

RITTAL TOP THERM



**Schaltschrank-
Kühlgerät**

Cooling unit

Climatiseur

Koelaggregaat

Kylaggregat

**Condizionatore
per armadi**

**Refrigerador
para armarios**

**エンクロージャー用
クーリングユニット**



**Rittal
Thermoelectric Cooler**

SK 3201.200

SK 3201.300

Montage-, Installations- und Bedienungsanleitung

Assembly and operating instructions

Manuel d'installation et de maintenance

Montage- en bedieningshandleiding

Montage- och hanteringsanvisning

Istruzioni di montaggio e funzionamento

Instrucciones de montaje

取扱説明書

**Before installation of the cooling unit,
please read this manual completely and carefully.**

**The manual is a permanent part of the supplied system
and must be retained until the device is decommissioned.**

We thank you for deciding to purchase a Rittal product!

The Rittal Thermoelectric Cooler is a high-performance thermoelectric light-weight cooling unit with the highest efficiency ($COP > 1$) of its class!

The cooling unit is particularly suitable for the climate control of operating housings and small enclosures!

Before using the cooling unit, read this manual carefully in order to make full use of the excellent performance characteristics of the product.

Rittal GmbH & Co. KG products are continually adapted to the requirements and needs of our customers. This means the information concerning the product characteristics and functions contained in this manual can be changed without notice in the case of product improvements.

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1 Unpacking and checking

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1 Unpacking and checking

The Rittal Thermoelectric Cooler is delivered in transport packaging.

The supplied system consists of:

- 1 x cooling unit
- 1 x assembly and operating instructions
- 1 x accessories bag

Shipping bag content:

- 1 x assembly and operating instructions
 - 1 x self-adhesive sealing tape
 - 1 x filter mat
 - 1 x drilling template
 - 1 x connector plug (power supply and alarm output)
- Assembly parts

Check that the delivered system is complete and undamaged. Any obvious transport damage must be reported without delay to the responsible transport company.

The latest version of the "General conditions for deliveries and services" of the ZVEI (Central Association of the German Electrotechnical Industry) applies.

Prior to disposal, check the packaging material for any loose function parts!

2 Notes on documentation

Assembly and operating instructions are available in printed form (provided with the supplied system) and as a PDF file for the **Rittal Thermoelectric Cooler**. A PDF file is available as free download from www.rittal.com. ACROBAT READER® is required to view the file.

The accompanying documentation must be observed for the assembly, installation and operation of the cooling unit. Rittal cannot accept any liability for damage associated with the failure to observe these instructions.

The information and safety notes in this manual follow the following structure:

Safety and other instructions:



Danger!
Warning of a potential danger source.
Danger to life and health in case of non-observance!



Danger!
Warning of a dangerous electrical voltage.
Danger to life and health in case of non-observance!



Danger!
Warning of slippery surface.
Danger to life and health in case of non-observance!



Note:
Useful information and special features.

2.1 Retention of the manual

The operating company is responsible for retaining the manual.

No part of the manual may be reproduced or processed, copied or distributed using electronic systems in any form (printed, microfilm or any other form) without the written approval of Rittal GmbH & Co. KG. No liability can be assumed for any damage resulting from the non-observance of the information contained in this manual.

3 Safety notes

The following general safety notes must be observed for the assembly, installation and operation of the cooling unit:

- The assembly, installation and servicing of the cooling unit may only be performed by properly trained specialists.
- The mains connector of the cooling unit must only be connected and disconnected with the system de-energised. The device must be protected with a pre-fuse.
- No changes may be made to the cooling unit.
- Only the customer service or authorised personnel may open the device. The opening of the device by the user or unauthorised persons is not permitted and will void any warranty claim.
- The cooling unit is intended only for the climate control of enclosures and housings. Any other use shall be deemed improper. The manufacturer is not liable for any resulting damage! Proper usage also includes the observance of all valid documents and compliance with the inspection and servicing conditions.
- The air inlet and outlet openings on the cooling unit must not be covered.
- Use only original spare parts and accessories expressly approved for the Rittal Thermoelectric Cooler. Otherwise malfunctions or damage can occur. Warranty claims cannot be accepted for such damage.

3.1 Proper usage

The Rittal Thermoelectric Cooler conforms to the current state-of-the-art.

The cooling unit is intended only for cooling enclosures and operating housings. Any other use shall be deemed improper.

Proper usage is possible only when all associated documents, and the device-specific assembly and operating instructions are observed.

The manufacturer is not liable for any damage resulting from improper use.

3.2 Standards, guidelines

The Rittal Thermoelectric Cooler meets the requirements of the following guidelines and standards:

- DIN 3168 Section 4.5 (enclosure cooling units)
- Machine directive 98/37/EC
- Low-voltage directive 2006/95/EC
- Electromagnetic compatibility 2004/108/EC
- EN 378-1 to -4 (cooling systems and heat pumps)
- EN ISO 12100-1 and -2 (machine safety)
- EN 294 (safety distances for contact)
- EN 60 204-1 (machine electrical equipment)
- EN 60 529 (degrees of protection provided by the housing IP rating)
- EN 60 335-1 and -2-40 (safety of electrical devices)
- EN 55 011 KI B (radio disturbances)
- EN 61 000-3-11 (electromagnetic compatibility)
- ISO 9001/14001
- RoHs COMPLIANT 2002/95/EC

4 How it works

4 How it works

The Rittal Thermoelectric Cooler uses the Peltier effect for cooling. This effect is based on the principle that an electric direct-current flowing through a circuit consisting of two different metals causes the cooling of one contact point and the heating of the other contact points. An appropriate layout for the cooling production is designated as Peltier element. When the Peltier effect is used for enclosure climate control, an air flow is fed over the upper and lower connection point. The heat energy is released or accepted from the air flow to the Peltier element.

The air flow that releases the heat energy to the element is introduced as cooling air flow in the enclosure or the operating housing. After the heating of the cooling air flow by the active installed equipment, it is returned to the cooling unit and fed for renewed cooling over the "cold" side of the Peltier element. This produces an air circulation that causes the cooling of the enclosure or the operating housing.

The air flow that accepts the heat energy from the "warm" side of the Peltier element is released as warm air flow to the external air circuit of the cooling unit. This means the heat produced by the components in the enclosure is dissipated to the ambient air surrounding the cooling unit.

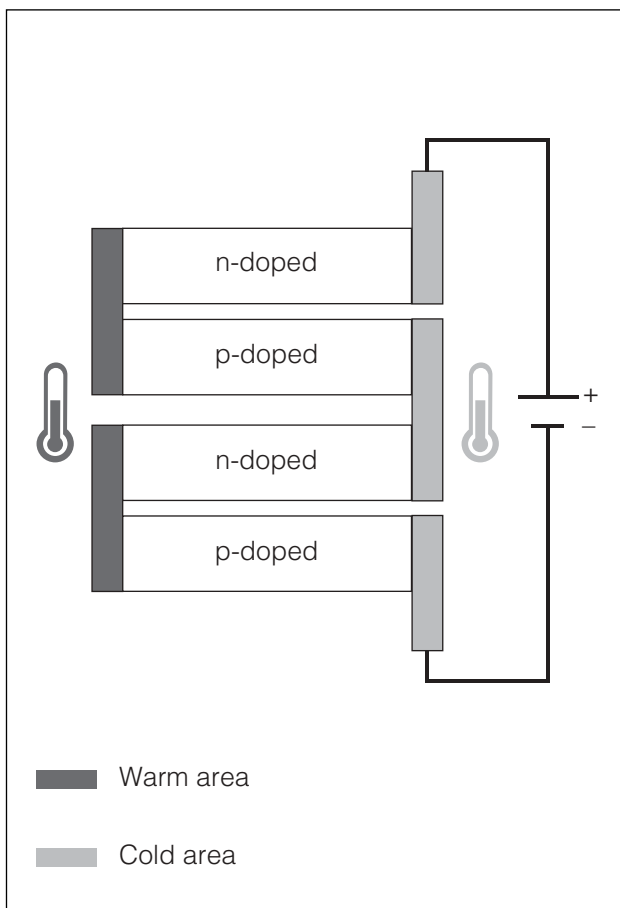


Fig. 1: Peltier element

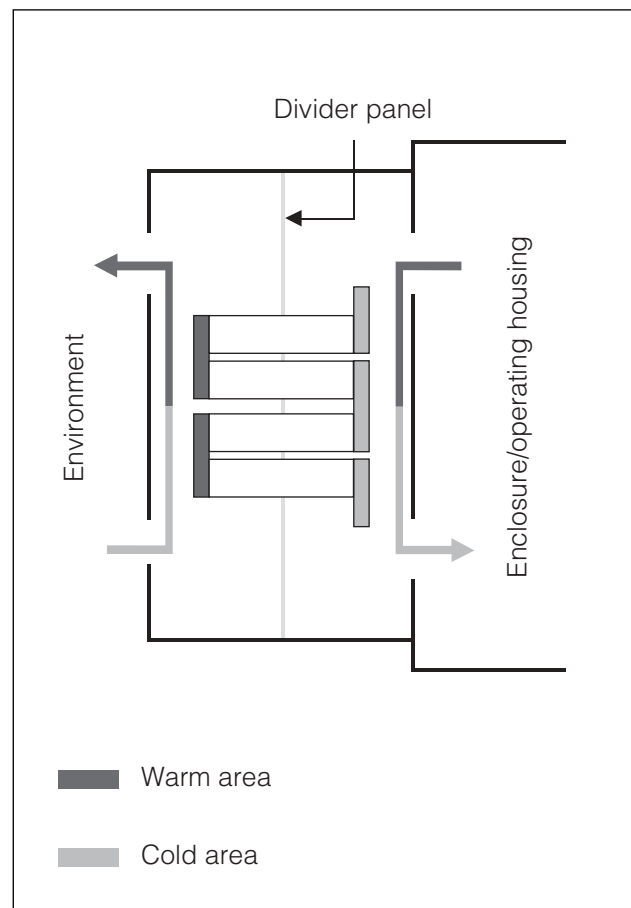


Fig. 2: Peltier cooling unit

5 Control

The Rittal Thermoelectric Cooler controls the cooling capacity of the Peltier elements and the air throughput of the integrated fans so that the required internal temperature of the enclosure or the operating housing is set with high accuracy. For this purpose, the device permanently monitors the air entry temperature at the warm air entry (internal circulation). If this temperature exceeds a parameterised temperature value (factory setting: 35°C), the device starts cooling operation. To do this, the trigger voltages of the Peltier elements and fans are corrected by a PID control so that the cooling capacity required for the cooling is always available and the cooling operation is provided with the least possible power. The redundant fans in the external air circuit of the Rittal Thermoelectric Cooler have variable air delivery rates (and consequently variable speeds) appropriate for the required cooling capacity. If only limited or indeed no cooling capacity is required, this control behaviour can lead to a temporary inactivity of the fans in the external air circuit. This does not constitute a malfunction of the device, but rather an extreme power-saving operating state that also increases the service life of the used fans.



Note:

The fan speed in the external air circuit of the cooling unit is matched to the current cooling capacity requirement. Consequently, a stoppage of the fans – interrupted by periodic, short-term fan starts – is not a malfunction of the device, but rather represents an extreme power-saving operating state!

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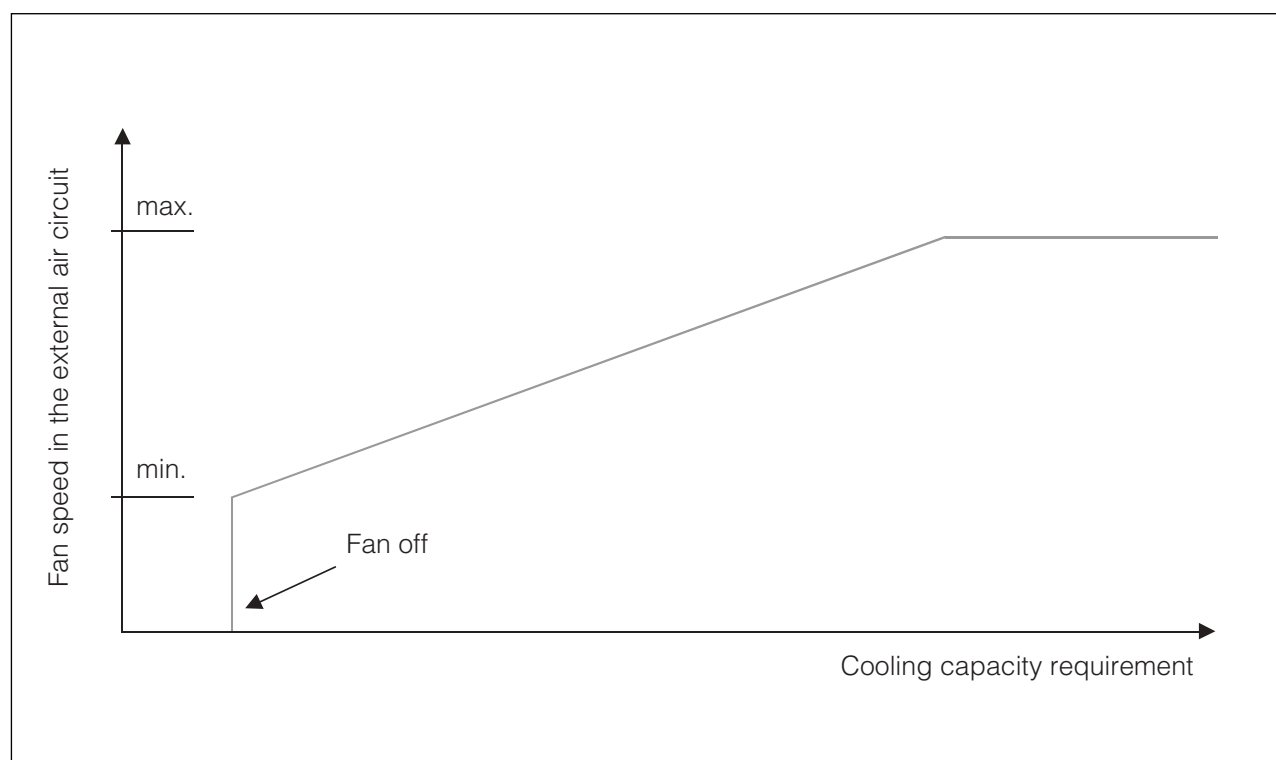


Fig. 3: Control behaviour of the fans in the external air circuit

6 Device description

6 Device description

GB

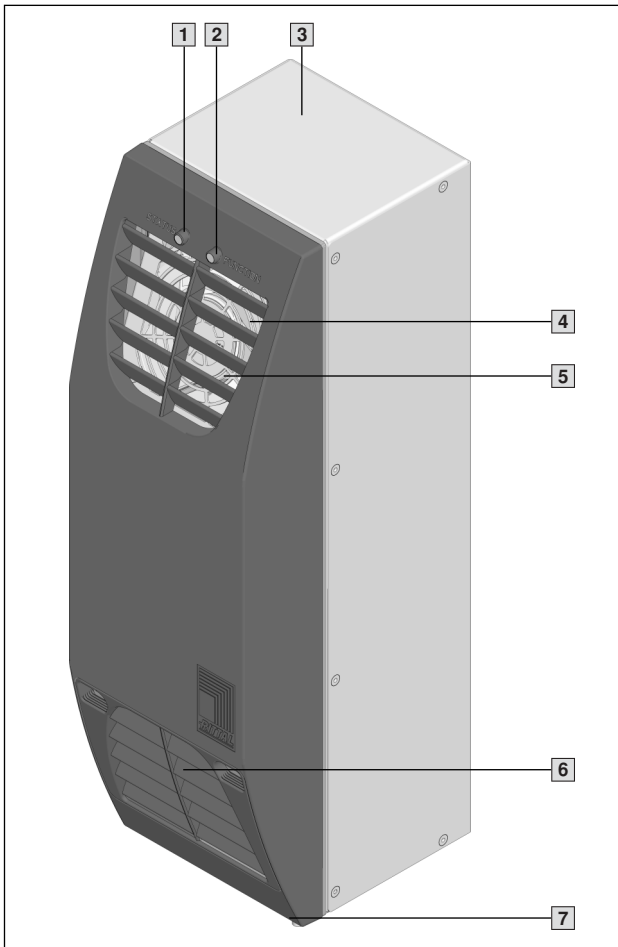


Fig. 4: Device front

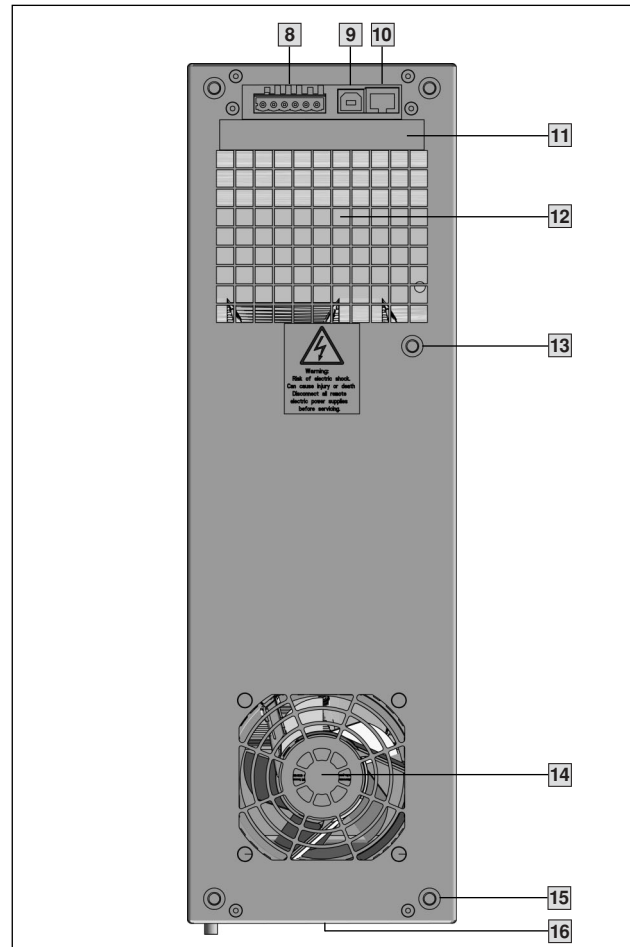


Fig. 5: Device rear

Legend

- 1 Status display
- 2 Function display
- 3 Housing
- 4 Louvred grille
- 5 Warm air outlet opening – external air circuit
- 6 Cold air inlet opening with filter element (optional) – external air circuit
- 7 Condensate discharge
- 8 Interface X1: supply voltage and alarm output
- 9 Interface X2: USB 2.0, type B
- 10 Interface X3: RJ 45
- 11 Connection diagram
- 12 Warm air inlet opening – air internal circuit
- 13 Earth connection
- 14 Cold air outlet opening – air internal circuit
- 15 Blind nut
- 16 Rating plate (on the device lower side)

7 Device mounting

The following principles must be observed for determining the mounting position on the enclosure or operating housing:



The direct incidence of cold air on temperature-sensitive components must be avoided!



Components with integrated fans determine the cooling air routing in the enclosure or operating housing.



The mounting position of the cooling unit must be chosen so that the cooling air flow supports the heat dissipation of these components.



A free space of at least 100 mm is required in front of the air inlet and outlet openings of the cooling unit in the internal and external circuit.



The cooling unit must be positioned on the enclosure so that the condensate discharge opening is located at the lowest point of the cooling unit.

The Rittal Thermoelectric Cooler is mounted as external or full internal mounting.

The supplied drilling template must be used to fasten the cooling unit on the enclosure or the operating housing.

The drilling template provides dimension lines for the various installation options of the cooling unit. Identify appropriate lines and dimensions on the drilling template for the required mounting type (external or full internal mounting) using figures 6 and 7.

Drill the required holes for fastening the cooling unit and then cut the required cut-out, including the line width, in accordance with the drilling template.



Risk of injury!

Wear protective gear (safety glasses, protective gloves) when cutting the mounting cut-out and drilling the fastening holes.

Carefully deburr all drilled holes and cut-outs to prevent injuries caused by sharp edges.

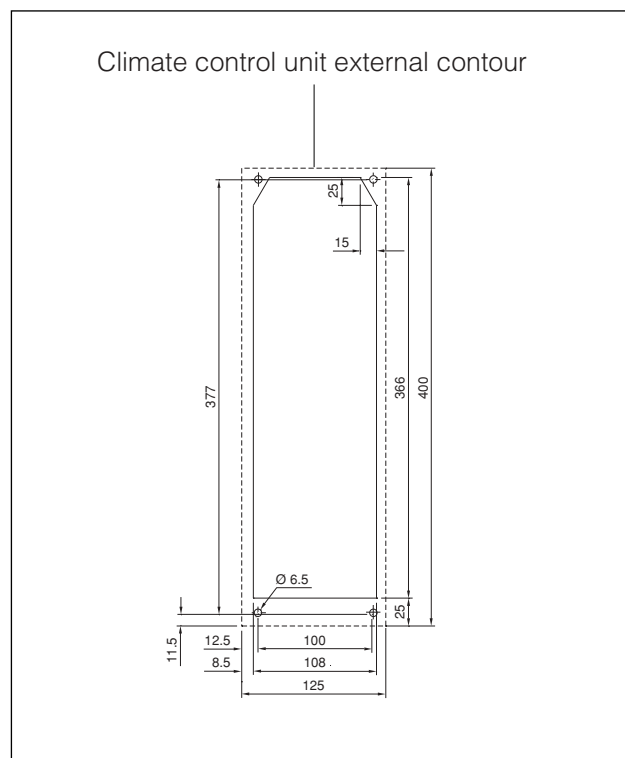


Fig. 6: Mounting cut-out and hole sizes for external mounting

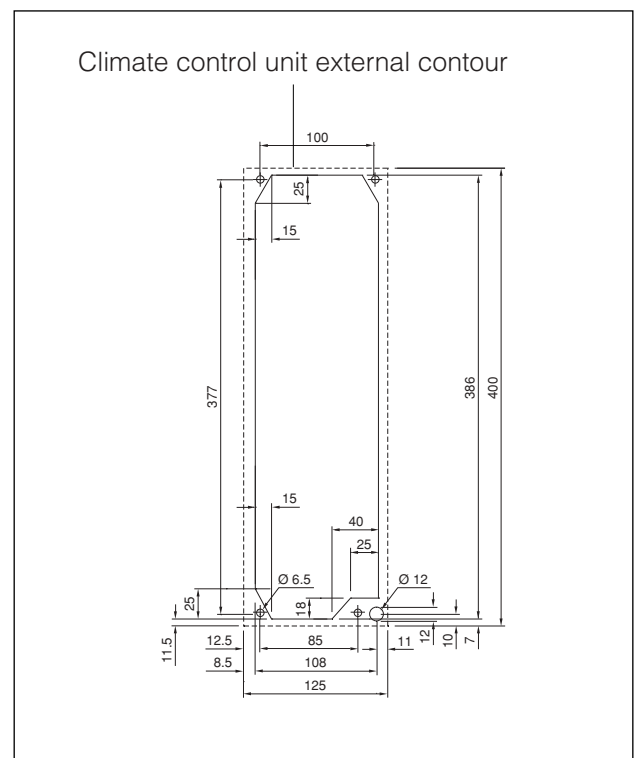


Fig. 7: Mounting cut-out and hole sizes for internal mounting (full internal mounting)

7 Device mounting

7.1 External mounting

When the cooling unit is mounted as externally-mounted variant, the supplied self-adhesive sealing tape must be fastened on the device rear wall of the cooling unit so that no gaps result at the joint edges. Then screw the supplied studs into the blind nuts at the rear of the unit. Secure the cooling unit using the supplied washers and nuts.

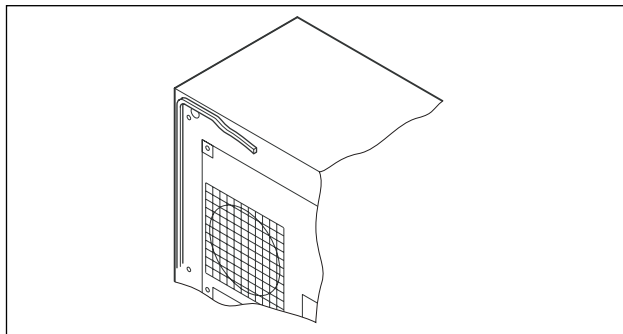


Fig. 8: Position of the sealing tape

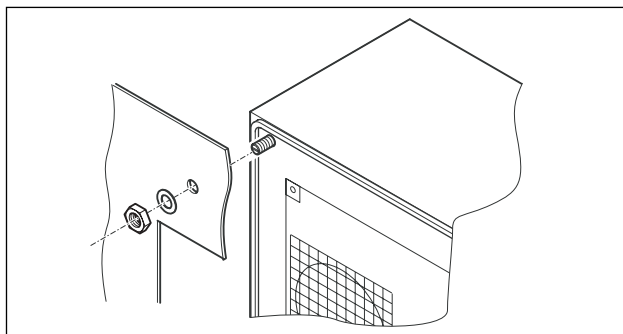


Fig. 9: Fastening the cooling unit

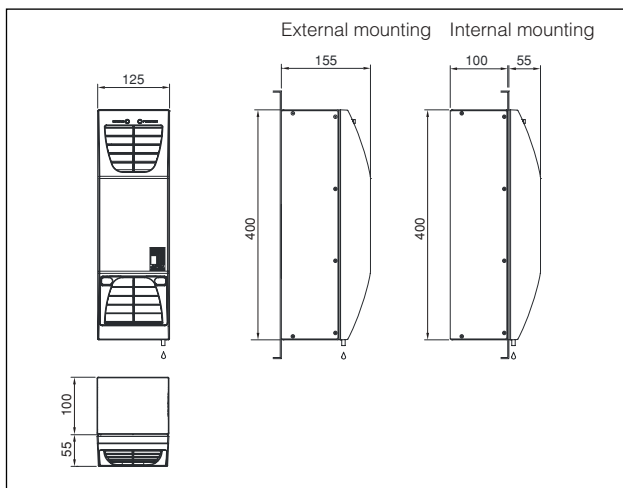


Fig. 10: External and internal mounting

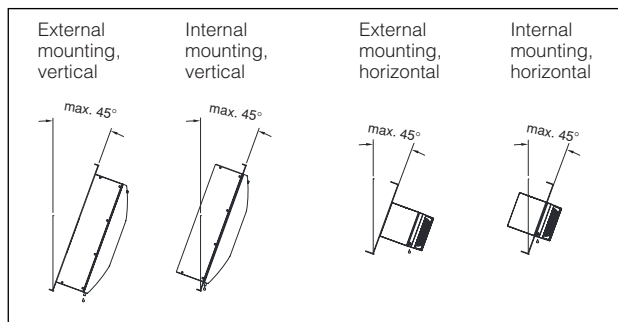


Fig. 11: Permissible mounting positions

7.2 Internal mounting

For the full internal mounting of the cooling unit, the louvred grille must be carefully removed from the device. The self-adhesive sealing tape supplied must be placed on the front of the cooling unit (the device face from which the louvred grille has been removed) so that no gaps result at the joints. Then screw the supplied studs into the blind nuts at the front of the unit. Secure the cooling unit using the supplied washers and nuts. To complete the mounting, the louvred grille must be re-attached.

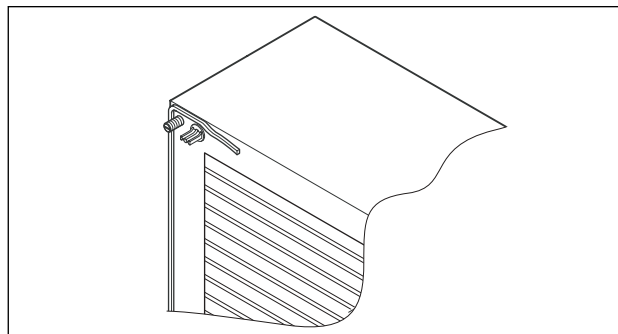


Fig. 12: Position of the sealing tape

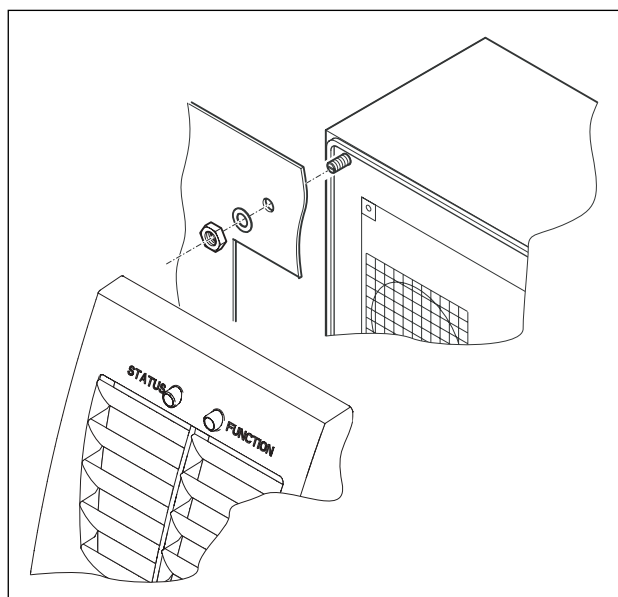


Fig. 13: Fastening the cooling unit

8 Filter mounting

The Rittal Thermoelectric Cooler can be equipped with a device filter (supplied). An appropriate filter unit is recommended when the cooling unit is used in ambient air subject to dust.



Note:

When a filter unit is used, it must be cleaned regularly or, if necessary, replaced.

When a filter is installed, the lower louvred grille in the air inlet of the cooling unit must be removed. To do this, raise the louvred grille with a light tug at the marked position (see Figure 14) and withdraw it at the front. Then place the filter mat in the filter holder of the device. The colour-marked side of the filter mat must face the device. Then re-mount the louvred grille and snap it into position by applying light pressure.

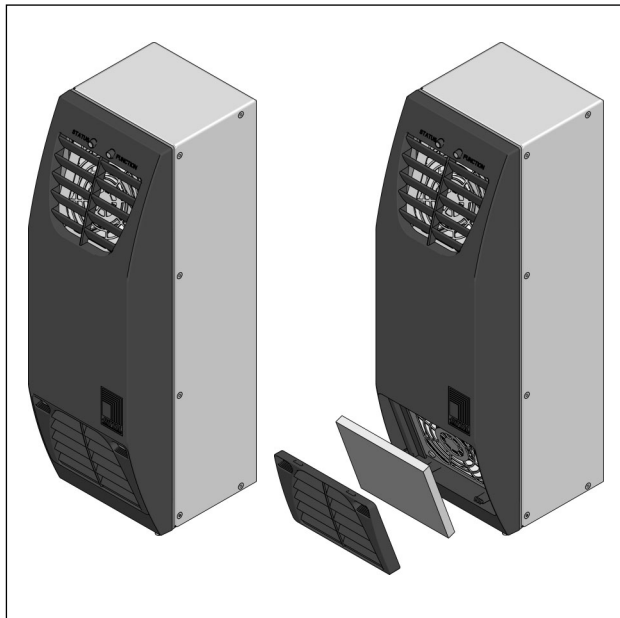


Fig. 14: Removable louvred grille

9 Mounting the condensate discharge

The Rittal Thermoelectric Cooler is equipped with a condensate discharge.

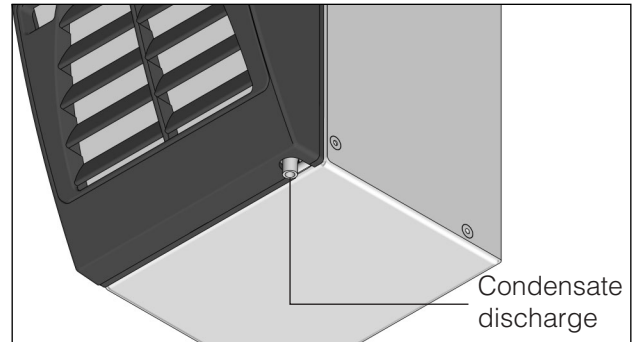


Fig. 15: Condensate discharge

The controlled condensate discharge requires a condensate discharge hose be connected to the cooling unit's condensate discharge supports. The condensate hose is available as accessory.

The installation of the condensate hose requires that it

- is laid with a gradient (no siphon formation),
- does not have any kinks,
- must not have a reduced cross-section if extended.



Risk of injury!

The operation of the cooling unit without controlled condensate discharge can cause liquid to accumulate below the device.

10 Electrical connection



Danger!
Warning of a dangerous electrical
voltage.
Danger to life and health in case of
non-observance!

- The mains voltage and frequency must correspond to the values stated on the rating plate.
- An all-range fuse specified on the rating plate must be connected upstream as line and device protection.
- No additional temperature control is allowed to be connected upstream of the cooling unit on the supply side.
- An isolating device that ensures a contact opening of at least 3 mm in switched-off state must be connected upstream of the cooling unit.
- The mains connection must ensure low-noise potential equalisation.

[illegible]

Fig. 17: SK 3201.200 connection diagram, with integrated power pack

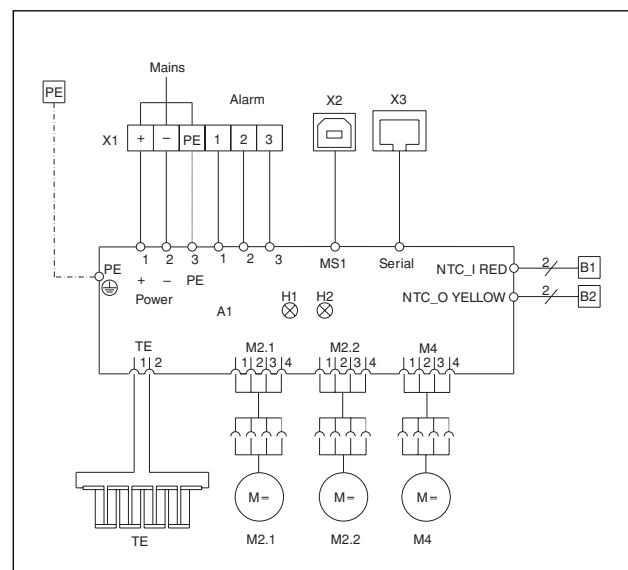


Fig. 18: SK 3201.300 connection diagram, without integrated power pack

A1	Power PCB
A2	Power pack
B1	Temperature sensor, internal temperature
B2	Ambient temperature sensor
B3	Temperature sensor, power pack
H1/H2	Status and function display
M2.1	Condenser fan 1
M2.2	Condenser fan 2
M4	Evaporator fan
TE	Thermoelectric elements
X1	Terminal strip
X2	USB connection
X3	Optional interface

11 Interfaces

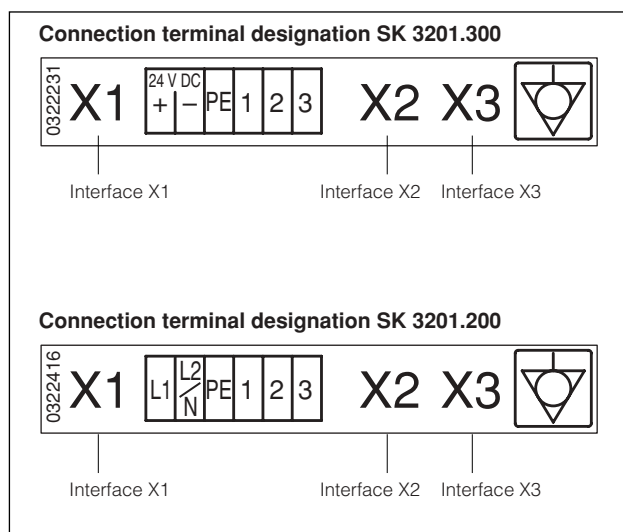


Fig. 19: Designations of the device interfaces

11.1 Interface X1 – power supply and alarm output

- Power supply
SK 3201.200: AC: 100 – 240 V, 50/60 Hz
SK 3201.300: DC: 24 V (SELV)
- Change-over contact/alarm output (floating connection)
Switching load: AC: 250 V/2 A, DC: 6...30 V/2 A
The signal relay releases for overtemperature, sensor break and fan failures.

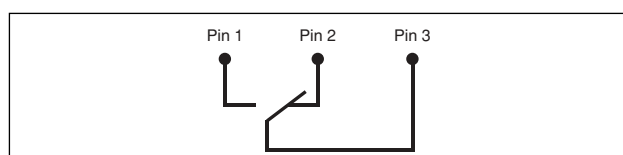


Fig. 20: Change-over contact assignment

11.2 Interface X2 – device programming

- USB 2.0

11.3 Interface X3 – integration in a higher-level monitoring system

- RJ 45

The interface X3 permits the connection of the cooling unit in higher-level monitoring systems.



Note:

The electrical signals at the interface X3 are extra-low voltages (not extra-low safety voltages in accordance with EN 60 335).

12 Earth connection

The Rittal Thermoelectric Cooler is equipped with a potential equalisation connection point. A conductor with a nominal cross-section of at least 6 mm² must be connected to this connection point and included in the provided potential equalisation.

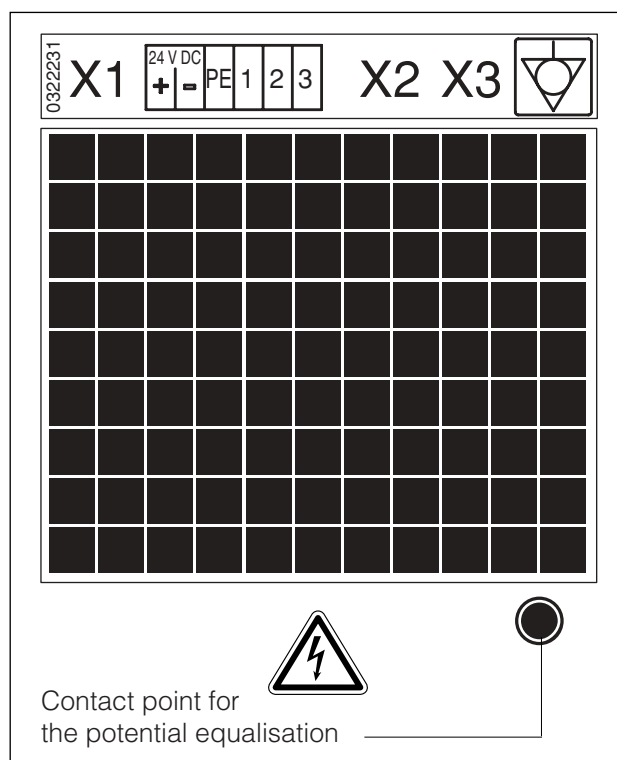


Fig. 21: Contact point for potential equalisation



Note:

According to the standard, the PE conductor in the mains connection cable is not classified as an equipotential bonding conductor.

13 Commissioning

13 Commissioning

The Rittal Thermoelectric Cooler is operational immediately after connection of the power supply. If the factory setting is unchanged, the temperature control of the enclosure or operating housing uses the following parameters:

Set enclosure interior temperature: +35°C

Start temperature for cooling operation: +35°C

Overtemperature alarm message: +45°C

Under normal operating conditions, device operation with unchanged factory setting should ensure a problem-free enclosure climate control. If it would appear to be useful to change the predefined parameters for special climate control requirements, this can be realised with programming software. In this case, please contact the device manufacturer.

14 Status and function displays

The Rittal Thermoelectric Cooler is equipped with a status and function display. Two coloured LEDs show the status, alarm and error messages that indicate the operating state of the cooling unit.

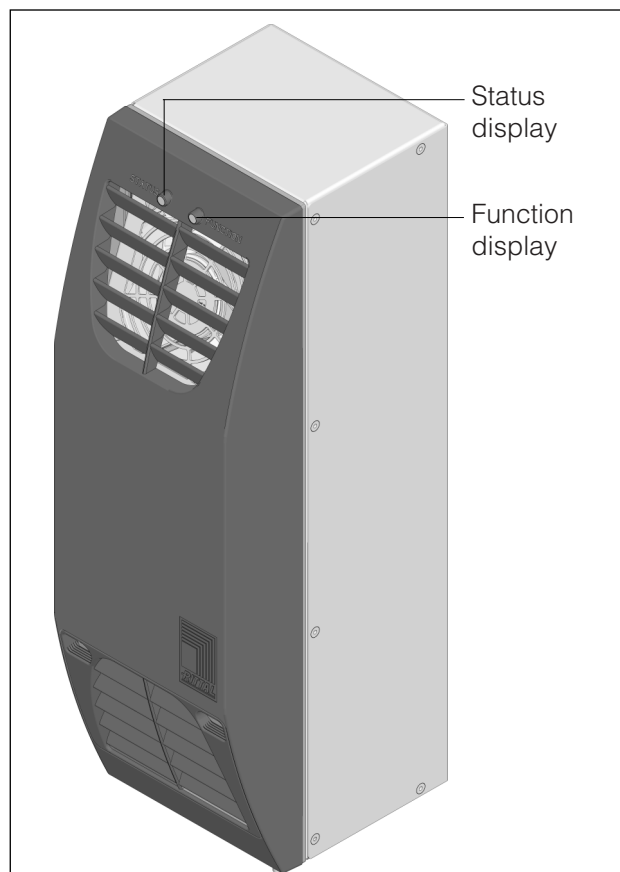


Fig. 22: Status and function displays on the cooling unit

Function LED	Description
Off	Unit OFF or Cooling OFF
Green	Cooling operation ON
Red	Error – unit

Tab. 1: Function display

Status LED	Description
Off	Unit OFF
Green	Unit OK
Orange	Warning (temperature alarm, temperature > alarm value)
Red	Error (sensor defective, fan defective, thermoelectric module defective)

Tab. 2: Status display

15 Technical specifications

Model No. SK		3201.200	3201.300
Dimensions in mm	W	125	
	H	400	
	D	155	
Operating voltage in volts, Hz		100 – 240 V AC, 50/60 Hz	24 V DC
Useful cooling output \dot{Q}_k in accordance with DIN 3168		L 35 L 35	100 W
Power consumption P_{el} in accordance with DIN 3168		L 35 L 35	Max. 100 W
Refrigeration factor (max.)/COP		L 35 L 35	1.0 1.2
Power pack		Integral	–
Housing colour		RAL 7024/anodised aluminium	
Protection category according to EN 60 529	Internal circuit	IP 54	
	External circuit	IP 34	
Weight		3.0 kg	2.4 kg
Noise level		Max. 63 dB(A)	
Operating temperature		+5°C to +55°C	
Storage temperature		–20°C to +70°C	
Installation position		Horizontal or vertical	
Air throughput, unimpeded air flow	Internal circuit	132 m³/h	
	External circuit	132 m³/h	
Temperature setting range		+20°C to +55°C	
Cooling activation temperature		+35°C (factory setting)	
Type of connection		Plug-in terminal strip	
Pre-fuse gG		2 A	10 A
Floating change-over contact; contact loading		DC: 6...30 V / 0.1...2 A AC: 250 V / 2 A	

Technical modifications reserved.

Tab. 3: Technical specifications

Variable	Range	Default value	EEPROM
Temperature conversion °C/°F	0...1	0 (°C)	Yes
Cooling setpoint	+20 to +55°C	35°C	Yes
Overtemperature alarm message	(0)2...15 K (0 = off)	10 K	Yes
Internal fan deactivation (during cooling pauses)	0...1	0 (no deactivation)	Yes

Tab. 4: Setting ranges

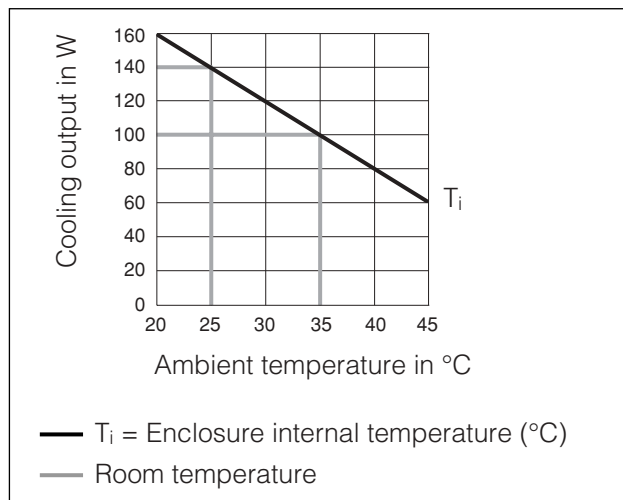


Fig. 23: Cooling output characteristic curve for full internal mounting and an enclosure internal temperature T_i of 35°C

16 Maintenance and cleaning

16 Maintenance and cleaning



Danger!

Prior to any cleaning or maintenance work, the power to the cooling unit must be disconnected!



Note:

When the filter is replaced, use only filter materials approved for the Rittal Thermoelectric Cooler.

The dust collecting efficiency and dust storage capacity of the filter equipment chosen is matched to the rated flow speed of the cooling unit in the external air circuit and so guarantees an excellent dust filtering for a high useful cooling output.

16.1 Maintenance

The Rittal Thermoelectric Cooler is low-maintenance.

16.2 Cleaning

If the Rittal Thermoelectric Cooler is used in ambient air subject to dust, dust can accumulate in the area of the air inlet and outlet openings and on the heat transferring surfaces of the Peltier element. This can cause a reduction of the air flow in the device and thus a gradually reducing cooling capacity. To remove the dust, withdraw the louvred grille at the device front side. Blow compressed air through the air inlet and outlet openings of the cooling unit.

If the Peltier cooling unit is equipped with a device filter, it must be cleaned or replaced regularly. The filter mat can be cleaned by washing, dusting or blowing with compressed air. The high-quality filter material used for the mat means the cleaning does not impair the filter-technical properties and the form stability. The fire class remains unchanged!

17 Fault correction

Fault description	Possible cause	Correction
The unit does not switch on.	No power supply.	Check the mains connection and the pre-fuse.
The unit does not cool adequately.	The air circulation in the enclosure is impaired.	Check the air circulation inside the enclosure. Check, in particular, those components equipped with a fan. Check the free spaces above and below the main heat dissipation sources.
	Ambient temperature too high.	Reduce the ambient temperature. Protect the unit from radiation heat caused by direct sunshine and hot surfaces.
	Filter equipment contaminated.	Check the filter and, if necessary, clean or replace.
	Internal fan defective.	Replace (Rittal Service).
	External fan defective.	Replace (Rittal Service).
	The heat produced in the enclosure exceeds the cooling capacity of the Peltier cooling unit.	Reduce the heat loss.
Condensation.	Enclosure leakages.	Check the enclosure for leaks (IP 54). Check, in particular, the cable entry points for leaks.
	Internal temperature of enclosure set too low.	Check the set enclosure internal temperature (factory setting: +35°C).

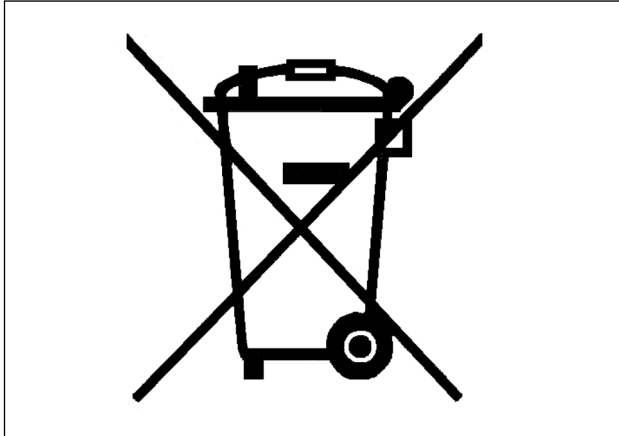
Tab. 5: Fault correction

18 Disposal

18 Disposal

To ensure the material reuse of the recyclable packaging materials, they must be delivered to the local collection sites.

The cooling unit must be delivered to a waste management service provider that ensures the correct reuse of the recyclable parts and the proper disposal of the rest.



19 Guarantee

Provided the unit is used correctly (refer to the operating instructions), Rittal gives its customers a 24-month “Rittal manufacturer’s guarantee” starting with date of manufacture.

If, within the guarantee period, during the 24 months after manufacture, a malfunction occurs on the product that substantially adversely affects its functionality, Rittal will, within a reasonable period of time, rectify the malfunction by telephone service or, if necessary, by replacement, repair or other measures, at its option. If this is inappropriate for the customer, Rittal also has the possibility to provide the customer with the replacement parts required to correct the malfunction.

Within the scope of its guarantee, Rittal will bear all costs concerning the dispatching, deployment and accommodation of its staff and with replacing or repairing any parts, provided the malfunction occurred during the proper usage of the products and provided the costs are not increased by the movement of the products to a place other than that where they were originally delivered. In addition, Rittal will bear the necessary costs for procuring and delivering the replacement parts to the place where the products were originally delivered.

Any parts delivered for or in replacement will be new or in mint condition and in a fully functional state free of faults; the replaced parts will become Rittal’s property; the customer warrants that no rights of any third parties will obstruct that exchange and transfer of title.

Any claims based on this guarantee are to be submitted to Rittal in writing within one month after the occurrence of the malfunction.

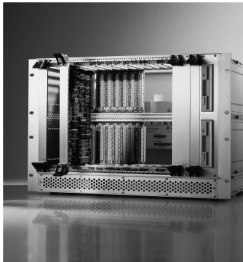
Any further claims, in particular claims for damages, are not covered by the guarantee. The statutory liability for defects is not affected by the guarantee.



Schaltschrank-Systeme
Industrial Enclosures
Coffrets et armoires électriques
Kastsystemen
Apparatskåpssystem
Armadi per quadri di comando
Sistemas de armarios
インダストリアル エンクロージャー



Stromverteilung
Power Distribution
Distribution de courant
Stroomverdeling
Strömfördelning
Distribuzione di corrente
Distribución de corriente
分電・配電システム



Elektronik-Aufbau-Systeme
Electronic Packaging
Electronique
Electronic Packaging Systems
Electronic Packaging
Contenitori per elettronica
Sistemas de montaje para la electrónica
エレクトロニクス パッケージシステム



System-Klimatisierung
System Climate Control
Climatisation
Systeemklimatisering
Systemklimatisering
Soluzioni di climatizzazione
Climatización de sistemas
温度管理システム



IT-Solutions
IT Solutions
Solutions IT
IT-Solutions
IT-lösningar
Soluzioni per IT
Soluciones TI
ITソリューション



Communication Systems
Communication Systems
Armoires outdoor
Outdoor-behuizingen
Communication Systems
Soluzioni outdoor
Sistemas de comunicación
コミュニケーションシステム