **Related multidrive manuals**

<table>
<thead>
<tr>
<th>Manual</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General manuals</strong></td>
<td></td>
</tr>
<tr>
<td>ACS880 liquid-cooled multidrive cabinets and modules safety instructions</td>
<td>3AXD50000048633</td>
</tr>
<tr>
<td>ACS880 liquid-cooled multidrive cabinets and modules electrical planning instructions</td>
<td>3AXD50000048634</td>
</tr>
<tr>
<td>ACS880 liquid-cooled multidrive cabinets mechanical installation instructions</td>
<td>3AXD50000048635</td>
</tr>
<tr>
<td>CIO-01 I/O module for distributed I/O bus control user's manual</td>
<td>3AXD50000126880</td>
</tr>
<tr>
<td><strong>Supply unit manuals</strong></td>
<td></td>
</tr>
<tr>
<td>ACS880-207LC IGBT supply units hardware manual</td>
<td>3AXD50000174782</td>
</tr>
<tr>
<td>ACS880 IGBT supply control program firmware manual</td>
<td>3AUA0000131562</td>
</tr>
<tr>
<td><strong>Inverter unit manuals</strong></td>
<td></td>
</tr>
<tr>
<td>ACS880-107LC inverter units hardware manual</td>
<td>3AXD50000196111</td>
</tr>
</tbody>
</table>
You can find manuals on the Internet. See www.abb.com/drives/documents. For manuals not available in the document library, contact your local ABB representative.

## Related component manuals

<table>
<thead>
<tr>
<th>Manual</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fusion-bonded plate heat exchangers Instruction Manual 76-400</td>
<td><a href="http://www.alfalaval.com">www.alfalaval.com</a></td>
</tr>
<tr>
<td>SPIRA-TROL K and L Series Two-port Control Valves Installation and Maintenance Instructions IM-S24-42</td>
<td><a href="http://www.spirax-sarco.com">www.spirax-sarco.com</a></td>
</tr>
<tr>
<td>AEL6 Series Smart Electric Actuators for DN15 to DN100 Control valves Installation and Maintenance Instructions IM-P358-24</td>
<td><a href="http://www.spirax-sarco.com">www.spirax-sarco.com</a></td>
</tr>
<tr>
<td>Flanged Strainers Installation and Maintenance Instructions IM-S60-18</td>
<td><a href="http://www.spirax-sarco.com">www.spirax-sarco.com</a></td>
</tr>
<tr>
<td>AUMA EQ60 part-turn actuator documentation</td>
<td><a href="http://www.auma.com">www.auma.com</a></td>
</tr>
</tbody>
</table>
Contents of this chapter
This chapter describes the operation basics and the hardware of the cooling unit.

Basics
ACS880-1007LC is a liquid cooling unit (LCU) for the ACS880 drives. The cooling unit forms a closed-loop cooling system (internal circuit) together with the piping and heat exchangers in the drive. The unit pumps the coolant through the heat exchangers in the drive, and the liquid-to-liquid heat exchanger in the LCU. The drive heat exchangers transfer the heat out of the drive cubicles. The external cooling circuit conveys the heat out of the liquid-to-liquid heat exchanger of the LCU.

The internal cooling circuit is equipped with an expansion vessel which damps the pressure variations due to liquid volume changes with temperature. The expansion vessel is located at the inlet of the cooling unit pump to provide stable pressure for the pump. The internal cooling circuit is also equipped with a control valve. The valve adjusts the flow suitable for the internal circuit of the drive. Optimal flow depends on the size of the drive (and cooling circuit). ABB defines and adjusts the setting for a cooling unit installed in the drive cabinet line-up.

The user must design, build and couple the external cooling circuit for the LCU. The user must also balance the cooling capacity of the LCU with the drive losses in order to sustain efficient cooling. The fine tuning is done by adjusting or controlling the flow in the external cooling circuit typically. There is a 2-way control valve available (option +C242) for the control of the external circuit coolant flow.

There are two cooling unit types available: one-pump unit and two-pump unit. With the two pump unit:
16 Operation basics and hardware description

- only one pump is in operation at the time\textsuperscript{1)
- the cooling unit alternates the pump in duty automatically (reduces wear)
- the user can disconnect one pump from the system in case of a failure, and still continue the operation (reduces downtime).

\textsuperscript{1) Exception: There is a Two pumps running option (+C213) available for large drives that require exceptionally high flow in the internal cooling unit.

Layout drawing – ACS880-1007LC-0070 in cabinet line-up

This figure shows the interior of the cooling unit which is attached to the right end of the drive cabinet line-up. The user connects the external cooling circuit from right.
##  ACS880-1007LC-0070 component designations

The table below lists the component designations used in layout drawings, piping and instrumentation (PI) diagrams, and circuit diagrams.

<table>
<thead>
<tr>
<th>Layout dr.</th>
<th>PI diag.</th>
<th>Circuit diag.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-</td>
<td>-</td>
<td>Outlet to internal cooling circuit</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>-</td>
<td>Inlet from internal cooling circuit</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>-</td>
<td>Inlet from external cooling circuit</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>-</td>
<td>Outlet to external cooling circuit</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>-</td>
<td>Pump de-airing screw</td>
</tr>
<tr>
<td>GA-201</td>
<td>GA-201</td>
<td>-M201</td>
<td>Coolant pump 1</td>
</tr>
<tr>
<td>EA-100</td>
<td>EA-100</td>
<td>-</td>
<td>Heat exchanger</td>
</tr>
<tr>
<td>PA-102</td>
<td>PA-102</td>
<td>-</td>
<td>Expansion vessel</td>
</tr>
<tr>
<td>VA-103</td>
<td>VA-103</td>
<td>-</td>
<td>Automatic float air vent</td>
</tr>
<tr>
<td>PT-201</td>
<td>PT-201</td>
<td>-T201</td>
<td>Inlet pressure transmitter with low limit alarm</td>
</tr>
<tr>
<td>PT-202</td>
<td>PT-202</td>
<td>-T202</td>
<td>Outlet pressure transmitter</td>
</tr>
<tr>
<td>PI-203</td>
<td>PI-203</td>
<td>-</td>
<td>Coolant pressure gauge</td>
</tr>
<tr>
<td>-</td>
<td>TIA(C)-210</td>
<td>-</td>
<td>Coolant temperature indicator and alarm (and control, if option +C242). This device is the LCU control unit.</td>
</tr>
<tr>
<td>TT-201</td>
<td>TT-201</td>
<td>-B201</td>
<td>Coolant temperature transmitter</td>
</tr>
<tr>
<td>TT-202</td>
<td>TT-202</td>
<td>-B202</td>
<td>Ambient temperature transmitter</td>
</tr>
<tr>
<td>TT-210</td>
<td>TT-210</td>
<td>(-A210)</td>
<td>Cabinet temperature transmitter</td>
</tr>
<tr>
<td>TT-211</td>
<td>TT-211</td>
<td>-B211</td>
<td>Coolant temperature transmitter if 2-way valve is installed (option +C242)</td>
</tr>
<tr>
<td>V0001</td>
<td>V0001</td>
<td>-</td>
<td>Shut-off valve for automatic float air vent</td>
</tr>
<tr>
<td>V0002</td>
<td>V0002</td>
<td>-</td>
<td>Pressure transmitter (PT-201) shut-off valve</td>
</tr>
<tr>
<td>V0008</td>
<td>V0008</td>
<td>-</td>
<td>Pressure transmitter (PT-202) shut-off valve</td>
</tr>
<tr>
<td>V0009</td>
<td>V0009</td>
<td>-</td>
<td>Pressure gauge (PI-203) shut-off valve</td>
</tr>
<tr>
<td>V0003</td>
<td>V0003</td>
<td>-</td>
<td>Expansion vessel shut-off valve</td>
</tr>
<tr>
<td>V0004,</td>
<td>V0004,</td>
<td>V0006</td>
<td>Pump shut-off valves</td>
</tr>
<tr>
<td>V0006</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V0010</td>
<td>V0010</td>
<td>-</td>
<td>Drain/fill valve (internal circuit LCU inlet)</td>
</tr>
<tr>
<td>V0011</td>
<td>V0011</td>
<td>-</td>
<td>Expansion vessel bleed valve</td>
</tr>
<tr>
<td>V0012</td>
<td>V0012</td>
<td>-</td>
<td>Drain valve (internal circuit LCU outlet)</td>
</tr>
<tr>
<td>V0014</td>
<td>V0014</td>
<td>-</td>
<td>Fill valve (Internal circuit LCU outlet)</td>
</tr>
<tr>
<td>V0013</td>
<td>V0013</td>
<td>-</td>
<td>Safety relief valve for UL (option +C129)</td>
</tr>
<tr>
<td>V0016</td>
<td>V0016</td>
<td>-</td>
<td>Control valve</td>
</tr>
<tr>
<td>V0018</td>
<td>V0018</td>
<td>-</td>
<td>Control valve if 2-way valve is installed (option +C242)</td>
</tr>
<tr>
<td>V0019</td>
<td>V0019</td>
<td>-</td>
<td>Shut off valve for the Safety relief valve (with option +C129 only)</td>
</tr>
<tr>
<td>-</td>
<td>SA-104</td>
<td>-</td>
<td>Strainer (with option +C242 only)</td>
</tr>
<tr>
<td>LA-201</td>
<td>LA-201</td>
<td>S201</td>
<td>Leakage detector</td>
</tr>
<tr>
<td>-</td>
<td>LA-211</td>
<td>S211</td>
<td>Leakage detector</td>
</tr>
</tbody>
</table>
Layout drawing – ACS880-1007LC-0195 in cabinet line-up

Page 1/2. These figures show the interior of the cooling unit which is attached to the right end of the drive cabinet line-up. The user connects the external cooling circuit from right.
### ACS880-1007LC-0195 component designations

The table below lists the component designations used in layout drawings, piping and instrumentation (PI) diagrams, and circuit diagrams.

<table>
<thead>
<tr>
<th>Layout dr.</th>
<th>PI diag.</th>
<th>Circuit diag.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>-</td>
<td>-</td>
<td>Outlet to and inlet from internal cooling circuit</td>
</tr>
<tr>
<td>3, 4</td>
<td>-</td>
<td>-</td>
<td>Inlet from and outlet to external cooling circuit</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>-</td>
<td>Pump de-airing screw</td>
</tr>
<tr>
<td>GA-201</td>
<td>GA-201</td>
<td>-M201</td>
<td>Coolant pump 1</td>
</tr>
<tr>
<td>GA-202</td>
<td>GA-202</td>
<td>-M202</td>
<td>Coolant pump 2</td>
</tr>
<tr>
<td>EA-100</td>
<td>EA-100</td>
<td>-</td>
<td>Heat Exchanger</td>
</tr>
<tr>
<td>PA-102</td>
<td>PA-102</td>
<td>-</td>
<td>Expansion vessel</td>
</tr>
<tr>
<td>VA-103</td>
<td>VA-103</td>
<td>-</td>
<td>Automatic float air vent</td>
</tr>
<tr>
<td>PT-201</td>
<td>PT-201</td>
<td>-T201</td>
<td>Inlet pressure transmitter with low limit alarm</td>
</tr>
<tr>
<td>PT-202</td>
<td>PT-202</td>
<td>-T202</td>
<td>Outlet pressure transmitter</td>
</tr>
<tr>
<td>PI-203</td>
<td>PI-203</td>
<td>-</td>
<td>Coolant pressure gauge</td>
</tr>
<tr>
<td>TIA(C)-210</td>
<td>-</td>
<td>-</td>
<td>Coolant temperature indicator and alarm (and control, if option +C242)</td>
</tr>
<tr>
<td>TT-201</td>
<td>TT-201</td>
<td>-B201</td>
<td>Coolant temperature transmitter</td>
</tr>
<tr>
<td>TT-202</td>
<td>TT-202</td>
<td>-B202</td>
<td>Ambient temperature transmitter</td>
</tr>
<tr>
<td>TT-210</td>
<td>TT-210</td>
<td>-(A210)</td>
<td>Cabinet temperature transmitter</td>
</tr>
<tr>
<td>TT-211</td>
<td>TT-211</td>
<td>-B211</td>
<td>Coolant temperature transmitter if 2-way valve is installed (option +C242)</td>
</tr>
<tr>
<td>V0001</td>
<td>V0001</td>
<td>-</td>
<td>Shut-off valve for automatic float air vent</td>
</tr>
<tr>
<td>V0002</td>
<td>V0002</td>
<td>-</td>
<td>Pressure transmitters (PT-201) shut-off valve</td>
</tr>
<tr>
<td>V0008</td>
<td>V0008</td>
<td>-</td>
<td>Pressure transmitter (PT-202) shut-off valve</td>
</tr>
<tr>
<td>V0009</td>
<td>V0009</td>
<td>-</td>
<td>Pressure gauge (PI-203) shut-off valve</td>
</tr>
<tr>
<td>V0003</td>
<td>V0003</td>
<td>-</td>
<td>Expansion vessel shut-off valve</td>
</tr>
<tr>
<td>V0004, V0005, V0006, V0007</td>
<td>V0004, V0005, V0006, V0007</td>
<td>-</td>
<td>Pump shut-off/check valves</td>
</tr>
<tr>
<td>V0010</td>
<td>V0010</td>
<td>-</td>
<td>Drain/fill valve (internal circuit LCU inlet)</td>
</tr>
<tr>
<td>V0011</td>
<td>V0011</td>
<td>-</td>
<td>Expansion vessel bleed valve</td>
</tr>
<tr>
<td>V0012</td>
<td>V0012</td>
<td>-</td>
<td>Drain/fill valve (internal circuit LCU outlet)</td>
</tr>
<tr>
<td>V0014</td>
<td>V0014</td>
<td>-</td>
<td>Fill valve (internal circuit LCU outlet)</td>
</tr>
<tr>
<td>V0013</td>
<td>V0013</td>
<td>-</td>
<td>Safety relief valve for UL (option +C129)</td>
</tr>
<tr>
<td>V0016</td>
<td>V0016</td>
<td>-</td>
<td>Control valve</td>
</tr>
<tr>
<td>V0015</td>
<td>V0015</td>
<td>-</td>
<td>Shut off valve for extra LCU cubicle cooler (with option +C213 only)</td>
</tr>
<tr>
<td>V0017</td>
<td>V0017</td>
<td>-</td>
<td>Shut off valve for extra LCU cubicle cooler (with option +C213 only)</td>
</tr>
<tr>
<td>V0018</td>
<td>V0018</td>
<td>-</td>
<td>Control valve (option +C242)</td>
</tr>
<tr>
<td>SA-104</td>
<td>-</td>
<td>-</td>
<td>Strainer (with option +C242 only)</td>
</tr>
<tr>
<td>V0019</td>
<td>V0019</td>
<td>-</td>
<td>Shut off valve for the Safety relief valve (with option +C129 only)</td>
</tr>
<tr>
<td>LA-201</td>
<td>LA-201</td>
<td>S201</td>
<td>Leakage detector</td>
</tr>
<tr>
<td>LA-211</td>
<td>-</td>
<td>S211</td>
<td>Leakage detector</td>
</tr>
</tbody>
</table>
Layout drawing – ACS880-1007LC-0195 stand-alone (option +C139)

This figure shows a stand-alone cooling unit. The user connects both the internal and external cooling circuits from right.

The components are described in section Layout drawing – ACS880-1007LC-0195 in cabinet line-up (page 18).
Layout drawing – 2-way control valve cubicle (option +C242) for ACS880-1007LC-0070

This figure shows the control valve cubicle for ACS880-1007LC-0070 in cabinet line-up. The cooling cubicle is on the left (not visible), and the external cooling circuit connection is on the right.

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Actuator for control valve</td>
</tr>
<tr>
<td>2</td>
<td>Circuit breaker for actuator</td>
</tr>
<tr>
<td>3</td>
<td>Control valve</td>
</tr>
<tr>
<td>4</td>
<td>Strainer</td>
</tr>
<tr>
<td>5</td>
<td>Leakage detector</td>
</tr>
</tbody>
</table>
**Layout drawing – 2-way control valve cubicle (option +C242) for ACS880-1007LC-0195**

This figure shows the control valve cubicle for ACS880-1007LC-0195 in cabinet line-up. The cooling unit cubicle is on the left (not visible), and the external cooling circuit connection is on the right.

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Actuator for control valve</td>
</tr>
<tr>
<td>2</td>
<td>Circuit breaker for actuator</td>
</tr>
<tr>
<td>3</td>
<td>Control valve</td>
</tr>
<tr>
<td>4</td>
<td>Strainer</td>
</tr>
<tr>
<td>5</td>
<td>Leakage detector</td>
</tr>
</tbody>
</table>
Swing out frame for electric devices in ACS880-1007LC-0070

1. Terminal block (X201)
2. Motor protective circuit breaker for pump (F201)
3. Circuit breaker for control voltage (F210)
4. Main contactor for pump (Q201)
5. 24 V DC power supply (for control board) (T210)
6. Power supply for lighting (T130)
7. Buffer unit (C210)
8. ZCU control unit (A210)
9. Terminal block (X211)
10. Cooling fan (G210)
11. Manual pump control switch (S210)
Swing out frame for electric devices in ACS880-1007LC-0195

1 Terminal block (X201)
2 Motor protective circuit breaker for pump (F201, F202)
3 Circuit breakers for control voltage (F210)
4 Main contactor for pump (Q201, Q202)
5 Manual pump control switch (S210)
6 24 V DC power supply (for control board) (T210)
7 Power supply for lighting (T130)
8 Cooling fan (G210)
9 Buffer unit (C210)
10 ZCU control unit (A210)
11 Terminal block (X211)
Control interfaces

■ General

The control program runs on the ZCU-14 control unit. The IO interface of the control unit is:

- the standard interface for the internal control and status signals (pump status, pressure monitoring, pump on/off, etc.)
- the default interface for the external control signals (start, reset, fault indication).

User cannot change the interface for the internal signals. For the external signals, user can use these signal interfaces also in addition to, or instead of the IO interface:

- a control panel (optional), or a PC with the Drive composer PC tool (optional)
- a fieldbus adapter module (optional)
- A DDCS communication adapter (optional).

When the cooling unit is part of the ABB drive cabinet line up, the drive supply unit controls the cooling unit as standard. That is: No customer wiring or setting is required. The external control signals of the cooling unit are wired from the drive supply unit and the related settings in the cooling unit control program are done at the factory. However, if there is a need to change the external control interface, user can do it with the control panel and the interface selection parameter (20.03):

- When the control panel is on the local control mode, the control panel is the control interface (despite of any parameter value).
- When the control panel is on the remote control mode, the interface selection parameter defines the control interface in use.

The user can switch between local and remote control modes by the Loc/Rem key of the control panel.

■ Control panel

Typically, there is a dedicated control panel in a stand-alone cooling unit, and when the unit is part of the multidrive cabinet line-up. When the unit is part of the single drive cabinet line-up, there is no dedicated panel for the cooling unit but the drive panel can also communicate with the cooling unit.

■ IO interface of the control unit

This table shows the signals of the control unit IO interface. The external control signal interfaces are marked with *. The other signals are internal (no user wiring is allowed/possible).

<table>
<thead>
<tr>
<th>IO</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI1</td>
<td>XDI.1</td>
<td>Status of the pump 1 motor protective circuit breaker and main contactor (1 = ON)</td>
</tr>
<tr>
<td>DI2</td>
<td>XDI.2</td>
<td>Status of the pump 2 motor protective circuit breaker and main contactor (1 = ON). Not in use in one-pump cooling unit.</td>
</tr>
<tr>
<td>DI3</td>
<td>XDI.3</td>
<td>Leakage detector (1 = LEAKAGE)</td>
</tr>
<tr>
<td>DI4</td>
<td>XDI.4</td>
<td>Reset (1 = RESET)*</td>
</tr>
<tr>
<td>DI5</td>
<td>XDI.5</td>
<td>Not in use</td>
</tr>
<tr>
<td>DI6</td>
<td>XDI.6</td>
<td>Start signal (1 = START)*</td>
</tr>
<tr>
<td>DIO1</td>
<td>XDIO.1</td>
<td>Not in use</td>
</tr>
<tr>
<td>DIO2</td>
<td>XDIO.1</td>
<td>Not in use</td>
</tr>
<tr>
<td>IO</td>
<td>Designation</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>DIIL</td>
<td>XD24.1</td>
<td>Not in use</td>
</tr>
<tr>
<td>RO1</td>
<td>XRO1</td>
<td>Pump 1 control (1 = RUN)</td>
</tr>
<tr>
<td>RO2</td>
<td>XRO2</td>
<td>Pump 2 control (1 = RUN). Not in use in one-pump cooling unit.</td>
</tr>
<tr>
<td>RO3</td>
<td>XRO3</td>
<td>Fault indication (0 = Fault)*</td>
</tr>
<tr>
<td>AI1</td>
<td>XAI.4-5</td>
<td>Inlet pressure sensor</td>
</tr>
<tr>
<td>AI2</td>
<td>XAI.6-7</td>
<td>Outlet pressure sensor</td>
</tr>
<tr>
<td>AO1</td>
<td>XAO.1-2</td>
<td>2-way control valve control (option +C242)</td>
</tr>
<tr>
<td>AO2</td>
<td>XAO.3-4</td>
<td>Not in use</td>
</tr>
<tr>
<td>X209</td>
<td></td>
<td>Ambient temperature sensor</td>
</tr>
</tbody>
</table>

**IO interface of the FAIO-01 analog interface module**

This table shows the signals of the FAIO-01 analog interface module. The module is attached on the control unit as standard.

<table>
<thead>
<tr>
<th>IO</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI1</td>
<td>XA1</td>
<td>Internal circuit coolant temperature measurement from the sensor</td>
</tr>
<tr>
<td>AI2</td>
<td>XAI2</td>
<td>External circuit coolant temperature measurement from the sensor (option +C242)</td>
</tr>
<tr>
<td>AO1</td>
<td>XAO1</td>
<td>Supply for internal circuit coolant temperature measurement</td>
</tr>
<tr>
<td>AO2</td>
<td>XAO2</td>
<td>Supply for external circuit coolant temperature measurement (option +C242)</td>
</tr>
</tbody>
</table>

**Use of the control unit expansion slots**

The control unit has three expansion slots. This table shows the use of the slots.

<table>
<thead>
<tr>
<th>Slot</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slot 1</td>
<td>FAIO-01 analog interface module (standard). Interface for the coolant temperature monitoring.</td>
</tr>
<tr>
<td>Slot 2</td>
<td>FENA-11 Ethernet adapter module (optional), or I/O extension module (optional). You can connect a PC with drive PC tool via Ethernet to FENA adapter and further to the cooling unit.</td>
</tr>
<tr>
<td>Slot 3</td>
<td>Fieldbus adapter module (optional), I/O extension module (optional) or FDCO-01 DDCS adapter module and FDPI-02 for panel bus adapter (optional)</td>
</tr>
</tbody>
</table>

**PC connection**

There is a USB connector on the control panel that can be used for connecting a PC to the cooling unit. When a PC is connected via the control panel, the control panel keypad is disabled.

If the cooling unit is equipped with an Ethernet adapter module FENA-11 or -21 (option +K473 or +K475), user can connect the PC via the module with an Ethernet cable.
Type designation label

The type designation (code) is printed on the type designation label of the cooling unit. It describes the composition of the unit in short. The complete designation is divided in sub-codes:

- The first digits form the basic code. It describes the basic construction of the unit. The fields in the basic code are separated by hyphens.
- The option codes (plus codes) come after the basic code. Each option code starts with an identifying letter (common for the whole product series), followed by descriptive digits. The plus codes are separated by plus signs.

### Basic code

The table below describes the fields of the basic code. ACS880-1007LC-0070-7 is used as an example.

<table>
<thead>
<tr>
<th>Fields</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACS880</td>
<td>Product series. ACS880: Industrial drives.</td>
</tr>
<tr>
<td>1007LC</td>
<td>Unit identifier. 1007LC: Cooling unit. Standard features (if not defined otherwise by the option codes): 50 Hz power supply, IP42 (UL Type 1), pipe connections from right, industrial water in external cooling circuit, 230 V AC control voltage, door hinges on right, bottom cable entry, standard cable entry plate, manuals on USB stick, coolant Antifrogen® L 25%.</td>
</tr>
<tr>
<td>0070</td>
<td>Unit size. 0070: 70 kW, 0195: 195 kW.</td>
</tr>
<tr>
<td>7</td>
<td>Voltage rating of the compatible drive line up. 7: 660/690 V AC.</td>
</tr>
</tbody>
</table>
## Option codes (plus codes)

The table below describes the option codes (plus codes).

<table>
<thead>
<tr>
<th>Plus code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A012</td>
<td>Supply frequency 50 Hz</td>
</tr>
<tr>
<td>A013</td>
<td>Supply frequency 60 Hz (The actual design does not differ from +A012.)</td>
</tr>
<tr>
<td>B054</td>
<td>IP42, UL type 1</td>
</tr>
<tr>
<td>B055</td>
<td>IP54, UL type 12</td>
</tr>
<tr>
<td>C121</td>
<td>Marine construction</td>
</tr>
<tr>
<td>C129</td>
<td>UL-approved</td>
</tr>
<tr>
<td>C132</td>
<td>Marine type approved</td>
</tr>
<tr>
<td>C134</td>
<td>CSA-approved</td>
</tr>
<tr>
<td>C138</td>
<td>Line-up connected cooling unit</td>
</tr>
<tr>
<td>C139</td>
<td>Stand alone cooling unit</td>
</tr>
<tr>
<td>C140</td>
<td>Single pump cooling unit</td>
</tr>
<tr>
<td>C141</td>
<td>Redundant pump cooling unit</td>
</tr>
<tr>
<td>C142</td>
<td>Bottom pipe connection</td>
</tr>
<tr>
<td>C143</td>
<td>Pipe connection on right</td>
</tr>
<tr>
<td>C144</td>
<td>Pipe connection on left</td>
</tr>
<tr>
<td>C145</td>
<td>ANSI flanges</td>
</tr>
<tr>
<td>C146</td>
<td>Sea water (external cooling circuit)</td>
</tr>
<tr>
<td>C164</td>
<td>Cabinet plinth height 100 mm</td>
</tr>
<tr>
<td>C176</td>
<td>Door hinges on left</td>
</tr>
<tr>
<td>C179</td>
<td>Cabinet plinth height 200 mm</td>
</tr>
<tr>
<td>C205</td>
<td>Marine product certification issued by Der Norske-Veritas Germanisher Lloyd (DNV-GL)</td>
</tr>
<tr>
<td>C206</td>
<td>Marine product certification issued by American Bureau of Shipping (ABS)</td>
</tr>
<tr>
<td>C207</td>
<td>Marine product certification issued by Lloyd's Register</td>
</tr>
<tr>
<td>C209</td>
<td>Marine product certification issued by Bureau Veritas (BV)</td>
</tr>
<tr>
<td>C213</td>
<td>Two pumps running</td>
</tr>
<tr>
<td>C228</td>
<td>Marine product certification issued by China Classification Society (CCS)</td>
</tr>
<tr>
<td>C229</td>
<td>Marine product certification issued by Russian Maritime Register of Shipping (RS)</td>
</tr>
<tr>
<td>C242</td>
<td>2-way control valve in own cabinet (external cooling circuit)</td>
</tr>
<tr>
<td>E210</td>
<td>EMC 2nd environment, C3</td>
</tr>
<tr>
<td>F274</td>
<td>100 kA short circuit rating</td>
</tr>
<tr>
<td>G300</td>
<td>Cabinet heater</td>
</tr>
<tr>
<td>G301</td>
<td>Cabinet lighting</td>
</tr>
<tr>
<td>G304</td>
<td>115 V AC control voltage</td>
</tr>
<tr>
<td>G307</td>
<td>External control voltage supply</td>
</tr>
<tr>
<td>G320</td>
<td>230 V AC control voltage</td>
</tr>
<tr>
<td>G330</td>
<td>Halogen free wiring</td>
</tr>
<tr>
<td>G338</td>
<td>Wire marking class A1</td>
</tr>
<tr>
<td>G339</td>
<td>Wire marking class A2</td>
</tr>
<tr>
<td>G340</td>
<td>Wire marking class A3</td>
</tr>
<tr>
<td>Plus code</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>G341</td>
<td>Wire marking class B1</td>
</tr>
<tr>
<td>G342</td>
<td>Wire marking class C1</td>
</tr>
<tr>
<td>G434</td>
<td>3〜380-415 V/50 Hz supply voltage for the pump motor(s), used with IEC</td>
</tr>
<tr>
<td>G436</td>
<td>3〜660-690 V/50 Hz supply voltage for the pump motor(s), used with IEC</td>
</tr>
<tr>
<td>G437</td>
<td>3〜660-690 V/60 Hz supply voltage for the pump motor(s), used with IEC</td>
</tr>
<tr>
<td>G454</td>
<td>External supply voltage 3〜380-400 V/60 Hz, used with IEC</td>
</tr>
<tr>
<td>G455</td>
<td>External supply voltage 3〜440-480 V/60 Hz, used with IEC</td>
</tr>
<tr>
<td>G456</td>
<td>External supply voltage 3〜460 V/60 Hz, used with UL/CSA</td>
</tr>
<tr>
<td>G457</td>
<td>External supply voltage 3〜575 V/60 Hz, used with UL/CSA</td>
</tr>
<tr>
<td>H352</td>
<td>Bottom power cable exit</td>
</tr>
<tr>
<td>H353</td>
<td>Top power cable exit</td>
</tr>
<tr>
<td>H358</td>
<td>Cable gland plates (Steel 3 mm, undrilled)</td>
</tr>
<tr>
<td>H364</td>
<td>Cable gland plates (aluminum 3 mm, undrilled)</td>
</tr>
<tr>
<td>H365</td>
<td>Cable gland plates (brass 6 mm, undrilled)</td>
</tr>
<tr>
<td>H367</td>
<td>Bottom control cable exit</td>
</tr>
<tr>
<td>H368</td>
<td>Top control cable exit</td>
</tr>
<tr>
<td>H390</td>
<td>Cable exit hole diameter 72 mm</td>
</tr>
<tr>
<td>J400</td>
<td>Control panel</td>
</tr>
<tr>
<td>J410</td>
<td>Control panel connection kit</td>
</tr>
<tr>
<td>K450</td>
<td>Panel bus selected</td>
</tr>
<tr>
<td>K451</td>
<td>FDNA-01 DeviceNet™ adapter module</td>
</tr>
<tr>
<td>K454</td>
<td>FPBA-01 PROFIBUS DP adapter module</td>
</tr>
<tr>
<td>K457</td>
<td>FCAN-01 CANopen adapter module</td>
</tr>
<tr>
<td>K458</td>
<td>FSNA-01 RS-485 (Modbus/RTU) adapter module</td>
</tr>
<tr>
<td>K462</td>
<td>FCNA-01 ControlNet™ adapter module</td>
</tr>
<tr>
<td>K469</td>
<td>FECA-01 EtherCat adapter module</td>
</tr>
<tr>
<td>K470</td>
<td>FEPL-02 EtherPOWERLINK adapter module</td>
</tr>
<tr>
<td>K473</td>
<td>FENA-11 Ethernet adapter module for EtherNet/IP™, Modbus TCP and PROFINET IO protocols</td>
</tr>
<tr>
<td>K475</td>
<td>FENA-21 Ethernet adapter module for EtherNet/IP™, Modbus TCP and PROFINET IO protocols, 2-port</td>
</tr>
<tr>
<td>K480</td>
<td>Ethernet switch for PC tool and control network</td>
</tr>
<tr>
<td>K483</td>
<td>Ethernet switch with optical link for PC tool and control network</td>
</tr>
<tr>
<td>K493</td>
<td>Ethernet switch for PROFINET</td>
</tr>
<tr>
<td>K494</td>
<td>Ethernet switch with optical link for PROFINET</td>
</tr>
<tr>
<td>L503</td>
<td>FDCO-01, DDCS Communication 10/10 MBd</td>
</tr>
<tr>
<td>L504</td>
<td>Additional I/O terminal block</td>
</tr>
<tr>
<td>L508</td>
<td>FDCO-02, DDCS Communication 5/10 MBd</td>
</tr>
<tr>
<td>L509</td>
<td>RDCO-04, DDCS Communication</td>
</tr>
<tr>
<td>M633</td>
<td>Pump motor in delta connection</td>
</tr>
<tr>
<td>M634</td>
<td>Pump motor in star connection</td>
</tr>
<tr>
<td>P913</td>
<td>Special color</td>
</tr>
<tr>
<td>P943</td>
<td>Documentation for PED compliance</td>
</tr>
<tr>
<td>Plus code</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>R700</td>
<td>English manuals</td>
</tr>
<tr>
<td>R701</td>
<td>German manuals ¹)</td>
</tr>
<tr>
<td>R702</td>
<td>Italian manuals ¹)</td>
</tr>
<tr>
<td>R705</td>
<td>Swedish manuals ¹)</td>
</tr>
<tr>
<td>R706</td>
<td>Finnish manuals ¹)</td>
</tr>
<tr>
<td>R707</td>
<td>French manuals ¹)</td>
</tr>
<tr>
<td>R708</td>
<td>Spanish manuals ¹)</td>
</tr>
<tr>
<td>R711</td>
<td>Russian manuals ¹)</td>
</tr>
<tr>
<td>R712</td>
<td>Chinese manuals ¹)</td>
</tr>
<tr>
<td>R716</td>
<td>User’s manuals paper copy, one set</td>
</tr>
<tr>
<td>R717</td>
<td>Paper copy of user's manuals, paper copy of dimensional drawings and circuit diagrams in A3</td>
</tr>
</tbody>
</table>

¹) The delivery includes manuals in English if the requested language is not available.
Mechanical installation

The figure below shows the internal and external cooling circuit connections of the stand-alone cooling unit (option +C139).

Procedure:
1. Fasten the cooling unit to the floor. See the appropriate drive manual for the instructions. In a marine installation (or other installations where the unit will be subjected to vibration), fasten the unit also from above.
2. Lead the bottom leakage hose to a sewer.
3. Remove the protective plates covering the flanges before you connect the pipes.
4. Stand-alone cooling unit (option +C139): Connect the drive internal cooling circuit to the cooling unit. Use only the bolt and nut types and tightening torque specified in section Flanges for connecting the piping (page 133). Secure the pipes mechanically.
5. Connect the external cooling circuit to the cooling unit. Use only the bolt and nut types and tightening torque specified in section Flanges for connecting the piping (page 133). Secure the pipes mechanically.
Electrical installation

What this chapter contains
This chapter shows the user connections of the liquid cooling unit (LCU).

Safety

WARNING!
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

Depending on the drive type, you can find the safety instructions either in the drive hardware manual (single drives), or in the separate safety instructions manual (multidrives cabinets and modules).

If you are not a qualified electrician, do not do installation or maintenance work.

Electrical safety precautions
These electrical safety precautions are for all personnel who do work on the drive, motor cable or motor.
Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur.

If you are not a qualified electrical professional, do not do installation or maintenance work.

Go through these steps before you begin any installation or maintenance work.

1. Clearly identify the work location and equipment.
2. Disconnect all possible voltage sources. Make sure that re-connection is not possible. Lock out and tag out.
   - Open the main disconnecting device of the drive.
   - Open the charging switch if present.
   - Open the disconnector of the supply transformer. (The main disconnecting device in the drive cabinet does not disconnect the voltage from the AC input power busbars of the drive cabinet.)
   - If the drive is equipped with a DC/DC converter unit (optional): Open the DC switch-disconnector ([Q11], option +F286) of the DC/DC converter. Open the disconnecting device of the energy storage connected to the DC/DC converter unit (outside the drive cabinet).
   - Open the auxiliary voltage switch-disconnector (if present), and all other possible disconnecting devices that isolate the drive from dangerous voltage sources.
   - In the liquid cooling unit (if present), open the motor protective circuit breaker(s) of the cooling pumps.
   - If you have a permanent magnet motor connected to the drive, disconnect the motor from the drive with a safety switch or by other means.
   - Disconnect any dangerous external voltages from the control circuits.
   - After you disconnect power from the drive, always wait 5 minutes to let the intermediate circuit capacitors discharge before you continue.
3. Protect any other energized parts in the work location against contact.
4. Take special precautions when close to bare conductors.
5. Measure that the installation is de-energized. If the measurement requires removal or disassembly of shrouding or other cabinet structures, obey the local laws and regulations applicable to live working (including – but not limited to – electric shock and arc protection).
   - Use a multimeter with an impedance greater than 1 Mohm.
   - Make sure that the voltage between the drive input power terminals (L1, L2, L3) and the grounding (PE) busbar is close to 0 V.
   - Make sure that the voltage between the drive output terminals (T1/U, T2/V, T3/W) and the grounding (PE) busbar is close to 0 V.
   - Make sure that the voltage between the drive DC busbars (+ and -) and the grounding (PE) busbar is close to 0 V.

WARNING!
The busbars inside the cabinet of liquid-cooled drives are partially coated. Measurements made through the coating are potentially unreliable, so only measure at uncoated portions. Note that the coating does not constitute a safe or touch-proof insulation.
6. Install temporary grounding as required by the local regulations.
7. Ask the person in control of the electrical installation work for a permit to work.

Connecting the power cables

**WARNING!**
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

Depending on the drive type, you can find the safety instructions either in the drive hardware manual (single drives), or in the separate safety instructions manual (multidrives cabinets and modules).

If you are not a qualified electrician, do not do installation or maintenance work.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 35)* before you start the work.
2. Open the door or the cooling unit.
3. Install the cables. See the circuit diagrams delivered with the unit and section below.

**Connection diagram**

1. Three-phase power supply for the pump motor(s). User connects to a user-defined power supply on site. For more information, see the type designation label, chapter *Technical data (page 127)* and the delivery-specific circuit diagrams.

   **WARNING!**
   As the normal touch current of the drive is higher than 3.5 mA AC or 10 mA DC, you must use a fixed protective earth connection. The minimum size of the protective earthing conductor must comply with the local safety regulations for high protective earthing conductor current equipment. See standard IEC/EN 61800-5-1, 4.3.5.5.2.

2. One-phase auxiliary power supply for the control circuit.
   *Cooling unit in drive cabinet line-up:* Connected to the drive auxiliary voltage supply at the factory. For more information, see the type designation label, chapter *Technical data (page 127)* and the delivery-specific circuit diagrams.
   *Stand-alone cooling unit:* User connects to a user-defined power supply on site. For more information, see the type designation label, chapter *Technical data (page 127)* and the delivery-specific circuit diagrams.
Connecting the control cables

Cooling unit in drive cabinet line-up (option +C138): As standard, there are no control connections to be connected by the user. The supply unit of the drive controls the LCU, and the connections are done at the factory. See the delivery-specific circuit diagrams.

Stand-alone cooling unit (option +C139): Connect the external control cabling according to the delivery-specific circuit diagrams.

Control cable connection procedure

WARNING!
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

Depending on the drive type, you can find the safety instructions either in the drive hardware manual (single drives), or in the separate safety instructions manual (multidrives cabinets and modules).

If you are not a qualified electrician, do not do installation or maintenance work.

1. Stop the drive and do the steps in section Electrical safety precautions (page 35) before you start the work.
2. Run the control cables into the cabinet as described in section Grounding the outer shields of the control cables at the cabinet entry below.
3. Route the control cables as described in section Routing the control cables inside the cabinet (page 40).
4. Connect the control cables as described in section Connecting control cabling (page 40).

Grounding the outer shields of the control cables at the cabinet entry

Ground the outer shields of all control cables 360 degrees at the EMI conductive cushions as follows (example constructions are shown below, the actual hardware may vary):

1. Loosen the tightening screws of the EMI conductive cushions and pull the cushions apart.
2. Cut adequate holes to the rubber grommets in the entry plate and put the cables through the grommets and the cushions.
3. Strip off the cable plastic sheath above the entry plate just enough to ensure proper connection of the bare shield and the EMI conductive cushions.
4. Tighten the two tightening screws so that the EMI conductive cushions press tightly round the bare shield.
**Note 1:** Keep the shields continuous as close to the connection terminals as possible. Secure the cables mechanically at the entry strain relief.

**Note 2:** If the outer surface of the shield is non-conductive:
- Cut the shield at the midpoint of the bare part. Be careful not to cut the conductors or the grounding wire (if present).
- Turn the shield inside out to expose its conductive surface.
- Cover the turned shield and the stripped cable with copper foil to keep the shielding continuous.

---

**Note for top entry of cables:** When each cable has its own rubber grommet, sufficient IP and EMC protection can be achieved. However, if very many control cables come to one cabinet, plan the installation beforehand as follows:
1. Make a list of the cables coming to the cabinet.
2. Sort the cables going to the left into one group and the cables going to the right into another group to avoid unnecessary crossing of cables inside the cabinet.
3. Sort the cables in each group according to size.
4. Group the cables for each grommet as follows ensuring that each cable has a proper contact to the cushions on both sides.

<table>
<thead>
<tr>
<th>Cable diameter in mm</th>
<th>Max. number of cables per grommet</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 13</td>
<td>4</td>
</tr>
<tr>
<td>≤ 17</td>
<td>3</td>
</tr>
<tr>
<td>&lt; 25</td>
<td>2</td>
</tr>
<tr>
<td>≥ 25</td>
<td>1</td>
</tr>
</tbody>
</table>

5. Arrange the bunches according to size from thickest to the thinnest between the EMI conductive cushions.

6. If more than one cable go through a grommet, seal the grommet by applying Loctite 5221 (catalogue number 25551) inside the grommet.

Routing the control cables inside the cabinet

Use the existing trunking in the cabinet wherever possible. Use sleeving if cables are laid against sharp edges. When running cables to or from a swing-out frame, leave enough slack at the hinge to allow the frame to open fully.

Connecting control cabling

Connect the conductors to the appropriate terminals. Refer to the wiring diagrams delivered with the drive.

Connect the inner twisted pair shields and all separate grounding wires to the grounding clamps closest to the terminals.

The drawing below represents the grounding of the control cabling when connecting to a terminal block inside the cabinet. The grounding is done in the same way when connecting directly to a component such as the control unit.

Notes:
• Do not ground the outer shield of the cable here since it is grounded at the cable entry.
• Keep any signal wire pairs twisted as close to the terminals as possible. Twisting the wire with its return wire reduces disturbances caused by inductive coupling.

At the other end of the cable, leave the shields unconnected or ground them indirectly via a high-frequency capacitor with a few nanofarads, eg. 3.3 nF / 630 V. The shield can also be grounded directly at both ends if they are in the same ground line with no significant voltage drop between the end points.
Installation checklist

Check the installation before start-up. Go through the checklist together with another person.

**WARNING!**
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

Depending on the drive type, you can find the safety instructions either in the drive hardware manual (single drives), or in the separate safety instructions manual (multidrives cabinets and modules).

If you are not a qualified electrician, do not do installation or maintenance work.

**WARNING!**
Stop the drive and do the steps in section *Electrical safety precautions (page 35)* before you start the work.

<table>
<thead>
<tr>
<th>Task</th>
<th>✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>The drive installation has been checked against the checklists in the drive manuals.</td>
<td>✓</td>
</tr>
<tr>
<td>The cooling unit has been fixed properly to floor. In marine applications the unit has also been fastened from above.</td>
<td>✓</td>
</tr>
<tr>
<td>The bottom leakage hose has been led to a sewer.</td>
<td>✓</td>
</tr>
<tr>
<td>The voltage of pump motor power supply is right. See technical data or pump type designation label.</td>
<td>✓</td>
</tr>
<tr>
<td>The power supply cable for the pump motor(s) has been connected to appropriate terminals and the connection is tight. Pull conductors to check.</td>
<td>✓</td>
</tr>
<tr>
<td>The PE (ground) conductor has been connected and the connection is tight. Pull conductor(s) to check.</td>
<td>✓</td>
</tr>
<tr>
<td>Stand-alone cooling unit (option +C139): The auxiliary power supply for the control circuits has been connected to appropriate terminals and the connection is tight. Pull conductors to check.</td>
<td>✓</td>
</tr>
<tr>
<td>Stand-alone cooling unit with cabinet heater (option +G300), and/or lighting (option +G301): The power supply for the cabinet heater/lighting has been connected to appropriate terminals and the connection is tight. Pull conductors to check.</td>
<td>✓</td>
</tr>
</tbody>
</table>
### Task

<table>
<thead>
<tr>
<th>Task</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The external control cabling (if any) has been connected to appropriate terminals and the connections are tight. Pull conductors to check.</td>
<td></td>
</tr>
<tr>
<td>There are no tools, foreign objects or dust from drilling inside the cooling unit.</td>
<td></td>
</tr>
<tr>
<td>All bleed valves and drain valves are closed (drive and cooling unit).</td>
<td></td>
</tr>
<tr>
<td>The cap of the automatic float air vent (VA-103) is not fully tightened (loosen approximately 2 to 3 turns).</td>
<td></td>
</tr>
<tr>
<td>The external cooling circuit is connected and the connections are tight.</td>
<td></td>
</tr>
<tr>
<td><strong>Stand-alone cooling unit (option +C139)</strong>: The internal cooling circuit is connected and the connections are tight.</td>
<td></td>
</tr>
</tbody>
</table>
Start-up

Contents of this chapter
This chapter contains a list for checking the installation.

Safety

**WARNING!**
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

Depending on the drive type, you can find the safety instructions either in the drive hardware manual (single drives), or in the separate safety instructions manual (multidrives cabinets and modules).

If you are not a qualified electrician, do not do installation or maintenance work.

Before start-up

<table>
<thead>
<tr>
<th>Task</th>
<th>Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use the required personal protective equipment. See the Safety data sheet for Antifrogen® L coolant by Clariant (<a href="http://www.clariant.com">www.clariant.com</a>) for the instructions on the respiratory, hand and eye protection.</td>
<td>✔️</td>
</tr>
<tr>
<td>Make sure that you have enough of right type of coolant at hand. For the coolant type, see Technical data (page 123). For the quantity of coolant in the drive cooling circuit: See the appropriate hardware manual(s). Quantity in the cooling unit: See Technical data (page 127).</td>
<td>☐️</td>
</tr>
<tr>
<td>Check that the external coolant temperature and the ambient temperature are within the limits. See Technical data (page 123), and Ambient conditions (page 128).</td>
<td>☐️</td>
</tr>
</tbody>
</table>
### Task

Check that you have at hand:

- tools for connecting hoses
- air pump with a pressure gauge and standard tire head for the air pressure adjustment of the expansion vessel
- container filled with coolant
- buckets for bleeding and draining of the system
- hoses for filling, draining and bleeding. Three hoses are included as standard in the cooling unit delivery. See also Fill/drain/bleed hoses and drain box (page 133).
- pump for filling the coolant. ABB recommends a hand pump with max. 5 l/min capacity for slow and air-free fill up. See also Filling pump (page 129).

If the cooling unit has been stored in cold or damp environment, warm and dry it with the cabinet heater (option +G300), or by some other means before the start.

### Adjusting air pressure of the expansion vessel

#### About the expansion vessel

The expansion vessel is divided into two sections: liquid and air sections. The air section is the reservoir into which the liquid section expands whenever a temperature rise increase the volume of the liquid in the system. You must set the air counterpressure at the system start-up.

#### Pressure adjusting procedure

The component designations refer to Piping and instrumentation diagrams (page 141) and Operation basics and hardware description (page 15). Study the drawings before starting the task and keep them at hand when performing it.

#### WARNING!

Stop the drive and do the steps in section Electrical safety precautions (page 35) before you start the work.

### Task

Close the shut-off valve (V0003) through which the expansion vessel (PA-102) is coupled to the internal cooling circuit.

Connect a hose to the bleed valve (V0011) of the expansion vessel and lead the hose to a bucket.

Open bleed valve to release pressure - if any - of the expansion vessel.

Remove (unscrew by hand) the protective cap that covers the air valve at the bottom of the expansion vessel.

Connect an air pump with a gauge to the air valve and measure the pressure in the lower section of the expansion vessel. Set the air counterpressure to 80 kPa. Replace the cap onto the air valve.

Close the bleed valve (V0011) and remove the hose from the valve.

Open the shut-off valve (V0003).

### Filling up the cooling circuit and starting the cooling unit

#### WARNING!

Stop the drive and do the steps in section Electrical safety precautions (page 35) before you start the work.
WARNING!
Do not use cooling unit pumps if filling and de-airing is not properly done. If there is air in the system or the pump is operating dry, the pump sealing damage can occur after a very short operation time.

Keep the pump shut-off valves closed until you start filling the internal cooling circuit. The pumps are filled with a protective mixture at the factory. The mixture can be left in the cooling circuit.

The component designations refer to the drawings in Piping and instrumentation diagrams (page 141) and Operation basics and hardware description (page 15). Study the drawings before starting the task and keep them at hand when performing it.

Task

Preparing the drive and cooling unit

Check and adjust the air pressure in the expansion vessel if not done yet. See Adjusting air pressure of the expansion vessel (page 46).

Check that the drain valves in all cubicles of the drive cabinet line-up are closed.

Open the valves at the inlet and outlet of the pump(s) by using loose valve handles or 1/2" socket wrench (valves V0004, V0006, V0005 (1), V0007 (1), GA-201, GA-202 (1)).

Open inlet, outlet and bleed valves (outlet drain valve) in one cubicle of the drive. Keep the valves still closed in the other drive cubicles. (The cubicles will be filled one at a time.)

Connect a filling hose to the fill valve of the cooling unit (V0012 or V0014 (1)).

Lead the bleed hose of the drive cubicle to bucket.

Open the shut-off valve (V0001) of the automatic float air vent (VA-103).

Make sure that the cap of the automatic float air vent (VA-103) is not fully tightened (loosen approximately 2 to 3 turns).

Open the fill valve of the cooling unit (V0012 or V0014 (1)).

Filling

Fill the system by pumping coolant in through the fill valve (V0012 or V0014 (1)). Pump slowly (5 l/min) to minimize foaming of the coolant.

When there is sufficient amount of coolant in the piping, coolant begins to overflow from the bleed hose of the drive cubicle. Drain some coolant to get all air out of the system, then close the bleed, inlet and outlet valves in the drive cubicle.

Lead the bleed hose of the next drive cubicle to a bucket, and open the inlet, outlet and bleed valves of the cubicle. Fill and bleed the drive cubicle. Repeat the procedure for the remaining drive cubicles.

Open the inlet and outlet valves of all drive cubicles and let the remaining air come out through the automatic float air vent (VA-103) of the cooling unit. The pressure in the internal circuit starts to rise.

WARNING!
If the pump sealing have dried during the storing, the sealing may not settle well.

If there are leaks near the pump sealing during the filling procedure, run the pump by using manual pump control switch [S210]. Run the pump for a minute to make sure that the sealing has settled.

Monitor the pressure on the pressure gauge (PI-203). Increase the pressure up to 250 kPa by pumping coolant in from the fill valve (V0012 or V0014 (1)). When the pressure has been reached, close the fill valve and stop the fill-in pump. Keep the fill hose still coupled for later use.
Task
Open the pump bleed valves (on the pump casing). See separate pump manual for instructions. Check the pressure again, and add some coolant if necessary.

WARNING! Do not fill in too much coolant. Ensure that the maximum permissible operating pressure (600 kPa, indicated by pressure gauge PI-203) is not exceeded.

Starting the cooling unit and checking the pressure
Switch on the power supplies:
• the pump powers supply
• the auxiliary power supply for the control circuits
• the power supply for the cabinet heater (option +G300), and/or lighting (option +G301).
See the circuit diagram delivered with the cooling unit.

Close the door of the cooling unit.
Start the pump for one or two minutes. Use manual motor control switch [S210].
Make sure that the control valve (V0016) is set to the design position which is shown on the label on the door.

Monitor inlet and outlet liquid pressures of the pump (01.01, 01.02) on the control panel. (Inside the cooling unit, there is also pressure gauge PI-203.)
Stop the pump: The pressure gauge should indicate pressure 250 kPa when the pump is stopped.
Re-start the pump for couple of minutes.
Listen for a humming sound or feel the piping for vibration to find out if there is still air left. If these symptoms appear:
• Make sure that the shut-off valve (V0001) for automatic float air vent (VA-103) is open.
• Make sure that the cap of the automatic float air vent (VA-103) is not fully tightened.
• Stop the pump, open the pump bleed valves and let air out. If necessary, add coolant (until pressure of 250 kPa is reached). Repeat the procedure until all air is removed from the system.
Stop the pump. Check that all drain and bleed valves are closed. Remove the filling hose.
Close the shut-off valve for automatic float air vent (V0001).

1) Only in the two-pump cooling unit.

Basic settings in the control program
For more information on the use of the control panel, see ACx-AP-x Assistant control panels user’s manual (3AUA0000085685 (English)).

Task
Check that the number of pumps setting corresponds to actual number of pumps (20.04).

Two-pump unit ACS880-1007LC-0195: Activate and tune the delays of the automatic pump alternation function (20.01, 20.05, 20.06).
If the drive and the cooling unit will be out of use for long time periods, activate the Standby function (20.08).
Check the operation of the auxiliary cooling fan (G210) by parameter 20.29.
If the cooling unit is equipped with the 2-way control valve (option +C242): Make sure that the valve control function is enabled (22.01).

Start/stop settings when the LCU will be controlled through the IO
Make sure that:
• Parameter 20.03 = Local. (That is: The control interface selection defines a digital input DI6 as the source for the start/stop signal in the remote control mode.)
• Control panel, if any, is in Remote control mode. Change with the Loc/Rem key when necessary.
### Task
Give start-command (and stop) command via digital input DI6. Verify that the cooling unit starts and stops accordingly. Note that there is an user-adjustable stop delay (20.07).

### Start/stop settings when the LCU will be controlled through a serial link
Make sure that:
- Parameter 20.03 = Fieldbus A. (That is: The control interface selection defines fieldbus adapter A as the source for the start/stop signal in the remote control mode.)
- Control panel, if any, is in Remote control mode. Change with the Loc/Rem key when necessary.

Give start-command and stop command from the overriding control system via Main control word bit b0. Verify that the cooling unit starts and stops accordingly. You can monitor the command status from the bits of parameter 06.01. Note that there is an user-adjustable stop delay (20.07).

### On-load settings
**Task**

**Two-pump unit ACS880-1007LC-0195:** Change the pump in duty, and verify that both pumps start, operate and stop normally, and the system pressure is normal. We also recommend that you verify:

- the automatic pump alternation function (20.01, 20.05, 20.06)
- the pump redundancy function: Take one pump out of use, ie, open its protective circuit breaker. Make sure that the cooling unit starts and operates with the pump available. Change the pump in use and repeat the test.

Define the warning limit for the minimum inlet pressure (31.01). Set the warning limit 1 bar below the pressure value during normal operation. Parameter 01.01 shows the measured actual value.

Define the warning limit for the maximum coolant temperature at internal circuit outlet (31.10). If the measured temperature during normal operation is below +36 °C, decrease the default warning limit accordingly. Parameter 01.23 shows the measured actual value.

Define the warning limit for the maximum coolant pressure at the pump outlet with parameter 31.03. A rule of thumb value: 1 bar above the value measured during normal operation. Parameter 01.02 shows the measured actual value.

**Note:** The higher the liquid temperature the higher the pressure.

Check the coolant temperature in the internal circuit as the load varies. Adjust the external cooling circuit flow when necessary.
Maintenance

Safety

**WARNING!**
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

Depending on the drive type, you can find the safety instructions either in the drive hardware manual (single drives), or in the separate safety instructions manual (multidrives cabinets and modules).

If you are not a qualified electrician, do not do installation or maintenance work.

Maintenance intervals

The tables below show the maintenance tasks which can be done by the end user. The complete maintenance schedule is available on the Internet ([www.abb.com/drivesservices](http://www.abb.com/drivesservices)). For more information, consult your local ABB Service representative ([www.abb.com/searchchannels](http://www.abb.com/searchchannels)).

Maintenance tasks, every year:

<table>
<thead>
<tr>
<th>Item</th>
<th>Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connections and environment</td>
<td></td>
</tr>
<tr>
<td>Quality of supply voltage</td>
<td>P</td>
</tr>
<tr>
<td><strong>Spare parts</strong></td>
<td></td>
</tr>
<tr>
<td>Spare parts</td>
<td>I</td>
</tr>
<tr>
<td><strong>Inspections by user</strong></td>
<td></td>
</tr>
<tr>
<td>Tightness of terminals</td>
<td>I</td>
</tr>
<tr>
<td>Dustiness, corrosion and temperature</td>
<td>I</td>
</tr>
</tbody>
</table>
Maintenance tasks, every 2nd year:

<table>
<thead>
<tr>
<th>Item</th>
<th>Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspection of coolant quality</td>
<td>P</td>
</tr>
</tbody>
</table>

Maintenance tasks, every 3 to 9 years:

<table>
<thead>
<tr>
<th>Item</th>
<th>Tasks and intervals (years from start-up)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>3</td>
</tr>
<tr>
<td>Coolant</td>
<td></td>
</tr>
<tr>
<td>Coolant draining and refill</td>
<td></td>
</tr>
<tr>
<td>Coolant pump</td>
<td></td>
</tr>
<tr>
<td>Pump</td>
<td></td>
</tr>
<tr>
<td>Pump motor</td>
<td></td>
</tr>
<tr>
<td>Expansion vessel</td>
<td></td>
</tr>
<tr>
<td>Cabinet cooling fans</td>
<td></td>
</tr>
<tr>
<td>Control unit fan (swing out frame cooling fan)</td>
<td></td>
</tr>
<tr>
<td>Aging</td>
<td></td>
</tr>
<tr>
<td>ZCU control unit battery (Real-time clock)</td>
<td>R</td>
</tr>
<tr>
<td>Control panel battery (Real-time clock)</td>
<td>R</td>
</tr>
</tbody>
</table>

Legend:

I  Inspection (visual inspection and maintenance action if needed)
P  Performance of on/off-site work (commissioning, tests, measurements or other work)
R  Replacement

Note:
- Maintenance and component replacement intervals are based on the assumption that the equipment is operated within the specified ratings and ambient conditions. ABB recommends annual drive inspections to ensure the highest reliability and optimum performance.
- Long term operation near the specified maximum ratings or ambient conditions may require shorter maintenance intervals for certain components. Consult your local ABB Service representative for additional maintenance recommendations.

Adding cooling liquid

See *Filling up the cooling circuit and starting the cooling unit (page 46).*
Draining the cooling unit

The designations refer to the drawings in *Piping and instrumentation diagrams (page 141)*. Study the drawings before starting the task and keep them at hand when performing it.

**WARNING!**
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

Depending on the drive type, you can find the safety instructions either in the drive hardware manual (single drives), or in the separate safety instructions manual (multidrives cabinets and modules).

If you are not a qualified electrician, do not do installation or maintenance work.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 35)* before you start the work.
2. Connect hoses to the drain/fill valves (V0010, V0012) and lead them into to a bucket.
3. Open the inlet and outlet valves of all drive cubicles, and make sure that the pump shut-off valves (V0004, V0005, V0006, V0007) are open.
4. Open the drain/fill valves (V0010, V0012) and let the liquid flow out of the system.
5. Open the expansion vessel bleed valve (V0011) to let air displace the liquid.
6. Dry the piping with compressed oil free air if the system will be empty for long period. Pressure may not exceed 600 kPa.

Storing the cooling unit

Fill the cooling circuit with coolant before the storing. See the procedure in *Filling up the cooling circuit and starting the cooling unit (page 46)*.

De-airing the coolant

**WARNING!**
The shut-off valve for automatic float air vent (V0001) can only be opened after the cooling system is refilled or more coolant is added, for example after module change.

The shut-off valve must be closed during the normal operation to prevent possible leaks.

1. Open the shut-off valve (V0001) for manual de-airing of the coolant.
2. Check that the cap of the automatic float air vent (VA-103) is not fully tightened (loosen approximately 2 to 3 turns).
3. Wait for the air to leave the system.
4. Close the shut-off valve (V0001).

Checking the quality of the coolant

The manufacturer checks the quality of coolant free of charge. Send a 250 milliliter sample to Clariant. See [www.clariant.com](http://www.clariant.com).

Antifreeze on-site testers are available from the Antifrogen® Distributors. See [www.clariant.com](http://www.clariant.com).
Cleaning and drying the leakage detector

**WARNING!**
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

Depending on the drive type, you can find the safety instructions either in the drive hardware manual (single drives), or in the separate safety instructions manual (multidrives cabinets and modules).

If you are not a qualified electrician, do not do installation or maintenance work.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 35)* before you start the work.
2. Open the cabinet door.
3. If there is liquid on the bottom of the cooling unit, dry it. Dry also the leakage detector.
4. Release the fastening screw (a) of the detector assembly plate and pull the plate and the detector out of the cabinet. The wiring cannot be disconnected but there is enough slack in the wiring to do the cleaning.
5. Rinse the detector with pure water and wipe the sensor dry carefully.
6. Re-install the detector.
7. Close the cabinet door, and energize the cooling unit. Reset the fault/warning.
8. If the fault/warning is repeated after the reset, the detector is faulty. Replace it.

ACS880-1007LC-0070 - replacing the pump motor

**WARNING!**
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

Depending on the drive type, you can find the safety instructions either in the drive hardware manual (single drives), or in the separate safety instructions manual (multidrives cabinets and modules).

If you are not a qualified electrician, do not do installation or maintenance work.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 35)* before you start the work.
2. Open the cabinet door.
3. Open the swing out frame on front of the pump:
   • Remove the screws (a) that fasten the frame to the side of the cabinet frame.
   • Remove the hinge locking screws (b) on top (1 pcs) and bottom (1 pcs) of the frame, and turn the frame fully aside.

4. Close the pump shut-off valves (a).

5. Open the motor connection box (b), disconnect the supply cable and pull it out of the box. Turn the cables out of the way.

6. Remove the plate (c) on top of the pump motor (9 screws).

7. Remove the coupling guard (a) that covers the motor shaft (4 screws), and de-couple the motor and pump shafts.

8. Attach a lifting device to the pump motor to make sure that it is safe to remove the pump fastening bolts.

9. Remove the bolts (a) that fasten the motor to the frame of the pump.

10. Lift the motor a small distance. Keep constant tension on the lifting rope. Pull the pump carefully out of the cabinet.

11. Install a new motor.
56 Maintenance
WARNING!
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

Depending on the drive type, you can find the safety instructions either in the drive hardware manual (single drives), or in the separate safety instructions manual (multidrives cabinets and modules).

If you are not a qualified electrician, do not do installation or maintenance work.

1. Do the steps in ACS880-1007LC-0070 - replacing the pump motor (page 54).
2. Attach a lifting device to the pump to make sure that it is safe to remove its fastening bolts.
3. Remove the inlet and outlet pipe couplings, and the pump fastening bolts:
   • Remove the upper bracket (a) on front of the pump.
   • Remove the lower bracket and its support plate (b) on front of the pump.
   • Remove the upper bracket (c) on back of the pump.
   • Remove the pump fastening bolts (d).
4. Attach the drain box below the pump sealing with a cable tie.
5. Twist the bleed and filling hoses to the drain boxes.
6. Remove pump clamp sealing and drain the cooling unit. See section Draining the cooling unit (page 53).
7. Move the pump sidewards.
8. Lift the pump up.
9. Pull the pump out of the cabinet.
10. Install a new pump. See separate pump manual for instructions.
    **Note:** Use plastic tool delivered with the pump to set the correct axial clearance.
ACS880-1007LC-0195 - replacing the pump motor

**WARNING!**
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

Depending on the drive type, you can find the safety instructions either in the drive hardware manual (single drives), or in the separate safety instructions manual (multidrives cabinets and modules).

If you are not a qualified electrician, do not do installation or maintenance work.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 35)* before you start the work.
2. Open the cabinet door.
3. Open the swing out frame on front of the pump:
   - Remove the screws (a) that fasten the frame to the side of the cabinet frame.
   - Remove the hinge locking screws (b) on top (1 pcs) and bottom (1 pcs) of the frame, and turn the frame fully aside.
4. Close the pump inlet and outlet shut-off valves.
5. Open the motor connection box (a), disconnect the supply cable and pull it out of the box. Turn the cables out of the way.
6. Remove the coupling guard (a) that covers the motor shaft (4 screws), and decouple the motor and pump shafts.
7. Remove the bolts (b) that fasten the motor to the frame of the pump.
8. Attach a lifting device to the pump to make sure that it is safe to remove its fastening bolts.
9. Remove the screws (a, 2 pcs) that fasten the motor to the supports on each side of the pump.
10. Turn the motor and remove the round sealing (a). Keep constant tension on the lifting rope. Pull the motor carefully out of the cabinet.
11. Install a new motor.
62 Maintenance
ACS880-1007LC-0195 - replacing the pump

WARNING!
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

Depending on the drive type, you can find the safety instructions either in the drive hardware manual (single drives), or in the separate safety instructions manual (multidrives cabinets and modules).

If you are not a qualified electrician, do not do installation or maintenance work.

1. Do the steps in ACS880-1007LC-0195 - replacing the pump motor (page 60).
2. Attach a lifting device to the pump to make sure that it is safe to remove its fastening bolts.
3. Attach the drain box below the pump sealing with a cable tie.
4. Remove the inlet and outlet pipe couplings (a), and the pump fastening bolts (b).
5. Twist the bleed and filling hoses to the drain boxes.
6. Lift the pump up.
7. Pull the pump out of the cabinet.
8. Install a new pump. See separate pump manual for instructions.

Note: Use plastic tool delivered with the pump to set the correct axial clearance.
ACS880-1007LC-0070 - replacing the swing out frame cooling fan

**WARNING!**
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

Depending on the drive type, you can find the safety instructions either in the drive hardware manual (single drives), or in the separate safety instructions manual (multidrives cabinets and modules).

If you are not a qualified electrician, do not do installation or maintenance work.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 35)* before you start the work.
2. Open the cabinet door.
3. Locate the fan (G210) in the swing out frame. See the layout drawing.
4. Loosen the screws that fasten the pump assembly to the frame.
5. Remove the fan assembly, and unplug the power supply cable.
6. Remove the screws that fasten the fan to its grating and base.
7. Install a new fan in reverse order.
ACS880-1007LC-0195 - replacing the swing out frame cooling fan

**WARNING!**
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

Depending on the drive type, you can find the safety instructions either in the drive hardware manual (single drives), or in the separate safety instructions manual (multidrives cabinets and modules).

If you are not a qualified electrician, do not do installation or maintenance work.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 35)* before you start the work.
2. Open the cabinet door.
3. Locate fan (G210) at the bottom of the swing out frame. See the layout drawings.
4. Remove the screws that fasten the pump assembly to the frame.
5. Pull the fan assembly out somewhat and unplug the power supply cable.
6. Remove the screws that fasten the fan to its grating and base.
7. Install a new fan in reverse order.
Program features

What this chapter contains
This chapter describes the features of the control program.

Basics
The cooling unit (LCU) controls the circulation in the internal cooling circuit by switching the pump on and off. During the normal operation of the drive, the pump runs constantly. The control program switches the pump off only if:
- It receives a stop command.
- The pump alternation function performs the motor change in a two-pump system (stops one motor and starts the other).
- The control program detects a fault, such as:
  - low inlet pressure
  - abnormal pressure or leakage in the internal cooling circuit.
- Motor protective circuit breakers of all pumps have tripped (or opened by user).
- The XSTO circuit on the control unit is open. (Jumper wire is not connected.)

Start/stop control, and reset
See Control interfaces (page 26).

Settings and diagnostics
Parameters: 20.03.
Events: -
Pump control

■ Basic operation

The control program switches pump(s) on or off via relay outputs: RO1 controls the contactor of pump 1 motor, RO2 controls the contactor of pump 2 motor (in the two-pump version). The control program monitors the pump power supply via digital inputs: The auxiliary contacts of the motor protective circuit breakers are wired to the digital inputs: DI1 monitors pump 1, DI2 pump 2 (in the two-pump version). This IO interface related to pump control and monitoring is fixed, and it cannot be adjusted by the user.

In the two-pump unit:
• One pump is operating at the time.\(^1\)
• Control program alternates pumps automatically at standard. The user can disable the alternation by a parameter, and force either pump 1 or pump 2 in use.
• User can disconnect one pump from the system, or the control program can do it in case of a failure. The cooling unit continues with the remaining pump only.

\(^1\) Exception: There is a Two pumps running option (option +C213) available for applications that require exceptionally high flow in the internal cooling unit.

Settings and diagnostics

Parameters: 20.01, 20.02

Events: -

■ Alternation

In a two-pump cooling unit, the control program alternates the pump in duty automatically. The alternation reduces the wear of an individual pump.

User activates the Alternation function by selecting the Auto control mode in use. The user also defines the run time periods for the pumps. When the cooling unit receives the start command, it first starts pump 1, and runs it for the user-defined pump 1 run time. After the time has passed, the control program stops pump 1 and starts pump 2 for the pump 2 run time, etc.

Settings and diagnostics

Parameters: 20.01, 20.02, 20.04, 20.05, 20.06

Events: -

■ Redundancy

The two-pump cooling unit is redundant. Since only one pump runs at the time, the unit can continue the operation also in case the other pump is out of use due to failure or maintenance. For example, the cooling unit detects if the motor protective circuit breaker of a pump is open: it will not try to start that pump but runs only the other pump until it is possible to return to normal two-pump operation with alternation. To enable the redundancy, you must have the Auto control mode in use.

Settings and diagnostics

Parameters: 20.01

Events: -
Two pumps running

A two-pump cooling unit can be equipped with the Two pumps running option (option +C242). The option is intended for large drive line ups that require very high mass flow in the internal cooling circuit, which cannot be supplied by one pump only. The option includes an additional cooler in the cooling unit cabinet to compensate the extra losses, and the activation of the Two pumps running function in the control program.

The Two pumps running function has two possible operation modes: normal or reduced. When the reduced mode is in use, the cooling unit can continue with a partial load using one pump only if the other pump fails.

The function is activated by a parameter at the factory by ABB. The parameter also selects the operation mode for the function.

Settings and diagnostics

Parameters: Service level hidden parameter for activating the function, and selecting its operation mode. Contact ABB for more information.

Events: -

Standby

The Standby function is useful in applications where the drive and the cooling unit are stopped for long time periods. A long non-operational standby time will dry up the pump, which can damage the sealing or bearings.

When the Standby function is active, the control program runs the pump automatically in user-defined cycles. The user can activate the function and define the stop and run times with parameters. In a two-pump cooling unit, the function operates both pumps: first pump 1, then pump 2. The user-defined run time is divided to half between the pumps. Note that the control program will use the same time setting for two purposes: It is the run time for the Standby function, and also the delay time for the Delayed cooling function.

Settings and diagnostics

Parameters: 20.07, 20.08, 20.09

Events: -

Delayed cooling

User activates the Delayed cooling function by defining a stop delay. When the control program receives the stop command, it keeps the pump running for the stop delay time.

Settings and diagnostics

Parameters: 20.07

Events: -

Pressure monitoring functions

The pressure monitoring functions supervise:

• the inlet pressure vs. user-defined minimum limit, and sensor status
• the outlet pressure vs. user-defined maximum limit, and sensor status
• the pressure difference vs. user-defined minimum limit
• the pressure monitoring delay.
If a function detects that the pump pressure is out of the range, it generates a warning, or trips the unit on a fault. The user can define the warning and fault limits. For the outlet pressure monitoring there is only a warning limit. For the pressure difference monitoring function, there is a resetting parameter: the user must reset the function after a fault trip before a pump restart is possible.

If a function detects that a sensor is faulty, or not connected, it generates a warning.

- **Operation of the Pressure difference monitoring function**

When the pressure difference goes below the warning limit, the function generates a warning (Pressure difference low). If the pressure difference keeps decreasing and goes below the fault limit, the one-pump cooling unit trips on a fault. The two-pump unit tries a pump change as follows:

1. The function checks if the control mode selection (20.01) allows the automatic pump alternation:
   - If yes, the function changes the pump in duty automatically (ie, stops the pump in use, and starts the other pump), and continues to step 2.
   - If no, the function trips the unit on a fault (Pumps failed), and the cooling unit stops. The user can start the unit only after repairing the pump, resetting the cooling unit, and resetting the pressure difference monitoring function (31.20).

2. If the control mode selection (20.01) allowed the pump change, the function keeps monitoring the pressure difference a few seconds, and then decides on the next steps:
   - If the pressure difference goes back to normal, the function considers the stopped pump to be damaged. The cooling unit continues the operation with one pump only. The Alternation function does not try to use the damaged pump, and the warning remains active. The cooling unit goes back to normal two-pump operation only after the user has repaired the damaged pump and reset the pressure difference monitoring function (31.20).
   - If the pressure difference stays below the fault limit, the function trips the unit on a fault (Pumps failed), and the cooling unit stops. The user can start the unit only after repairing the pumps, resetting the cooling unit, and resetting the pressure difference monitoring function (31.20).

- **Settings and diagnostics**

Parameters: 20.01, 31.01, 31.02, 31.03, 31.04, 31.05, 31.06, 31.07, 31.20.

Events: Inlet pressure, Outlet pressure, Pressure difference low, Inlet pressure, Pressure difference, Inlet pressure sensor, Outlet pressure sensor.

**Temperature monitoring functions**

The temperature monitoring functions supervise:
- the coolant temperature level and sensor status
- the internal temperature level (inside the cooling unit cabinet) and sensor status
- the ambient temperature level (outside the cooling unit cabinet) and sensor status.

If a function detects a temperature that is out of the range, or a faulty or not connected sensor, it generates a warning. The user can define:
- minimum and maximum limits for the coolant temperature monitoring
- maximum limit for the internal temperature monitoring
- minimum and maximum limits for the ambient temperature monitoring.
Settings and diagnostics
Events: Coolant temperature below limit, Coolant overtemperature, Coolant temperature sensor, Cabinet overtemperature, Cabinet temperature sensor, Ambient temperature below limit, Ambient overtemperature, Ambient temperature sensor

Leakage monitoring function
The leakage monitoring function supervises the leakage sensor on the bottom of the cooling unit. If the sensor indicates a leakage, the function generates a warning, or trips the unit on a fault. User can define the action, and the delay time for it.

Settings and diagnostics
Parameters: 31.06, 31.07
Events: Coolant leakage (warning), Coolant leakage (fault)

2-way control valve function
A 2-way control valve (option +C242) is available for the cooling unit. Using the valve, the cooling unit can control the flow in the external cooling circuit, and the heat exchanger cooling capacity.

The control program includes a specific function for the 2-way control valve. The function monitors the temperature of the internal circuit coolant after the heat exchanger, and adjust the control valve position to keep the temperature at the constant reference value of 26 ºC (79 ºF). This reference value cannot be adjusted by the user. However, for special cases, the user can activate Follow ambient mode. Then the coolant temperature reference is not a constant value but it follows the measured ambient temperature when the temperature is within a certain temperature range. This feature helps in preventing condensation in warm and humid conditions.

For more information, see the layout drawings, piping and instrumentation diagrams, circuit diagrams, related parameters and start-up.

Settings and diagnostics
Parameters: 22 Coolant temperature control
Events: Valve control limit (warning)

Miscellaneous
User lock
For better cybersecurity, it is highly recommended that you set a master pass code to prevent eg. the changing of parameter values and/or the loading of firmware and other files.

WARNING!
ABB will not be liable for damages or losses caused by the failure to activate the user lock using a new pass code. See Cybersecurity disclaimer (page 139).

To activate the user lock for the first time,
72 Program features

- Enter the default pass code, 10000000, into 96.02. This will make parameters 96.100…96.102 visible.
- Enter a new pass code into 96.100 Change user pass code. Always use eight digits; if using Drive composer, finish with Enter.
- Confirm the new pass code in 96.101 Confirm user pass code.

**WARNING!**
Store the pass code in a safe place – the user lock cannot be opened even by ABB if the pass code is lost.

- In 96.102 User lock functionality, define the actions that you want to prevent (we recommend you select all the actions unless otherwise required by the application).
- Enter an invalid (random) pass code into 96.02.
- Activate control board boot (96.08), or cycle the power to the control unit.
- Check that parameters 96.100…96.102 are hidden. If they are not, enter another random pass code into 96.02.

To reopen the lock, enter your pass code into 96.02. This will again make parameters 96.100…96.102 visible.

**Settings and diagnostics**

Settings: 96.02, and 96.100…96.102
Parameters

What this chapter contains
The chapter describes the parameters, including actual signals, of the control program.

Terms and abbreviations

<table>
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<th>Term</th>
<th>Definition</th>
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<tr>
<td>Actual signal</td>
<td>Type of parameter that is the result of a measurement or calculation by the control program, or contains status information. Most actual signals are read-only, but some (especially counter-type actual signals) can be reset.</td>
</tr>
<tr>
<td>Def</td>
<td>(In the following table, shown on the same row as the parameter name). The default value of a parameter.</td>
</tr>
<tr>
<td>FbEq16</td>
<td>(In the following table, shown on the same row as the parameter range, or for each selection) 16-bit fieldbus equivalent: The scaling between the value shown on the panel and the integer used in communication when a 16-bit value is selected for transmission to an external system. A dash (-) indicates that the parameter is not accessible in 16-bit format.</td>
</tr>
<tr>
<td>Other</td>
<td>The value is taken from another parameter. Choosing &quot;Other&quot; displays a parameter list in which the user can specify the source parameter.</td>
</tr>
<tr>
<td>Note</td>
<td>The source parameter must be a 32-bit real (floating point) number. To use a 16-bit integer (for example, received from an external device in data sets) as the source, data storage parameters can be used.</td>
</tr>
<tr>
<td>Other [bit]</td>
<td>The value is taken from a specific bit in another parameter. Choosing &quot;Other&quot; displays a parameter list in which the user can specify the source parameter and bit.</td>
</tr>
<tr>
<td>Parameter</td>
<td>Either a user-adjustable operating instruction for the control program, or an actual signal.</td>
</tr>
<tr>
<td>p.u.</td>
<td>Per unit</td>
</tr>
</tbody>
</table>
## Summary of parameter groups

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<td>Information on warnings and faults that occurred last.</td>
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<td>06 Control and status words</td>
<td>Control and status words.</td>
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<td>16 I/O extension module 3</td>
<td>I/O extension module 3 settings.</td>
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<td>Control of the coolant temperature in external cooling circuit.</td>
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<td>Configuration of external events; selection of behavior of the drive upon fault situations.</td>
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<td>50 Fieldbus adapter (FBA)</td>
<td>Fieldbus communication configuration.</td>
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<td>51 FBA A settings</td>
<td>Fieldbus adapter A configuration.</td>
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<tr>
<td>52 FBA A data in</td>
<td>Selection of data to be transferred from drive to fieldbus controller through fieldbus adapter A.</td>
</tr>
<tr>
<td>53 FBA A data out</td>
<td>Selection of data to be transferred from fieldbus controller to drive through fieldbus adapter A.</td>
</tr>
<tr>
<td>54 FBA B settings</td>
<td>Fieldbus adapter B configuration.</td>
</tr>
<tr>
<td>55 FBA B data in</td>
<td>Selection of data to be transferred from drive to fieldbus controller through fieldbus adapter B.</td>
</tr>
<tr>
<td>56 FBA B data out</td>
<td>Selection of data to be transferred from fieldbus controller to drive through fieldbus adapter B.</td>
</tr>
<tr>
<td>60 DDCS communication</td>
<td>DDCS communication configuration.</td>
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<td>61 D2D and DDCS transmit data</td>
<td>Defines the data sent to the DDCS link.</td>
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<tr>
<td>62 D2D and DDCS receive data</td>
<td>Mapping of data received through the DDCS link.</td>
</tr>
<tr>
<td>96 System</td>
<td>Language selection; access levels; macro selection; parameter save and restore; control unit reboot; user parameter sets; unit selection.</td>
</tr>
</tbody>
</table>
01 Actual values

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.01</td>
<td>Inlet pressure</td>
<td>Shows the coolant inlet pressure for pump(s).</td>
<td>0.0 bar</td>
</tr>
<tr>
<td></td>
<td>0.0 ... 10.0 bar</td>
<td>Pressure</td>
<td>1000 = 1 bar</td>
</tr>
<tr>
<td>01.02</td>
<td>Outlet pressure</td>
<td>Shows the outlet pressure for pump(s).</td>
<td>0.0 bar</td>
</tr>
<tr>
<td></td>
<td>0.0 ... 10.0 bar</td>
<td>Pressure</td>
<td>1000 = 1 bar</td>
</tr>
<tr>
<td>01.03</td>
<td>Pressure difference</td>
<td>Shows the pressure difference over inlet and outlet.</td>
<td>0.0 bar</td>
</tr>
<tr>
<td></td>
<td>0.0 ... 10.0 bar</td>
<td>Pressure</td>
<td>1000 = 1 bar</td>
</tr>
<tr>
<td>01.21</td>
<td>Cabinet temperature</td>
<td>Shows the measured cabinet temperature.</td>
<td>0.0 °C</td>
</tr>
<tr>
<td></td>
<td>-40.0 ... 120.0 °C</td>
<td>Temperature</td>
<td>100 = 1 °C</td>
</tr>
<tr>
<td>01.22</td>
<td>Ambient temperature</td>
<td>Shows the cabinet ambient temperature.</td>
<td>0.0 °C</td>
</tr>
<tr>
<td></td>
<td>-40.0 ... 120.0 °C</td>
<td>Temperature</td>
<td>100 = 1 °C</td>
</tr>
<tr>
<td>01.23</td>
<td>Coolant int temper-</td>
<td>Shows the coolant temperature in the internal cooling circuit.</td>
<td>0.0 °C</td>
</tr>
<tr>
<td></td>
<td>-ature</td>
<td>Temperature</td>
<td>100 = 1 °C</td>
</tr>
<tr>
<td>01.24</td>
<td>Coolant ext temper-</td>
<td>Shows the coolant temperature in the external cooling circuit.</td>
<td>0.0 °C</td>
</tr>
<tr>
<td></td>
<td>-ature</td>
<td>Temperature</td>
<td>100 = 1 °C</td>
</tr>
</tbody>
</table>

04 Warnings and faults

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>04.01</td>
<td>Tripping fault</td>
<td>Shows the code of the 1st active fault (the fault that caused the current fault trip).</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>1st active fault.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.02</td>
<td>Active fault 2</td>
<td>Shows the code of the 2nd active fault.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>2nd active fault.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.03</td>
<td>Active fault 3</td>
<td>Shows the code of the 3rd active fault.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>3rd active fault.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.04</td>
<td>Active fault 4</td>
<td>Shows the code of the 4th active fault.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>4th active fault.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.05</td>
<td>Active fault 5</td>
<td>Shows the code of the 5th active fault.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>5th active fault.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.06</td>
<td>Active warning 1</td>
<td>Shows the code of the 1st active warning.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>1st active warning.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.07</td>
<td>Active warning 2</td>
<td>Shows the code of the 2nd active warning.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>2nd active warning.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.08</td>
<td>Active warning 3</td>
<td>Shows the code of the 3rd active warning.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>3rd active warning.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.09</td>
<td>Active warning 4</td>
<td>Shows the code of the 4th active warning.</td>
<td>-</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
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<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>04.10</td>
<td>Active warning 5</td>
<td>Shows the code of the 5th active warning.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>4th active warning.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.11</td>
<td>Latest fault</td>
<td>Shows the code of the 1st stored (non-active) fault.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>1st stored fault.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.12</td>
<td>2nd latest fault</td>
<td>Shows the code of the 2nd stored (non-active) fault.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>2nd stored fault.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.13</td>
<td>3rd latest fault</td>
<td>Shows the code of the 3rd stored (non-active) fault.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>3rd stored fault.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.14</td>
<td>4th latest fault</td>
<td>Shows the code of the 4th stored (non-active) fault.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>4th stored fault.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.15</td>
<td>5th latest fault</td>
<td>Shows the code of the 5th stored (non-active) fault.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>5th stored fault.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.16</td>
<td>Latest warning</td>
<td>Shows the code of the 1st stored (non-active) warning.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>1st stored warning.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.17</td>
<td>2nd latest warning</td>
<td>Shows the code of the 2nd stored (non-active) warning.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>2nd stored warning.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.18</td>
<td>3rd latest warning</td>
<td>Shows the code of the 3rd stored (non-active) warning.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>3rd stored warning.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.19</td>
<td>4th latest warning</td>
<td>Shows the code of the 4th stored (non-active) warning.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>4th stored warning.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.20</td>
<td>5th latest warning</td>
<td>Shows the code of the 5th stored (non-active) warning.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>5th stored warning.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>04.21</td>
<td>Fault word</td>
<td>Shows the cooling unit fault word.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>See below for the bit assignments of the word.</td>
<td>1 = 1</td>
</tr>
<tr>
<td></td>
<td>b0 Pumps failed</td>
<td>1 = See fault <em>Pumps failed.</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b3 Inlet pressure low</td>
<td>1 = See fault <em>Inlet pressure.</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b7 XSTO open</td>
<td>1 = Circuit connected from terminal XSTO:OUT to XSTO:IN1 and/or XSTO:IN2 on the control unit is open.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b10 Coolant leakage</td>
<td>1 = See fault <em>Coolant leakage.</em></td>
<td></td>
</tr>
<tr>
<td>04.31</td>
<td>Warning word 1</td>
<td>Shows the warning word 1.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>See below for the bit assignments of the word.</td>
<td>1 = 1</td>
</tr>
<tr>
<td></td>
<td>b0 Coolant temp low</td>
<td>1 = The coolant temperature in the internal cooling circuit is below the defined limit. See parameter 31.09.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b1 Coolant temp high</td>
<td>1 = The coolant temperature in the internal cooling circuit exceeds the defined limit. See parameter 31.10.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b2 Inlet pressure low</td>
<td>1 = Inlet pressure is below the defined limit. See parameter 31.01.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b3 Outlet overpressure</td>
<td>1 = Outlet pressure exceeds the defined limit. See parameter 31.03.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b4 Pressure difference</td>
<td>1 = Pressure difference over pump(s) is below the defined limit. See parameter 31.04.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b7 Cabinet overtemp</td>
<td>1 = Cabinet temperature exceeds the defined limit. See parameter 31.11.</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Name/Value</td>
<td>Description</td>
<td>Def/FbEq16</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>b8</td>
<td>Ambient temp low</td>
<td>1 = Ambient temperature is below the minimum limit. See parameter 31.12.</td>
<td></td>
</tr>
<tr>
<td>b9</td>
<td>Ambient overtemp</td>
<td>1 = Ambient temperature exceeds the defined limit. See parameter 31.13.</td>
<td></td>
</tr>
<tr>
<td>b11</td>
<td>Valve control limit</td>
<td>1 = 2-way valve PI-controller output in the upper limit.</td>
<td></td>
</tr>
<tr>
<td>b12</td>
<td>Auxiliary fan failure</td>
<td>1 = Auxiliary cooling fan not running.</td>
<td></td>
</tr>
<tr>
<td>b13</td>
<td>Coolant leakage</td>
<td>1 = Coolant leakage in internal/external cooling circuit or condensation detected.</td>
<td></td>
</tr>
<tr>
<td>b14</td>
<td>Pump MCB</td>
<td>1 = Pump 1 or 2 motor protective circuit breaker is open.</td>
<td></td>
</tr>
<tr>
<td>b15</td>
<td>Pressure diff low</td>
<td>1 = The difference between the inlet and outlet pressure is below the defined limit. See parameter 31.04.</td>
<td></td>
</tr>
</tbody>
</table>

04.32 Warning word 2 Shows the warning word 2. -

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>b0</td>
<td>Inlet pressure sensor</td>
<td>1 = Inlet coolant pressure sensor failure</td>
<td></td>
</tr>
<tr>
<td>b1</td>
<td>Outlet pressure sensor</td>
<td>1 = Outlet coolant pressure sensor failure</td>
<td></td>
</tr>
<tr>
<td>b2</td>
<td>Coolant temp sensor</td>
<td>1 = Coolant temperature sensor failure</td>
<td></td>
</tr>
<tr>
<td>b3</td>
<td>Cabinet temp sensor</td>
<td>1 = Cabinet temperature sensor failure</td>
<td></td>
</tr>
<tr>
<td>b4</td>
<td>Ambient temp sensor</td>
<td>1 = Ambient temperature sensor failure</td>
<td></td>
</tr>
</tbody>
</table>

06 Control and status words

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>06.01</td>
<td>Control word</td>
<td>Shows the cooling unit control word.</td>
<td></td>
</tr>
<tr>
<td>b0</td>
<td>Start/Stop</td>
<td>1 = Start</td>
<td></td>
</tr>
<tr>
<td>b7</td>
<td>Reset</td>
<td>1 = Reset</td>
<td></td>
</tr>
<tr>
<td>06.11</td>
<td>Status word</td>
<td>Shows the cooling unit status word.</td>
<td></td>
</tr>
<tr>
<td>b0</td>
<td>Pump 1</td>
<td>1 = Pump 1 is active.</td>
<td></td>
</tr>
<tr>
<td>b1</td>
<td>Pump 2</td>
<td>1 = Pump 2 is active.</td>
<td></td>
</tr>
<tr>
<td>b2</td>
<td>Auto mode</td>
<td>1 = Auto mode is selected. See parameter 20.01.</td>
<td></td>
</tr>
<tr>
<td>b4</td>
<td>Fault</td>
<td>1 = Fault is active.</td>
<td></td>
</tr>
<tr>
<td>b7</td>
<td>Warning</td>
<td>1 = Warning is active.</td>
<td></td>
</tr>
<tr>
<td>b9</td>
<td>Panel</td>
<td>1 = The control panel is in local control mode (and the control interface for the cooling unit).</td>
<td></td>
</tr>
<tr>
<td>06.20</td>
<td>DI status</td>
<td>Shows the status for digital inputs.</td>
<td></td>
</tr>
<tr>
<td>b0...b5</td>
<td>DI1 ... DI6</td>
<td>1 = Digital input DIx is on.</td>
<td></td>
</tr>
<tr>
<td>b15</td>
<td>DIIL</td>
<td>1 = Digital input DIIL is on.</td>
<td></td>
</tr>
<tr>
<td>06.21</td>
<td>DIO status</td>
<td>Shows the status of the digital input/output signals.</td>
<td></td>
</tr>
</tbody>
</table>
### 78 Parameters

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>See below for the bit assignments of the data word.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>b0</td>
<td>DIO1</td>
<td>1 = Digital IO DIO1 is active.</td>
<td></td>
</tr>
<tr>
<td>b1</td>
<td>DIO2</td>
<td>1 = Digital IO DIO2 is active.</td>
<td></td>
</tr>
<tr>
<td>06.22</td>
<td>RO status</td>
<td>Shows the status of the relay output signals.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>See below for the bit assignments of the data word.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>b0</td>
<td>RO1</td>
<td>1 = Relay output RO1 is energized.</td>
<td></td>
</tr>
<tr>
<td>b1</td>
<td>RO2</td>
<td>1 = Relay output RO2 is energized.</td>
<td></td>
</tr>
<tr>
<td>b2</td>
<td>RO3</td>
<td>1 = Relay output RO3 is energized.</td>
<td></td>
</tr>
<tr>
<td>06.23</td>
<td>Inlet pressure raw value</td>
<td>Shows the inlet pressure signal in milliamperes (mA) (value received from the sensor).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-22.000 ... 22.000 mA</td>
<td>Pressure value</td>
<td>1000 = 1</td>
</tr>
<tr>
<td>06.24</td>
<td>Outlet pressure raw value</td>
<td>Shows the outlet pressure signal in milliamperes (mA) (value received from the sensor).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-22.000 ... 22.000 mA</td>
<td>Pressure value</td>
<td>1000 = 1</td>
</tr>
<tr>
<td>06.25</td>
<td>Cabinet temp raw value</td>
<td>Shows the cabinet temperature signal in volts (V) (value received from the sensor).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-22.000 ... 22.000 V</td>
<td>Temperature value</td>
<td>1000 = 1</td>
</tr>
<tr>
<td>06.26</td>
<td>Ambient temp raw value</td>
<td>Shows the ambient temperature signal in volts (V) (value received from the sensor).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-22.000 ... 22.000 V</td>
<td>Temperature value</td>
<td>1000 = 1</td>
</tr>
<tr>
<td>06.27</td>
<td>Coolant temp raw value</td>
<td>Shows the coolant temperature signal in volts (V) (value received from the sensor).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-22.000 ... 22.000 V</td>
<td>Temperature value</td>
<td>1000 = 1</td>
</tr>
<tr>
<td>06.28</td>
<td>Coolant ext temp raw value</td>
<td>Shows the coolant external temperature signal in volts (V) (value received from the sensor).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-22.000 ... 22.000 V</td>
<td>Temperature value</td>
<td>1000 = 1</td>
</tr>
</tbody>
</table>

### 07 System info

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>07 System info</td>
<td>Information on firmware. All parameters in this group are read-only.</td>
<td></td>
</tr>
<tr>
<td>07.04</td>
<td>Firmware name</td>
<td>Shows the firmware identifier.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>07.05</td>
<td>Firmware version</td>
<td>Shows the firmware version number. The format is A.B.B.C.D, where A = major version, B = minor version, C = patch (ie. firmware variant code), D = 0.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>07.06</td>
<td>Loading package name</td>
<td>Shows the name of the firmware loading package. The format is ALCLX, where X denotes the control unit type (6 = ZCU-14).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>07.07</td>
<td>Loading package version</td>
<td>Shows the version number of the firmware loading package. Format: See parameter 07.05.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 15 I/O extension module 2

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.01</td>
<td>Module 2 type</td>
<td>Selects the optional module 2 type.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>None.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>FIO-01</td>
<td>Digital I/O extension.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>FIO-11</td>
<td>Analog I/O extension.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>FDOI-01</td>
<td>Digital I/O extension.</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>FAIO-01</td>
<td>Analog I/O extension.</td>
<td>4</td>
</tr>
<tr>
<td>15.02</td>
<td>Module 2 location</td>
<td>Selects the slot where option module 2 is attached in. Alternatively give the node address set by rotary switch of FEA-02 board.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Not selected</td>
<td>None.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Slot 1</td>
<td>Slot 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Slot 2</td>
<td>Slot 2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Slot 3</td>
<td>Slot 3</td>
<td>3</td>
</tr>
<tr>
<td>15.03</td>
<td>Module 2 status</td>
<td>Shows the type of the option found from given location. This parameter is read-only.</td>
<td>0, 1, 5, 7, 9</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>No option</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>FIO-01</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>FIO-11</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>FAIO-01</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>FDOI-11</td>
<td>9</td>
</tr>
</tbody>
</table>

### 16 I/O extension module 3

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.01</td>
<td>Module 3 type</td>
<td>Selects the optional module 3 type.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>None.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>FIO-01</td>
<td>Digital I/O extension.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>FIO-11</td>
<td>Analog I/O extension.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>FDOI-01</td>
<td>Digital I/O extension.</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>FAIO-01</td>
<td>Analog I/O extension.</td>
<td>4</td>
</tr>
<tr>
<td>16.02</td>
<td>Module 3 location</td>
<td>Selects the slot where option module 3 is attached in. Alternatively give the node address set by rotary switch of FEA-02 board.</td>
<td>1</td>
</tr>
</tbody>
</table>
### 80 Parameters

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not selected</td>
<td>None.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Slot 1</td>
<td>Slot 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Slot 2</td>
<td>Slot 2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Slot 3</td>
<td>Slot 3</td>
<td>3</td>
</tr>
<tr>
<td>16.03</td>
<td>Module 3 status</td>
<td>Shows the type of the option found from given location. This parameter is read-only.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>No option</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>FIO-01</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>FIO-11</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>FAIO-01</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>FDIO-01</td>
<td>9</td>
</tr>
</tbody>
</table>

### 20 LCU control

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20 LCU control</td>
<td>Cooling unit control and settings.</td>
<td></td>
</tr>
<tr>
<td>20.01</td>
<td>Control mode</td>
<td>Selects the control mode of the cooling unit.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Manual</td>
<td>Manual control mode. User forces either pump 1 or pump 2 into use by parameter 20.02.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Auto</td>
<td>Auto control mode. The cooling unit control logic selects pump 1 or pump 2 into use automatically. See Alternation (page 68).</td>
<td>1</td>
</tr>
<tr>
<td>20.02</td>
<td>Pump selection</td>
<td>If parameter 20.01 has value Manual, this parameter defines the pump in use (pump 1 or pump 2).</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Pump 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Pump 2</td>
<td>2</td>
</tr>
<tr>
<td>20.03</td>
<td>Control location</td>
<td>Selects the interface through which the cooling unit reads the start/stop signal.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Local control</td>
<td>Digital input DI6. 1 = start, 0 = stop.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>DDCS controller</td>
<td>Serial DDCS channel (fibre optic link). Applicable only when the control unit is equipped with the FDCO adapter module (option +L508).</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Fieldbus A</td>
<td>Fieldbus adapter A. Applicable only when the control unit is equipped with a fieldbus adapter module (option +K4xx). See Fieldbus control through a fieldbus adapter (page 115).</td>
<td>2</td>
</tr>
<tr>
<td>20.04</td>
<td>Number of pumps</td>
<td>Defines the number of pumps in operation.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1 Pump</td>
<td>1 pump. Use this value value for the one-pump cooling unit. If you select it for a two-pump unit, the control program will disable pump 2 and the automatic pump alternation feature, and operates only pump 1.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2 Pumps</td>
<td>2 pumps. Use this value for a two-pump cooling unit as standard.</td>
<td>1</td>
</tr>
<tr>
<td>20.05</td>
<td>Run time period P1</td>
<td>Defines run time period for pump 1 in a two-pump cooling unit when the automatic alternation is in use. See section Alternation (page 68).</td>
<td>3d</td>
</tr>
<tr>
<td>No.</td>
<td>Name/Value</td>
<td>Description</td>
<td>Def/FbEq16</td>
</tr>
<tr>
<td>-----</td>
<td>------------</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>20.06</td>
<td>Run time period P2</td>
<td>Defines run time period for pump 2 in a two-pump cooling unit when the automatic alternation is in use. See <em>Alternation (page 68)</em>.</td>
<td>3 d</td>
</tr>
<tr>
<td>20.07</td>
<td>Stop delay</td>
<td>Defines the running time of pump(s) after the stop command. Tune this value on site if a delayed cooling period after the stop is needed. <strong>Note:</strong> This parameter also defines the time for the Standby function (20.08).</td>
<td>10 min</td>
</tr>
<tr>
<td>20.08</td>
<td>Standby enable</td>
<td>Enables the Standby function. See <em>Standby (page 69)</em>.</td>
<td>On</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Disable</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>On</td>
<td>Enable</td>
<td>1</td>
</tr>
<tr>
<td>20.09</td>
<td>Standby delay</td>
<td>Defines the delay time for the Standby function (20.08).</td>
<td>7 d</td>
</tr>
<tr>
<td></td>
<td>1 ... 21 d</td>
<td>Time in days</td>
<td>1 = 1 d</td>
</tr>
<tr>
<td>20.11</td>
<td>Start trigger type</td>
<td>Selects the trigger type for the start/stop signal.</td>
<td>Level</td>
</tr>
<tr>
<td></td>
<td>Edge</td>
<td>Start at the rising edge of the signal (0-&gt; 1), stop at the falling edge of the signal (1 -&gt; 0).</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Level</td>
<td>Start signal on (1) = start, start signal off (0) = stop.</td>
<td>1</td>
</tr>
<tr>
<td>20.29</td>
<td>Test auxiliary fan</td>
<td>Tests auxiliary fan operation.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>Disable. If the fan operation is set to 0, the auxiliary fan stops when the temperature of the cabinet drops under 50 ºC.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Enable. If you test the auxiliary fan, return the parameter value to 0 after testing. If you activate the control board boot (96.08) or cycle the power, parameter value returns to 0 automatically.</td>
<td>1</td>
</tr>
</tbody>
</table>

### 22 Coolant temperature control

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 Coolant temperature control</td>
<td>Control of the coolant temperature.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.01</td>
<td>Valve control</td>
<td>Enables the 2-way control valve function.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>On</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>22.02</td>
<td>Coolant temp reference</td>
<td>Shows the value of coolant temperature reference (internal cooling circuit) of the 2-way control valve function.</td>
<td>0 ºC</td>
</tr>
<tr>
<td></td>
<td>-5.0 ... 60.0 ºC</td>
<td>Temperature value</td>
<td>100 = 1 ºC</td>
</tr>
<tr>
<td>22.20</td>
<td>Follow ambient mode</td>
<td>Activates the Follow ambient temperature mode. The Follow ambient temperature mode adjusts the coolant temperature to correspond the ambient temperature between 26 ºC (low limit) and 40 ºC (high limit).</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Inactive (coolant temperature 26 ºC)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>On</td>
<td>Active</td>
<td>1</td>
</tr>
<tr>
<td>22.31</td>
<td>Proportional gain</td>
<td>Defines the proportional gain (Kp) of the valve PI controller (2-way control valve function).</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>0.2 ... 2.5</td>
<td>Proportional gain</td>
<td>100 = 1</td>
</tr>
</tbody>
</table>
### Def/FbEq16

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.32</td>
<td>Integration time</td>
<td>Defines the integration time of the valve PI controller (2-way control valve function). The integration time defines the rate at which the controller output changes when the error value is constant and the proportional gain of the speed controller is 1. The shorter the integration time, the faster the continuous error value is corrected. Too short integration time makes the control unstable.</td>
<td>60.0</td>
</tr>
<tr>
<td></td>
<td>Integration time</td>
<td>0 ... 600 s</td>
<td>10 = 1</td>
</tr>
<tr>
<td>22.34</td>
<td>Preset valve position</td>
<td>Defines the position of the 2-way control valve when the 2-way control valve function is disabled (22.01), or when the cooling unit is stopped. You can use a preset position for testing purposes, i.e., to test that the valve reaches its maximum (100%) and minimum limits (0%). <strong>Note:</strong> When the 2-way control valve function is enabled (22.01), but it does not receive the temperature measurement value (e.g., due to broken connection), the control function operates the preset position defined by this parameter.</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Valve position</td>
<td>0.0 ... 100.0%</td>
<td>10 = 1%</td>
</tr>
<tr>
<td>22.35</td>
<td>Valve control output</td>
<td>Shows the output of the 2-way control valve function. This value is used as the valve control signal (4...20 mA signal of analog output AO1 of the FAIO-01 module). 4...20 mA corresponds to 0...100%.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Output value</td>
<td>0.0 ... 100.0%</td>
<td>10 = 1%</td>
</tr>
</tbody>
</table>

### 31 Fault functions

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>Fault functions</td>
<td>Configuration of external events; selection of behavior of the unit upon fault situations.</td>
<td></td>
</tr>
<tr>
<td>31.01</td>
<td>Inlet pressure min warning</td>
<td>Defines the minimum inlet pressure for the warning (Inlet pressure).</td>
<td>1.5 bar</td>
</tr>
<tr>
<td></td>
<td>Pressure value</td>
<td>0.0 ... 10.0 bar</td>
<td>10 = 1 bar</td>
</tr>
<tr>
<td>31.02</td>
<td>Inlet pressure min fault</td>
<td>Defines minimum inlet pressure for the fault (Inlet pressure).</td>
<td>1.0 bar</td>
</tr>
<tr>
<td></td>
<td>Pressure value</td>
<td>0.0 ... 10.0 bar</td>
<td>10 = 1 bar</td>
</tr>
<tr>
<td>31.03</td>
<td>Outlet pressure max warning</td>
<td>Defines maximum outlet pressure for warning (Outlet pressure).</td>
<td>6.0 bar</td>
</tr>
<tr>
<td></td>
<td>Pressure value</td>
<td>0.0 ... 10.0 bar</td>
<td>10 = 1 bar</td>
</tr>
<tr>
<td>31.04</td>
<td>Pressure diff warning</td>
<td>Defines the minimum pressure difference for warning (Pressure difference low).</td>
<td>1.0 bar</td>
</tr>
<tr>
<td></td>
<td>Pressure value</td>
<td>0.0 ... 10.0 bar</td>
<td>10 = 1 bar</td>
</tr>
<tr>
<td>31.05</td>
<td>Pressure diff fault</td>
<td>Defines the minimum pressure difference limit for fault (Pressure difference).</td>
<td>0.8 bar</td>
</tr>
<tr>
<td></td>
<td>Pressure value</td>
<td>0.0 ... 10.0 bar</td>
<td>10 = 1 bar</td>
</tr>
<tr>
<td>31.06</td>
<td>Leakage action</td>
<td>Selects the action in case the control program detects a leakage.</td>
<td>Fault</td>
</tr>
<tr>
<td></td>
<td>Warning</td>
<td>Warning (Coolant leakage).</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Fault</td>
<td>Fault (Coolant leakage).</td>
<td>1</td>
</tr>
<tr>
<td>31.07</td>
<td>Leakage delay</td>
<td>Defines the delay for the leakage function (31.06).</td>
<td>0 min</td>
</tr>
<tr>
<td></td>
<td>Delay</td>
<td>0 ... 500 min</td>
<td>1 = 1 min</td>
</tr>
<tr>
<td>No.</td>
<td>Name/Value</td>
<td>Description</td>
<td>Def/FbEq16</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>31.08</td>
<td>Pressure delay</td>
<td>Defines the pressure delay for the liquid pressure monitoring function. The delay is in use during the pump start.</td>
<td>5 s</td>
</tr>
<tr>
<td></td>
<td>1 ... 10 s</td>
<td>Time</td>
<td>1 = 1 s</td>
</tr>
<tr>
<td>31.09</td>
<td>Coolant min temperature</td>
<td>Defines the warning limit of the minimum liquid temperature in the internal cooling circuit <em>(Coolant temperature below limit).</em></td>
<td>5.0 °C</td>
</tr>
<tr>
<td></td>
<td>-5.0 … 40.0 °C</td>
<td>Temperature</td>
<td>100 = 1 °C</td>
</tr>
<tr>
<td>31.10</td>
<td>Coolant max temperature</td>
<td>Defines the warning limit of the maximum liquid temperature in the internal cooling circuit <em>(Coolant overtemperature).</em></td>
<td>45.0 °C</td>
</tr>
<tr>
<td></td>
<td>0.0 … 70.0 °C</td>
<td>Temperature</td>
<td>100 = 1 °C</td>
</tr>
<tr>
<td>31.11</td>
<td>Cabinet max temperature</td>
<td>Defines the warning limit of the maximum cabinet temperature <em>(Cabinet overtemperature).</em></td>
<td>60.0 °C</td>
</tr>
<tr>
<td></td>
<td>-10.0 … 70.0 °C</td>
<td>Temperature</td>
<td>100 = 1 °C</td>
</tr>
<tr>
<td>31.12</td>
<td>Ambient min temperature</td>
<td>Defines the warning limit of the minimum ambient temperature <em>(Ambient temperature below limit).</em></td>
<td>5.0 °C</td>
</tr>
<tr>
<td></td>
<td>-10.0 … 60.0 °C</td>
<td>Temperature</td>
<td>100 = 1 °C</td>
</tr>
<tr>
<td>31.13</td>
<td>Ambient max temperature</td>
<td>Defines the warning limit of the maximum ambient temperature <em>(Ambient overtemperature).</em></td>
<td>55.0 °C</td>
</tr>
<tr>
<td></td>
<td>-10.0 … 60.0 °C</td>
<td>Temperature</td>
<td>100 = 1 °C</td>
</tr>
<tr>
<td>31.20</td>
<td>Pressure difference reset</td>
<td>Resets the pressure difference monitoring function. Reset after fixing the cause for the pressure difference fault/warning.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Done</td>
<td>Done (control program restores automatically this value after reset)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Reset</td>
<td>Reset</td>
<td>1</td>
</tr>
</tbody>
</table>

### 47 Data storage

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>47</td>
<td>Data storage parameters that can be written to and read from using other parameters’ source and target settings. Note that there are different storage parameters for different data types. Integer-type storage parameters cannot be used as the source of other parameters.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47.01</td>
<td>Data storage 1 real32</td>
<td>Shows the real-type data storage parameter 1. Parameters 47.01…47.08 are real 32-bit numbers that can be used as source values of other parameters.</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>2147483.264 … 2147473.264</td>
<td>32-bit real (floating point) number.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>…</td>
<td>…</td>
<td></td>
</tr>
<tr>
<td>47.08</td>
<td>Data storage 8 real32</td>
<td>Shows the real-type data storage parameter 8.</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>2147483.264 … 2147473.264</td>
<td>32-bit real (floating point) number.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>…</td>
<td>…</td>
<td></td>
</tr>
<tr>
<td>47.11</td>
<td>Data storage 1 int32</td>
<td>Shows the 32-bit integer-type data storage parameter 1.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>-2147483648 … 2147483647</td>
<td>32-bit integer.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>…</td>
<td>…</td>
<td></td>
</tr>
<tr>
<td>47.18</td>
<td>Data storage 8 int32</td>
<td>Shows the 32-bit integer-type data storage parameter 8.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 49 Panel port communication

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>49.01</td>
<td>Node ID number</td>
<td>Defines the node ID of the unit. All devices connected to the network must have a unique node ID.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1...32</td>
<td>Node ID.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>49.03</td>
<td>Baud rate</td>
<td>Defines the transfer rate of the link</td>
<td>230.4 kbps</td>
</tr>
<tr>
<td></td>
<td>38.4 kbps</td>
<td>38.4 kbit/s</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>57.6 kbps</td>
<td>57.6 kbit/s</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>86.4 kbps</td>
<td>86.4 kbit/s</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>115.2 kbps</td>
<td>115.2 kbit/s</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>230.4 kbps</td>
<td>230.4 kbit/s</td>
<td>5</td>
</tr>
<tr>
<td>49.04</td>
<td>Communication loss time</td>
<td>Sets a timeout for control panel (or PC tool) communication. If a communication break lasts longer than the timeout, the action specified by parameter 49.05 Communication loss action is taken</td>
<td>10.0 s</td>
</tr>
<tr>
<td></td>
<td>0.3 … 3000.0 s</td>
<td>Panel/PC tool communication timeout.</td>
<td>10 = 1 s</td>
</tr>
<tr>
<td>49.05</td>
<td>Communication loss action</td>
<td>Selects how the unit reacts to a control panel (or PC tool) communication break. Changes to this parameter take effect after the control unit is rebooted or the new settings validated by parameter 49.06 Refresh settings.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>No action</td>
<td>No action taken</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Fault</td>
<td>Unit trips (Control panel loss). This only occurs if control is expected from the control panel (it is selected as source of start/stop in the currently active control location).</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Warning</td>
<td>Control program generates a warning (Control panel loss). This only occurs if control is expected from the control panel (it is selected as source of start/stop in the currently active control location).</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="#">WARNING!</a> Make sure that it is safe to continue operation in case of a communication break.</td>
<td></td>
</tr>
<tr>
<td>49.06</td>
<td>Refresh settings</td>
<td>Applies to parameters 49.01...49.05. Note: Refreshing may cause a communication break, so reconnecting the unit may be required.</td>
<td>Done</td>
</tr>
<tr>
<td></td>
<td>Done</td>
<td>Refresh done or not requested.</td>
<td>0</td>
</tr>
</tbody>
</table>
## 50 Fieldbus adapter (FBA)

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>Fieldbus adapter (FBA)</td>
<td>Fieldbus communication configuration.</td>
<td></td>
</tr>
<tr>
<td>50.01</td>
<td>FBA A enable</td>
<td>Enables/disables communication between the unit and fieldbus adapter A, and specifies the slot the adapter is installed into.</td>
<td>Disable</td>
</tr>
<tr>
<td></td>
<td>Disable</td>
<td>Communication between unit and fieldbus adapter A disabled.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Option slot 1</td>
<td>Reserved. Slot 1 is not available for fieldbus adapters.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Option slot 2</td>
<td>Communication between unit and fieldbus adapter A enabled. The adapter is in slot 2.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Option slot 3</td>
<td>Communication between unit and fieldbus adapter A enabled. The adapter is in slot 3.</td>
<td>3</td>
</tr>
<tr>
<td>50.02</td>
<td>FBA A comm loss func</td>
<td>Selects how the unit reacts upon a fieldbus communication break. A time delay for the action can be defined by parameter 50.03. See also parameter 50.26.</td>
<td>No action</td>
</tr>
<tr>
<td></td>
<td>No action</td>
<td>No action taken.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Fault</td>
<td>Unit trips (FBA A communication). This only occurs if control is expected from the FBA A interface (FBA A selected as source of start/stop), or if supervision is forced using parameter 50.26.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Fault always</td>
<td>Unit trips (FBA A communication). This occurs even though no control is expected from the FBA A interface.</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Warning</td>
<td>Unit generates a warning (FBA A communication). This only occurs if control is expected from the FBA A interface, or if supervision is forced using parameter 50.26.</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>WARNING!</strong> Make sure that it is safe to continue operation in case of a communication break.</td>
<td></td>
</tr>
<tr>
<td>50.03</td>
<td>FBA A comm loss t out</td>
<td>Defines the time delay before the action defined by parameter 50.02 is taken. Time count starts when the communication link fails to update the message. As a rule of thumb, this parameter should be set to at least 3 times the transmit interval of the master.</td>
<td>0.3 s</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> There is a 60-second boot-up delay immediately after power-up. During the delay, the communication break monitoring is disabled (but communication itself can be active).</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>0.3 s</strong> - 6553.5 s Time delay.</td>
<td></td>
</tr>
<tr>
<td>50.04</td>
<td>FBA A ref1 type</td>
<td>Note: The control program does not need/use this reference value. Selects the type and scaling of reference ref1 received from fieldbus adapter A. <strong>Note:</strong> Fieldbus-specific communication profiles may use different scalings. For more information, see the manual of the fieldbus adapter.</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td>Auto</td>
<td>See Transparent.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Transparent</td>
<td>No scaling is applied (the 16-bit scaling is 1 = 1 unit).</td>
<td>1</td>
</tr>
</tbody>
</table>
### 86 Parameters

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>General</td>
<td>Generic reference with a scaling of 100 = 1 (ie. integer and two decimals).</td>
<td>2</td>
</tr>
<tr>
<td>50.05</td>
<td>FBA A ref2 type</td>
<td><strong>Note:</strong> The control program does not need/use this reference value.</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Selects the type and scaling of reference ref2 received from fieldbus adapter A. See parameter 50.04.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Auto</td>
<td>See parameter 50.04 FBA A ref1 type.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50.07</td>
<td>FBA A actual 1 type</td>
<td>Selects the type and scaling of actual value act1 transmitted to the fieldbus network through fieldbus adapter A.</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td>Auto</td>
<td>See Transparent.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Transparent</td>
<td>The value selected by parameter 50.10 is sent as actual value act1. No scaling is applied (the 16-bit scaling is 1 = 1 unit).</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>General</td>
<td>The value selected by parameter 50.10 is sent as actual value act1 with a 16-bit scaling of 100 = 1 unit (ie. integer and two decimals).</td>
<td></td>
</tr>
<tr>
<td>50.08</td>
<td>FBA A actual 2 type</td>
<td>Selects the type and scaling of actual value act2 transmitted to the fieldbus network through fieldbus adapter A.</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td>Auto</td>
<td>See parameter 50.08.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>...</td>
<td>See parameter 50.07.</td>
<td>1</td>
</tr>
<tr>
<td>50.09</td>
<td>FBA A SW transparent source</td>
<td>Selects the source of the fieldbus adapter A status word (SW) when the fieldbus adapter A is set to a transparent communication profile eg. by its configuration parameters (group 51 FBA A settings).</td>
<td>Not selected</td>
</tr>
<tr>
<td></td>
<td>Not selected</td>
<td>No source selected.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Other…</td>
<td>Other source. See Terms and abbreviations (page 73).</td>
<td></td>
</tr>
<tr>
<td>50.10</td>
<td>FBA A act1 transparent source</td>
<td>When parameter 50.07 is set to Transparent or General, this parameter selects the source of actual value act1 transmitted to the fieldbus network through fieldbus adapter A.</td>
<td>Not selected</td>
</tr>
<tr>
<td></td>
<td>Not selected</td>
<td>No source selected.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Other…</td>
<td>Other source. See Terms and abbreviations (page 73).</td>
<td></td>
</tr>
<tr>
<td>50.11</td>
<td>FBA A act2 transparent source</td>
<td>When parameter 50.08 is set to Transparent or General, this parameter selects the source of actual value act2 transmitted to the fieldbus network through fieldbus adapter A.</td>
<td>Not selected</td>
</tr>
<tr>
<td></td>
<td>Not selected</td>
<td>No source selected.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Other…</td>
<td>Other source. See Terms and abbreviations (page 73).</td>
<td></td>
</tr>
<tr>
<td>50.12</td>
<td>FBA A debug mode</td>
<td>Enables the display of raw (unmodified) data received from and sent to fieldbus adapter A in parameters 50.13…50.18. This functionality should only be used for debugging.</td>
<td>Disable</td>
</tr>
<tr>
<td></td>
<td>Disable</td>
<td>Display of raw data from fieldbus adapter A disabled.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Fast</td>
<td>Display of raw data from fieldbus adapter A enabled.</td>
<td>1</td>
</tr>
<tr>
<td>50.13</td>
<td>FBA A control word</td>
<td>Displays the raw (unmodified) control word sent by the master (PLC) to fieldbus adapter A if debugging is enabled by parameter 50.12. This parameter is read-only.</td>
<td>00.00.00.00</td>
</tr>
<tr>
<td>No.</td>
<td>Name/Value</td>
<td>Description</td>
<td>Def/FbEq16</td>
</tr>
<tr>
<td>-----</td>
<td>------------</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>50.14</td>
<td>FBA A reference 1</td>
<td>Displays raw (unmodified) reference ref1 sent by the master (PLC) to fieldbus adapter A if debugging is enabled by parameter 50.12.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>-2147483648...2147483648</td>
<td>Raw REF1 sent by master to fieldbus adapter A.</td>
<td></td>
</tr>
<tr>
<td>50.15</td>
<td>FBA A reference 2</td>
<td>Displays raw (unmodified) reference ref2 sent by the master (PLC) to fieldbus adapter A if debugging is enabled by parameter 50.12.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>-2147483648...2147483648</td>
<td>Raw ref2 sent by master to fieldbus adapter A.</td>
<td></td>
</tr>
<tr>
<td>50.16</td>
<td>FBA A status word</td>
<td>Displays the raw (unmodified) status word sent by fieldbus adapter A to the master (PLC) if debugging is enabled by parameter 50.12. This parameter is read-only.</td>
<td>00.00.00.00</td>
</tr>
<tr>
<td></td>
<td>00000000h...FFFFFFFFh</td>
<td>Status word sent by fieldbus adapter A to master.</td>
<td></td>
</tr>
<tr>
<td>50.17</td>
<td>FBA A actual value 1</td>
<td>Displays raw (unmodified) actual value act1 sent by fieldbus adapter A to the master (PLC) if debugging is enabled by parameter 50.12.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>-2147483648...2147483648</td>
<td>Raw act1 sent by fieldbus adapter A to master.</td>
<td></td>
</tr>
<tr>
<td>50.18</td>
<td>FBA A actual value 2</td>
<td>Displays raw (unmodified) actual value act2 sent by fieldbus adapter A to the master (PLC) if debugging is enabled by parameter 50.12.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>-2147483648...2147483648</td>
<td>Raw act2 sent by fieldbus adapter A to master.</td>
<td></td>
</tr>
<tr>
<td>50.21</td>
<td>FBA A timelevel sel</td>
<td>Selects the communication time levels for fieldbus adapter A. In general, lower time levels of read/write services reduce CPU load. The table below shows the time levels of the read/write services for cyclic high and cyclic low data with each parameter setting.</td>
<td>Normal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Selection</td>
<td>Cyclic high **</td>
<td>Cyclic low **</td>
</tr>
<tr>
<td></td>
<td>Monitoring</td>
<td>10 ms</td>
<td>2 ms</td>
</tr>
<tr>
<td></td>
<td>Normal</td>
<td>2 ms</td>
<td>10 ms</td>
</tr>
<tr>
<td></td>
<td>Fast</td>
<td>500 us</td>
<td>2 ms</td>
</tr>
<tr>
<td></td>
<td>Very fast</td>
<td>250 us</td>
<td>2 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Cyclic high data consists of fieldbus status word, act1 and act2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>** Cyclic low data consists of the parameter data mapped to parameter groups 52 and 53, and acyclic data. Control word, ref1 and ref2 are handled as interrupts generated on receipt of cyclic high messages.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Normal</td>
<td>Normal speed</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Fast</td>
<td>Fast speed</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Very fast</td>
<td>Very fast speed</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Monitoring</td>
<td>Low speed. Optimized for PC tool communication and monitoring usage.</td>
<td>3</td>
</tr>
</tbody>
</table>
### Parameters

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>50.26</td>
<td>FBA A comm supervision force</td>
<td>Not in use. FBA A communication monitoring selection.</td>
<td>0000b</td>
</tr>
<tr>
<td>50.31</td>
<td>FBA B enable</td>
<td>Enables/disables communication between the unit and fieldbus adapter B, and specifies the slot the adapter is installed into. <strong>Note:</strong> The cooling unit cannot be controlled by the FBA B control word.</td>
<td>Disable</td>
</tr>
<tr>
<td>Disable</td>
<td>Communication between unit and fieldbus adapter B disabled.</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Option slot 1</td>
<td>Reserved. Slot 1 is not available for fieldbus adapters.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Option slot 2</td>
<td>Communication between unit and fieldbus adapter B enabled. The adapter is in slot 2.</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Option slot 3</td>
<td>Communication between unit and fieldbus adapter B enabled. The adapter is in slot 3.</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>50.32</td>
<td>FBA B comm loss func</td>
<td>Selects how the unit reacts upon a fieldbus adapter B communication break. A time delay for the action can be defined by parameter 50.33.</td>
<td>No action</td>
</tr>
<tr>
<td>No action</td>
<td>No action taken.</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Fault</td>
<td>Unit trips on 7520 FBA B communication. This only occurs if control is expected from the FBA B interface (FBA B selected as source of start/stop/reference in the currently active control location), or if supervision is forced using parameter 50.56.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Fault always</td>
<td>Unit trips on 7520 FBA B communication.</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Warning</td>
<td>Unit generates an A7C2 FBA B communication warning. This only occurs if control is expected from the FBA B interface, or if supervision is forced using parameter 50.56. <strong>WARNING!</strong> Make sure that it is safe to continue operation in case of a communication break.</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>50.33</td>
<td>FBA B comm loss timeout</td>
<td>Defines the time delay before the action defined by parameter 50.32 is taken. Time count starts when the communication link fails to update the message. As a rule of thumb, this parameter should be set to at least 3 times the transmit interval of the master. <strong>Note:</strong> There is a 60-second boot-up delay immediately after power-up. During the delay, the communication break monitoring is disabled (but communication itself can be active).</td>
<td>0.3 s</td>
</tr>
<tr>
<td>0.3 … 6553.5 s</td>
<td>Time delay.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50.34</td>
<td>FBA B ref1 type</td>
<td><strong>Note:</strong> The control program does not need/use any external references. Selects the type and scaling of reference ref1 received from fieldbus adapter B. See parameter 50.04.</td>
<td>Auto</td>
</tr>
<tr>
<td>…</td>
<td>…</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50.35</td>
<td>FBA B ref2 type</td>
<td><strong>Note:</strong> The control program does not need/use any external references. Selects the type and scaling of reference ref2 received from fieldbus adapter B. See parameter 50.04.</td>
<td>Auto</td>
</tr>
<tr>
<td>…</td>
<td>…</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Name/Value</td>
<td>Description</td>
<td>Def/FbEq16</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>50.37</td>
<td>FBA B actual 1 type</td>
<td>Selects the type and scaling of actual value act1 transmitted to the fieldbus network through fieldbus adapter B. See parameter 50.07.</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50.38</td>
<td>FBA B actual 2 type</td>
<td>Selects the type and scaling of actual value act2 transmitted to the fieldbus network through fieldbus adapter B. See parameter 50.07.</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50.39</td>
<td>FBA B SW transparent source</td>
<td>Selects the source of the fieldbus adapter B status word when the fieldbus adapter B is set to a transparent communication profile e.g. by its configuration parameters (group 54). See parameter 50.09.</td>
<td>Not selected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not selected</td>
<td>No source selected.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>Other source. See Terms and abbreviations (page 73).</td>
<td></td>
</tr>
<tr>
<td>50.40</td>
<td>FBA B act1 transparent source</td>
<td>When parameter 50.37 is set to Transparent or General, this parameter selects the source of actual value act1 transmitted to the fieldbus network through fieldbus adapter B.</td>
<td>Not selected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not selected</td>
<td>No source selected.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>Other source. See Terms and abbreviations (page 73).</td>
<td></td>
</tr>
<tr>
<td>50.41</td>
<td>FBA B act2 transparent source</td>
<td>When parameter 50.38 is set to Transparent or General, this parameter selects the source of actual value act2 transmitted to the fieldbus network through fieldbus adapter B.</td>
<td>Not selected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not selected</td>
<td>No source selected.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>Other source. See Terms and abbreviations (page 73).</td>
<td></td>
</tr>
<tr>
<td>50.42</td>
<td>FBA B debug mode</td>
<td>Enables the display of raw (unmodified) data received from and sent to fieldbus adapter B in parameters 50.43…50.48. This functionality should only be used for debugging.</td>
<td>Disable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Disable</td>
<td>Display of raw data from fieldbus adapter B disabled.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Fast</td>
<td>Display of raw data from fieldbus adapter B enabled.</td>
<td>1</td>
</tr>
<tr>
<td>50.43</td>
<td>FBA B control word</td>
<td>Displays the raw (unmodified) control word sent by the master (PLC) to fieldbus adapter B if debugging is enabled by parameter 50.42.</td>
<td>00.00.00.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>000000000h…FFFFFFFFFFh</td>
<td>Control word sent by master to fieldbus adapter B.</td>
<td>-</td>
</tr>
<tr>
<td>50.44</td>
<td>FBA B reference 1</td>
<td>Displays raw (unmodified) reference ref1 sent by the master (PLC) to fieldbus adapter B if debugging is enabled by parameter 50.42.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-2147483648…2147483648</td>
<td>Raw REF1 sent by master to fieldbus adapter B.</td>
<td>0</td>
</tr>
<tr>
<td>50.45</td>
<td>FBA B reference 2</td>
<td>Displays raw (unmodified) reference ref2 sent by the master (PLC) to fieldbus adapter B if debugging is enabled by parameter 50.42.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-2147483648…2147483648</td>
<td>Raw REF2 sent by master to fieldbus adapter B.</td>
<td>0</td>
</tr>
<tr>
<td>50.46</td>
<td>FBA B status word</td>
<td>Displays the raw (unmodified) status word sent by fieldbus adapter B to the master (PLC) if debugging is enabled by parameter 50.42.</td>
<td>00.00.00.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>000000000h…FFFFFFFFFFh</td>
<td>Status word sent by fieldbus adapter B to master.</td>
<td>-</td>
</tr>
</tbody>
</table>
## 90 Parameters

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>50.47</td>
<td>FBA B actual value 1</td>
<td>Displays raw (unmodified) actual value act1 sent by fieldbus adapter B to the master (PLC) if debugging is enabled by parameter 50.42.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>-2147483648…2147483648</td>
<td>Raw act1 sent by fieldbus adapter B to master.</td>
<td></td>
</tr>
<tr>
<td>50.48</td>
<td>FBA B actual value 2</td>
<td>Displays raw (unmodified) actual value act2 sent by fieldbus adapter B to the master (PLC) if debugging is enabled by parameter 50.42.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>-2147483648…2147483648</td>
<td>Raw act2 sent by fieldbus adapter B to master.</td>
<td></td>
</tr>
<tr>
<td>50.51</td>
<td>FBA B timelevel sel</td>
<td>Selects the communication time levels.</td>
<td>Normal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In general, lower time levels of read/write services reduce CPU load. The table below shows the time levels of the read/write services for cyclic high and cyclic low data with each parameter setting.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Selection</td>
<td>Cyclic high *</td>
<td>Cyclic low **</td>
</tr>
<tr>
<td></td>
<td>Monitoring</td>
<td>10 ms</td>
<td>2 ms</td>
</tr>
<tr>
<td></td>
<td>Normal</td>
<td>2 ms</td>
<td>10 ms</td>
</tr>
<tr>
<td></td>
<td>Fast</td>
<td>500 us</td>
<td>2 ms</td>
</tr>
<tr>
<td></td>
<td>Very fast</td>
<td>250 us</td>
<td>2 ms</td>
</tr>
<tr>
<td></td>
<td>* Cyclic high data consists of fieldbus status word, act1 and act2.</td>
<td>** Cyclic low data consists of the parameter data mapped to parameter groups 55 and 56, and acyclic data. Control word, ref1 and ref2 are handled as interrupts generated on receipt of cyclic high messages.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Normal speed.</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fast</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very fast</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitoring</td>
<td>3</td>
<td>Low speed. Optimized for PC tool communication and monitoring usage.</td>
</tr>
<tr>
<td>50.56</td>
<td>FBA B comm supervision force</td>
<td>Not in use.</td>
<td>0000b</td>
</tr>
<tr>
<td></td>
<td></td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>
## 51 FBA A settings

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>51.01</td>
<td>FBA A type</td>
<td>Displays the type of the connected fieldbus adapter module.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 = Module is not found or is not properly connected, or is disabled by parameter 50.01 FBA A enable</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 = PROFINET</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>32 = CANopen</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>37 = DeviceNet</td>
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<td>485 = RS-485 comm</td>
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<td>62944 = SERCOS</td>
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<td>2222 = Ethernet/IP</td>
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<td></td>
<td></td>
<td>502 = Modbus/TCP</td>
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</table>
### 92 Parameters

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>51.30</td>
<td>FBA A mapping file ver</td>
<td>Displays the fieldbus adapter module mapping file revision stored in the memory of the unit in decimal format. This parameter is read-only.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0…65535</td>
<td>Mapping file revision.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>51.31</td>
<td>D2FBA A comm status</td>
<td>Displays the status of the fieldbus adapter module communication.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Not configured</td>
<td>Adapter is not configured.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Initializing</td>
<td>Adapter is initializing.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Time out</td>
<td>A timeout has occurred in the communication between the adapter and the unit.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Configuration error</td>
<td>Adapter configuration error: mapping file not found in the file system of the unit, or mapping file upload has failed more than three times.</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Off-line</td>
<td>Fieldbus communication is off-line.</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>On-line</td>
<td>Fieldbus communication is on-line, or fieldbus adapter has been configured not to detect a communication break. For more information, see the documentation of the fieldbus adapter.</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Reset</td>
<td>Adapter is performing a hardware reset.</td>
<td>6</td>
</tr>
<tr>
<td>51.32</td>
<td>FBA A comm SW ver</td>
<td>Displays the patch and build versions of the adapter module firmware in format xxy, where xx = patch version number, yy = build version number. Example: C802 = 200.02 (patch version 200, build version 2).</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patch and build versions of adapter module firmware.</td>
<td>-</td>
</tr>
<tr>
<td>51.33</td>
<td>FBA A appl SW ver</td>
<td>Displays the major and minor versions of the adapter module firmware in format xyy, where x = major revision number, yy = minor revision number. Example: 300 = 3.00 (major version 3, minor version 00).</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Major and minor versions of adapter module firmware.</td>
<td>-</td>
</tr>
</tbody>
</table>

#### 52 FBA A data in

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>52.01</td>
<td>FBA A data in1</td>
<td>Selection of data to be transferred from the cooling unit to the fieldbus controller through fieldbus adapter A. Note: When fieldbus adapter A is enabled, some fieldbus adapter modules reserve parameters in this group for the transfer of predefined data such as status word (SW). See the fieldbus adapter module manual for more information. Note: 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Selects the data to be transferred from the cooling unit to the fieldbus controller as the data in1 word through the fieldbus adapter A.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>None.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>CW 16bit</td>
<td>Control Word (16 bits). See parameter 06.01.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Ref1 16bit</td>
<td>Reference ref1 (16 bits). Not valid for LCU.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Ref2 16bit</td>
<td>Reference ref2 (16 bits). Not valid for LCU.</td>
<td>3</td>
</tr>
</tbody>
</table>
### Parameters 93

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
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<tbody>
<tr>
<td>4</td>
<td>SW 16bit</td>
<td>Status Word (16 bits). See parameter 06.11.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Act1 16bit</td>
<td>Actual value act1 (16 bits). See parameter 50.10.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Act2 16bit</td>
<td>Actual value act2 (16 bits). See parameter 50.11.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>CW 32bit</td>
<td>Control Word (32 bits)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Ref1 32bit</td>
<td>Reference REF1 (32 bits). Not valid for LCU.</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Ref2 32bit</td>
<td>Reference REF2 (32 bits). Not valid for LCU.</td>
<td></td>
</tr>
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<td>14</td>
<td>SW 32bit</td>
<td>Status Word (32 bits)</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Act1 32bit</td>
<td>Actual value act1 (32 bits)</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Act2 32bit</td>
<td>Actual value act2 (32 bits)</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>SW2 16bit</td>
<td>Status Word 2 (16 bits)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other...</td>
<td>Other source. See Terms and abbreviations (page 73).</td>
<td></td>
</tr>
<tr>
<td>52.02</td>
<td>FBA A data in2</td>
<td>See parameter 52.01.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>...</td>
<td>...</td>
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</tr>
<tr>
<td>52.12</td>
<td>FBA A data in12</td>
<td>See parameter 52.01.</td>
<td>None</td>
</tr>
<tr>
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<td>...</td>
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### 53 FBA A data out

<table>
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<th>No.</th>
<th>Name/Value</th>
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<th>Def/FbEq16</th>
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<tbody>
<tr>
<td>53</td>
<td>FBA A data out</td>
<td>Selection of data to be transferred from the fieldbus controller to cooling unit through fieldbus adapter A.</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** When fieldbus adapter A is enabled, some fieldbus adapter modules reserve parameters in this group for the transfer of predefined data such as control word (CW). See the fieldbus adapter module manual for more information.

**Note:** 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.

<table>
<thead>
<tr>
<th>53.01</th>
<th>FBA A data out1</th>
<th>Selects the data to be transferred from the fieldbus controller to the cooling unit as the data in1 word through the fieldbus adapter A.</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None.</td>
<td>None.</td>
<td>0</td>
</tr>
<tr>
<td>CW 16bit</td>
<td>Control word (16 bits).</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Ref1 16bit</td>
<td>Reference ref1 (16 bits)</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Ref2 16bit</td>
<td>Reference ref2 (16 bits)</td>
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<td>3</td>
</tr>
<tr>
<td>CW 32bit</td>
<td>Control word (32 bits)</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Ref1 32bit</td>
<td>Reference ref1 (32 bits)</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Ref2 32bit</td>
<td>Reference ref2 (32 bits)</td>
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<td>13</td>
</tr>
<tr>
<td>CW2 16bit</td>
<td>Control word 2 (16 bits)</td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>Other</td>
<td>Other source. See Terms and abbreviations (page 73).</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>53.02</td>
<td>FBA A data out2</td>
<td>See parameter 53.01.</td>
<td>None</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>53.12</td>
<td>FBA A data out12</td>
<td>See parameter 53.01.</td>
<td>None</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
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</table>
## 54 FBA B settings

<table>
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<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>54 FBA B settings</td>
<td></td>
<td>Fieldbus adapter B configuration. <strong>Note:</strong> You can use the fieldbus adapter B only for monitoring purposes, not as the control location/interface.</td>
<td></td>
</tr>
<tr>
<td>54.01</td>
<td>FBA B type</td>
<td>Displays the type of the connected fieldbus adapter module. &lt;br&gt;0 = Module is not found or is not properly connected, or is disabled by parameter 50.31 &lt;br&gt;1 = PROFIBUS-DP &lt;br&gt;32 = CANopen &lt;br&gt;37 = DeviceNet &lt;br&gt;128 = Ethernet &lt;br&gt;132 = PROFInet IO &lt;br&gt;135 = EtherCAT &lt;br&gt;136 = ETH Pwrlink &lt;br&gt;485 = RS-485 comm &lt;br&gt;62944 = SERCOS &lt;br&gt;101 = ControlNet &lt;br&gt;133 = PROFIsafe &lt;br&gt;47808 = BACnet/IP &lt;br&gt;2222 = Ethernet/IP &lt;br&gt;502 = Modbus/TCP. This parameter is read-only.</td>
<td>None</td>
</tr>
<tr>
<td>54.02</td>
<td>FBA B Par2</td>
<td>Parameters 54.02...54.26 are adapter module-specific. For more information, see the documentation of the fieldbus adapter module. Note that not all of these parameters are necessarily in use.</td>
<td>0</td>
</tr>
<tr>
<td>0...65535</td>
<td></td>
<td>Fieldbus adapter configuration parameter.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>54.26</td>
<td>FBA B Par26</td>
<td>See parameter 54.02.</td>
<td>0</td>
</tr>
<tr>
<td>0...65535</td>
<td></td>
<td>Fieldbus adapter configuration parameter.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>54.27</td>
<td>FBA B par refresh</td>
<td>Validates any changed fieldbus adapter module configuration settings. After refreshing, the value reverts automatically to Done. &lt;br&gt;<strong>Note:</strong> This parameter cannot be changed while the unit is running.</td>
<td>Done</td>
</tr>
<tr>
<td>Done</td>
<td>Refreshing done.</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Refresh</td>
<td>Refreshing.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>54.28</td>
<td>FBA B par table ver</td>
<td>Displays the parameter table revision of the fieldbus adapter module mapping file (stored in the memory of the unit). In format axyz, where ax = major table revision number; yz = minor table revision number.</td>
<td>0 hex</td>
</tr>
<tr>
<td>Parameter table revision of adapter module.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>54.29</td>
<td>FBA B drive type code</td>
<td>Displays the unit type code in the fieldbus adapter module mapping file (stored in the memory of the unit).</td>
<td>0</td>
</tr>
<tr>
<td>0...65535</td>
<td></td>
<td>Unit type code stored in the mapping file.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>54.30</td>
<td>FBA B mapping file ver</td>
<td>Displays the fieldbus adapter module mapping file revision stored in the memory of the unit in decimal format.</td>
<td>0</td>
</tr>
<tr>
<td>0...65535</td>
<td></td>
<td>Mapping file revision.</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Name/Value</td>
<td>Description</td>
<td>Def/FbEq16</td>
</tr>
<tr>
<td>------</td>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>54.31</td>
<td>D2FBA B comm</td>
<td>Displays the status of the fieldbus adapter module communication.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>status</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not configured</td>
<td>Adapter is not configured.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Initializing</td>
<td>Adapter is initializing.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Time out</td>
<td>A timeout has occurred in the communication between the adapter and the unit.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Configuration</td>
<td>Adapter configuration error: mapping file not found in the file system of</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>error</td>
<td>the unit, or mapping file upload has failed more than three times.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Off-line</td>
<td>Fieldbus communication is off-line.</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>On-line</td>
<td>Fieldbus communication is on-line, or fieldbus adapter has been configured</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Reset</td>
<td>Adapter is performing a hardware reset.</td>
<td>6</td>
</tr>
</tbody>
</table>

| 54.32| FBA B comm SW    | Displays the patch and build versions of the adapter module firmware in     | 0 hex      |
|      | ver              | format xxy, where xx = patch version number, yy = build version number.      |            |
|      |                  | Example: C802 = 200.02 (patch version 200, build version 2).                |            |

| 54.33| FBA B appl SW    | Displays the major and minor versions of the adapter module firmware in     | 0 hex      |
|      | ver              | format xyy, where x = major revision number, yy = minor revision number.    |            |
|      |                  | Example: 300 = 3.00 (major version 3, minor version 00).                     |            |

**55 FBA B data in**

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>FBA B data in</td>
<td>Selection of data to be transferred from cooling unit to fieldbus controller</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>through fieldbus adapter B.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> When fieldbus adapter B is enabled, some fieldbus adapter modules</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>reserve parameters in this group for the transfer of predefined data such</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>as status word (SW). See the fieldbus adapter module manual for more</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>information.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> 32-bit values require two consecutive parameters. Whenever a</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>32-bit value is selected in a data parameter, the next parameter is</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>automatically reserved.</td>
<td></td>
</tr>
</tbody>
</table>

| 55.01| FBA B data in1  | Selects the data to be transferred from the cooling unit to the fieldbus    | None       |
|      |                 | controller as the data in1 word through the fieldbus adapter B.             |            |
|      | None            | None.                                                                       | 0          |
|      | CW 16bit        | Control Word (16 bits).                                                     | 1          |
|      | Ref1 16bit      | Reference REF1 (16 bits).                                                   | 2          |
|      | Ref2 16bit      | Reference REF2 (16 bits).                                                   | 3          |
|      | SW 16bit        | Status Word (16 bits), that is, the value of parameter 06.11.              | 4          |
|      | Act1 16bit      | Actual value act1 (16 bits)                                                 | 5          |
|      | Act2 16bit      | Actual value act2 (16 bits)                                                 | 6          |
### 56 FBA B data out

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>56</td>
<td>FBA B data out</td>
<td>Selection of data to be transferred from fieldbus controller to cooling unit through fieldbus adapter B.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> You can use Fieldbus B only for monitoring purposes. You cannot control the cooling unit through it.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> When fieldbus adapter B is enabled, some fieldbus adapter modules reserve parameters in this group for the transfer of predefined data such as control word (CW). See the fieldbus adapter module manual for more information.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.</td>
<td></td>
</tr>
<tr>
<td>56.01</td>
<td>FBA B data out1</td>
<td>Selects the data to be transferred from fieldbus controller to the cooling unit as the data out1 word through the fieldbus adapter B.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>None.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>CW 16bit</td>
<td>Control Word (16 bits).</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Ref1 16bit</td>
<td>Reference REF1 (16 bits).</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Ref2 16bit</td>
<td>Reference REF2 (16 bits).</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CW 32bit</td>
<td>Control Word (32 bits).</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Ref1 32bit</td>
<td>Reference REF1 (32 bits).</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Ref2 32bit</td>
<td>Reference REF2 (32 bits).</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>CW 16bit</td>
<td>Control Word 2 (16 bits).</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Other...</td>
<td>Other source. See Terms and abbreviations (page 73).</td>
<td></td>
</tr>
<tr>
<td>56.02</td>
<td>FBA B data out2</td>
<td>See parameter 56.01.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>56.12</td>
<td>FBA B data out12</td>
<td>See parameter 56.01.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>
# 60 DDCS communication

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 DDCS communication</td>
<td>DDCS communication configuration. The DDCS protocol is used in the communication between • units in a master/follower configuration, • the unit and an external controller such as the AC 800M, or • the units of the drive system. All of the above utilize a fiber optic link which also requires an FDCO module (typically with ZCU control units) or an RDCO module (with BCU control units). Master/follower and external controller communication can also be implemented through shielded twisted-pair cable connected to the XD2D connector of the unit. This group also contains parameters for drive-to-drive (D2D) communication supervision.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>60.51</th>
<th>DDCS controller comm port</th>
<th>Selects the DDCS channel used for connecting an external controller (such as an AC 800M).</th>
<th>Not in use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not in use</td>
<td>None (communication disabled).</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Slot 1A</td>
<td>Channel A on FDCO module in slot 1.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Slot 2A</td>
<td>Channel A on FDCO module in slot 2.</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Slot 3A</td>
<td>Channel A on FDCO module in slot 3.</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Slot 1B</td>
<td>Channel B on FDCO module in slot 1.</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Slot 2B</td>
<td>Channel B on FDCO module in slot 2.</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Slot 3B</td>
<td>Channel B on FDCO module in slot 3.</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>60.52</th>
<th>DDCS controller node address</th>
<th>Selects the node address of the unit for communication with the external controller. No two nodes on-line may have the same address. With an AC 800M (CI858) DriveBus connection, units must be addressed 1…24. With an AC 80 DriveBus connection, units must be addressed 1…12. With optical ModuleBus, the unit address is set according to the position value as follows: 1. Multiply the hundreds of the position value by 16. 2. Add the tens and ones of the position value to the result. For example, if the position value is 101, this parameter must be set to 1×16 + 1 = 17.</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1..254</td>
<td>Node address.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>60.55</th>
<th>DDCS controller HW connection</th>
<th>Selects the topology of the fiber optic link with an external controller.</th>
<th>Star</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ring</td>
<td>The devices are connected in a ring topology. Forwarding of messages is enabled.</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Star</td>
<td>The devices are connected in a star topology (for example, through a branching unit). Forwarding of messages is disabled.</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>60.56</th>
<th>DDCS controller baud rate</th>
<th>Selects the communication speed of the channel selected by parameter 60.51.</th>
<th>4 mbps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mbps</td>
<td>1 megabit/second.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2 mbps</td>
<td>2 megabit/second.</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4 mbps</td>
<td>4 megabit/second.</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>
60.58 DDCS controller comm loss time
Sets a timeout for communication with the external controller. If a communication break lasts longer than the timeout, the control program generates a warning (DDCS controller comm loss). This only occurs if control is expected from the external controller.

As a rule of thumb, this parameter should be set to at least 3 times the transmit interval of the controller.

Note:
- There is a 60-second boot-up delay immediately after power-up. During the delay, the communication break monitoring is disabled (but communication itself can be active).
- With an AC 800M controller, the controller detects a communication break immediately but re-establishing the communication is done at 9-second idle intervals. Also note that the sending interval of a data set is not the same as the execution interval of the application task. On ModuleBus, the sending interval is defined by controller parameter Scan Cycle Time (by default, 100 ms).

60.64 Mailbox dataset selection
Selects the pair of data sets used by the mailbox service in the unit/controller communication.

<table>
<thead>
<tr>
<th>Dataset</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>32/33</td>
<td>Data sets 32 and 33.</td>
</tr>
<tr>
<td>24/25</td>
<td>Data sets 24 and 25.</td>
</tr>
</tbody>
</table>

61 D2D and DDCS transmit data
Defines the data sent to the DDCS link. See also parameter group 60.

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>61.101</td>
<td>Data set 11 data 1 selection</td>
<td>Parameters 61.51…61.74 preselect data to be sent in data sets 11, 13, 15, 17, 19, 21, 23 and 25 to the external controller. Parameters 61.101…61.124 display the data to be sent to the external controller. If no data has been preselected, the value to be sent can be written directly into these parameters. For example, this parameter preselects the data for word 1 of data set 11. Parameter 61.101 displays the selected data in integer format. If no data is preselected, the value to be sent can be written directly into parameter 62.101.</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>None.</td>
<td>SW 16bit</td>
<td></td>
</tr>
<tr>
<td>CW 16bit</td>
<td>Control Word (16 bits) (06.01)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>SW 16bit</td>
<td>Status Word (16 bits) (06.01)</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Fault word</td>
<td>Fault word (04.21)</td>
<td></td>
<td>1045</td>
</tr>
<tr>
<td>Warning word 1</td>
<td>Warning word 1 (04.31)</td>
<td></td>
<td>1055</td>
</tr>
<tr>
<td>Warning word 2</td>
<td>Warning word 2 (04.32)</td>
<td></td>
<td>1056</td>
</tr>
<tr>
<td>DI status</td>
<td>DI status (06.20)</td>
<td></td>
<td>1556</td>
</tr>
<tr>
<td>Coolant temperature</td>
<td>Coolant temperature (01.23)</td>
<td></td>
<td>279</td>
</tr>
<tr>
<td>Inlet pressure</td>
<td>Inlet pressure (01.01)</td>
<td></td>
<td>257</td>
</tr>
<tr>
<td>Outlet pressure</td>
<td>Outlet pressure (01.02)</td>
<td></td>
<td>258</td>
</tr>
<tr>
<td>No.</td>
<td>Name/Value</td>
<td>Description</td>
<td>Def/FbEq16</td>
</tr>
<tr>
<td>------</td>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td>Pressure difference</td>
<td>Pressure difference (01.03)</td>
<td>259</td>
</tr>
<tr>
<td></td>
<td>Cabinet temperature</td>
<td>Cabinet temperature (01.21)</td>
<td>277</td>
</tr>
<tr>
<td></td>
<td>Ambient temperature</td>
<td>Ambient temperature (01.22)</td>
<td>278</td>
</tr>
<tr>
<td></td>
<td>Other…</td>
<td>Other source. See Terms and abbreviations (page 73).</td>
<td></td>
</tr>
<tr>
<td>61.52</td>
<td>Data set 11 data 2 selection</td>
<td>Preselects the data to be sent as word 2 of data set 11 to the external controller. See also parameter 61.102. For the selections, see parameter 61.51.</td>
<td>Fault word</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61.53</td>
<td>Data set 11 data 3 selection</td>
<td>Preselects the data to be sent as word 3 of data set 11 to the external controller. See also parameter 61.103. For the selections, see parameter 61.51.</td>
<td>Warning word 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61.54</td>
<td>Data set 13 data 1 selection</td>
<td>See parameter 61.51.</td>
<td>Warning word 2</td>
</tr>
<tr>
<td>61.55</td>
<td>Data set 13 data 2 selection</td>
<td>See parameter 61.51.</td>
<td>DI status</td>
</tr>
<tr>
<td>61.56</td>
<td>Data set 13 data 3 selection</td>
<td>See parameter 61.51.</td>
<td>Coolant temperature</td>
</tr>
<tr>
<td>61.57</td>
<td>Data set 15 data 1 selection</td>
<td>See parameter 61.51.</td>
<td>Inlet pressure</td>
</tr>
<tr>
<td>61.58</td>
<td>Data set 15 data 2 selection</td>
<td>See parameter 61.51.</td>
<td>Outlet pressure</td>
</tr>
<tr>
<td>61.59</td>
<td>Data set 15 data 3 selection</td>
<td>See parameter 61.51.</td>
<td>Pressure difference</td>
</tr>
<tr>
<td>61.60</td>
<td>Data set 17 data 1 selection</td>
<td>See parameter 61.51.</td>
<td>Cabinet temperature</td>
</tr>
<tr>
<td>61.61</td>
<td>Data set 17 data 2 selection</td>
<td>See parameter 61.51.</td>
<td>Ambient temperature</td>
</tr>
<tr>
<td>61.62</td>
<td>Data set 17 data 3 selection</td>
<td>See parameter 61.51.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61.74</td>
<td>Data set 25 data 3 selection</td>
<td>See parameter 61.51.</td>
<td>None</td>
</tr>
<tr>
<td>61.101</td>
<td>Data set 11 data 1 value</td>
<td>Displays (in integer format) the data to be sent to the external controller as word 1 of data set 11. If no data has been preselected by 61.51 selection, the value to be sent can be written directly into this parameter.</td>
<td>0…65535</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61.102</td>
<td>Data set 11 data 2 value</td>
<td>Displays (in integer format) the data to be sent to the external controller as word 2 of data set 11. If no data has been preselected by parameter 61.52, the value to be sent can be written directly into this parameter.</td>
<td>0…65535</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61.103</td>
<td>Data set 11 data 3 value</td>
<td>Displays (in integer format) the data to be sent to the external controller as word 3 of data set 11. If no data has been selected by parameter 61.53, the value to be sent can be written directly into this parameter.</td>
<td>0…65535</td>
</tr>
<tr>
<td>No.</td>
<td>Name/Value</td>
<td>Description</td>
<td>Def/FbEq16</td>
</tr>
<tr>
<td>-----</td>
<td>------------</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>61.104</td>
<td>Data set 13 data 1 value</td>
<td>Displays (in integer format) the data to be sent to the external controller as word 1 of data set 13. If no data has been selected by parameter 61.54, the value to be sent can be written directly into this parameter.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data to be sent as word 1 of data set 13.</td>
<td>...</td>
</tr>
<tr>
<td>61.124</td>
<td>Data set 25 data 3 value</td>
<td>Displays (in integer format) the data to be sent to the external controller as word 3 of data set 25. If no data has been selected by parameter 61.74, the value to be sent can be written directly into this parameter.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data to be sent as word 3 of data set 25.</td>
<td>...</td>
</tr>
</tbody>
</table>

### 62 D2D and DDCS receive data

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>62 D2D and DDCS receive data</td>
<td>Mapping of data received through the DDCS link. See also parameter group 60 DDCS communication.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>62.51</td>
<td>Data set 10 data 1 selection</td>
<td>Parameters 62.51…62.74 define a target for the data received in data sets 10, 12, 14, 16, 18, 20, 22 and 24 from the external controller. Parameters 62.101…62.124 display the data received from the external controller in integer format, and can be used as sources by other parameters. For example, this parameter selects a target for word 1 of data set 10. Parameter 62.101 Data set 10 data 1 value displays the received data in integer format, and can also be used as a source by other parameters.</td>
<td>CW 16bit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>None</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CW 16bit</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other...</td>
<td>-</td>
</tr>
<tr>
<td>62.52</td>
<td>Data set 10 data 2 selection</td>
<td>Defines a target for the data received as word 2 of data set 10. See also parameter 62.102. For the selections, see parameter 62.51.</td>
<td>None</td>
</tr>
<tr>
<td>62.53</td>
<td>Data set 10 data 3 selection</td>
<td>Defines a target for the data received as word 3 of data set 10. See also parameter 62.103. For the selections, see parameter 62.51.</td>
<td>None</td>
</tr>
<tr>
<td>62.54</td>
<td>Data set 12 data 1 selection</td>
<td>See parameter 62.51.</td>
<td>None</td>
</tr>
<tr>
<td>62.74</td>
<td>Data set 24 data 3 selection</td>
<td>See parameter 62.51.</td>
<td>None</td>
</tr>
<tr>
<td>62.101</td>
<td>Data set 10 data 1 value</td>
<td>Displays (in integer format) the data received from the external controller as word 1 of data set 10. A target for this data can be selected by parameter 62.51. The value can also be used as a source by another parameter.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data received as word 1 of data set 10.</td>
<td>...</td>
</tr>
</tbody>
</table>

**Note:** To obey the commands of the DDCS link control word, cooling unit must also have DDCS selected as the control location. See parameter 20.03.
<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>62.102</td>
<td>Data set 10 data 2 value</td>
<td>Displays (in integer format) the data received from the external controller as word 2 of data set 10. A target for this data can be selected by parameter 62.52. The value can also be used as a source by another parameter.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0…65535</td>
<td>Data received as word 2 of data set 10.</td>
<td></td>
</tr>
<tr>
<td>62.103</td>
<td>Data set 10 data 3 value</td>
<td>Displays (in integer format) the data received from the external controller as word 3 of data set 10. A target for this data can be selected by parameter 62.53. The value can also be used as a source by another parameter.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0…65535</td>
<td>Data received as word 3 of data set 10.</td>
<td></td>
</tr>
<tr>
<td>62.104</td>
<td>Data set 12 data 1 value</td>
<td>Displays (in integer format) the data received from the external controller as word 1 of data set 12. A target for this data can be selected by parameter 62.54. The value can also be used as a source by another parameter.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0…65535</td>
<td>Data received as word 1 of data set 12.</td>
<td></td>
</tr>
<tr>
<td>62.124</td>
<td>Data set 24 data 3 value</td>
<td>Displays (in integer format) the data received from the external controller as word 3 of data set 24. A target for this data can be selected by parameter 62.74. The value can also be used as a source by another parameter.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0…65535</td>
<td>Data received as word 3 of data set 24.</td>
<td></td>
</tr>
</tbody>
</table>

**96 System**

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>96 System</td>
<td></td>
<td>Language selection; access levels; macro selection; parameter save and restore; control unit reboot; user parameter sets; unit selection; data logger triggering; parameter checksum calculation; user lock.</td>
<td></td>
</tr>
<tr>
<td>96.01</td>
<td>Language</td>
<td>Selects the language of the parameter interface and other displayed information when viewed on the control panel. <strong>Note:</strong> Not all languages listed below are necessarily supported. This parameter does not affect the languages visible in the Drive composer PC tool. (Those are specified under View – Settings.)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Not selected</td>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>English</td>
<td>English</td>
<td>1033</td>
</tr>
<tr>
<td></td>
<td>Deutsch</td>
<td>German</td>
<td>1031</td>
</tr>
<tr>
<td></td>
<td>Italiano</td>
<td>Italian</td>
<td>1040</td>
</tr>
<tr>
<td></td>
<td>Español</td>
<td>Spanish</td>
<td>3082</td>
</tr>
<tr>
<td></td>
<td>Português</td>
<td>Portuguese</td>
<td>2070</td>
</tr>
<tr>
<td></td>
<td>Nederlands</td>
<td>Dutch</td>
<td>1043</td>
</tr>
<tr>
<td></td>
<td>Français</td>
<td>French</td>
<td>1036</td>
</tr>
<tr>
<td></td>
<td>Dansk</td>
<td>Danish</td>
<td>1030</td>
</tr>
</tbody>
</table>
Pass codes can be entered into this parameter to activate further access levels (see parameter 96.03 Access levels active) or to configure the user lock. Entering "358" toggles the parameter lock, which prevents the changing of all other parameters through the control panel or the Drive composer PC tool.

**Note:** You must change the default user pass code to maintain a high level of cybersecurity. Store the code in a safe place – the protection cannot be disabled even by ABB if the code is lost.

<table>
<thead>
<tr>
<th>No.</th>
<th>Name/Value</th>
<th>Description</th>
<th>Def/FbEq16</th>
</tr>
</thead>
<tbody>
<tr>
<td>96.02</td>
<td>Pass code</td>
<td>Pass codes can be entered into this parameter to activate further access levels (see parameter 96.03 Access levels active) or to configure the user lock. Entering &quot;358&quot; toggles the parameter lock, which prevents the changing of all other parameters through the control panel or the Drive composer PC tool. <strong>Note:</strong> You must change the default user pass code to maintain a high level of cybersecurity. Store the code in a safe place – the protection cannot be disabled even by ABB if the code is lost.</td>
<td>0</td>
</tr>
<tr>
<td>96.03</td>
<td>Access levels active</td>
<td>Shows which access levels have been activated by pass codes entered into parameter 96.02 Pass code. This parameter is read-only.</td>
<td>0001h</td>
</tr>
<tr>
<td>96.06</td>
<td>Parameter restore</td>
<td>Restores the original settings of the control program, ie. parameter default values. This parameter cannot be changed while the unit is running.</td>
<td>Done</td>
</tr>
<tr>
<td></td>
<td>Restore defaults</td>
<td>All editable parameter values are restored to default values, except</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• control panel/PC communication settings</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• I/O extension module settings</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• fieldbus adapter settings</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clear all</td>
<td>All editable parameter values are restored to default values, except</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td></td>
<td>control panel/PC communication settings</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>except control panel/PC communication settings</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PC tool communication is interrupted during the restoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reset all fieldbus settings</td>
<td>Fieldbus adapter and embedded fieldbus interface settings (parameter groups 50...58) are restored to default values. This will also restore the default settings of the fieldbus adapter if one is connected</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Parameter save manually</td>
<td>Saves the valid parameter values to permanent memory. This parameter should be used to store values sent from a fieldbus, or when using an external power supply to the control board as the supply might have a very short hold-up time when powered off. <strong>Note:</strong> A new parameter value is saved automatically when changed from the PC tool or control panel but not when altered through a fieldbus adapter connection.</td>
<td>Done</td>
</tr>
<tr>
<td></td>
<td>Done</td>
<td>Save completed</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Save</td>
<td>Save in progress</td>
<td>1</td>
</tr>
<tr>
<td>No.</td>
<td>Name/Value</td>
<td>Description</td>
<td>Def/FbEq</td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>96.08</td>
<td>Control board boot</td>
<td>Reboots the control unit (without requiring a power off/on cycle). The value reverts to 0 automatically.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0...1</td>
<td>1 = Reboot the control unit</td>
<td>1 = 1</td>
</tr>
<tr>
<td>96.24</td>
<td>Full days since 1st Jan 1980</td>
<td>Shows the number of full days passed since beginning of the year 1980. This parameter, together with 96.25 and 96.26 Time in ms within one minute makes it possible to set the date and time in the unit via the parameter interface from a fieldbus or application program. This may be necessary if the fieldbus protocol does not support time synchronization.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1...59999</td>
<td>Days since beginning of 1980.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>96.25</td>
<td>Time in minutes within 24 h</td>
<td>Shows the number of full minutes passed since midnight. For example, the value 860 corresponds to 2:20 pm. See parameter 96.24.</td>
<td>0 min</td>
</tr>
<tr>
<td></td>
<td>1...1439</td>
<td>Minutes since midnight</td>
<td>1 = 1</td>
</tr>
<tr>
<td>96.26</td>
<td>Time in ms within one minute</td>
<td>Shows the number of milliseconds passed since last minute. See parameter 96.24.</td>
<td>0 ms</td>
</tr>
<tr>
<td></td>
<td>0...59999</td>
<td>Number of milliseconds since last minute.</td>
<td>1 = 1</td>
</tr>
<tr>
<td>96.29</td>
<td>Time sync source status</td>
<td>Shows time source status word. This parameter is read-only</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0000h...FFFFh</td>
<td>See below for the bit assignments of the word.</td>
<td>1 = 1</td>
</tr>
<tr>
<td></td>
<td>b0 Time tick received</td>
<td>1 = 1st priority tick received: Tick has been received from 1st priority source.</td>
<td>No Tick</td>
</tr>
<tr>
<td></td>
<td>b1 Aux Time tick received</td>
<td>1 = 2nd priority tick received: Tick has been received from 2nd priority source</td>
<td>No Tick</td>
</tr>
<tr>
<td></td>
<td>b2 Tick interval is too long</td>
<td>1 = Yes: Tick interval too long (accuracy compromised).</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>b3 DDCS controller</td>
<td>1 = Tick received: Tick has been received from an external controller.</td>
<td>No Tick</td>
</tr>
<tr>
<td></td>
<td>b4 Master/Follower</td>
<td>1 = Tick received: Tick has been received through the master/follower link.</td>
<td>No Tick</td>
</tr>
<tr>
<td></td>
<td>b5 Reserved</td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b6 D2D</td>
<td>1 = Tick received: Tick has been received through the drive-to-drive link.</td>
<td>No Tick</td>
</tr>
<tr>
<td></td>
<td>b7 Fbus A</td>
<td>1 = Tick received: Tick has been received through fieldbus adapter A.</td>
<td>No Tick</td>
</tr>
<tr>
<td></td>
<td>b8 Fbus B</td>
<td>1 = Tick received: Tick has been received through fieldbus adapter B.</td>
<td>No Tick</td>
</tr>
<tr>
<td></td>
<td>b9 EFB</td>
<td>1 = Tick received: Tick has been received through the embedded fieldbus interface.</td>
<td>No Tick</td>
</tr>
<tr>
<td></td>
<td>b10 Ethernet</td>
<td>1 = Tick received: Tick has been received through the Ethernet port on type BCU control unit.</td>
<td>No Tick</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> The BCU control unit does not have Ethernet interface.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b11 Panel link</td>
<td>1 = Tick received: Tick has been received from the control panel, or Drive composer PC tool connected to the control panel.</td>
<td>No Tick</td>
</tr>
<tr>
<td></td>
<td>b12 Ethernet tool link</td>
<td>1 = Tick received: Tick has been received from Drive composer PC tool through an FENA module.</td>
<td>No Tick</td>
</tr>
<tr>
<td></td>
<td>b13 Parameter setting</td>
<td>1 = Tick received: Tick has been set by parameters 96.24...96.26.</td>
<td>No Tick</td>
</tr>
<tr>
<td>No.</td>
<td>Name/Value</td>
<td>Description</td>
<td>Def/FbEq16</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>b14</td>
<td>RTC</td>
<td>1 = RTC time in use: Time and date have been read from the real-time clock.</td>
<td>RTC time in use</td>
</tr>
<tr>
<td>b15</td>
<td>Drive On-Time</td>
<td>1 = Drive on-time in use: Time and date are displaying unit on-time.</td>
<td>Not used</td>
</tr>
<tr>
<td>96.61</td>
<td>User data logger status word</td>
<td>Provides status information on the user data logger.</td>
<td>0000b</td>
</tr>
<tr>
<td></td>
<td>0000b...1111b</td>
<td>User data logger status word</td>
<td></td>
</tr>
<tr>
<td>b0</td>
<td>Running</td>
<td>1 = The user data logger is running. The bit is cleared after the post-trigger time has passed.</td>
<td>0</td>
</tr>
<tr>
<td>b1</td>
<td>Triggered</td>
<td>1 = The user data logger has been triggered. The bit is cleared when the logger is restarted.</td>
<td>0</td>
</tr>
<tr>
<td>b2</td>
<td>Data available</td>
<td>1 = The user data logger contains data that can be read. Note that the bit is not cleared because the data is saved to the memory unit.</td>
<td>0</td>
</tr>
<tr>
<td>b3</td>
<td>Configured</td>
<td>1 = The user data logger has been configured. Note that the bit is not cleared because the configuration data is saved to the memory unit.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Reserved</td>
<td>Reserved</td>
<td>-</td>
</tr>
<tr>
<td>96.63</td>
<td>User data logger trigger</td>
<td>Triggers, or selects a source that triggers, the user data logger.</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>On</td>
<td>1 (triggers)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>Other source. See Terms and abbreviations (page 73).</td>
<td>-</td>
</tr>
<tr>
<td>96.64</td>
<td>User data logger start</td>
<td>Starts, or selects a source that starts, the user data logger</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>On</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>Other source. See Terms and abbreviations (page 73).</td>
<td>-</td>
</tr>
<tr>
<td>96.65</td>
<td>Factory data logger time level</td>
<td>Selects the sampling interval for the factory data logger.</td>
<td>500μs</td>
</tr>
<tr>
<td></td>
<td>500μs</td>
<td>500 microseconds</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>2ms</td>
<td>2 milliseconds</td>
<td>2000</td>
</tr>
<tr>
<td></td>
<td>10ms</td>
<td>10 milliseconds</td>
<td>10000</td>
</tr>
<tr>
<td>96.100</td>
<td>Change user pass code</td>
<td>(Visible when user lock is open) To change the current user pass code, enter a new code into this parameter as well as 96.101. A warning will be active until the new pass code is confirmed. To cancel changing the pass code, close the user lock without confirming. To close the lock, enter an invalid pass code in parameter 96.02, activate parameter 96.08, or cycle the power. See section User lock (page 71).</td>
<td>10000000</td>
</tr>
<tr>
<td></td>
<td>10000000...99999999</td>
<td>New user pass code.</td>
<td>-</td>
</tr>
<tr>
<td>96.101</td>
<td>Confirm user pass code</td>
<td>(Visible when user lock is open) Confirms the new user pass code entered in 96.100.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10000000...99999999</td>
<td>Confirmation of new user pass code.</td>
<td>-</td>
</tr>
<tr>
<td>No.</td>
<td>Name/Value</td>
<td>Description</td>
<td>Def/FbEq16</td>
</tr>
<tr>
<td>------</td>
<td>----------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>96.102</td>
<td>User lock functionality</td>
<td>(Visible when user lock is open) Selects the actions or functionalities to be prevented by the user lock. Note that the changes made take effect only when the user lock is closed. See parameter 96.02. Note: ABB recommends you select all the actions and functionalities unless otherwise required by the application.</td>
<td>0000h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Disable ABB access levels</td>
<td>1 = ABB access levels (service, advanced programmer, etc.; see 96.03) disabled</td>
</tr>
<tr>
<td>1</td>
<td>Freeze parameter lock state</td>
<td>1 = Changing the parameter lock state prevented.</td>
</tr>
<tr>
<td>2</td>
<td>Disable file download</td>
<td>1 = Disable all file downloads and software download.</td>
</tr>
<tr>
<td>3</td>
<td>Disable FB write to hidden</td>
<td>1 = Access to parameters on disabled access levels from fieldbus prevented.</td>
</tr>
<tr>
<td>4, 5</td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Protect AP</td>
<td>1 = Disables uploading application program to PC. Making backup is disabled when the bit is set.</td>
</tr>
<tr>
<td>7</td>
<td>Disable panel bluetooth</td>
<td>1 = Panel bluetooth disabled.</td>
</tr>
<tr>
<td>8...10</td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Disable OEM access level 1</td>
<td>1 = OEM access level 1 disabled</td>
</tr>
<tr>
<td>12</td>
<td>Disable OEM access level 2</td>
<td>1 = OEM access level 2 disabled</td>
</tr>
<tr>
<td>13</td>
<td>Disable OEM access level 3</td>
<td>1 = OEM access level 3 disabled</td>
</tr>
<tr>
<td>14, 15</td>
<td>Reserved</td>
<td></td>
</tr>
</tbody>
</table>

0000h…FFFFh Selection of actions to be prevented by user lock.
Fault tracing

What this chapter contains

The chapter lists the warning and fault messages including possible causes and corrective actions. The causes of most warnings and faults can be identified and corrected using the information in this chapter. If not, contact an ABB service representative.

Warnings and faults are listed below in separate tables. Each table is sorted by warning/fault code.

Safety

WARNING!
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

Depending on the drive type, you can find the safety instructions either in the drive hardware manual (single drives), or in the separate safety instructions manual (multidrives cabinets and modules).

If you are not a qualified electrician, do not do installation or maintenance work.
### Warnings

<table>
<thead>
<tr>
<th>Code (hex)</th>
<th>Warning</th>
<th>Cause</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>A6E5</td>
<td>AI parametrization</td>
<td>The current/voltage hardware setting of an analog input does not correspond to parameter settings.</td>
<td>Identify the analog input with the setting conflict (auxiliary code for this warning). Adjust the hardware setting. Note: Control board reboot (either by cycling the power or through parameter 96.08) is required to validate any changes in the hardware settings.</td>
</tr>
<tr>
<td>A7AA</td>
<td>Extension AI parametrization</td>
<td>The hardware current/voltage setting of an analog input (on an I/O extension module) does not correspond to parameter settings.</td>
<td>Identify the analog input with the setting conflict (auxiliary code for this warning). Adjust the hardware setting. Note: Control board reboot (either by cycling the power or through parameter 96.08) is required to validate any changes in the hardware settings.</td>
</tr>
<tr>
<td>A7C1</td>
<td>FBA A communication</td>
<td>Programmable warning (50.02). Cyclical communication between cooling unit and fieldbus adapter A or between PLC and fieldbus adapter A is lost.</td>
<td>Check status of fieldbus communication. See user documentation of fieldbus adapter module. Check settings of fieldbus adapter A parameters (50, 51, 52 and 53). Check cable connections. Check if communication master is able to communicate.</td>
</tr>
<tr>
<td>A7CA</td>
<td>DDCS controller comm loss</td>
<td>DDCS (fiber optic) communication between cooling unit and external controller is lost.</td>
<td>Check status of controller. See user documentation of controller. Check DDCS communication parameter settings (60). Check cable connections. If necessary, replace cables.</td>
</tr>
<tr>
<td>A7EE</td>
<td>Control panel loss</td>
<td>Programmable warning (49.05). Control panel (or PC tool) has stopped communicating.</td>
<td>Check PC tool or control panel connection. Check control panel connector. Check mounting platform if being used. Disconnect and reconnect the control panel.</td>
</tr>
<tr>
<td>FF90</td>
<td>Inlet pressure</td>
<td>Programmable monitoring function (31.01). Too low inlet pressure. Possible causes: excessive minimum warning limit value. leakage in internal cooling circuit too low air pressure in expansion vessel too low coolant temperature.</td>
<td>Check and adjust value of fault function (31.01). Check that all bleed and drain valves in internal cooling circuit are closed. Check and repair any leakage. Check pressure in expansion vessel and adjust when necessary. See Adjusting air pressure of the expansion vessel (page 46).</td>
</tr>
<tr>
<td>Code (hex)</td>
<td>Warning</td>
<td>Cause</td>
<td>What to do</td>
</tr>
<tr>
<td>-----------</td>
<td>---------</td>
<td>-------</td>
<td>------------</td>
</tr>
</tbody>
</table>
| FF91      | Outlet pressure | This is a programmable monitoring function \(31.03\). Excessive outlet pressure. Possible causes:  
- too low pressure limit  
- closed valve in the cooling system  
- excessive temperature in internal cooling circuit  
- dirty, blocked or faulty heat exchanger. | Check limit \(31.03\) and adjust when necessary.  
Check temperature in internal cooling circuit \(01.23\). Make sure that there is sufficient coolant flow in external cooling circuit.  
Check heat exchanger. Wash and/or clean it. Replace if it is faulty. |
| FF92      | Pressure difference | This is a programmable monitoring function \(31.04\). Too low pressure difference between pump outlet and inlet. Possible causes:  
- too high monitoring limit  
- wrong phase order of the pump motor (wrong rotation direction)  
- improper pump operation  
- broken pump impeller. | Check limit \(31.04\) and adjust when necessary.  
Check phase order of the pump motor. Change when necessary.  
Check for leakage and repair when necessary.  
Check pump. If you have two-pump system, test to switch pump in duty. See parameters \(20.01\) and \(20.02\). Replace faulty pump.  
Check that cooling circuit is not blocked by a closed valve. After you have corrected the root cause, reset pressure difference monitoring function \(31.20\). |
| FF93      | Inlet pressure sensor | Inlet pressure sensor is not connected or it is broken. | Check that sensor is connected to right terminals. See circuit diagrams. Replace faulty sensor. |
| FF94      | Outlet pressure sensor | Outlet pressure sensor is not connected or it is broken. | Check that sensor is connected to right terminals. See circuit diagrams. Replace faulty sensor. |
| FF95      | Coolant leakage | Leakage in the internal liquid circuit. Faulty detector. | Repair the leakage point. Dry up the detector and the bottom of the cooling unit. If necessary, remove the leakage detector, open the enclosure, dry the sensor and re-install. Replace a faulty detector.  
**Note:** You can change indication type (fault/warning) by parameter \(31.06\). |
| FF96      | Pump MCB | Motor protective circuit breaker of pump has tripped. Possible causes:  
- user opened breaker manually  
- breaker detected overload  
- breaker detected short circuit. | Check auxiliary code to identify breaker: "1" = pump 1, "2" = pump 2.  
Close breaker. Check if you can restart pump. In a two pump system you may need to define pump in operation first. See parameters \(20.01\) and \(20.02\). Check pump and pump motor cabling. |
<table>
<thead>
<tr>
<th>Code (hex)</th>
<th>Warning</th>
<th>Cause</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF97</td>
<td>Pressure difference low</td>
<td>This is a programmable monitoring function (31.04). Pump pressure difference is too low. Possible causes: • too high limit for monitoring function • faulty pump • leakage.</td>
<td>Check limit (31.04) and adjust when necessary. Check for leakage and repair when necessary. Check pump. If you have two-pump system, test to switch pump in duty. See parameters 20.01 and 20.02. Replace faulty pump. After you have corrected the root cause, reset pressure difference monitoring function (31.20).</td>
</tr>
<tr>
<td>FF98</td>
<td>Cabinet overtemperature</td>
<td>This is a programmable monitoring function (31.11). Excessive cabinet temperature. Possible causes: • too low limit for monitoring function • excessive ambient temperature • excessive coolant temperature in internal cooling circuit.</td>
<td>Check limit (31.11) and adjust when necessary. Check ambient temperature vs. specification. See technical data. Check liquid temperature in internal cooling circuit (01.23). If excessive, check that there are proper circulation both in internal and external cooling circuits.</td>
</tr>
<tr>
<td>FF99</td>
<td>Ambient temperature below limit</td>
<td>This is a programmable monitoring function (31.12). Too low ambient temperature. <strong>Note:</strong> Too low temperature will cause condensation. If in doubt of condensation, make sure that there is cabinet heater inside cooling unit (option +G300).</td>
<td>Check limit (31.12) and adjust when needed. Check the ambient temperature (01.22) vs. specification. See technical data. Install optional cabinet heater if not yet installed.</td>
</tr>
<tr>
<td>FF9A</td>
<td>Ambient overtemperature</td>
<td>This is a programmable monitoring function (31.13). Excessive ambient temperature. Possible causes: • too low limit for monitoring function • excessive ambient temperature.</td>
<td>Check limit (31.13) and adjust when needed. Check ambient temperature (01.22) vs. specification. See technical data.</td>
</tr>
<tr>
<td>FF9B</td>
<td>Coolant temperature below limit</td>
<td>This is a programmable monitoring function (31.09). Too low coolant temperature in internal cooling circuit. Possible causes: • too low limit for monitoring function • too low ambient temperature, and simultaneous low drive load.</td>
<td>Check limit (31.09) and adjust when needed. Check ambient temperature (01.22) vs. specification. See technical data. Check coolant temperature (01.23) vs. specification. See technical data.</td>
</tr>
<tr>
<td>FF9C</td>
<td>Coolant overtemperature</td>
<td>This is a programmable monitoring function (31.10). Excessive coolant temperature in internal cooling circuit. Possible causes: • too high limit for monitoring function • too low circulation in external circuit • too low cooling capacity vs. drive size and load • dirty, blocked or faulty heat exchanger.</td>
<td>Check limit (31.10) and adjust when needed. Check circulation in external cooling circuit. Check cooling unit cooling capacity vs. drive size and load. Check heat exchanger. Wash and/or clean it. Replace if it is faulty.</td>
</tr>
<tr>
<td>FF9D</td>
<td>Coolant temperature sensor</td>
<td>Coolant temperature sensor is not connected or it is broken.</td>
<td>Check that sensor is connected to right terminals. See circuit diagrams. Replace faulty sensor.</td>
</tr>
</tbody>
</table>
### Code (hex) | Warning | Cause | What to do
--- | --- | --- | ---
FF9E | Cabinet temperature sensor | Cabinet temperature sensor is not connected or it is broken. | Check that sensor is connected to right terminals. See circuit diagrams. Replace faulty sensor.
FF9F | Ambient temperature sensor | Ambient temperature sensor is not connected or it is broken. | Check that sensor is connected to right terminals. See circuit diagrams. Replace faulty sensor.
FFA0 | Fan control | Cooling fan of ZCU board does not rotate. | Check cooling fan wiring. Replace faulty cooling fan.
FFA1 | Valve control limit | PI controller keeps 2-way control valve (option +C242) fully open. Possible causes: • insufficient cooling capacity of external cooling circuit • faulty external cooling circuit • dirty, blocked or faulty 2-way control valve | Check dimensioning of external cooling circuit. Check and clean 2-way control valve, and coolant flow and temperature in external cooling circuit.

### Faults

<table>
<thead>
<tr>
<th>Code (hex)</th>
<th>Fault</th>
<th>Cause</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>5E03</td>
<td>XSTO circuit open</td>
<td>Circuit between control unit terminal XSTO:out and XSTO:IN1 (or XSTO:IN2) is open.</td>
<td>Check for loose or missing connection wire between OUT and IN1 or IN2 terminals. Reconnect.</td>
</tr>
<tr>
<td>64FF</td>
<td>Fault reset</td>
<td>Informative fault.</td>
<td>An active fault has been reset.</td>
</tr>
<tr>
<td>7081</td>
<td>Control panel loss</td>
<td>This is a programmable monitoring function (49.05). Control panel (or PC tool) has stopped communicating.</td>
<td>Check PC tool or control panel connection. Check control panel connector. Check mounting platform if being used. Disconnect and reconnect the control panel.</td>
</tr>
<tr>
<td>7082</td>
<td>Ext I/O comm loss</td>
<td>The I/O extension module types specified by parameters do not match the detected configuration.</td>
<td>Check the auxiliary code (format XXYY YYYY). “XX” specifies the number of the I/O extension module (02: 15 I/O extension module 2, 03: 16 I/O extension module 3). “YY YYYY” indicates the problem (see actions for each code below).</td>
</tr>
<tr>
<td>00 0001</td>
<td>Communication with the module failed.</td>
<td>Check that the module is properly seated in its slot. Check that the module and the slot connector is not damaged. Try installing the module into another slot.</td>
<td></td>
</tr>
<tr>
<td>Code (hex)</td>
<td>Fault</td>
<td>Cause</td>
<td>What to do</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------</td>
<td>-----------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>00 0002</td>
<td>Module not found</td>
<td>Check the type and location settings of the</td>
<td>Check the type and location settings of the modules (parameters 15.01/15.02 or 16.01/16.02).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>modules (parameters 15.01/15.02 or 16.01/16.02).</td>
<td></td>
</tr>
<tr>
<td>00 0003</td>
<td>Configuration of</td>
<td>Check that the module is properly seated in</td>
<td>Check the module is properly seated in its slot.</td>
</tr>
<tr>
<td></td>
<td>module failed</td>
<td>its slot.</td>
<td>Check that the module is properly seated in its slot.</td>
</tr>
<tr>
<td>00 0004</td>
<td>Configuration of</td>
<td>Check that the module and the slot connector</td>
<td>Try installing the module into another slot.</td>
</tr>
<tr>
<td></td>
<td>module failed</td>
<td>is not damaged.</td>
<td></td>
</tr>
<tr>
<td>7510</td>
<td>FBA A communication</td>
<td>This is programmable warning (50.02). Cyclical</td>
<td>Check status of fieldbus communication.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>communication between cooling unit and fieldbus</td>
<td>See user documentation of fieldbus adapter module.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>adapter A or between PLC and fieldbus adapter</td>
<td>Check settings of fieldbus adapter A parameters (50, 51, 52 and 53).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A is lost.</td>
<td>Check cable connections.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check if communication master is able to communicate.</td>
</tr>
<tr>
<td>FF00</td>
<td>Coolant leakage</td>
<td>Leakage in the internal liquid circuit. Faulty</td>
<td>Repair the leakage point. Dry up the detector and the bottom of the cooling unit. If necessary, remove the leakage detector, open the enclosure, dry the sensor and re-install. Replace a faulty detector.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>detector.</td>
<td>Note: You can change indication type (fault/warning) by parameter (31.06).</td>
</tr>
<tr>
<td>FF01</td>
<td>Inlet pressure</td>
<td>This is a programmable monitoring function (31.01).</td>
<td>Check and adjust value of parameter 31.01.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Too low inlet pressure. Possible causes:</td>
<td>Check that all bleed and drain valves in internal cooling circuit are closed. Check and repair any leakage.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• excessive minimum limit value.</td>
<td>Check pressure in expansion vessel and adjust when necessary. See Adjusting air pressure of the expansion vessel (page 46).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• leakage in internal cooling circuit</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• too low air pressure in expansion vessel</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• too low coolant temperature.</td>
<td></td>
</tr>
<tr>
<td>FF02</td>
<td>Pressure difference</td>
<td>This is a programmable monitoring function</td>
<td>Check parameter 31.05 and adjust when necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(31.05).</td>
<td>Check phase order of the pump motor. Change when necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Too low pressure difference between pump</td>
<td>Check for leakage and repair when necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>outlet and inlet. Possible causes:</td>
<td>Check pump. If you have two-pump system, test to switch pump in duty.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• too high monitoring limit</td>
<td>See parameters 20.01 and 20.02. Replace faulty pump.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• wrong phase order of the pump motor (wrong</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>rotation direction)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• improper pump operation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• broken pump impeller</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• closed valve in the cooling system.</td>
<td></td>
</tr>
<tr>
<td>FF03</td>
<td>Pumps failed</td>
<td>All pumps fail to start.</td>
<td>See warning Pump MCB.</td>
</tr>
</tbody>
</table>
Additional information

■ Indications

Warnings and faults

Warnings and faults indicate an abnormal drive/unit status. The codes and names of active warnings/faults are displayed on the control panel as well as the Drive composer PC tool. Only the codes of warnings/faults are available over fieldbus.

Warnings do not need to be reset; they stop showing when the cause of the warning ceases. Warnings do not latch and the drive/unit will continue to operate.

Faults do latch inside the drive/unit and cause the drive to trip. After the cause of a fault has been removed, the fault can be reset from a selectable source such as the control panel, Drive composer PC tool, the digital inputs of the drive/unit, or fieldbus. After the fault is reset, the drive/unit can be restarted. Note that some faults require a reboot of the control unit either by switching the power off and on, or using parameter 96.08 Control board boot - this is mentioned in the fault listing whenever appropriate.

Editable messages

For some warnings and faults, the message text can be edited and instructions and contact information added. To edit these messages, choose Menu - Settings - Edit texts on the control panel.

■ Warning/fault history and analysis

Event logs

The unit has two event logs that can be accessed from the main Menu on the control panel. The logs can also be accessed (and reset) using the Drive composer PC tool.

One of the logs contains faults and fault resets. The other log lists warnings and pure events, as well as clearing entries. Both logs contain the 64 most recent events. All indications are stored in the event logs with a time stamp and other information.

Auxiliary codes

Some events generate an auxiliary code that often helps in pinpointing the problem. The auxiliary code is displayed on the control panel together with the message. It is also stored in the event log details. In the Drive composer PC tool, the auxiliary code (if any) is shown in the event listing.

Factory data logger

The unit has a data logger that samples preselected values at 500-microsecond (default; see parameter 96.65 Factory data logger time level) intervals. By default, approximately 700 samples recorded immediately before and after a fault, are saved to the memory unit. The fault data of the last five faults is accessible in the event log when viewed in the Drive composer pro PC tool. (The fault data is not accessible through the control panel.)

Other data loggers

User data logger

A custom data logger can be configured using the Drive composer pro PC tool. This functionality enables the free selection of up to eight parameters to be sampled at selectable intervals. The triggering conditions and the length of the monitoring period can also be defined by the user within the limit of approximately 8000 samples. In addition to the PC
tool, the status of the logger is shown by parameter 96.61 User data logger status word. The triggering sources can be selected by parameters 96.63 User data logger trigger and 96.64 User data logger start). The configuration, status and collected data is saved to the memory unit for later analysis.

**Parameters that contain warning/fault information**

The unit is able to store a list of the active faults actually causing the unit to trip at the present time. The faults are displayed in parameter group 04 Warnings and faults. The parameter group also displays a list of faults and warnings that have previously occurred.

- **QR Code generation for mobile service application**

A QR Code (or a series of QR Codes) can be generated by the unit for display on the control panel. The QR Code contains unit identification data, information on the latest events, and values of status and counter parameters. The code can be read with a mobile device containing the ABB service application, which then sends the data to ABB for analysis. For more information on the application, contact your local ABB service representative.

Choose **Menu - Assistants - QR code** on the control panel to generate a QR code.
Fieldbus control through a fieldbus adapter

What this chapter contains

This chapter describes the fieldbus control and instructs how to set up the fieldbus communication.

System overview

The cooling unit can be connected to an external control system through an optional fieldbus adapter attached onto the control unit. The control program has two independent interfaces for fieldbus connection, called “fieldbus adapter A” (FBA A) and “fieldbus adapter B” (FBA B).

Note: This chapter describes the configuration of the fieldbus adapter A (FBA A). The second adapter, fieldbus adapter B (FBA B), if present, is configured in a similar fashion. You can use the fieldbus adapter B only for the monitoring, not for the control.

Fieldbus adapters are available for various communication systems and protocols.
Cyclic (process I/O)
Acyclic
Control word (CW)
References (ref1, ref2)
Parameter R/W requests/responses
Status word (SW)
Actual values (act1, act2)

Fieldbus controller
Fieldbus network
Cooling unit with fieldbus adapter module installed on the control unit
Other devices

1. Fieldbus controller
2. Fieldbus network
3. Cooling unit with fieldbus adapter module installed on the control unit
4. Other devices
5. Cyclic data flow:
   - From fieldbus controller to cooling unit: control word (CW), reference ref1, reference ref2, and user-defined data words
   - From cooling unit to fieldbus controller: status word (SW), actual value act1, actual value act2, and user-defined data words

Acyclic data flow: parameter read write requests and responses

Basics of the fieldbus control interface

The cyclic communication between the fieldbus system and the cooling unit consists of 16- or 32-bit input and output data words. The diagram below illustrates the fieldbus communication through the fieldbus adapter A interface.
1. Fieldbus network

2. Fieldbus adapter module
   2a: Fieldbus-specific interface
   2b: Data out words - data transfer from fieldbus controller
   2c: Data in words - data transfer to fieldbus controller
   2d: Additional data words (if any) - data transfer to and from fieldbus controller. For more information, see the appropriate fieldbus adapter module manual.
   2e: Profile-instance selection parameters (fieldbus adapter module specific). For more information, see the appropriate fieldbus adapter module manual.

3. Data transfer between fieldbus adapter module, and cooling unit:
   3a: Selection of targets for the fieldbus data out words in the cooling unit control program (53 FBA A data out)
   3b: Selection of sources for the fieldbus data in words in the cooling unit control program (52 FBA A data in)
   3c: Additional data words (if any). For more information, see the appropriate fieldbus adapter module manual.

4. Fieldbus adapter A interface: control word, references (ref1 and ref2), status word, actual signals (act1 and act2), etc.

5. Selection of cooling unit control location

6. Cooling unit parameter table
Control word (CW) and Status word (SW)

The control word (CW) is the principal means for controlling the cooling unit from a fieldbus system. The fieldbus master station sends it to the cooling unit through the fieldbus adapter. The cooling unit switches between its states according to the bit-coded instructions in the control word. Cooling unit returns status information to the master in the fieldbus status word (SW).

The contents of the cooling unit control word and the status words are detailed in group 06. When the user enables fieldbus adapter A (50.02):

- the fieldbus control word (CW) is written to the fieldbus A control word (FBA A CW), and further to the cooling unit control word (06.01)
- the cooling unit status word (06.11) is read to the fieldbus A status word (FBA A SW), and further to the fieldbus status word (SW).

Depending on the fieldbus adapter module type, either the fieldbus Data in1 and Data out1 words, or some additional data words are reserved for the transfer of CW and SW automatically. The user cannot affect on the transfer of the CW and SW, and the words used for their transfer. However, the user can define additional data transmissions by parameters in groups 52 FBA A data in and 53 FBA A data out.

Debugging the network words

You can enable a debug mode for the "fieldbus adapter A" to monitor raw (unmodified) content of the fieldbus data words. See parameters 50.12, … ,50.18.

Actual values act1 and act2

Actual values act1 and act2 are data words containing information on the operation of the unit. User selects the signals for actual values act1 and act2 for the fieldbus interface A by parameters in group 50 Fieldbus adapter (FBA).

Debugging the network words

You can enable a debug mode for the fieldbus adapter A to monitor raw (unmodified) content of fieldbus data word. See parameters 50.12, … ,50.18.

References ref1 and ref2

Cooling unit does not use any user-defined reference signals. Thus the parameters related to the fieldbus references ref1 and ref2 are not connected in the cooling unit control program and they have no effect on the operation.

Setting up the cooling unit for fieldbus control (adapter A)

1. Install the fieldbus adapter module mechanically and electrically according to the instructions given in the User’s manual of the module.
2. Power up the cooling unit.
3. Enable the communication between the cooling unit and the fieldbus adapter A (50.01).
4. Select how the cooling unit should reacts to a fieldbus interface A communication break (50.02), and define the time between communication break detection and the selected action (50.03).
5. If needed, tune also the values for the rest of the parameters in group 50 Fieldbus adapter (FBA). For example, you may want to define monitored cooling unit signals for the actual values act1 and act 2 of the fieldbus adapter A (50.07, 50.10, 50.11).
6. Set the fieldbus adapter module A configuration parameters in group **51 FBA A settings**. At a minimum, set the communication profile, and node address.

7. If needed, define additional data transfers to and from the cooling unit (**52 FBA A data in**, **53 FBA A data out**). (The transfer of CW and SW are non-user adjustable.)

8. Save the valid parameter values to permanent memory (**96.07**).

9. Validate the settings made in parameter groups 51, 52 and 53 (**51.27**).

10. Select fieldbus adapter A as the cooling unit control location, that is, the source for the start/stop signal. (**20.03**). 


Internal cooling circuit

Contents of this chapter
The cooling system of a liquid-cooled drive consists of two circuits: the internal cooling circuit and the external cooling circuit. The internal cooling circuit covers the heat-generating electrical components of the drive and transfers the heat to the cooling unit. In the cooling unit, the heat is transferred to the external cooling circuit which is usually part of a larger external cooling system. This chapter deals with the internal cooling circuit.

Applicability
The information in this chapter is applicable to cabinet-built ACS880 liquid-cooled drives. Except where otherwise indicated, the information is also applicable to drives built out of ACS880 liquid-cooled multidrive modules.

Internal cooling system
Note: This section describes cabinet-built, liquid-cooled ACS880 drives. The information in this section can be used as guidelines for building a drive system out of ACS880 liquid-cooled modules.

Each cubicle has an inlet and an outlet manifold, fitted with a stop valve and a drain valve. The stop valves can be closed to isolate all modules in the cubicle from the main cooling circuit.

In cabinet line-ups built by ABB, valves are color-coded:
- Blue – Open during operation
- Red – Closed during operation

The following diagram shows the coolant pipe connections in a drive system consisting of a supply unit and an inverter unit.
The coolant used with ACS880 liquid-cooled drive systems is Antifrogen® L 25% or 50% mixture. See *Coolant specification (page 123).*
Maintenance intervals

As a general rule, the quality of the coolant should be checked at intervals of two years. This can be done by distributors of Antifrogen® L (see www.clariant.com) if a 250 milliliter sample is provided.

Technical data

- Coolant specification

Coolant type

Antifrogen® L (by Clariant International Ltd, www.clariant.com) 25% or 50% mixture, available from Clariant distributors and ABB Service representatives.

Note: Do not dilute the coolant. It is ready to use.

Antifrogen® L 25% mixture is usable in storage temperatures down to -16 °C (3.2 °F).
Antifrogen® L 50% mixture is usable in storage temperatures down to -40 °C (-40 °F).

Note that operation below 0 °C (32 °F) is not allowed regardless of the freezing point of the coolant.

⚠️ WARNING!
The warranty does not cover damage occurring from use of improper coolant.

- Temperature limits

Ambient temperature: See the technical data of the drive/unit.

Freeze protection: The freezing point of the coolant is determined by the concentration of heat transfer fluid in the mixture.

The higher the concentration of heat transfer fluid, the higher the viscosity of the coolant. This results in a higher pressure loss in the system. See Pressure limits (page 125).

The nominal current ratings of drive system modules apply to an Antifrogen® L / water solution of 25/75% (volume). With the Antifrogen® L concentration between 25% and 50%, the drive output current must be derated by 1/3 percentage point per 1 p.p. increase in Antifrogen® L concentration. The drawing below shows the derating factor ($k$) in relation to Antifrogen® L concentration.

Incoming coolant temperature:
### Internal cooling circuit

- **0…40 °C (32…104 °F):** no drive output current derating required.
- **40…45 °C (104…113 °F):** drive output current must be derated by 2 percentage points per 1 °C (1.8 °F) temperature increase, as shown by curve (a).
- **45…50 °C (113…122 °F):**
  - If components with a maximum operating temperature of 55 °C (131 °F) are installed in the same space as the drive modules, drive output current must be derated by 6 percentage points per 1 °C (1.8 °F) temperature increase, as shown by curve (c).
  - If there are no components with a maximum operating temperature of 55 °C (131 °F) installed in the same space as the drive modules, drive output current must be derated by 2 percentage points per 1 °C (1.8 °F) temperature increase, as shown by curve (b).

The drawing below shows the derating factor \( k \) in relation to coolant temperature.

![Derating Factor Chart](chart.png)

Condensation is not allowed. The minimum coolant temperature to avoid condensation (at an atmospheric pressure of 1 bar) is shown below as a function of relative humidity (RH) and ambient temperature \( T_{\text{air}} \).

<table>
<thead>
<tr>
<th>( T_{\text{air}} ) (^{\circ}\text{C} )</th>
<th>Min. ( T_{\text{coolant}} ) (^{\circ}\text{C} )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RH = 95%</td>
</tr>
<tr>
<td>5</td>
<td>4.3</td>
</tr>
<tr>
<td>10</td>
<td>9.2</td>
</tr>
<tr>
<td>15</td>
<td>14.2</td>
</tr>
<tr>
<td>20</td>
<td>19.2</td>
</tr>
<tr>
<td>25</td>
<td>24.1</td>
</tr>
<tr>
<td>30</td>
<td>29.1</td>
</tr>
<tr>
<td>35</td>
<td>34.1</td>
</tr>
<tr>
<td>40</td>
<td>39.0</td>
</tr>
<tr>
<td>45</td>
<td>44.0</td>
</tr>
<tr>
<td>50</td>
<td>49.0</td>
</tr>
<tr>
<td>55</td>
<td>53.9</td>
</tr>
</tbody>
</table>

\( \text{= Not allowed as standard but the coolant temperature must be 0 °C (32 °F) or above.} \)
**Maximum temperature rise:** Depends on heat losses and mass flow. Typically 10 °C (18 °F) with nominal losses and flow.

**Pressure limits**

**Base pressure:** 250 kPa (recommended); 300 kPa (maximum). “Base pressure” denotes the pressure of the system compared with the atmospheric pressure when the cooling circuit is filled with coolant.

**Air counterpressure in expansion vessel (with ACS880-1007LC cooling unit):** 80 kPa

**Design pressure (PS):** 600 kPa

**Nominal pressure difference:** 120 kPa with Antifrogen® L 25% coolant solution, 140 kPa with Antifrogen® L 50% coolant solution. This has to be taken into account when dimensioning the liquid cooling circuit.

**Maximum pressure difference:** 160 kPa

**Coolant flow rate limits**

The maximum coolant flow rate for all drive equipment is 1.3 × nominal. See the technical data chapter for nominal values.

**Cooling circuit materials**

Materials used in the internal cooling circuit are listed below. These are also the only materials that can be used in the external cooling circuit.

- stainless steel AISI 316L (UNS 31603)
- heavy gauge aluminum
- plastic materials such as PA, PEX and PTFE

**Note:** PVC hoses are not suitable for use with antifreeze.

- rubber gasketing NBR (nitrile rubber).

---

**WARNING!**

If connecting external piping to the internal cooling circuit, use only materials that are specified above. Copper, brass or bronze must not be used under any circumstances. Even minor dissolution of copper can cause copper precipitation on aluminum and subsequent galvanic corrosion. The liquid cooling system must not contain any zinc (eg. galvanized pipes).

---

If the plant incorporates normal iron pipes or cast iron accessories (eg. motor housings), a cooling unit with a heat exchanger (such as the ACS880-1007LC) must be used to separate the systems.

---

<table>
<thead>
<tr>
<th>$T_{\text{air}}$ (°C)</th>
<th>$T_{\text{coolant}}$ (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RH = 95%</td>
</tr>
<tr>
<td>Example:</td>
<td>At an air temperature of 45 °C and relative humidity of 65% the coolant temperature may not be below +36.8 °C</td>
</tr>
</tbody>
</table>
Technical data

What this chapter contains
This chapter contains the technical specifications of the cooling unit.

Nominal cooling power, losses and pressure drop

<table>
<thead>
<tr>
<th>ACS880-1007LC-…</th>
<th>$P_{\text{max}}$</th>
<th>$P_{\text{loss total}}$</th>
<th>$P_{\text{loss coolant}}$</th>
<th>$P_{\text{loss air}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kW</td>
<td>kW</td>
<td>kW</td>
<td>kW</td>
</tr>
<tr>
<td></td>
<td>hp</td>
<td>hp</td>
<td>hp</td>
<td>hp</td>
</tr>
<tr>
<td>0070</td>
<td>70</td>
<td>0.4</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>0070+C242</td>
<td>70</td>
<td>0.4</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>0195+C140</td>
<td>195</td>
<td>1.3</td>
<td>1.3</td>
<td>0.3</td>
</tr>
<tr>
<td>0195+C141</td>
<td>195</td>
<td>1.3</td>
<td>1.3</td>
<td>0.3</td>
</tr>
<tr>
<td>0195+C213</td>
<td>195</td>
<td>2.1</td>
<td>1.8</td>
<td>0.3</td>
</tr>
<tr>
<td>0195+C242</td>
<td>195</td>
<td>2.1</td>
<td>1.8</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Dimensions, weight and noise

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>See Dimension drawings (page 157).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>200 kg / 441 lb (ACS880-1007LC-0070)</td>
</tr>
<tr>
<td></td>
<td>280 kg / 617 lb (ACS880-1007LC-0070+C242)</td>
</tr>
<tr>
<td></td>
<td>310 kg / 683 lb (ACS880-1007LC-0195+C140)</td>
</tr>
<tr>
<td></td>
<td>366 kg / 807 lb (ACS880-1007LC-0195+C141)</td>
</tr>
<tr>
<td></td>
<td>373 kg / 822 lb (ACS880-1007LC-0195+C213)</td>
</tr>
<tr>
<td></td>
<td>459 kg / 1012 lb (ACS880-1007LC-0195+C141+C242)</td>
</tr>
<tr>
<td>Noise (Avg)</td>
<td>55 dB</td>
</tr>
</tbody>
</table>
Protection classes

<table>
<thead>
<tr>
<th>Degree of protection (IEC/EN 60529)</th>
<th>IP42, IP54 (option +B055)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overvoltage category (IEC 60664-1)</td>
<td>OVCII (with PD2)</td>
</tr>
</tbody>
</table>

Ambient conditions

<table>
<thead>
<tr>
<th>Ambient temperature</th>
<th>0 … 55 °C (32 … 131 °F). No condensation or frost allowed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altitude</td>
<td>0 … 2000 m (6562 ft)</td>
</tr>
</tbody>
</table>

For more information, see the technical data of the drive.

Coolant flow and quantity

<table>
<thead>
<tr>
<th>ACS880-1007LC-…</th>
<th>Internal flow 1)</th>
<th>External flow 2)</th>
<th>Internal volume</th>
<th>External volume</th>
<th>External coolant pressure loss</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>l/min US gal-lon/min</td>
<td>l/min US gal-lon/min</td>
<td>l US gal-lon</td>
<td>l US gal-lon</td>
<td>kPa</td>
</tr>
<tr>
<td>0070</td>
<td>81/107</td>
<td>21/28</td>
<td>120</td>
<td>32</td>
<td>4.5</td>
</tr>
<tr>
<td>0070+C242</td>
<td>81/107</td>
<td>21/28</td>
<td>120</td>
<td>32</td>
<td>4.5</td>
</tr>
<tr>
<td>0195+C140</td>
<td>270/355</td>
<td>71/93</td>
<td>467</td>
<td>124</td>
<td>31</td>
</tr>
<tr>
<td>0195+C141</td>
<td>270/355</td>
<td>71/93</td>
<td>467</td>
<td>124</td>
<td>35</td>
</tr>
<tr>
<td>0195+C213</td>
<td>310/415</td>
<td>81/109</td>
<td>467</td>
<td>124</td>
<td>35</td>
</tr>
<tr>
<td>0195+C242</td>
<td>310/415</td>
<td>81/109</td>
<td>467</td>
<td>124</td>
<td>35</td>
</tr>
</tbody>
</table>

1) 120 kPa, Antifrogen® L 25%, 40 °C, 50/60 Hz
2) 36 °C water

Pump and pump motor

<table>
<thead>
<tr>
<th>Unit type</th>
<th>ACS880-1007LC-0070</th>
<th>ACS880-1007LC-0195</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage code</td>
<td>+G434, +G436, +G437, +G454</td>
<td>+G434, +G436, +G437, +G454</td>
</tr>
<tr>
<td>Pump type</td>
<td>5SV04V0156T/D 2F</td>
<td>15SV02V0406T/D 2F</td>
</tr>
<tr>
<td>Motor type</td>
<td>SM90RB14/315</td>
<td>PLM112RB14S6/340 E3</td>
</tr>
<tr>
<td>Pump manufacturer</td>
<td>Lowara</td>
<td>Lowara</td>
</tr>
<tr>
<td>Motor power</td>
<td>1.5 kW</td>
<td>4 kW</td>
</tr>
<tr>
<td>Motor voltage and current (50 Hz)</td>
<td>Delta: 3<del>380 V ± 5%, 3.21 A / Star: 3</del>660 V ± 5%, 1.85 A</td>
<td>Delta: 3<del>380 V ± 5%, 7.80 A / Star: 3</del>660 V ± 5%, 4.50 A</td>
</tr>
<tr>
<td>Motor speed (50 Hz)</td>
<td>2885 rpm</td>
<td>2900 rpm</td>
</tr>
<tr>
<td>Motor voltage and current (60 Hz)</td>
<td>Delta: 3<del>380 V ± 5%, 3.05 A / Star: 3</del>690 V ± 5%, 1.61 A</td>
<td>Delta: 3<del>380 V ± 5%, 7.44 A / Star: 3</del>690 V ± 5%, 4.30 A</td>
</tr>
</tbody>
</table>
With external supply voltage 3~440-480 V/60 Hz, used with IEC (option +G455)

<table>
<thead>
<tr>
<th>Unit type</th>
<th>ACS880-1007LC-0070</th>
<th>ACS880-1007LC-0195</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor speed (60 Hz)</td>
<td>3505 rpm</td>
<td>3480 rpm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit type</th>
<th>ACS880-1007LC-0070</th>
<th>ACS880-1007LC-0195</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage code</td>
<td>+G455</td>
<td>+G455</td>
</tr>
<tr>
<td>Pump type</td>
<td>5SV04V0156T/D</td>
<td>15SV02V0406T/D</td>
</tr>
<tr>
<td>Motor type</td>
<td>SM80…/315 E3</td>
<td>PLM100…/340 E3</td>
</tr>
<tr>
<td>Pump manufacturer</td>
<td>Lowara</td>
<td>Lowara</td>
</tr>
<tr>
<td>Motor power</td>
<td>1.5 kW</td>
<td>4 kW</td>
</tr>
<tr>
<td>Motor voltage and current (60 Hz)</td>
<td>Delta: 3~440 V ± 5%, 2.8 A</td>
<td>Delta: 3~480 V ± 5%, 2.82 A</td>
</tr>
<tr>
<td>Star: 3~440 V ± 5%, 6.78 A</td>
<td>Star: 3~480 V ± 5%, 6.71 A</td>
<td></td>
</tr>
<tr>
<td>Motor speed (60 Hz)</td>
<td>3490/3510 rpm</td>
<td>3515/3530 rpm</td>
</tr>
</tbody>
</table>

**Filling pump**

Example pump: 3421610 pump WGK

**Pump motor power supply**

User must connect the power supply for the pump motor(s).

<table>
<thead>
<tr>
<th>Power, voltage and current</th>
<th>See section Pump and pump motor (page 128).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage tolerance</td>
<td>IEC motors: ± 5%</td>
</tr>
<tr>
<td></td>
<td>UL motors: ± 10%</td>
</tr>
<tr>
<td>Supply network</td>
<td>TN system or IT system. Prospective short-circuit current (with the fuses specified) max. 6.5 kA / 400 V, 4 kA / 690 V</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 or 60 Hz ± 5%</td>
</tr>
<tr>
<td>Imbalance</td>
<td>Maximum 3% of nominal phase-to-phase voltage</td>
</tr>
<tr>
<td>Network quality</td>
<td>Maximum allowed voltage THD &lt; 5%</td>
</tr>
<tr>
<td></td>
<td>Maximum voltage spikes &lt; 1800 V</td>
</tr>
<tr>
<td></td>
<td>Maximum dV/dt &lt; 2500 V/us</td>
</tr>
<tr>
<td>Fuse size and type</td>
<td>IEC: max. fuse 25 A gG / 16 A aM at 50 kA supply network</td>
</tr>
<tr>
<td></td>
<td>UL/CSA: max. fuse 30 A, J type fuse at 10 kA supply network</td>
</tr>
<tr>
<td>Recommended conductor size</td>
<td>4.0 mm² (Cu)</td>
</tr>
<tr>
<td>Cable voltage rating</td>
<td>min. 600 V AC cable for up to 500 V AC, min. 750 V AC cable for up to 600 V AC, min. 1 kV AC cable for above 600 V AC supply</td>
</tr>
<tr>
<td>Terminal size and tightening torque</td>
<td>0.75 … 10 mm², 0.8 N·m</td>
</tr>
<tr>
<td>Protective earth (PE) connection</td>
<td>Fixed</td>
</tr>
<tr>
<td>Residual current device (RCD)</td>
<td>Not recommended</td>
</tr>
</tbody>
</table>
### Requirements for pump power supply (Q200)

<table>
<thead>
<tr>
<th>ASC880-1007LC-…</th>
<th>$S_p$</th>
<th>$I_{p,max}$</th>
<th>Term. min.</th>
<th>Term. max.</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>VA</td>
<td>A</td>
<td>mm$^2$ (AWG)</td>
<td>mm$^2$ (AWG)</td>
<td>N·m</td>
<td></td>
</tr>
<tr>
<td>0070</td>
<td>1500</td>
<td>3.21</td>
<td>0.75 (18)</td>
<td>10 (8)</td>
<td>0.8</td>
</tr>
<tr>
<td>0195</td>
<td>4000</td>
<td>7.8</td>
<td>0.75 (18)</td>
<td>10 (8)</td>
<td>0.8</td>
</tr>
<tr>
<td>0195+C213</td>
<td>8000</td>
<td>15.6</td>
<td>0.75 (18)</td>
<td>10 (8)</td>
<td>0.8</td>
</tr>
</tbody>
</table>

### ASC880-1007LC-…

<table>
<thead>
<tr>
<th>3~380-480 V AC</th>
<th>$I_{cb}$</th>
<th>$I_{sc,min}$</th>
<th>3~660-690 V AC</th>
<th>$I_{cb}$</th>
<th>$I_{sc,min}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>A</td>
<td></td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>0070</td>
<td>2.5…4</td>
<td>54</td>
<td>1.6…2.5</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>0195</td>
<td>6.3…10</td>
<td>225</td>
<td>4…6.3</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>0195+C213</td>
<td>2 × 6.3…10</td>
<td>225</td>
<td>2 × 4…6.3</td>
<td>56</td>
<td></td>
</tr>
</tbody>
</table>

- **$S_p$**: Apparent power when the cooling unit is running
- **$I_{p,max}$**: Maximum continuous load current when the cooling unit is running
- **Term. min.**: Minimum conductor size accepted by the input terminal (supply disconnecting device Q200)
- **Term. max.**: Maximum conductor size accepted by the input terminal (supply disconnecting device Q200)
- **Torque**: Terminal tightening torque
- **$I_{cb}$**: Current range rating of the internal motor circuit breaker
- **$I_{sc,min}$**: Minimum short circuit current. The user-defined power supply, and the power supply cable must be able to feed this fault current at the minimum to the cooling unit connection point when there is a short circuit fault. The cable short circuit protection must also limit the duration of the fault under 5 seconds ($t < 5$ s).

Customer needs to dimension supply cable according to national requirements. Cable size depends on upstream fuse, cable length, cable type, assembly method and ambient temperature. $I_{sc,min}$ needs to be available at input terminals of pump power supply (Q200).

### Auxiliary power supply for the control circuits

Cooling unit in drive cabinet line-up: Supplied from the drive auxiliary power source (factory-installed). No user connections needed.

Stand-alone cooling unit (option +C139): User must connect the power supply. Specification:

<table>
<thead>
<tr>
<th>Power</th>
<th>ACS880LC-1007-0070: 138 VA, ACS880LC-1007-0195: 150 VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage and frequency</td>
<td>1~230 or 115 V AC ± 10%, 50 or 60 Hz ± 5%</td>
</tr>
<tr>
<td>Supply network</td>
<td>TN system. For IT system, consult ABB. Prospective short-circuit current (with the fuses specified) max. 6.5 kA / 400 V, 4 kA / 690 V</td>
</tr>
<tr>
<td>Fuse size and type</td>
<td>IEC: max. fuse 10 A gG at 50 kA supply network</td>
</tr>
<tr>
<td></td>
<td>UL/CSA: max. fuse 6 A, J type fuse at 10 kA supply network</td>
</tr>
<tr>
<td>Recommended conductor size</td>
<td>1.5 mm$^2$ (Cu)</td>
</tr>
<tr>
<td>Terminal size and tightening torque</td>
<td>0.75 … 10 mm$^2$, 0.8 N·m</td>
</tr>
</tbody>
</table>
### Requirements for control circuit power supply (Q210)

<table>
<thead>
<tr>
<th>ASC880-1007-…</th>
<th>$S_R$</th>
<th>$S_{SB}$</th>
<th>Term. min.</th>
<th>Term. max.</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VA</td>
<td>VA</td>
<td>mm$^2$ (AWG)</td>
<td>mm$^2$ (AWG)</td>
<td>N·m</td>
</tr>
<tr>
<td>-0070</td>
<td>138</td>
<td>126</td>
<td>0.75 (18)</td>
<td>10 (8)</td>
<td>0.8</td>
</tr>
<tr>
<td>-0195</td>
<td>150</td>
<td>126</td>
<td>0.75 (18)</td>
<td>10 (8)</td>
<td>0.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ASC880-1007-…</th>
<th>$I_{cb}$</th>
<th>$I_{sc,min}$</th>
<th>$I_{cb}$</th>
<th>$I_{sc,min}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>~230 V AC</td>
<td>~115 V AC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$I_{cb}$</td>
<td>$I_{sc,min}$</td>
<td>$I_{cb}$</td>
<td>$I_{sc,min}$</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>-0070</td>
<td>4</td>
<td>40</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>-0195</td>
<td>4</td>
<td>40</td>
<td>4</td>
<td>40</td>
</tr>
</tbody>
</table>

- $S_R$: Apparent power when the cooling unit is running (with 75% load of the 24 V DC power source)
- $S_{SB}$: Apparent power when the cooling unit is at stand-by (with 75% load of the 24 V DC power source)
- Term. min: Minimum conductor size accepted by the input terminal (supply disconnecting device Q210)
- Term. max: Maximum conductor size accepted by the input terminal (supply disconnecting device Q210)
- Torque: Terminal tightening torque
- $I_{cb}$: Current range rating of the internal miniature circuit breaker
- $I_{sc,min}$: Minimum short circuit current. See Requirements for pump power supply (Q200) (page 130).

Customer needs to dimension supply cable according to national requirements. Cable size depends on upstream fuse, cable length, cable type, assembly method and ambient temperature. $I_{sc,min}$ needs to be available at input terminals of control circuit power supply (Q210).

### Power supply for the cabinet heater (option +G300) and lighting (option +G301)

**Cooling unit in drive cabinet line-up:** Supplied from the drive auxiliary power source (factory-installed). No user connections needed.

**Stand-alone cooling unit (option +C139):** User must connect the power supply. Specification:

<table>
<thead>
<tr>
<th>Power</th>
<th>90 VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage and frequency</td>
<td>1–230 or 115 V AC ± 10%, 50 or 60 Hz ± 5%</td>
</tr>
<tr>
<td>Supply network</td>
<td>TN system. For IT system, consult ABB. Prospective short-circuit current (with the fuses specified) max. 6.5 kA / 400 V, 4 kA / 690 V</td>
</tr>
<tr>
<td>Fuse size and type</td>
<td><strong>IEC:</strong> max. fuse 25 A gG at 50 kA supply network <strong>UL/CSA:</strong> max. fuse 15 A, J type fuse at 10 kA supply network</td>
</tr>
</tbody>
</table>
### Requirements for heating and lighting power supply (Q295)

<table>
<thead>
<tr>
<th>ASC880-1007-...</th>
<th></th>
<th>~230 V AC</th>
<th>~115 V AC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>S</strong></td>
<td><strong>Term. min.</strong></td>
<td><strong>Term. max.</strong></td>
</tr>
<tr>
<td></td>
<td>VA</td>
<td>mm² (AWG)</td>
<td>mm² (AWG)</td>
</tr>
<tr>
<td>-0070…0195</td>
<td>90</td>
<td>0.75 (18)</td>
<td>10 (8)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ASC880-1007-...</th>
<th><strong>I_{cb}</strong></th>
<th><strong>I_{sc,min}</strong></th>
<th><strong>I_{cb}</strong></th>
<th><strong>I_{sc,min}</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>-0070…0195</td>
<td>4</td>
<td>40</td>
<td>4</td>
<td>40</td>
</tr>
</tbody>
</table>

- **S**: Apparent power
- **Term. min.**: Minimum conductor size accepted by the input terminal (supply disconnecting device Q295)
- **Term. max**: Maximum conductor size accepted by the input terminal (supply disconnecting device Q295)
- **Torque**: Terminal tightening torque
- **I_{cb}**: Current range rating of the internal miniature circuit breaker
- **I_{sc,min}**: Minimum short circuit current. See *Requirements for pump power supply (Q200) (page 130)*

Customer needs to dimension supply cable according to national requirements. Cable size depends on upstream fuse, cable length, cable type, assembly method and ambient temperature. \( I_{sc,min} \) needs to be available at input terminals of heating and lighting power supply (Q295).
**Fill/drain/bleed hoses and drain box**

Cooling unit delivery includes three fill/drain/bleed hoses:

<table>
<thead>
<tr>
<th>Length</th>
<th>~3 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>15/13 mm</td>
</tr>
<tr>
<td>Material</td>
<td>urethane UL 94 V-1 (or equivalent)</td>
</tr>
<tr>
<td>Connectors</td>
<td>R1/2&quot; internal thread with flat sealing surface and gasket</td>
</tr>
</tbody>
</table>

Cooling unit delivery includes three drain boxes (for pump sealing, fill and bleed hoses):

Use the drain boxes when replacing the pump.

**Flanges for connecting the piping**

Use A2-70 M12 stainless steel bolts and nuts when connecting the piping. Tightening torque is 125 N·m.

---

**WARNING!**

Do not use other than the specified bolt and nut types. It can cause corrosion damages and leakages.

---

<table>
<thead>
<tr>
<th>ACS880-1007LC-..</th>
<th>External circuit</th>
<th>Internal circuit (stand-alone unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Flange type (DIN / ANSI)</td>
<td>Pipe size (DN / NPS)</td>
</tr>
<tr>
<td>0070</td>
<td>DIN 2633 PN 16 / ANSI B 16.5</td>
<td>32 / 1 1/4&quot;</td>
</tr>
<tr>
<td>0195</td>
<td>DIN 2633 PN 16 / ANSI B 16.5</td>
<td>50 / 2&quot;</td>
</tr>
</tbody>
</table>
Internal cooling circuit data

See section Technical data (page 123) in chapter Internal cooling circuit.

■ Control valve (V0016) setting vs. coolant flow
External cooling circuit data

- Liquid quality for standard heat exchanger and piping

Industrial water suitable for stainless steel AISI 316 piping material is allowed. The liquid must not contain sediment, or organic or chemically active matter. The liquid can be treated with corrosion inhibitors suitable for AISI 316. For sea water heat exchanger the inhibitor must also be suitable for NBR rubber gaskets.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH value</td>
<td>5 … 9.5</td>
</tr>
<tr>
<td>Chloride</td>
<td>&lt; 100 mg/l</td>
</tr>
<tr>
<td>Sulphate</td>
<td>&lt; 200 mg/l</td>
</tr>
<tr>
<td>Total hardness</td>
<td>&lt; 2.5 mmol/l</td>
</tr>
<tr>
<td>Maximum particle size</td>
<td>1 mm</td>
</tr>
<tr>
<td>Total dissolved solids</td>
<td>&lt; 500 mg/l</td>
</tr>
</tbody>
</table>

Sea water in the external circuit is allowed only if the cooling unit is equipped with sea water piping and heat exchanger (option +C146).

- Temperature and pressure limits

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum inlet temperature</td>
<td>0</td>
</tr>
<tr>
<td>Nominal inlet temperature</td>
<td>36 (^1)</td>
</tr>
<tr>
<td>Maximum inlet temperature</td>
<td>46 (^1)</td>
</tr>
<tr>
<td>Maximum design pressure</td>
<td>1 000 kPa</td>
</tr>
<tr>
<td>Maximum temperature variation</td>
<td>±7</td>
</tr>
</tbody>
</table>
136 Technical data

<table>
<thead>
<tr>
<th>Maximum temperature rise (°C)</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal difference in pressure (kPa)</td>
<td>150</td>
</tr>
</tbody>
</table>

1) If the coolant inlet temperature is above the nominal value in the external cooling circuit, this will be the case also in the internal cooling circuit of the drive. Thus, the drive output current must be derated. ABB derates it for the cabinet-installed drive deliveries. For the module installations, the system integrator must do it. See chapter Internal cooling circuit (page 121) for more information.

- **Recommended pipe size and material**

<table>
<thead>
<tr>
<th>Size</th>
<th>ACS880-1007LC-0070: 42.2 mm (1 1/4&quot;, DN32)</th>
<th>ACS880-1007LC-0195: 60.3 mm (2&quot;, DN50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended material:</td>
<td>Stainless steel AISI 316. If the unit is equipped with a sea water heat exchanger (option +C146), the external cooling circuit material must also be sea-water-resistant.</td>
<td></td>
</tr>
</tbody>
</table>

- **Heat exchanger pressure drop charts**

![Heat exchanger pressure drop chart](chart.png)

External flow pressure loss @water 36 °C
ACS880-1007LC-0070

- **External flow [l/min]**
- **Pressure loss [kPa]**

<table>
<thead>
<tr>
<th>External flow [l/min]</th>
<th>0</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>80</th>
<th>100</th>
<th>120</th>
<th>140</th>
<th>160</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure loss [kPa]</td>
<td>0</td>
<td>50</td>
<td>100</td>
<td>150</td>
<td>200</td>
<td>250</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Materials

<table>
<thead>
<tr>
<th>Cabinet</th>
<th>Hot-dip zinc-coated (thickness approx. 20 µm) steel sheet (thickness 1.5 mm) with polyester thermosetting powder coating (thickness approx. 80 µm) on visible surfaces except back panel. Color: RAL 7035 (light beige, semigloss)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal cooling circuit piping</td>
<td>Heavy gauge aluminium, stainless steel AISI 316L (UNS 31603), plastic materials such as PA, PEX and Teflon.</td>
</tr>
<tr>
<td>Fire safety of materials (IEC 60332-1)</td>
<td>Insulating materials and non-metallic items: Mostly self-extinctive</td>
</tr>
<tr>
<td>Packaging</td>
<td>Frame: Wood or plywood. Plastic wrapping: PE-LD. Bands: PP or steel</td>
</tr>
<tr>
<td>Disposal</td>
<td>The main parts of the drive can be recycled to preserve natural resources and energy. Product parts and materials should be dismantled and separated. Generally all metals, such as steel, aluminum, copper and its alloys, and precious metals can be recycled as material. Plastics, rubber, cardboard and other packaging material can be used in energy recovery. Printed circuit boards and large electrolytic capacitors need selective treatment according to IEC 62635 guidelines. To aid recycling, plastic parts are marked with an appropriate identification code. Contact your local ABB distributor for further information on environmental aspects and recycling instructions for professional recyclers. End of life treatment must follow international and local regulations.</td>
</tr>
</tbody>
</table>

Applicable standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>European electrical safety requirements product standards</td>
<td></td>
</tr>
<tr>
<td>IEC/EN 61800-5-1:2007</td>
<td>Adjustable speed electrical power drive systems. Part 5-1: Safety requirements – electrical, thermal and energy</td>
</tr>
</tbody>
</table>
The cooling unit has been designed, and it is manufactured in accordance with the Sound Engineering Practices (SEP) defined in the European Pressure Equipment Directive (PED). The SEP category equipment cannot be CE marked under the PED.

For the SEP, the customer-defined external cooling circuit must meet these criteria:
- maximum pressure is PS 10 bar
- maximum volume is 1000 l
- pipe diameter is smaller than DN200.

For the SEP, the internal cooling circuit must meet these criteria:
- maximum pressure is PS 6 bar
- maximum volume is 1600 l.

The internal cooling circuit meets the SEP criteria as standard when the cooling unit is in the drive cabinet line-up. For a stand-alone cooling unit with a customer-defined internal cooling circuit, the customer must make sure that the criteria will be met.

Disclaimers

- **Generic disclaimer**

The manufacturer shall have no obligation with respect to any product which (i) has been improperly repaired or altered; (ii) has been subjected to misuse, negligence or accident; (iii) has been used in a manner contrary to the manufacturer’s instructions; or (iv) has failed as a result of ordinary wear and tear.
Cybersecurity disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is Customer's sole responsibility to provide and continuously ensure a secure connection between the product and Customer network or any other network (as the case may be). Customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.
Piping and instrumentation diagrams
ACS880-1007LC-0070 component designations

The table below lists the component designations used in layout drawings, piping and instrumentation (PI) diagrams, and circuit diagrams.

<table>
<thead>
<tr>
<th>Layout dr.</th>
<th>PI diag.</th>
<th>Circuit diag.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-</td>
<td>-</td>
<td>Outlet to internal cooling circuit</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>-</td>
<td>Inlet from internal cooling circuit</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>-</td>
<td>Inlet from external cooling circuit</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>-</td>
<td>Outlet to external cooling circuit</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>-</td>
<td>Pump de-airing screw</td>
</tr>
<tr>
<td>GA-201</td>
<td>GA-201</td>
<td>-M201</td>
<td>Coolant pump 1</td>
</tr>
<tr>
<td>EA-100</td>
<td>EA-100</td>
<td>-</td>
<td>Heat exchanger</td>
</tr>
<tr>
<td>PA-102</td>
<td>PA-102</td>
<td>-</td>
<td>Expansion vessel</td>
</tr>
<tr>
<td>VA-103</td>
<td>VA-103</td>
<td>-</td>
<td>Automatic float air vent</td>
</tr>
<tr>
<td>PT-201</td>
<td>PT-201</td>
<td>-T201</td>
<td>Inlet pressure transmitter with low limit alarm</td>
</tr>
<tr>
<td>PT-202</td>
<td>PT-202</td>
<td>-T202</td>
<td>Outlet pressure transmitter</td>
</tr>
<tr>
<td>PI-203</td>
<td>PI-203</td>
<td>-</td>
<td>Coolant pressure gauge</td>
</tr>
<tr>
<td>-</td>
<td>TIA(C)-210</td>
<td>-</td>
<td>Coolant temperature indicator and alarm (and control, if option +C242). This device is the LCU control unit.</td>
</tr>
<tr>
<td>TT-201</td>
<td>TT-201</td>
<td>-B201</td>
<td>Coolant temperature transmitter</td>
</tr>
<tr>
<td>TT-202</td>
<td>TT-202</td>
<td>-B202</td>
<td>Ambient temperature transmitter</td>
</tr>
<tr>
<td>TT-210</td>
<td>TT-210</td>
<td>-(A210)</td>
<td>Cabinet temperature transmitter</td>
</tr>
<tr>
<td>TT-211</td>
<td>TT-211</td>
<td>-B211</td>
<td>Coolant temperature transmitter if 2-way valve is installed (option +C242)</td>
</tr>
<tr>
<td>V0001</td>
<td>V0001</td>
<td>-</td>
<td>Shut-off valve for automatic float air vent</td>
</tr>
<tr>
<td>V0002</td>
<td>V0002</td>
<td>-</td>
<td>Pressure transmitter (PT-201) shut-off valve</td>
</tr>
<tr>
<td>V0008</td>
<td>V0008</td>
<td>-</td>
<td>Pressure transmitter (PT-202) shut-off valve</td>
</tr>
<tr>
<td>V0009</td>
<td>V0009</td>
<td>-</td>
<td>Pressure gauge (PI-203) shut-off valve</td>
</tr>
<tr>
<td>V0003</td>
<td>V0003</td>
<td>-</td>
<td>Expansion vessel shut-off valve</td>
</tr>
<tr>
<td>V0004, V0006</td>
<td>V0004, V0006</td>
<td>-</td>
<td>Pump shut-off valves</td>
</tr>
<tr>
<td>V0010</td>
<td>V0010</td>
<td>-</td>
<td>Drain/fill valve (internal circuit LCU inlet)</td>
</tr>
<tr>
<td>V0011</td>
<td>V0011</td>
<td>-</td>
<td>Expansion vessel bleed valve</td>
</tr>
<tr>
<td>V0012</td>
<td>V0012</td>
<td>-</td>
<td>Drain valve (internal circuit LCU outlet)</td>
</tr>
<tr>
<td>V0014</td>
<td>V0014</td>
<td>-</td>
<td>Fill valve (Internal circuit LCU outlet)</td>
</tr>
<tr>
<td>V0013</td>
<td>V0013</td>
<td>-</td>
<td>Safety relief valve for UL (option +C129)</td>
</tr>
<tr>
<td>V0016</td>
<td>V0016</td>
<td>-</td>
<td>Control valve</td>
</tr>
<tr>
<td>V0018</td>
<td>V0018</td>
<td>-</td>
<td>Control valve if 2-way valve is installed (option +C242)</td>
</tr>
<tr>
<td>V0019</td>
<td>V0019</td>
<td>-</td>
<td>Shut off valve for the Safety relief valve (with option +C129 only)</td>
</tr>
<tr>
<td>-</td>
<td>SA-104</td>
<td>-</td>
<td>Strainer (with option +C242 only)</td>
</tr>
<tr>
<td>LA-201</td>
<td>LA-201</td>
<td>S201</td>
<td>Leakage detector</td>
</tr>
<tr>
<td>-</td>
<td>LA-211</td>
<td>S211</td>
<td>Leakage detector</td>
</tr>
</tbody>
</table>
ACS880-1007LC-0195 component designations

The table below lists the component designations used in layout drawings, piping and instrumentation (PI) diagrams, and circuit diagrams.

<table>
<thead>
<tr>
<th>Layout dr.</th>
<th>PI diag.</th>
<th>Circuit diag.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>-</td>
<td>-</td>
<td>Outlet to and inlet from internal cooling circuit</td>
</tr>
<tr>
<td>3, 4</td>
<td>-</td>
<td>-</td>
<td>Inlet from and outlet to external cooling circuit</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>-</td>
<td>Pump de-airing screw</td>
</tr>
<tr>
<td>GA-201</td>
<td>GA-201</td>
<td>-M201</td>
<td>Coolant pump 1</td>
</tr>
<tr>
<td>GA-202</td>
<td>GA-202</td>
<td>-M202</td>
<td>Coolant pump 2</td>
</tr>
<tr>
<td>EA-100</td>
<td>EA-100</td>
<td>-</td>
<td>Heat Exchanger</td>
</tr>
<tr>
<td>PA-102</td>
<td>PA-102</td>
<td>-</td>
<td>Expansion vessel</td>
</tr>
<tr>
<td>VA-103</td>
<td>VA-103</td>
<td>-</td>
<td>Automatic float air vent</td>
</tr>
<tr>
<td>PT-201</td>
<td>PT-201</td>
<td>-T201</td>
<td>Inlet pressure transmitter with low limit alarm</td>
</tr>
<tr>
<td>PT-202</td>
<td>PT-202</td>
<td>-T202</td>
<td>Outlet pressure transmitter</td>
</tr>
<tr>
<td>PI-203</td>
<td>PI-203</td>
<td>-</td>
<td>Coolant pressure gauge</td>
</tr>
<tr>
<td>-</td>
<td>TIA(C)-210</td>
<td>-</td>
<td>Coolant temperature indicator and alarm (and control, if option +C242)</td>
</tr>
<tr>
<td>TT-201</td>
<td>TT-201</td>
<td>-B201</td>
<td>Coolant temperature transmitter</td>
</tr>
<tr>
<td>TT-202</td>
<td>TT-202</td>
<td>-B202</td>
<td>Ambient temperature transmitter</td>
</tr>
<tr>
<td>TT-210</td>
<td>TT-210</td>
<td>(-A210)</td>
<td>Cabinet temperature transmitter</td>
</tr>
<tr>
<td>TT-211</td>
<td>TT-211</td>
<td>-B211</td>
<td>Coolant temperature transmitter if 2-way valve is installed (option +C242)</td>
</tr>
<tr>
<td>V0001</td>
<td>V0001</td>
<td>-</td>
<td>Shut-off valve for automatic float air vent</td>
</tr>
<tr>
<td>V0002</td>
<td>V0002</td>
<td>-</td>
<td>Pressure transmitters (PT-201) shut-off valve</td>
</tr>
<tr>
<td>V0008</td>
<td>V0008</td>
<td>-</td>
<td>Pressure transmitter (PT-202) shut-off valve</td>
</tr>
<tr>
<td>V0009</td>
<td>V0009</td>
<td>-</td>
<td>Pressure gauge (PI-203) shut-off valve</td>
</tr>
<tr>
<td>V0003</td>
<td>V0003</td>
<td>-</td>
<td>Expansion vessel shut-off valve</td>
</tr>
<tr>
<td>V0004, V0005, V0006, V0007</td>
<td>V0004, V0005, V0006, V0007</td>
<td>-</td>
<td>Pump shut-off/check valves</td>
</tr>
<tr>
<td>V0010</td>
<td>V0010</td>
<td>-</td>
<td>Drain/fill valve (internal circuit LCU inlet)</td>
</tr>
<tr>
<td>V0011</td>
<td>V0011</td>
<td>-</td>
<td>Expansion vessel bleed valve</td>
</tr>
<tr>
<td>V0012</td>
<td>V0012</td>
<td>-</td>
<td>Drain/fill valve (internal circuit LCU outlet)</td>
</tr>
<tr>
<td>V0014</td>
<td>V0014</td>
<td>-</td>
<td>Fill valve (internal circuit LCU outlet)</td>
</tr>
<tr>
<td>V0013</td>
<td>V0013</td>
<td>-</td>
<td>Safety relief valve for UL (option +C129)</td>
</tr>
<tr>
<td>V0016</td>
<td>V0016</td>
<td>-</td>
<td>Control valve</td>
</tr>
<tr>
<td>V0015</td>
<td>V0015</td>
<td>-</td>
<td>Shut off valve for extra LCU cubicle cooler (with option +C213 only)</td>
</tr>
<tr>
<td>V0017</td>
<td>V0017</td>
<td>-</td>
<td>Shut off valve for extra LCU cubicle cooler (with option +C213 only)</td>
</tr>
<tr>
<td>V0018</td>
<td>V0018</td>
<td>-</td>
<td>Control valve (option +C242)</td>
</tr>
<tr>
<td>-</td>
<td>SA-104</td>
<td>-</td>
<td>Strainer (with option +C242 only)</td>
</tr>
<tr>
<td>V0019</td>
<td>V0019</td>
<td>-</td>
<td>Shut off valve for the Safety relief valve (with option +C129 only)</td>
</tr>
<tr>
<td>LA-201</td>
<td>LA-201</td>
<td>S201</td>
<td>Leakage detector</td>
</tr>
<tr>
<td>-</td>
<td>LA-211</td>
<td>S211</td>
<td>Leakage detector</td>
</tr>
</tbody>
</table>
Example circuit diagrams

What this chapter contains

This chapter contains an example circuit diagram set of ACS880-1007LC-0195, integrated in the drive cabinet line up. The unit designations:
- "=20" refers to the cooling unit in the drive cabinet line up.
- "=01" refers to the supply unit in the drive cabinet line up. The supply unit circuit diagrams are not shown in this manual.
- "=11" refers to the inverter unit in the drive cabinet line up. The inverter unit circuit diagrams are not shown in this manual.
Circuit diagrams
152 Example circuit diagrams
NOTE: THESE WIRES ARE ON SLEEVE

Circuit Diagrams for User Manual

N. N Circuit diagram EFS2

20.02.2020

NOTE: THESE WIRES ARE ON SLEEVE

CONTROL VALUE KIT
DC/22 230V

COMMISSIONING

Button

Position Switches

Terminals 18-21

Set Value

Input

Terminals 1-3

+0(2)-10V

Actual Value

Feedback

Terminals 4-6

+0(4)-20mA

Monitor relay

Potential free

Terminals 7-8

MAX. Load

L/+(24Vac/Vdc)

Binary input signals

Terminals 9-11

N/-(24Vac/Vdc)

Fail safe signals

Terminals 12-13

+0(4)-20mA

24Vdc/100mA

Supply

Terminal 14

RJ45

Terminals 15-16

+0(2)-10V

24 Vdc

GND

Terminals 17

+0(2)-10V

GND

Terminals 19

GND

Terminals 20

Position Switches

Terminals 18-21

+0(4)-20mA

GND

Terminals 3

GND

Terminals 5

GND

Terminals 7

GND

Terminals 8

GND

Terminals 10

GND

Terminals 11

GND

Terminals 13

GND

Terminals 15

GND

Terminals 17

GND

Terminals 19

GND

Terminals 20

GND

Terminals 22

GND

Terminals 23

GND

Terminals 21

GND

Terminals 25

GND

Terminals 27

GND

Terminals 26

GND

Terminals 28

GND

Terminals 29

GND

Terminals 30

GND

Terminals 31

GND

Terminals 32

GND

Terminals 33

GND

Terminals 34

GND

Terminals 35

GND

Terminals 36

GND

Terminals 37

GND

Terminals 38

GND

Terminals 39

GND

Terminals 40

GND

Terminals 41
Dimension drawings

What this chapter contains
This chapter contains cooling unit dimension drawings.
The dimensions are in millimeters (for inches, divide by 25.4).
Cable entry (bottom)

<table>
<thead>
<tr>
<th>ACS880-1007LC-0070</th>
<th>ACS880-1007LC-0195</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram ACS880-1007LC-0070" /></td>
<td><img src="image2" alt="Diagram ACS880-1007LC-0195" /></td>
</tr>
</tbody>
</table>

**Note:** External piping on right side. The location of the cable entries differ in other constructions.
ACS880-1007LC-0070 in cabinet line-up (at right), external cooling circuit from right
ACS880-1007LC-0070 stand-alone cooling unit, external cooling circuit from right
ACS880-1007LC-0195 in cabinet line-up (at right), external cooling circuit from right
ACS880-1007LC-0195 stand-alone cooling unit, external cooling circuit from right
2-way control valve cubicle (option +C242) for ACS880-1007LC-0070

The cooling unit cubicle is on the left (not visible), and the external cooling circuit connection is on the right.
2-way control valve cubicle (option +C242) for ACS880-1007LC-0195

The cooling unit cubicle is on the left (not visible), and the external cooling circuit connection is on the right.
½ inch socket wrench adapter for valve without handle

**Note:** Some valves (ie V0006, V0007) do not have an operating handle. Instead, they have an adapter with a square 13×13 mm slot suitable for a ½ inch socket wrench (with no socket attached).
Further information

Product and service inquiries
Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to www.abb.com/searchchannels.

Product training
For information on ABB product training, navigate to new.abb.com/service/training.

Providing feedback on ABB manuals
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