



# Operation manual

## Ultracool chillers

containing natural refrigerant

UC 2, UC 4, UC 8, UC 14, UC 24, UC 50, UC 65, UC 80

DMI-0229-00  
23/03/2026

Read this manual prior to performing any task!

## Warnings

This Operation Manual is to be followed by all persons working with the unit. It is imperative that this Manual is made freely available at all times to service personnel and is kept at the point where the unit is installed.

The basic maintenance should be carried out by properly trained personnel and, if necessary, under the supervision of a person qualified for this job.

LAUDA Ultracool S.L. personnel, or personnel authorized by LAUDA Ultracool S.L., should carry out any work in the refrigerating or electric circuit during the warranty period. After the warranty period, the work must be carried out by qualified personnel.



Only certified specialists who are trained to handle flammable refrigerants are authorized to perform repair and disposal work.

Disposal of Waste Equipment by Users in Private Household in the European Union.



This symbol on the product or on its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or the shop where you purchased the product.



Never dispose of a cooling circuit that is still pressurized.

Only certified specialists who are trained in the handling of flammable refrigerants are permitted to perform disposal work.

## Table of contents

<b>1</b>	<b>Introduction .....</b>	<b>5</b>
1.1	General notes .....	5
1.2	Safety regulations .....	5
1.3	Special considerations: Chiller with natural refrigerant.....	6
<b>2</b>	<b>Unpacking .....</b>	<b>7</b>
2.1	Reception and Inspection .....	7
2.2	Transportation.....	7
2.3	Site.....	7
<b>3</b>	<b>Ultracool unit description .....</b>	<b>10</b>
3.1	Setup of the Ultracool unit (UC 2 and UC 4) .....	10
3.2	Setup of the Ultracool unit (UC 8 to UC 65) .....	12
3.3	Setup of the Ultracool unit (UC 80) .....	14
3.4	Identification labels on the Ultracool unit .....	16
3.5	Water Connection.....	16
3.6	Electrical Connection (UC 2 and UC 4) .....	17
3.7	Electrical Connection (UC 8 to UC 80) .....	17
3.8	Additional electrical connections .....	19
3.9	EMC Requirements .....	20
<b>4</b>	<b>Startup.....</b>	<b>21</b>
4.1	Gas warning sensor.....	21
4.2	Operating Conditions .....	22
4.3	Chiller start-up.....	24
<b>5</b>	<b>Chiller Controls .....</b>	<b>27</b>
5.1	Control and monitoring elements .....	27
5.2	UC Controller.....	28
5.3	Operation.....	29
5.3.1	Remote On/Off and On/Off from the display .....	29
5.3.2	On/Off from the display .....	29
5.3.3	Setting the temperature.....	29
5.3.4	Setting the language.....	30
5.3.5	Setting the Units of Measure (UoM) .....	30
5.3.6	Setting the Date and Time .....	31
5.3.7	Setting the external alarm signal logic.....	31

5.3.8	Setting LAUDA.LIVE permissions.....	32
5.3.9	Information screens loop.....	32
5.3.10	Refrigerant compressor control and temperature stability .....	32
5.4	Preheating function.....	33
5.5	Ethernet Configuration .....	34
5.6	Embedded Webserver.....	35
5.7	Modbus TCP/IP communications.....	35
5.8	LAUDA.LIVE Cloud Service.....	35
<b>6</b>	<b>Maintenance .....</b>	<b>37</b>
6.1	Basic Maintenance .....	37
<b>7</b>	<b>Troubleshooting .....</b>	<b>38</b>
7.1	Saving a log file in case of alarm .....	38
7.1.1	Connecting a USB drive to the controller .....	38
7.1.2	Log files export screens .....	39
7.1.3	Retrieving exported Log files from the internal memory .....	39
7.2	Alarms and Warnings list.....	40
<b>8</b>	<b>Technical data .....</b>	<b>45</b>
8.1	Technical data .....	45
8.2	Energy Efficiency Information .....	46
<b>9</b>	<b>Accessories and Consumables .....</b>	<b>54</b>
<b>10</b>	<b>Approved liquids .....</b>	<b>57</b>
<b>11</b>	<b>Log Book.....</b>	<b>58</b>
11.1	Log Book .....	58
<b>12</b>	<b>Annexes .....</b>	<b>59</b>
12.1	Water quality.....	59
<b>13</b>	<b>EC DECLARATION OF CONFORMITY .....</b>	<b>60</b>



Attention. Points of special interest to keep in mind.



**DANGER!** Critical points to consider due to the use of natural refrigerant in this chiller.

## 1 Introduction

### 1.1 General notes

- This water chiller complies fully with CE.
- The Company does not accept responsibility if safety regulations are not met during handling, operation, maintenance and repair, even though these may not be strictly stated in this operation manual.
- We recommend the translation of this operation manual into the native language of foreign workers.
- The usability and life cycle of the water chiller as well as avoiding premature repairs depends on proper operation, maintenance, care and competent repair under consideration of this operation manual.
- We are constantly updating our products and are confident that they respond to the latest scientific and technological demands. However, as manufacturers, we do not always know the end use or the total range of our products' applications. Therefore we cannot accept liability for our products in applications where additional safety measures may be necessary. We highly recommend that users inform us of the intended application in order to undertake additional safety measures, if necessary.

### 1.2 Safety regulations



The operator must observe the national working, operating and safety regulations. Also, existing internal factory regulations must be met.

Maintenance and repair work must only be carried out by specially trained personnel and, if necessary, under supervision of a person qualified for this work.

- Protective or safety devices must not be removed, modified or readjusted.
- During operation of the water chiller none of the protective or safety devices must be removed, modified or readjusted, temporarily or permanently.
- Only use correct tools for maintenance and repair work.
- Use original spare parts only.
- All maintenance and repair work must only be carried out to the machine once it has been stopped and disconnected from the power supply. Ensure that the water chiller cannot be switched on by mistake by unplugging it.
- Do not use flammable solvents for cleaning.
- Keep the surrounding area absolutely clean during maintenance and repair work. Keep free of dirt by covering the parts and free openings with clean cloth, paper or adhesive tape.
- Ensure that no tools, loose parts or similar are left inside the system.
- The refrigerant circuit controls are set before shipment of the unit. They must not be re-adjusted under any circumstances (except by an authorized service agent). This would void the warranty of the unit and could create safety risks.
- Ensure that the minimum room size requirements are met, see point 2.3. If the room size does not meet the minimum requirements, additional measures must be implemented. For example, installation in the machinery room or outdoors.
- Avoid ignition sources in the immediate vicinity.
- The gas warning sensor must be replaced at the end of its service life, see point 6. However, local regulations may stipulate the need for earlier periodic testing and/or calibration.

- If the gas warning sensor triggers, a specialist trained in handling flammable refrigerants must identify and rectify the cause. Only then can the system be recommissioned.

### 1.3 Special considerations: Chiller with natural refrigerant

The chiller is filled with natural refrigerant from safety group A3 and the filling quantity is above 0,15 kg. These natural refrigerants are highly flammable.

According to DIN EN 378-1, the refrigeration system is a “sealed refrigeration system”.

All parts carrying refrigerant are tightly installed by welding, brazing or similar permanent joints. Service connections are fitted with caps. The refrigeration system also has a tested leakage rate of less than 3 g per year at a minimum of one quarter of the maximum permissible pressure.

#### Quantity of refrigerant

With consideration for the category of the access area in buildings, each circuit may contain a maximum of 1 kg of flammable refrigerant according to EN 378-1. This applies to basements in monitored access areas (such as laboratories, offices or business premises, premises for general manufacturing and work purposes). For ground floors and upper floors, the maximum filling quantity in the monitored access area is 2,5 kg. It is the operator’s responsibility to use the interfaces provided on the device according to any risk assessments conducted (e.g. evacuation of the room, shutdown of ignition sources in the room). The chiller can only detect the presence of an explosive atmosphere when energized.

The refrigerant designation and charge are specified on the Characteristics plate of the unit, attached to its back panel (see point 3). If the external Characteristics plate gets damaged, an additional copy is attached inside the electrical box of the chiller.

Note the installation conditions outlined in point 2.3.

## 2 Unpacking

### 2.1 Reception and Inspection



**WARNING!** If you notice any damage to the transport packaging, store the device either in a well-ventilated place with no sources of ignition or outdoors. **Contact LAUDA Service.**

Unpack the Ultracool unit. **Keep the original packaging of your unit for subsequent transportation.**



Check the Ultracool unit and accessories for completeness and transport damage immediately after delivery. In the case of any damage, external or internal, this cannot be referred to the manufacturer because all units are checked before dispatch. **If any damage is observed, this should be documented and reported to the forwarding company.** The LAUDA Ultracool S.L. warranty does not include any damages incurred during transportation.

**Never operate a device that has sustained transport damage.**

Accessories and consumables included as standard

Ultracool type	Designation	Quantity	Catalogue number
UC 8 to UC 80	External controller display	1	E5326071-02K
All types	Operation manual	1	- -

### 2.2 Transportation



Keep the unit upright at all times. Do not tilt when shipping or moving.

The Ultracool unit must be transported by pallet jack or forklift truck.

Models with wheels can be moved on the wheels **only on completely flat surfaces.**



**NEVER** move the unit on their wheels on slopes or tilted surfaces: There would be a high risk of property damage or personal injury or death.



**NEVER** move the unit with its internal tank full; always empty it first.

Moving the unit with a full tank can cause damages that would not be covered by the unit's warranty.

### 2.3 Site

Ensure that adequate aeration is provided where the chiller is installed.

Minimum free room volume per kg of refrigerant according to DIN 378-1:

For refrigerant quantity, see the Characteristics plate of the unit, attached to its back panel (see point 3). If the external Characteristics plate gets damaged, an additional copy is attached inside the electrical box of the chiller.

Refrigerant and room volume:

Refrigerant	Room volume per kg of refrigerant
R-290	132 m <sup>3</sup> /kg

**Example: Quantity of refrigerant 0,83 kg of propane (R-290)**

Minimum room size = room volume per kg of refrigerant x quantity of refrigerant

Minimum room size =  $132 \text{ m}^3/\text{kg} \times 0,83 \text{ kg} = 109,6 \text{ m}^3$



Note the minimum room volume. If the lower limit is exceeded, additional measures must be taken, such as installation in the machinery room or outdoors.

There must be no ignition sources in the immediate vicinity of the chiller.

The Ultracool unit must be installed in an atmosphere where the range of temperatures is within the indicated margins mentioned in point 4.2. It is necessary to add ethylene glycol to the water of the circuit, as indicated in point 4.2.

The chiller must be installed on a solid level surface that is capable of supporting a minimum of 150 kg (330 lb) for UC 2 and UC 4 models, 300 kg (660 lb) for UC 8 to UC 24 models, 650 kg (1430 lb) for UC 50 and UC 65 models and 850 kg (1875 lb) for UC 80 models. The floor must not have any slope.



If the chiller has wheels, make sure to activate their brakes once the unit is in place to prevent it from moving.

Do not place heavy objects on top of the unit.

We recommend the installation of the Ultracool unit in a well-ventilated site and in a corrosive-free, dust-free atmosphere.

Models UC 2 and UC 4 have an electrical protection degree of IP32. If installed outdoors, they must be completely protected from rain and installed in such a way that the control panel receives as few direct sunlight as possible. For both models an option “Outdoor installation” is available that ensures an electrical protection degree of IP54.

Models UC 8 to UC 80 have an electrical protection degree of IP54. In the case of outdoor installation, it is recommended to protect the Ultracool unit from rain with a roof.

Leave a space of 0,5m (20”) around the chiller for UC 2 and UC 4 models, 1m (40”) for UC 8 to UC 24 models and 2m (80”) for the UC 50 to UC 80 models. This space is important to facilitate maintenance work and cleaning, especially in front of the condenser (the heat exchanger on the back side of UC 2 and UC 4 models, the left side of UC 8 to UC 65 models and both left and right sides of UC 80).

If necessary, units UC 8 to UC 65 can be installed without any free space on the right and back sides. In this case, foresee that the unit can be moved forwards to free the access panels when there are maintenance works to be carried out.

The inlet of fresh air onto the condenser should be in the most direct way possible, avoiding any chance of air recycling (the ceiling above should not be at less than 1m (40”) for UC 8 to UC 24 models and 2m (80”) for the UC 50 to UC 80 models).

UC 2 and UC 4 models do not need any free space above them during operation, but at least 0,5m (20”) should be available to have enough space to remove the top panel and access the electrical box inside. If no space is left available on top of the unit, foresee that it can be moved forwards to free access to the top panel.

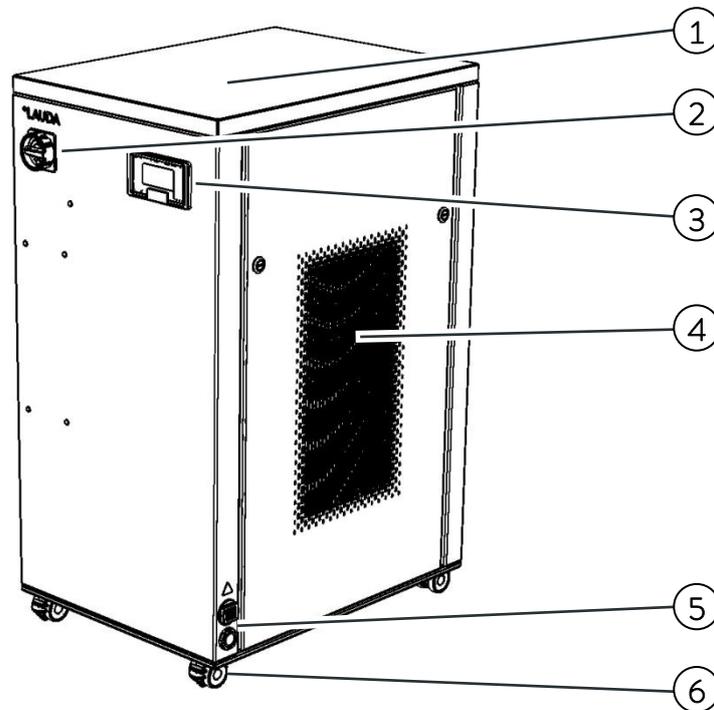
In case of installation in a small room (**it must exceed the minimum room size described above**) it is imperative that the room has an appropriate ventilation system to evacuate all the heat generated by the chiller as explained before on this same point. If the heat is not removed the temperature in the room will quickly increase beyond the operating limits of the unit and it will stop by high pressure alarm (see point 4.2).



The Ultracool units must always operate with the panels closed to enable the inlet of fresh air only through the condenser. The only exception to this are models UC 2 and UC 4, which can still work even if the lateral panels are open.

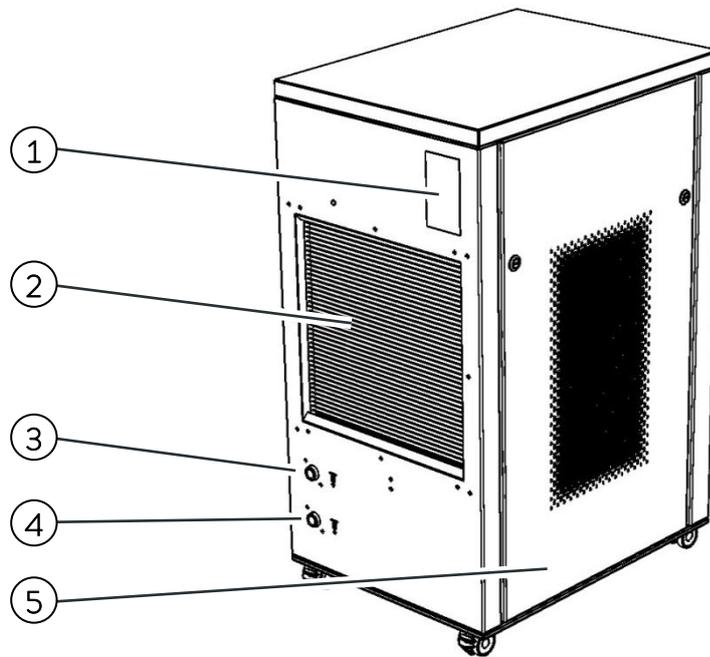
## 3 Ultracool unit description

### 3.1 Setup of the Ultracool unit (UC 2 and UC 4)



Front of the UC 4

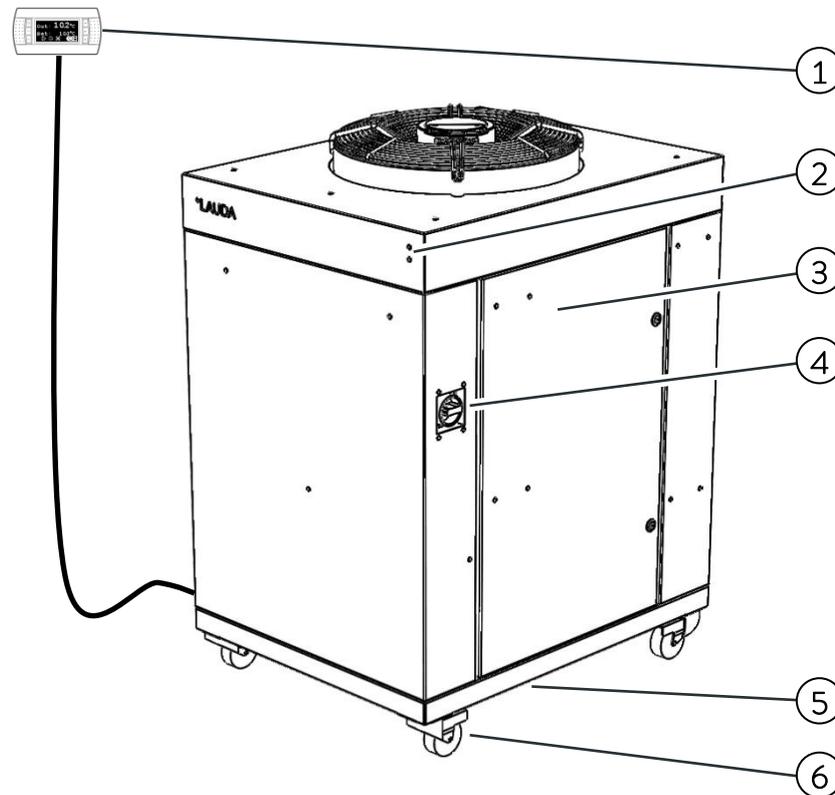
1. Top panel. It gives access to the electrical box
2. Main power switch
3. Controller
4. Ventilation grid (on both sides, cool air intake)
5. Power and communications cables inlet
6. Four wheels with locking brake



Back of the UC 4

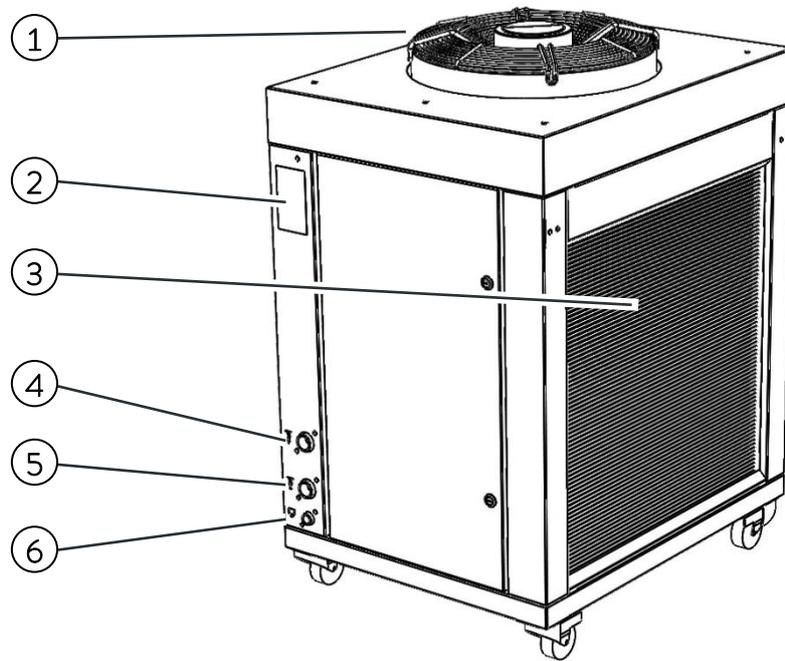
1. Characteristics plate
2. Condenser (warm air exhaust)
3. Process water inlet connection
4. Process water outlet connection
5. Drain connection (inside the unit)

## 3.2 Setup of the Ultracool unit (UC 8 to UC 65)



Front of the UC 24

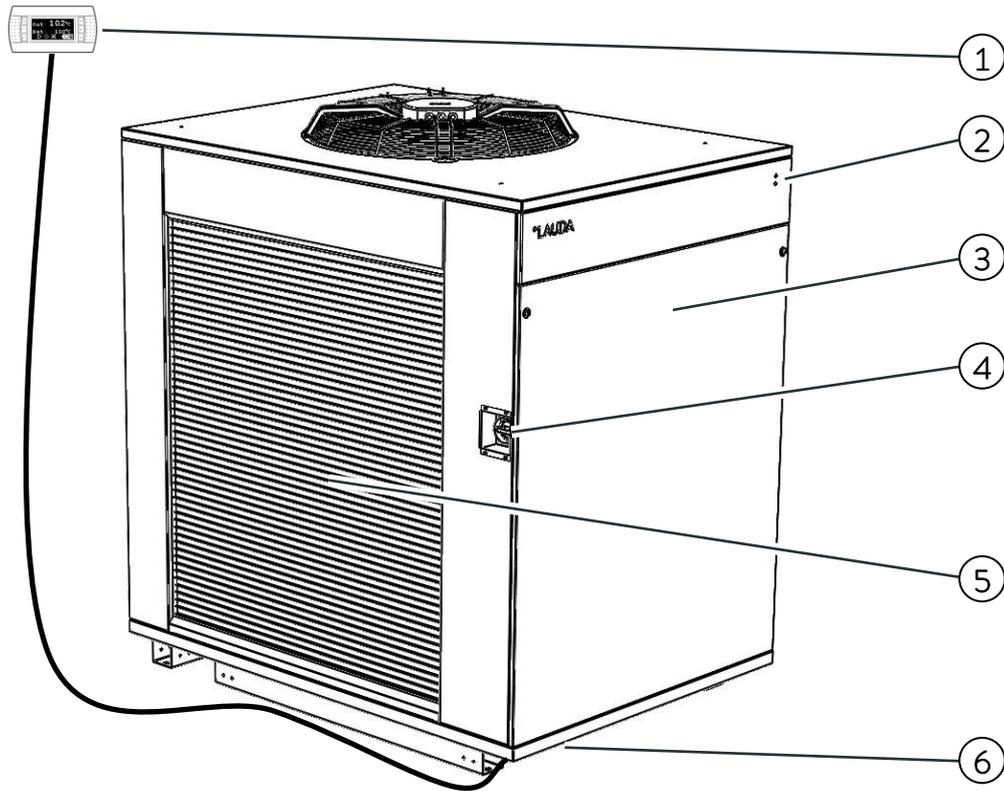
1. External controller display
2. Status and Warning/Alarm LEDs
3. Right panel. It gives access to the electrical box
4. Main power switch
5. Power and communications cables inlet (below the unit)
6. Four wheels with locking brake (feet on UC 50 and UC 65)



Back of the UC 24

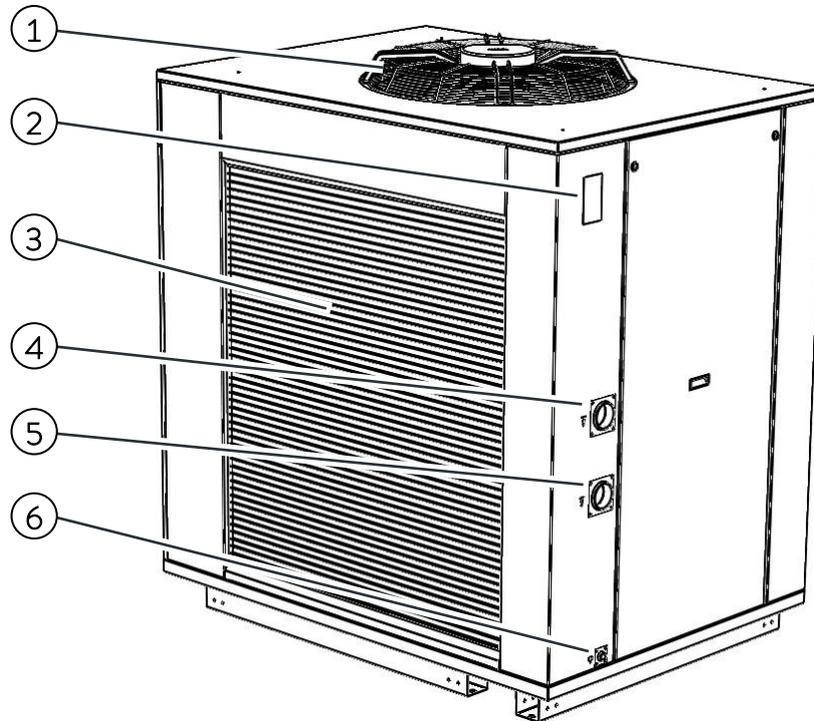
1. Motor fan (warm air exhaust)
2. Characteristics plate
3. Condenser (cool air intake)
4. Process water inlet connection
5. Process water outlet connection
6. Drain connection

## 3.3 Setup of the Ultracool unit (UC 80)



Front of the UC 80

1. External controller display
2. Status and Warning/Alarm LEDs
3. Front panel. It gives access to the electrical box
4. Main power switch
5. Condenser (cool air intake)
6. Power and communications cables inlet (below the unit)

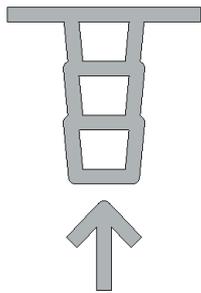


Back of the UC 80

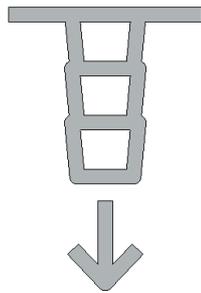
1. Motor fan (warm air exhaust)
2. Characteristics plate
3. Condenser (cool air intake)
4. Process water inlet connection
5. Process water outlet connection
6. Drain connection

### 3.4 Identification labels on the Ultracool unit

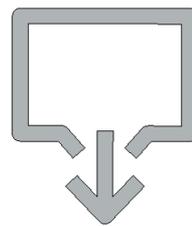
You can find the following labels on the Ultracool unit:



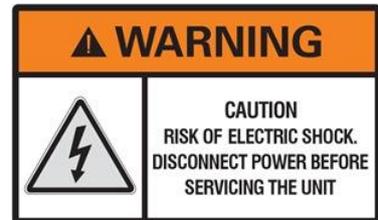
Water inlet from the installation to the UC unit



Water outlet from the installation to the UC unit



Drain



Danger, risk of electric shock



A “flammable substances” and “avoid ignition sources” graphic symbol is affixed to the device. This symbol warns of a possible danger zone on the device, which may pose an impending or imminent danger to the health of personnel.

### 3.5 Water Connection

Leave at least **1.5 meters (5 feet) of flexible pipe** right after the chiller’s inlet and outlet connection. This will allow moving the unit for a better maintenance access without dismantling the water pipes.

The chiller should be located as close as possible to the application. Pressure drop in the pipe should not exceed 0.7 bar. The water lines must be in pipes of at least ½” for UC 2 and UC 4 models, 1” for UC 8 to UC 24 models, 1 ½” for UC 50 and UC 65 models and 2 ½” for UC 80 models.

Minimize the number of bends in the water lines. The length of hose, number of fittings, valves, etc. will also cause an increase of the pressure drop.



Always install thermal insulation for all pipes or, at least, make sure that the pipes are opaque to the light.



When possible, install the water lines at the same level as the chiller until reaching the application. The height difference between the chiller and the application should never exceed 10m (33 feet). In the installations in which the water level of the circuit exceeds the maximum level of the tank inside the Ultracool unit, it may be necessary to install a check valve in the water outlet of the Ultracool unit and a solenoid valve in the water inlet (an accessory is available including these elements).

To prevent rusting of the water pipes, we recommend plastic, rubber or stainless-steel pipes and brass fittings.

Where flexible tubing is used, it should be of reinforced construction and rated for a minimum working pressure of 6 bar g (90 psig) within -15°C and 40°C (5°F and 104°F).



For pressure-sensitive applications with a maximum permissible working pressure below the maximum pressure of the pump (see characteristics plate of the unit), a safety valve must be installed before the application's water inlet to protect against operating errors.

In these cases it's also strongly recommended to install a pressure reducing valve before the application's water inlet (available as an accessory).

### 3.6 Electrical Connection (UC 2 and UC 4)

Operating voltage 230VAC +/-10%, 50Hz, 1 Ph or 230VAC +/-10%, 60Hz, 1 Ph depending on the version (see characteristic plates of the unit). In terms of Electromagnetic emissions and immunity, this unit is intended for installation in an industrial environment.

Make sure that the supply voltage does not exceed a maximum variation of 10% referring to nominal.

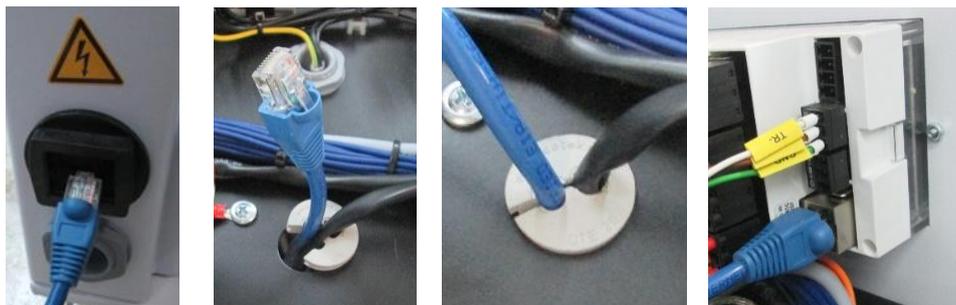


This unit integrates a frequency inverter with a leakage current that exceeds 3,5 mA. On installations where a Residual Current Device (RCD) is used for extra protection, use only an RCD of Type B (time delayed). The use of RCDs must always follow national and local regulations.



The chiller is intended for operation on centrally grounded networks. Operation on IT networks, for example, is not permitted.

Ethernet cable connection, if the chiller is connected to a local network via Ethernet or to a Cloud gateway: Introduce the Ethernet cable through the brush gland on the right side of the chiller and into the electrical box through the rubber cable holder, then connect it to the controller:



### 3.7 Electrical Connection (UC 8 to UC 80)

Operating voltage 400VAC +/-10%, 50Hz, 3 Ph or 460VAC +/-10%, 60Hz, 3 Ph. In terms of Electromagnetic emissions and immunity, this unit is intended for installation in an industrial environment.

Make sure that the supply voltage does not exceed a maximum variation of 10% referring to nominal.



This unit integrates a frequency inverter with a leakage current that exceeds 3,5 mA. On installations where a Residual Current Device (RCD) is used for extra protection, use only an RCD of Type B (time delayed). A sensitivity of at least 100 mA is recommended to avoid unwanted trips of the RCD.

The use of RCDs must always follow national and local regulations.



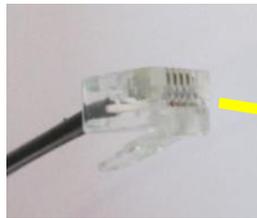
The chiller is intended for operation on centrally grounded networks. Operation on IT networks, for example, is not permitted.

Introduce the main power supply cable through the cable gland located on the base of the chiller and connect it to the incoming power terminals which are located on the left side of the X1 terminal block inside the electrical box of the chiller:



For the electrical supply of the Ultracool unit, use an appropriate electrical line according to the data in the characteristics plate.

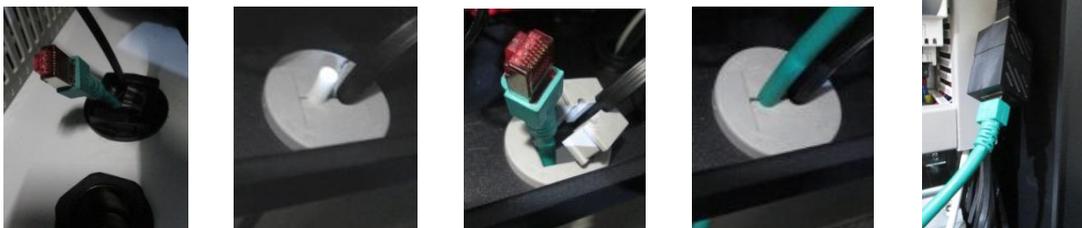
Take the cable for the external controller display out of the chiller through the brush gland on the base of the chiller and connect it to the back of the display.



Note: The external controller display has no IP protection; make sure it is installed on a location protected from the weather, from dust and from any water splashes.

If the chiller is controlled remotely, it is also possible to remove the display after the initial configuration and store it in a safe location, as the chiller does not need it to operate. In such a case the end connector of the display's cable also needs to remain protected from the elements, for example keeping it inside the electrical box of the chiller.

Ethernet cable connection, if the chiller is connected to a local network via Ethernet or to a Cloud gateway: Introduce the Ethernet cable through the brush gland on the base of the chiller and into the electrical box through the rubber cable holder, then connect it to the Ethernet connector:



### 3.8 Additional electrical connections

The chiller also has some special terminals prepared for the following functions (introduce the required cables also through the brush gland on the right side or the base of the chiller depending on the model):

**Terminals 23 and 24, remote On/Off operation:** This chiller can be turned On and Off automatically by an external signal. This remote On/Off signal is transmitted to these terminals by a dry contact in the application (open contact = chiller Off, closed contact= chiller On).



**Note:** The chiller will not turn On unless these terminals are bridged. Once the commissioning operation is complete, if the remote On/Off function described above is not used, connect the supplied wire bridge between terminals 23 and 24 to be able to turn the chiller On from the display.

**Terminals 57 and 61, external alarm report signal:** These terminals provide a dry contact to report a general alarm of the chiller. By default this contact closes when there is an active alarm and it remains open when the unit is working normally without any alarm. The behaviour of this contact can be inverted in the settings menu of the controller, see point 5.3.7.

**Terminals 62 and 63, main contactor status report signal:** These terminals provide a dry contact to report the status of the main contactor that supplies power to the unit. This contact remains open if the Main Power switch is Off (see point 5.1) or if the gas sensor is initialising or detecting the presence of gas around it (see points 4.1 and 7.2).



A system of fuses or circuit breakers must be installed before the power inlet connection to the Ultracool unit. The maximum size of these protections is defined in the Ultracool characteristics plate.

### 3.9 EMC Requirements

Table 1: Classification in accordance with EMC requirements.

Device	Interference immunity	Emissions class	Customer power supply
UC 2 to UC 80	Type 2 (Industrial) in accordance with DIN EN 61326-1	Emissions Class B in accordance with CISPR 11	No limitation

Instructions for Class A digital device, USA:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC (Federal Communication Commission) Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

## 4 Startup

### 4.1 Gas warning sensor



This unit is equipped with a gas sensor that continuously monitors the presence of natural refrigerant gas around it.

The gas sensor works as long as the unit is connected to the power supply, even if the Main Power switch (see point 5.1) is turned Off.

The gas sensor has an initialization time of around one minute. Only after this time can the chiller be switched on using the Main Power switch. This initialization time also applies if the power supply gets interrupted and is later restored.

The gas warning sensor triggers an automatic shutdown if a predefined threshold corresponding to 15% of the Lower Flammability Limit (LFL) is exceeded.

In this situation, all power is cut from the rest of the unit (the main contactor of the unit remains off), except for the 24VDC power supply that feeds the gas sensor and the timer relay that delays the start-up during its initialization. Both of these elements are ATEX rated.

During normal operation, the gas sensor LED flashes green. If the gas warning sensor triggers, its LED lights up red.



**If the gas sensor triggers, a specialist trained in handling flammable refrigerants must identify and rectify the cause. Only then can the chiller be recommissioned.**

If the gas concentration is between 10% and 15% of the Lower Flammability Limit (LFL) and the Main Power switch is on, the chiller immediately shuts down if it was running, the alarm AL820 is triggered (see point 7.2), and the fan starts running or keeps on running to try to reduce the gas concentration.

There is no separate error message when the 15% of LFL threshold is exceeded, as all power is cut from the chiller and the controller also turns Off.

The current gas concentration measured by the gas sensor can be checked at any time directly via the controller's display (see point 5.3.9) and it can also be monitored continuously via Modbus communications (see point 5.7).

## 4.2 Operating Conditions

### Water temperature at the inlet:

Nominal:	15°C (59°F)
Maximum:	40°C (104°F) (1)

### Cold water temperature at the outlet:

Nominal:	10°C (50°F)
Minimum:	7°C (45°F) (2)
Maximum:	35°C (95°F)

### Temperature of the ambient air:

Nominal:	25°C (77°F)
Minimum:	-20°C (-4°F) (3)
Maximum:	50°C (122°F)



Observe the permissible storage and operating temperatures. See point 8.1 for storage temperature limits.

(1) If the temperature difference between inlet and outlet is higher than 10°C (18°F) or if the inlet temperature will exceed 40°C (104°F), the external by-pass accessory should be installed. This typically happens with applications that use a water flow significantly lower than the chiller's nominal flow.

The external by-pass option allows the chiller to work with close to its nominal flow even if the application is only using part of that flow.

Please note that a flow lower than the chiller's nominal flow can negatively affect the outlet temperature stability.

(2) The Ultracool units can work with cold water temperatures lower than 7°C (45°F). To do so, add ethylene glycol to the water and contact an authorized technical service to adjust the chiller.

(3) In order to work at temperatures lower than 0°C (32°F), add ethylene glycol to the water and contact an authorized technical service to adjust the chiller.



Only an authorized technical service can adjust the antifreeze set point. The following tables show the ethylene glycol concentration and the antifreeze adjustment required:

Glycol concentration (4) and antifreeze adjustment		Min Ambient Temperature		
		0°C or more	Less than 0°C to -5°C	Less than -5°C to -20°C
Cold Water Set Point	7°C or more	0% 0°C	15% -5°C	40% -20°C
	Less than 7°C to 5°C	15% -5°C	15% -5°C	40% -20°C
	Less than 5°C to 0°C	30% -15°C	30% -15°C	40% -20°C
	Less than 0°C to -5°C	30% -15°C	30% -15°C	40% -20°C
	Less than -5°C to -10°C	40% -20°C	40% -20°C	40% -20°C

Glycol concentration (4) and antifreeze adjustment		Min Ambient Temperature		
		32°F or more	Less than 32°F to 23°F	Less than 23°F to -4°F
Cold Water Set Point	45°F or more	0% 32°F	15% 23°F	40% -4°F
	Less than 45°F to 41°F	15% 23°F	15% 23°F	40% -4°F
	Less than 41°F to 32°F	30% 5°F	30% 5°F	40% -4°F
	Less than 32°F to 23°F	30% 5°F	30% 5°F	40% -4°F
	Less than 23°F to 14°F	40% -4°F	40% -4°F	40% -4°F

(4) The ethylene glycol percentage is given as % measured as weight of the total mixture. In case of any modification in the quantity of water in the installation, the concentration of ethylene glycol should be checked.

If more volume is required, it is necessary to keep the ethylene glycol concentration.



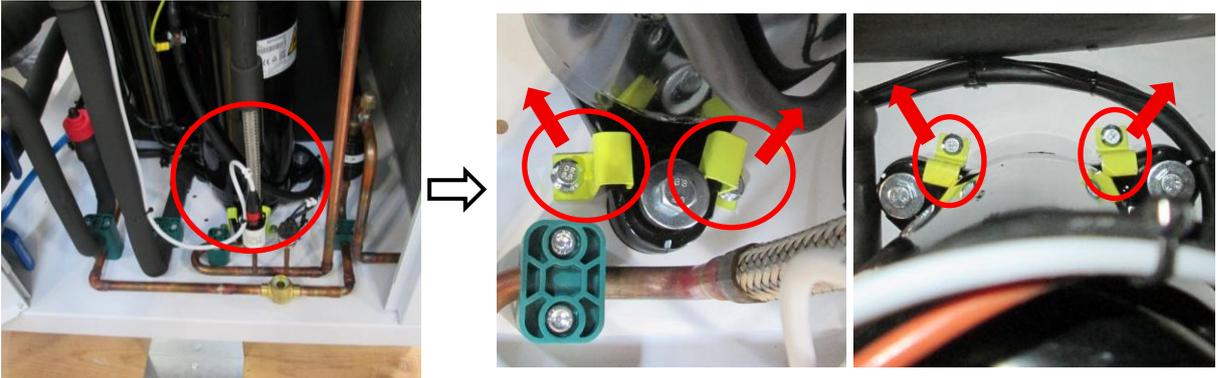
Do not use automotive antifreeze. Use lab grade ethylene glycol only! Do not use an ethylene glycol concentration above 40%; this would damage the water pump.

## 4.3 Chiller start-up



Only for models UC 8 and UC 14: These models are shipped with transport clamps attached to the base of the refrigerant compressor that minimize its movement during transport.

Before starting the unit up, make sure the yellow transport clamps for the compressor have been removed. Open the back panel to get access to the transport clamps and remove them:



Operating the unit with these clamps still in place can damage the compressor or the refrigerant pipes. Such damages would not be covered by the unit's warranty.



Clean the application water circuit with tap water to be sure that there are no free particles. Otherwise, the filter element can block up during the start-up process.

Turn Off the Main power switch (to avoid any possibility of unexpected start-up of the equipment during this operation). Open the lateral panel, open the tank cover and fill the tank. Heat transfer liquids from LAUDA are recommended (see point 10). Alternatively, **water of the required quality (see annex 12.1) and the suitable glycol concentration according to point 4.2** can be used. Fill the tank directly until the maximum level of the tank is reached. On UC 50 to UC 80 models, lift the level switch manually to make sure it resets itself: when it resets you will hear its contact "click".



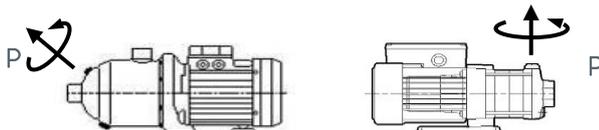
While filling the tank, make sure no water splashes onto any electrical components. Keep the cover of the electrical box closed during the filling procedure.

Prime the pump to release any air inside:

Remove the priming plug (P, see diagram below).

Keep the priming plug open until only liquid runs out the priming plug.

Replace the priming plug and tighten securely.



Do not start the Ultracool unit until the pump has been properly vented.

Open the water inlet valve completely and close the outlet water valve completely as shown on the following picture:



Make sure that the external fuses are installed, see point 3.8.

Switch OFF the main power switch during any electrical intervention.

Connect the Remote On/Off control from the application to terminals 23 and 24 of the unit (**only valid if the Remote On/Off control is a dry contact**). If a remote control is not used, connect the wire-bridge supplied inside the electrical box to link terminals 23 and 24.

Close both access panels. Switch ON the general switch and, if remote On/Off is used, give a remote On signal. Finally switch the chiller On from the controller display (see point 5.3) and **the unit will start up**.



**Phase Sequence Verification (only required on 3-Phase units):** Check that the working pressure of the pump is higher than the nominal pressure indicated on the characteristics plate. If it is below this value, the pump is turning in the wrong direction. If this happens **switch OFF the main power switch, disconnect the chiller from the power supply** and exchange two phases in the main power supply.

Increase the cold water setpoint up to the maximum allowed value (see point 4.2) to prevent the compressor from starting. Switch the main power switch OFF and then back ON. Open the right panel, make sure the water inlet valve is fully open and adjust the water outlet valve so that the pump works at the nominal pressure indicated in the chiller's data plate. You can see the pump pressure on the "Info – Process circuit" screen from the Information screens loop on the controller display (see point 5.3).



If the water tank temperature is above the programmed setpoint, the compressor will start roughly 2 minutes after switching the main power switch ON. If this happens switch the main power switch OFF and perform the operation again within 2 minutes. If the compressor works with the lateral panel open the chiller could trip by high pressure alarm, see point 7.

After 5 minutes, or when the unit stops by low water level alarm, turn the main power switch OFF, open the lateral panel and check the level in the tank. If the level is below the maximum refill the water tank until the maximum level.

Repeat this operation until water level in the tank remains constant.

When refilling the tank, respect the ethylene glycol concentration as per point 4.2.

Select the desired temperature of the cold water outlet (see point 5.3). The Ultracool units are delivered with a pre-set temperature of 10°C (50°F).



Check the working pressure of the water pump, if it is higher than the nominal value indicated in the characteristics plate and all manual valves in the circuit are fully open, check that the water pipes meet the requirements on point 3.5.



Please note that, under normal operation, the refrigerant compressor and some copper pipes can reach temperatures above 100°C (212°F).

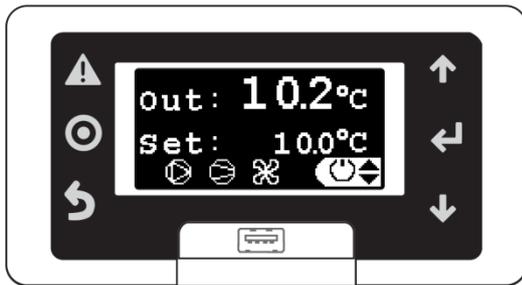


Be careful not to touch these elements shortly after turning Off the chiller; allow enough time for the components inside to cool down before opening the access panels.

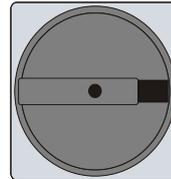
## 5 Chiller Controls

### 5.1 Control and monitoring elements

Controller (UC 2 and UC 4)



Main Power Switch

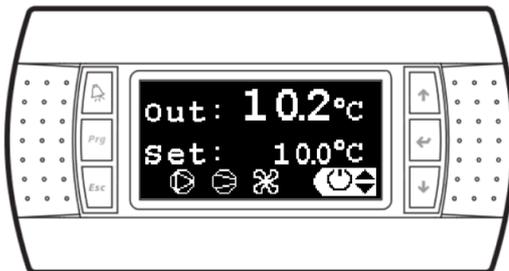


-  Status LED (UC 8 to UC 80)
-  Warning/Alarm LED (UC 8 to UC 80)

Webserver controller display



External controller display (UC 8 to UC 80)



The following elements allow controlling the chiller and monitoring its status:

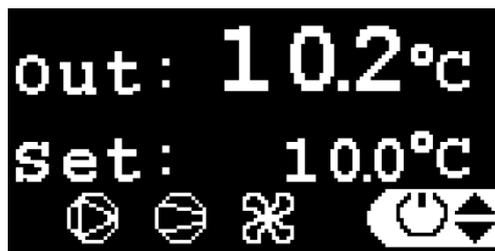
1. **Status LED (UC 8 to UC 80):** It blinks when the unit is turned Off and is waiting for an On signal. It is lit steadily when the unit is turned On.
2. **Warning/Alarm LED (UC 8 to UC 80):** It blinks when a Warning is active, the chiller is still running. It is lit steadily when an Alarm is active; either the refrigerant circuit or the complete unit is stopped. See point 7 for troubleshooting.
3. **Main power switch:** Located on the right side of the chiller. It connects and disconnects the Ultracool unit from the power supply.
4. **Controller display:** It shows all information on the operation of the chiller and allows controlling it. It can be accessed either from the external display connected to the chiller or from any computer connected to the same Ethernet network as the chiller by accessing its webservice from a web browser. To access the webservice, the chiller must be connected to the network with an Ethernet cable, see point 3.6 or 3.7 and its IP address must be configured as indicated on point 5.5.

## 5.2 UC Controller

Controller buttons:

-  **Alarm button:** Displays the list of active alarms. It's also used to manually reset alarms
-  **Prg button:** Used to access the configuration menu (for authorized service only)
-  **Esc button:** Return to the main screen
-  **Up – Down buttons:** Navigate between the display screens or increase/decrease the value of a selected parameter
-  **Enter button:** Used to enter a subscreen/menu from the main screen or to switch between screen navigation and the different parameters that can be modified on a specific screen

Main screen:



The main screen shows the current outlet temperature, the current setpoint and it shows which motors in the chiller are currently running.

The motor symbols are, from left to right, the water pump, the refrigerant compressor and the motor fan.

If a motor is running, its symbol is lit and if it is stopped, its symbol is not shown. A blinking symbol means that an Off signal has been received, but the motor is still running and it will turn Off shortly, it is being delayed by an internal minimum running time timer in the chiller's software.

From the main screen it's also possible to access the On/Off screen, the Settings screens loop and the Information screens loop. Use the **Up/Down** buttons to select the desired subscreen/menu and press **Enter** to access it:



Pressing **Esc** from any screen goes back to this main screen

## 5.3 Operation

### 5.3.1 Remote On/Off and On/Off from the display



The unit will only turn On when it receives **both** an On signal from its remote On/Off contacts (circuit closed between terminals 23 and 24, see point 3.8) and it **also** receives an On command from the display. In the same way, the unit will turn Off either when the circuit between terminals 23 and 24 is open or when an Off command is issued from the display.

#### On/Off memory:

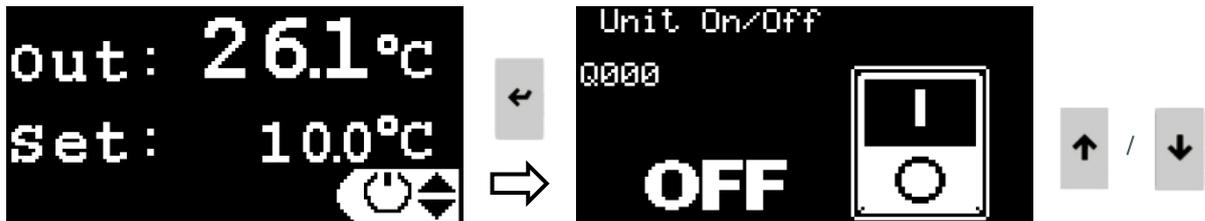
Bear in mind that, when the Main Power Switch is turned On, the controller comes back to the last mode/status (“On” or “Off”) as it was when the Main Power Switch was last as powered off.

This means that, if the chiller was running when the Main Power Switch was turned Off, it will start suddenly next time it is switched back On.

### 5.3.2 On/Off from the display

As long as the remote On/Off is connected, the unit can be turned On and Off from the display (either the local display on the unit or the webserver on a connected computer).

In order to start/stop the unit from the display, go to the On/Off screen (see point 5.2), and use the Up/Down buttons to toggle between On and Off.



### 5.3.3 Setting the temperature

The required outlet temperature can be set between -10°C (14°F) and 35°C (95°F) from the display (either the remote display connected to the chiller or the webserver on a connected computer).

In order to set the temperature, go to the Settings screens loop (see point 5.2), press **Enter** to highlight the current set value, use the **Up/Down** buttons to change the value and press **Enter** again to confirm the new value.



### 5.3.4 Setting the language

To change the language of the display, go to the **Settings screens loop** (see point 5.2), press **Down** until the “press ENTER to change language” screen and press **Enter** to access the language configuration screen. From the new screen, press **Enter** to change the language and press **Esc** or let the timer run out to confirm the new language.



### 5.3.5 Setting the Units of Measure (UoM)

To change the Units of Measure used by the controller, go to the **Settings screens loop** (see point 5.2), press **Down** until the “press ENTER to change Units of Measure” screen and press **Enter** to access the Units of Measure configuration screen.

From the new screen, press **Up** or **Down** to select the Units of Measure to be changed:

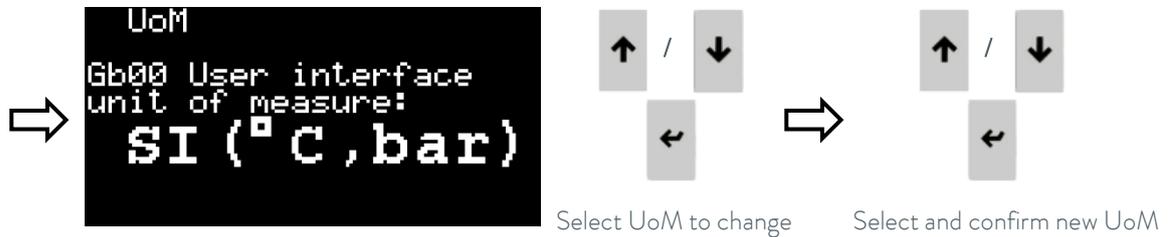
- User interface: Changes the units of measure used by the display of the unit, both the External controller display and also the Webserver controller display.
- Modbus TCP/IP: Changes the units of measure used to transmit data through the Modbus TCP/IP communications.
- Web pages: Changes the units of measure of the information shown on the Webserver.



Please note and bear in mind that a different set of Units of Measure can be selected for each of these three options.

Press **Enter** to highlight the current Units of Measure, press **Up** or **Down** to change them and **Enter** again to confirm the selection.

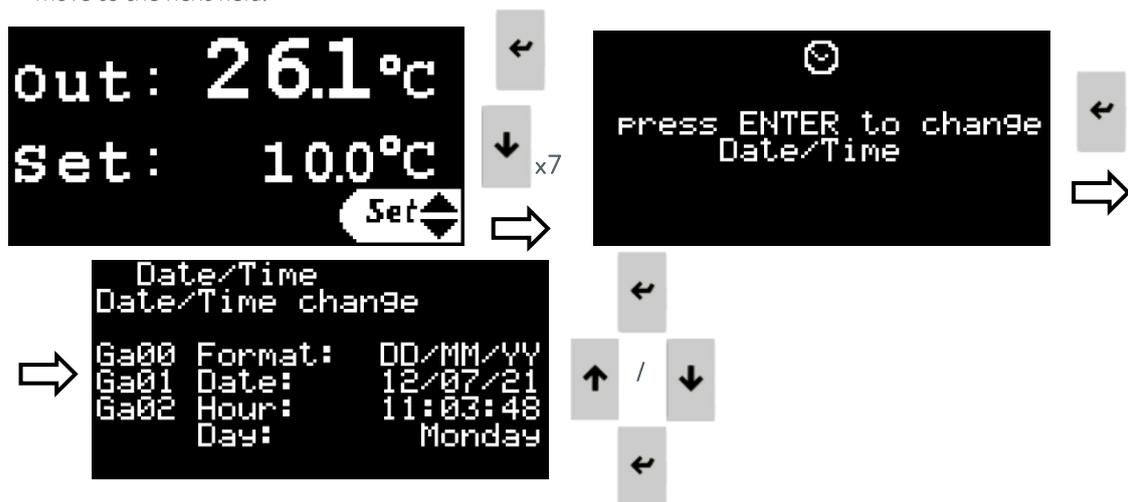




### 5.3.6 Setting the Date and Time

To change the Date and Time used by the controller, go to the **Settings screens loop** (see point 5.2), press **Down** until the “press ENTER to change Date/Time” screen and press **Enter** to access the Date and Time configuration screen.

Press **Enter** to highlight each field, **Up/Down** to change the value and **Enter** to confirm the new value and to move to the next field.



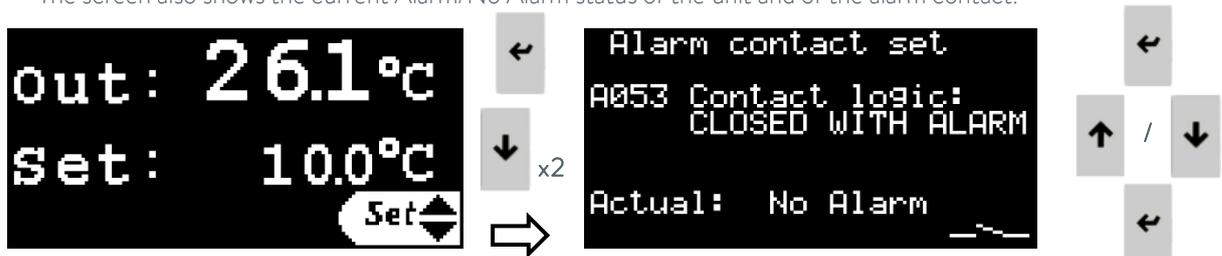
### 5.3.7 Setting the external alarm signal logic

The chiller has a dry contact available to report a general alarm of the unit (see point 3.8).

To change the logic of this contact (closed when an alarm is active or open when an alarm is active), go to the **Settings screens loop** (see point 5.2), press **Down** until the “Alarm contact set” screen.

Press **Enter** to highlight the current contact logic, use the **Up/Down** buttons to change it and press **Enter** again to confirm the new logic.

The screen also shows the current Alarm/No Alarm status of the unit and of the alarm contact.



### 5.3.8 Setting LAUDA.LIVE permissions

The Settings screen loop also contains a screen to enable or disable the communications with the LAUDA.LIVE service and to set its access permissions (see point 5.8).

This function only works if the service has been requested and activated for this particular unit and if the unit itself is connected to a Cloud gateway through an Ethernet connection. **The unit does not have internet connectivity on its own.**

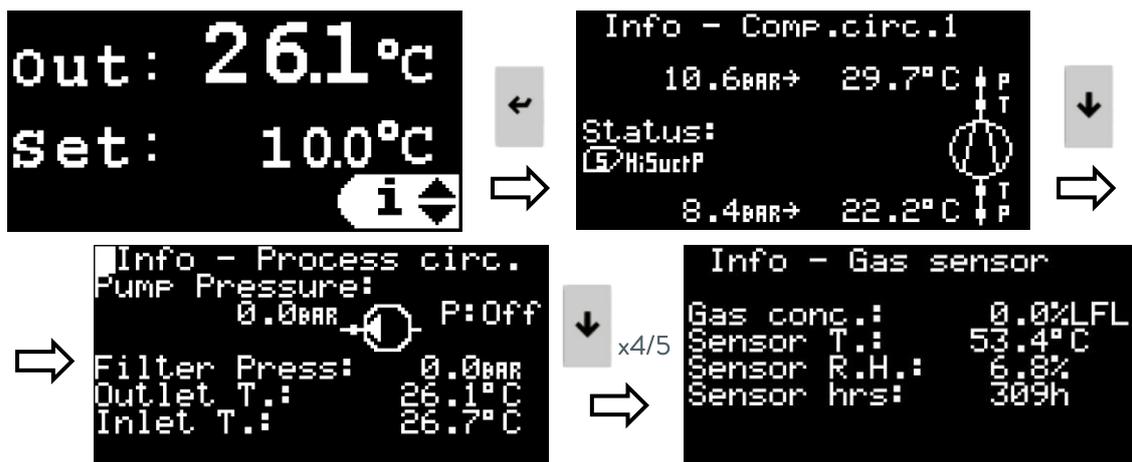
To enable/disable the LAUDA.LIVE service and set its permissions, go to the **Settings screens loop** (see point 5.2), press **Down** until the "LAUDA.LIVE" screen. Press **Enter** to highlight each field, **Up/Down** to change it and **Enter** to confirm the new setting and to move to the next field.



### 5.3.9 Information screens loop

This is a series of information screens that can be accessed from the controller display (see point 5.2). They contain information on the operation of the unit, readings of physical sensors, software version and its serial number. Use the **Up/Down** buttons to navigate the different screens. Information on the pump pressure can be found within this loop, on the "Info - Process circ." screen.

Information on the gas concentration measured by the gas sensor can also be found on this loop, on the "Info - Gas sensor" screen.



### 5.3.10 Refrigerant compressor control and temperature stability

The chiller relies in its ability to adjust the compressor speed to match the cooling capacity required by the application to maintain a high water outlet temperature stability.

Please note that the compressor has a minimum speed ranging from 15% to 30% depending on the chiller model and specific working conditions.

When the heat load from the application is lower than the minimum capacity of the compressor, the compressor will stop automatically. The compressor restarts once the temperature increases enough, as long as a minimum compressor Off time has elapsed.

In this kind of situation, the outlet temperature stability can be worse than +/- 0.5 K.

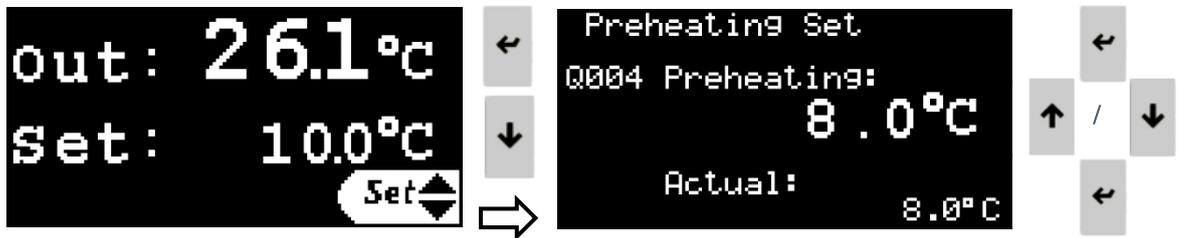
## 5.4 Preheating function

The chiller controller integrates an automated preheating system that can turn on the water pump when the temperature in the water circuit drops below a specified setpoint. The heat introduced by the pump operation maintains the water in the tank and in the rest of the circuit at the preset temperature. This system will operate as long as the general switch is turned On by turning the water pump On and Off when necessary.

By default, this system is disabled in most situations, as it has a factory setting of -15°C (5°F).

**Setting the preheating temperature:** The required preheating temperature can be set between -25°C (-13°F) and 35°C (95°F) from the display (either the remote display connected to the chiller or the webserver on a connected computer).

In order to set the temperature, go to the Settings screens loop (see point 5.2), press **Down** to access the Preheating set screen, press **Enter** to highlight the current set value, use the **Up/Down** buttons to change the value and press **Enter** again to confirm the new value.



Please note that the heat generated by the pump is limited and, depending on the thermal losses in the whole water circuit, it's possible that the temperature cannot reach the preheating setpoint even with the pump running all the time.

It is strongly recommended that all water pipes are properly insulated to minimize the thermal losses.

While the chiller is turned Off but the pump is On because of the preheating system, the pump icon will remain lit, with the letters "PH" blinking besides it:



To completely disable the preheating system, leave it set at the minimum possible value (-25°C, -13°F).



The fastest way to stop the pump in case of emergency (for example if there's a major water leak), is to turn Off the Main Power Switch.

## 5.5 Ethernet Configuration

The unit can be remotely monitored and operated through any PC connected to the same network where the unit is connected via Ethernet.

To be able to access the unit remotely it is first necessary to configure its IP address. Follow these steps on the external controller display to do so:

1. Press the **Alarm** and the **Enter** buttons for a few seconds, until the display changes to the following screen:

```
> INFORMATION
  SETTINGS
  APPLICATION
  UPGRADE
  LOGGER
  DIAGNOSTICS
```

2. Use the **Down** button to select "SETTINGS" and press **Enter** to access the Settings menu:

```
> PASSWORD
  USB SETTINGS
  PLAN SETTINGS
  CLOCK SETTINGS
  APP SETTINGS
  NET SETTINGS
  TCP/IPv4 SETTINGS
```

3. Use the **Down** button to select "TCP/IPv4 SETTINGS" and press **Enter** to access the IP Configuration screen:

```
Enable: Static
IP:      0.  0.  0.  0
Mask:    0.  0.  0.  0
GW:      0.  0.  0.  0
DNS:     0.  0.  0.  0

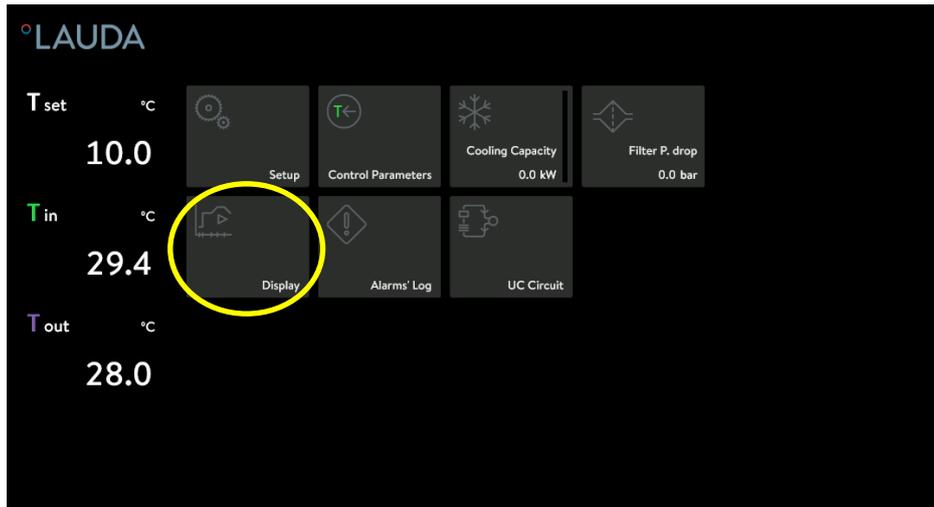
Update config? No
```

4. In this screen, use the **Enter** button to move to the next field and **Up** and **Down** to change the values. Check with your IT team which values are correct for your local network. Once done, select the "Update config?" field, change it to Yes with the **Up** button and confirm with **Enter**. This will save all the new values.

**Note:** If no button is pressed for 30 seconds, the controller discards any changes that have not been saved and goes back to the Main screen.

## 5.6 Embedded Webserver

Once the IP address is configured, it will be possible to access the webserver of the unit from a web browser on any PC connected to the same network as the unit. To do so, just introduce the IP number of the unit on the navigation bar of the web browser and select the Display tile from the home page.



## 5.7 Modbus TCP/IP communications

If the chiller is connected to the Ethernet network and its IP address has been configured, it can also be remotely monitored and operated by using Modbus TCP/IP communications. To use this kind of communications with the chiller, please ask for the document DMO-0576 to your sales representative.

## 5.8 LAUDA.LIVE Cloud Service

The Ultracool unit enables the communication of device data to the cloud-based LAUDA.LIVE service. The service provides various optional features and offers, such as remote maintenance.

Please contact LAUDA or visit our website for detailed information about LAUDA.LIVE and its services.

To implement the LAUDA.LIVE service, device data is exchanged with the LAUDA.LIVE cloud via an encrypted connection, enabling the LAUDA service to remotely maintain the unit.

Requirements:

- The Ultracool unit needs a custom gateway device to have a direct connection to the Cloud services (contact LAUDA to request more information).
- The Ultracool unit will need to connect through Ethernet directly to the gateway.
- The gateway will need access to a power socket and have the antenna placed in a location with good signal reception.

By default the Ultracool units block the communications with the CLOUD and must be given permission through the display menu explicitly (see point 5.3.8). In this menu the permissions are divided between write/read and operation/service parameters.



Within this distinction, operating parameters are those directly shown to the user via the device display and could be changed by the user. The service parameters are only available to the LAUDA Service team.

## 6 Maintenance

### 6.1 Basic Maintenance

General safety instructions:



The unit must be disconnected from the main power supply before any kind of maintenance is performed. Unit's maintenance is to be done only by skilled personnel. Bring device parts, accessories and heat transfer liquid to room temperature before touching them.

**Weekly:**

Verify that the water temperature indicated on the controller display is approximately at the setpoint.

Verify the water level in the tank.

Check water filter pressure drop while the unit is running on the "Info – Process circuit" screen of the Information screens loop, see point 5.3.9.

If the pressure drop exceeds 1,5 bar (22 psi) change the filter element.

**Monthly:**

With the Unit disconnected (Main power switch Off), clean the condenser removing dust/dirt with a soft brush and/or vacuum clean the surface from the outside.



Do not use any detergents to clean the condenser.

Clean the housing, internally and externally, eliminating the dust present especially on the water pump rack.

**Yearly:**

Change the filter element and refill the circuit with a LAUDA approved liquid (see point 10) or water of the required quality (see annex 12.1) and the suitable ethylene glycol concentration according to point 4.2.

**Every five years:**

Check the function of the gas sensor, contact LAUDA Service for more information.

**Every ten years at the latest:**

Replace the gas warning sensor at the end of its service life, contact LAUDA Service for more information.

## 7 Troubleshooting

### 7.1 Saving a log file in case of alarm

The unit has a built-in log function that continually records data from the last 36 hours of operation (older data is automatically overwritten).

If an alarm triggers and it's not possible to restore the unit by following the indications on this chapter, then follow these steps to save a copy of the stored Operation Log shortly after the alarm has triggered. Save also the Alarm Log of the unit.

The information contained in these log files with the operation data of the hours preceding the alarm and the complete list of alarms can greatly help the service engineers to diagnose the problem and solve it faster.

When an alarm causes the unit to stop, the controller also automatically stores a small operation log file to its internal flash memory that can be very helpful for troubleshooting.

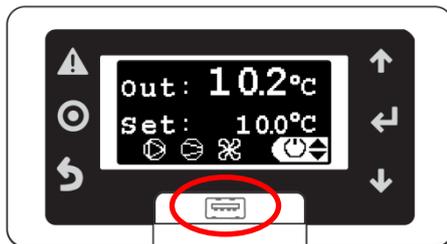
#### 7.1.1 Connecting a USB drive to the controller

The Log files can be saved to the controller's internal memory or to a connected USB drive.

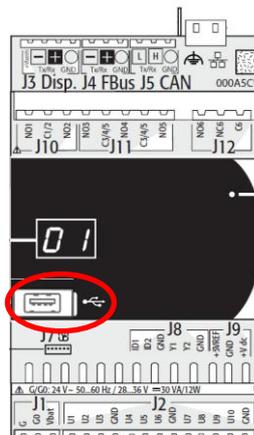
If using a USB drive, connect it to the microUSB port available on the front of the chiller's controller. Use a microUSB to USB adapter if necessary.

On UC 2 and UC 4 models the controller is accessible on the front of the chiller.

On UC 8 to UC 80 models the controller is inside the electrical box: Turn the chiller Off with the Main Power Switch, open the lateral panel (UC 8 to UC 65) or the front panel (UC 80) and the electrical box to reach it. Once the USB drive is connected, close the panel and turn the Main Power Switch back On.



UC 2 and UC 4



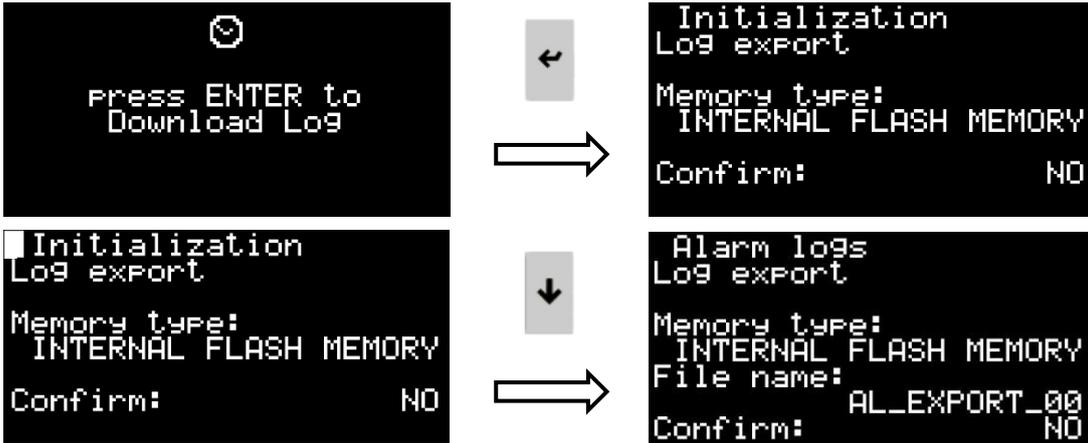
UC 8 to UC 80



microUSB to USB adapter

## 7.1.2 Log files export screens

To save the operation log and alarm list files, go to the Information screens loop (see point 5.2), press **Up** once and then **Enter** to access the Log export screens. The first screen is the Operation Log export screen. Pressing **Down** once while the cursor is on the top left corner of the display moves on to the Alarm Log export screen:



On either export screen, press **Enter** and then the **Up** or **Down** buttons to select where to save the log file.

On the Alarm Log export screen, a file name can be chosen to avoid overwriting previously saved Alarm Log files. After selecting the save location, press **Enter** and then choose a file number with **Up** and **Down**.

After selecting the save location on the Operation Log screen or the file name on the Alarm Log screen, press **Enter**, select YES on the “Confirm:” field with the **Up** or **Down** buttons and press **Enter** again to begin the Log export.

**Note:** A full Operation Log file when the unit has been running for more than 36 hours is more than 9MB in size and it can take around 9 minutes to save to the internal memory or to an USB drive.



Some time after starting the download process, the display will go back to the Main screen due to user inactivity, but the download continues in the background. Make sure to not disconnect the USB drive or switch Off the Main power switch until at least 10 minutes have passed since starting the download process. Before submitting the saved file, make sure it's a bit larger than 9MB or open it and make sure the last line matches the current date and time on the controller.

If files are saved to the Internal Flash Memory, when the service engineer is on site with the unit, they will be able to retrieve them for analysis. Please note that if this process is repeated at a later time, the saved log file will be overwritten, which could cause the relevant data to diagnose the alarm to be lost.

## 7.1.3 Retrieving exported Log files from the internal memory

The exported Log file can be retrieved by connecting a USB cable (microUSB to USB A cable) between the controller and a laptop.

When the controller is powered On and connected to a laptop via USB, its internal flash memory will appear as a connected USB drive on the laptop, so the log files can be accessed and saved to the laptop and sent to our service team for analysis. This can greatly help in identifying the problem in advance.



Fault	Cause	Solution	Restart procedure
<b>AL165</b> <b>Alarm freeze evaporating temp.</b> <b>Alarm due to low evaporating temperature:</b> The evaporation temperature is too low and there is risk of freezing. It stops the compressor if it happens 3 times in a short period	Initial start-up after several hours Off in a cold ambient  Water circuit blocked  Possible freezing due to low ambient temperature  Water tank temperature sensor fault	The unit automatically resets itself up to 2 times. If it trips again, reset it manually until the refrigerant circuit warms up. Adding glycol to the process fluid and adjusting the antifreeze protection to the corresponding freezing point can alleviate or eliminate the issue.  Clean the water circuit. If necessary replace the water filter element. Check for closed valves in the circuit  The ethylene glycol concentration must be according to point 4.2 and the antifreeze setpoint also has to be adjusted accordingly. <b>Contact authorized technical service</b>  Measure the water temperature inside the tank and check that it is approximately the same as shown on the controller's display. If it isn't <b>contact authorized technical service</b>	Disconnect the chiller by turning Off the main power switch (see point 5.1). Turn it back On after at least 30 seconds have passed
<b>AL129 or 390</b> <b>Circuit 1 Power+ offline or Alarm Offline Drive</b> It stops the compressor	Q1 circuit breaker tripped  Compressor drive faulty	Check if the electrical connections are correct. Check supply voltage and power surges  <b>Contact authorized technical service</b>	Disconnect the chiller by turning Off the main power switch (see point 5.1). Open the electrical box (see point 3) and reset the Q1 circuit breaker. Turn the Main power switch back On
<b>AL562</b> <b>ABB: Comms Error</b> It stops the compressor	Communications with compressor drive interrupted due to momentary Power Supply loss or when main power switch is turned On	Check if there have been interruptions in the power supply  Turn the unit On and Off through the display, remote On/Off or webserver, leaving the main power switch always On	Disconnect the chiller by turning Off the main power switch (see point 5.1). Turn it back On after at least 30 seconds have passed
<b>AL012</b> <b>Tank level alarm</b> It stops the whole unit	Level switch did not switch to the "full" position	Check that the level switch works properly and that the tank is full enough. After disconnecting the Main Power switch open the right	Disconnect the chiller by turning Off the main power switch (see point 5.1). Turn it back On after at least 30 seconds have passed

Fault	Cause	Solution	Restart procedure
		panel, open the water tank to check the water level. UC 50 to UC 80 only: Lift the level switch manually. If it works correctly you should hear its contact “click”. Close the tank and the panel and try to start the unit again	
	Water leak in the internal circuit of the UC	<b>Contact authorized technical service</b>	
	Water leak in the external water circuit	Find the leak and get it repaired	
	Water leak in the water pump	<b>Contact authorized technical service</b> to replace the water pump. Check that the water quality is inside the limits (see point 12.1)	
or <b>Pump overload</b> It stops the whole unit	Circuit breaker Q2 has tripped	Check if the electrical connections are correct. Check voltages, intensities and variations. Check water pressure. Check water quality. Check if the pump is blocked	Disconnect the chiller by turning Off the main power switch (see point 5.1). Open the electrical box (see point 3) and reset the Q2 circuit breaker. Turn the Main power switch back On
or <b>Phase sequence</b> It stops the whole unit	Wrong phase sequence at the main power supply	Switch OFF the main power switch, disconnect the chiller from the power supply and exchange two phases in the main power supply	Once the phase sequence is correct the chiller will work normally automatically
<b>AL337</b> <b>Offline EBM 1</b> It stops the compressor	Q3 circuit breaker tripped	Check if the electrical connections are correct. Check supply voltage and power surges	Disconnect the chiller by turning Off the main power switch (see point 5.1). Open the electrical box (see point 3) and reset the Q3 circuit breaker. Turn the Main power switch back On
	Motor fan faulty	<b>Contact authorized technical service</b>	

Fault	Cause	Solution	Restart procedure
AL022 Chilled water high temperature	The water tank temperature has been more than 5°C (9°F) above the programmed setpoint for some minutes	Check the cold water set point is within the limits indicated on point 4.2, the ethylene glycol proportion is correct and the antifreeze protection is set accordingly. Stop the application so that it does not generate heat and let the chiller without load for some minutes. If the problem persists <b>contact authorized technical service</b>	It's a warning only; the chiller is still working normally
AL463 High water temperature Safety Alarm It stops the whole unit	The water inlet temperature or water tank temperature has exceeded 45°C (113°F)	Wait until the temperature decreases or change the water in the circuit and restart the unit	Once all water temperatures are below 45°C, disconnect the chiller by turning Off the main power switch (see point 5.1). Turn it back On after at least 30 seconds have passed
AL100 and AL101 Discharge pressure probe error AND Suction pressure probe error It stops the compressor	Major refrigerant leak, the unit has lost all of its refrigerant gas  Faulty pressure probes	<b>Contact authorized technical service</b>  <b>Contact authorized technical service</b>	The chiller can be restarted after it is repaired
AL819 Gas sensor offline It stops the whole unit	Loose connector or wire  Gas sensor faulty	Check if the electrical connections are tight  <b>Contact authorized technical service</b>	The chiller can be restarted when the communications are recovered
AL820 Gas detection alarm It stops the whole unit. The fan keeps running to try to reduce the gas concentration	The gas sensor has detected a gas concentration higher than 10% of LFL	Ventilate the room as much as possible and make sure there are no ignition sources near the unit. <b>Contact authorized technical service</b>	The chiller can be restarted after a specialist trained in handling flammable refrigerants has identified and rectified the cause

Fault	Cause	Solution	Restart procedure
<p>The unit does not power up with the Main Power switch On (and after at least 60 seconds have passed since it was connected to the power supply)</p>	<p>The gas sensor has detected a gas concentration higher than 15% of LFL</p>	<p>If the gas sensor LED is fixed red, ventilate the room as much as possible and make sure there are no ignition sources near the unit. <b>Contact authorized technical service</b></p>	<p>The chiller can be restarted after a specialist trained in handling flammable refrigerants has identified and rectified the cause</p>
	<p>Gas sensor is in error mode</p>	<p>If the gas sensor LED is blinking red, it means it's in error mode. This still stops the chiller for safety reasons</p>	<p>Try disconnecting the unit from the power supply, waiting at least 10 seconds and connect it again. If the problem persists, <b>contact authorized technical service to replace the sensor</b></p>
	<p>Loose connector or wire</p>	<p>Check if the electrical connections are tight</p>	<p>The chiller can be restarted when the connection is fixed</p>
<p>Gas sensor, timer relay or main contactor faulty</p>	<p><b>Contact authorized technical service</b></p>	<p>The chiller can be restarted when the faulty component is replaced</p>	
<p><b>Various temperature / pressure / flow probe errors</b> Depending on the probe, the unit may keep running or it may stop working</p>	<p>A probe is damaged or not reading correctly</p>	<p>Check that the electrical connections are tight. If the problem persists, <b>contact authorized technical service</b></p>	<p>The chiller can be restarted when the faulty probe is replaced</p>
<p><b>The external controller display shows the message „NO LINK“ or „I/O board 01 fault“ or it doesn't light up at all</b> The chiller keeps running and still responds to commands received through its digital inputs and to remote control through Ethernet</p>	<p>External controller display cable damaged or loose connections</p>	<p>Check that the cable connections are tight at both ends and examine the total length of the cable for any damages. If the cable is damaged <b>contact authorized technical service</b> to replace it</p>	<p>The chiller is still running normally and it accepts On/Off commands through the 23/24 digital input. Other settings and information functions are still available through the Ethernet connection</p>
	<p>External controller display damaged</p>	<p><b>Contact authorized technical service</b></p>	
<p><b>Maintenance request</b></p>	<p>The chiller has exceeded the working hours defined between preventive maintenances</p>	<p>Contact authorized technical service for a preventive maintenance of the unit</p>	<p>It's a warning only; the chiller is still working normally. The authorized technical service will reset the warning during the preventive maintenance</p>

## 8 Technical data

### 8.1 Technical data

UC		UC 2	UC 4	UC 8	UC 14	UC 24	UC 50	UC 65	UC 80	
Cooling capacity	kcal/h	2554	4803	8677	13150	22644	44548	57666	68483	
	kW	3,0	5,6	10,1	15,3	26,3	51,8	67,1	79,6	
Water flow	l/min	5,6	13,8	26,6	43,8	84,1	150	196	247	
Water pressure	bar (50 Hz)	3,3	2,8	3,5	3,2	3,8	3,1	3,3	4,6	
	bar (60 Hz)	3,4	3,2	5,2	5,0	6,2	5,0	5,7	6,9	
Refrigerant circuits	N°	1	1	1	1	1	1	1	1	
Compressor	N°	1	1	1	1	1	1	1	1	
	kW (each)	0,5	1,3	2,4	4,0	6,5	12,8	17,7	20,4	
	kW (total)	0,5	1,3	2,4	4,0	6,5	12,8	17,7	20,4	
Condenser	N°	1	1	1	1	1	1	1	2	
	kW (each)	3,5	6,9	12,5	19,3	32,8	64,6	84,8	50,0	
	kW (total)	3,5	6,9	12,5	19,3	32,8	64,6	84,8	100,0	
Evaporator	N°	1	1	1	1	1	1	1	1	
	kW (each)	3,0	5,6	10,1	15,3	26,3	51,8	67,1	79,6	
	kW (total)	3,0	5,6	10,1	15,3	26,3	51,8	67,1	79,6	
Motor fan	N°	1	1	1	1	1	1	1	1	
	kW (max)	0,17	0,17	0,50	0,98	0,98	3,03	3,03	3,03	
	kW (nom)	0,05	0,15	0,25	0,41	0,76	1,15	2,00	1,93	
	m <sup>3</sup> /h (max)	3050	3050	4500	7500	7500	19000	19000	24000	
Pump (50 Hz)	kW	0,30	1,10	1,10	2,50	2,50	2,30	3,70	3,7	
	max	l/min	42	105	105	166	242	250	367	367
			min	4,2	10,5	10,5	16,6	24,2	25	36,7
	max	bar	3,4	3,9	3,9	4,7	3,8	5	5,3	5,3
			min	1,5	0,7	0,7	1,4	1,4	2,7	3,3
Pump (60 Hz)	kW	0,6	0,6	1,1	1,1	2,5	2,5	4,0	6,4	
	max	l/min	50	50	128	128	200	292	300	450
			min	5	5	13	13	20	29	30
	max	bar	3,5	3,5	5,6	5,6	6,8	5,6	7,2	7,5
			min	1,5	1,5	1,2	1,2	2,5	2,0	3,8
Volume water tank	l	12	12	35	35	35	125	125	125	
Sound Pressure Level (1)	dB(A)	54,5	54,5	62,6	63,7	65,0	67,0	67,1	65,6	
Power	50 Hz	kW	0,9	1,8	3,2	5,5	9,7	16,4	22,0	26,0
	60 Hz	kW	1,2	2,1	3,2	5,5	9,7	16,4	23,7	28,7
Max. Fuse	A	16	16	25	25	32	50	63	80	
Voltage	V/Ph/Hz	230V/1Ph/50Hz or 230V/1Ph/60Hz			400V/3Ph/50Hz or 460V/3Ph/60Hz					
Storage Temp. Limits	°C (°F)	-25°C to 60°C (-13°F to 140°F)								
SEPR		8,70	6,42	5,80	5,92	5,28	5,72	5,51	5,47	

(1) Sound Pressure Level at 5 meters from the chiller in free-field conditions. This sound level corresponds to the chillers working at full load in a high ambient temperature. In most situations, at part load and lower ambient temperatures, the sound level is much lower.

All data related to nominal conditions: Water outlet temperature 10°C and ambient temperature 25°C.

## 8.2 Energy Efficiency Information

The Energy Efficiency data included in the following pages is required by the Ecodesign directive 2009/125/EC and is reported as specified in said directive.

<b>Model: UC 2</b>			
Type of condensing: Air-cooled			
Refrigerant fluid: R-290			
Item	Symbol	Value	Unit
Operating temperature	t	7	°C
Seasonal energy performance ratio	SEPR	8,70	[-]
Annual electricity consumption	Q	2061	kWh/a
Parameters at full load and reference ambient temperature at rating point A			
Rated refrigeration capacity	P <sub>A</sub>	2,42	kW
Rated power input	D <sub>A</sub>	0,72	kW
Rated energy efficiency ratio	EER <sub>DC,A</sub>	3,35	[-]
Parameters at rating point B			
Rated refrigeration capacity	P <sub>B</sub>	2,27	kW
Rated power input	D <sub>B</sub>	0,44	kW
Rated energy efficiency ratio	EER <sub>DC,B</sub>	5,20	[-]
Parameters at rating point C			
Rated refrigeration capacity	P <sub>C</sub>	2,09	kW
Rated power input	D <sub>C</sub>	0,27	kW
Rated energy efficiency ratio	EER <sub>DC,C</sub>	7,84	[-]
Parameters at rating point D			
Rated refrigeration capacity	P <sub>D</sub>	1,95	kW
Rated power input	D <sub>D</sub>	0,16	kW
Rated energy efficiency ratio	EER <sub>DC,D</sub>	12,47	[-]
Other items			
Capacity control	Variable		
Degradation co-efficient chillers	C <sub>dc</sub>	0,90	[-]
GWP of the refrigerant		3	kg CO <sub>2</sub> eq (100 years)
Contact details	LAUDA Ultracool S.L. – Ctra. Rubí 316, 08228 Terrassa (Barcelona), Spain		

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**Model: UC 4**


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 Type of condensing: Air-cooled
 

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 Refrigerant fluid: R-290
 

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Item	Symbol	Value	Unit
Operating temperature	t	7	°C
Seasonal energy performance ratio	SEPR	6,42	[-]
Annual electricity consumption	Q	5123	kWh/a

---

 Parameters at full load and reference ambient temperature at rating point A
 

---

Rated refrigeration capacity	$P_A$	4,44	kW
Rated power input	$D_A$	1,61	kW
Rated energy efficiency ratio	$EER_{DC,A}$	2,75	[-]

---

 Parameters at rating point B
 

---

Rated refrigeration capacity	$P_B$	4,12	kW
Rated power input	$D_B$	1,05	kW
Rated energy efficiency ratio	$EER_{DC,B}$	3,91	[-]

---

 Parameters at rating point C
 

---

Rated refrigeration capacity	$P_C$	3,80	kW
Rated power input	$D_C$	0,66	kW
Rated energy efficiency ratio	$EER_{DC,C}$	5,73	[-]

---

 Parameters at rating point D
 

---

Rated refrigeration capacity	$P_D$	3,51	kW
Rated power input	$D_D$	0,38	kW
Rated energy efficiency ratio	$EER_{DC,D}$	9,16	[-]

---

 Other items
 

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Capacity control	Variable		
Degradation co-efficient chillers	$C_{dc}$	0,90	[-]
GWP of the refrigerant		3	kg CO <sub>2</sub> eq (100 years)

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Contact details	LAUDA Ultracool S.L. – Ctra. Rubí 316, 08228 Terrassa (Barcelona), Spain
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**Model: UC 8**


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 Type of condensing: Air-cooled
 

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 Refrigerant fluid: R-290
 

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Item	Symbol	Value	Unit
Operating temperature	t	7	°C
Seasonal energy performance ratio	SEPR	5,80	[-]
Annual electricity consumption	Q	10667	kWh/a

---

 Parameters at full load and reference ambient temperature at rating point A
 

---

Rated refrigeration capacity	$P_A$	8,36	kW
Rated power input	$D_A$	3,06	kW
Rated energy efficiency ratio	$EER_{DC,A}$	2,73	[-]

---

 Parameters at rating point B
 

---

Rated refrigeration capacity	$P_B$	7,80	kW
Rated power input	$D_B$	2,09	kW
Rated energy efficiency ratio	$EER_{DC,B}$	3,72	[-]

---

 Parameters at rating point C
 

---

Rated refrigeration capacity	$P_C$	7,24	kW
Rated power input	$D_C$	1,38	kW
Rated energy efficiency ratio	$EER_{DC,C}$	5,24	[-]

---

 Parameters at rating point D
 

---

Rated refrigeration capacity	$P_D$	6,69	kW
Rated power input	$D_D$	0,84	kW
Rated energy efficiency ratio	$EER_{DC,D}$	7,91	[-]

---

 Other items
 

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Capacity control	Variable		
Degradation co-efficient chillers	$C_{dc}$	0,90	[-]
GWP of the refrigerant		3	kg CO <sub>2</sub> eq (100 years)
Contact details	LAUDA Ultracool S.L. – Ctra. Rubí 316, 08228 Terrassa (Barcelona), Spain		

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**Model: UC 14**


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 Type of condensing: Air-cooled
 

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 Refrigerant fluid: R-290
 

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Item	Symbol	Value	Unit
Operating temperature	t	7	°C
Seasonal energy performance ratio	SEPR	5,92	[-]
Annual electricity consumption	Q	16547	kWh/a

---

 Parameters at full load and reference ambient temperature at rating point A
 

---

Rated refrigeration capacity	$P_A$	13,22	kW
Rated power input	$D_A$	4,58	kW
Rated energy efficiency ratio	$EER_{DC,A}$	2,88	[-]

---

 Parameters at rating point B
 

---

Rated refrigeration capacity	$P_B$	12,32	kW
Rated power input	$D_B$	3,14	kW
Rated energy efficiency ratio	$EER_{DC,B}$	3,91	[-]

---

 Parameters at rating point C
 

---

Rated refrigeration capacity	$P_C$	11,60	kW
Rated power input	$D_C$	2,11	kW
Rated energy efficiency ratio	$EER_{DC,C}$	5,48	[-]

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 Parameters at rating point D
 

---

Rated refrigeration capacity	$P_D$	10,63	kW
Rated power input	$D_D$	1,37	kW
Rated energy efficiency ratio	$EER_{DC,D}$	7,73	[-]

---

 Other items
 

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Capacity control	Variable		
Degradation co-efficient chillers	$C_{dc}$	0,90	[-]
GWP of the refrigerant		3	kg CO <sub>2</sub> eq (100 years)
Contact details	LAUDA Ultracool S.L. – Ctra. Rubí 316, 08228 Terrassa (Barcelona), Spain		

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**Model: UC 24**


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 Type of condensing: Air-cooled
 

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 Refrigerant fluid: R-290
 

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Item	Symbol	Value	Unit
Operating temperature	t	7	°C
Seasonal energy performance ratio	SEPR	5,28	[-]
Annual electricity consumption	Q	30011	kWh/a

---

 Parameters at full load and reference ambient temperature at rating point A
 

---

Rated refrigeration capacity	P <sub>A</sub>	21,40	kW
Rated power input	D <sub>A</sub>	9,06	kW
Rated energy efficiency ratio	EER <sub>DC,A</sub>	2,36	[-]

---

 Parameters at rating point B
 

---

Rated refrigeration capacity	P <sub>B</sub>	20,03	kW
Rated power input	D <sub>B</sub>	5,66	kW
Rated energy efficiency ratio	EER <sub>DC,B</sub>	3,53	[-]

---

 Parameters at rating point C
 

---

Rated refrigeration capacity	P <sub>C</sub>	18,56	kW
Rated power input	D <sub>C</sub>	3,45	kW
Rated energy efficiency ratio	EER <sub>DC,C</sub>	5,36	[-]

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 Parameters at rating point D
 

---

Rated refrigeration capacity	P <sub>D</sub>	17,26	kW
Rated power input	D <sub>D</sub>	2,74	kW
Rated energy efficiency ratio	EER <sub>DC,D</sub>	6,28	[-]

---

 Other items
 

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Capacity control	Variable		
Degradation co-efficient chillers	C <sub>dc</sub>	0,90	[-]
GWP of the refrigerant		3	kg CO <sub>2</sub> eq (100 years)
Contact details	LAUDA Ultracool S.L. – Ctra. Rubí 316, 08228 Terrassa (Barcelona), Spain		

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**Model: UC 50**


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 Type of condensing: Air-cooled
 

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 Refrigerant fluid: R-290
 

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Item	Symbol	Value	Unit
Operating temperature	t	7	°C
Seasonal energy performance ratio	SEPR	5,72	[-]
Annual electricity consumption	Q	55823	kWh/a

---

 Parameters at full load and reference ambient temperature at rating point A
 

---

Rated refrigeration capacity	P <sub>A</sub>	43,08	kW
Rated power input	D <sub>A</sub>	15,85	kW
Rated energy efficiency ratio	EER <sub>DC,A</sub>	2,71	[-]

---

 Parameters at rating point B
 

---

Rated refrigeration capacity	P <sub>B</sub>	40,35	kW
Rated power input	D <sub>B</sub>	10,63	kW
Rated energy efficiency ratio	EER <sub>DC,B</sub>	3,79	[-]

---

 Parameters at rating point C
 

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Rated refrigeration capacity	P <sub>C</sub>	37,21	kW
Rated power input	D <sub>C</sub>	6,99	kW
Rated energy efficiency ratio	EER <sub>DC,C</sub>	5,31	[-]

---

 Parameters at rating point D
 

---

Rated refrigeration capacity	P <sub>D</sub>	34,65	kW
Rated power input	D <sub>D</sub>	4,65	kW
Rated energy efficiency ratio	EER <sub>DC,D</sub>	7,44	[-]

---

 Other items
 

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Capacity control	Variable		
Degradation co-efficient chillers	C <sub>dc</sub>	0,90	[-]
GWP of the refrigerant		3	kg CO <sub>2</sub> eq (100 years)
Contact details	LAUDA Ultracool S.L. – Ctra. Rubí 316, 08228 Terrassa (Barcelona), Spain		

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**Model: UC 65**


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 Type of condensing: Air-cooled
 

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 Refrigerant fluid: R-290
 

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Item	Symbol	Value	Unit
Operating temperature	t	7	°C
Seasonal energy performance ratio	SEPR	5,16	[-]
Annual electricity consumption	Q	78071	kWh/a

---

 Parameters at full load and reference ambient temperature at rating point A
 

---

Rated refrigeration capacity	$P_A$	58,05	kW
Rated power input	$D_A$	21,18	kW
Rated energy efficiency ratio	$EER_{DC,A}$	2,73	[-]

---

 Parameters at rating point B
 

---

Rated refrigeration capacity	$P_B$	54,09	kW
Rated power input	$D_B$	14,09	kW
Rated energy efficiency ratio	$EER_{DC,B}$	3,83	[-]

---

 Parameters at rating point C
 

---

Rated refrigeration capacity	$P_C$	49,72	kW
Rated power input	$D_C$	9,40	kW
Rated energy efficiency ratio	$EER_{DC,C}$	5,27	[-]

---

 Parameters at rating point D
 

---

Rated refrigeration capacity	$P_D$	46,67	kW
Rated power input	$D_D$	6,85	kW
Rated energy efficiency ratio	$EER_{DC,D}$	6,79	[-]

---

 Other items
 

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Capacity control	Variable		
Degradation co-efficient chillers	$C_{dc}$	0,90	[-]
GWP of the refrigerant		3	kg CO <sub>2</sub> eq (100 years)
Contact details	LAUDA Ultracool S.L. – Ctra. Rubí 316, 08228 Terrassa (Barcelona), Spain		

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**Model: UC 80**


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 Type of condensing: Air-cooled
 

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 Refrigerant fluid: R-290
 

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Item	Symbol	Value	Unit
Operating temperature	t	7	°C
Seasonal energy performance ratio	SEPR	5,47	[-]
Annual electricity consumption	Q	90823	kWh/a

---

 Parameters at full load and reference ambient temperature at rating point A
 

---

Rated refrigeration capacity	$P_A$	67,05	kW
Rated power input	$D_A$	25,03	kW
Rated energy efficiency ratio	$EER_{DC,A}$	2,67	[-]

---

 Parameters at rating point B
 

---

Rated refrigeration capacity	$P_B$	62,37	kW
Rated power input	$D_B$	16,53	kW
Rated energy efficiency ratio	$EER_{DC,B}$	3,77	[-]

---

 Parameters at rating point C
 

---

Rated refrigeration capacity	$P_C$	58,40	kW
Rated power input	$D_C$	11,31	kW
Rated energy efficiency ratio	$EER_{DC,C}$	5,15	[-]

---

 Parameters at rating point D
 

---

Rated refrigeration capacity	$P_D$	53,72	kW
Rated power input	$D_D$	7,80	kW
Rated energy efficiency ratio	$EER_{DC,D}$	6,87	[-]

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 Other items
 

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Capacity control	Variable		
Degradation co-efficient chillers	$C_{dc}$	0,90	[-]
GWP of the refrigerant		3	kg CO <sub>2</sub> eq (100 years)
Contact details	LAUDA Ultracool S.L. – Ctra. Rubí 316, 08228 Terrassa (Barcelona), Spain		

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## 9 Accessories and Consumables

The following accessories and consumables are available for the Ultracool units.

Accessories for UC 2 and UC 4 230V/1Ph/50Hz (BSP) (1)	Catalogue number
IK10: 2x10m Installation Kit: Includes 2 hoses and 2 sets of fittings	A000001
IK20: 2x20m Installation Kit: Includes 2 hoses and 2 sets of fittings	A000004
EB: External by-pass: Required when the temperature difference between inlet and outlet is higher than 10 °C to avoid possible damages of components	A000009
PRV: Pressure Reducing Valve: For adjustment of the maximum pressure with pressure sensitive applications	A001513
SV: Water Solenoid Valve kit: To avoid fluid return from an application installed above the chiller. Includes check valve and solenoid valve	A001514
RCP: Remote Control Panel: For installation away from the unit. Cable length 10 metres, electrical protection IP40	A001561

(1) BSP = Rp = G parallel thread

Accessories for UC 2 and UC 4 230V/1Ph/60Hz (NPT) (2)	Catalogue number
IK10: 2x10m Installation Kit: Includes 2 hoses and 2 sets of fittings	A001515
IK20: 2x20m Installation Kit: Includes 2 hoses and 2 sets of fittings	A001516
EB: External by-pass: Required when the temperature difference between inlet and outlet is higher than 10 °C to avoid possible damages of components	A001508
PRV: Pressure Reducing Valve: For adjustment of the maximum pressure with pressure sensitive applications	A001509
SV: Water Solenoid Valve kit: To avoid fluid return from an application installed above the chiller. Includes check valve and solenoid valve	A001510
RCP: Remote Control Panel: For installation away from the unit. Cable length 10 metres, electrical protection IP40	A001561

(2) NPT = NPT taper thread

Accessories for UC 8 to UC 24	Catalogue number
IK10: 2x10m Installation Kit: Includes 2 hoses and 2 sets of fittings	A000002
IK20: 2x20m Installation Kit: Includes 2 hoses and 2 sets of fittings	A000005
IK50: 2x50m Installation Kit: Includes 2 hoses and 2 sets of fittings	A000007
BSP-NPT Adapters: 2 fittings male-male to convert from the female BSP on the unit to an NPT male thread to the customer application	A000036
EB: External by-pass: Required when the temperature difference between inlet and outlet is higher than 10 °C to avoid possible damages of components	A000010
PRV: Pressure Reducing Valve: For adjustment of the maximum pressure with pressure sensitive applications	A000034
SV: Water Solenoid Valve kit: To avoid fluid return from an application installed above the chiller. Includes check valve and solenoid valve	A001444
25 metres cable for the External controller display: Longer cable that replaces the one that comes with the chiller	A001558
50 metres cable for the External controller display: Longer cable that replaces the one that comes with the chiller	A001559
IP54 External controller display: It replaces the one that comes with the chiller. It's suitable for outdoor installation	A001560

Accessories for UC 50 and UC 65	Catalogue number
IK10: 2x10m Installation Kit: Includes 2 hoses and 2 sets of fittings	A000003
IK20: 2x20m Installation Kit: Includes 2 hoses and 2 sets of fittings	A000006
IK50: 2x50m Installation Kit: Includes 2 hoses and 2 sets of fittings	A000008
BSP-NPT Adapters: 2 fittings male-male to convert from the female BSP on the unit to an NPT male thread to the customer application	A000037
EB: External by-pass: Required when the temperature difference between inlet and outlet is higher than 10 °C to avoid possible damages of components	A000011
PRV: Pressure Reducing Valve: For adjustment of the maximum pressure with pressure sensitive applications	A000035
SV: Water Solenoid Valve kit: To avoid fluid return from an application installed above the chiller. Includes check valve and solenoid valve	A000014
25 metres cable for the External controller display: Longer cable that replaces the one that comes with the chiller	A001558
50 metres cable for the External controller display: Longer cable that replaces the one that comes with the chiller	A001559
IP54 External controller display: It replaces the one that comes with the chiller. It's suitable for outdoor installation	A001560

Accessories for UC 80	Catalogue number
BSP-NPT Adapters: 2 fittings male-male to convert from the female BSP on the unit to an NPT male thread to the customer application	A001631
EB: External by-pass: Required when the temperature difference between inlet and outlet is higher than 10 °C to avoid possible damages of components	A001632
SV: Water Solenoid Valve kit: To avoid fluid return from an application installed above the chiller. Includes check valve and solenoid valve	A001633
25 metres cable for the External controller display: Longer cable that replaces the one that comes with the chiller	A001558
50 metres cable for the External controller display: Longer cable that replaces the one that comes with the chiller	A001559
IP54 External controller display: It replaces the one that comes with the chiller. It's suitable for outdoor installation	A001560

Consumables	Chiller model				
	Catalogue number				
	UC 2 and UC 4	UC 8 and UC 14	UC 24	UC 50 and UC 65	UC 80
Filter Element: Replacement for the water filter	E7427204K	E7011400K	E7427006AK	E7427020BK	E7424008R3K

## 10 Approved liquids

**Kryo 10** (1) water/propylene glycol mixture with corrosion inhibitors. Suitable for applications in the food and pharmaceutical industries.

Temperature range: -10°C to 90°C (14°F to 194°F).

Container size	Catalogue number
5 L	LZB 132
10 L	LZB 232
20 L	LZB 332
200 L	LZB 832

(1) Ready to use mixture. **Do not dilute.**

**Kryo 15** (1) water/ethylene glycol mixture with corrosion inhibitors.

Temperature range: -20°C to 90°C (-4°F to 194°F).

Container size	Catalogue number
5 L	LZB 133
10 L	LZB 233
20 L	LZB 333
200 L	LZB 833

(1) Ready to use mixture. **Do not dilute.**

**Algicide Aquastab** (2) Protective agent for the prevention and control of algae formation.

Container size	Catalogue number
100 mL	LZB 929
1 L	LZB 429

(2) Dose recommendation: 5 mL / 10 L water



## 12 Annexes

### 12.1 Water quality

In order to protect the water circuits of the Ultracool units, the water to be cooled must have specific physical/chemical properties so that it is not aggressive. If the water is outside any of the limits listed in the table below, it can seriously damage some of the materials of the Ultracool unit.

Parameter	Limit values
pH	7 – 8
Total Hardness (TH)	< 150 ppm
Conductivity	50 – 500 $\mu\text{S}/\text{cm}$
NH <sub>3</sub>	< 2 ppm
Total iron ions (Fe <sup>2+</sup> and Fe <sup>3+</sup> )	< 0.2 ppm
Chloride (Cl <sup>-</sup> )	< 300 ppm
H <sub>2</sub> S	< 0.05 ppm
Solid particles	< 150 $\mu\text{m}$
Ethylene glycol	Max 40%

The Total Hardness is specified in ppm (mg/L) of Ca<sub>2</sub>CO<sub>3</sub>.

Please note that ultra-pure waters like deionized water can also be harmful for some of the materials of the Ultracool unit as they have a conductivity below 50  $\mu\text{S}/\text{cm}$ .



Do not use automotive antifreeze. Use lab grade ethylene glycol only! Do not use an ethylene glycol concentration above 40%; this would damage the water pumps.

See point 10 for LAUDA approved liquids that can be directly used with the Ultracool chillers.



LAUDA Ultracool S.L. will not accept any warranty for any damage caused by water that is out of one or more of the above limits.

