Rittal – The System.

Faster – better – everywhere.

TopTherm LCP Rack DX
TopTherm LCP Inline DX

3311.415/425
3311.435/445

Montage-, Installations- und Bedienungsanleitung
Assembly and operating instructions
Notice d'emploi, d'installation et de montage
Montage- en bedieningshandleiding

EN

Foreword

Dear Customer!

Thank you for choosing a Rittal Liquid Cooling Package DX (referred to hereafter also as "LCP DX").

This documentation applies to the following devices in the LCP DX series (DX = Direct Expansion):
– LCP Rack DX
– LCP Inline DX

Those sections where information only applies to one of the two units are labelled accordingly in the documentation.

Please take the time to read this documentation carefully and pay particular attention to the safety instructions in the text and to section 2 "Safety instructions".

This is the prerequisite for:
– secure assembly of the LCP DX
– 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,
Rittal GmbH & Co. KG

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

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1 Notes on documentation

1.1 UL labelling

Rittal GmbH & Co. KG hereby confirms that the cooling units in the LCP DX series are compliant with the EC EMC Directive 2004/108/EC as well as with the EC Machinery Directive 2006/42/EC. A corresponding declaration of conformity has been issued and enclosed with the documentation package supplied with the unit.

The cooling unit bears the following mark.

c UL us LISTED

1.2 Information on electromagnetic compatibility

The LCP DX is a class A device as defined by EN 55022. Under certain circumstances, the device may cause radio interference in domestic environments. In such cases, the operator may be asked to implement appropriate measures.

1.3 Storing the documents

The assembly and operating instructions as well as all applicable documents are integral components of the product. They must be handed to those persons who are engaged with the unit and must always be available and on hand for operating and maintenance personnel.

1.4 Symbols in these operating instructions

The following symbols are found in this documentation:

Danger!
Hazardous situation which may lead to death or serious injury if the instructions are not followed.

Warning!
Hazardous situation which may lead to death or serious injury if the instructions are not followed.

Caution!
Hazardous situation which may lead to (minor) injuries if the instructions are not followed.

Note:
Information concerning individual procedures, explanations, or tips for simplified approaches. Also indicates situations which may result in material damage.

- This symbol indicates an "Action Point" and shows that you should carry out an operation/procedure.

1.5 Other applicable documents

The general plant documentation for the room where the equipment is situated (construction specifications for the ventilation system) also applies in conjunction with these assembly and operating instructions.

1.6 Normative instructions

1.6.1 Legal information concerning the operating instructions

We reserve the right to make changes in content. Rittal GmbH & Co. KG is not responsible for any damage which may result from failure to comply with these assembly and operating instructions. The same applies to failure to comply with the valid documentation for accessories used.

1.6.2 Copyright

1.6.3 Revision

Rev. 0A of 01/11/2016

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2 Safety instructions

The devices in the LCP DX series produced by Rittal GmbH & Co. KG are developed and produced with due regard for all safety precautions. Nevertheless, the unit still poses a number of unavoidable dangers and residual risks. The safety instructions provide you with an overview of these dangers and the necessary safety precautions.

In the interests of your safety and the safety of others, please read these safety instructions carefully before assembly and commissioning of the LCP DX.

Follow the user information found in these instructions and on the unit carefully.

2.1 Important safety instructions:

Danger! Electric shock!
Contact with live electrical parts may be lethal.
Before switching on, ensure that there is no possibility of accidental contact with live electrical parts.
The unit has a high discharge current. Before connecting to the supply circuit, therefore, it is essential to make a 6 mm² (minimum of 10 AWG) earth connection (see section 14.4 "Circuit diagram").

Danger! Injury caused by fan impellers!
Keep persons and objects away from the fan impellers! Do not remove covers until the power supply is disconnected and impellers are not moving! Always use mechanical protection when working! Shut down the respective fan during maintenance work, if possible! Tie long hair back! Do not wear loose clothing!
Fans start up automatically following power disruptions!

Danger! Hot components may cause injury!
In particular, never touch the compressor and cables while operational and for some time thereafter, as they may still be hot.

Danger! Risk of poisoning from refrigerant gases created under the influence of heat.
When carrying out welding and soldering work on the refrigerant circuit, use protective gloves and breathing apparatus with a filter. In case of major leaks, stop smoking immediately. Avoid fire and naked flames.

Danger! Risk of injury from incorrect installation.
Installation of the refrigerant lines and other media connections must only be carried out by qualified plumbers or cooling technology specialists.

Danger! Threat to the environment from escaping refrigerant!
Never allow the refrigerant to escape into the environment if at all possible. In case of unintentional release, direct water jets at the gases, and allow any residue to evaporate.

Danger! Injury due to falling loads!
Do not stand under suspended loads when transporting the unit with a hoist trolley, a forklift, or a crane.

Warning! Danger of cut wounds, especially from the sharp edges of the fan module and heat exchanger modules!
Put on protective gloves before beginning assembly or cleaning work!

Warning! Injuries from escaping refrigerant!
Escaping gas may freeze the skin. Before working on the cooling circuit, put on protective gloves and goggles.

Caution! Risk of malfunction or damage!
Do not modify the unit! Use only original spare parts!

Caution! Risk of malfunction or damage! Proper and flawless unit operation can only be ensured when it is operated under the intended ambient conditions. As far as possible, observe the ambient conditions for which the unit was designed, e.g. temperature, humidity, air purity.

Caution! Risk of malfunction or damage! All media required for the control system, such as the correct fill volume of refrigerant, must be available throughout the entire operating period of the device.

Caution! Risk of malfunction or damage! Installation, and in particular the refrigerant line pipework between the external condenser and the LCP DX, must only be carried out by trained, qualified and accredited cooling system specialists.

Caution! Risk of malfunction or damage! In order to prevent EMC-related malfunctions during operation, and to allow access for servicing purposes, cross-wiring through the LCP DX to the bayed racks is prohibited.

As a general guideline, please observe the following five safety rules when working in and on the LCP DX, in order to avoid accidents:

1. Switch off!
   Switch off the LCP DX at the master switch.
2. Prevent reactivation!
3. Ensure that all poles are de-energized!
4. Earth and short-circuit!
5. Cover or shield adjacent, live parts

2.2 Service and technical staff

The installation, commissioning, maintenance and repair of this unit may only be carried out by trained, qualified mechanical and electro-technical EPA certified personnel.

Only properly instructed personnel may service a unit while in operation.

2.2.1 Personal safety equipment

Personal safety equipment, which should as a minimum include thermally insulated gloves and protective goggles, is to be worn during any work on this unit when personnel might come into contact with refrigerant (see section 14.1 "Refrigerant information").

Additionally, in the event of fire, airtight respiratory masks must be worn.

2.3 Operator requirements

It is recommended that the operator carry out a leak test using a suitable test device at least once a year. Any leaks that are detected must be repaired immediately.

Note:
Rittal offers leak testing of the device as a service.

2.3.1 Abbreviated instructions

The operator must ensure that abbreviated instructions containing the following information are available in a readily accessible location on the LCP DX.

1. Name, address and telephone number of the installation company, its customer service department, or the customer service department of the owner/operator, or as a minimum requirement, the individual responsible for the cooling system, together with the address and telephone number of the fire department, police, hospitals and burn victims centers.
2. Type of refrigerant: R-410a, comprising 50% difluormethane R-32 (CH_2F_2) and 50% R-125 pentafluoroethane (C_2HF_5);
3. Instructions for switching off the cooling system in an emergency (see section 7.2.3 "Switching off in an emergency");
4. The maximum permissible pressures (see section 11 "Technical specifications").
5. List the actual field piping length and charge amount on the provided label.

2.3.2 System log

Follow applicable national and local codes and good practices by keeping a system log and ensure that it is regularly updated. The system log may need to contain the following information:

1. Details of all repair work
2. Quantity and type (new, reused or recycled) of refrigerant added, quantity of refrigerant removed
3. Outcome of any analysis of reused refrigerant, if available
4. Origin of reused refrigerant
5. Amendments to and replacement of system components
6. Results of all regular routine checks and
7. Any significant shutdowns.

2.3.3 F-gas regulation

Follow all applicable EPA and national and local codes as it relates to the use, recovery and destruction of certain fluorinated greenhouse gases, and the labelling and disposal of products and equipment containing such gases.

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2.4 RoHS compliance

The LCP DX fulfils the requirements of EU Directive 2011/65/EC on the Restriction of Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) of 1 July 2011.

Note:
Corresponding information about the RoHS Directive may be found on our website at www.rittal.com/RoHS.

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3 Device description

3.1 General functional description

The Liquid Cooling Package DX (DX = Direct Expansion) is essentially a split air conditioning unit used to dissipate high heat losses from server enclosures or for the effective cooling of devices built into a server enclosure.

The air routing in the LCP DX supports the "front to back" cooling principle of the devices built into the server enclosure. The hot air expelled by the devices in the server enclosure is drawn in by the fans at the rear directly from the server enclosure (LCP Rack DX) or from the hot aisle (LCP Inline DX) and thus routed through the heat exchanger module.

In the heat exchanger module, the heated air is directed through a heat exchanger (refrigerant evaporator), and its thermal energy (heat losses from the server) is transferred to the refrigerant. This causes the refrigerant to change from a liquid to a gaseous state. As a result, the air is cooled to a freely selectable temperature within the authorised parameters and then routed directly in front of the 482.6 mm (19") level in the server enclosure (LCP Rack DX) or into the cold aisle (LCP Inline DX).

In its delivered state, cold air from the LCP Inline DX is expelled to the front; it is also possible to expel the cold air on both sides, or by mounting a side panel, at one side of the device.

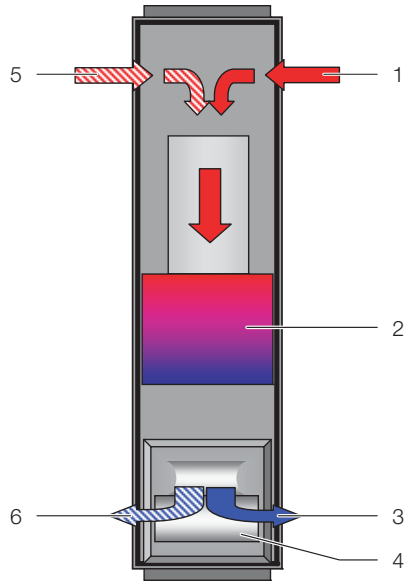

Fig. 1: Air routing on the LCP Rack DX – top view

Key

1 Air inlet
2 Heat exchanger
3 Air outlet
4 Fan module
5 2nd air inlet
6 2nd air outlet

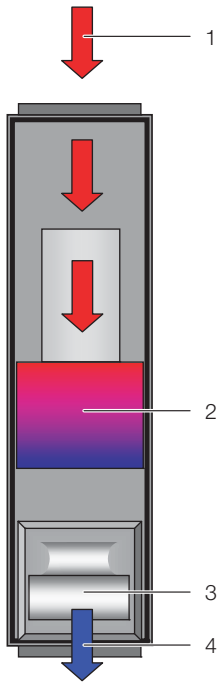

Fig. 2: Air routing on the LCP Inline DX – top view

Key

1 Air inlet
2 Heat exchanger
3 Fan module
4 Air outlet

In the LCP Rack DX and LCP Inline DX, the temperature of the impelled cold air is controlled by continuously comparing the actual temperature with the setpoint temperature (preset to +22°C/71.6°F).

If the actual temperature exceeds the setpoint temperature, the speed of the compressor is automatically increased, providing a greater cooling output from the heat exchanger, until the setpoint temperature is reached.

In the LCP Rack DX and LCP Inline DX, the temperature differential between the setpoint and the warm air intake is used to calculate and control the fan speed.

Any condensate incurred is collected in the condensate collecting tray integrated into the LCP DX below the heat exchanger, and from there is routed outside via a condensate discharge hose.

3.2 Air routing

3.2.1 General

In order to achieve sufficient cooling in the server enclosure, it is important to ensure that the cooling air passes through the interior of the built-in units and is unable to flow past at the sides.

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Targeted air routing inside the server enclosure has a major effect on the heat loss to be dissipated.

In order to ensure targeted air routing in the system, the server enclosure should be divided vertically into warm air and cold air sections. The division is accomplished in the front section of the server assembly to the left and right of the 482.6 mm (19") level using foam strips or air baffle plates which, depending on the enclosure width and the number of server enclosures to be cooled, can be ordered as an accessory (see section 13 "Accessories").

If devices which require sideways air throughput are also built into the server enclosure (e.g. switches, router, etc.), these may be cooled by means of targeted placement of the foam strips or air baffle plates.

Note:
The 482.6 mm (19") level must likewise be completely sealed. This is already the case in a fully equipped server enclosure. With a partially configured server enclosure, the open height units (U) of the 482.6 mm (19") level must be sealed with blanking plates, which are available as Rittal accessories (see section 13 "Accessories").
The more devices are installed in the server enclosure, the more important it becomes to follow this specification.

3.2.2 LCP Rack DX

The LCP Rack DX may optionally be bayed on the right or left of a server enclosure or between two server enclosures, according to preference.

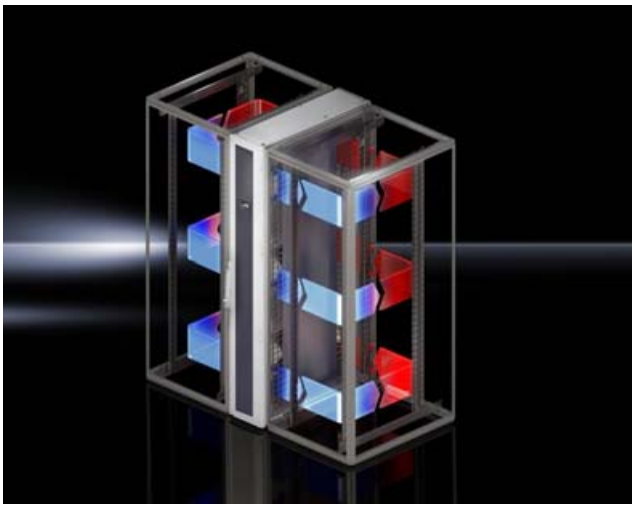

Fig. 3: LCP Rack DX on two server enclosures

Together with the bayed server enclosure, the LCP Rack DX forms an airtight cooling system with horizontal air routing. It places no additional demands on the room's climate control system.

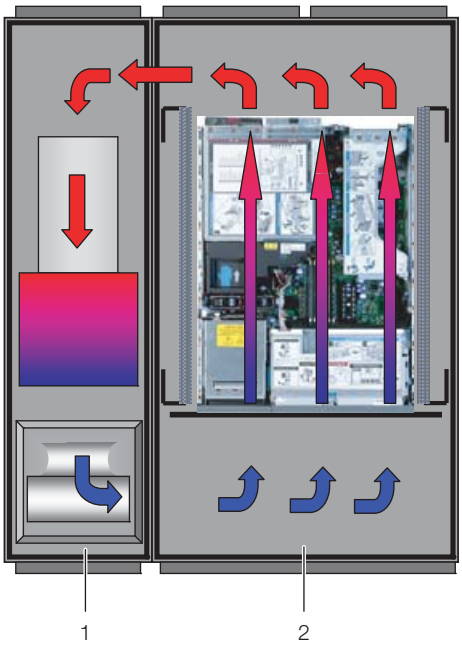

Fig. 4: Air routing with a bayed server enclosure – top view

Key
1 LCP Rack DX
2 Server enclosure

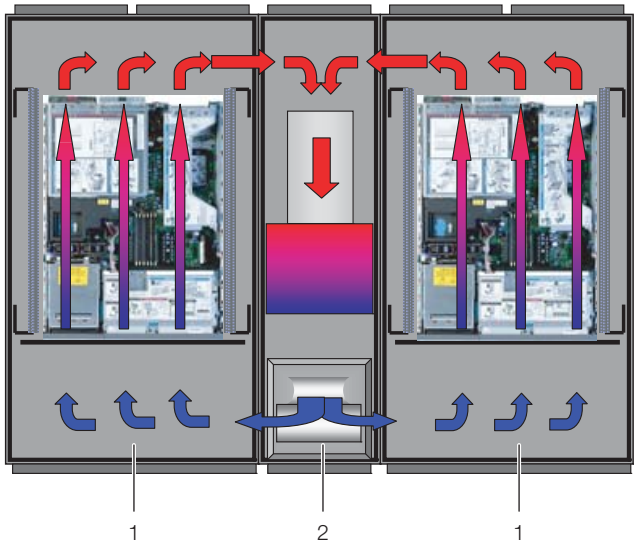

Fig. 5: Air routing with two bayed server enclosures – top view

Key
1 Server enclosure
2 LCP Rack DX

The system consisting of the LCP Rack DX and the server enclosure should be sealed as effectively as possible in order to prevent the loss of cooling air. To accomplish this, the enclosure is equipped with side panels, roof and gland plates. Any existing cable entries should be sealed e.g. using suitable brush strips.
Whilst the system is in operation, both the front and the rear doors should be kept completely shut.

Note:
However, the system does not need to be completely airtight, thanks to the high, co-ordinated air throughputs of the server and LCP fans.

3.2.3 LCP Inline DX

Targeted air routing by hot air extraction from the hot aisle and cold air blown into the cold aisle has a fundamental effect on the amount of heat to be dissipated.

In order to achieve sufficient cooling in the server enclosure, it is important to ensure that the cooling air passes through the interior of the built-in units and is unable to flow past at the sides.

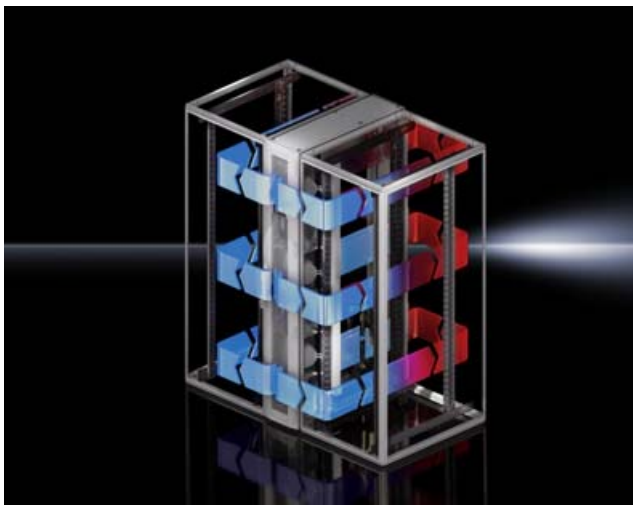

Fig. 6: LCP Inline DX on two server enclosures

For this purpose, the system consisting of LCP Inline DX, server enclosure and cold aisle containment should be well sealed in order to avoid a decrease of the cooling capacity due to mixing of cold and hot air. This is achieved by sealing the cold aisle with doors at the beginning and end of the rack rows, and sealing it at the top with roof elements. Existing cable entry glands are additionally sealed e.g. using suitable brush strips.

3.3 Equipment assembly

3.3.1 Unit components

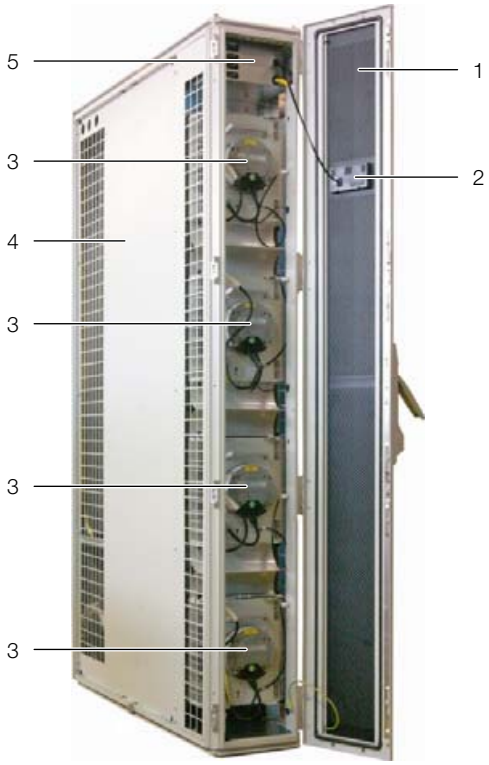

Fig. 7: LCP Rack DX front – open front door

Key

1 LCP door
2 Display
3 Fan
4 Rack
5 Electronics box with switches for fans

The device variants differ as follows at the front:
– LCP Rack DX: Solid front door
– LCP Inline DX: Perforated front door

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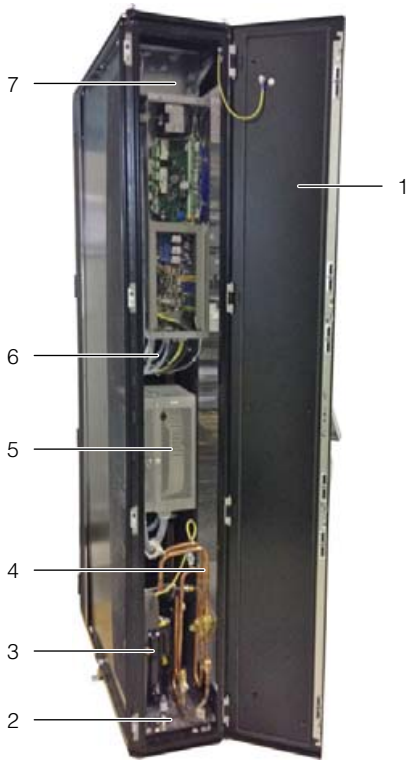

Fig. 8: LCP Rack DX rear – rear door open

Key

1 Rear door
2 Condensate collecting tray
3 Compressor
4 Connection lines to the external condenser
5 Inverter
6 Heat exchanger (evaporator coil)
7 Electronics box with voltage connection and network connection

The device variants differ as follows at the rear:
– LCP Rack DX: Solid rear door
– LCP Inline DX: Perforated rear door

The LCP DX consists of a hollow welded frame in which the evaporator coil, fan modules and compressor are installed.

3.3.2 Heat exchanger assembly

The Heat exchanger assembly consists of the following components:
– Compressor: The compressor compresses the refrigerant and causes it to circulate from the low-pressure side (evaporator coil) to the high-pressure side (external condenser). The motor is activated by an external inverter, which controls the speed of the compressor and therefore allows the cooling output to be precisely adapted to the actual cooling requirement.
– Evaporator coil: The evaporator coil (air/refrigerant heat exchanger) is positioned in the centre of the LCP DX. Any condensate incurred is discharged into a condensate collecting tray in the bottom section of the device.
– Electronic expansion valve: The expansion valve supplies the evaporator coil with the required volume of refrigerant to provide the corresponding cooling output in the current ambient conditions.
– External condenser: The condenser is sited outdoors from the room where the LCP DX is situated. Connection details for the LCP DX may be found in section 6 "Installation".

Note:
Condenser unit 9951.077 is required in order to operate the LCP DX. No other external condenser may be used.

Fig. 9: External condenser (9951.077)

– Temperature sensors: There are three temperature sensors installed on the front of the device near the fans. These measure the cold air temperature and forward the readings to the control unit. There are three further temperature sensors installed on the rear of the evaporator coil. These measure the hot air temperature and likewise forward the readings to the control unit.

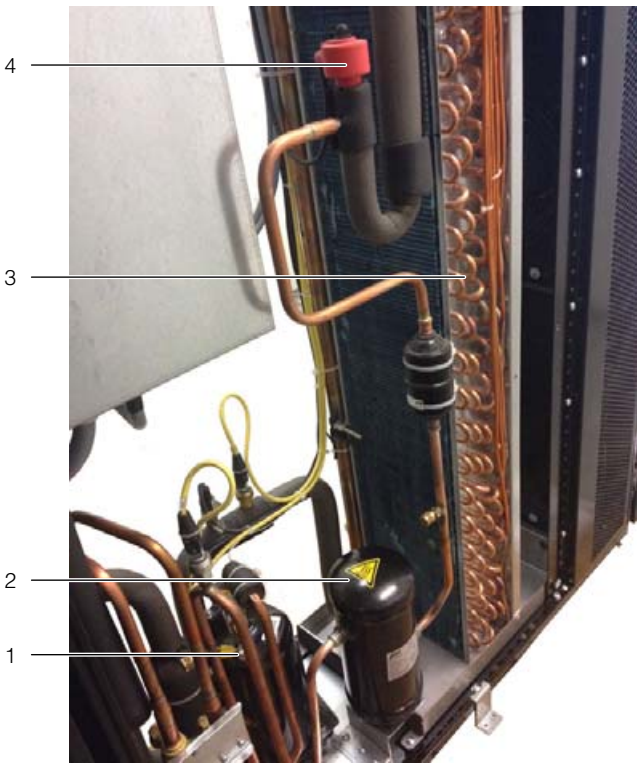

Fig. 10: Heat exchanger

Key

1 Compressor
2 Refrigerant receiver
3 Evaporator coil
4 Electronic expansion valve

3.3.3 Fan module

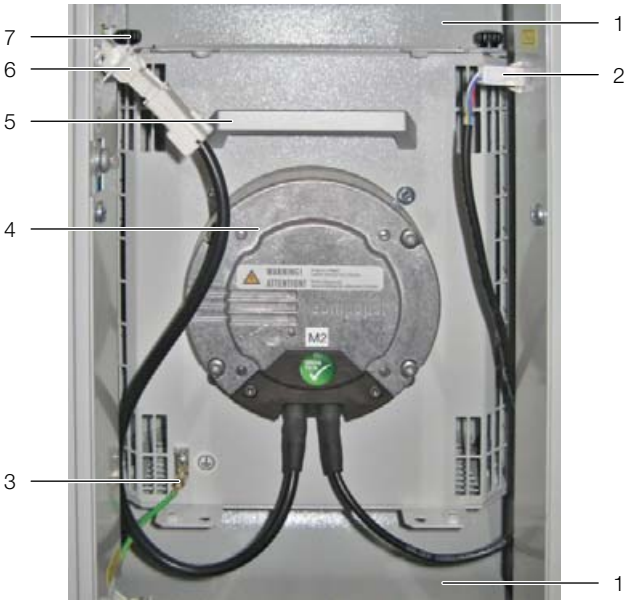

Fig. 11: Fan module in fan tray

Key

1 Air baffle plate
2 DC connection cable (control voltage)
3 PE conductor connection
4 Fan
5 Handle
6 AC connection cable (power supply)
7 Knurled screws

A fan module is essentially comprised of the fan itself. All fan modules are controlled via a joint control unit mounted in the electronics box in the upper section of the LCP DX. Fans may be operated with linear control between 30% and 100%.

The fan modules are installed on rack-mounted shelves in the front section of the LCP DX.

It takes approximately 2 minutes to replace a single fan module with the system operational (see section 5.3 "Fan installation").

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3.4 Proper and improper usage

The LCP DX is used to dissipate high heat losses and effectively cool devices built into a server enclosure. The unit is designed solely for static use in sealed rooms.

The unit is state of the art and built according to recognized safety regulations. Nevertheless, improper use can present a hazard to life and limb of the user or third parties, or result in possible damage to the system and other property.

Consequently, the unit must only be used properly and in a technically sound condition.
Any malfunctions which impair safety should be rectified immediately. Follow the operating instructions!
Proper usage also includes following the operating instructions and fulfilling the inspection and maintenance conditions.

Inappropriate use can be dangerous. Examples of inappropriate use include:
– Using a different condenser unit other than Model No. 9951.077.
– Use of impermissible tools.
– Improper operation.
– Use of a refrigerant other than R-410a.
– Use of a refrigerant fill volume other than that specified.
– Installation of the external condenser in an unsuitable position.
– Operation with less than four installed fans.
– Improper rectification of malfunctions.
– Use of replacement parts which are not authorized by Rittal GmbH & Co. KG.
– Non-static use, e.g. on moving or vibrating machines.
– Using outside any of the design specifications, including heatload and ambient conditions.

3.5 Supplies included with the LCP DX

The LCP DX supply includes:

Qty.	Parts
1	LCP DX, ready for connection
	Accessories:
1	Condensate hose, 90° and straight fittings
1	Fuse grip

Tab. 1: Supplies included with the LCP DX

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4 Transportation and handling

4.1 Transportation

The LCP DX is delivered shrink-wrapped on a pallet.

Caution!
Because of its height and small base, the LCP DX is subject to tipping. Risk of toppling, especially after the unit is removed from the pallet!

Caution!
Transport of the LCP DX without a pallet: Use only suitable and technically sound lifting gear and load-bearing devices with sufficient load capacity.

4.2 Unpacking

- Remove the unit's packaging materials.

Note:
After unpacking, the packaging materials must be disposed of in an environmentally friendly way. They are comprised of the following materials:
Wood, polyethylene film (PE film), strap, edge protectors.

- Check the unit for any damage that occurred during transport.
- Place the unit in its intended location.

The electrical box is secured with 2 brackets for transportation.

Fig. 12: Brackets for transportation

Key
1 Brackets

- Remove these 2 brackets with a screwdriver.

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5 Assembly and installation

5.1 General

5.1.1 Installation site requirements

In order to ensure problem-free operation of the LCP DX, the following conditions for the installation site should be observed:

Positioning of the LCP DX in the server room relative to the external condenser

The interior device (LCP DX) and the external condenser must be connected with a suitable copper pipe connection in accordance with national and local codes. Refer to ASHRAE Refrigeration Handbook for general good practices for refrigeration piping. The entire system must then be filled with refrigerant R-410a (see section 6.2 "Notes on pipework").

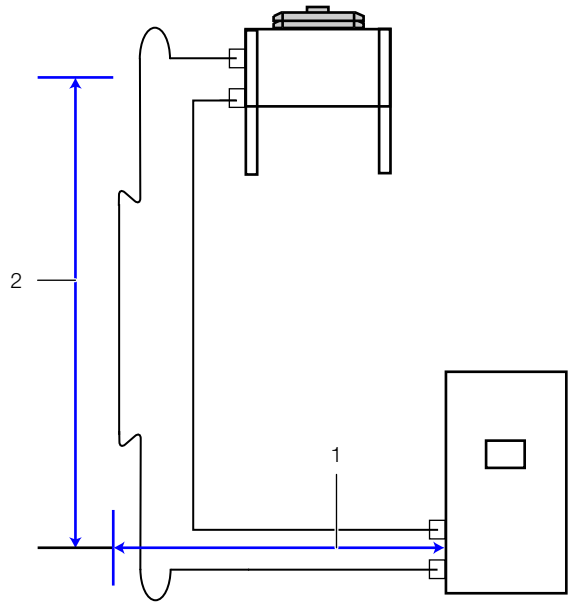

Fig. 13: Relative positioning – condenser above the LCP DX

Key

1 Offset in a side direction
2 Condenser offset above the LCP DX

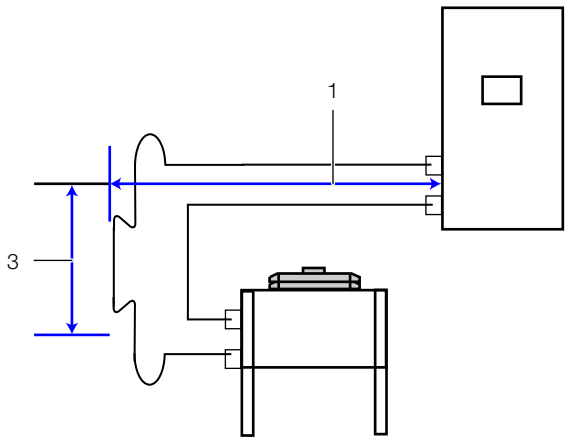

Fig. 14: Relative positioning – condenser below the LCP DX

Key

1 Offset in a side direction
3 Condenser offset below the LCP DX

The following distances and elevation differences must not be exceeded when installing the LCP DX and the external condenser:

Position	Distance
Sum total of horizontal (fig. 13, item 1) and vertical spacing (fig. 13, item 2 or item 3) between the LCP DX and the condenser	Max. 30 m (98.4 ft) equivalent length
Condenser above LCP DX (fig. 13, item 2)	max. 20 m (65.6 ft)
Condenser below LCP DX (fig. 13, item 3)	max. 3 m (9.8 ft)

Tab. 2: Distances and elevation differences

Note:
Maximum distance includes bends and traps (see section 6.2 "Notes on pipework").

Supply connections required at the installation site

Type of connection	Connection description:
LCP DX power inlet	208 V, 1~, N, PE, 60 Hz
External condenser power inlet	208/230 V, 1~, 60 Hz
Refrigerant pipe	Copper pipework, 0.5" actual OD and minimum 0.032" thickness. See Note below.

Tab. 3: Supply connections required at the installation site

Type of connection	Connection description:
Refrigerant pipe reducing couplers	0.5" x 0.875" OD to OD and 0.5" x 1.125" OD to OD copper reducing couplers to connect condenser. They may be obtained from companies like Mueller/ Streamline Industries.

Tab. 3: Supply connections required at the installation site

Note:
Rittal recommends using Type "K" or "L" Nitrogenized ACR/MED hard copper tubing or rolled dehydrated and nitrogen purged and sealed copper tube manufactured in accordance to ASTM B280 and ANSI B9.1 refrigeration industry standards. Tubing size is ½" actual OD and minimum wall thickness of 0.032".

Note:
A voltage of at least 208 V is required to start the device.
If the mains voltage briefly drops 10% below 208 V with the system operational, it will not malfunction.

Note:
Please also observe the instructions and data relating to the refrigerant connection as outlined in section 6 "Installation".

Recommendation:
For easier servicing of the LCP DX, maintain a distance of at least 1 m (3.2 ft) between the front and rear of the device and the nearest wall.

Floor conditions

– The floor of the installation space should be rigid and level.
– Choose the installation site so that the unit is not situated on a step or uneven surface, etc.

Indoor Climate Conditions

Recommendation:
Room temperature +22°C (71.6°F) at 50% relative air humidity, according to ASHRAE guidelines.
Where necessary, these values should be achieved by an additional room air-conditioning system.

Electromagnetic interference

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

Heat loss from the equipment

– The equipment in the server enclosure being cooled must generate a heat loss of at least 3 kW.

5.1.2 Prepare the installation room for the LCP Inline DX

The installation room of the LCP Inline DX must be divided into one cold air zone and one hot air zone. This ensures that no cooling capacity is lost due to mixing of cold and hot air.

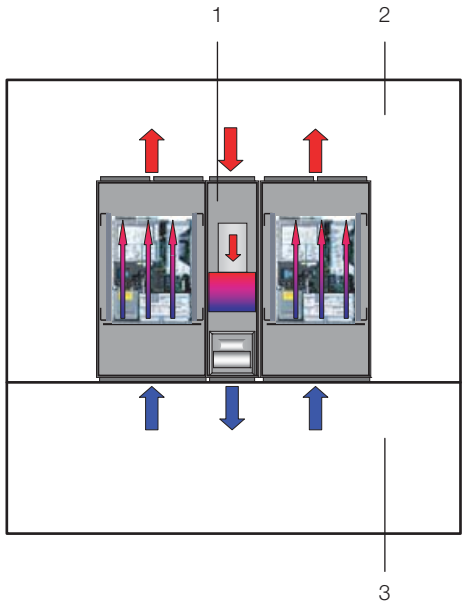

Fig. 15: Installation room with cold aisle containment

Key

1 LCP Inline DX
2 Hot aisle
3 Cold aisle

Note:
All the components needed for cold aisle containment are available from Rittal as accessories.

5.1.3 Installation guidelines for LCP Inline DX

The positioning in the rack aisles must be considered when planning the layout. The following points are to be considered:

– Heat loss in the adjacent server racks
– Air throughput in the adjacent server racks
– Distances from the adjacent server racks

Heat losses in the adjacent server racks

If the LCP Inline DX is used in combination with server enclosures with high heat losses, the number of LCP Inline DX units must be adapted according to the char-

acteristic curves. The air temperature difference between server inlet and server outlet, which is determined by the equipment used, is particularly important. As a rule of thumb, a temperature difference of 15 K (27°F) can be expected. There may, however, be greater differences.

Air throughput in the adjacent server racks
Due to the containment of the hot and cold zones, it is important to ensure that the LCP Inline DX delivers a sufficient amount of cold air into the cold zone. From there, the cold air is drawn back into the server enclosures by the equipment. A small surplus of air should generally be provided in order to compensate for any short-term demands of the equipment.

Distances from the adjacent server racks
In small applications and short aisles, the above points will not have a major impact on properties or cooling capacity provided the hot zone is thoroughly and precisely sealed off from the cold zone. For larger applications and long aisles, however, it is important to ensure even spacing of the cooling units, due to the loss of air throughput caused by external pressure losses and convection or radiation heat of the equipment. Other factors, such as high-temperature rooms adjacent to the cold zone or exterior walls warmed by the sun, can also occur.

5.2 Assembly procedure

5.2.1 General

Before the LCP DX can be bayed onto a server enclosure, the following work should be carried out.
– Dismantle the side panels,
– Seal the server enclosure and
– Dismantle the server enclosure door.

5.2.2 Dismantle the side panels

Caution! Risk of injury!
The side panel holders have sharp-edged teeth, which enable earthing of the server enclosure's side panel.

If there is a side panel or partition mounted on the server enclosure side to which the LCP DX is to be bayed, this must be removed first.

- 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 LCP DX is to be bayed.
- Dismantle both side panel mountings from the upper mounting rail of the server enclosure, using an appropriate lever.
- Loosen and remove the screws on both of the side panel mounting brackets (top and bottom) in the middle of the mounting rail.
- Loosen and remove the screws from the 6 side panel holders on the side mounting rails.

5.2.3 Seal the server enclosure

In order to ensure targeted air routing in the system, the server enclosure is vertically divided into hot air and cold air zones 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.

Note:
Blanking plates in a range of height units (U), together with both narrow and wide foam strips and air baffle plates, are available as Rittal accessories (see section 13 "Accessories")

- Fasten the wider (Model No. 3301.370 / 3301.320) of the two foam strips from the LCP DX accessories onto one of the front uprights of the server rack from the outside (fig. 16). Make sure to install this strip on the side of the server enclosure onto which the LCP DX is to be bayed.
- **If you are only baying the LCP DX on one side:** Fasten the narrower (Model No. 3301.380 / 3301.390) of the two foam strips from the LCP DX accessories onto one of the front uprights of the server rack from the outside (fig. 16). Make sure to install this strip on the side of the server enclosure which will again be sealed by a side panel.

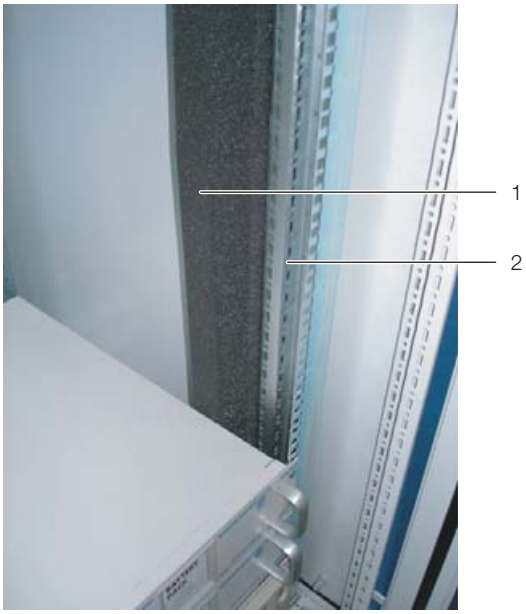

Fig. 16: Foam strip on a server rack upright

Key

1 Foam strip
2 Server rack

If the server enclosure contains devices which require cooling via sideways air throughput (e.g. switches, router, etc.), cut-outs must be incorporated into the foam strips.

- To do this, cut out a piece of the foam strip using 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 or right at the height of each such device in the server rack. Ensure that there are no gaps on the hot air side of the devices (fig. 17, item 3).
- Using a sharp knife, cut additional pieces from the foam strip that are at least as long as the height of the built-in devices.
- Attach the foam strips to the cold air side of the devices set back towards the rear (fig. 17, item 4), making sure that all fans built into the devices can draw air and that none of them are blocked.

Note:
The foam strips can be attached between the front and rear uprights of the server rack along the entire depth of the devices with sideways air throughput (fig. 17, item 5).

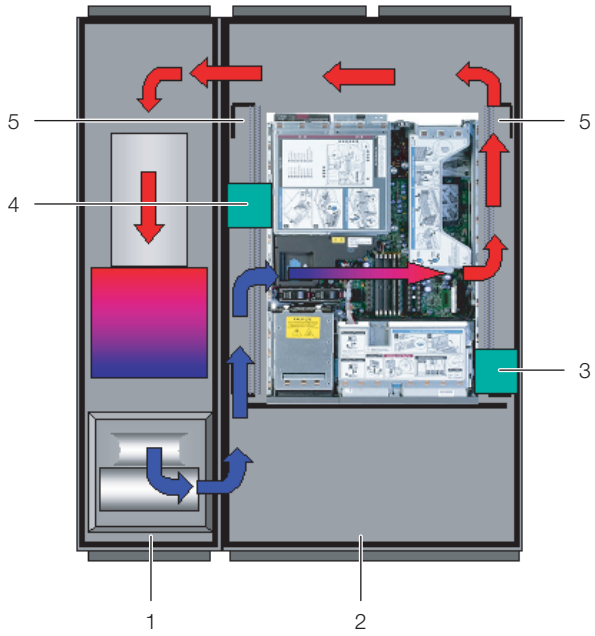

Fig. 17: Placement of foam strips for devices with sideways air throughput (top view) – LCP Rack DX

Key

1 LCP Rack DX
2 Server enclosure
3 Foam strips on hot air side
4 Foam strips on cold air side
5 Area in which the foam strips can be positioned

- If there is any surplus length of the foam strip on the server rack, cut it off at the top edge of the rack.

Note:
The LCP DX may optionally be bayed onto a server enclosure either 600 mm or 800 mm wide. For this reason, the LCP DX accessories include a total of four foam strips or corresponding air baffle plates with differing dimensions (see section 13 "Accessories").

- On the side of the server enclosure opposite the LCP DX, mount a side panel on the two side panel mountings. Align it with the front and rear 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.

5.2.4 Dismantle the server enclosure door

Before baying a LCP DX, at least one of the two 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.

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Note:
It is only necessary to dismantle a server enclosure door when the LCP DX is to be bayed onto a previously erected server enclosure. Otherwise, this work is not necessary.
If the LCP DX is to be installed together with a new server enclosure, proceed according to the enclosure's assembly instructions and bay the LCP DX 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 using 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 pin holding fixture as far as they will go (see fig. 18, step A).
  Begin with the lowest door hinge.

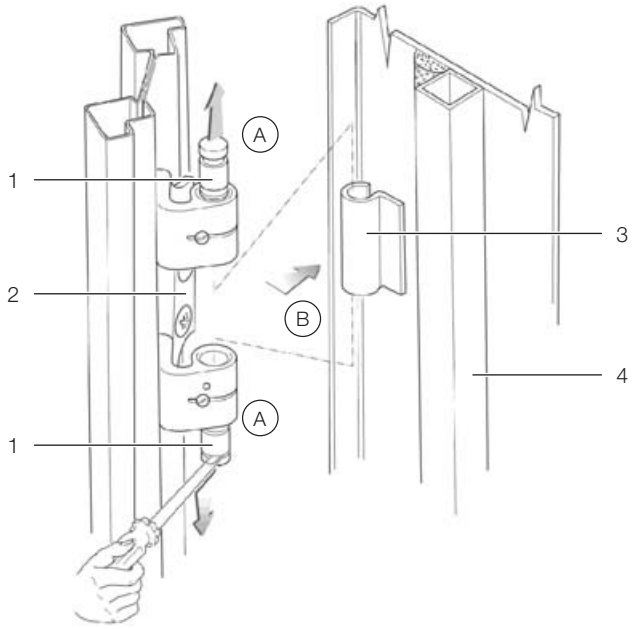

Fig. 18: Removing a door hinge

Key
1 Door hinge
2 Hinge pin holding fixture
3 Hinge joint
4 Server enclosure door

Note:
Support the server enclosure door so that it will not fall as the door hinge pins are loosened. If necessary, work with a second person.

- Remove the server enclosure door (fig. 18, step B).

5.2.5 Installation and baying of the LCP DX

- Position the LCP DX on the side of the server enclosure to which it is to be bayed.
- Align the LCP DX with the server enclosure. Ensure that the LCP DX is aligned horizontally and that both enclosures are adjusted to the same height and are vertically aligned to each other.
- Dismantle the door of the LCP DX whose hinges are on the side on which the server enclosure is to be bayed. Proceed as described in section 5.2.4 "Dismantle the server enclosure door".

Note:
If the LCP DX is to be bayed between two server enclosures, both doors of the LCP DX must be dismantled before the baying connectors are installed, so that the attachment points for the baying connectors are accessible.

- Using the corresponding assembly screws, fasten three baying connectors each (fig.19, item 2) onto the attachment points provided in the mounting strips on the front and rear of the LCP DX (fig.19, item 1).

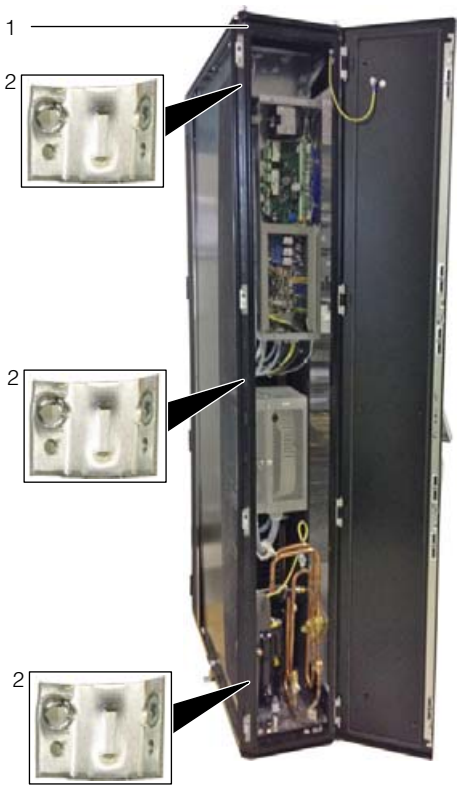

Fig. 19: LCP Rack DX – rear

Key
1 LCP Rack DX
2 Baying connector

- In the same way, fasten the baying connectors onto the attachment points provided in the mounting strips on the front and rear of the server enclosure. As needed, press the LCP DX lightly against the server enclo-

sure in order to bring the baying connectors into alignment with the attachment points.
- If applicable, attach the rear door to the LCP DX.
- Finally, check the stability of the LCP DX once again.

5.2.6 Mounting the side panel

If the LCP DX is not bayed between two server enclosures, close it off with a side panel.

Caution! Risk of injury!
The side panel holders have sharp-edged teeth, to enable earthing of the side panel through the LCP DX.

Proceed as follows to assemble the side panel:
- Remove the various assembly components from the optional side panel package (Model. No. 9966.012) 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 LCP DX which is opposite to the server enclosure.
- Place both side panel mountings as symmetrically as possible onto the upper mounting rail of the LCP DX and, using your hand, press them firmly in place.
- Screw down the two side panel mounting brackets top and bottom in the centre of the mounting rail using one screw each.
- Screw down 3 side panel holders onto each of the two side mounting rails with one screw each.
- Mount a side panel onto the two side panel mountings of the LCP DX and align them to the front and rear of the unit.
- Using the 8 assembly screws, screw the side panel firmly onto the side panel holders and the side panel mounting brackets.

5.3 Fan installation

In its delivered state, the LCP DX contains 4 fan modules as standard. Even if a smaller cooling output is required, all 4 fan modules must remain in the device.

Caution! Risk of injury!
Before installing or removing a fan, be sure to de-energize the relevant fan using the toggle switch.

If a fan module is defective, it can be replaced quickly and easily with the unit operational.

Proceed as follows to remove a fan module:
- Open the front door of the LCP DX.
- On the electronics box, deactivate the switch for the fan you wish to replace.

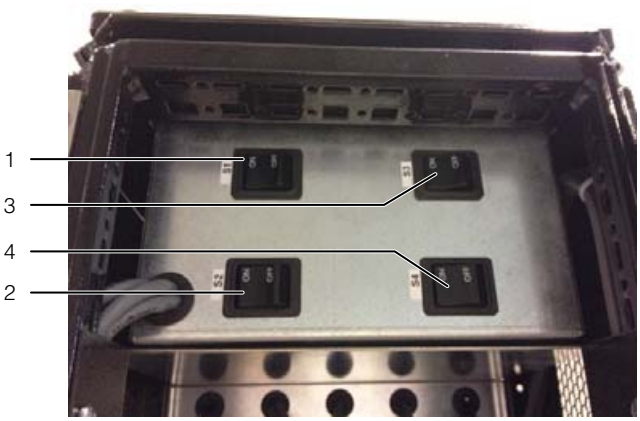

Fig. 20: Electronics box – front

Key
1 Switch for fan 1 (top fan in the LCP DX)
2 Switch for fan 2
3 Switch for fan 3
4 Switch for fan 4 (bottom fan in the LCP DX)

- Release the two DC and AC fan connectors on the left and right (fig. 21, items 2 and 6).
- Disconnect the PE conductor connection on the fan (fig. 21, item 3).
- Loosen the two knurled screws, right and left (fig. 21, item 7), at the top and bottom of the fan air baffle plates.

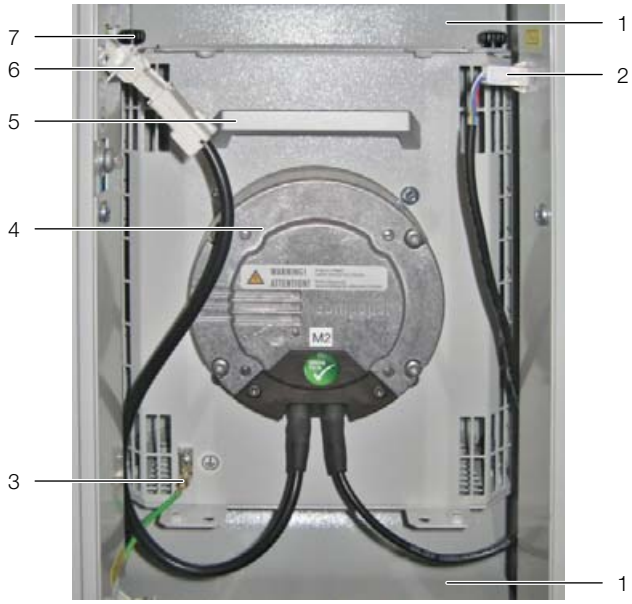

Fig. 21: Fan module in fan tray

Key
1 Air baffle plate
2 DC connection cable (control voltage)
3 PE conductor connection
4 Fan
5 Handle
6 AC connection cable (power supply)
7 Knurled screws

- Rotate the fan module in the rack in a clockwise direction by 90° (fig. 22).

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- Grasp the fan module with both hands on the left and right, and pull it out of the rack.

Fig. 22: Rotated fan module in fan tray

Note:
For permanent operation: the LCP DX may only be operated with all four fans running.

5.4 External condenser

The installation site of the external condenser must be selected in such a way as to ensure an adequate supply and distribution of the airflow, even in unfavourable conditions (see section 5.1.1 "Installation site requirements").

To ensure ease of access to the external condenser for servicing purposes, a sufficiently large distance from the surrounding walls must be ensured.

It is also important to ensure that no foreign bodies such as leaves can be drawn into the condenser.

With unprotected installation of the external condenser, it is important to prevent unwanted external air streams through the condenser (e.g. via roof installation). Such air streams and other weather factors, such as snow and ice, may alter the control response of the LCP DX (see section 6.4.3 "Connecting the external condenser").

Note:
Horizontal units (fan air flow is horizontal) should be installed with coil side facing the prevailing winds. If strong variable winds are common, it is recommended that a field fabricated wind baffle be used on the inlet side of the unit. Refer to condenser instructions for more details.

Note:
Refer to condenser instructions for minimum air clearance requirements and proper installation procedures (see http://Rittal.us).

Note:
Where inclement winter weather is anticipated, horizontal condenser mounting may help keep snow and ice from blocking fans. Make sure condenser is mounted above the anticipated snow level and keep unit clear during the winter.

Note:
Keep condenser clear of leaves, vegetation, and other debris. Blocked coil and/or fan will affect DX performance.

6 Installation

Caution! Risk of malfunction or damage! Installation, and in particular the refrigerant line pipework between the external condenser and the LCP DX, must only be carried out by trained, qualified and accredited cooling system specialists.

6.1 General

The interior device (LCP DX) and the external condenser must be connected with suitable copper pipework. This pipework may either be inserted from above via ducting in the roof plate or, if the device is positioned on a raised floor or on a pedestal, from below into the LCP DX. Also, if there is no raised floor, a pedestal will be required for the condensate tube to exit the unit (see section 6.3 "Connecting the condensate discharge").

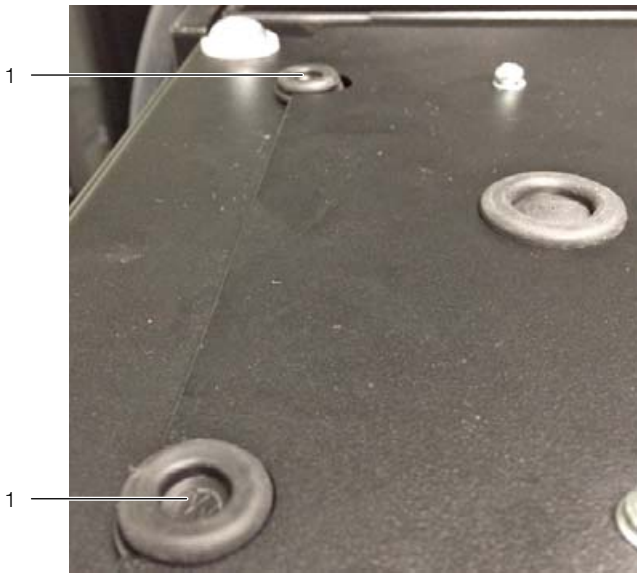

Fig. 23: Duct for refrigerant piping from above

Prior to delivery, the LCP DX is filled with 1.5 bar (21.8 psi) nitrogen. It is therefore crucial that the following steps are always carried out in the order shown.

Note:
Installation of the pipework, creation of a vacuum and filling with refrigerant must only be carried out by qualified, trained staff in accordance with the valid technical regulations. Furthermore, when carrying out the installation, it is important to observe all the pipework instructions in section 6.2.

6.2 Notes on pipework

The following basic rules should be observed when connecting the LCP DX and external condenser.

General

1. The piping system may be made exclusively of special copper pipes that have been cleansed inside and sealed on both ends. The material of the copper pipework must comply with the specifications outlined in national and local codes.
2. The external diameter of the copper pipe must be 0.5" actual OD and minimum wall thickness of 0.032" (see section 5.1.1 "Installation site requirements" for details), both for the hot gas line from the compressor to the condenser, and for the liquid line from the condenser to the expansion valve. The copper pipe must be suitable for the admissible pressure PS = 42 bar (609 psi) of the R-410a refrigerant.

In order to ensure the correct spatial arrangement of the pipework, particular consideration should be given to the position of the individual pipes, the flow conditions (two-phase flow, oil transportation in part-load operation), condensation processes, thermal expansion, vibration, and good accessibility.

Note:
The routing and brackets of the pipework have a significant influence on the operational reliability and service-friendliness of a cooling system.

As a general rule, pipelines should be laid in such a way as to prevent damage associated with routine activities. For safety reasons, and in order to protect the environment, the following aspects should be taken into account when laying pipework:

1. There must not be any threat to human safety, i.e. escape and emergency vehicle routes must not be obstructed or restricted in any way. When using refrigerants of groups A2, B1, B2, A3 or B3, no detachable connections or fittings must be positioned in publicly accessible areas. When using other refrigerants, protection against unintentional actuation or disconnection should be provided.
2. Pipework should be protected from the thermal influence of hot lines and heat sources by means of spatial separation.
3. Brazing, welding and mechanical joints in connection pipes (e.g. in split systems) should be carried out before the fittings are opened, so as to ensure the flow of refrigerant between the plant parts. A valve should be provided to extract air from the connection pipes and/or any part of the cooling system that remains unfilled.
4. Refrigerant lines must be protected or covered to prevent damage.
5. Flexible connecting parts such as connection lines between indoor and outdoor devices that could become displaced during regular work operations must be protected against mechanical damage.
6. The maximum distance between the brackets of the copper pipes is 2 m (6.5 ft).

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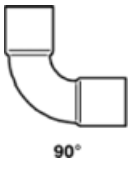
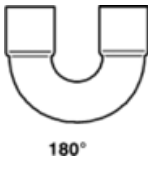
Laying the pipework

1. The equivalent length of the overall line between the LCP DX and the condenser must not exceed a maximum of 30 m (98.4 ft). To calculate the equivalent length, in addition to the actual length of the pipeline, the equivalent length of curves and valves should be taken into account.

		
0.25 m (0.82 ft)	0.5 m (1.64 ft)	0.75 m (2.46 ft)
		
1.90 m (6.23 ft)	2.10 m (6.89 ft)	3.0 m (9.84 ft)

Tab. 4: Equivalent length for external diameter 12 mm (0.5")

2. The number of bends should be kept to a bare minimum so as to avoid pressure losses. Where curves are unavoidable, the radius chosen should be as large as possible.
3. When planning the piping layout ensure that the lines between the LCP DX and the condenser are as short as possible. Only allow for exceptions to save unnecessary bends.
4. If at all possible, do not route refrigerant lines through rooms which are occupied by people, such as offices and meeting rooms.
5. The gas line must be laid with an incline of 1% in the direction of flow of the refrigerant.
6. A distance of at least 20 mm (0.78") between the gas and the liquid line should be observed. If this is not possible, both lines should be adequately insulated.
7. When laying out the refrigerant lines, be sure no sag is created in which oil may collect; install oil traps if necessary.
8. Provide one elevation arc at least every 6 m (19.7 ft) of line length.

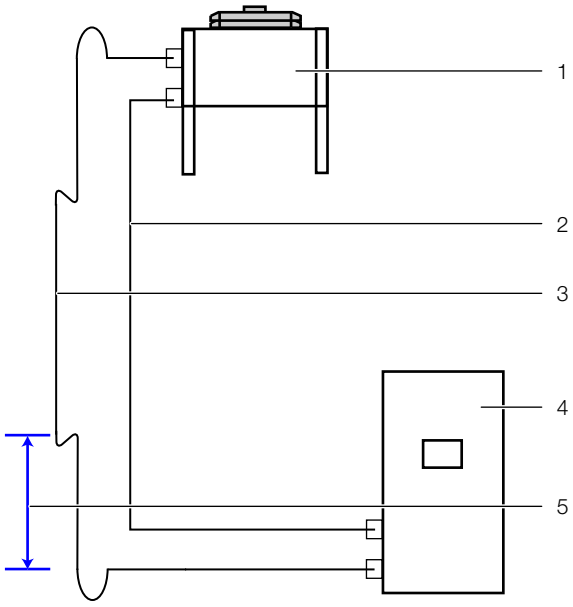


Fig. 24: Oil elevation arc

Key

1 External condenser
2 Liquid line
3 Hot gas line
4 LCP DX
5 Spacing max. 6 m (19.7 ft)

Protecting the pipework

1. Suitable precautions should be taken to prevent excessive vibrations or pulsations. In particular, care should be taken to prevent the direct transmission of noise or vibrations onto or through the supporting structure and the connected devices.

Note:
Vibrations and pulsations should be assessed with the system operational at maximum condensation temperature and when switching the system on and off, which has unfavourable impacts on the pipework.

2. Safety devices, pipework and fittings should be protected from unfavourable environmental influences as far as possible. Due consideration should be given to unfavourable environmental influences, such as the risk of water collecting, freezing of relief lines or the accumulation of dirt and waste.
3. With long pipelines, adequate precautions should be taken with regard to expansion and contraction.
4. The pipelines of cooling systems should be designed and laid in such a way that the system cannot be damaged by liquid slugging (hydraulic shock).
5. Pipelines with detachable connections must not be positioned in public thoroughfares, vestibules, stairwells, steps, entrances, exits or in ducts or shafts with unsecured openings to such areas, unless protected against disconnection.

6. Pipelines without detachable connections, valves, control and regulatory devices that are protected against accidental damage may be positioned in public thoroughfares, stairwells or vestibules, provided they are situated at least 2.2 m (7.2 ft) above the ground.

Pipe brackets

1. Both horizontal and vertical lines must be laid with vibration-damping elements (such as rubber seals). These must be used at a spacing of at least 2 m (6.6 ft).
2. The first pipe bracket downstream of the LCP DX and upstream of the condenser should be elastic. Pipe brackets must not be too close to bends, to allow elongation of lines.

Installing the piping

1. To connect the refrigerant piping system open the line ends on the LCP DX and the condenser. Upon opening, gas must escape audibly; this is evidence that there are no leakages in the refrigerating circuit.
2. Cut lines only using a pipe cutting device!
3. Never saw lines open, to prevent generation of sawing swarf!
4. Only braze lines while using nitrogen as a protective gas! To achieve this, introduce dry nitrogen on one end of the line already prepared. Before starting brazing, introduce a generous nitrogen flow, when starting brazing reduce it to a minimum and maintain this low protective gas flow during the entire brazing process.
5. Vent nitrogen during the entire brazing process.

Low-temperature insulation of the liquid lines

1. Rittal recommends insulating the liquid cooling line outside of the building with low-temperature insulation made from UV-resistant HT/Armaflex or an equivalent material.
2. A wall thickness of 9 mm (0.35") is recommended.

Low-temperature insulation of the hot-gas line

1. The gas line must be insulated indoors (contact hazard protection).

Leak test / conducting the leak test

The system must undergo leak testing as a complete system. Following completion of the system, the test should be carried out at the site of installation.

Any leak detected must be repaired and subjected to a further leak test.

1. Systems with dry nitrogen should be tested at an overpressure of at least 28 bar (406 psi). The Rotalock valves on the intake and pressure sides of the compressors must be closed. This ensures the compressor is not subjected to the test pressure.
2. Check the system for tightness. We recommend to inspect all connections for tightness, including screwed joints.

Evacuating

1. Upon successful pressure testing, the air still remaining in the system must be removed. To do so, connect a vacuum pump and evacuate the system to a pressure of 250 microns (absolute pressure).
2. Evacuate the entire indoor/outdoor/field installed tubing using all three (3) access ports provided in the LCP DX refrigeration system for complete evacuation of non-condensable gases and prevent contamination.
3. Fill the system with dry nitrogen and repeat the evacuation. This removes air and remaining moisture from the system.

Filling with refrigerant, cooling system in a vacuum

1. The system must only be filled gravimetrically (i.e. by weight) using refrigerant as the liquid in the liquid line. Fill liquid virgin R-410a only until the fill quantity corresponds as precisely as possible to the maximum fill weight as per the rating plate. Thereafter switch the unit on and, while it runs, continue filling carefully and slowly from the intake side of the compressor, until the right SH value between 6 K (11°F) and 10 K (18°F) is reached and visualized on the mask D14 when the compressor is running at its maximum speed of 110 rps.
2. Note the refrigerant volume and tubing length on the provided label.
3. Refrigerant filling volumes for unit and condenser see technical data. Determine the refrigerant filling volume for the piping system from the individual lengths and interior diameters of the refrigerant lines.
4. The weight of the refrigerant volume actually filled in is determined during filling by means of a refrigerant bottle.

6.3 Connecting the condensate discharge

Any condensate which may develop is collected in the condensate collecting tray (fig. 25, item 2) beneath the heat exchanger.

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Fig. 25: Condensate discharge

Key
1 Condensate discharge hose

The LCP DX is additionally equipped with a condensate discharge (fig. 25) via which the condensate is pressurelessly routed out of the LCP DX.
A hose (Ø = 8 mm (.31"), length = 2 m (6.5 ft), 1/8" connector with male thread) to discharge condensate is connected in the factory. It will be accessible for the customer by lifting the metal plate below the fans. This hose, in turn, must be routed to a drain trap by the customer, so that any condensate can be discharged from the device.

Note:
In order to ensure safe condensate discharge, the following points should be observed:
– Lay the drainage hose so that it always runs downhill and without any kinks.
– Do not constrict the hose cross section.
– If there is no raised floor, a pedestal will be required for the condensate tube to exit the unit.

6.4 Electrical connection

6.4.1 General

Note:
Please keep the wiring plan readily available so that it is always on hand when needed. This is the only authoritative documentation for this unit.

Caution!
Work on electrical systems or equipment may only be carried out by an electrician or by trained personnel under the guidance and supervision of an electrician. All work must be carried out in accordance with electrical engineering regulations.

Contact with live electrical parts may be lethal.

The unit may only be connected after the personnel mentioned above have read this information!

Use only insulated tools.

The connection regulations of the appropriate electrical 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/ rating plate should be provided to protect the cable and equipment from short-circuits. The unit must be individually fused.

The unit has a high discharge current. Before connecting to the supply circuit, therefore, it is essential to make a 6 mm² (minimum of 10 AWG) earth connection (see section 14.4 "Circuit diagram").

The unit must be connected to the mains using an all-pole red/yellow isolating device as described in DIN EN 60204-1, section 5.3, which ensures at least 3 mm (0.12") contact opening when switched off.

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

The LCP DX and the external condenser are supplied with voltage independently of one another.

6.4.2 Connecting the LCP DX

Power is supplied to the LCP DX via a 4-wire connection cable (208 V, 1~, N, PE). The cable has to be inserted into the device from above via a cable gland (fig. 26).

Fig. 26: Roof plate

Key

1 Cable gland, power supply
2 Cable gland, collective fault signal
3 Network connection (optional)

Inside the device, the cable is routed into the electronics box via the large cable gland in the centre (fig. 26, item 1). It is connected to the appropriately labelled terminals (PE, L1, L2, N) in the electronics box (see section 14.4 "Circuit diagram").

- Remove approximately 45 mm (1.77") from the rubber sheathing of the flexible cable.
- Trim the neutral conductor (N) and the single phase conductors (L1 and L2) to a length of approximately 35 mm (1.38"). Leave the length of the PE conductor at approximately 45 mm (1.77").
- Remove approximately 9 mm (0.35") from the insulation of all conductors with a suitable tool.
- Attach wire end ferrules without insulating barrel to the ends of the cables, using a crimping tool. Terminal block can accept 6 AWG wire.

Note:
A voltage of at least 208 V is required to start the device.
If the mains voltage briefly drops 10% below 208 V with the system operational, it will not malfunction.

- Connect the LCP DX using an all-pole isolating device with at least 3 mm (0.125") contact opening when switched off, or per local or national electric codes and regulations.
- The customer should provide a pre-fuse in the supply line to the LCP DX, as specified on the rating plate of the device.

Danger!
Take utmost care not to short-circuit one of the phases with the zero conductor or the earth conductor. Otherwise, there is a risk of damage or injury.

6.4.3 Connecting the external condenser

Connecting the external condenser entails simply plugging it into the external power supply. Internally, the condenser is fully wired, and no connection is needed between the LCP DX and the external condenser (via a data cable etc.). The fan speed of the condenser is controlled via the system pressure (fan #1) and thermostat switch (fan #2). The thermostat switch for fan #2 should be factory set at 15°C (60°F). Check the switch to make sure it is set to this temperature. The switch has an adjustment range of -6°C to 21°C (20°F to 70°F) but it should only be adjusted by trained installation technician.

Power is supplied to the external condenser via a 3-wire connection cable (208/230 V, 1~, N, PE). The 3-wire cable must be inserted into the main switch box of the external condenser. The main switch is wired to the fan control in the factory, and the pressure transducer is mechanically and electrically connected to the condenser. Once the system is powered on, the fan(s) will come on based on pressure and ambient temperature.

6.4.4 Fuse grip

In the roof area of the unit, two 40 A Siemens fuses are integrated.

Fig. 27: 40 A Siemens fuses

- For checking the fuses or replacement after damage, please use the supplied fuse grip.

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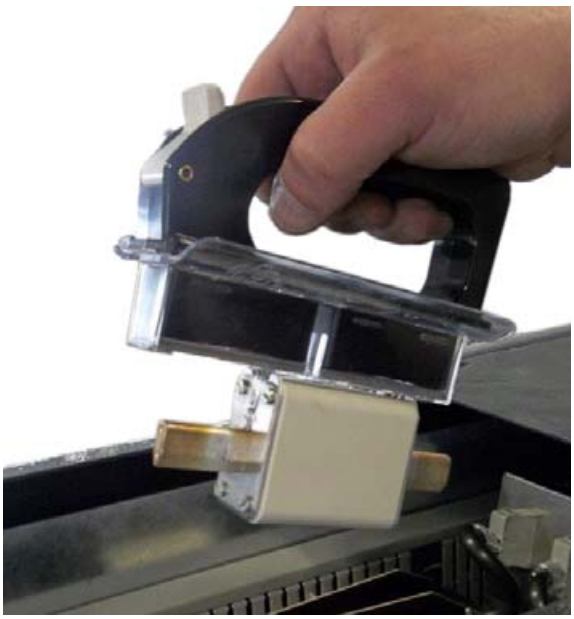

Fig. 28: Fuse grip

6.5 Checking the entire system prior to commissioning

Before operating the cooling system, the entire system, including the complete cooling system, must be checked for conformity with the relevant diagrams, flow charts and piping and instrumentation diagrams of the system and wiring plans.

Cooling systems must be checked by a trained plant inspector and should include a review of the following points:

1. Inspect the documents.
2. Check the safety switchgear for pressure limiting. In this connection, it is important to check that the safety switchgear for pressure limiting is operational and correctly installed.
3. Check selected hard solder connections on pipework.
4. Check the refrigerant pipelines.
5. Inspect the report on the cooling system leak test.
6. Visually inspect the cooling system.
7. Check the labels.

This inspection must be documented. No cooling system may be operated without the correct documentation.

The installer must document the fact that the system was installed in accordance with the construction requirements and state the safety and control device settings, if adjustable, following commissioning. This documentation must be kept by the installer and presented upon request.

6.6 Use of the pCO Web card 3311.320 (optional)

To incorporate the device into a building management system, a pCO Web card may be installed in the electronics box.

Then the LCP DX website provides all essential information on the homepage. For example, it depicts a collective alarm. The name and location of the LCP DX may also be configured on this website. A second operating level allows you to set the server air injection temperature.

Fig. 29: Optional 3311.320 pCO Web card kit from Rittal

- Insert the 2 m (6.5 ft) cable (part number 2482.720) from the hole on top of the unit. Secure the connector with its ring.

Fig. 30: Installing the pCO Web card

Key

1 Cable
2 pCO Web card slot

- Install the pCO Web card in its slot.

The connecting point for customer LAN is at top of unit.

Fig. 31: LAN connecting point

Key
1 Connecting point for customer LAN

- Pass the RJ45 connector through a free grommet on the electrical box bottom.

Fig. 32: RJ45 connector

- Connect the RJ45 connector to the pCO Web card.

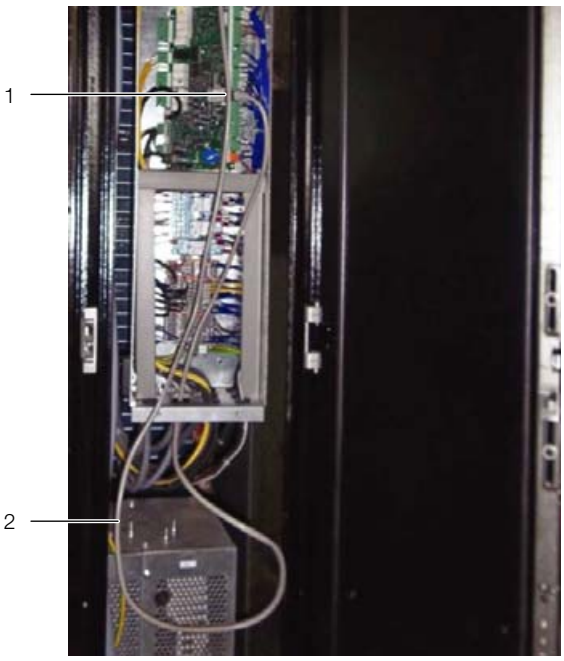

Fig. 33: Connecting RJ45 to pCO Web card

Key
1 RJ45 connector to pCO Web card
2 Cable

- Roll up and secure excess cable.
- Close the box.

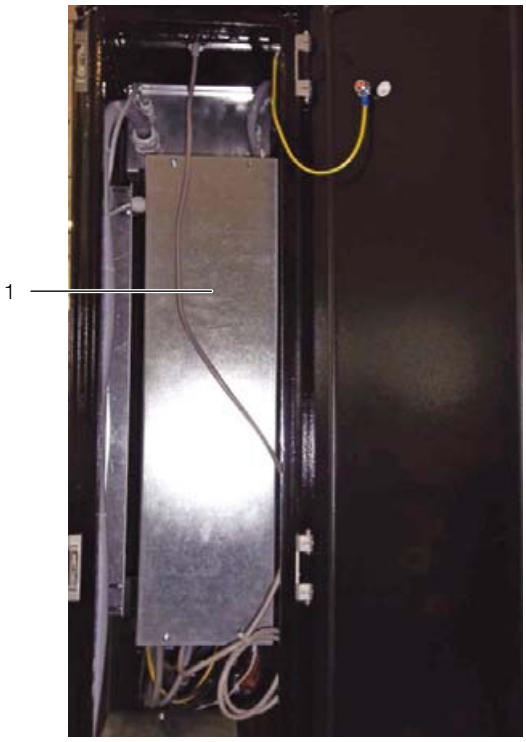

Fig. 34: Closed box

- Even if you rotate the box, the cable length is enough.

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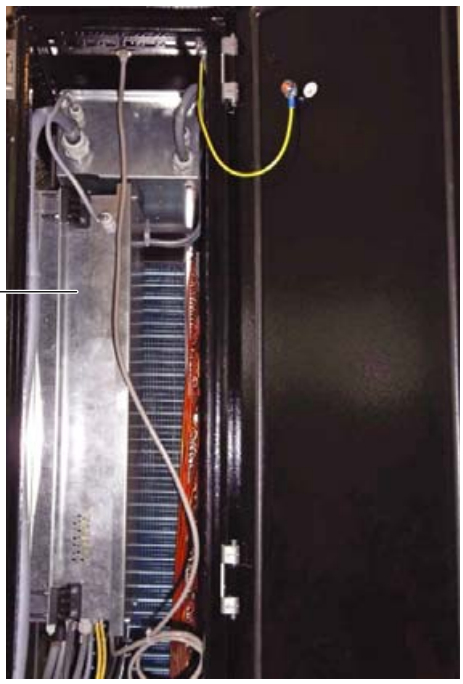

Fig. 35: Rotated box

Logging on to the LCP DX website

- Open the browser and enter the IP address of the LCP DX (or the pCO Web card) in the address line.
  Example of a static IP address:
  http://172.16.0.1
  A dialogue will appear for logging onto the LCP DX.
- Enter **rittal** as the user and **1234** as the password.
  The LCP DX website will appear.

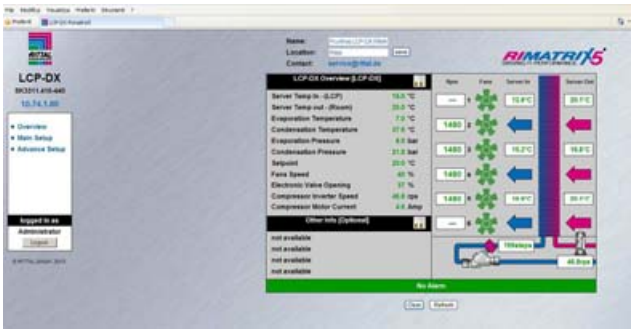

Fig. 36: LCP DX homepage

The following parameters are displayed in tabular form on the LCP DX homepage.
– Server Temp In (average)
– Server Temp Out (average)
– Evaporation Temperature
– Condensation Temperature
– Evaporation Pressure
– Condensation Pressure
– Setpoint
– Fans Speed
– Electronic Valve Opening
– Compressor Inverter Speed
– Compressor Motor Current

The following parameters are displayed in diagrammatic form on the LCP DX homepage.
– Setpoint speed for the fans
– Server-in temperature (top, middle, bottom)
– Server-out temperature (top, middle, bottom)
– Position of the electronic expansion valve
– Compressor speed

The 2nd menu level, **Main Setup**, is password-protected. The server air injection temperature of the LCP DX may be set here.

- Click on the **Main Setup** entry in the left-hand section of the website.
  Alternatively, click on the stylised Allen key in the central section of the website, under **LCP-DX Overview**.
  A further dialogue will appear for authentication.

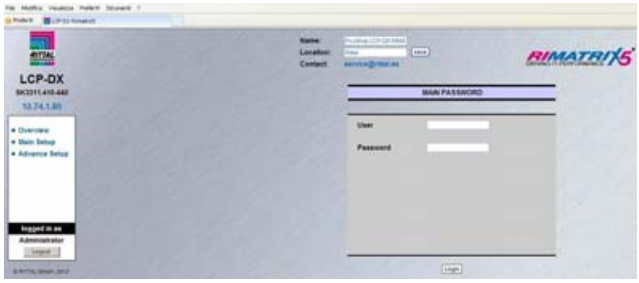

Fig. 37: Logging on to the 2nd menu level (Main Setup)

- Once again, enter **rittal** as the user and **1234** as the password.
  The following screen will appear:

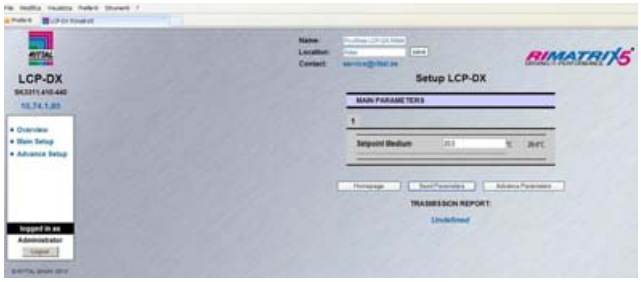

Fig. 38: Setting the server air injection temperature

- Set the server air injection temperature to the required value between 18°C (64.4°F) and 25°C (77°F).
- Confirm your entry by clicking on the **Send Parameters** button.
- Clicking on the **Homepage** button will take you back to the LCP DX homepage.

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7 Operation

This section describes operation of the LCP DX using the control and display devices directly on the unit itself. If there is a pCO Web card installed in the device, this may also be accessed via a network connection (see section 6.6 "Use of the pCO Web card 3311.320 (optional)").

7.1 Control and display components

Fig. 39: Control and display components

Key

1 Display
2 "Up" button
3 "Return" button
4 "Down" button
5 "Esc" button
6 "Prg" button
7 "Alarm" button

7.2 Switching the LCP DX on and off

7.2.1 Switching on the LCP DX and the external condenser

Once both the LCP DX and the condenser are electrically connected and switched on at their respective master switches, carry out the following two steps:

- If you wish to switch the LCP DX on and off remotely: In the electronics box, remove the jumper between the two terminals 24 and 27 ("Remote On-Off") and connect a floating remote switch (normally open contact). If the two terminals are not jumpered, the status message "Din-Off" will appear in the display.
- Change the status of the device in the "On/Off Unit" menu from "Off" to "On" (see section 7.6 "Menu level A "On/Off Unit"").

7.2.2 Switching off the LCP DX and the external condenser

To switch off the LCP DX and the condenser, proceed as follows:

- Change the status of the device in the "On/Off Unit" menu from "On" to "Off" (see section 7.6 "Menu level A "On/Off Unit"").
- Switch off the LCP DX and the condenser at their respective master switches.

7.2.3 Switching off in an emergency

To switch off the LCP DX and the condenser, proceed as follows:

- Switch off the LCP DX and the condenser at their respective master switches.

7.3 Layout of the user interface

The user interface is divided into eight menu levels. This level and, where applicable, the level below is displayed in the top right of every menu.

– Level A: Switch the device on and off
– Level B: Enter settings
– Level C: Set time and date
– Level D: View the status of inputs and outputs
– Level E: View and confirm error messages
– Level F: Replace the motherboard
– Level G: Edit basic settings (service)
– Level H: Edit basic settings (manufacturer)

7.4 General operating instructions

You can use the buttons on the command panel to move between the different menu levels and menus and change parameter settings.

7.4.1 Moving between menus

- Press the "Prg" button to move from the start screen to the main menu.
- Press the "Up" or "Down" button to select the entries (sub-menus) in a menu.
- Press the "Return" button to move to the selected sub-menu.
- Press the "Esc" button to move from a sub-menu to the menu above.

7.4.2 Changing parameter values

- Press the "Up" or "Down" button to select the entries (parameters) in a menu.
- Press the "Return" button to change the selected parameter value.
- Press the "Up" button to increase the parameter value, and the "Down" button to reduce the parameter value.
- Press the "Return" button to confirm the amended parameter value.
- Press the "Esc" button to move to the menu above.

7.5 Start screen

Current basic parameters are displayed on the start screen whilst the device is operational.

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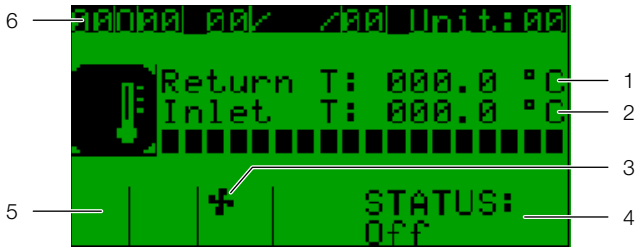

Fig. 40: Start screen

Key

1 Air inlet temperature
2 Air outlet temperature
3 Status of LCP DX
4 Status of fan speed
5 Status of compressor
6 Time and date

7.6 Menu level A "On/Off Unit"

Use this menu to switch the device on and off.

- Press the "Prg" button to move from the start screen to the main menu.
- Press the "Up" or "Down" button to select the entry "A. On/Off Menu".
- Press the "Return" button to move to the selected sub-menu.

7.6.1 Menu A01

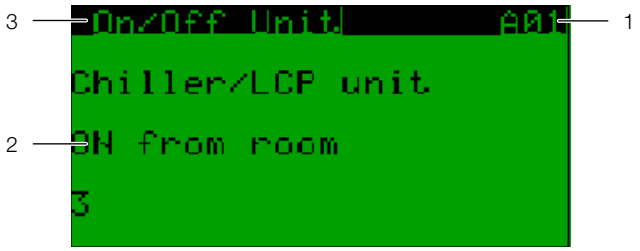

Fig. 41: Menu A01

Key

1 Menu level A01
2 Parameter "ON/OFF"
3 Menu "On/Off Unit"

To switch on the device:

- Press the "Down" button to select the "OFF" entry.
- Press the "Return" button to edit the selected parameter value.
- Press the "Up" or "Down" button to change the parameter value to "ON".
- Press the "Return" button to confirm the amended parameter value.
  The device is now switched on.
- Press the "Esc" button to move back to the start screen.

To switch off the device:

- Press the "Down" button to select the "ON" entry.
- Press the "Return" button to edit the selected parameter value.
- Press the "Up" or "Down" button to change the parameter value to "OFF".
- Press the "Return" button to confirm the amended parameter value.
  The device is now switched off.
- Press the "Esc" button to move back to the start screen.

7.6.2 Menu A02

A sleep mode may be activated in menu A02. As the LCP DX adapts to the required cooling output in any case, settings are not generally required here.

7.7 Menu level B "Setpoint"

7.7.1 Menu B01

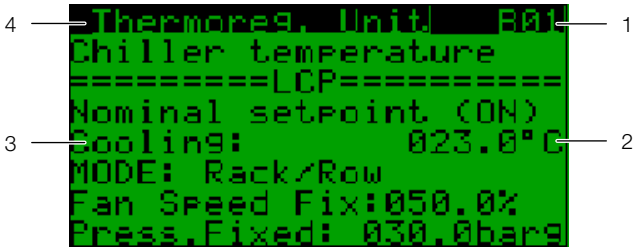

Fig. 42: "Setpoint" menu

Key

1 Menu level B01
2 Current setting
3 "Cooling" parameter
4 "Thermo-reg. unit" menu

Parameter	Explanation
Cooling	Current setting for setpoint temperature.
MODE	Operating mode of device.
Fan Speed Fix	Set a fixed fan speed.

Tab. 5: Settings in menu B01

7.7.2 Menu B02

Parameter	Explanation
Enable Alarm	Activate an alarm when the limits specified below are exceeded.
Setpoint Diff.	Difference between the actual temperature and the setpoint temperature.
Setpoint ABS	Absolute maximum temperature.
Hysteresis	If both the above limits are exceeded, an alarm is output immediately. The alarm stops when the respective limit is undercut by the value specified here.
Delay Alarm	Time delay by which the alarm is output.

Tab. 6: Settings in menu B02

7.8 Menu level C "Clock/Scheduler"

7.8.1 Menu C01

Set the current time and date in menu C01.

- Press the "Return" button, and the numerical display for the day will start to flash.
- Press the "Up" or "Down" button to change the value for the day.
- Press the "Return" button to move to the entry for the month.
- Again, press the "Up" or "Down" button to change the value for the month.
- Proceed in the same way to set the year, hours and minutes. The display of the week day will change automatically according to the set date.

Parameter	Explanation
Day	Displays the day of the week.
Date	Today's date in the format dd/mm/yy.
Hour	Current time.

Tab. 7: Settings in menu C01

7.8.2 Menu C02 – C04

In menus C02 to C04 it is possible to switch off the device on certain days (such as public holidays) or for a specified period (e.g. factory shutdown). As the LCP DX adapts to the required cooling output in any case, settings are not generally required here.

7.8.3 Menu C05

Settings for the changeover to summertime may be made in menu C05.

Parameter	Explanation
DST	Activate or deactivate the changeover to summertime.
Transition time	No. of minutes by which the clock is set forward or back.
Start	Start of changeover to summertime (e.g. "last Sunday in March at 2.00 am").
End	End of changeover to summertime (e.g. "last Sunday in October at 3.00 am").

Tab. 8: Settings in menu C05

7.9 Menu level D "Input/Output"

The current values of the digital and analog inputs and outputs are displayed in menu level D. We have not included a detailed representation of all parameters, since these displays are not required in normal operation.

7.9.1 Menu D01 – D06

The current values of the analog inputs are displayed in menus D01 to D06.

7.9.2 Menu D07 – D12

The current values of the digital inputs are displayed in menus D07 to D12.

7.9.3 Menu D13

The current values of the analog outputs are displayed in menu D13.

7.9.4 Menu D14

The following parameters of the electronic expansion valve are displayed in an overview screen in menu D14.

– Superheat
– Degree of opening of the valve in %
– Evaporation pressure
– Evaporation temperature

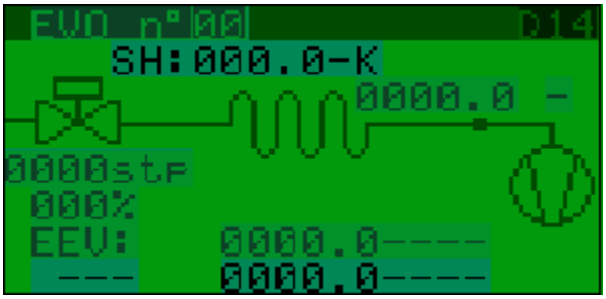

Fig. 43: Menu D14

7.9.5 Input/output menu

Other parameters of inputs and outputs are displayed in the input/output menu. The following parameters showing the compressor's current consumption levels can be viewed here.

Parameter	Explanation
Motor current	Current power consumption of the compressor motor [109].
Motor voltage	Current voltage of the compressor motor [111].

Tab. 9: Displays in the Power+ n°1 menu (3/6)

Parameter	Explanation
Motor power	Current output of the compressor motor [110].

Tab. 10: Displays in the Power+ n°1 menu (4/6)

7.10 Menu level E "Data logger"

7.10.1 Menu E01

Error messages are displayed in menu E01 and in the following menus E02, E03 etc. (see section 8.1 "General").

7.11 Menu level F "Board switch"

The pLAN device addresses of the display and the motherboard are displayed in menu F01. This may be

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helpful following an exchange of the respective hardware component.

Parameter	Explanation
Unit address	pLAN device address of display and motherboard

Tab. 11: Displays in menu F01

7.12 Menu level G "Service"

7.12.1 Menu Ga "Change language"

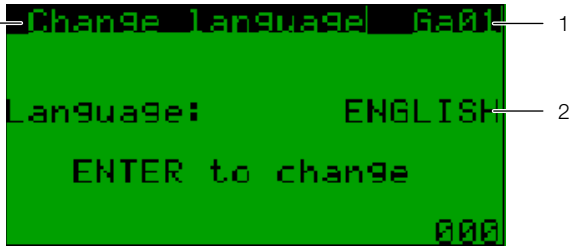

Fig. 44: Menu A01

Key
1 Menu level Ga01
2 Currently selected language
3 Menu "Change language"

- Keep pressing the "Return" button until your preferred language is selected.

Parameter	Explanation
Disable language mask at start-up	Activate or deactivate language selection when the device is booted up.
Show mask time	Period for which the language selection is displayed.

Tab. 12: Settings in menu Ga02

7.12.2 Menu Gb "Information"

Information on the individual software and hardware components is displayed in menus Gb01 to Gb05.

7.12.3 Menu Gd "Working hours"

The operating hours of the device as a whole and its individual components are displayed in menu Gd01 and Gd02.

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8 Troubleshooting

8.1 General

If there is a malfunction or alarm on the device, a corresponding error message will be displayed. The corresponding LED on the command panel will be illuminated and the alarm relay switched where applicable (collective fault signal).

Errors are divided into three categories.

1. **Alarms:** The device will be stopped (at least individual components).
2. **Warnings:** Selected device functions will no longer be executed.
3. **Messages:** A message is output on the display (for example, if a limit is exceeded) but the device remains operational.

- Press the "Alarm" button on the command panel to view all active error messages.
  The location of the error and the component affected will be shown on the display.
- In the event of multiple errors, use the "Up" and "Down" buttons to scroll through the list.
- Press the "Alarm" button again to confirm the currently selected error.
  Once the cause of the error has been rectified, the error message will be deleted from the list.

Note:
Following an automatic restart, the alarm LED and the corresponding message text will remain active until the "Alarm" button on the command panel has been pressed twice.

The following additional information about the error messages will be output at the end of the aforementioned list of error messages:

1. Sequence of error messages. "E01" is the oldest error, "E02" the one after that, and so on.
2. Date and time when the error occurred.
3. The alarm code, e.g. "ALF01".
4. A brief description of the cause of the error.
5. Inlet and outlet temperature and high and low pressure in the cooling circuit.

Note:
A maximum of 50 error messages will be saved. If further errors occur, the oldest error messages will be overwritten.

Note:
For technical queries, or if servicing is required, please contact Rittal using the addresses shown in section 16 "Customer service addresses".

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8.2 List of error messages and solutions

Alarm code	Display	Possible cause	Possible solution
ALA02	Alarms ALA02 Position: B2 Probe B2 faulty or disconnected alarm	Sensor failure or sensor not correctly connected.	Check the connection on the motherboard or replace the sensor.
ALA03	Alarms ALA03 Position: B3 Probe B3 faulty or disconnected alarm	Sensor failure or sensor not correctly connected.	Check the connection on the motherboard or replace the sensor.
ALA04	Alarms ALA04 Position: B4 Probe B4 faulty or disconnected alarm	Sensor failure or sensor not correctly connected.	Check the connection on the motherboard or replace the sensor.
ALA06	Alarms ALA06 Position: B6 Probe B6 faulty or disconnected alarm	Sensor failure or sensor not correctly connected.	Check the connection on the motherboard or replace the sensor.
ALA07	Alarms ALA07 Position: B7 Probe B7 faulty or disconnected alarm	Sensor failure or sensor not correctly connected.	Check the connection on the motherboard or replace the sensor.
ALA08	Alarms ALA08 Position: B8 Probe B8 faulty or disconnected alarm	Sensor failure or sensor not correctly connected.	Check the connection on the motherboard or replace the sensor.
ALA09	Alarms ALA09 Position: B9 Probe B9 faulty or disconnected alarm	Sensor failure or sensor not correctly connected.	Check the connection on the motherboard or replace the sensor.
ALA10	Alarms ALA10 Position: B10 Probe B10 faulty or disconnected alarm	Sensor failure or sensor not correctly connected.	Check the connection on the motherboard or replace the sensor.
ALA11	Alarms ALA11 Position: B11 Probe B11 faulty or disconnected alarm	Sensor failure or sensor not correctly connected.	Check the connection on the motherboard or replace the sensor.
ALA12	Alarms ALA12 Position: B12 Probe B12 faulty or disconnected alarm	Sensor failure or sensor not correctly connected.	Check the connection on the motherboard or replace the sensor.
ALB01	Alarms ALB01 Position: ID3 High pressure	High ambient temperature, incorrect refrigerant filling, defective fan.	Check device limits, check refrigerant volume and check correct functioning of fan.
ALB02	Alarms ALB02 High pressure compressor 1 by transducer	High ambient temperature, incorrect refrigerant filling, defective fan.	Check device limits, check refrigerant volume and check correct functioning of fan.
ALB03	Alarms ALB03 Low pressure compressor/compressors by transducer	Incorrect refrigerant filling, insufficient quantity of refrigerant, blocked refrigerant lines, electronic expansion valve closed.	Check refrigerant volume, check lines for leaks, check electronic expansion valve.

Alarm code	Display	Possible cause	Possible solution
ALC01	Alarms ALC01 Position: ID2 Compressor 1 overload or inverter alarm	High inlet temperature, high heat load, incorrect pipework, incorrect wiring.	Check operating conditions as per compressor specifications, check device limits, check pipework and wiring.
ALC03	Alarms ALC03 Envelope alarm zone	Operating conditions outside of compressor specifications.	Check operating conditions as per compressor specifications.
ALC04	Alarms ALC04 Compressor start failure (temp.:/max.:)	Inadequate pressure difference during device startup, excess current or missing phase on inverter, blocked inverter.	Check operating conditions as per compressor specifications, check device limits, check error codes in inverter manual.
ALC05	Alarms ALC05 High discharge gas temperature	High inlet temperature, high heat load, incorrect pipework.	Check operating conditions as per compressor specifications, check device limits, check pipework.
ALC06	Alarms ALC06 Low pressure differential (insuff. lubrication)	Operating conditions outside of compressor specifications or device limits, blocked compressor, incorrect wiring.	Check operating conditions as per compressor specifications, check device limits, check wiring.
ALF01	Alarms ALF01 Position: ID1 Fan overload	Incorrect wiring.	Check wiring against circuit diagram.
ALD02	Alarms ALD02 Probe S1: Probe S2: Probe S3: Probe S4:	Sensor failure or sensor not correctly connected.	Check the connection on the motherboard or replace the sensor.
ALD03	Alarms ALD03 EEV motor error	Incorrect or missing wiring between motherboard and valve motor.	Check the connection on the motherboard or replace on the valve motor.
ALD04	Alarms ALD04 Low superheat (LowSH)	Incorrect refrigerant filling, insufficient heat load, insufficient fan speed.	Check device limits, check refrigerant volume, check fan speed.
ALD05	Alarms ALD05 Low suction temperature	Cf. ALD04 and ALD06.	Cf. ALD04 and ALD06.
ALD06	Alarms ALD06 Low evaporation temperature (LOP)	Incorrect refrigerant filling, insufficient refrigerant volume, blocked refrigerant lines, thermostatic valve closed.	Check refrigerant volume, check lines for leaks, check thermostatic valve.
ALD07	Alarms ALD07 High evaporation temperature (HOP)	High inlet temperature, incorrect PID valve parameter.	Check valve PID parameters, alarm delay, raise the MOP limit (max. 25°C/77°F) if condenser ambient temperature is max. 35°C/95°F.
ALD08	Alarms ALD08 High condensing temperature (HiTcond)	High ambient temperature, incorrect refrigerant filling, defective fan on condenser.	Check device limits, check refrigerant volume, check fan on condenser.
ALD09	Alarms ALD09 Driver offline	Cf. inverter manual.	Cf. inverter manual.
ALL01	Alarms ALL01 Power+ offline	Wrong communication between the driver and the motherboard.	Check the MODbus connection cable; check the communication parameters.

Alarm code	Display	Possible cause	Possible solution
ALL02	Alarms ALL02 Power+ Generic Alarm	Over or under current; over or under voltage; over or under temperature of the drive of the compressor motor; see drive manual "code [105]".	Check the cable; check previous high pressure alarm.
ALL99	99 Unexpected inverter stop	Short power failure.	Restart the unit; connect to a UPS if necessary. After the reset, the alarm is stored in the alarm data log as ALL01.
ALW04	ALW04 Max temperature (warning)	A previous alarm has stopped the unit; heat load too high compared to the cooling capacity of the unit.	Reset the previous alarm.

9 Inspection and maintenance

The following maintenance work should be carried out on the LCP DX:

– The condensate water discharge device should be checked regularly for correct functioning.
– Regularly check the refrigerant circuit and all main components for correct functioning (at least once a year or per national or local codes).

Note:
At an ambient temperature of 40°C (104°F), the nominal service life of the built-in fan is 40,000 operating hours.

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10 Storage and disposal

Caution! Risk of damage!
The LCP DX must not be subjected to temperatures above +60°C (140°F) during storage.

During storage, the LCP DX must stand upright.
Disposal can be performed at the Rittal plant.
Please contact us for advice.

Caution! Risk of environmental contamination!
Never allow refrigerant from the cooling circuit or oil from the compressor to escape into the environment.
Refrigerant and oil must be properly disposed of in accordance with the valid national legislation and regulations.

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11 Technical specifications

Technical specifications	
Description/Model No.	TopTherm LCP Rack DX / 3311.415 (1000 mm depth)
Description/Model No.	TopTherm LCP Rack DX / 3311.425 (1200 mm depth)
Description/Model No.	TopTherm LCP Inline DX / 3311.435 (1000 mm depth)
Description/Model No.	TopTherm LCP Inline DX / 3311.445 (1200 mm depth)
Dimensions and weight	
Dimensions width x height x depth [mm]	300 x 2000 x 1000 (3311.415/435) or 1200 (3311.425/445)
U height	42
Weight, max. [kg] (lb)	201 (443)
Electrical connection	
Type of electrical connection	Connection clamp
Rated voltage [V, Hz]	208 V, 60, 1~/N/PE
Compressor rated current [A]	15.5
Maximum Overcurrent Protection (MOP) [A]	60
Minimum Circuit Ampacity (MCA) [A]	48
Duty cycle [%]	100
Cooling output	
Nominal cooling capacity EN 14511 [kW]	L35 L35 12.0 (T_i 95 T_a 95 12.0)
	L35 L45 8.0 (Ti 95 Ta 113 8.0)
Total power input [kW]	L35 L35 4.0 (T_i 95 T_a 95 4.0)
Energy Efficieny Ratio (EER) L35 L35	3.0
Air throughput, max. [m^3/h] (CFM)	4,800 (2825)
Cooling circuit	
Refrigerant/Fill volume [kg] (lb)	R-410a/2.8 (6.17) (Fluid Group 2)
Max. allowable pressure [bar]	PS HP: 42
	PS LP: 30
External diameter of refrigerant lines [mm] (in)	12.7 (0.5)
Other information	
Storage temperatures [°C] (°F)	-20…+60 (-4…+140)
Temperature range [°C] (°F)	+15…+35 (+59…+95) (indoor), -18…+45 (0…+113) (outdoor) *
IP protection category IEC 60529	IP 20 (indoor)
Color	RAL 9005

Tab. 13: Technical specifications LCP DX

Note:
Contact Rittal for options at temperatures below this range (*).

11 Technical specifications

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Technical specifications	
Description/Model No.	Condenser / 9951.077
Dimensions and weights	Horizontal
Dimensions width x height x depth [in]	69.8 x 45.6 x 18.1
Weight, operating [lb]	164
Weight, shipping [lb]	233
Electrical connection	
Rated voltage [V, Hz]	208/230, 1~, 60
Voltage range [V]	187…253
Fan quantity	2
Power/Fan [HP]	⅓
Full load amps [A]	3.2
Minimum circuit amps [A]	15
Maximum overcurrent protective device [A]	15
Cooling circuit	
Refrigerant	R-410a
External diameter of refrigerant lines [in]	1⅛(gas), ⅞ (liquid)
Other information	
Ambient temperature [°C] (°F)	-29…+38 ±6 (-20…+100 ±10)

Tab. 14: Technical specifications for the condenser unit (for operation with 3311.415/425/435/445)

12 Spare parts

Article	Part. No.
Compressor, LCP DX, inverter	3398187
Compressor speed controller LCP DX	3398325
Fan LCP DX EC type	3398183
Refrigerant expansion valve LCP DX Electronic valve, EXV*	3398181
Inlet and outlet refrigerant valves 12mm*	3398323
Check valve on refrigerant liquid line*	3398180
Liquid line filter dryer for LCP DX	3398122
High pressure switch FISS 42 (PA)*	3398324
Low pressure switch FISS 2.2 (PB)*	3398317
High pressure transducer (HPT)*	3398188
Low pressure transducer (LPT)*	3398186
Control board	3398189
Transformer 240 V AC – 24 V DC	3398322
Protection fuses compressor line 40 A gR NH0 1000V	3398321
Front door display LCP DX	3398094
Connection kit to the control board	3398190
Sensor, air temperature inlet-outlet probes 6.0 m	3397682
Sensor, discharge compressor refrigerant line	3398184
Sensor, suction compressor refrigerant line	3398185
Klixon overload, compressor protection 120°C	3398319
Refrigerant safety valve on liquid line 1/4" NPT, 2 – 45 bar*	3398318
Evaporator coil*	3398320

Tab. 15: Spare parts list – LCP DX

* recommend to be replaced at time of service of p/n 3398122 (liquid line filter drier)

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13 Accessories

Article	Model No.	Qty./Pack	Remarks
Condenser (Horizontal Air Flow)	9951.077	1	Required for operation of the LCP DX.
Vertical shielding (foam strips) for enclosure width 600 mm, for external mounting on side panel	3301.380	1	
Vertical shielding (foam strips) for enclosure width 600 mm, for external mounting on LCP DX	3301.370	1	
Vertical shielding (foam strips) for enclosure width 800 mm, for external mounting on side panel	3301.390	1	
Vertical shielding (foam strips) for enclosure width 800 mm, for external mounting on LCP DX	3301.320	1	
SNMP network card for remote monitoring	3311.320	1	
Ethernet cable for SNMP network card	2482.720	1	Required for SNMP card operation

Tab. 16: Accessories list – LCP DX

Note:
For additional enclosure accessories, please visit www.rittal.us.

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14 Further technical information

14.1 Refrigerant information

Caution!
The LCP DX may only be operated with refrigerant R-410a. Use of any other refrigerant will invalidate the warranty.

Caution! Risk of malfunction or damage!
Installation, and in particular the refrigerant line pipework between the external condenser and the LCP DX, must only be carried out by trained, qualified and accredited cooling system specialists.

To avoid damage to the device, Rittal prescribes the use of refrigerant R-410a.
R-410a is virtually azeotropic and is comprised of equal parts of R-32 and R-125. The basic properties of R-410a are:
– No ozone depletion potential
– Clear
– Liquefied gas smelling of ether
– Non-combustible
– Low toxicity

Property	Value
Composition	50%: R-32 (CH_2F_2) 50%: R-125 (C_2HF_5)
Molar mass [g/mol]	72.585
Boiling point [°C] (°F)	-52.7 (-62.9)
Vapour pressure [bar]	12.46 at 15°C (at 59°F)
Relative density	1.11 at 15°C (at 59°F)

Tab. 17: Material data for R-410a

Note:
Safety data sheets are available as downloads on www.rittal.com.

14.2 Characteristic curves

14.2.1 Cooling output

Due to the device configuration comprising two subunits, and the partially linear operation of the components (fan, inverter-controlled compressor), the cooling output of the device is dependent on various factors:
– External temperature at the installation site of the external condenser
– Heat loss from the server enclosure
– Inlet temperature of hot air into the LCP DX
– Settings

The tables apply to the following operating data:
– Exterior temperatures between -5°C (23°F) and +42°C (107.6°F)
– Cooling output from 3 kW to 12 kW in 3 kW increments
– Setpoint temperature +22°C (71.6°F) for the LCP Inline DX/Rack DX

Exterior temperature 23°F

Exterior temperature [°F]	23			
Cooling output [kW]	3	6	9	12
Inlet temperature [°F]	77.41	81.88	84.33	91.35
Outlet temperature [°F]	71.94	71.65	71.02	74.34
dT [°F]	5.47	10.23	13.31	17.01
Output [kW]	0.738	1.522	2.477	4.198

Tab. 18: Tabular view

Exterior temperature 50°F

Exterior temperature [°F]	50			
Cooling output [kW]	3	6	9	12
Inlet temperature [°F]	78.12	81.55	84.38	91.72
Outlet temperature [°F]	71.87	70.81	70.27	74.59
dT [°F]	6.25	10.74	14.11	17.13
Output [kW]	0.825	1.608	2.639	4.02

Tab. 19: Tabular view

Exterior temperature 68°F

Exterior temperature [°F]	68			
Cooling output [kW]	3	6	9	12
Inlet temperature [°F]	77.77	81.41	84.33	91.09
Outlet temperature [°F]	71.35	70.7	70.14	73.76
dT [°F]	6.42	10.71	14.19	17.33
Output [kW]	0.777	1.627	2.717	4.142

Tab. 20: Tabular view

Exterior temperature 86°F

Exterior temperature [°F]	86			
Cooling output [kW]	3	6	9	12
Inlet temperature [°F]	78.01	81.66	84.04	91.9
Outlet temperature [°F]	71.4	70.81	70.09	74.48
dT [°F]	6.61	10.85	13.95	17.42
Output [kW]	0.859	1.772	2.861	4.193

Tab. 21: Tabular view

Exterior temperature 108°F

Exterior temperature [°F]	108			
Cooling output [kW]	3	6	9	10.46
Inlet temperature [°F]	77.92	81.18	83.61	87.35
Outlet temperature [°F]	71.11	70.2	68.73	72
dT [°F]	6.81	10.98	14.88	15.35
Output [kW]	1.084	2.258	4.182	4.521

Tab. 22: Tabular view

Exterior temperature 113°F

At very high exterior temperatures above +113°F, the device will achieve a maximum cooling output of approx. 10 kW.

Exterior temperature [°F]	113			
Cooling output [kW]	3	6	9	9.76
Inlet temperature [°F]	78.13	79.79	83.1	86.63
Outlet temperature [°F]	71.74	67.77	68.41	71.67
dT [°F]	6.39	12.02	14.69	14.96
Output [kW]	1.084	2.258	4.182	4.676

Tab. 23: Tabular view

14.3 Overview drawing

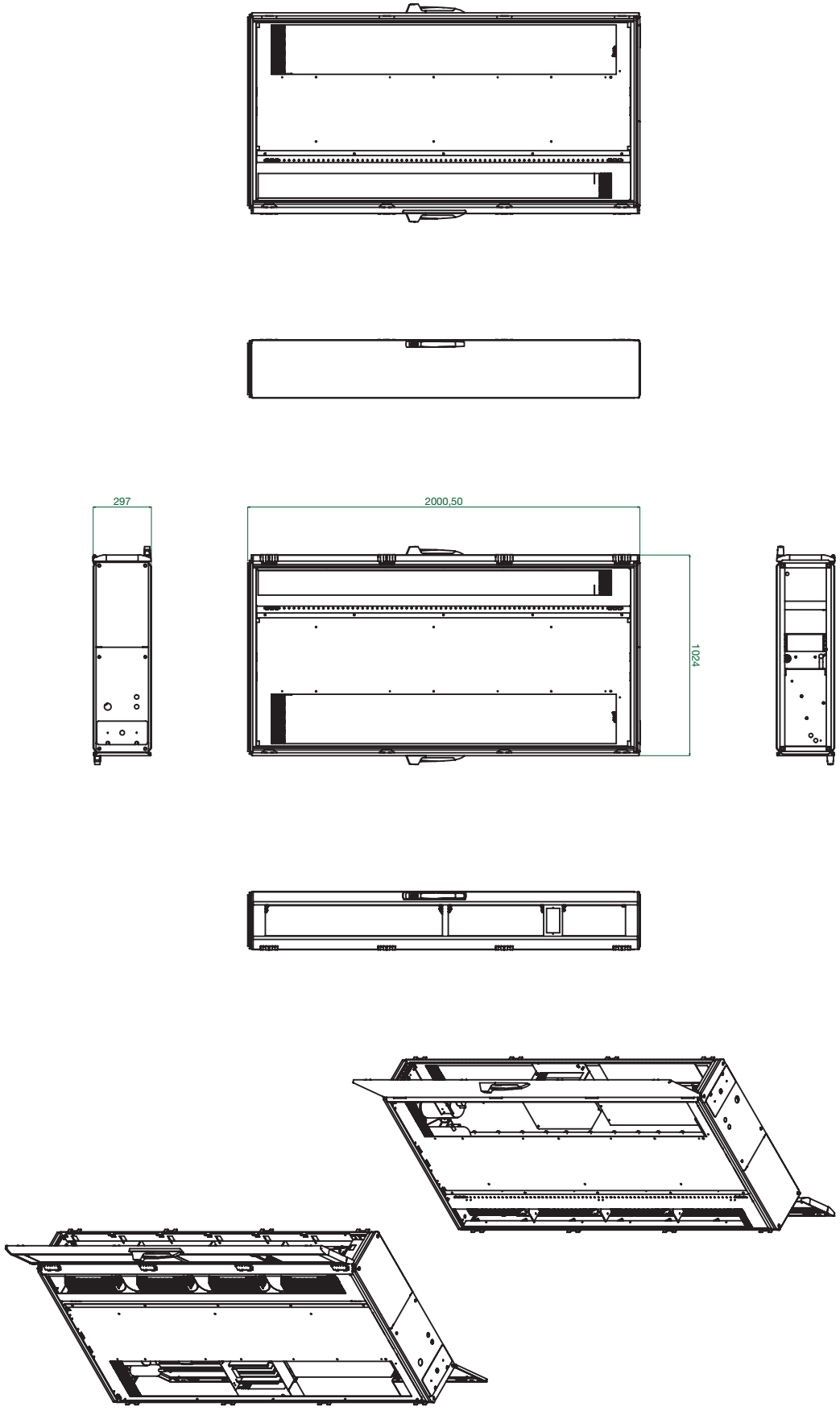

Fig. 45: Overview drawing of the LCP DX (depth 1000 mm)

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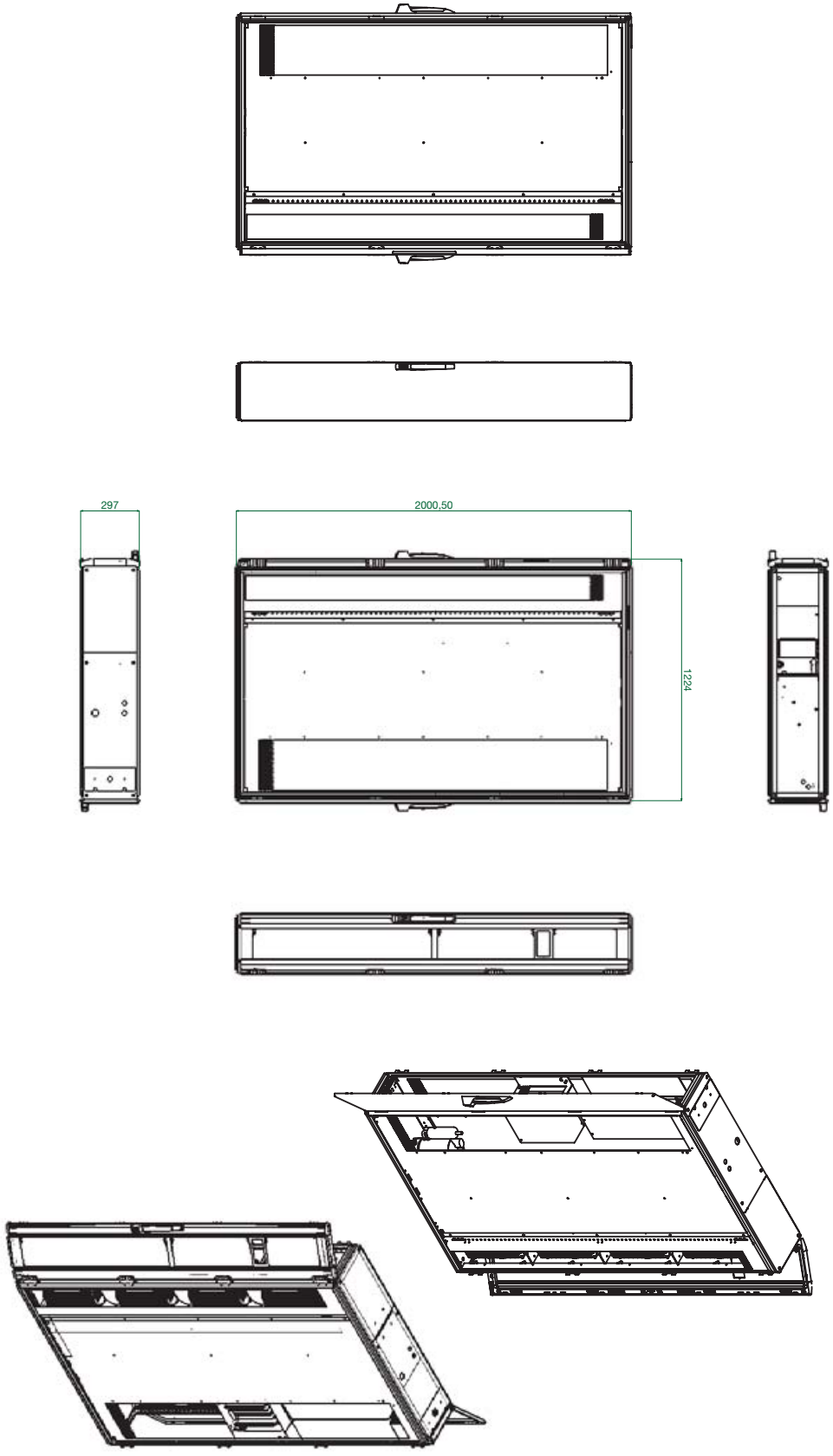

Fig. 46: Overview drawing of the LCP DX (depth 1200 mm)

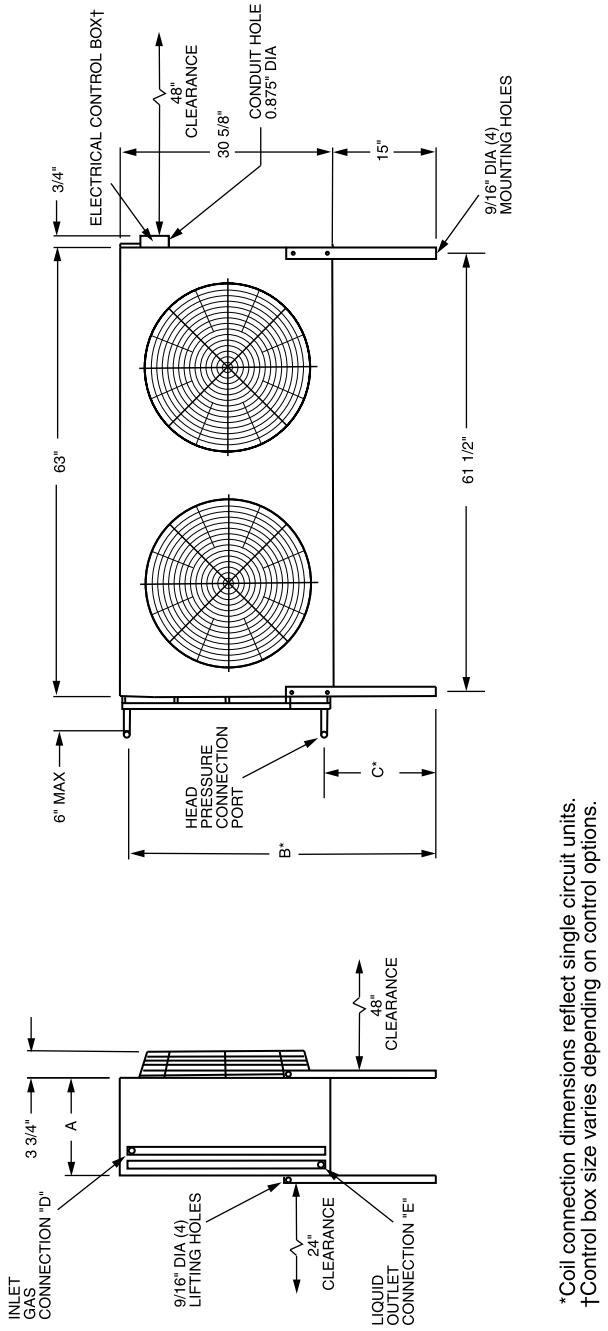

Fig. 47: External condenser

Unit	Dimensions (in.)				
	A	B*	C*	D	E
9951.077	14⅜	37⅜	16¾	1⅛	⅞

Tab. 24: Dimensions of the external condenser

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14.4 Circuit diagram

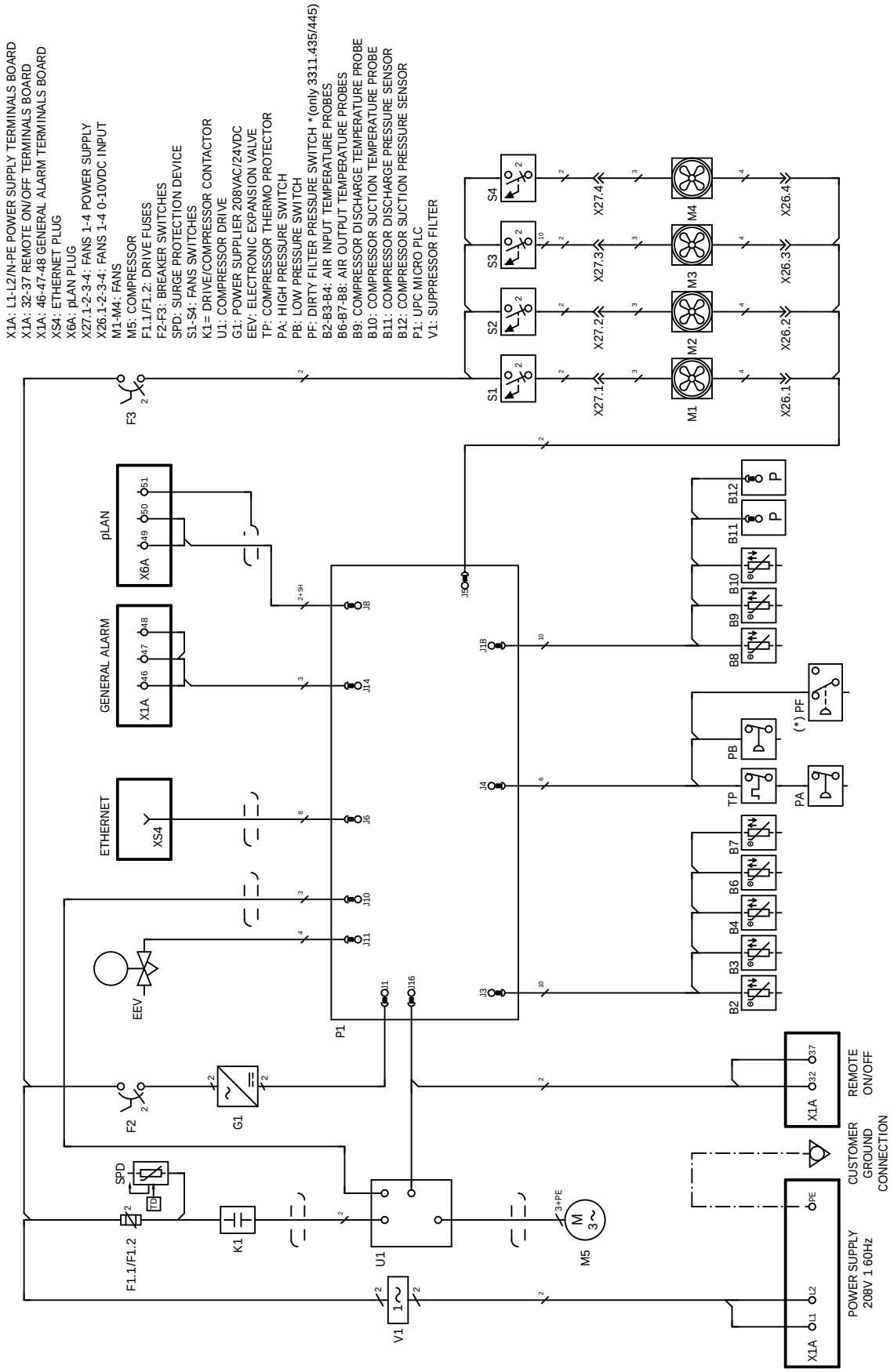

Fig. 48: Circuit diagram of the LCP DX

14.5 Piping and instrumentation diagram

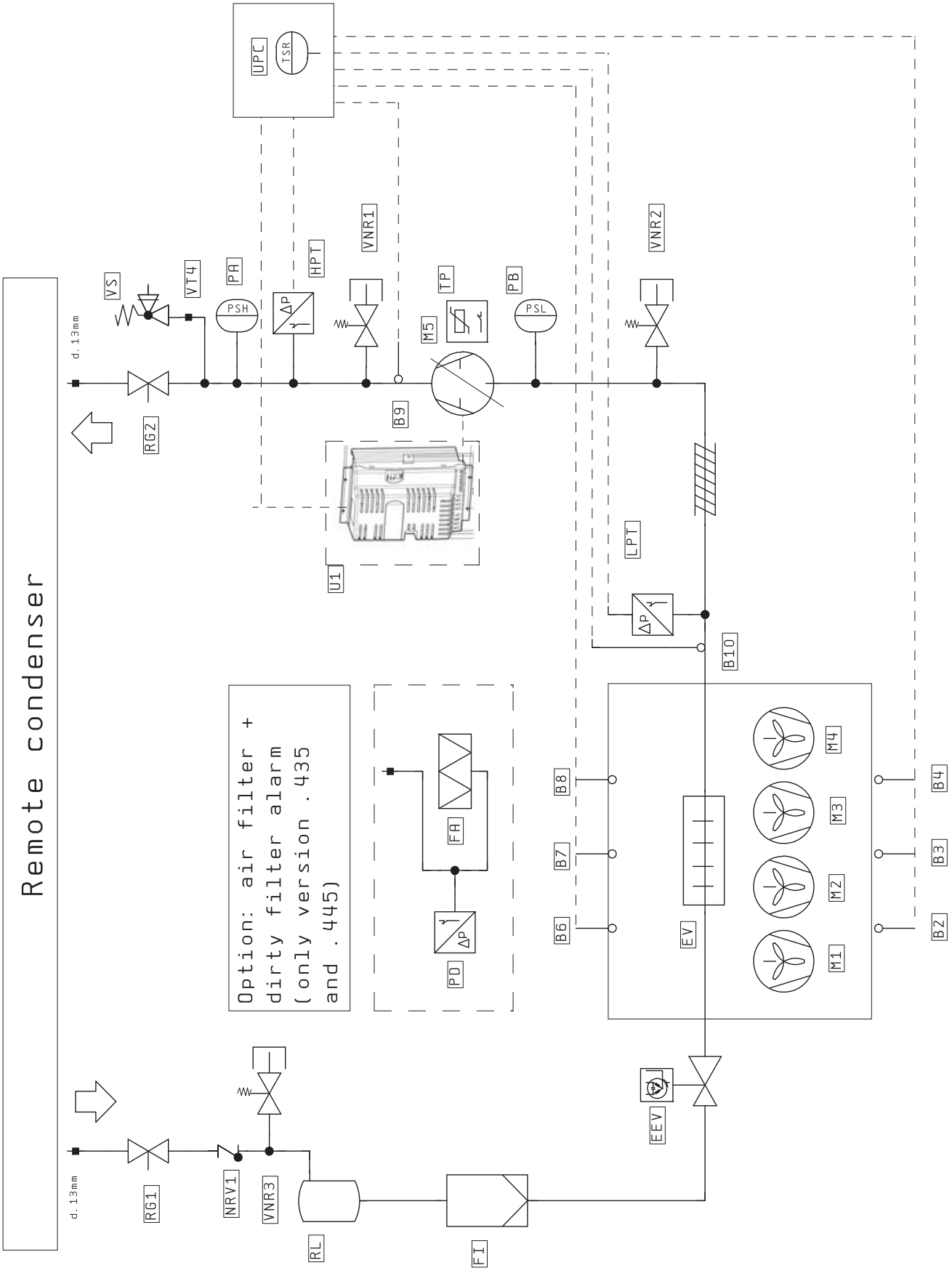

Fig. 49: Piping and instrumentation diagram

Stückliste / Bill of material

RICRIT1 11.07.2003

Bezeichnung	Menge	SI	Artikelnummer	Beschereibung	Hersteller	Interne Artikel. Nr.	S/P
RL	1	ST	140.0492.A RV-101.6X251	LIQREC 1.6 FRIGOMEC MAX P.225 BAR	FRIGO MEC SPA	925506	3. 2
FI	1	ST	DML084	FILTER DEIDR DANFOSS DML084	DANFOSS	916264	3. 2
RG1	1	ST	GBC12s 009G7032	VALV REF MAN DANFOSS GBC12s	DANFOSS	925505	3. 2
NRV1	1	ST	NRV12s	NO RETURN VALVE DANFOSS NRV12s R410A	DANFOSS	919833	3. 2
VNR3	1	ST	M 5/16"	SCHR TUBE M 5/16" SAE	FRIGO SYSTEM SPA	917253	3. 2
VNR3	1	ST	5/16"	SCHRADER VALVE 5/16"	FRIGO SYSTEM SPA	917254	3. 2
VNR3	1	ST	F 5/16"	SCHR CAP F 5/16" SAE	FRIGO SYSTEM SPA	917255	3. 2
EEV	1	ST	E2V24USF10	VALVEXP ELETTR CAREL E2V24USF10	CAREL	918099	3. 2
M1	1	ST	R3G250-RO40-A1	RADIAL FAN EBM R3G250-RO40-A1	EBMPAPST SRL	919746	3. 3
B6	1	ST	NTC060WP00	PROBE-TEMP NTC CAREL NTC060WP00	CAREL	903061	3. 3
B2	1	ST	NTC060WP00	PROBE-TEMP NTC CAREL NTC060WP00	CAREL	903061	3. 3
PD	1	ST	DBL-205C	PRESS DIFFAIR INDTECK DBL-205C	INDUSTRIE TECHNIK SRL	908650	3. 4
EV	1	ST	D98174	0722H(35+35)04018525E0312	LUVATA GAITAL GMBH	SOFIT02	3. 4
M2	1	ST	R3G250-RO40-A1	RADIAL FAN EBM R3G250-RO40-A1	EBMPAPST SRL	919746	3. 4
B7	1	ST	NTC060WP00	PROBE-TEMP NTC CAREL NTC060WP00	CAREL	903061	3. 4
B3	1	ST	NTC060WP00	PROBE-TEMP NTC CAREL NTC060WP00	CAREL	903061	3. 4
M3	1	ST	R3G250-RO40-A1	RADIAL FAN EBM R3G250-RO40-A1	EBMPAPST SRL	919746	3. 4
B8	1	ST	NTC060WP00	PROBE-TEMP NTC CAREL NTC060WP00	CAREL	903061	3. 4
B4	1	ST	NTC060WP00	PROBE-TEMP NTC CAREL NTC060WP00	CAREL	903061	3. 4
FA	1	ST	G3 1907x207x16	FILTER AIR AL 1907x207x16 UL	SIFIM SRL	SOFIT02	3. 4
M4	1	ST	R3G250-RO40-A1	RADIAL FAN EBM R3G250-RO40-A1	EBMPAPST SRL	919746	3. 5
B10	1	ST	NTC060HF01	PROBE-TEMP NTC CAREL NTC060HF01	CAREL	902230	3. 5
LPT	1	ST	SPKT0043R0	TRASD-PRES -1+17,3bar CAREL SPKT0043R0	CAREL	918015	3. 5
LPT	1	ST	A000013423	CABLE WIRED SK3232XXX TRANSDUCER	CAREL	911473	3. 5
U1	1	ST	PSD1016200	INVERTER MOT BRUSH CAREL PSD1016200	CAREL	925510	3. 6
M5	1	ST	SNB172FEKMT	COMP ROTATIVE MITSUBISHI SNB172FEKMT	MITSUBISHI	918086	3. 6
RG2	1	ST	GBC12s 009G7032	VALV REF MAN DANFOSS GBC12s	DANFOSS	925505	3. 7
VNR1	1	ST	M 5/16"	SCHR TUBE M 5/16" SAE	FRIGO SYSTEM SPA	917253	3. 7
VNR1	1	ST	5/16"	SCHRADER VALVE 5/16"	FRIGO SYSTEM SPA	917254	3. 7
VNR1	1	ST	F 5/16"	SCHR CAP F 5/16" SAE	FRIGO SYSTEM SPA	917255	3. 7
VNR2	1	ST	M 5/16"	SCHR TUBE M 5/16" SAE	FRIGO SYSTEM SPA	917253	3. 7
VNR2	1	ST	5/16"	SCHRADER VALVE 5/16"	FRIGO SYSTEM SPA	917254	3. 7
VNR2	1	ST	F 5/16"	SCHR CAP F 5/16" SAE	FRIGO SYSTEM SPA	917255	3. 7
B9	1	ST	NTC060HT00	PROBE-TEMP NTC CAREL NTC060HT00	CAREL	918014	3. 7
HPT	1	ST	SPKT00B6R0	TRASD-PRES +0+45 bar CAREL SPKT00B6R0	CAREL	918016	3. 7
HPT	1	ST	A000013423	CABLE WIRED SK3232XXX TRANSDUCER	CAREL	911473	3. 7
VS	1	ST	GBC12s 009G7032	VALV REF MAN DANFOSS GBC12s	DANFOSS	925505	3. 7
PA	1	ST	P100CP-142D	PRESSHP PSAH FISS 42	JOHNSON	925503	3. 7
TP	1	ST	2455R 82-715 L120C	MECC THERMOSTAT 120°C COD. RS 331-534	HONEYWELL	925511	3. 7
PB	1	ST	P100AP-298D	PRESS LP FISS 2.2	JOHNSON	925504	3. 7
VT4	1	ST	3035/2	REF CONNECTION CASTEL 3035/2	CASTEL SR	925508	3. 7

Fig. 50: Parts list, piping and instrumentation diagram

15 Glossary

1 U server:

1 U servers are very flat and deep, modern high performance servers, whose height corresponds to one height unit (1 U = 44.54 mm, the smallest standard height division). Typical dimensions are (W x D x H) 482.6 mm (19") x 800 mm x 1 U.

These systems normally include 2 CPUs, many GB RAM and hard drives, so that they require up to 100 m^3/h cooling air at a maximum of 32°C (89.6°F).

482.6 mm (19") level:

The front sides of the devices built into the server enclosure form the 482.6 mm (19") level.

Blade server:

By orienting dual CPU systems vertically and placing up to 14 units on a common backplane to provide for signal routing and power supply, one has a blade server.

Blade servers can "generate" up to 4.5 kW heat loss per 7 U and 700 mm depth.

"Front to back" cooling principle:

The devices built into the server enclosure are normally cooled according to the "front to back" cooling principle.

Under this cooling principle, cold air supplied by external air conditioning is blown to the front of the server enclosure. The fans in the devices built into the server enclosure direct this air horizontally through the server enclosure. The air is warmed through this process and is exhausted out of the rear of the enclosure.

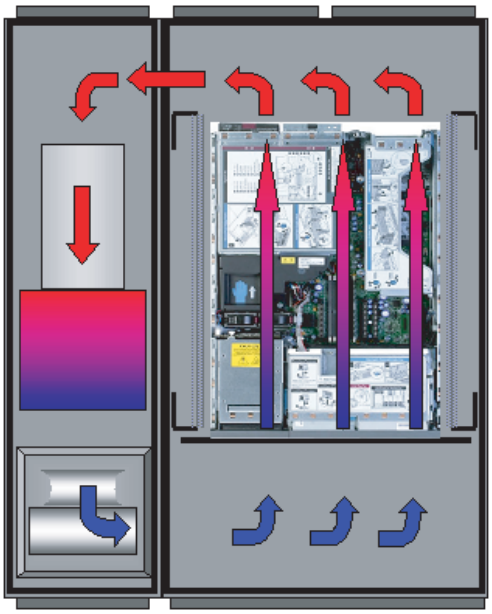

Fig. 51: "Front to back" cooling principle with bayed LCP Rack

Hotspot:

A hotspot is the concentration of thermal energy in a small area.

Hotspots normally lead to local overheating and can cause system malfunctions.

Switch:

Multiple servers normally communicate with one another and in the network using switches.

Because as many inputs as possible are located on the front of switches, they frequently have an airflow from the side, not "front to back" cooling.

Hysteresis:

If an upper limit value is overshot (SetPtHigh) or a lower limit value is undershot (SetPtLow) a warning or an alarm will be output **immediately**. For a hysteresis of x%, the warning or alarm for undershooting an upper limit value or overshooting a lower limit value clears only for a difference of x/100*limit value to the limit value.

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16 Customer service addresses

For customer service, please contact:
Tel.: 800-477-4000
E-mail: customerservice@rittal.us
Homepage: www.rittal.us

For complaints or service requests, please contact:
Tel.: 800-477-4000
E-mail: service@rittal.us

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