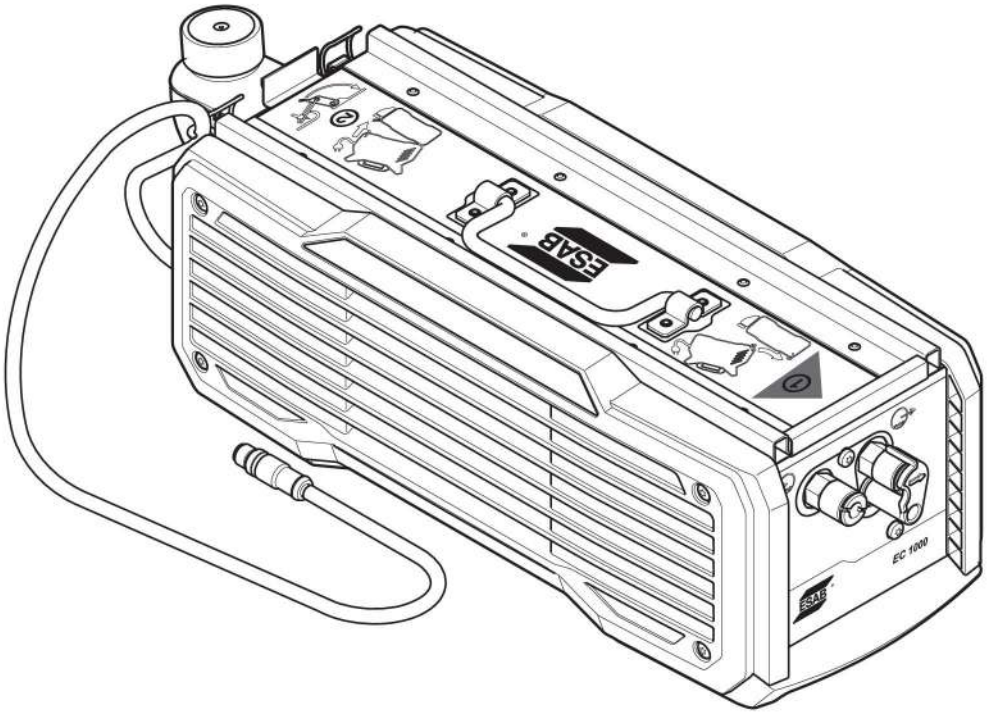
EC 1000

RENEGADE™



Service manual

0463 428 001 GB 20170519

Valid for: serial no. 720-xxx-xxxx

READ THIS FIRST

Maintenance and repair work must be performed by an experienced person, and electrical work only by a trained electrician. Use only recommended replacement parts.

This service manual is intended for use by technicians with electrical/electronic training for help in connection with fault-tracing and repair.

Use the wiring diagram as a form of index. The circuit boards are divided into numbered blocks. Component names in the wiring diagram are listed in the component description.

Use the spare parts list as a guide to where the components are located in the equipment. The spare parts list is published as a separate document, see the "SPARE PARTS" chapter in this manual.

This manual contains details of design changes that have been made up to and including May 2017.

The manual is valid for: EC 1000 with serial number 720-xxx-xxxx

NOTE!
The unit is tested by ESAB in a general set-up. The responsibility for safety and function, of the specific set-up, lies with the integrator.

The EC 1000 is designed and tested in accordance with the standards stated in the instruction manual. On completion of service or repair work, it is the responsibility of the person(s) performing the work to ensure that the product still complies with the requirements of the involved standards.

CAUTION!
Read and understand the instruction manual before installing or operating.

CAUTION!
STATIC ELECTRICITY can damage circuit boards and electronic components.

- Observe precautions for handling electrostatic sensitive devices.
- Use proper static-proof bags and boxes.

BEFORE STARTING SERVICE

Service aid

ESAB can offer a number of service tools that will simplify the service.

Antistatic service kit

Ordering no. 0740 511 001

The kit makes it easier to protect sensitive components from electrostatic discharge.

Contents:

- A conductive mat (size 610 x 610 mm / 24 × 24 in.)
- A 1.5 metre (3.28 ft) long ground cable with a crocodile clip
- An adjustable wrist strap and cable with an inbuilt protective resistor

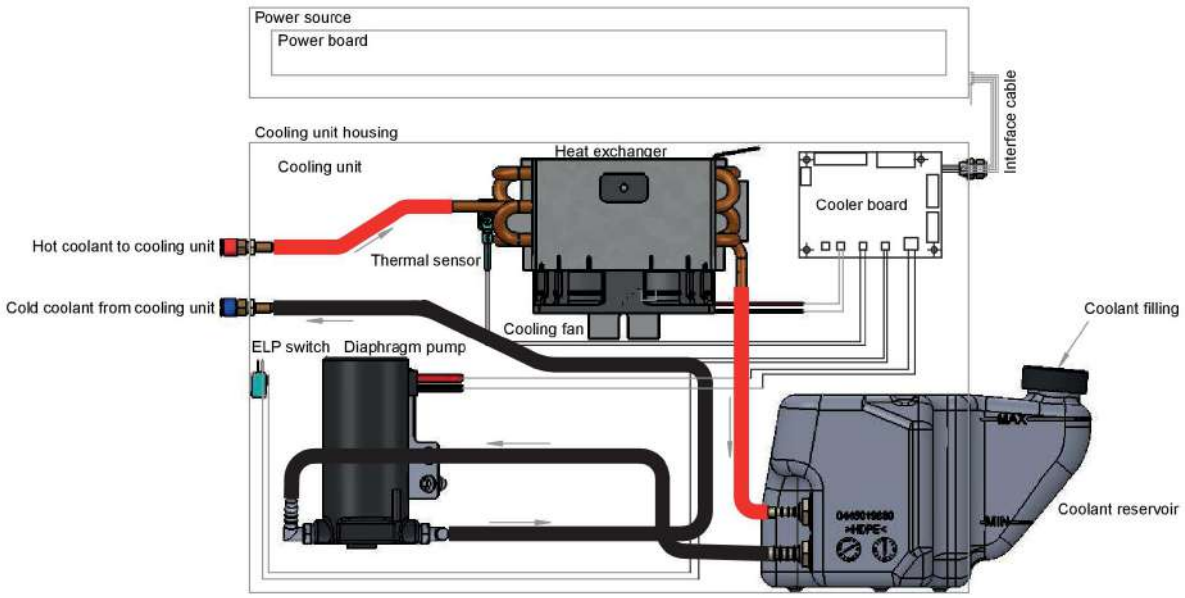
Antistatic service kit

INTRODUCTION

Cooling unit EC 1000 is intended for cooling water-cooled TIG welding torches.

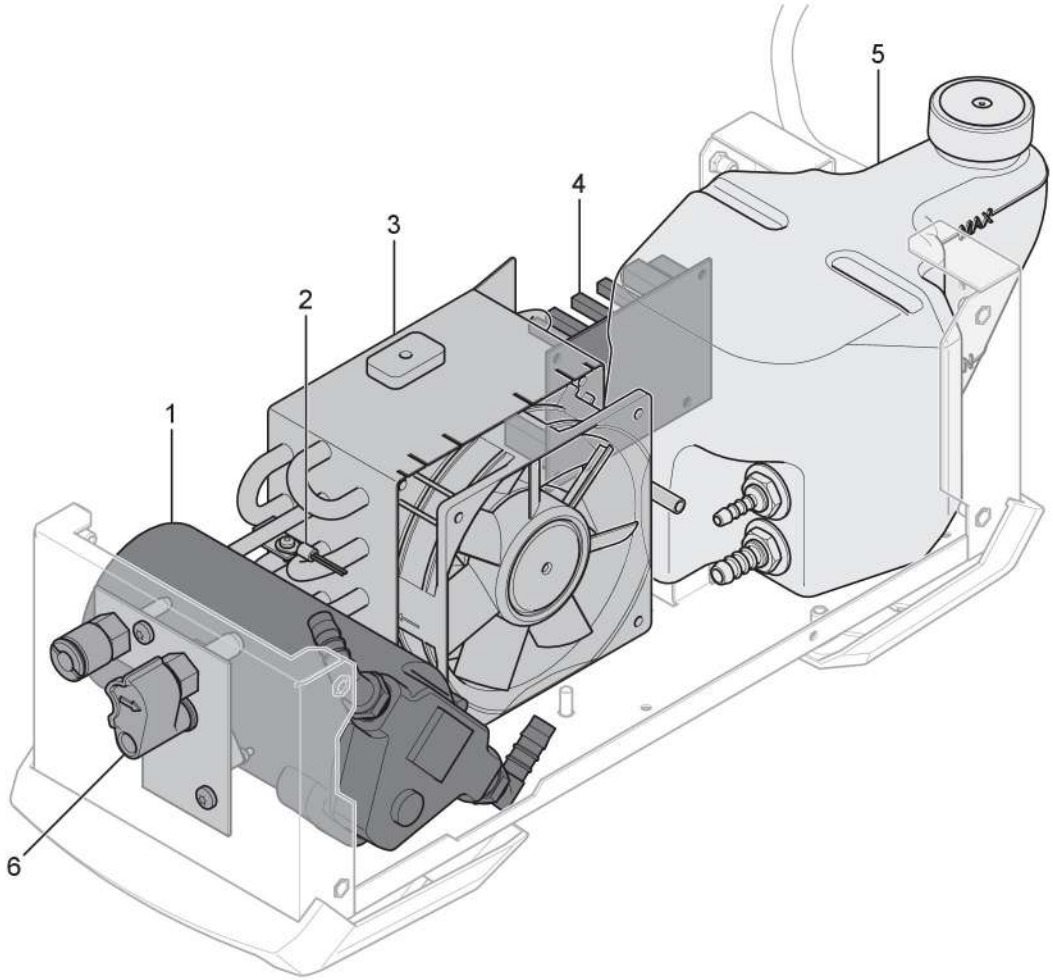
Design structure of the cooling unit

The cooling unit consists of a cooler board, a heat exchanger, a cooling fan, a diaphragm water pump, a coolant tank and an ELP (ESAB Logic Pump). The cooler board is powered and controlled from the welding power source. The water pump is circulating the coolant through the heat exchanger and onwards in the system. The cooling fan is used to cool down the coolant during its way through the heat exchanger. A thermal sensor is attached to the heat exchanger. The sensor monitors the temperature of the coolant and facilitates control of the cooling unit functionality. The ELP is a detection system which checks whether a water-cooled TIG torch is connected to the welding equipment and enables start of cooling. The power from the welding power source is converted in the cooler board, to the appropriate supply voltage for the thermal sensor and the ELP.



Block diagram of the cooling unit

Component positions



1. Water pump
2. Coolant thermal sensor
3. Heat exchanger with cooling fan
4. 5AP1 cooler board
5. Water tank
6. ELP (ESAB Logic Pump)

ERROR CODES

The error code is used to indicate that a fault has occurred in the equipment. Errors are indicated by the text "Err" and the error code number flashing alternately in the power source display.

Error code descriptions

Error code	Description
Err 2	**Coolant fault** The temperature of the coolant fluid is too high, i.e. it has exceeded +65 °C (+149 °F). **Action:** Make sure there is sufficient coolant in the cooler and wait until the coolant temperature has decreased. Also make sure the recommended duty cycle for the weld current has not been exceeded (see *"TECHNICAL DATA"*, page 10). The error code will automatically disappear and the LED indicating temperature fault will be turned off when the coolant temperature has decreased below +55 °C (+131 °F). If the coolant temperature is below +55 °C (+131 °F) and error code Err 2 is still displayed, troubleshoot the thermal sensor (see *"Coolant thermal sensor"*, page 15).
Err 8	**Cooler hose disconnected** The hose for coolant out from the cooling unit (blue connector) to the TIG torch is not connected. **Action:** Make sure the hose for coolant to the TIG torch is properly connected to the coolant output connector (blue) on the cooling unit. If the hose for coolant to the TIG torch is properly connected and error code Err 8 is still displayed, troubleshoot the switch for the ELP (see *"Switch for ELP"*, page 14).

WIRING DIAGRAM

The cooling unit is function module 5. The names of the circuit boards and components included in the cooling unit contains the number 5 to indicate that they belong to the cooling unit. The circuit boards and components are listed in the component description below.

Wires/cables within modules are marked 100 - 6999.

Wires/cables between modules are marked 7000 - 7999.

Components outside modules, e.g. capacitors, are named such as C1 - C99, connectors XS1 - XS99 (S = socket), XT1 - XT99 (T = terminal).

Circuit boards within each module have names such as 20AP1 - 20AP99.

20 = module association, 1-69

AP = circuit board

1 = individual identification number, 0-99

Transistors within particular modules have identification numbers such as 15Q1 - 15Q99.

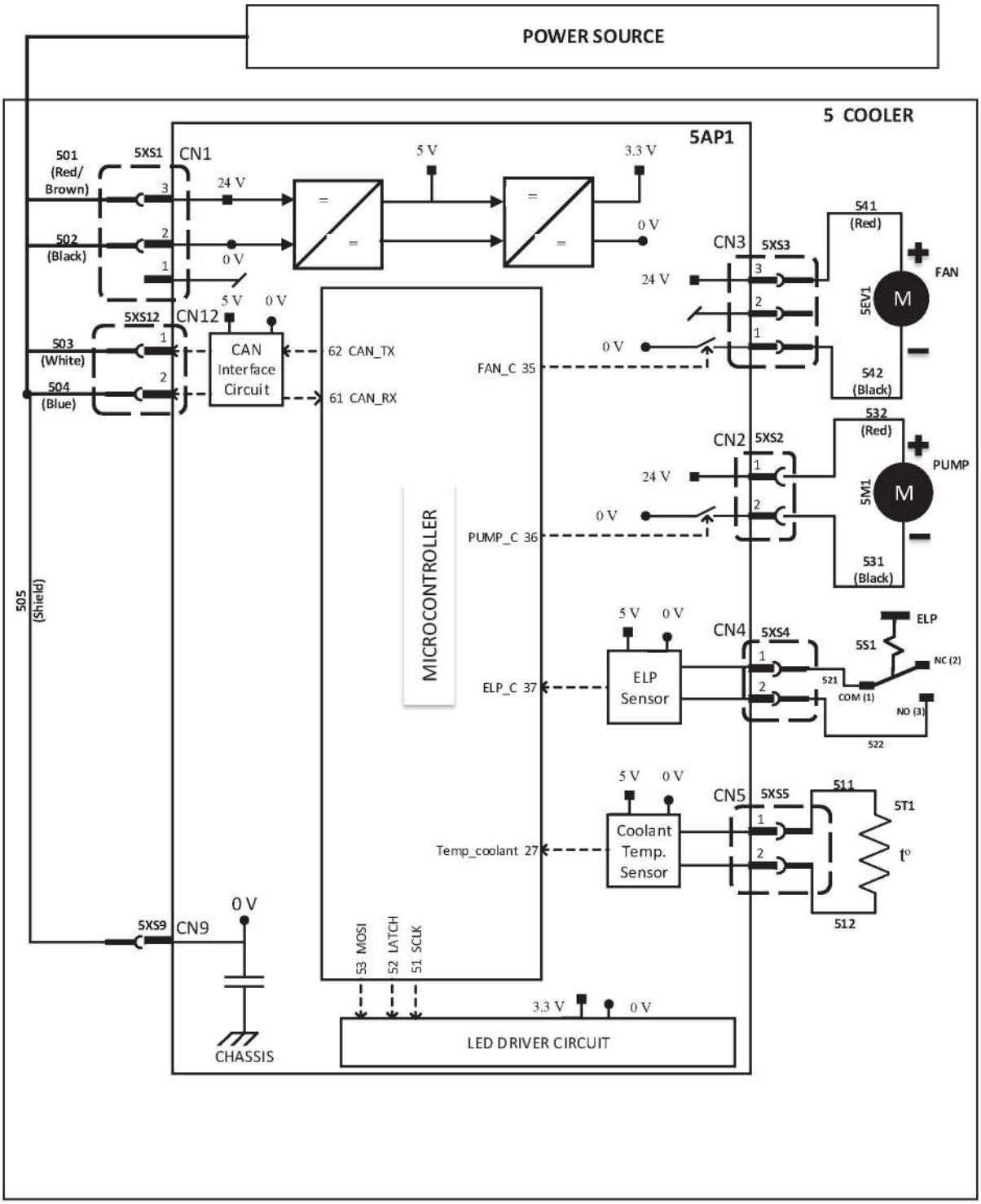
15 = module association, 1-69

Q = transistor

1 = individual identification number, 0-99

Component description

Component	Description
5	**Cooling unit module** Wire numbers 500–599
5AP1	Cooler board
5EV1	Cooling fan, 24 V DC
5M1	Water pump with motor, 24 V DC
5S1	Switch for ELP (ESAB Logic Pump)
5ST1	Coolant thermal sensor
5XS...	Socket connector (Sleeve)


POWER SOURCE
5 COOLER
5AP1
501 (Red/ Brown)
502 (Black)
503 (White)
504 (Blue)
505 (Shield)
5XS1
CN1
5XS12
CN12
CAN Interface Circuit
62 CAN_TX
61 CAN_RX
24 V
5 V
3.3 V
0 V
MICROCONTROLLER
FAN_C 35
PUMP_C 36
ELP_C 37
Temp_coolant 27
S3 MOSI
S2 LATCH
S1 SCLK
CN3
5XS3
541 (Red)
542 (Black)
5EV1
FAN
CN2
5XS2
532 (Red)
531 (Black)
5M1
PUMP
CN4
5XS4
ELP Sensor
5S1
ELP
NC (2)
COM (1)
NO (3)
521
522
CN5
5XS5
Coolant Temp. Sensor
511
512
5T1
t°
5XS9
CN9
CHASSIS
LED DRIVER CIRCUIT

TECHNICAL DATA

EC 1000	
Power consumption	24 V DC, 3.0 A
Cooling power	0.9 kW
Noise **(Constant sound pressure when idling)**	< 70 dB(A)
Coolant	ESAB's ready mixed coolant, see the "ACCESSORIES" chapter in the instruction manual.
Coolant quantity	1.5 l
Maximum water flow	1.8 l/min
Max pressure lift for torch Q_{max}	4.5 bar (65 psi)
Operating temperature	-10 °C to +40 °C (+14 °F to +104 °F)
Transportation temperature	-20 °C to +55 °C (-4 °F to +131 °F)
Dimensions (l × w × h)	540 × 200 × 170 mm (21.26 × 7.874 × 6.693 in)
Weight empty	8 kg (17.6 lb)
Enclosure class	IP23

The cooling unit is rated 300 A at 40% duty cycle at 25°C (77°F) ambient temperature.

Duty cycle

The duty cycle refers to the time as a percentage of a ten-minute period that you can weld or cut at a certain load without overloading. The duty cycle is valid for 40 °C / 104 °F, or below.

Enclosure class

The **IP** code indicates the enclosure class, i.e. the degree of protection against penetration by solid objects or water.

Equipment marked **IP23** is intended for indoor and outdoor use.

SOFTWARE UPDATE AND CONFIGURATION

For information about software update and configuration of the welding equipment, see the "SOFTWARE UPDATE AND CONFIGURATION" chapter in the **power source** service manual.

TROUBLESHOOTING

Service log

For troubleshooting purposes, a service log can be retrieved from the memory of the welding power source. For information about how to extract and interpret the service log, see the TROUBLESHOOTING chapter in the **power source** service manual. The script file needed to extract the service log, can be downloaded from your local country or region ESAB partner login site.

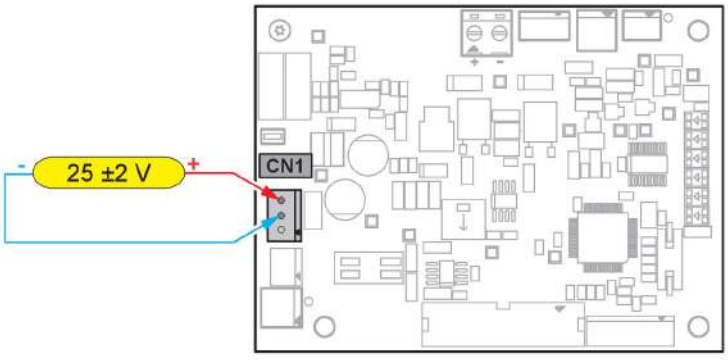
Troubleshooting the electrical hardware

Equipment

- Multimeter

Measuring the incoming 24 V supply voltage

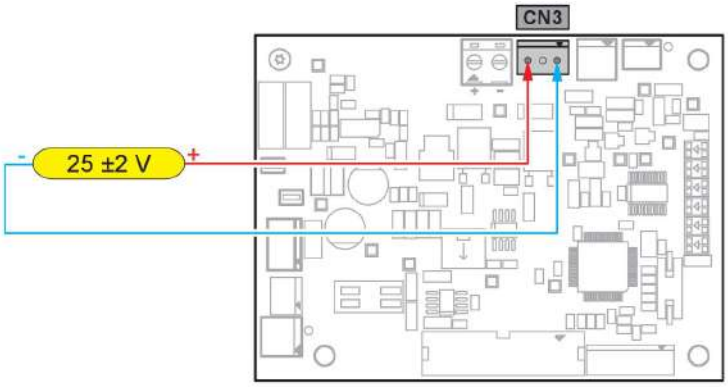
1. Disconnect the cooling unit from the welding power source and the welding torch. Then remove the cooling unit panels according to chapter *"Disassembly and reassembly"*, page 18.
2. Place the welding power source next to the cooling unit, connect the internal CAN cable between the power source and the cooling unit and turn the power source mains supply switch on.
3. Measure the incoming 24 V supply voltage from the power source to the cooler board between pins 3 and 2 of connector CN1 on the cooler board 5AP1. The voltage should be **25 ±2 V**.
   If the measurement specification is **not** met, disconnect the CAN cable and measure the output voltage from the CAN connector (Internal CAN) on the power source.
   If there are 25 ±2 V in the power source CAN connector but no voltage on connector CN1 on the cooler board (with CAN cable connected), replace the CAN cable.
   If the output voltage from the power source CAN connector is **not** within the specification given above, troubleshoot the power source (see the TROUBLESHOOTING chapter in the **power source** service manual).



If the measured incoming supply voltage to the cooler board is within the specification given above, proceed by troubleshooting the applicable components below.

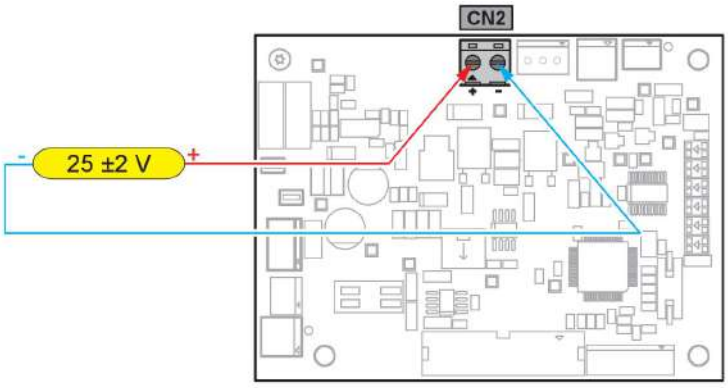
Cooling fan

1. Connect a TIG torch to the welding power source and to the coolant connectors on the cooling unit.
2. Trigger start of welding and wait at least 10 seconds.
3. Measure the voltage between pins 3 and 1 of connector CN3 on the cooler board 5AP1. The voltage should be **25 ±2 V**.
   If there is no voltage, replace the cooler board (see section *"Replacing the cooler board"*, page 23).
   If the voltage is within the specification given above but the fan is still not running, replace the fan (see section *"Replacing the cooling fan"*, page 22).



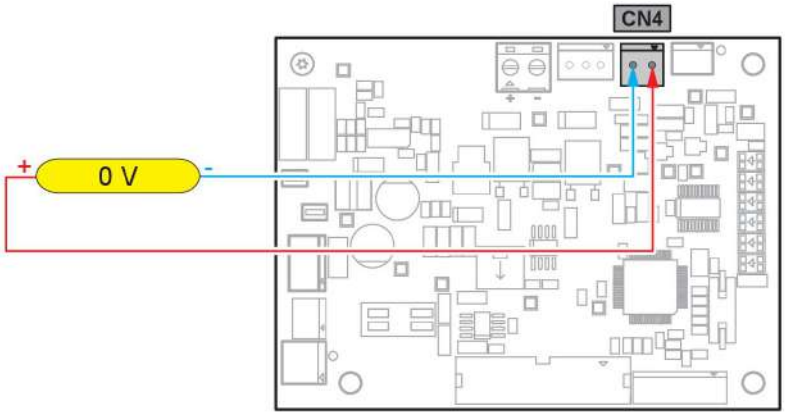
Water pump

1. Connect a TIG torch to the welding power source and to the coolant connectors on the cooling unit.
2. Trigger start of welding and wait at least 10 seconds.
3. Measure the voltage between pins 1 and 2 of connector CN2 on the cooler board 5AP1. The voltage should be **25 ±2 V**.
   If there is no voltage, replace the cooler board (see section *"Replacing the cooler board"*, page 23).
   If the voltage is within the specification given above but the pump is still not running, replace the pump (see section *"Replacing the water pump"*, page 21).



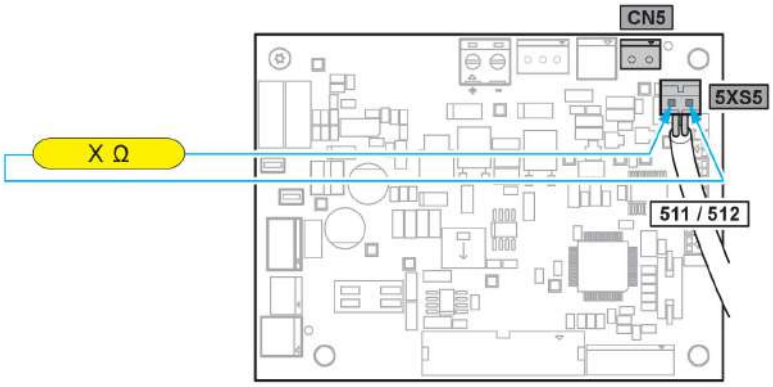
Switch for ELP

1. Make sure **no** TIG torch is connected to the cooling unit and measure the voltage between pins 1 and 2 of connector CN4 on the cooler board 5AP1. The voltage should be **25 ±2 V**.
2. **Connect** the **coolant hose** for the TIG torch to the coolant output connector from the cooling unit (blue) and measure the voltage between pins 1 and 2 of connector CN4 on the cooler board 5AP1. The voltage should be **0 V**.
   If the voltage is still **25 V**, despite the fact that a TIG torch is connected, replace the ELP switch.



Coolant thermal sensor

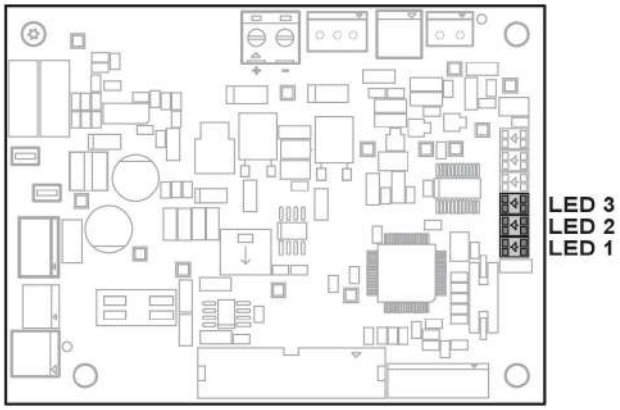
1. Disconnect the thermal sensor harness from connector CN5 on the cooler board.
2. Measure the resistance between cables 511 and 512 in socket connector 5XS5 disconnected from CN5. The resistance should vary according to the table below depending on the measured temperature from the thermal sensor.
   If the measurement specification is **not** met, replace the thermal sensor.



Temperature (°C)	Resistance over thermal sensor (Ω) ± approx. 3%
0	16 312
+5	12 691
+10	9 948
+15	7 856
+20	6 246
+25	5 000
+30	4 028
+35	3 265
+40	2 662
+45	2 183
+50	1 799
+55	1 491
+60	1 242
+65	1 039
+70	873.8

Status indications on the cooler board 5AP1

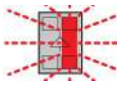
On the cooler board there are a number of LEDs (light-emitting diodes) used to indicate the present status of the cooler. The meanings of the different indications are explained in the sub-sections below.



The LEDs **not** described below are not in use.

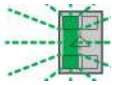
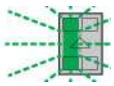
LED 3 – Overtemperature condition

LED 3 is used to indicate overtemperature condition according to below.

LED 3	
Red (3 Hz flash) 	Overtemperature condition. The cooling liquid temperature has exceeded +65 °C (+149 °F). The LED will go out when the cooling liquid temperature has decreased below +55 °C (+131 °F).

LED 1 and LED 2 – Software run level

LED 1 and LED 2 are used to indicate the current software run level of the cooler board. The meanings of the different indications are explained in the table below.

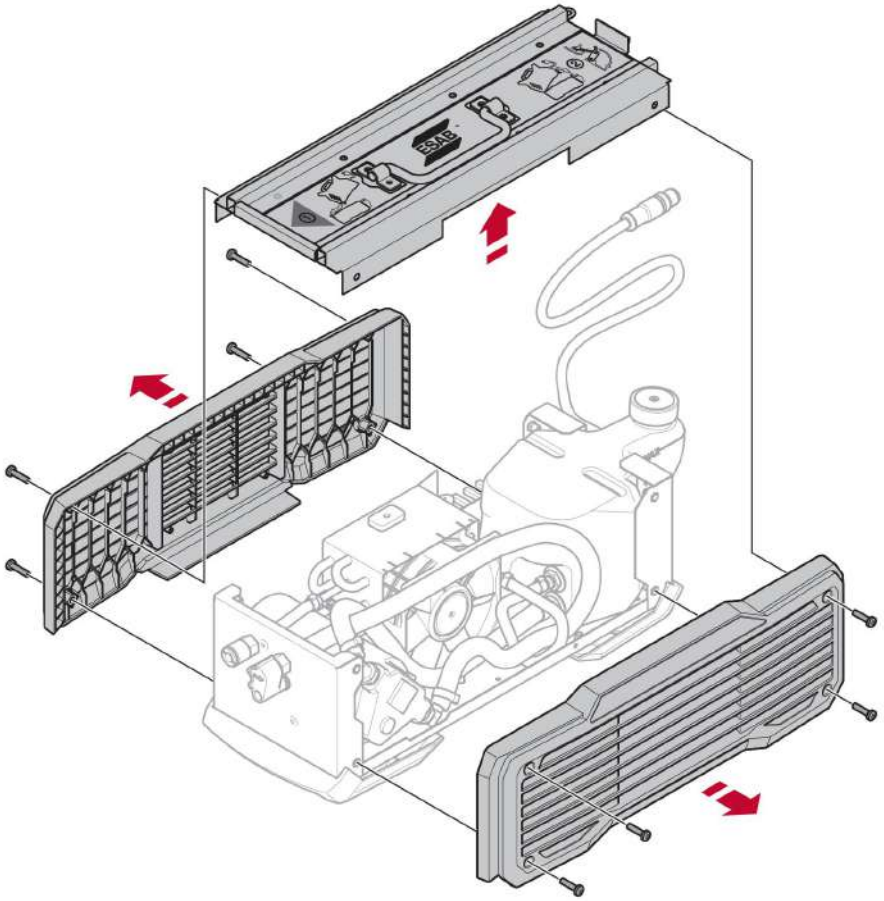
LED 1	LED 2	Software run level
Off 	Off 	The cooling unit is not connected to the power source, i.e. there is no supply voltage to the cooler board.
Green 	Off 	Application start up
Green (fixed) 	Green (fixed) 	Application running ok, Idle run state as in TIG mode
Green (1 Hz flash) 	Green (1 Hz flash) 	Application running ok, Interactive run state, i.e. the user may interact with the equipment, As in MMA mode
Green (3 Hz flash) 	Green (3 Hz flash) 	Application running ok, Processing run state
Red 	Green 	Application error (recoverable)
Red 	Red 	Application error (non-recoverable). Power off or reset is required.
Red 	Off 	Application in test or debug mode
Green 	Red 	Application shut down

DISASSEMBLY AND REASSEMBLY

Equipment

- Screwdrivers, Torx T25 and T30

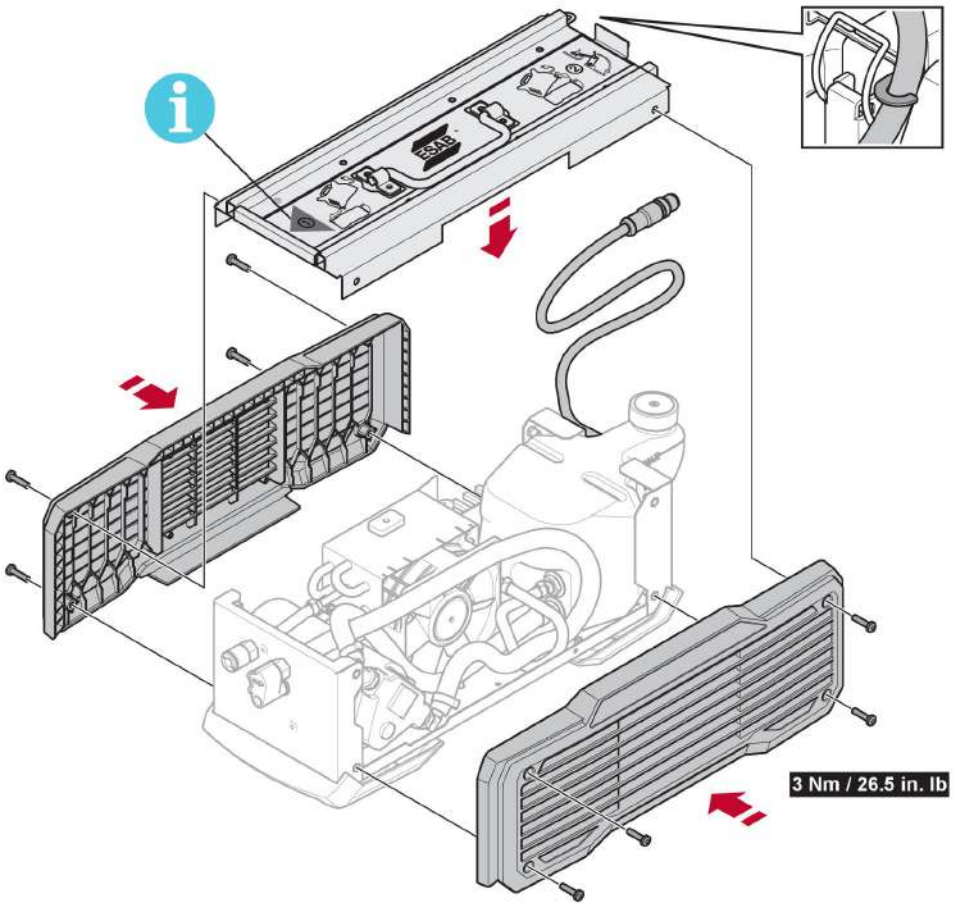
1. Remove the screws holding the cooling unit side panels (four screws in the left side panel and four screws in the right side panel). Remove the side panels.
2. Remove the top panel.



3. After having finished the required service work inside the cooling unit, reattach the panels in the reverse order. Before attaching the left side panel, route the internal CAN cable behind the cable bracket in the top panel. Tighten the screws using the correct tightening torque according to the illustration below.

NOTE!

Make sure the top panel is fitted in the correct direction! The yellow arrow on the top panel decal should point towards the front of the cooler, i.e. towards the short side where the coolant connectors are located.



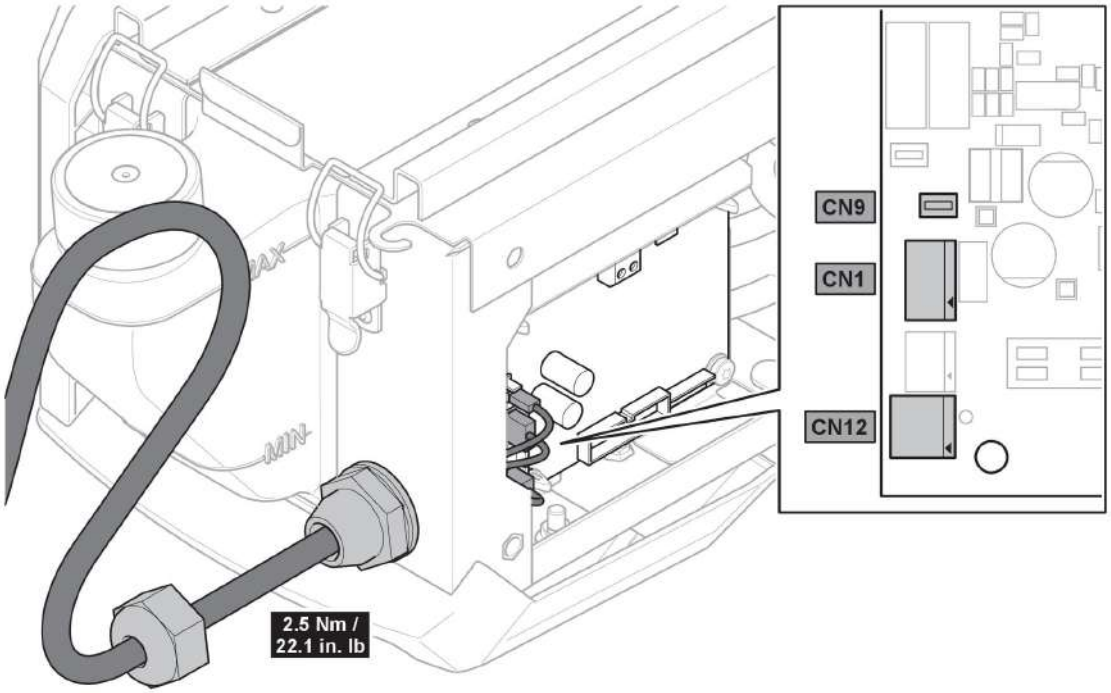
REPLACEMENT INSTRUCTIONS

General

The replacement instructions below presume that you have first removed the cooling unit panels according to chapter *“Disassembly and reassembly”*, page 18.

Replacing the CAN interface cable

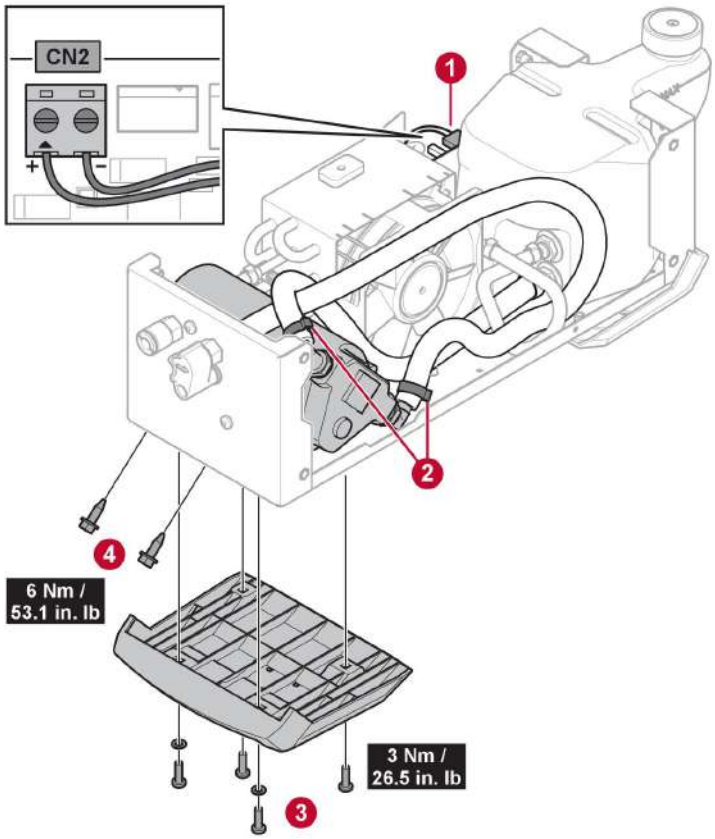
1. Disconnect the interface harness from connectors CN1, CN12 and CN9 on the cooler board.
2. Loosen the cable grommet and remove the CAN interface cable.



3. Insert the new CAN interface cable through the grommet and connect the harness to the afforementioned connectors.
4. Tighten the cable grommet using the correct tightening torque according to the illustration.

Replacing the water pump

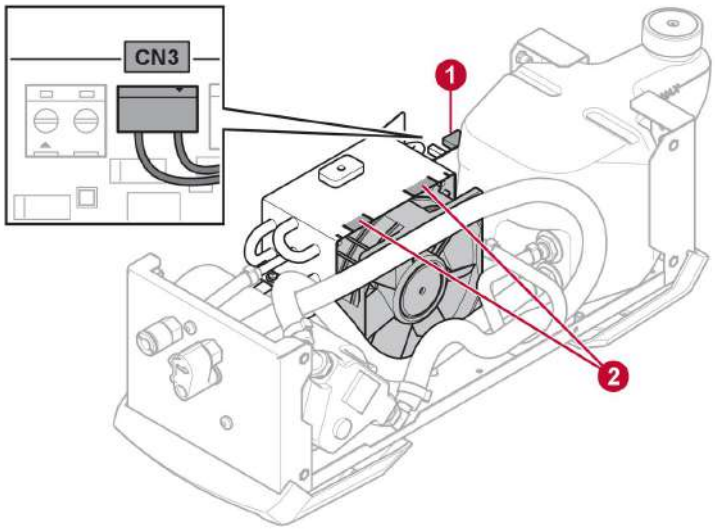
1. Disconnect the pump harness (cables 531 and 532) from connector CN2 on the cooler board.
2. Loosen the hose clips and disconnect the two coolant hoses connected to the water pump.
3. Remove the four screws holding the **front** bottom foot of the cooling unit. Remove the foot.
4. Insert a wrench through the holes in the cooling unit bottom panel and remove the two screws connecting the pump to the pump consol.
5. Slide out the pump sideways to the right.



6. Insert the new pump and reinstall in the reverse order. Tighten the screws and the hose clips, using the correct tightening torques according to the illustration.

Replacing the cooling fan

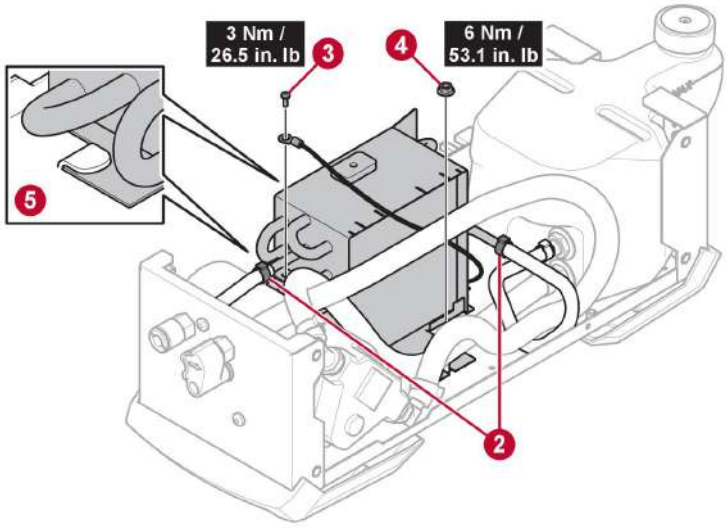
1. Disconnect the fan harness (cables 541 and 542) from connector CN3 on the cooler board.
2. Release the cooling fan by bending up the "teeth" in the heat exchanger housing plate.
3. Lift out the fan.



4. Insert the new fan and reinstall in the reverse order. After having bent down the "teeth" from the heat exchanger housing plate, check that the fan is properly secured.

Replacing the heat exchanger

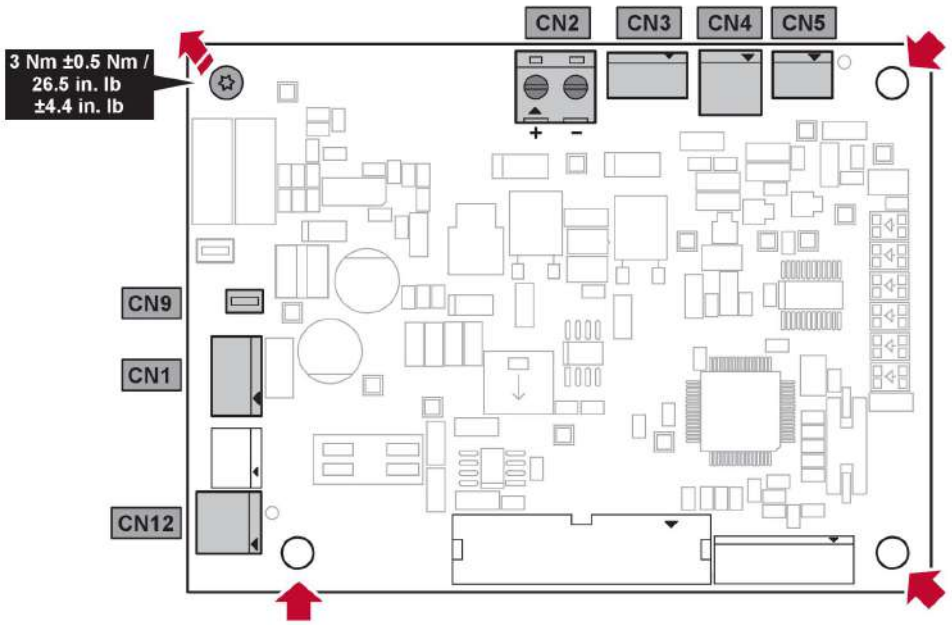
1. Remove the fan according to section *"Replacing the cooling fan"*, page 22.
2. Loosen the hose clips and disconnect the two coolant hoses connected to the heat exchanger.
3. Remove the screw connecting the thermal sensor to the heat exchanger inlet.
4. Remove the nut attaching the heat exchanger to the bottom panel.
5. Slide the heat exchanger towards the right side of the cooling unit, until it is released from the two small brackets at the bottom of the heat exchanger.
6. Lift out the heat exchanger from the cooling unit.



7. Attach and connect the new heat exchanger in the reverse order. Tighten all joints, using the correct tightening torques according to the illustration.

Replacing the cooler board

1. Disconnect the cables from the following connectors on the cooler board (clockwise from the left): CN12, CN1, CN9, CN2, CN3, CN4 and CN5.
2. Loosen the earth connection screw in the upper left corner of the board.
3. Detach the cooler board from the snap fittings, using a pair of flat pliers, and remove the board.



4. Locate the insulation sheet on the back of the new cooler board, attach the new board to the snap fittings and reconnect all cables to the afforementioned connectors. Fasten the earth connection screw using the correct tightening torque according to the illustration. Finally fold down the insulation sheet in front of the cooler board.
5. Update the welding equipment software with the latest version (see the "SOFTWARE UPDATE AND CONFIGURATION" chapter in the **power source** service manual).

Replacing the coolant

1. Flush the cooling system via the red coolant return connection.

> **NOTE!**
> Flushing can **only** be performed via the red connection.

2. Drain the coolant tank manually, i.e. empty it via the coolant filling hole.
3. Fill new coolant into the tank, using ESAB's ready mixed coolant (see the "ACCESSORIES" chapter in the instruction manual). Follow the instructions regarding coolant filling and torch installation in the "INSTALLATION" chapter in the instruction manual!

SPARE PARTS AND ACCESSORIES

For spare parts, see the spare parts list for the product. For accessories, see the instruction manual for the product. These documents can be downloaded from the Internet: www.esab.com

Document type	File name	Product	Note
Spare parts list	0463 427 001	EC 1000	
Instruction manual	0445 030 *	EC 1000	Ordering number 0445 045 880

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