



Rittal – Liquid Cooling Package



Quick Guide – "Getting Started"

Rittal Liquid Cooling Package Standard

Model No. SK 3301.230 (230 V version)

Model No. SK 3301.210 (115 V version)

Rittal Liquid Cooling Package Standard

Foreword

Dear Customer!

We would like to thank you for choosing our Rittal Liquid Cooling Package Standard (referred to hereafter simply as "Liquid Cooling Package" or LCP).

The Quick Guide "Getting Started" is excerpted from the complete operating and maintenance instructions for the Rittal Liquid Cooling Package Standard. It includes all procedures for the assembly and commissioning of an Liquid Cooling Package in a condensed format.

Please take the time to read this Quick Guide carefully before assembly and commissioning.

This is prerequisite for:

- safe assembly of the Liquid Cooling Package



Caution!

The Quick Guide "Getting Started" is not a substitute for the complete operating and maintenance instructions for the Rittal Liquid Cooling Package Standard.

All necessary information for the safe and sound operation of the Liquid Cooling Package is found only in the complete operating and maintenance instructions.

We request that you take the time to read the complete operating and maintenance instructions carefully.

Please pay particular attention to the safety instructions in the text and to Chapter 2, "Safety instructions".

This is the prerequisite for:

- **secure assembly of the Liquid Cooling Package,**
 - **safe handling and**
 - **the most trouble-free operation possible.**
-

Please keep the complete documentation readily available so that it is always on hand when needed.

We wish you every success!

Your
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We are always happy to answer any technical questions regarding our entire range of products.

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1 Installation – "Getting Started"

1.1 Installation conditions

In order to ensure problem-free operation of the Liquid Cooling Package, the following conditions for the installation location should be observed:

Supply connections required at the installation site

Type of connection	Connection description:
Power connection:	<ul style="list-style-type: none">- 230 V, 50/60 Hz/115 V, 50/60 Hz,- Shockproof socket,- IEC socket or- Fixed wiring
Cooling water connection:	<ul style="list-style-type: none">- +6 °C to +20 °C inlet temperature- 5 bar permissible operating pressure- Volumetric flow: depending on design (cf. Chapter 6.5.1, "Cooling output" in the operation and maintenance instructions)- 3/4" threaded pipe connection

Tab. 1: Supply connections required at the installation site

Note:



Please see the notes and data regarding the cold water connection in Chapter 1.3.2, "Cooling water connection" and in Chapter 14.1, "Hydrological information" in the operation and maintenance instructions.

Floor conditions

- The floor of the installation space should be rigid and level.
- Choose the installation location site so that the unit is not situated on a step, unlevel location, etc.

Climatic conditions

- The room temperature must be between +6 °C and +40 °C
- The relative air humidity must be below 80%.

Recommendation:



Room temperature +22 °C at 50% relative air humidity, according to ASHRAE guidelines.

Electromagnetic interference

- Interfering electrical installations (high frequency) should be avoided.

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1.2 Assembling the Liquid Cooling Package

1.2.1 Preparatory work on the server enclosure

Before the Liquid Cooling Package can be bayed onto the server enclosure, the following work should be carried out.

- Dismantle the side panels,
- Seal the server enclosure and
- Dismantle the server enclosure door.

Dismantle the side panels

Note:



It is only necessary to dismantle the side panels when the Liquid Cooling package is to be bayed onto a previously erected server enclosure. Otherwise, this work is not necessary.

Proceed as follows to dismantle the side panels:

- Loosen and remove the 8 assembly screws found on each side panel of the server enclosure.
 - Remove all side panel securing elements from the side of the server enclosure onto which the Liquid Cooling Package is to be bayed.
 - Dismantle both side panel mountings from the upper mounting rail of the server enclosure. Use an appropriate lever to do this.
 - Loosen and remove the screws on both of the side panel mounting brackets (upper and lower) in the middle of the mounting rail.
 - Loosen and remove the screws from the 6 side panel holders on the side mounting rails.
-

Caution! Risk of injury!



The side panel holders have sharp-edged teeth, which allow for an earthing of the server enclosure's side panel.

Seal the server enclosure

In order to ensure the targeted air routing in the system, the server enclosure is horizontally divided into warm air and cold air sections by sealing the 482.6 mm (19") level.

Proceed as follows to seal the 482.6 mm (19") level:

- If the server enclosure is only partially configured, seal the open sections of the 482.6 mm (19") level using blanking plates. Screw these tightly into the server rack from the front side.
-

Note:



The blanking plates are available in various heights (U) from the Rittal accessory range.

- Fasten the broader (Model No. SK 3301.370/3301.320) of the two foam strips from the Liquid Cooling Package accessories from outside onto one of the front supports of the server rack (cf. Fig. 1). Make sure to install this strip on the side of the server enclosure onto which the Liquid Cooling Package is to be bayed.
- Fasten the smaller (Model No. SK 3301.380/3301.390) of the two foam strips from the Liquid Cooling Package accessories from outside onto one of the front supports of the server rack (cf. Fig. 1). Make sure to install this strip on the side of the server enclosure which will again be sealed by a side panel.

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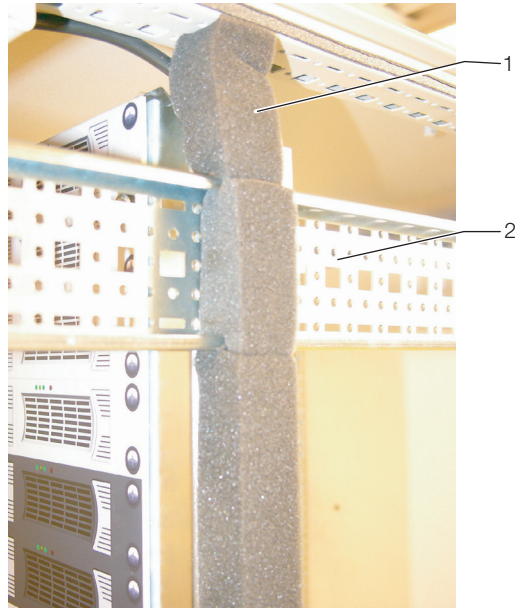


Fig. 1: Foam strip on a server rack support

- 1 Foam strip
- 2 Server rack

- If devices which require cooling via sideways air throughput (e.g. switches, router, etc.) are built into the server enclosure, cut-outs must be incorporated into the foam strips.
 - To do this, cut-out a piece of the foam strip with a sharp knife.
 - If several devices which require sideways air throughput are included, cut out several pieces of the foam strip, as is appropriate, so that, ultimately, there is a cut-out in the foam to the left and right in the height of each such device in the server rack.
 - If there is any remaining length of the foam strip on the server rack, cut it off at the top edge of the rack.

Note:



The Liquid Cooling Package can, as desired, be bayed onto a server enclosure with a width of either 600 mm or 800 mm. Thus, the Liquid Cooling Package accessories include a total of four foam strips with differing dimensions.

The foam strips for a 600 mm wide server enclosure may be ordered with the following numbers from the Rittal accessory range:

- Model No. SK 3301.370 for the LCP side
- Model No. SK 3301.380 for the side with the side panel

The foam strips for a 800 mm wide server enclosure may be ordered with the following numbers from the Rittal accessory range:

- Model No. SK 3301.320 for the LCP side
- Model No. SK 3301.390 for the side with the side panel

-
- On the side of the server enclosure opposite the Liquid Cooling Packing, mount a side panel on the two side panel mountings. Align it with the front and rear side of the enclosure.
 - Using the 8 assembly screws, screw the side panel firmly onto the side panel holders and the side panel mounting brackets.
 - Seal off any cable entries which may be present with corresponding brush strips or similar.

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Dismantle the server enclosure door

Before buying a Liquid Cooling Package, one or both of the server enclosure doors must be dismantled so that the attachment points for the baying connectors are accessible and are not covered by a door edge.

Note:



It is only necessary to dismantle a server enclosure door when the Liquid Cooling package is to be bayed onto a previously erected server enclosure. Otherwise, this work is not necessary.

If the Liquid Cooling Package is to be set up with a new server enclosure, proceed according to the enclosure's assembly instructions and bay the Liquid Cooling Package onto the server enclosure before assembling the server enclosure doors.

Proceed as follows to dismantle a server enclosure door:

- Remove the sealing bungs from the four door hinges with an appropriate tool (e.g. screwdriver).
- Release and open the server enclosure door.
- Loosen the hinge bolts from the four door hinges by raising them with an appropriate tool (e.g. screwdriver). Pull the bolts out of the hinge bolt holding fixture up to the catch (see Fig. 2, Step A). Begin with the lowest door hinge.

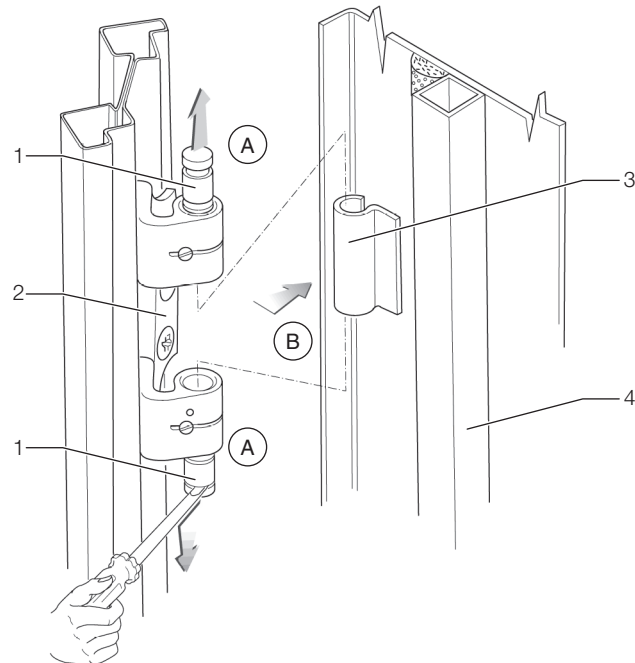


Fig. 2: Door hinge – dismantling

- 1 Door hinges
- 2 Hinge bolt holding fixture
- 3 Hinge joint
- 4 Server enclosure door

Note:



Support the server enclosure door so that it will not fall as the door hinges are loosened. If needed, work with a second person.

- Remove the server enclosure door (see Fig. 2, Step B).

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1.2.2 Removing the transport clamps

- Place the Liquid Cooling Package in the assembly location.
- Remove the 4 screws of the transport clamps on both sides of the Liquid Cooling Package.

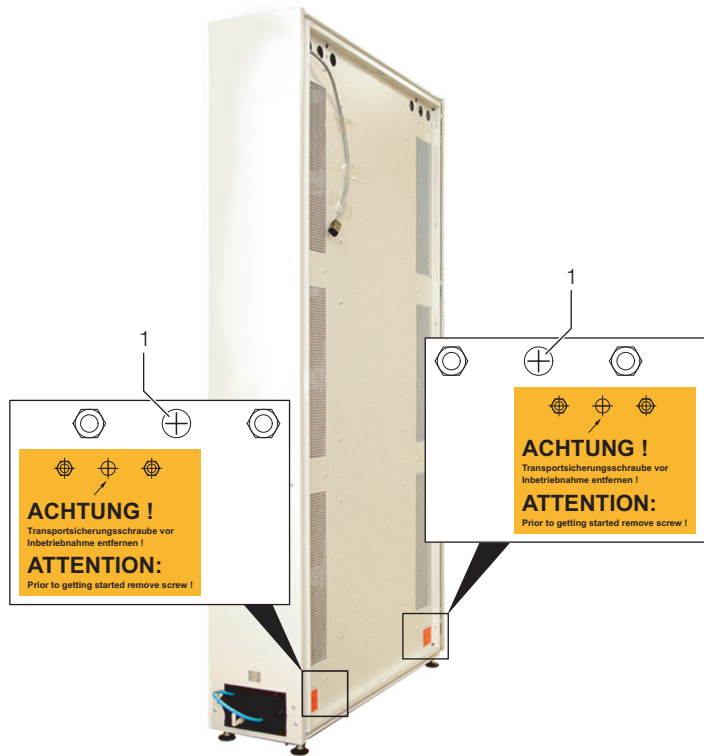


Fig. 3: Transport clamps on the Liquid Cooling Package

1 Screws on the transport clamps

Note:



The screws from the transport clamps must be removed before the Liquid Cooling Package is bayed. Afterwards, they are not accessible.

- Loosen the 8 assembly screws (Fig. 4, Pos. 1) on the rear panel of the Liquid Cooling Package and remove the rear panel.

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1.2.3 Installation and baying of the Liquid Cooling Package

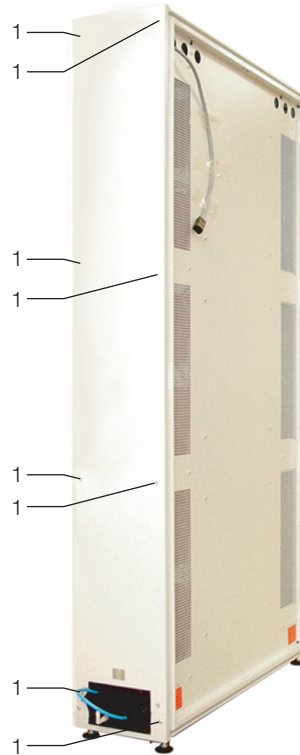


Fig. 4: Liquid Cooling Package (rear)
1 Assembly screw

- Position the Liquid Cooling Package on the side of the server enclosure to which it is to be bayed.
- Align the Liquid Cooling Package with the server enclosure using the levelling feet. Be sure that both enclosures are at the same height and are vertically aligned with one another.

Note:



If the Liquid Cooling Package is to be bayed onto the side of a server enclosure which has door hinges or if it is to be bayed between two server enclosures, the door of the LCP must be dismantled before the baying connector is installed so that the attachment points for the baying connector are accessible. Proceed as is described in Chapter 1.2.1, "Preparatory work on the server enclosure".

-
- Using assembly screws, fasten three baying connectors each (Fig. 5, Pos. 3) onto the intended attachment points in the mounting rails on the front and rear sides of the Liquid Cooling Package (Fig. 5, Pos. 1).

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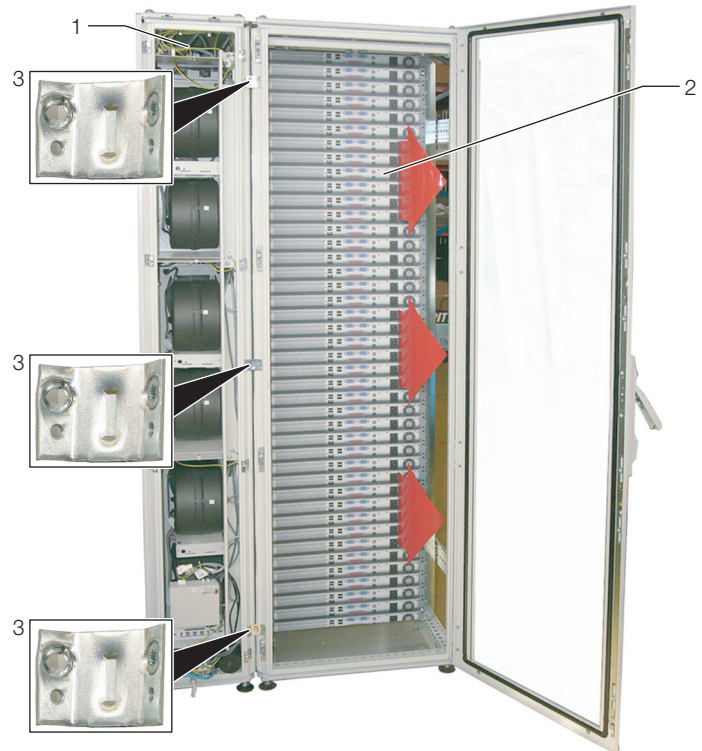


Fig. 5: Liquid Cooling Package on a server enclosure (rear)

- 1 Liquid Cooling Package
- 2 Server enclosure
- 3 Baying connector

- Using the corresponding assembly screws, fasten the baying connectors (Fig. 5, Pos. 3) onto the intended attachment points in the mounting rails on the front and rear sides of the server enclosure (Fig. 5, Pos. 2). As needed, press the Liquid Cooling Package lightly against the server enclosure in order to bring the baying connectors into alignment with the attachment points.
- Then, check the stability of the Liquid Cooling Package once more and adjust the levelling feet if necessary.

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1.2.4 Assembly of the side panel on the Liquid Cooling Package

If the Liquid Cooling Package is not bayed between two server enclosures, close it off with a side panel. Proceed as follows to assemble the side panel:

- Remove the various assembly components from the optional side panel package (Model. No. SK 8100.235) or use those from a server enclosure which has already been dismantled.
- Using the assembly screws, mount the assembly components (2 side panel mountings, 2 side panel mounting brackets, 6 side panel holders) onto the side of the Liquid Cooling Package which is opposite to the server enclosure.
- Place both side panel mountings (Fig. 6, Pos. 1) as symmetrically as possible onto the upper mounting rail of the LCP and, using your hand, press them firmly in place.
- Screw down the two side panel mounting brackets (Fig. 6, Pos. 2) above and below in the middle of the mounting rail using one screw each.
- Screw down 3 side panel holders (Fig. 6, Pos. 3) onto each of the two side mounting rails with one screw each.



Caution! Risk of injury!

The side panel holders have sharp-edged teeth, which allow for an earthing of the side panel through the Liquid Cooling Package.

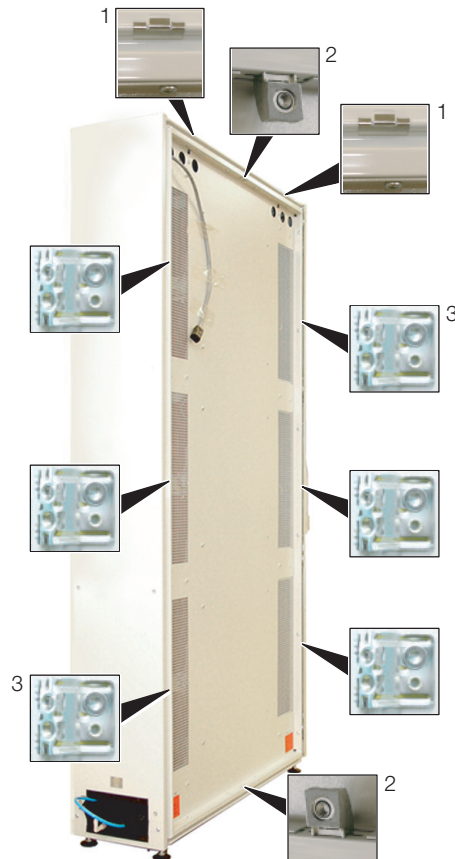


Fig. 6: Assembly components for the side panel

- 1 Side panel mounting
- 2 Side panel mounting bracket
- 3 Side panel holder

- Mount a side panel onto the two side panel mountings of the Liquid Cooling Package and align them to the front and rear sides of the unit.
- Using the 8 assembly screws, screw the side panel firmly onto the side panel holders and the side panel mounting brackets.

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1.3 Connecting the Liquid Cooling Package

1.3.1 Electrical connection



Note:

Please keep this electrical documentation readily available so that it is always on hand when needed. This is the only documentation which is authoritative for the unit.



Caution!

Work on electrical systems or equipment may only be carried out by an electrician or by trained personnel guided and supervised by an electrician. All work must be carried out in accordance with electrical engineering regulations.

The unit may only be connected after the above-named personnel have read this information.

Use insulated tools.

The connection regulations of the appropriate power company are to be followed.

The voltage values shown in the wiring plan or on the rating plate must match the mains voltage.

The pre-fuse specified in the wiring plan or on the rating plate should be provided as power protection. The unit must be individually fused.

The unit must be connected to the mains via an isolating device which ensures at least 3 mm contact opening when switched off.

The mains connection may only be made using the connection cable which extends from the unit.

No additional control equipment may be connected upstream of the device at the supply end.

The Liquid Cooling Package's power supply is made either through the power supply in the server enclosure or through a separate infeed, as desired. The unit is always delivered with a connecting cable without a mains plug so that the user may connect his/her own plug (earthing plug, IEC connector, etc.) according to local requirements.



Note:

The cross section and the fusing of the connection cable may be found in Chapter 14.4, "Circuit diagram" in the operating and maintenance instructions.

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1.3.2 Cooling water connection

The Liquid Cooling Package is connected to the cold water network via two 3/4" threaded pipe connections on the inlet and return, located on the lower rear side of the unit. The connecting pieces of both pipes are composed of T-joints, to allow for the option of connecting from the rear or through the raised floor.

Note:



Optionally, Liquid Cooling Package's cooling water connection may be made with quick release fasteners. The fasteners are available from the Rittal accessory range (Model No. SK 3301.360).

Note:



As much as possible, use armoured hoses for the cooling water hoses. The water connection may be made in a fixed manner using solid pipes as well. This may be done locally by the appropriate qualified person.

Note:



When tightening the connecting nuts, use an appropriate tool to provide counter-support on the pieces (on the Liquid Cooling Package and on the building).

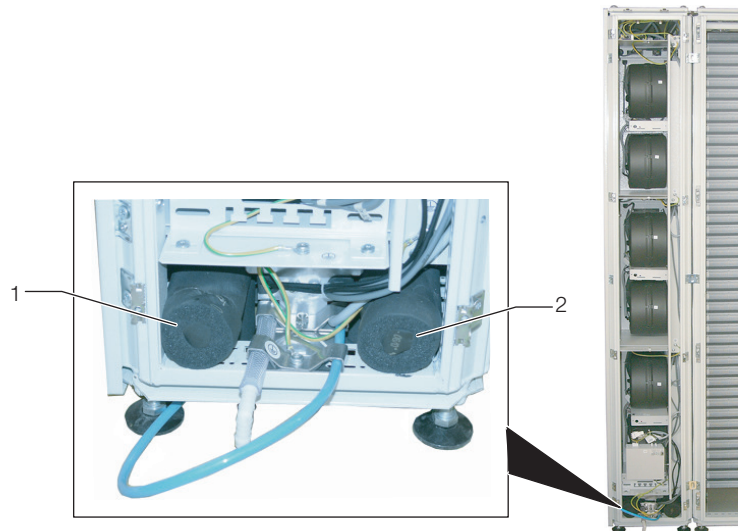


Fig. 7: Cold water network connection:

- 1 Cooling water return (outlet) with 3/4" external threads
- 2 Cooling water flow (inlet) with 3/4" external threads

Note:



To ensure proper functioning of the magnetic valve, a bypass or a water hammer damper should be provided.

Caution!



When installing, observe the applicable specifications concerning water quality and water pressure.

Optionally, the cooling water connection may be made from below through the raised floor. This may be done through a built-in T-joint.

In case of a low water inlet temperature (<12 °C), the inlet and return lines should be appropriately insulated. If this is not done, condensate may form on the supply lines.

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Note:

It is possible to test the flow of the water cycle immediately after connection, since the magnetic valve is open at zero current. That may be done using a CMC (see Chapter 6.7, "Extended options by connecting a Computer Multi Control – Top Concept (CMC-TC)" in the operating and maintenance instructions).



Note:

The building-side piping should be designed according to the Tichelmann Principle in order to maintain a hydraulically balanced system. If this is not the case, the flow volume of each Liquid Cooling Package must be assured by using a flow quantity regulator.

Ideally, the Liquid Cooling Package is connected to the cooling water system using a water/water heat exchanger.

Advantage:

- Reduction of water volumes in the secondary circuit,
 - Setting of a defined water quality,
 - Setting of a defined input temperature and
 - Setting of a defined volumetric flow.
-

Notes on water quality

For safe operation, it is vital that the VBG guidelines on cooling water are observed (VGB R 455P). Cooling water must not contain any limescale deposits or loose debris and it should have a low level of hardness, particularly a low level of carbonate hardness. For recooling within the plant, the carbonate hardness should not be too high. On the other hand, however, the water should not be so soft that it attacks the operating materials. When recooling the cooling water, the salt content should not rise too high as the result of evaporation of large quantities of water, since electrical conductivity increases as the concentration of dissolved substances rises, and the water thereby becomes more corrosive. For this reason, it is not only always necessary to add a corresponding quantity of fresh water, but also to remove part of the enriched water. Gypsiferous water is unsuitable for cooling purposes because it has a tendency to form boiler scale, which is particularly difficult to remove. Furthermore, cooling water should be free from iron and manganese, because otherwise deposits may occur which settle in the pipes and block them. At best, organic substances should only be present in small quantities, because otherwise sludge deposits and microbiological contamination may occur.

**Note:**

To avoid frost and corrosion damage as well as biological contaminants, Rittal GmbH & Co. recommends that a water/glycol mixture be used (up to max. 30% glycol).

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1.3.3 Condensate discharge connection

Any condensate which may develop is collected in each individual LCP module and led to the condensate collecting tray in the water module of the Liquid Cooling Package. When multiple LCP modules are used, the condensate discharge hoses are connected using quick-release fasteners. Any condensate is then led away through this series connection to the condensate collecting tray.

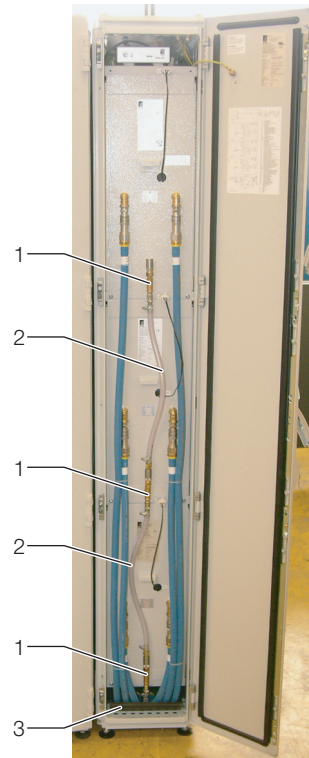


Fig. 8: Liquid Cooling Package equipped with 3 LCP modules

- 1 Condensate connection
- 2 Condensate hose
- 3 Water module with condensate collecting tray

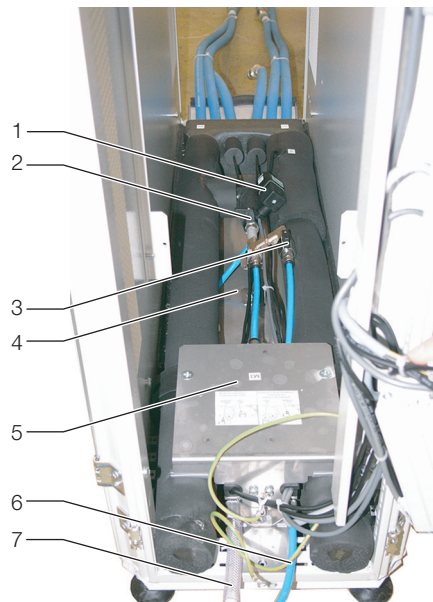


Fig. 9: Water module

- 1 Magnetic valve
- 2 Ball valve 1
- 3 Ball valve 2
- 4 Condensate collecting tray
- 5 Condensate pump
- 6 Condensate discharge (from condensate pump)
- 7 Condensate overflow (no pressure)

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Upon reaching a defined condensate level in the collecting tray, a float actuated switch activates a pump, which pumps off the condensate.

Basically, there are two options for disposing of the condensate.

- Discharge into the cooling water return
- Leading out of the Liquid Cooling Package and disposal through an external drain (factory setting).

In the first case, set both condensate ball valves as shown in Fig. 10.

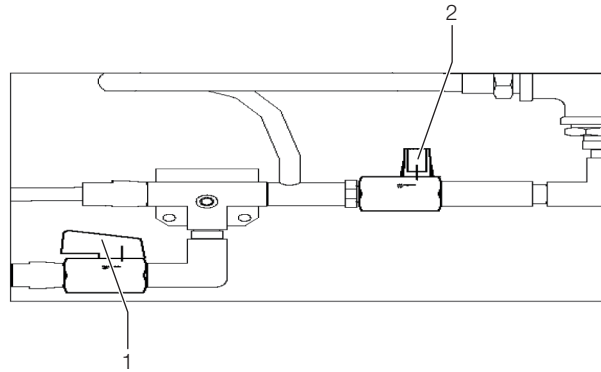


Fig. 10: Position of the condensate ball valves – feedback into the cooling water return

- 1 Ball valve 1 (cooling water return) – open
- 2 Ball valve 2 (condensate discharge) – shut

In both cases, connect the condensate discharge hose (Fig. 9, Pos. 6) to an on site drain, equipped with a siphon trap. The hose dimensions are:

- $\varnothing_{\text{ext.}} = 8 \text{ mm}$
- $\varnothing_{\text{int.}} = 6 \text{ mm}$

In this case, set both condensate ball valves as shown in Fig. 11.

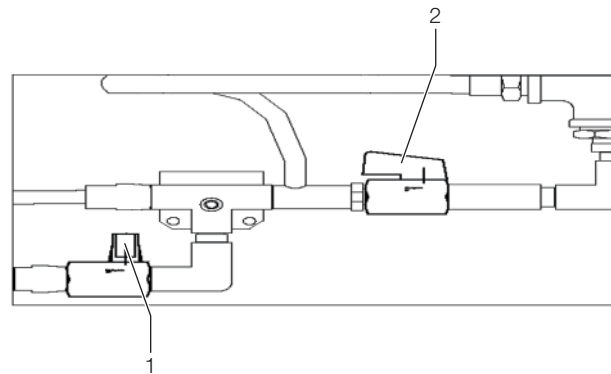


Fig. 11: Position of the condensate ball valves – discharge through the condensate discharge

- 1 Ball valve 1 (cooling water return) – shut
- 2 Ball valve 2 (condensate discharge) – open

Both, the condensate overflow hose as well as the condensate discharge hose (when used), are to be connected to a drain equipped with a siphon trap.

Note:



In order to ensure safe condensate discharge, the following points should be observed:

- Lay the discharge hose without kinks
- Do not constrict the hose cross section
- Lay the condensate overflow hose with a gradient

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Note:

In order to avoid increased condensation and to reduce energy use, the cooling water temperature should be adapted to match the required cooling output.

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1.4 Operation

The control unit of the LCP system carries out the following functions:

- Retrieves all measurements over the I²C bus from the fan modules and the water module (temperature, speed, flow, etc.).
- Evaluates all measurements and generates alarm and warning signals.
- Controls the air temperature in the server enclosure by regulating the fan speed and the water volume through the heat exchanger.
- Sets the setpoint temperature for the cold air blown in (factory setting 20 °C).
- Communicates with the CMC-TC/PU (when connected).

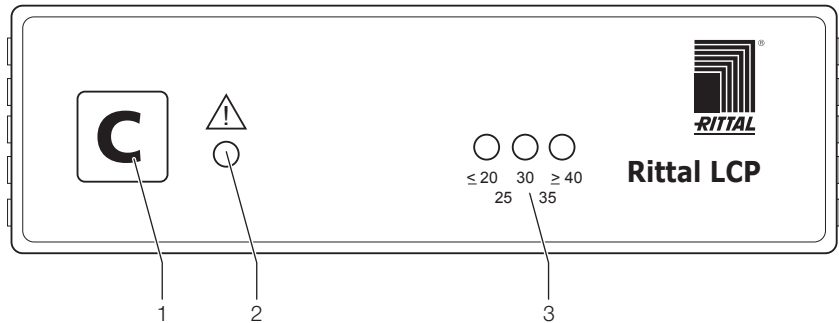


Fig. 12: Control unit Liquid Cooling Package – front

- 1 Button "C"
- 2 Status LED
- 3 Setpoint temperature indicator

The control unit cyclically collects all measurements from the fan module(s) and water module which are connected. This communication takes place over the I²C bus. The control unit thus serves as the master and cyclically polls the measurements from the slave units or returns the setting data.

The measurements which are delivered from the individual modules are evaluated by the control unit and possible warning and alarm signals are generated. If a new warning or alarm occurs, the internal beeper communicates this. At the same time, the alarm relay is switched. This acoustic alarm may be cleared by pressing the clear button "C" down briefly. At the same time, the alarm relay is reset. The Status Duo LED shows a code that notifies which warning or alarm arose. To do this, the LED emits short flashing impulses. The number of impulses corresponds to the code number of the error message. The flash codes are displayed as long as the warning or alarm exists. The following codes are emitted by the Status Duo LED:

Warnings (number of orange flash impulses)

- 1 Fan speed error (one of the fans in the fan modules has issued a fan speed error).
- 2 Door open (if a door has been open for more than about 15 s, a warning signal is emitted).
- 3 Defective magnetic valve (this warning is emitted when the magnetic valve is closed and a flow is still measured after about 90 s).
- 4 Defective flow meter (this warning arises when the magnetic valve is opened and no flow can be measured after about 90 s).

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Alarms (number of red flash impulses)

- 1 Leakage determined (when a leak is detected, the magnetic valve shuts and the fans are turned off for about 30 s. After an additional 30 s, the fans are turned on to maximum speed).
- 2 T_{imax} exceeded (if the setpoint temperature is exceeded by a given value (standard 5 K), this high temperature alarm is triggered).
- 3 No water module (this alarm is triggered when no water module is found).
- 4 No fan module (this alarm is triggered when no fan module is found).
- 5 Temperature sensor faulty (this alarm is triggered when a temperature sensor (water or air temperature) is faulty).

If no warning or alarm exists, the status LED shows green.

Note:



After turning on for the first time or after repair work, it is possible that the Liquid Cooling Package will operate in emergency operation mode. In order to switch the unit to normal operation (control operation), press down the "C" button (Fig. 12, Pos. 1) once quickly.

Changing the Module Configurations

If a new module is found over the I²C bus or when a module which had previously been found is no longer present, a "Configuration change" message will be triggered. This will also be shared acoustically and via the alarm relay. This will be indicated on the status LED through quick flashes in the series "red/orange/green". This message is cleared by pressing the Clear button "C" for approx. 2 s, and the new configuration is stored in the internal memory of the control unit.

Design of the temperature control circuit

The actual temperature values of the cold air on the air input side delivered by the LCP modules are used to control the air which is blown into the server enclosure. An average value is determined from the actual temperature values. The control unit constantly compares this (average) actual temperature with the set setpoint temperature. When the setpoint temperature is exceeded, the control unit attempts to maintain a constant temperature by opening and closing the magnetic valve (at approx. 1 minute intervals). Only when the actual temperature falls below the value of "setpoint temperature minus hysteresis" is the magnetic valve closed continuously, i.e. no cold water flows through the heat exchanger. The hysteresis value is normally set at 3 K. Additionally, the necessary fan speed is determined and controlled through determining the temperature difference between the input and the exhaust air (also, in this case, an average value is determined through the modules.) The respective setpoint temperature for the fans and the setting of the magnetic valves is sent to the connected modules via the I²C bus.

Setting the setpoint temperature

The setpoint temperature can be set through the "C" button during stand-alone operation.

- To do this, hold down the "C" button for approx. 5 s.

Next, the unit goes into setting mode. This is indicated through a short acoustical signal and through flashing the setpoint LEDs. The setpoint can be raised 5 K step-by-step while in this mode (range 20 °C to 40 °C).

- To raise the setpoint, press the "C" button quickly.

The current setpoint is shown by the 3 setpoint LEDs (Fig. 12, Pos. 3).

Note:



Extended setting options are possible with the optional CMC (cf. Chapter 6.7, "Extended options by connecting a Computer Multi Control – Top Concept (CMC-TC)" in the operation and maintenance instructions).

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If the C button is not again pressed for approx 10 s, the setpoint will be stored in the internal memory of the control unit and the unit will leave the setting mode. This is indicated by an acoustical signal lasting about 1 s. Additionally, the setpoint LEDs will stop flashing. The setpoints are displayed on the 3 setpoint LEDs, as shown in Fig. 13.

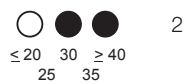
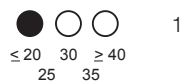


Fig. 13: Temperature setpoint display (example)

- 1 Setpoint temperature 20 °C
- 2 Setpoint temperature 35 °C

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2 Troubleshooting

Malfunction location	Malfunction	Cause of malfunction	Effect	Remedy
Magnetic valve	A connected CMC-TC shows flow, although the magnetic valve is displayed as closed.	Dirty magnetic valve	If a CMC-TC is present: The flow meter displays a value. There is a ΔT .	Use the CMC-TC to open and close the magnetic valve several times; contaminants may be loosened. If no CMC is present, the magnetic valve must be removed and cleaned. It is highly recommended that a filter be installed in the system to ensure the required water quality.
Flow meter		Flow meter is dirty	If a CMC-TC is present: The flow meter displays no value, even when the magnetic valve is open and there is a ΔT .	The flow meter must be removed and cleaned or replaced by authorised personnel. It is highly recommended that a filter be installed in the system to ensure the required water quality.
Electronics/ Software	The electronics/ software do not respond	The system is hung up, e.g. through loose connection or incorrect operation	No response, display and control through the CMC-TC is faulty.	Disconnect power to the complete LCP and restart. Also disconnect any existing network connections by removing the control unit network connector from the LCP.
Liquid Cooling Package	The LCP is not regulating temperature and is operating in emergency mode.	After a power supply interruption or upon first installation, the LCP may operate in emergency mode because of an alarm, e.g. because there is no water pressure.	The magnetic valve is open and the fans operate at full speed.	Press the "C" button on the LCP control unit. The system will then enter regulating mode if all is properly connected and the unit is supplied with electricity and cold water.
	The unit is not providing the required cooling output.	Air in the system	If there is air in the system, the water cannot circulate properly in the heat exchanger. Thus, it cannot remove heat.	Venting the air from the LCP module/heat exchanger module through a special tool (Model No. SK 3301.400).
		Increased pressure loss on the piping network side, e.g. through a clogged filter or incorrectly set flow limiter.	The external pumps are not able to pump enough cold water through the LCP.	Clean the filter, set the flow limiter correctly.
		Air routing not correct	The cooled air passes through unsealed openings past the equipment to the back of the enclosure.	Unused height units in the 482.6 mm (19") level as well as side slots and openings must be sealed using blanking plates or foam strips. Both are available as accessories.
Server enclosure	Overheating of individual equipment in the server enclosure	Disadvantageous arrangement of the LCP module.	As a result of an unfavourable arrangement of the LCP modules on the one hand and the 482.6 mm (19") equipment on the other hand, both unintentional air flows and hotspots may arise.	Basically, the LCP modules should be installed in close physical proximity to the components which are to be cooled. Hotspots arise chiefly in the upper part of a server enclosure. This may be avoided by the targeted installation of an LCP module.

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Malfunction location	Malfunction	Cause of malfunction	Effect	Remedy
Cold water system	Corrosion and contaminants in the cold water system	Insufficient cleaning after a new installation	Unclean and aggressive water leads to a weakening of the material and to improper function. The function of components such as the magnetic valve and the flow meter is strongly impaired through contaminants.	During initial installation, the pipe network and the system parts should be flushed out before the installation of the LCP.
		Improper treatment of the water with corrosion protection additives.		Rittal GmbH & Co. KG recommends the installation of filters and the treatment of the water with appropriate corrosion and, if needed, antifreeze additives. The recommended notes regarding water quality are found in Chapter 14.1, "Hydrological information" in the operation and maintenance instructions.
		Older systems with existing contaminants		Upon integration in critically existing cold water networks, the use of a water/water heat exchanger is recommended. This forms a second water cycle.

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Appendix 1 Installation checklist

Rittal GmbH & Co. KG hopes that this checklist will help its customers and cooperation partners install and operate the products of the Liquid Cooling Package family successfully.

Before the installation:

Are shut-off valves installed in the flow and return?

These valves serve to facilitate exchange or maintenance of the Liquid Cooling Package without requiring that the entire cold water supply is shut off.



Is a tacho setter installed in the return of each Liquid Cooling Package?

The tacho setter ensures a constant volumetric flow and helps to maintain the hydraulic balance of the system, especially when operating with other types of units, such as convectors.

Note:



If the pipework for the Liquid Cooling Package is carried out according to the Tichelmann principle, a tacho setter is not necessary.

Is a dirt trap/filter installed in the flow of each Liquid Cooling Package?

Rittal GmbH & Co. KG recommends that the flow of each Liquid Cooling Package is equipped with a filter in order to protect the parts of the device from malfunction due to contamination from the water system.



Is the water supply area insulation carried out cleanly?

Proper insulation protects against condensate formation, especially on the parts of the cooling water flow.



Photo Amacell

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Are the allowable bend radii of the hoses adhered to?

The hoses may not be kinked too strongly, otherwise the flow volume may be impaired and the materials may fatigue prematurely.



Is there a good water supply available which meets the quality requirements?

Water quality is determinative for the lasting reliability of the system. It ensures that no undesirable corrosion or harmful deposits will occur. The exact manufacturer's recommendations regarding water quality are found in Chapter 14.1, "Hydrological information" in the operating and maintenance instructions of your Liquid Cooling Package. The recommended water quality should be ensured even after the installation.

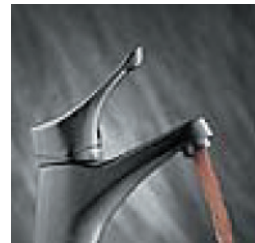


Photo Honeywell

Was the pipework sufficiently flushed before the Liquid Cooling Package was connected?

It is important to clean or flush the water circuits appropriately, especially for new installations. Experience has shown that there are often remnants of sealants, lubricants, and even metal chips in new systems, which may lead to a premature failure of the Liquid Cooling Package. Cleaning the cold water system carefully before connecting the Liquid Cooling Package ensures sure operation later.



If the water quality of the primary cold water supply is inadequate, was a separate water circuit with a water/water heat exchanger installed?

If the cold water supply is strongly contaminated, it may make sense to install a second, high quality cold water circuit which is connected to the primary circuit via a water/water heat exchanger. Even in this case, the water circuit on the Liquid Cooling Package side must be carefully cleaned before connecting the device. Our recommendations regarding water quality in Chapter 14.1, "Hydrological information" in the operating and maintenance instructions of your Liquid Cooling Package apply in this case as well.

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Was the water prepared/
treated with the appropriate
additives?

In addition to our recommendations regarding water quality, we recommend that the water be enriched with corrosion inhibitor and/or antifreeze. Also, a treatment to prevent algae and biofilms may be expedient in some cases.



Photo Clariant

Are unused height units in the
bayed server enclosures
sealed through vertical
blanking plates, and are the
side vertical foam strips
installed?

So that there are no undesired air short circuits and circulation patterns inside the server enclosure, all unused height units of the 482.6 mm (19") level should be closed off with blanking plates. Thus, the air will only enter the rear side of the server enclosure through the server itself, where it is drawn off by the Liquid Cooling Package. The blanking plates are available in various heights, e.g. Model No. SK 1931.200 for one height unit. The vertical foam sealing strips, which are installed on the side in the server enclosure, ensure that the cooled air does not flow on the sides, past the 482.6 mm (19") level. Sealing strips are available for 2 applications and 2 enclosure widths. The respective model numbers are found in Chapter 13, "Accessories" in the operating and maintenance instructions of your Liquid Cooling Package

Are all electrical, water, and
power connections correctly
made?

Before water is admitted, thus, ideally before the ball valves are opened, be sure to check that all connections are properly made. Pay special attention to check that all quick release fasteners are fully snapped into place.

Is the TS/PS – server
enclosure equipped with the
appropriate door?

Both the Liquid Cooling Package Standard and the Liquid Cooling Package Plus function with a sealed air circuit. Thus, the cooled server enclosure must largely be hermetically sealed and equipped with unperforated steel or glass doors on the front and rear sides.

Exception when using the Liquid Cooling Package Extend:
The front/front door of the server enclosure must, in this case, be fully air permeable.

After admitting cold water:

Are all parts and connections
water tight?

Please check to be sure that all parts and connections which carry water are water tight. The Liquid Cooling Package is subject to an individual, comprehensive factory test, which also includes checking for leaks. This additional check serves to locate problems, such as possible transport damage, and to prevent greater damage.

Is the air bled from all modules/
heat exchangers built into the
Liquid Cooling Package?

It is recommended that the air be bled from the Liquid Cooling Package and its modules, especially when the Liquid Cooling Package forms the highest point of the cold water cycle. A vent valve (Model No. SK 3301.400) is available to bleed the air from the modularly built Liquid Cooling Package (Model No. SK 3301.230 and 3301.210). Liquid Cooling Package Plus and Liquid Cooling Package Extend may be bled, following the operating instructions, by their own built-in valves.

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After installation:

We recommend that the following selected parameters be gathered and documented within a short time after installation.

- Inlet temperature
- Return temperature
- Volumetric flow with opened magnetic valve

Note:



Documenting these parameters helps with error analysis if, during operation, malfunctions occur.

Please feel free to contact Rittal if you have further questions or problems:

For malfunctions and repairs

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