

1. Purpose

This specification establishes the standards for implementing the protective grounding system (PE-system) in electrical cabinets, boxes, junction boxes etc.

2. Application area

This specification is valid for assemblies designed by Bühler Alzenau or manufactured according to BLOA drawings. It is valid mainly for electrical cabinets supplied by Rittal (PS-series). It should however, also be applied to other types of cabinets.

3. Equipment-Grounding (PE) System**3.1 Equipment-Grounding (PE) bus bar**

Each assembly e.g. the electrical cabinet, junction box, control desk, etc. must be equipped with a PE-bus bar. The external equipment-grounding-conductors (i.e. the main grounding conductor from customer's power distribution panel as well as the other conductors of the grounding system outside of cabinets and boxes) are attached to these PE-bus bars. The point-of-attachment will be marked „PE“. The external equipment-grounding-conductors shall be shown in the wiring diagrams, section 'grounding connections'. The cross-sectional area of the equipment-grounding-conductor can be determined from DIN EN 61439-1 / VDE 0660-600-1, whereby a minimum cross-sectional area has to be maintained (refer to table 1).

If the external equipment-grounding-conductor has a cross-sectional area up to 16mm^2 , the support rail (C-rail) NS35/7,5 may be used as a PE-bus bar. To attach the equipment-grounding-conductor to the C-rail, grounding terminals (USLKG 10... -35 of Phoenix Contact) shall be used.

For equipment-grounding-conductors with a cross-sectional area larger than 16mm^2 , a copper bus bar (30 x 5, ...) must be used as PE-bus bar. The equipment-grounding-conductor, in this case, shall be attached to the bus bar with attachment clamps (Rittal SV 35 XX).

Table 1:

Cross-sectional area of main equipment-grounding-conductor (from customers power distribution panel)	Minimum cross-sectional area of external equipment-grounding-conductor
$< 16\text{ mm}^2$	= cross-sectional area of main equipment-grounding-conductor
$\geq 16\text{ mm}^2$	16 mm^2

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3.2 Attaching the internal Grounding-Conductor in Cabinets

All necessary grounding connections within an electrical cabinet are listed in the following. This is a minimum requirement. These connections are normally not shown in the wiring diagrams. A connection must however be represented in the wiring diagram, if explicitly stated in this standard.

An entry should be made on the panel layout drawing (assembly drawing):

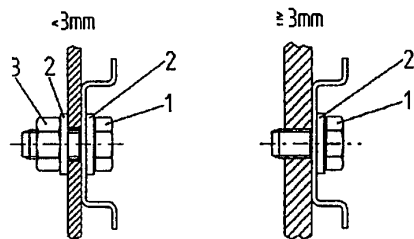
'Grounding-Conductor attachments carried out according to LHH-N 905.001/3.2'

In case of grounding for maintaining EMC integrity plaited strips of copper (BLOA Part no. 10074933) must be used.

3.2.1 Mounting Panel

The PE-bus bar is attached to a mounting panel using conductive attachment parts.

Diagram 1: Using Support rail (C-rail) NS35 as PE-bus bar



1. M6 x ...
2. Contact washers
3. Nut M6

Distance between points-of-attachment:

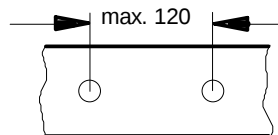
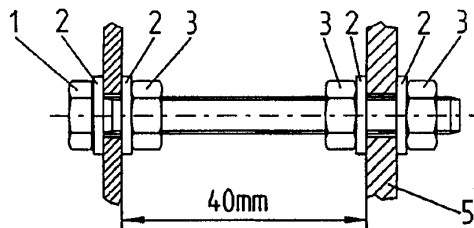
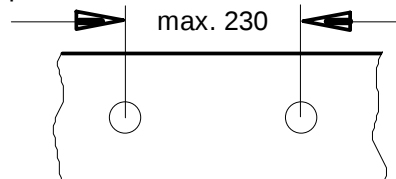


Diagram 2: Using Copper Bus Bar



1. M8 x 60
2. Contact washers
3. Nut M8
5. Copper Bus Bar (e.g. 30x5)

Distance between points-of-attachment:

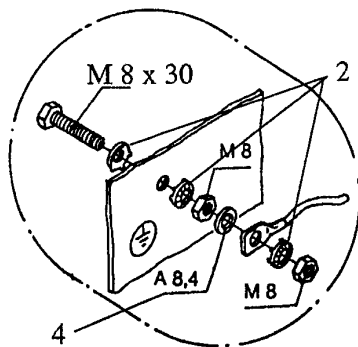


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Special Case:

In case, the PE-bus bar is isolated from the mounting panel (e.g. when the mounting panel is lacquered) or if the PE-bus bar is not attached to the mounting panel at all, a copper lead must be used to connect the PE-bus bar to the mounting panel. The copper lead shall have a cross-sectional area, which is the same as that of the external equipment-grounding-conductor attached to that PE-bus bar (refer to Table 1). **This connection has to be shown in the wiring diagrams.** The correct connection to a lacquered mounting panel is shown in Diagram 3.

Diagram 3:

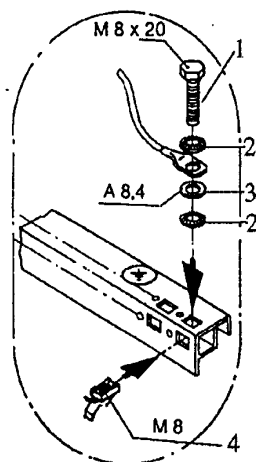


- 2. Contact washers
- 4. Plain-washer

3.2.2 Cabinet Frames

A grounding strip * (16 mm² and of short length) shall be used to attach the cabinet frame to the PE-bus bar. Diagram 4 shows the attaching method.

Diagram 4:



- 1. M8x20
- 2. Contact washers
- 3. Cage nut (Rittal PS 4165)
- 4. Plain-washer

* preferably use:
Grounding strip 16 mm², 170 mm
Rittal SZ 2565, part no.: 00154811

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3.2.3 Removable Panels of Cabinets (without electrical components)

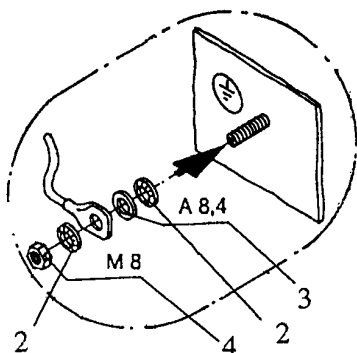
Short lengths of 16 mm² grounding strip* shall be used to connect the removable parts of the cabinet i.e.

- side panels
- doors
- back panel
- top panel

to the cabinet frame. The cabinet panels are thus integrated into the PE-System.

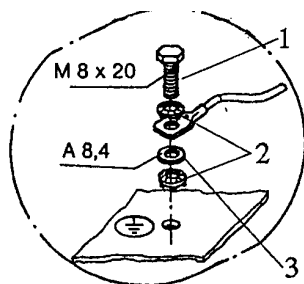
Make all attachments to the cabinet frame using Diagram 4.
Make all attachments to the cabinet panels using Diagram 5.
Make all attachments to the bottom panel using Diagram 6.

Diagram 5:



- 2. Contact washer
- 3. Nut M8
- 4. Plain-washer

Diagram 6:



- 1. M8x20
- 2. Contact washer
- 4. Plain-washer

* Grounding strip 16 mm², 170 mm
Rittal SZ 2565, LO part no.: 00154811

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3.2.4 Devices in Cabinets

The type of equipment-grounding-conductor attachments used for the built-in modules in a cabinet shall be clearly stated in the schematics/ assembly drawings:

- If a separate equipment-grounding-conductor is used for a built-in module this must be attached to the PE-bus bar and shown accordingly in the schematics.
- If the ground connection to the mounting panel is accomplished by use of the attaching parts of the module, then this shall be shown in the assembly drawings.

In this case the attachments shall be made according to the following table:

<u>Cross-sectional area of copper equipment-grounding-conductor</u>	<u>Attaching Parts</u>
Up to 6 mm ²	minimum 2 screws M6
Up to 16 mm ²	minimum 2 screws M8 or 4 screws M6
Up to 50 mm ²	minimum 4 screws M8

NOTE: Contact washers shall be used between the modules and the mounting panel.

3.2.5 Special Features of 19" Cabinets (Front Side)

For mounting of module-supports, 19"-modules and the front panels on the angle profiles of 19" cabinets **cage nuts M6, Rittal EL 2094** must be used.

These provide a connection between the anodized 19"angle profiles and e.g. the lacquered front plate that is electrically conductive. An electrically conductive connection between the 19"angle profile and the cabinet frame is ensured by the cabinet manufacturer.

3.2.5.1 Module Supports, Front Panels (without built-in modules)

Connected to the PE-System via suitable attachments (see above).

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3.2.5.2 19"-modules

If required, these modules are connected to the PE-System via the equipment-grounding-conductor terminal provided by the manufacturer.

This connection shall be shown in the schematics.

3.2.5.3 Front Panels with built-in modules

If these elements must be connected to the PE-System, a grounding-conductor connected to the PE-bus bar is used.

This connection shall be shown in the schematics.

3.3 PE-System in junction boxes

The instructions above are also valid for the incorporation of the PE-system in junction boxes of the Rittal KL series.

Note that the cover of the junction box shall be grounded using an equipment-grounding-conductor lead of 4mm² (see Diagram 3).

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