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OPERATION AND MAINTENANCE MANUAL

LAHMEYER COMPACT SUBSTATION Type NDV 630

Doc. no.: 0152C40.0

LAHMEYER
Compactstation

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CONTENTS

1 Safety advice

Please read this manual thoroughly before installing, operating or maintaining the equipment. The manual must be stored in a suitable and accessible location.

Installation, commissioning and operation of the Compactstation must be carried out by qualified personnel who have received appropriate training in the handling of medium-voltage (MV) switchgear, transformers, and low-voltage (LV) distribution. Personnel must be also familiar with the applicable VDE regulations (German electro-technical association) and accident prevention requirements of DGUV Regulation 3 (German Social Accident Insurance).

The following five safety rules in accordance with DIN VDE 0105 must be strictly observed:

1. Disconnect the installation from the mains.
2. Secure the installation against re-connection.
3. Verify that the installation is de-energised (absence of voltage).
4. Earth and short-circuit the installation.
5. Protect against adjacent live parts (e.g. by covers or safety barriers).

2 Intended use and technical provisions

2.1 Use

The Compactstation **Type NDV 630** is designed for use as both a grid substation and a customer substation. When combined with certain MV switchgear types, the station is protected against internal arc faults in accordance with **IAC classification (IAC AB, 20 kA, 1s)**.

2.2 Premises / Advice for dimensioning

Requirements for a proper and safe operation:

- correct transportation, professional loading and unloading, and appropriate storage;
- proper assembly, installation and commissioning;
- careful operation and maintenance by qualified personnel;
- strict observance of this manual;
- compliance with all applicable safety and operating regulations, connection requirements, grid operator regulations, and relevant national standards and regulations at the installation site.

When installing in a substation, please note that, in accordance with DIN EN 62271-202, if certain ambient conditions in combination with the enclosure class are present, the transformer's nominal power is subject to a reduction in accordance with the load profile and the ambient conditions.

Furthermore, the rated current of the low-voltage switchgear may also be subject to a reduction depending on the prevailing ambient conditions.

2.3 Torque specifications for bolted connections

Unless otherwise specified by the respective manufacturer, the tightening torque values listed below apply to all bolted connections of the enclosure and other components.
(see table below)

	Stahlschrauben, verzinkt	Edelstahlschrauben A2-70
	Schaftschrauben metrisches Regelgewinde DIN 13, Teil 13 Festigkeitsklasse: 8.8	Schaftschrauben metrisches Regelgewinde DIN 13, Teil 13 Festigkeitsklasse: 70
Abmessung	**Anziehmoment M_A in Nm**	**Anziehmoment M_A in Nm**
M5	5,9	4,2
M6	10,0	7,3
M8	25,0	17,5
M10	40,0	40,0
M12	60,0	60,0
M14	90,0	90,0
M16	120,0	120,0

2.4 Torque specifications for copper busbar and cable lug connections

Unless otherwise specified by the respective manufacturer, the tightening torque values listed below apply to all copper busbar and cable lug connectionsn.

	Steel screws, zinc plated	Stainless steel screws A2-70, A4-70
	metric coarse pitch thread DIN 13 Strength class: 8.8	metric coarse pitch thread DIN 13 Strength class: 70
Dimensions	**Tightening torque [Nm]**	**Tightening torque [Nm]**
M5	4	4
M6	7	7
M8	20	20
M10	40	40
M12	60	60
M14	90	90
M16	120	120

Important: Different torque values apply to busbars mounted on MV current transformers!

2.5 VDE provisions, IEC Standards

The compact substation complies with the following standards and regulations:

DIN VDE 0100	General principles for the safe design of technical products
DIN EN IEC 619361 (DIN VDE 0101)	Power installations exceeding a nominal voltage of 1 kV
DIN VDE 0105100	Operation of electrical installations
DIN EN 600711 (VDE 01111)	Insulation co-ordination; Part 1: Definitions, principles and rules
DIN EN 600712 (VDE 01112)	Insulation co-ordination; Part 2: Application guidelines
DIN EN 60445 (VDE 0197)	Basic and safety principles for man-machine interface, marking and identification. Identification of equipment terminals, conductor terminations and conductors
DIN EN IEC 60947-1 (VDE 0660-100)	Low-voltage switchgear and controlgear Part 1: General rules
DIN EN 60529 (VDE 0470-1)	Degrees of protection provided by enclosures (IP Code)
DIN EN 50274 (VDE 0660-514)	Low-voltage switchgear and controlgear assemblies - Protection against electric shock - Protection against unintentional direct contact with hazardous live parts
DIN EN 622711 (VDE 0671-1)	High-voltage switchgear and controlgear - Part 1: Common specifications
DIN EN IEC 62271-202 (VDE 0671-202)	High-voltage switchgear and controlgear, Part 202: High-voltage switchgear and controlgear - AC prefabricated substations for rated voltages above 1 kV and up to and including 52 kV
DIN EN IEC 61439-1 (VDE 0660-600-1)	Low-voltage switchgear and controlgear assemblies Part1: General rules
DIN EN IEC 61439-2 (VDE 0660-600-2)	Low-voltage switchgear and controlgear assemblies Part2: Power switchgear and controlgear assemblies
DIN EN 61230 (VDE 0683-100)	Live working - Portable equipment for earthing or earthing and short-circuiting
DGUV Vorschrift 3	Accident prevention regulation: electrical installations and means of production
26. Federal Immission Control Act (BImSchV)	Twenty-sixth regulation for the implementation of the Federal Immission Control Act (Regulation on electromagnetic fields, 26 BImSchV)

3 Substation enclosure

Temperature class (at 630kVA) = 20 K
Like all Lahmeyer Compact Substations, the Type NDV 630 is a prefabricated, factory-assembled, and routine tested installation. It consists of at least one medium-voltage compartment, one transformer compartment and one low-voltage compartment. Additional compartments can be provided upon request. As a rule, each Compact Substation is delivered ready for connection. To make it ready for operation connect the MV and LV grid cables and, if required, fuses must be installed and further connection work, protection tests, etc. carried out.

3.1 Structure

The enclosure of the Compact Substation Type NDV 630 is made from bent sheet metal and consists of the following main components:

- bottom tray with oil leakage sump, oil-tight welding, hot-dip galvanised and powder coated, or waterproof concrete with a front panel separating it from the enclosure and ground;
- two crossbeams made of folded sheet steel supporting the MV and LV equipment and fixed to the bottom tray;
- easily removable roof;
- lockable snap-on panel(s) (for access to the transformer);
- upper structure including doors and steel cover panels for the MV and LV compartments, removable as a single unit from the bottom tray.

3.2 Material and surface treatment

External parts (below ground):
Oil leakage sump:
Reinforced concrete, oil-tight and waterproof concrete or steel sheet 4mm, hot-dip galvanised (> 750 g/m^2) and powder coated (zinc 70 µm, topcoat > 70 µm)
Front metal:
Steel sheet, 3 mm, continuous hot-dip galvanisation (> 275 g/m^2)
100 % non-porous double powder coated (zinc powder 70 µm, topcoat > 140 µm)

External parts (above ground):
Steel sheet, 2 mm, continuous hot-dip galvanisation (> 275 g/m^2) and powder coated (> 70 µm)

Internal parts (above ground):
Steel sheet, 2 mm, continuous hot-dip galvanisation (> 275 g/m^2)

Surface treatment:
Thanks to the computer-controlled powder coating equipment and five stage surface preparation, a dry film thickness of > 70 µm is achieved. The coating powders used are free from heavy metals and non-toxic.

Zinc and powder coating = highest level of corrosion protection
Standard colour: Pebble grey (RAL 7032 - textured finish)

Note:
If required, the user may repaint the existing powder coating in a different colour using a special wet paint system. The original corrosion protection remains unaffected!

3.3 Connection elements

All connection elements of the enclosure are corrosion-resistant.

3.4 Doors & Locks

The transformer compartment can be accessed via a door, a snap-on panel or via the clearance on the front. The door panels to the other compartments are mounted with three hinges each (for door adjustment, see section 9.3)
The connections between doors and enclosure are electrically conductive and therefore integrated into the earthing system.
The doors are fitted with metal swing handles, which can be equipped with cylinder locks. The locks are protected by dust covers. Cylinder locks are not included in the scope of supply (unless agreed otherwise).
The same type of swing handle is used for the snap-on panels.
Lockable door opening angles: 90° and 125°.

3.5 Degrees of protection

Closed compartments:	IP 54
Around ventilation openings:	IP 23D
LV distribution:	IP XXA or higher

3.6 Lifting

The Compact Substation Type NDV 630 can be lifted and transported in a fully equipped condition.
Lifting is done via the bottom tray. (cf. Installation conditions)

3.7 Earthing

All installed components are electrically interconnected and therefore conductive. The central earthing point is the bottom tray or a central main earthing busbar. In systems with five conductors, a PE busbar is provided in the LV compartment.

3.8 Lighting

The MV and/or LV compartments can each be equipped with lighting, switched via door contact (optional).

4 MV Switchgear

The Type NDV 630 Compactstation is suited for use with SF6-free switchgear or air-insulated metering cubicles, as well as with HV-HRC fuse cubicles manufactured by SBG.

Switchgear type	Max. configuration	Manufacturer	Nominal voltage	Insulation
8DJH 24 blue GIS	3 K + 1T/L	Siemens	12 / 24 kV	Air
RM AirSeT	3 K + 1T/L	Schneider Electric	12 / 24 kV	Air
ecoGIS	3 K + 1T/L	ABB	12 / 24 kV	Air
MV transformer compartment for MV metering	3 CTs 3 VTs	SBG	12 / 24 kV	Air

Abbreviations: K : Cable circuit feeder T/L: Transformer-feeder, fused or circuit-breaker-protected

⚠ Depending on the grid status, medium voltage areas may remain live after opening the door of the MV compartment.

Work on live, hazardous parts that are accessible by contact is only permitted:
- after disconnection and verification of absence of voltage (five safety rules);
- when carried out by personnel duly trained for work on live parts.

For gas-insulated medium-voltage switchgear, the absence of hazardous voltage can be verified using the integrated voltage indicators or voltage test plugs.
For air insulated HV-HRC fuse cubicles, voltage detectors must be used. Please ensure that the voltage detection equipment is appropriate for the respective voltage level!

5 Transformer compartment

Hermetically sealed oil distribution transformers up to 630 kVA
Dry-type (cast resin) transformers up to 400 kVA
Maximum dimensions L x W x H = 1650 x 900 x 1900 mm (incl. safety clearance)

Transformers are lowered into the bottom tray without wheels and placed on slip-resistant mats.

5.1 Cargo securing:

⚠ As a rule, the transformers are secured with additional straps. Removal of these straps is permitted only if they are reinstalled prior to lifting or transporting the substation!

The transformer is connected to the MV switchgear via prefabricated and tested N2XSY 70 mm^2 - 16 mm^2 CU RM, 12/24 kV MV cable assemblies. The connecting cables are mechanically secured.

The LV connection is made in accordance with the respective rating using highly flexible 3 kV insulated cables, type NSGAFÖU.

5.2 Installation or replacement of the transformer

Before installing or replacing a transformer, make sure that the corresponding feeders to the MV switchgear and LV distribution are **disconnected, verified as de-energised, and earthed**. For replacement, the transformer must be lifted vertically out of the substation.

⚠ **Procedure and guidance:**
- Loosen the fastening screws (marked in red) of the roof at the upper door frame of the MV and LV compartments; shift the roof by approx. 100 mm to the MV or LV side and lift it off (use of a crane is recommended).
- Open snap-on panel.
- Remove installed transformer, if present, by lifting it vertically out of the compartment.
- Place the slip-resistant mats according to the gauge of the transformer base.
- Lower the transformer into position (without wheels), connect it electrically, connect it to the earthing system, and apply the transport protection. Observe all equipment-specific instructions!
- Connect and adjust any protection devices or make them ready for operation.
- Check the tightening torques of the terminals and line connections.
- Reinstall the roof until it locks in place, then fasten the screws.
- Reinstall and close the snap-on panel.

After removing the roof, the upper section of the enclosure can also be lifted off as a single unit without loosening additional screws or dismantling components.

6 Low-voltage distribution (LVD)

The low-voltage distribution panels of Lahmeyer Compactstations can be adapted to individual customer requirements and within the technical limits.

6.1 Protection against contact

As a rule, the low-voltage distribution is built back-of-hand proof (IPXXA acc. to VDE 0660-514). For this reason, operation and maintenance of the LVD must only be carried out by electrically skilled or electrically instructed personnel wearing personal protective equipment (PPE) and using suitable tools for work on electrical installations.

⚠ Depending on the grid status, the low-voltage distribution may be live when opening the door of the LV compartment!

Work on live, hazardous parts that are accessible by contact is only permitted:

- after disconnection and verification of absence of voltage (five safety rules);
- when carried out by personnel duly trained for work on live parts.

Gauges or indicators as well as fuses and clamping ledgers are generally integrated into an instrument panel in the LV compartment. Separate built-on devices may also be installed.

As a rule, the N/PEN and PE bars or, depending on the specifications, the main earthing bar / main equipotential bonding bar (HES/HPAS) for the earthing of the entire substation and the connection of the outer earth conductor are located in the lower part of the LV compartment. The cable support for the power cables is located in the cable connection compartment.

⚠ 6.2 Notes on main devices

(may vary according to configuration):

Automatic circuit breakers
The expected load values, short-circuit values, and tripping delays must be set in the trip devices before initial operation!

Fuse switch-disconnector / NH strip-type fuse switch disconnectors on the incoming feeder side
Must be equipped with appropriate NH (=LV HRC) fuse links in accordance with selectivity requirements before initial operation. **Risk of burns.** Fuses may reach high temperatures during operation!

Outgoing strips (standard width 50/100mm)
Must be equipped with appropriate NH (=LV HRC) fuse links in accordance with selectivity requirements before initial operation.

Insertion or withdrawal of fuse links from strip-type NH fuseways must only be carried out in a de-energised condition! The use of fuseway covers is recommended.

NH strip-type fuse switch-disconnectors are recommended due to better user protection. These devices can be switched under load. This constitutes work on live parts!
When replacing outgoing strips, make sure to apply the tightening torque values specified by the respective manufacturer.

Synchronisation sockets
For synchronisation during short-time parallel operation of emergency power systems in DSO grids.

Cable entries for auxiliary power systems
For connection and operation of emergency power systems.

Schuko socket(s)
For maintenance purposes.

RCD circuit breaker / fuses / circuit breakers / motor protective circuit breakers
For protection of several built-in devices and circuits; partially sealable.

Uninterruptible Power Supplies (UPS)
Supply auxiliary power to devices (e.g. protection equipment) in the event of a power failure. UPS units may remain energised for a long period after a power failure in order to supply parts of the substation. That is why they must be shut down before any work is carried out in the substation.

Protection / Detection devices
They have to be configured, adjusted and tested prior to commissioning!
Under certain conditions (e.g. low-voltage tripping circuits) it may be necessary to provide power from an external source (like UPS or auxiliary power system) for their commissioning.

Meter boxes
Provide space for electricity meters, radio equipment, or modems; sealable.

Multifunction metering devices
For indication, storage, logging, and transmission of type-related measurements (U, I, P, Q etc.).

Switchable voltmeters
For indication of instantaneous voltage values.

Analogue ammeters
For indication of instantaneous and peak current values. Depending on the type, the scale is changeable.

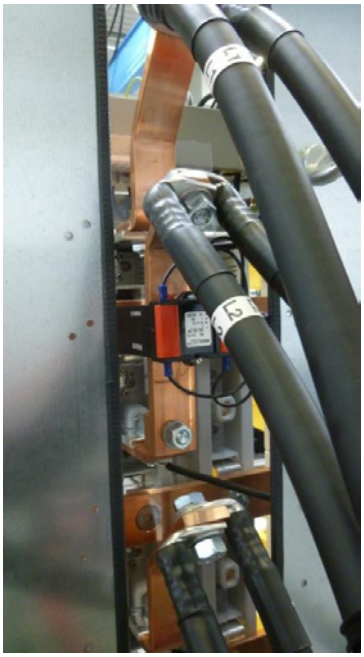
Plug-in current transformers
For measurement of the current for display, protection, or metering purposes; may be reconnectable depending on the type.

Quantity of plug-in current transformers (standard aperture dimensions 50 x 10 mm) in standard LVDs with NH strip-type fuse switch disconnectors on the incoming feeder side:

- L1, L2 and L3: up to two units, depending on station design
- Current transformers are installed on the connection bars at the rear of the feeder or main switching panel (see picture on the right) accessible via the transformer compartment, or on CT busbars within the busbar system.

Number of plug-in current transformers in LVDs with NH fuse switch-disconnector or circuit breaker:

- L1, L2 and L3: up to two units, depending on station design
- Current transformers are installed on CT busbars or connection bars below or above the main switching unit or on CT busbars within the busbar system.



7 Earthing system

The central earthing bar is located inside the LV compartment. The earthing belt (installed approx. at a distance of 0.5 m - 1.0 m from the station), and/or earthing rod installed by the customer are connected to it. In this way, all the parts of the enclosure and the bottom tray are connected to the main earthing system.

8 Transport, installation and assembly

Unless otherwise agreed, the Compactstation NDV 630 is manufactured ready-to-connect and routine tested at the factory. The documents relevant for transport, installation, and assembly include the technical documentation such as dimensional drawings, lifting plans, excavation depth specifications and loading plans.

8.1 Installation at site:

see document “Installation conditions”
When specifying the excavation depth, take into account the final ground level, ground composition, and any surface water that may be expected.

The base of the excavation pit must have sufficient load-be aring capacity. Any unevenness must be levelled out by means of a horizontally flattened sand bed.

In case of difficult ground conditions, the use of a substructure made of lean concrete or support beams is recommended. A readjustment of the doors may be required. The relevant procedure is described in section 9.3.

Use suitable lifting equipment to place the substation into the excavation pit. The NDV 630 Compactstation can be lifted in a fully equipped condition. Please note the specifications provided in the document “Installation conditions”.

8.2 Cable connections, MV and LV side:

⚠ When connecting the cables, the following must be observed:

- Low-voltage cables with aluminium conductors may only be connected to box terminals if all tightening torque values specified by the manufacturer are observed, and the connections are retightened at regular intervals (fire hazard)!
- V-shaped box terminals must not be used for more than one conductor!
- Always respect the specified tightening torque values!

Cable connection MV-side:

- Disassemble the front panel of the bottom tray
- Remove the cover of the MV switchgear cable connection compartments in accordance with the manufacturer’s instruction manual.
- The transversal panel of the switchgear mounting frame must only be removed if necessary
- Loosen the front bottom plate (with pre-cut openings)
- Connect the cables and secure them with cable clamps. Apply screen wire if required.

Cable connection LV-side:

- Disassemble the front panel of the bottom tray
- Loosen front bottom plate (if present)
- Connect the cables and secure them with cable clamps. Apply screen wire if required.

8.3 Cargo securing

As a rule, the transformers are secured with additional straps. Removal of these straps is permitted only if they are reinstalled prior to lifting or transporting the substation!

9 Maintenance and care

9.1 Cleaning and care

The substation is manufactured from high-strength, weather-resistant materials. Powder coated surfaces must be cleaned carefully using mild cleansing agents. Do not use abrasive cleaning agents; use water and a mild detergent (e.g. washing-up liquid) instead.

9.2 Maintenance

Due to its specific characteristics, this installation is subject to statutory safety regulations, governing inspection and maintenance scope and intervals. It is further subject to the local conditions, notably environmental factors.

Further manufacturer recommendations for routine maintenance and inspections:

⚠ **Observe all applicable safety regulations!**

- perform periodic visual inspections to detect potential damages on or within the substation;
- check that ventilation elements of the substation are free from dust and dirt to ensure proper airflow;
- remove dirt from surfaces intended for heat dissipation;
- check the correct alignment and closing of the substation's doors;
- check the condition and correct fit of the gaskets (no damage);
- perform periodic checks of electrical connections and the earthing system.

If there are no further specifications or rules regarding maintenance and inspections, we recommend repeating visual inspections and cleaning operations at least every 12 months.

For maintenance of individual components, please refer to the respective manufacturer's operation manuals!

9.3 Door adjustment

Safe closure of the doors can only be ensured if the doors are aligned parallel to the lower edge of the roof. If this is not the case, minor readjustment of the doors is possible.

Each door has three hinges. The centre hinge is fixed in a circular hole. The upper and lower hinges are bolted into horizontally slotted holes.

Cut-outs in the lateral door frame allow the fastening nuts of the upper and lower hinges to be loosened with a spanner, enabling door alignment.

Confirmation

in accordance with paragraph 5 section 4 of the accident prevention regulation

“Electrical installations and means of production” (DGUV Regulation 3)

Sächsisch-Bayerische Starkstrom-Gerätebau GmbH

Ohmstraße 1

08496 Neumark

Deutschland

hereby confirms that the electrical installation / electrical means of production

Lahmeyer-Compact Substation Type NDV 630

complies with the provisions of the accident prevention regulations “Electrical installations and means of production” („Elektrische Anlagen und Betriebsmittel“ DGUV Regulation 3).

This confirmation does not release the operators from their obligations to check the electrical installation before initial operation, e.g. for the correct fastening of the bolted connections which might have loosened during transport, and the obligation to inspect the installation periodically (in accordance with paragraph 5 section 1.4 of DGUV Regulation 3).

Risk assessment

Product: Lahmeyer Compact Substation

No	Hazard	Hazard area	Hazard description	Risk before	Description of measures taken	Risk after
1	Direct contact	Electric substation equipment	Direct contact between a person and live parts presents a serious risk of injury or death.	• Risk: high • Severity: Death • Exposure to hazard area: rarely • Possibility to identify and avoid: possible • Probability of occurrence: low	• Installation, commissioning, operation and maintenance only by trained skilled staff • Identification • Professional design, assembly and testing • Protection through enclosure • Protection through insulation of live parts • Repair and maintenance, and recurring inspections	• Risk: medium • Severity: Death • Exposure to hazard area: rarely • Possibility to identify and avoid: possible • Probability of occurrence: low
2	Indirect contact	Electric substation equipment	Direct contact between a person and parts which have become live due to a fault condition presents a serious risk of injury or death.	• Risk: high • Severity: Death • Exposure to hazard area: rarely • Possibility to identify and avoid: possible • Probability of occurrence: high	• Installation, commissioning, operation and maintenance only by trained skilled staff • Identification • Professional design and assembly • Tests prior to commissioning • Recurring inspections • Repair and maintenance • Instructions for transport, assembly, dismantling, disposal, operation, repair and maintenance • Protective measures against indirect contact	• Risk: medium • Severity: Death • Exposure to hazard area: rarely • Possibility to identify and avoid: possible • Probability of occurrence: low
3	High voltage	Electric substation equipment	A person approaching parts under high voltage is exposed to a serious risk of injury or death	• Risk: high • Severity: Death • Exposure to hazard area: often • Possibility to identify and avoid: possible • Probability of occurrence: high	• Installation, commissioning, operation and maintenance only by trained skilled staff • Identification • Professional design and assembly • Tests prior to commissioning • Recurring inspections • Repair and maintenance • Protection through enclosure • Protection through insulation of live parts • Proper disconnection of the substation from power sources • Instructions for transport, assembly, dismantling, disposal, operation, repair and maintenance	• Risk: medium • Severity: Death • Exposure to hazard area: rarely • Possibility to identify and avoid: possible • Probability of occurrence: low

Risk assessment

Product: Lahmeyer Compact Substation

No	Hazard	Hazard area	Hazard description	Risk before	Description of measures taken	Risk after
4	Thermal radiation or particles	Electric substation equipment	A person approaching thermal radiation, ejections of molten particles, chemical reactions in case of short-circuits, overload situations etc. is exposed to a serious risk of injury or death.	• Risk: high • Severity: Death • Exposure to hazard area: often • Possibility to identify and avoid: possible • Probability of occurrence: high	• Installation, commissioning, operation and maintenance only by trained skilled staff • Identification • Professional design and assembly • Tests prior to commissioning • Recurring inspections • Repair and maintenance • Protection through enclosure • Protection against overload • Protection against short-circuit • Flash barrier • Proper disconnection of the substation from power sources • Instructions for transport, assembly, dismantling, disposal, operation, repair and maintenance	• Risk: low • Severity: Death • Exposure to hazard area: rarely • Possibility to identify and avoid: possible • Probability of occurrence: low
5	Radiation: Frequencies	Electric substation equipment	A person approaching low frequency radiation, radio frequencies etc. is exposed to a serious risk of injury.	• Risk: medium • Severity: Serious injuries • Exposure to hazard area: often • Possibility to identify and avoid: hardly possible • Probability of occurrence: high	• Installation, commissioning, operation and maintenance only by trained skilled staff • Tests prior to commissioning • Recurring inspections • Repair and maintenance • Protection through fully closed enclosure • Instructions for transport, assembly, dismantling, disposal, operation, repair and maintenance	• Risk: low • Severity: Serious injuries • Exposure to hazard area: rarely • Possibility to identify and avoid: possible • Probability of occurrence: medium
6	Third parties	Electric substation equipment	Risk of injury and death, and possible destruction of the substation through unauthorized startup and operation	• Risk: high • Severity: Death • Exposure to hazard area: often • Possibility to identify and avoid: possible • Probability of occurrence: high	• Installation, commissioning, operation and maintenance only by trained skilled staff • Identification • Tests prior to commissioning • Recurring inspections • Repair and maintenance • Closed installation • Instructions for transport, assembly, dismantling, disposal, operation, repair and maintenance	• Risk: low • Severity: Death • Exposure to hazard area: rarely • Possibility to identify and avoid: possible • Probability of occurrence: low

Risk assessment

Product: Lahmeyer Compact Substation

Nr.	Gefähr-dung	Gefahren-stelle	Gefahren-Beschreibung	Risiko vorher	Maßnahmen-beschreibung	Risiko nachher
7	Strength of compo-nents	Electric substation equipment	Risk of injury and death, and possible destruction of the substation through poor execution of transport and lifting operations	• Risk: high • Severity: Death • Exposure to hazard area: often • Possibility to identify and avoid: possible • Probability of occurrence: high	• Installation, commissioning, operation and maintenance only by trained skilled staff • Identification • Professional design and assembly • Repair and maintenance • Instructions for transport, assembly, dismantling, disposal, operation, repair and maintenance	• Risk: medium • Severity: Death • Exposure to hazard area: rarely • Possibility to identify and avoid: possible • Probability of occurrence: low
8	Lifting hooks and pulleys	Electric substation equipment	Risk of injury and death, and possible destruction of the substation through poor execution of transport and lifting operations	• Risk: high • Severity: Death • Exposure to hazard area: often • Possibility to identify and avoid: possible • Probability of occurrence: high	• Installation, commissioning, operation and maintenance only by trained skilled staff • Identification • Professional design and assembly • Repair and maintenance • Instructions for transport, assembly, dismantling, disposal, operation, repair and maintenance	• Risk: medium • Severity: Death • Exposure to hazard area: rarely • Possibility to identify and avoid: possible • Probability of occurrence: low
9	Lightning strike	Electric substation equipment	Risk of injury and death, and possible destruction of the substation through lightning strike	• Risk: high • Severity: Death • Exposure to hazard area: often • Possibility to identify and avoid: possible • Probability of occurrence: high	• Installation, commissioning, operation and maintenance only by trained skilled staff • Professional assembly • Tests prior to commissioning • Recurring inspections • Repair and maintenance	• Risk: medium • Severity: Death • Exposure to hazard area: rarely • Possibility to identify and avoid: possible • Probability of occurrence: low

Measures adequate: YES

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