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空机柜/端子柜
Empty Enclosure/
Terminal Enclosure



KEL
1194255 1194256
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1194279 1194281



装配和操作系统说明

Assembly and operating instructions



ENCLOSURES

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FRIEDHELM LOH GROUP

目标读者:

有经验的电工 (按照操作安全规程) 和受过培训的相关人员

带组件证书的空机柜需要指定机构提供的整体检验证书。

**Empty enclosures with component certificate require a
examination certificate of a notified body for the
overall approval.**

1. 用途

由不锈钢制成的空机柜/端子柜专门设计用于安装防爆部件和端子。

2. 本文目的

在存在爆炸性风险的区域内工作时，必须遵守相关安全规程，以确保人员和设备的安全。
因此，在此类系统上工作的安装和维护人员就担负着特殊的责任。
这里有一个前提，那就是要非常清楚适用的规程和标准。
本文简要汇总了最重要的一些安全措施。相关责任人员除了要严格遵守相关规程之外，本文所述的安全措施也可作为有益的补充。
本说明以及其他内容在运行时可能并不会保留在机柜内。

3. 安全说明

空机柜/端子柜主要用于永久性安装于1 和2区以及21和22区。
上述机柜均不能用于0和20区。
如果粉尘累积厚度 $\geq 5\text{ mm}$ ，则不能在这样的条件下使用这些机柜。
若使用不当或未经授权擅自使用以及未能遵守本文所述内容，则都将无法享受我们的质保服务。
严禁改动或修改空机柜/端子柜，以免有损防爆性能。
在安装时，应确保空机柜/端子柜清洁且无损伤。

具体来说，必须遵守以下内容：

- + 国家安全规程
- + 国家工作场所健康和安全规程
- + 国家安装和设置规程
- + 广为人知的工程标准
- + 本文所述安全说明
- + 铭牌和额定值铭牌上的参数和额定工作条件
- + 检验证书

不遵守上述要求将无法享受质保服务！

4. 符合标准

空机柜/端子柜符合GB3836/ GB12476标准的要求。
机柜在制造时采用最新技术，符合ISO 9001标准。
在适用的条件下，也符合EN 61439-1（低压成套开关设备）和DIN EN 62208（空机柜总要求）标准的要求。

当外壳喷塑时，在可燃性粉尘环境中使用时，须采取措施避免静电积聚。

1. Use

The empty enclosures / terminal enclosures made of stainless steel are designed for installation of Ex components and terminals.

2. Purpose of these instructions

When work is done in areas where there is risk of explosion, the safety of persons and equipment depends on adherence to the relevant safety regulations.
Consequently, the installation and maintenance personnel who work on such systems have a special responsibility. The prerequisite here is the exact knowledge of the applicable regulations and standards.
These instructions present a brief summary of the most important safety measures. It is intended as an enhancement to the appropriate regulations with which the responsible persons must comply.
The instructions and other objects may not remain in the enclosure during operation.

3. Safety information

The empty enclosures / terminal enclosures are designed for permanent installation in explosion-endangered areas of zones 1 and 2 or in zones 21 and 22. The above-mentioned enclosures may not be used in zones 0 and 20.
The enclosures may not be operated in conditions subject to dust accumulations $\geq 5\text{ mm}$ thickness.
Inappropriate or unauthorised use or failure to comply with the information contained in these instructions voids any warranty on our part.
Modifications or changes to the empty enclosure / terminal enclosure which impair explosion protection are not allowed.
The empty enclosure / terminal enclosure must be clean and undamaged when it is installed.

In particular, the following must be observed:

- + national safety regulations
- + national workplace health and safety regulations
- + national installation and set-up regulations
- + generally accepted engineering standards
- + the safety information contained in these operating instructions
- + the data and rated operating conditions on the name plate and rating plate
- + prototype testing certificate

Non-compliance with these instructions will invalidate the warranty!

4. Conformance to standards

The empty enclosures / terminal enclosures conform to the requirements of GB3836/ GB12476. The enclosures are also state-of-the-art at the time of manufacturing and conform to the ISO 9001.
The requirements from EN 61439-1 (low-voltage switchgear combinations) and the DIN EN 62208 (empty enclosure - general requirements) are also satisfied, provided applicable.

When enclosure with powder coated, need to take actions to avoid static electricity accumulation in dust environment.

5.技术参数

防护类别符合EN 60529 + A1:2000标准接触、外物和防水
防护等级：IP66

机柜和盖子之间的密封由泡沫硅胶密封实现。由于材料自身特性的限制，不可能无缝覆盖泡沫球（起点/终点）。但是这并不影响达到指定的防护等级。

采用硅胶密封时，容许环境温度为 - 50° C 到160° C。内部组件必须要考虑额定工作温度范围。

6.安装

在安装和操作防爆型机柜时，必须遵守被人们广泛接受的技术规则，比如GB3836/ GB12476，以及本文提供的安装和操作说明。 如果要在防爆型机柜中使用本安型电路或Ex-i组件，则必须符合相应的本安电气限值。

安装位置

对于防爆型机柜而言，必须精心选择安装位置，避免工业卡车或叉车对其造成任何损坏。
安装在支撑架上的防爆型机柜一定要防止跌落。
所有紧固孔都必须都装上紧固螺钉。

锁具安装

锁具的安装扭矩为15 N • M。
增加防松标记，以便识别锁具是否松动。

环境温度

为了维持规定的表面温度，一定不能超出或低于环境温度限值。
任何外部热源或太阳照射都不应导致机柜的额外发热。

进线底板安装

为保证箱体底部进线底板的防护等级，必须安装所有的紧固螺钉，扭矩为5+1 N • M。

5. Enclosure protection degree

Protection category per EN 60529: 1991 + A1:2000 + A2:2013 Contact, foreign body and water protection IP66
The sealing of the housing to the cover is realised with a foamed silicone sealing.

Due to the properties of the material, it is impossible to overlap the foamed bead (starting point/end point) seamlessly. This however, does not affect the specified protection category in any way.

Permitted ambient temperature -50°C to 160°C in conjunction with silicone seal. The permitted operational temperature range must be considered for internal components.

6. Installation

For the installation and operation of explosion-protected enclo- sure variants, the recognised rules of technology in accordance with GB3836/ GB12476, and the accompanying installation and operating instructions must be observed.
If intrinsically safe circuits or Ex-i components are assigned to the explosion-protected enclosure variants, the relevant electri- cal limit values for the intrinsic safety must be observed.

Installation location

The installation location for explosion-protected enclosure vari- ants must be chosen to prevent any damage caused by indus- trial trucks or forklift trucks. Explosion-protected enclosure variants installed on support frameworks must be protected from falling over.
All provided fastening holes must be given fastening screws.

Lock installation

The mounting torque of the lock is 15 N·M.
Add a lock marker to identify if the lock is loose.

Ambient temperature

To maintain the determined surface temperature, the envi- ronment temperature limit values may not be undershot or overshot.
Any present external heat sources or solar radiation may not cause additional heating of the enclosure.

Gland Plate Mounting

To ensure the sealing performance of the gland plate, all the screws must be fastened, with torque 5+1 N • M.

7. 电缆和导线格兰头

可以使用金属或耐冷冲击塑料制成的电缆和导线格兰头以及密封塞。所有电缆和导线格兰头都必须具有单独的防爆证书。

电缆和导线格兰头必须安装，其用途是避免发生松动，以及确保电缆和导线入口位置的永久密封。
在确定电缆格兰头之间的距离时，要确保可以使用力矩扳手上紧电缆和导线格兰头以及固定螺母。

在安装电缆和导线格兰头时，必须遵守规定的紧固力矩。

进线底板及箱体开孔规则：

1. 格兰圆孔安装区间：距离进线底板边缘40mm以上，距离箱体边缘20mm以上为可开孔区域；
2. 不同格兰的开孔边缘的间距：

M16-M32	15mm
M35-M75	20mm
M75-M100	35mm
3. 箱体方孔：距边40mm以上；方孔边缘间距75mm；方孔最大尺寸150x216mm
4. 格兰板方孔：距长边40mm以上，距短边80mm以上；方孔边缘间距39mm；方孔最大尺寸110x216mm

7. Cable and wire entries

Cable and wire entries as well as sealing plugs made of metal or cold impact resistant plastic can be used. All cable and wire entries must have a separate Ex test certificate, for example:

The cable and wire entries must be installed so that a self-loosening is prevented and the permanent sealing of the cable and wire entry locations can be guaranteed.
The distances between the cable entries should be chosen so that a torque wrench can be used to tighten the cable and wire entries and the box nuts.

The tightening torques must be observed for the installation of the cable and wire entries.

Rittal Ex enclosure cut-out rules:

1. Drill holes from 40mm away the border of gland plate and 20mm away the border of the enclosure body;
2. Minimum distance between holes's borders:

M16-M32	15mm
M35-M75	20mm
M75-M100	35mm

3. Square holes in enclosure body: 40mm away from the border of enclosure body; minimum distance between hole's border is 75mm; maximum size 150x216mm

4. Square holes in gland plate: 40mm away from the long border of enclosure body and 80mm away from the short border; minimum distance between hole's border is 39mm; maximum size 110x216mm

尺寸图

Dimension sketch



- [illegible]

9. 保护接地导线/ 等电位连接导线 (PA)

必须遵守EN 61439-1标准第7.4.3.1节（保护接地电路）中的相关要求。

一般而言，必须连接外部保护接地导线或等电位连接导线。

空机柜的所有PE/PA连接均为M8螺钉连接。

空机柜中的所有提供的内部和外部连接地点起到这样的作用。

连接时必须遵守EN 60079-0标准第15章的要求。

使用空机柜随附的不锈钢螺钉、螺母、平垫圈和弹垫，按照图纸A2961900KE23连接PE/等电位连接导线。对于从外面进入机柜内部的PE/等电位连接导线，应该装上一个具有相应截面积和环形直径的标准电缆端子。所使用的电缆端子应该满足DIN 46234标准对于环形端子或者DIN 46235标准对于叉形端子的要求。该要求也适用于单股和多股导线。

9. PE conductor/equipotential bonding conductor (PA) connection

The requirements defined in EN 61439-1, Section 7.4.3.1 (protective earth circuits) must be adhered to.

As a general rule, the outer protective conductor or an equipotential bonding conductor must be connected.

All PE / PA connections of the empty enclosures are designed in M8.

An internal and external connection point located at the empty enclosures is provided for this purpose. The connection must be performed in agreement with EN 60079-0, Section 15.

Connect the PE / equipotential bonding conductor as described on drawing A2961900KE23 using the stainless steel screws, nuts, plain washers and split washers that accompany the empty enclosure. Attach a standard cable lug with the appropriate cross-section and ring diameter to the PE / equipotential bonding conductor which is fed in from the outside. The cable lug you select should fulfil the requirements for ring cable lugs defined in the DIN 46234 standard or for spade-type cable lugs defined in the DIN 46235 standard. This requirement applies to solid single conductors as well as multi-wire conductors.

为保护接地和等电位连接导线提供的端子最少能容纳一根导线。截面积必须满足以下要求：

S设备相线的截面积	对应保护接地导线Sp的最小截面积
S ≤ 16	S
16 < S ≤ 35	16
S > 35	0,5 S

PE/等电位连接导线端子接头的最小截面积为4 mm²。

在安装外部导线/等电位连接导线时，一定要在靠近机柜框架主体的固定位置正确走线，确保导线不会旋转或松动。将螺钉上紧到10 Nm，并使用所提供的**弹垫**提供足够的接触压力。机柜主体和门之间的SL/PA连接必须使用标有绿/黄标记的柔性接头接地线实现。选择的截面积应该与最大号外部导线相匹配，如果上表中没有可用的数值，那么也要确保不能低于4 mm。

保护接地导线端子的材料应该不易受到电化学腐蚀。必须采取相应的保护措施，避免保护接地导线受到机械、电动和热动力应力。采取机械保护措施的接地连接必须便于检查和测试。

The terminals for the protective earth and equipotential bonding conductor are designed to accept at least one conductor. The cross-sections must be selected as follows:

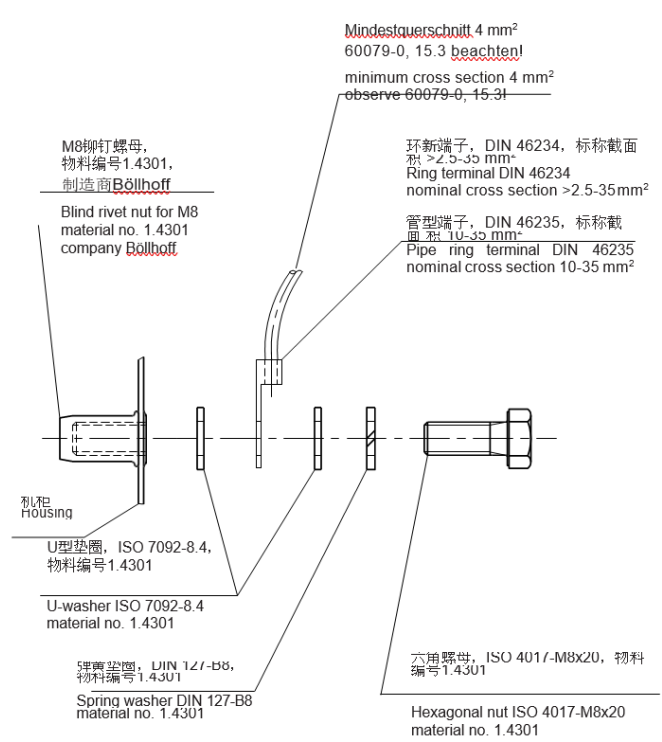
Cross-section of the phase wire of the installation S	Minimum cross-section of the associated Protective conductor Sp
S ≤ 16	S
16 < S ≤ 35	16
S > 35	0.5 S

The PE / equipotential bonding conductor terminal fittings are designed for a minimum cross-section of 4 mm².

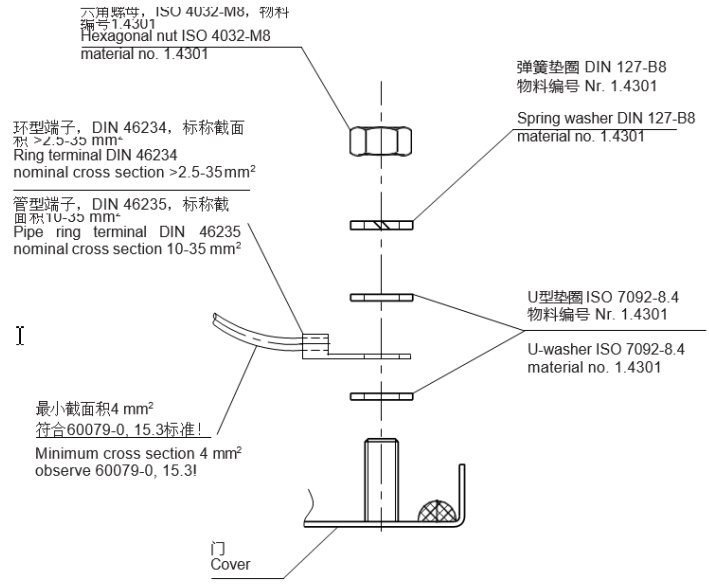
When you are installing the outer conductor / equipotential bonding conductor, be sure that you route the conductor properly in a fixed position near the enclosure main body to ensure that the conductor will not rotate or become loose. Torque the screwed connection to 10 Nm to provide sufficient contact pressure using the split washer provided. The SL / PA connection between the enclosure main body and the door must be achieved with a flexible connector marked in green/yellow. Select the cross-section to match the heaviest installed gauge outer conductor but not less than 4 mm² if the cross-section table above does not apply.

Select materials for the protective conductor terminal that are not likely to be susceptible to electro-chemical corrosion. Appropriate measures must be taken to protect protective earth conductors against mechanical, electro-dynamic and thermodynamic stress. Mechanical protective earth connections must be accessible for inspection and testing.

外部保护接地导线 Protective earth conductor outside



用于门/内部设备的保护接地导线 Protective earth conductor for door / corpus inside



M8保护接地连接的紧固力矩为10 Nm
 Tightening torque for M8 protective earth connection 10 Nm

如果不使用M8螺钉连接PE/等电位连接导线，则相应的紧固力矩可参见下表：

螺钉尺寸	力矩/Nm
M 4	2,0
M 5	3,2
M 6	5,0
M 8	10,0
M10	16,0

If you do not use M8 screws to connect the PE / equipotential bonding conductor, refer to the table below for the correct torque settings:

Screw size	Torque / Nm
M 4	2.0
M 5	3.2
M 6	5.0
M 8	10.0
M10	16.0

10. 调试

在首次上电之前，必须进行以下检查：

- + 机柜必须已正确安装
- + 确保机柜无损伤；尤其是密封件
- + 机柜中不能有任何外物
- + 确保布线区域清洁
- + 安装和设备螺钉都要上紧
- + 电缆和导线格兰头都必须上紧
- + 所有电缆和导线都必须安装在相应防护等级的线槽中
- + 空闲电缆和导线格兰头必须使用经过认证的插塞封住
- + 空闲孔必须使用经过认证的堵头密封好
- + 外部保护接地连接必须正确安装（在机柜附近）

11. 维修、维护和检修

上述维修和维护工作只能由经过相关培训且具备资质的人员执行。
维护和检修应符合GB标准。作为维护的一部分，尤其是依赖于防爆安全性的部件而言，必须进行检查。
具体而言，包括紧固系统、电缆和导线格兰头等。
必须根据运行条件和运行时间选择合适的维护间隔。
在本安端子柜上执行维护操作时，必须格外小心，确保不会出现与电路有关的危险间接影响。

防静电措施：

清理控制箱体时，可使用湿抹布擦拭箱体表面，能有效避免静电集聚。
做好箱体接地工作也可有效避免静电集聚。

10. Commissioning

Before you apply power for the first time, you must check the following items:

- + the enclosure must be properly installed
- + the enclosure must not be damaged; this applies in particular to the seals
- + there must not be any foreign objects in the enclosure
- + the wiring space must be clean
- + mounting and device screws must be securely fastened
- + cable and wire entries must be securely fastened
- + all cables and wires must be installed in the lead-throughs as required for the protection category
- + unused cable and wire entries must be closed with certified plugs
- + unused holes must be sealed with certified plugs
- + the outer protective earth connection must be properly installed near the enclosure

11. Repair, maintenance and servicing

Repair and maintenance work on the enclosures listed above may be performed only by authorised personnel with the appropriate training.
Maintenance and servicing is performed based on GB related rules. As part of the maintenance, in particular, parts that depend on the ignition safety must be inspected.
This includes, in particular, the seals, the fastening system, cable and wire entries.
The maintenance intervals must be chosen depending on the operating conditions and the operating time.
When maintenance work is performed on intrinsically safe terminal enclosures, care must be taken to ensure that no circuit-dependent dangerous remote effects can occur.

Anti-static measures:

When cleaning the control enclosure, you can use a wet rag to wipe the surface of the enclosure, which can effectively avoid static accumulation.
Doing a good job of grounding the box can also effectively avoid static accumulation.

APPLICABLE NATIONAL REGULATIONS MUST BE ADHERED TO DURING OPERATION OF THE ENCLOSURES LISTED ABOVE.

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