

# ASSEMBLY MANUAL

# INTILION



## INTILION | scalestac power INTILION | scalestac power boost

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**Store for later use!**

AC-coupled lithium-ion battery storage system for  
indoor installation

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## 1 Introduction

This assembly manual describes the assembly and installation of the INTILION | scalestac battery storage system.

### 1.1 Means of representation

Text that should be paid particular attention to and that constitutes instructions or a direct warning against hazards is indicated as follows in this operating manual:

#### 1.1.1 Section-relevant warnings

Section-relevant warnings apply not only to a certain action, but to all actions within a section.

##### Structure



#### SIGNAL WORD



Symbol  
providing  
more  
details on  
a hazard

##### Hazard type and source

Possible consequence(s) of non-observation  
– Measure(s) for risk prevention

##### Hazard levels



#### DANGER

Hazard with a high level of risk that, if not avoided, can lead to death or serious bodily injury.



#### WARNING

Hazard with a medium level of risk that, if not avoided, can lead to death or serious bodily injury.



#### CAUTION

Hazard with a low level of risk that, if not avoided, can lead to minor or moderate bodily injury.

## NOTE

Hazard with a low level of risk that, if not avoided, can lead to material damage.



This assembly manual is only valid in connection with the operating manual. All persons involved in the assembly of the battery storage system must be familiar with, and act in accordance with, the operating manual.

## 1.1.2 Embedded warnings

Incorporated warnings are directly integrated into certain actions.

### Structure

**⚠ SIGNAL WORD** Hazard type and source

Possible consequences of non-observance, measures for preventing the hazard

### Hazard levels

- **⚠ DANGER/WARNING/CAUTION**
- **NOTE** (without warning triangle, see Section 1.1.1 “Section-relevant warnings”)

## 1.1.3 Other means of representation



The information symbol provides useful information.

- These markings are followed by lists.
  - These markings are followed by text describing activities that need to be performed in the order in which they are listed.
- “ “ Text in quotation marks constitutes references to other chapters or sections.

## 1.1.4 Symbols used in this manual

Particular hazards are indicated as follows in the form of warnings:



### Warning of electrical voltage

This symbol warns of the risk to life due to dangerous electrical voltage.



### Warning of the danger due to lithium-ion batteries

This symbol warns of potential hazards due to the use of lithium-ion batteries.



### Unauthorized access prohibited

This symbol prohibits access to the indicated areas by unauthorised persons.

Hazards cannot be recognised by unauthorised persons.



### Observe manual

This symbol stipulates the observance of the operating manual and the safety instructions.

## 1.2 Warranty and liability

The obligations agreed upon in the delivery contract apply, along with the general terms and conditions and the delivery conditions of the battery storage system and the statutory regulations valid at the time the contract was concluded.

All information and specifications in this operating manual have been compiled taking into account the applicable standards and regulations, the current state of technology and our many years of knowledge and experience.

Warranty and liability claims for personal injury or material damage are excluded if they are due to one or several of the following causes:

- Improper use of the battery storage system or use other than the intended use
- Improper installation, commissioning, operation and maintenance of the battery storage system
- Operation of the battery storage system with faulty safety devices or with improperly fitted or non-functioning safety and protective equipment
- Failure to observe the operating manual and the instructions in the operating manual with regard to the installation, commissioning, operation and maintenance of the battery storage system
- Use of non-qualified or untrained personnel
- Structural modifications to the battery storage system (conversions or other changes to the battery storage system must not be made without the prior written approval of INTILION AG. The battery storage system will lose its EU conformity in the event of any infringements)
- Incorrectly performed repairs
- The use of non-approved spare parts or the use of spare parts that do not meet the technically define requirements.
- Disaster situations, the infiltration of foreign bodies and force majeure

The time between the installation and commissioning of the battery storage system must not exceed three months.

We reserve the right to make technical changes as part of improvements to the usage properties and further development.

## 1.3 Guarantee

INTILION AG provides a five-year product guarantee for all components of the battery storage system, with the exception of the lithium-ion battery cells.

INTILION AG also provides a ten-year performance guarantee for the capacity of the lithium-ion battery cells. With the conclusion of this contract, INTILION AG guarantees that the remaining useful battery capacity does not fall below a relative minimum value for the specified battery capacity. The State of Health (SoH) (a classifying factor for the remaining useful capacity of a battery) is an indication of the ageing condition of the battery storage system.



Additional information and the conditions of the guarantee can be found in the separately provided document entitled "Guarantee conditions for the INTILION | scalestac storage system".

## 1.4 Copyright protection

This operating manual is copyright-protected.

The release of the operating manual to third parties, reproductions of any type or form – including of extracts – and the processing and/or communication of the content of the manual is not permitted for purposes other than external purposes without the written approval of INTILION AG.

Infringements will lead to liability for damages. The right to make any further claims remains reserved.

## 1.5 Customer service



INTILION AG is part of the HOPPECKE Group. Our customer service team is available to provide you with any technical information you may require:

**HOPPECKE Service Competence Center**

**Phone: +49 (0) 2963 61 591**

**Fax: +49 (0) 2963 61-543**

**E-mail: [service@hoppecke.com](mailto:service@hoppecke.com)**

Our employees are also always interested in any information or feedback on your experiences with actual use that may be useful for us in improving our products.

## 1.6 Installation location requirements

Observe the installation location requirements for the battery storage system, as specified in the document "Empfehlung\_Aufstellort\_scalestac\_3.1.pdf"

## 2 Safety



### DANGER

Failing to observe the following safety instructions can have serious consequences:



- Environmental damage due to escaping hazardous substances



- Failure of important assembly functions



- Danger to persons due to electrical, mechanical or chemical influences

Read the safety instructions and warnings in this section carefully before putting the battery storage system into operation.



In addition to the instructions in this operating manual, make sure to also observe the general safety and accident-prevention regulations.

In addition to the instructions in this operating manual, the operator must also observe any existing national working, operating and safety regulations. Any existing internal site regulations must also be observed.

### 2.1 Intended use

The operational safety of the battery storage system is only guaranteed if it is used as intended.

INTILION | scalestac is an AC-coupled battery storage system and in grid-building operation, it is primarily suitable for the “behind-the-meter” application.

There are three important features that are worth mentioning for the behind-the-meter field of application:

- The system interacts with the energy meter at the operating company's mains connection\*
- The system optimises the load and energy flows within the operating company's infrastructure\*
- The system does not provide any energy to the public power grid (in Germany: UCTE network) <sup>1</sup>

The battery storage system is not intended for any use other than that specified in this document.

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<sup>1</sup> additional hardware required, please contact. INTILION AG

## NOTE

The battery storage system is designed for indoor use.  
INTILION AG offers alternative product solutions for outdoor use.

Intended use also includes

- Observation of all instructions in the operating manual
- Compliance with the inspection and maintenance intervals
- Use of consumables in accordance with the applicable safety regulations
- Compliance with the operating conditions

The technical specifications set out in the technical data must be complied with without exception.



Only ever use the battery storage system as intended in order to guarantee safe operation.

The operating company using the battery storage system and not the manufacturer is responsible for all personal injury and property damage arising from improper use.

## 2.1.1 Structural changes to the battery storage system

The design and the manufacturer acceptance are performed based on the German Product Safety Act (ProdSG). No modifications, additions or conversions may be made to the battery storage system without the prior written approval of INTILION AG.

The product will lose its EU conformity in the event of non-compliance. The manufacturer of the battery storage system is outside of the warranty and any warranty claims.

Components not in perfect condition must be reported to the HOPPECKE Service team immediately (see section 1.5). Continued use of the system is not permitted.

Only use original spare parts/wear parts/accessories. These parts have been specially designed for the battery storage system. If parts that are manufactured by third parties are used, it cannot be guaranteed that they have been designed and produced such that they can bear sufficient loads and comply with safety standards.

Parts and special equipment that have not been approved by INTILION AG must not be used.

## 2.1.2 Foreseeable misuse



### DANGER

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Any use that differs from or goes beyond the intended use of the battery storage system can lead to serious injury.

- Only use the battery storage system as per the intended use.
- Do not charge or discharge the battery modules outside of the temperature range specified in section 2.6.3.
- Do not operate the battery modules outside of the operating conditions defined in the data sheet.
- Do not expose the lithium-ion cells of the battery storage system to ambient temperatures of above 40 °C or below 0° C. Compliance with the temperature specifications must be ensured during operation by a room air-conditioning system.
- Avoid short circuits.
- Do not operate the battery storage system in a potentially explosive environment.
- Only operate the battery storage system in intended networks.

## 2.2 Personnel requirements



### DANGER



**Unauthorised persons are prohibited from working on the battery storage system. The operating manual must be observed.**



The battery storage system must only be installed, commissioned, operated, maintained, repaired, decommissioned and/or disassembled by persons who are qualified and/or trained in the performance of this work. These persons must have completed an INTILION | scalestac product training session and must be familiar with and act in accordance with the operating manual. The relevant authorisations of the various personnel must be clearly defined.

The following qualifications are specified in the operating manual for different activity areas.

#### Personnel in training

Personnel in training, such as apprentices or temporary employees, are not familiar with all of the hazards that can occur when operating the battery storage system. Work must only be performed on the battery storage system under the supervision of trained or qualified personnel.

#### Trained personnel

Trained personnel have been instructed by the operating company or by qualified personnel on the tasks assigned to them and the potential hazards involved with improper conduct as part of a training session.

#### Qualified personnel

Qualified personnel are those who because of their training, knowledge and experience, coupled with knowledge of the applicable regulations, are in a position to perform the work assigned to them and to independently recognise and prevent potential hazards.

#### Specialised electricians

Specialised electricians are individuals who, because of their specialist training, knowledge and experience, coupled with knowledge of the applicable regulations, are in a position to perform work on electrical equipment and to independently recognise and prevent potential hazards.

Specialised electricians are specifically trained for the working environment in which they are employed, and they are also familiar with the relevant standards and regulations.

#### Specialised electrician with WLE certification

Only a specially trained specialised electrician is permitted to carry out work on live equipment (WLE work). Certification must be performed based on DGUV Rule 103-011/3.2.4 and VDE 0105-100 Section 6.3.2.

## 2.2.1 Responsibilities

Incorrect use can result in serious personal injury and material damage.

Therefore, have all tasks performed by qualified personnel only.

- People are only permitted to be approved as personnel if they can be expected to perform their work reliably. No persons may work on the battery storage system if their response capability is impaired as a result of substances such as drugs, alcohol or medication.
- All persons who work on battery storage system must read the operating manual and provide their signature to confirm that they have understood the content.
- Personnel in training must initially only work on the battery storage system under the supervision of qualified personnel. Successfully completed training must be confirmed in writing.

The operating company is responsible for personnel training.

## 2.2.2 Obligations of personnel

All persons assigned with work on the battery storage system are obligated to do the following prior to starting work:

- Observe the basic requirements regarding occupational safety and accident prevention
- Read the safety instructions and warnings in this operating manual and to sign to confirm having understood them

## 2.2.3 Unauthorised persons

Unauthorised persons who do not meet the qualification requirements for personnel will not be familiar with the hazards in the working area.

- Keep unauthorised persons away from the working area.
- If in doubt, approach persons in the working area and escort them out if necessary.
- Stop work if there are unauthorised persons in the working area.

## 2.2.4 Training

Personnel must receive regular training from the operating company (e. g. every six months). A log must be created after the completion of training (see Table 1 as an example).

Tab. 1: Training

Date	Name	Type of instruction	Training performed by	Signature

## 2.3 Personal protective equipment

Observe the signs affixed in the working area regarding personal protective equipment.

Irrespective of the workplace risk assessment, personal protective equipment must be worn when operating the battery storage system in order to keep health risks to a minimum.

- Always wear the necessary protective equipment when performing work.
- Do not wear any metallic watches, rings, chains or other jewellery.

The symbols have the following meanings:



### **Wear protective clothing (insulating protective clothing)**

Protective work clothing is closely fitting work clothing with a low tear-resistance, with narrow sleeves and no protruding parts. It is primarily intended for protection against being caught by moving product parts. Insulating protective clothing is non-conductive and prevents the passage of electrical current when the wearer comes into contact with a live part.



### **Wear foot protection (insulating safety boots)**

Wear non-slip safety boots to protect against heavy falling parts or slipping on smooth surfaces.

Specialised electricians require insulating shoes for carrying out work on live parts. When worn in combination with insulating protective clothing, these shoes are designed to protect the wearer from electric shock while also preventing current from flowing through the body and into the ground via the feet.



### **Wear hand protection (1000-V protective gloves)**

Wear protective gloves to protect the hands from friction, abrasions, punctures or deep wounds, aggressive chemicals and from contact with hot surfaces or chemical substances.

Wear insulating (1000 V) protective gloves in accordance with EN 60903 or VDE 0682 Part 311 to protect the hands from dangerous electric shock when touching live parts.

**Wear head protection (electrician's safety helmet)**

Wear a safety helmet to protect against falling or flying parts.  
Wear an electrician's safety helmet marked with 1000 V to protect against thermal impacts such as arcs and to protect against dangerous electric shock when touching live parts in accordance with DIN EN 50365.

**Wear face protection (electrician's face protection)**

Wear face protection to protect the eyes and face.  
Wear electrician's face protection suitable for working on live equipment (WLE) to protect against potential electric arcs.

**Wear ear protection**

Wear hearing protection to protect against hearing damage.

**Wear a harness**

Use suitable fall protection (safety cable and harness) when working at heights.

Personal protective equipment must be provided by the operating company and must comply with the applicable requirements.

The national regulations and specifications from the workplace risk assessment must also be observed, along with any internal instructions from the operating company.

## 2.4

### General safety information

- The battery storage system must only be commissioned, maintained, decommissioned and/or disassembled once this operating manual has been read.
- Only use the battery storage system as per the intended use (see Section 0)
- Do not put the battery storage system into operation if there are other people in the danger zone.
- When operating the battery storage system, avoid any operation that might impair the safety of persons or the battery storage system.
- Never operate the battery storage system without the associated protective and safety devices. Never take the installed safety devices out of operation.
- If an alarm is triggered, maintain the maximum possible distance from the battery storage system and do not open the battery storage system. With indoor battery storage systems, leave the room and/or building immediately and warn any other persons in the room.
- Always keep the working area of the battery storage system clean and tidy in order to prevent hazards as a result of dirt or parts that have been left lying around.
- Keep the ventilation slots on the battery storage system open. Do not place any materials in front of the ventilation slots either from the inside or the outside.
- Do not exceed the technical performance data (see technical data sheet).

- Keep all safety instructions and warnings on the product in a legible condition and replace them if necessary.
- Operation of and work on the battery storage system must only be performed by trained and qualified personnel (see Section 2.2).
- Remote updates must only be performed under the supervision of a qualified person on site. The qualified person on site may act immediately in the event of an error (e. g. by carrying out a reboot or importing the old, runnable version).
- Take the battery storage system out of operation immediately in the event of malfunctions. Have the malfunctions rectified by appropriately trained specialists or by INTILION AG or the HOPPECKE Service team.
- Always store the operating manual in the location where the battery storage system is used. It must be ensured that all persons carrying out work on the battery storage system can access the operating manual at any time.

## 2.5 Safety measures for environmental protection

For all work, make sure to comply with regulations on waste avoidance and proper waste recycling or disposal.

During installation and maintenance work in particular, as well as during decommissioning, it must be ensured that substances that are harmful to groundwater, such as grease, oils, coolants, cleaning fluids containing solvents etc. do not infiltrate the ground or get into the sewer system. These substances must be collected, stored and transported in suitable containers, and disposed of in accordance with national legal provisions.

## 2.6 Special warnings

### 2.6.1 Symbols used on the battery storage system



#### **Warning of electrical voltage**

This symbol warns of the risk to life due to dangerous electrical voltage. There is an immediate risk to life in the event of contact with live parts.



#### **Warning of the danger due to lithium-ion batteries**

This symbol warns of potential hazards due to the use of lithium-ion batteries.



#### **Unauthorized access prohibited**

This symbol prohibits access to the indicated areas by unauthorised persons. Hazards cannot be recognised by unauthorised persons.



#### **No access for persons with pacemakers or defibrillator implants**

This symbol prohibits the presence of persons with medical implants in the area of the battery storage system, as the electromagnetic fields risk causing devices such as pacemakers to malfunction.



#### **No open flames; fire, open ignition sources and smoking are prohibited**

This symbol prohibits fire, open flame and smoking in the area of the battery storage system.



#### **Observe manual**

This symbol stipulates the observance of the operating manual and the safety instructions.



Keep all safety instructions and warnings on the battery storage system in a legible condition. Replace the warnings as necessary.

## 2.6.2 Danger due to electrical energy



### DANGER



**There is a risk of electric shock when touching parts that are under voltage. This also poses a danger of secondary accidents as a result of shock (e. g. falls).**

- Keep electrical components closed at all times.
- Only ever have work on the electrical equipment performed by specialised electricians with WLE certification and who have been specifically trained for working on electrical equipment and who are capable of recognising and avoiding dangers.
- Adhere to the five safety rules when working on the electrical equipment:
  1. Disconnect
  2. Secure against being switched back on
  3. Verify that the system is de-energised
  4. Connect to earth and short circuit
  5. Cover or partition off live parts



In order to ensure the safe performance of electrical work, the operating company can transfer its obligations over to a system manager (specialised electrician). The transfer of responsibility must be made in writing.

- Before working on the electrical equipment, de-energise the battery storage system and secure it against re-activation.



### DANGER



**There is a risk of electric shock when touching parts that are under voltage.**

**Because the system contains batteries that cannot be de-energised, life-threatening DC voltages are always present in some sub-areas of the system.**

Each battery rack on the battery storage system can only be de-energised up to the output + and output - connections on the control box that is part of the battery management system on the mains side. The individual battery modules cannot be de-energised. There is always dangerous electrical voltage at the power connections on the battery modules and at the input + and input - connections on the control box.

- Work on the electrical equipment must only be performed by a responsible specialised electrician (e. g. industrial electrician) with WLE certification.
- The responsible specialist electrician must have completed an INTILION | scalestac product training session.
- Always used insulated tools (up to 1000 V) when working.
- Check the electrical equipment for defects such as loose connections or singed cables on a regular basis. Have any defects rectified immediately.
- Have the electrical equipment and local electrical operating equipment checked by a specialised electrician once a year or as per the stipulated intervals.

Local electrical operating equipment refers to permanently installed operating equipment or operating equipment with no carrying device and with a weight that means that it cannot be easily moved. This also includes electrical operating equipment that is permanently attached on a temporary basis and that is operated via moving connection cables.

- At least every 6 months, have a specialised electrician check the portable electrical operating equipment, the connection cables with connectors and the extension and device-connection cables together with their connector systems where used.

Portable operating equipment refers to equipment that can be moved when live in accordance with the type of equipment and its normal use. These include items such as electrical floor-cleaning machines.

- Check all of the safety devices on the battery storage system for correct functioning on a regular basis.
- Damaged housings or cables must be repaired or replaced immediately and before switch-on.

## 2.6.3 Dangers due to lithium-ion batteries



### DANGER



There is a considerable risk to health and life in the event of electric shocks at battery voltages higher than just 60 V.

Lithium-ion batteries can deliver a high short-circuit current even when they appear to be discharged.

Electrolyte and gases may escape as a result of mechanical damage (e. g. impact), electrical faults (e. g. short circuit, deep discharge, overloading) or thermal impacts above 70°C (e. g. internal overheating). This can cause a fire to break out due to thermally intensifying chemical reactions inside the cell.

Contact with the escaping electrolytes or gases can lead to breathing difficulties, suffocation or intoxication, or can cause cancer.

- The battery modules must only ever be handled by a specialist. Always used insulated tools when working.
- Always wear protective work clothing and protective gloves when working on the battery modules.

- Only transport the battery modules in their original packaging or in packaging that corresponds to the applicable guidelines. Keep the packaging in a safe place.
- Do not heat up the battery modules beyond the maximum permissible temperature and do not burn them.
- Make sure that there are no external ignition sources.
- Do not short-circuit the battery modules and do not cause them any mechanical damage (do not pierce, deform, destroy etc.).



### DANGER



- When handling suspicious battery modules (leaking contents, deformation, discolouration, dents etc.), wear protective work clothing and protective gloves and ensure sufficient ventilation. Do not breathe in any of the escaping gases.

- Cover the terminals with masking tape to secure the damaged battery modules against short circuit.

When packaging damaged battery modules, make sure that they are as hermetically sealed as possible, and surround with dry sand, calcium carbonate powder (CaCO<sub>3</sub>) or Vermiculite.

Wherever possible, store damaged battery modules outside of buildings and in a shock-proof and fire-proof outer packaging.

Use warning signs to mark and secure the storage location.

- Have used battery modules disposed of by a certified specialist company or by INTILION AG.

In the event of contact with escaping electrolyte, proceed as follows:

- In the event of inhalation, move the affected person into the fresh air and leave in a resting position. Consult a doctor if larger quantities have been inhaled or in the event of irritation of the airways.
- In the event of contact with the skin, immediately rinse the area with water for at least 15 minutes. Consult a doctor in the event of persistent skin irritation.
- In the event of contact with the eyes, immediately rinse the eyes with water for at least 15 minutes and consult a doctor. Protect the other uninjured eye.
- In the event of swallowing, consult a doctor immediately. Do not induce vomiting. Rinse the mouth and surrounding areas with water.

## 2.6.4 Dangers due to hot surfaces



### WARNING

Contact with hot components may cause burns.

- Always wear protective work clothing and protective gloves when working near hot components.
- Allow components to cool down to ambient temperature before working on the battery storage system.

## 2.6.5 Dangers due to working at height



### WARNING

When working on the product, there is a danger of falling from a great height, which can lead to fatal injuries.

- Use fall protection (e. g. safety cable and harness) when working at heights of over 1 m.
- If a harness is used as fall protection, the rescue concept for people in harnesses must be observed. A person must not be left suspended in a harness for more than 15 minutes, as otherwise they could go into shock, with potentially fatal consequences.

Qualification for working at heights must be demonstrated.

## 2.6.6 Dangers due to noise



### CAUTION

The sound pressure level in the working area can lead to lasting hearing damage in the event of long-term exposure.

- The operating company must provide ear protection for sound pressure levels of 80 dB(A) and over.
- Ear protection must be work at sound pressure levels of 85 dB(A) and over.

## 2.6.7 Dangers due to the use of incorrect spare parts

### NOTE

Incorrect or faulty spare parts can lead to damage, malfunctions or total failure, and can also impair safety.

- Only use original spare parts.
- Procure spare parts from INTILION AG. The necessary information regarding spare parts can be found in the enclosed parts lists or in Section 1.5 “Service/customer service”.

## 2.7 Safety and protective devices

- Make sure to cordon off the working area of the battery storage system.
- Always check that the safety and protective devices are all properly attached and fully functioning before switching on the battery storage system.
- For the delivery of sub-components, the protective devices must be attached by the operating company in accordance with the regulations.
- During operation, the safety and protective devices must not be bypassed, removed or otherwise rendered inoperative.
- Protective devices may only be removed following a standstill and only after the battery storage system has been secured against re-activation.
- Check all of the safety devices on the battery storage system for correct functioning on a regular basis.

## 2.8 Information regarding emergencies

### Preventative measures

- Always be prepared for accidents or fire.
- Keep first-aid equipment (first-aid kit, blankets etc.) to hand.
- Make sure that you are familiar with the accident-reporting, first-aid, fire-extinguishing and rescue facilities.
- Keep the access routes clear for rescue vehicles and mark them accordingly if necessary.

### Measures in the event of accidents

- Rescue people from the danger zone.
- Perform resuscitation immediately if heart or breathing stops.
- In the event of personal injury, inform the first-aid officer and an emergency doctor or the emergency services immediately.
- Clear the access routes for rescue vehicles. If necessary, assign somebody with the task of briefing the emergency services.

## 2.9 Obligations of the operating company

The battery storage system is used in a commercial environment. The operating company of the battery storage system is therefore subject to the legal obligations regarding occupational safety.

In addition to the safety instructions in this operating manual, the safety, accident-prevention and environmental-protection regulations that apply in the field of application of the battery storage system must also be complied with. The following applies in particular in this regard:

- The operating company must ensure that the battery storage system is only used as intended (see Section 0)
- The operating company must provide and indicate escape routes. The operating company must also ensure that escape routes are always kept clear.
- The operating company must provide the operating manual in the location where the battery storage system is used, making sure that it is in a complete and legible condition at all times.
- The operating company must clearly regulate and define the various responsibilities for commissioning, operation, maintenance, decommissioning and disassembly.
- The operating company must only allow people to work on the battery storage system who have reached the statutory minimum age limit.
- The operating company must only allow people to work on the battery storage system who have the appropriate qualifications and training.
- The operating company must ensure that all employees who work with the battery storage system have read and understood the operating manual. It must also provide employees with regular documented training and must inform them of the associated dangers.
- The operating company must provide personnel with the personal protective equipment and make sure that it is used.
- The operating company must ensure that no work is carried out on the battery storage system by persons whose response capability is impaired as a result of substances such as drugs, alcohol or medication.
- The operating company must ensure that all employees who work with the battery storage system take sufficient breaks in order to rule out as far as possible any symptoms of fatigue or lack of concentration when working with the battery storage system.

The operating company is also responsible for ensuring that the battery storage system is always in a technically perfect condition. The following rules apply in this regard:

- The operating company must ensure that the maintenance intervals specified in this operating manual are complied with.
- The operating company must have all safety devices checked for correct functioning and completeness on a regular basis.
- The operating company must perform regular checks to establish that all of the safety instructions and warnings attached to the battery storage system are legible and permanently affixed.

## 2.10 Obligations of the system manager

The system manager is responsible for the safe performance of electrical work. The transfer of responsibility is performed in writing by the operating company.

The system manager must have read and understand the operating manual. He or she must consult the HOPPECKE Service Competence Center in the event of misunderstandings.

## 3 Assembly

- The assembly work for the INTILION | scalestac is split into the following steps:
- Preparatory measures
- Positioning and assembling the pre-assembled individual parts
- NARADA cabinets
  - Inserting the battery modules
  - Inserting the Control Box
  - Connecting the battery modules (power and communication cables)
  - Connecting the communication cables for the rack BMS
  - Establishing the DC connection to the INTILION cabinet
  - Setting up the communication wiring and auxiliary voltage lines to the INTILION cabinet
  - Connecting the busbars
  - Connecting the communication lines and auxiliary voltage lines
  - Establishing the AC connection to the network

### 3.1 General information

At least two people must be provided for the assembly work as well as the necessary tool.

The INTILION | scalestac is delivered on pallets in pre-assembled individual parts. It must be connected to the low-voltage network via a 5-pin supply line (L1, L2, L3, N, PE). A network connection must also be established for connecting the INTILION | scalestac to the Internet. The network cable can also be used for controlling the battery storage system via the external interface.

The connection area of the INTILION | scalestac is intended for a maximum connection cross-section of 2 x 5 x 1 x 240 mm<sup>2</sup>.

### 3.2 Personal protective equipment (PPE)

- Helmet with protective visor
- Electrician's jacket
- Insulated gloves
- Safety boots
- Insulating mat
- Work gloves (for non-electrical work)

## 3.3 Line list

The line list contains details of all the supplied lines. It must be checked for completeness before starting the assembly work.

Table 1: Cable list between the control cabinets (+ACC/+ICU, +IPCS1/2, +DCC/+IBU)

Cable name	Wire no.	Origin	Terminal	Destination	Terminal	Description
=BS+ICU-WD6.4 (YSLY-JZ 3x2.5 mm <sup>2</sup> )	1	=BS+ICU	X2:7	=BS+IBU	X2.1:1	Supply voltage IBU 230 V AC
	2		X2:10		X2.1:2	
					X2.1:3	
	PE		X2:13 (PE)		(PE)	
=ScS+ICU-WD7.1 (YSLY-JZ 3x1.5 mm <sup>2</sup> )	1	=ScS+ICU	X4:1	=BS+IPCS1- GQ	X4:1	Fan IPCS 1/IPCS 2
	2		X4:2		X4:2	
					X4:3 (PE)	
	PE		X4:3 (PE)			
=ScS+ICU-WG7.4 (YSLY-JZ 3x1 mm <sup>2</sup> )	1	=ScS+ICU	X4:4	=BS+IPCS1- GQ	X4:4	Messages, fan IPCS 1/IPCS 2
	2		X4:5		X4:5	
					X4:6 (PE)	
	PE		X4:6 (PE)			
=BS+IPCS1-WD4.1 (YSLY-JZ 5x2.5 mm <sup>2</sup> )	1	=ScS+ICU	X3.3:1	=BS+IPCS1	X3.3:1	Supply voltage 24 V DC IPCS 1
	2		X3.3:1		X3.3:1	
	3		X3.3:2		X3.3:2	
	4		X3.3:2		X3.3:2	
					X3.1:3	
	PE		X3.3:3 (PE)		(PE)	
=BS+IPCS2-WD4.1 (YSLY-JZ 5x2.5 mm <sup>2</sup> )	1	=ScS+ICU	X3.4:1	=BS+IPCS2	X3.3:1	Supply voltage 24 V DC IPCS 2
	2		X3.4:1		X3.3:1	
	3		X3.4:2		X3.3:2	
	4		X3.4:2		X3.3:2	
					X3.1:3	
	PE		X3.4:3 (PE)		(PE)	
=ScS+ICU-WG17.1 (YSLY-JZ 5x0.5 mm <sup>2</sup> )	1	=ScS+ICU	X8:1	=BS+IBU	X3:5	Release and safety circuit
	2		X8:2		X3:6	
	3		X8:3		X3:7	
	4		X8:4		X3:8	
					X3:9 (PE)	
	PE		X8:5 (PE)			
=BS+IPCS1-WD3.1 (YSLY-JZ 12x0.75 mm <sup>2</sup> )	1	=ScS+ICU	X3:1	=BS+IPCS1	X3:1	Feedback, supply voltage and feedback, MSS inverter 1-8
	2		X3:2		X3:2	
	3		X3:3		X3:3	
	4		X3:4		X3:4	
	5		X3:5		X3:5	
	6		X3:6		X3:6	
	7		X3:7		X3:7	
	8		X3:8		X3:8	
	9		X3:9		X3:9	

	10		X3:10		X3:10	
	11		X3:11		X3:11	
	PE		X3:13 (PE)		X3:13 (PE)	
=BS+IPCS2-WD3.1 (YSLY-JZ 12x0.75 mm <sup>2</sup> )	1	=ScS+ICU	X3.1:1	=BS+IPCS2	X3:1	Feedback, supply voltage and feedback, MSS inverter 1-8
	2		X3.1:2		X3:2	
	3		X3.1:3		X3:3	
	4		X3.1:4		X3:4	
	5		X3.1:5		X3:5	
	6		X3.1:6		X3:6	
	7		X3.1:7		X3:7	
	8		X3.1:8		X3:8	
	9		X3.1:9		X3:9	
	10		X3.1:10		X3:10	
	11		X3.1:11		X3:11	
	PE		X3.1:13 (PE)		X3:13 (PE)	
=BS+IPCS1-WF5.1 Ethernet CAT6a	RJ45	=ScS+ICU	XF21.2 Port 6	=BS+IPCS1	A5.0 Ethernet1	Network cable, system control
=BS+IBU-WF6.1 Ethernet CAT6a	RJ45	=ScS+ICU	XF21.2 Port 5	=BS+IBU	KF6.1:X1	Network cable to IBU
=BS+IPCS1-WD1.6 (YSLY-JZ 3x2.5 mm <sup>2</sup> )	1	=BS+ICU	X2:8	=BS+IPCS1	X1:6	Supply of the AC contactor upstream of WR
	2		X2:11		X1:N	
	PE		X2:14		X1:PE	
=BS+IPCS2-WD1.6 (YSLY-JZ 3x2.5 mm <sup>2</sup> )	1	=BS+ICU	X2:9	=BS+IPCS2	X1:6	Supply of the AC contactor upstream of WR
	2		X2:12		X1:N	
	PE		X2:15		X1:PE	
=BS+ICU-WD6.6 (YSLY-JZ 3x2.5 mm <sup>2</sup> )	1	=BS+ICU	X3.7:1	=BS+IBU	X3.7:1	24V DC supply of the IBU in the DC connection field
	2		X3.7:2		X3.7:2	
	PE		X3.7:3 (PE)		X3.7:3 (PE)	







Table +IBU/+DCC battery rack connection



Cable name	Wire no.	Origin	Terminal	Destination	Cable/connector	Description
=BS+IBU-WF8.5 (PT1000)	white	=BS+IBU	X4:5	Battery rack 1		Top left on the battery racks
	red		X4:6			
=BS+IBU-WF8.6 (PT1000)	white	=BS+IBU	X4:7	Battery rack 1		Bottom right on the battery racks
	red		X4:8			
=BS+IBU-WD11.4 (YSLY-OZ 2x0.75 mm <sup>2</sup> )	1	=BS+IBU		Battery rack 1	J1 /GPIO -1	Emergency off, battery rack
	2				J1 / PWR -	
Patch cable 5 m	RJ45	=BS+IBU	-KF6.1:X2	Battery rack 1	Ethernet	Communication connection
=BS+IBU-WD4.1 (YSLY-JZ 3x1.5 mm <sup>2</sup> )	1	=BS+IBU	X2:1L	Battery rack 1	Connector for non-heating appliances	Power supply rack 1
	2		X2:1N			
	PE		X2:1PE			
=BS+IBU-WD4.3 (YSLY-JZ 3x1.5 mm <sup>2</sup> )	1	=BS+IBU	X2:2L	Battery rack 2	Connector for non-heating appliances	Power supply rack 2
	2		X2:2N			
	PE		X2:2PE			
=BS+IBU-WD4.5 (YSLY-JZ 3x1.5 mm <sup>2</sup> )	1	=BS+IBU	X2:3L	Battery rack 3	Connector for non-heating appliances	Power supply rack 3
	2		X2:3N			
	PE		X2:3PE			
=BS+IBU-WD4.7 (YSLY-JZ 3x1.5 mm <sup>2</sup> )	1	=BS+IBU	X2:4L	Battery rack 4	Connector for non-heating appliances	Power supply rack 4
	2		X2:4N			
	PE		X2:4PE			
=BS+DCC-WB1.1 (NSSHÖU 1x70mm <sup>2</sup> )	-	=BS+DCC	-Q1.1:1	Battery rack 1	Output +	Power connection positive, rack 1
=BS+DCC-WB1.2 (NSSHÖU 1x70 mm <sup>2</sup> )	-	=BS+DCC	-Q1.1:1	Battery rack 2	Output +	Power connection positive, rack 2
=BS+DCC-WB1.5 (NSSHÖU 1x70 mm <sup>2</sup> )	-	=BS+DCC	-Q1.1:4	Battery rack 1	Output -	Power connection negative, rack 1
=BS+DCC-WB1.6 (NSSHÖU 1x70 mm <sup>2</sup> )	-	=BS+DCC	-Q1.1:4	Battery rack 2	Output -	Power connection negative, rack 2

## 3.4 Necessary tools

- Insulated screwdriver set
- Electric screwdriver with bit set
- Ladder, forklift truck, high-lift truck
- Gloves and insulated gloves
- Ratchet wrench set
- Insulated torque wrench, 1/4", 1/2", insulated sockets (inch/metric) 1 x 5/8" (15.9 mm) 1 x 11/16" (17.5 mm)
- Rotating field meter
- Multimeter
- Side cutters

Table 2: Tool list

No.	Name of tool	Purpose	Form
1	Electric tool	Rack screws	
2	Insulated torque wrench	Installing high-current cables	
3	Insulated socket	For the installation of high-current cables (use 17- and 19-mm connector)	
4	Insulated extension	Installing high-current cables	
5	Cutter	Unpacking	
6	Forklift truck	Transport cabinets and modules	

7	High-lift truck (recommended)	Transporting and assembling battery modules	
8	Inclinometer/level	Assembling the rack frame	

## 3.5 Assembly work steps

### 3.5.1 Delivery of the cabinets and components

- Check for completeness based on the parts list/delivery note
- Unpack the components
- Check the delivery for damage



*Illustration 1: Cabinet delivery on a pallet*

## 3.5.2 Positioning and installing the cabinets at the installation location

No general information can be provided regarding positioning the cabinets within the installation location, as this is heavily dependent on the local conditions.

Nevertheless, INTILION AG recommends using a lift truck and forklift truck or similar for this step, as the control cabinets are difficult to move by hand due to their weight.

After removing the packaging, the cabinets should be carefully lifted off the transport pallet. To do so, the forks of the forklift truck must be positioned between the feet of the housing. The base plates (sheets) between the feet may need to be removed. When transporting a cabinet on the tines of the forklift truck, it must be ensured that the tines are fully inserted through the cabinet base.

### NOTE

- The control cabinets must only be moved vertically.



*Illustration 2: Lifting the control cabinet off the transport pallet*

Depending on the local conditions, the cabinets are then either moved to their precise installation location using a forklift truck, or loaded onto a lift truck for onward transportation.

The installation sequence for the cabinets must be observed without fail.

It is preferable to start with the installation of cabinet no. 1 (ICU), i.e. to install one cabinet after the other from left to right. However, it is also possible to install the cabinets from right to left, starting with cabinet no. 5 (battery rack 2).

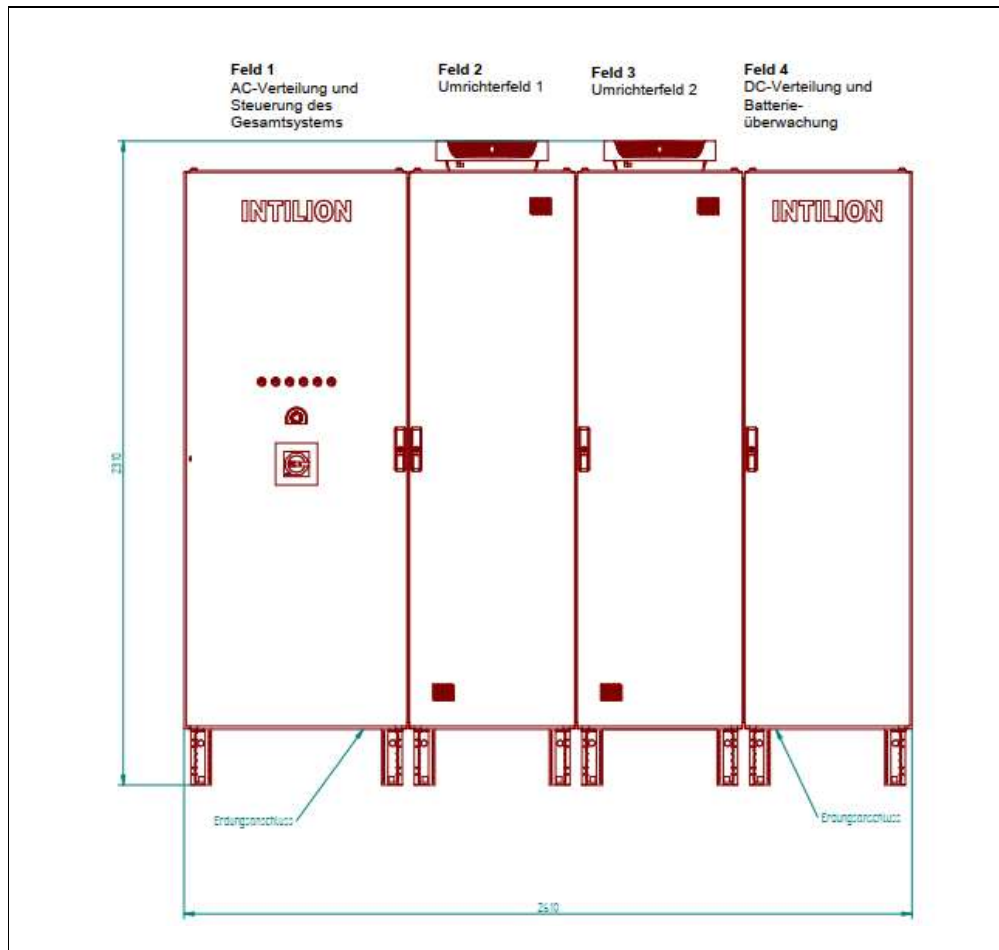


Illustration 3: Field 1 (ICU), field 2 (IPSC1), field 3 (IPCS2), field 4 (IBU/DCC)

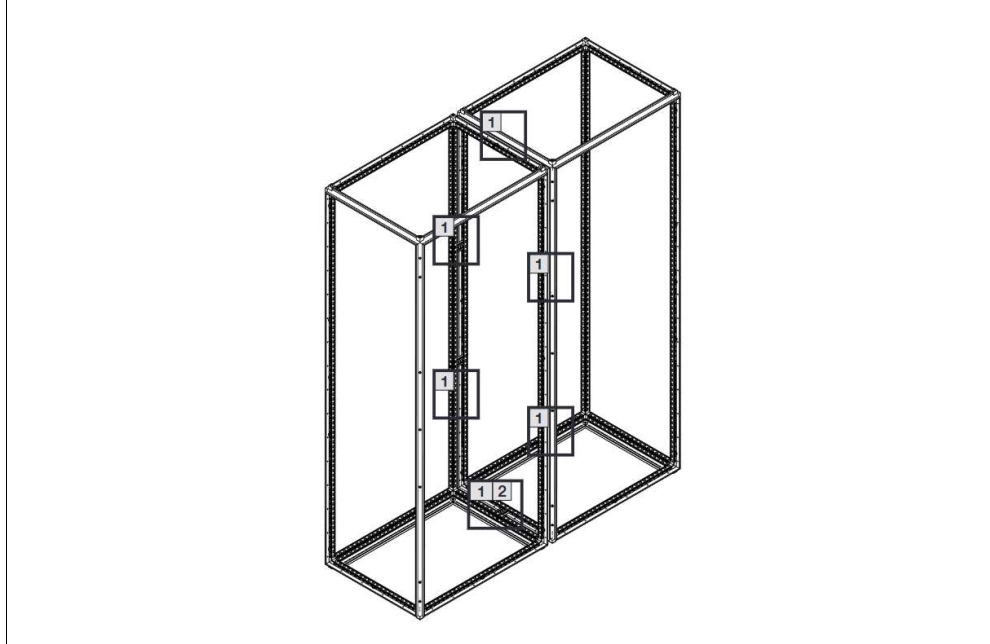
With fields 1 to 4, a minimum distance of 200 mm from the back of the cabinet to the wall must be maintained for the air supply, as shown in the following figure.



Illustration 4: Distance to the wall (200 mm)

In order to ensure that the copper busbar described later on in this manual can be connected from cabinet to cabinet, it must be ensured that the cabinets are precisely installed in a straight line. The connection plates can be used to help with this.

The enclosed Rittal connectors (Art. no.: VX 8617.501) must be used when connecting the cabinets. The connector positions are shown in the figure below.



*Illustration 5: Position of the connectors*



*Illustration 6: Cabinet connector for centring*

Once fields 1 to 3 have been installed, the battery racks are installed. These must be arranged flush, on the right next to the control cabinets. If installing the racks in a different position, the required cables must be provided by the customer. If the battery racks are being installed opposite one another, a minimum passage width of 1.5 m must be maintained.

The battery cabinets (field 4) do not need to be a minimum distance from the wall, and are installed flush with the wall. The empty, unequipped battery racks can also be brought into the room horizontally if this is required due to the height of the room opening.

### 3.5.3 Assembling the HMI cover plate

The steps for the correct assembly of the HMI cover plate onto the rack door are described below.

Materials for assembly:

- 1x cover plate
- 4x M6 x 16 screws
- 2x M6 K-discs
- 2x M6 washers
- 4x M6 nuts
- 2x M6 toothed lock washers

Assembling the cover plate:

1. Remove the cover plate from the protective film
2. Insert the four M6 x 16 screws into the plate
3. Hold the plate onto the opening. Connect the two toothed lock washers onto the bottom screws. When doing so, make sure that the toothed lock washers are positioned as shown in Figure 7. The toothed lock washer should protrude over the edge of the opening in order to allow for effective earthing of the plate.
4. The plate must now be fixed onto the door by means of the K discs on the top two screws. The bottom two screws are fixed in place with the washers.

The earthing resistance of the HMI cover plate must now be checked in accordance with the specifications.

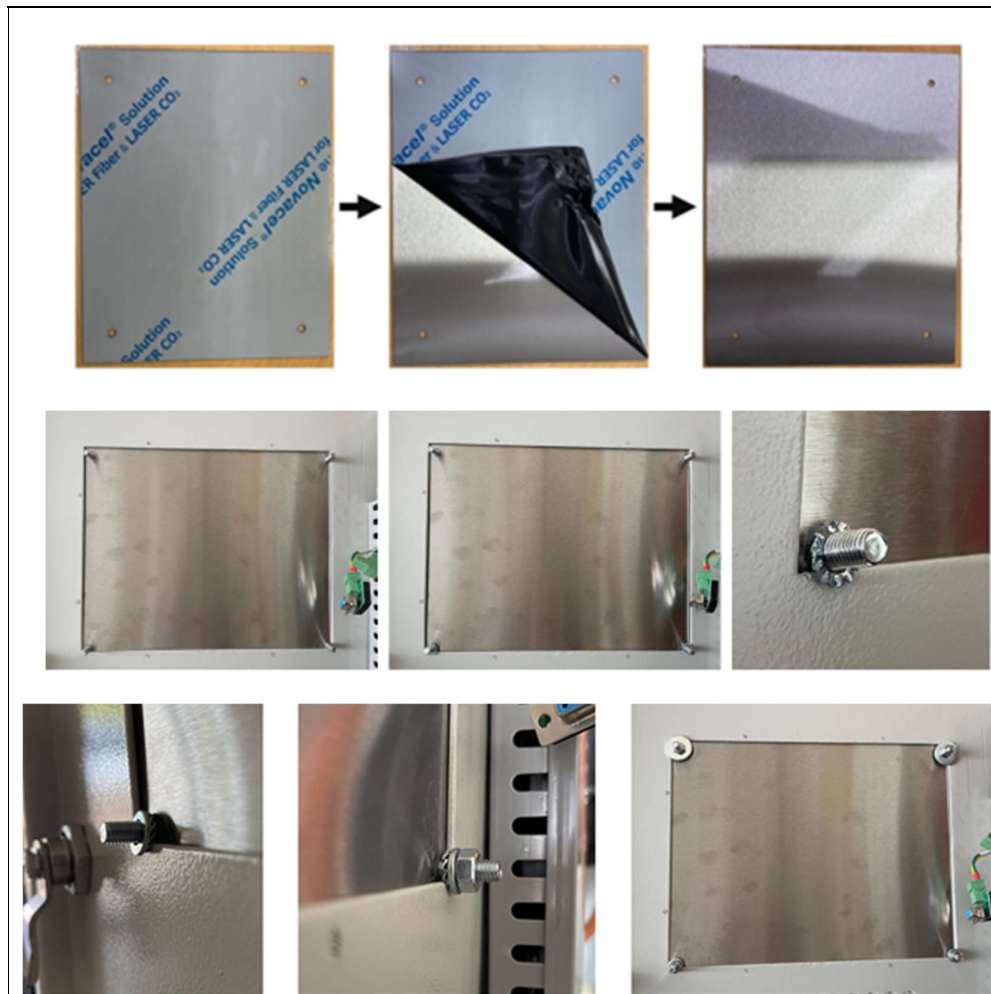


Illustration 7: Assembly of the HMI cover

## 3.5.4 Battery cabinets (Narada battery racks)



Additional information can also be found in the enclosed Narada installation manual and in the connection list for the communication lines of the battery racks.

### 3.5.4.1 Preparing the battery racks

- Anchor the cabinets to the ground
- Connect the equipotential bonding system
  - Connect the equipotential bonding of rack 1 in cabinet no.4 +IBU.
  - Establish an equipotential bonding connection between the following racks and the previous rack using an equipotential bonding strap.
- Disconnect the protective conductor (PE) from the doors and unhinge the doors.

## 3.5.4.2 Inserting the battery modules and the rack BMS

- Fit the mounting bracket on the control box
- Insert the rack BMS at the top left of the rack
- Unpack the battery modules. Use a forklift truck or other suitable lifting aid to lift the battery modules to the correct height and then insert. Install modules A and B according to the Narada manual.



*Fig. 8 Arrangement of battery modules and module connectors*

- Establish the screw connections for the modules and the rack BMS in the rack using M6 x 25 screws, washers and lock washers (torque 9 Nm).



### **DANGER**

The module connectors must be installed from top to bottom so as to prevent a short circuit in the battery modules due to the connectors tipping over.

- For safety reasons, always proceed module by module and cover the module poles that are not required with an insulating mat. Screw the cover back on again immediately after completion.
- Remove the cover for the modules being connected.
- Screw on the busbars (torque 9 Nm) firstly at the top and then at the bottom

- Connect the communication line; observe the arrangement of the connections on the module BMS (input (ADR) from the previous module or rack BMS and the output (ADT) to the next module)
- Install the final cover of the battery module
- Fix the communication line onto the eyes on the battery rack if necessary
- Hinge the doors and connect the protective conductor (torque 8 Nm).

### 3.5.4.3 Installing additional control and safety components in the first battery rack

- Install the BAU in the door of the first rack. If multiple racks are installed, the BAU must only be installed in rack 1.
- The HMI is then installed in the door of the first battery rack. It will then behave similarly to the BAU. This is only installed once per system.



*Fig. 9 Installation position of the HMI and the BAU*

- Establish the cable connections according to the cable list in Table 1.

### 3.5.4.4 Connecting to INTILION cabinet no. 4 (IBU/DCC)

- Connect the DC lines to output+ and output- on the rack BMS (30 Nm) of the installed racks, and connect the lines to DC+ and DC- on the DC cabinet (-Q1.1) with a torque of 30 Nm.
- Connect the RJ45 network cable from BAU Ethernet to IBU (terminal BS-KF6.1 X2).

## 3.5.5 INTILION cabinets



For further information, please also refer to the enclosed wiring diagram and the connection list for the INTILION cabinets.

Cabinets no. 1 (ICU), 2 (IPSC1) and 4 (IBU/DCC) must then be connected to one another via control lines, communication lines and busbar connectors.

For the power supply, cabinet no.1 is connected to the power network via the copper busbar connections. An Ethernet connection is also required for Internet connection and connection to an external EMS.

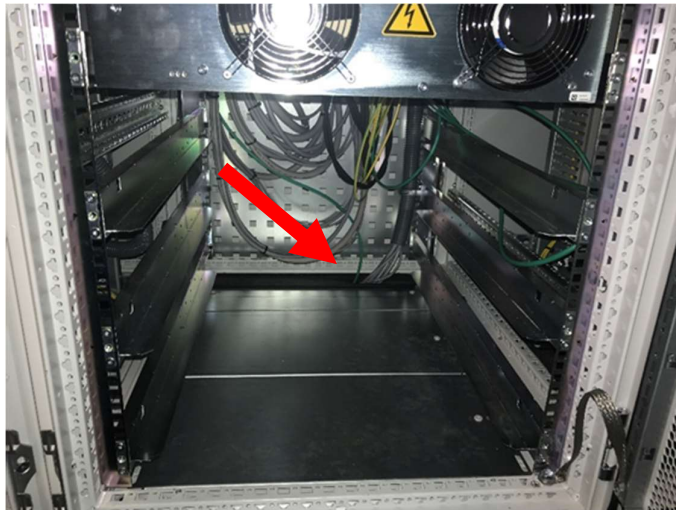
### 3.5.5.1 Communication connection

To ensure communication between the cabinets, communication and auxiliary voltage lines must be laid from cabinets no. 2-4 to cabinet no. 1, and then connected there.

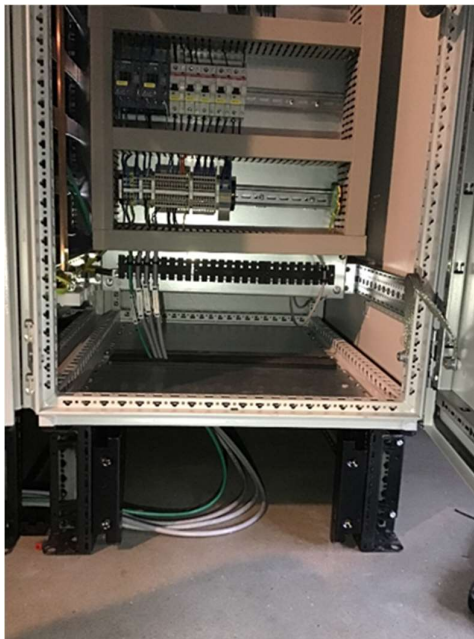
The required lines are pre-assembled and delivered in cabinets no. 2-4. These lines are laid in cabinet no. 1 according to the cable list in Table 1. The lines are laid through the base of the control cabinets. Cable relief must be provided via the strain relief plate.



*Illustration 10: As-delivered state (cabinet no. 2)*

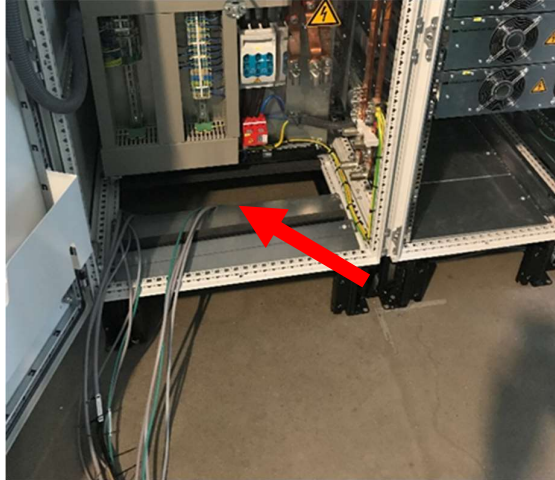


*Illustration 11: Cabinet cable feed-through*

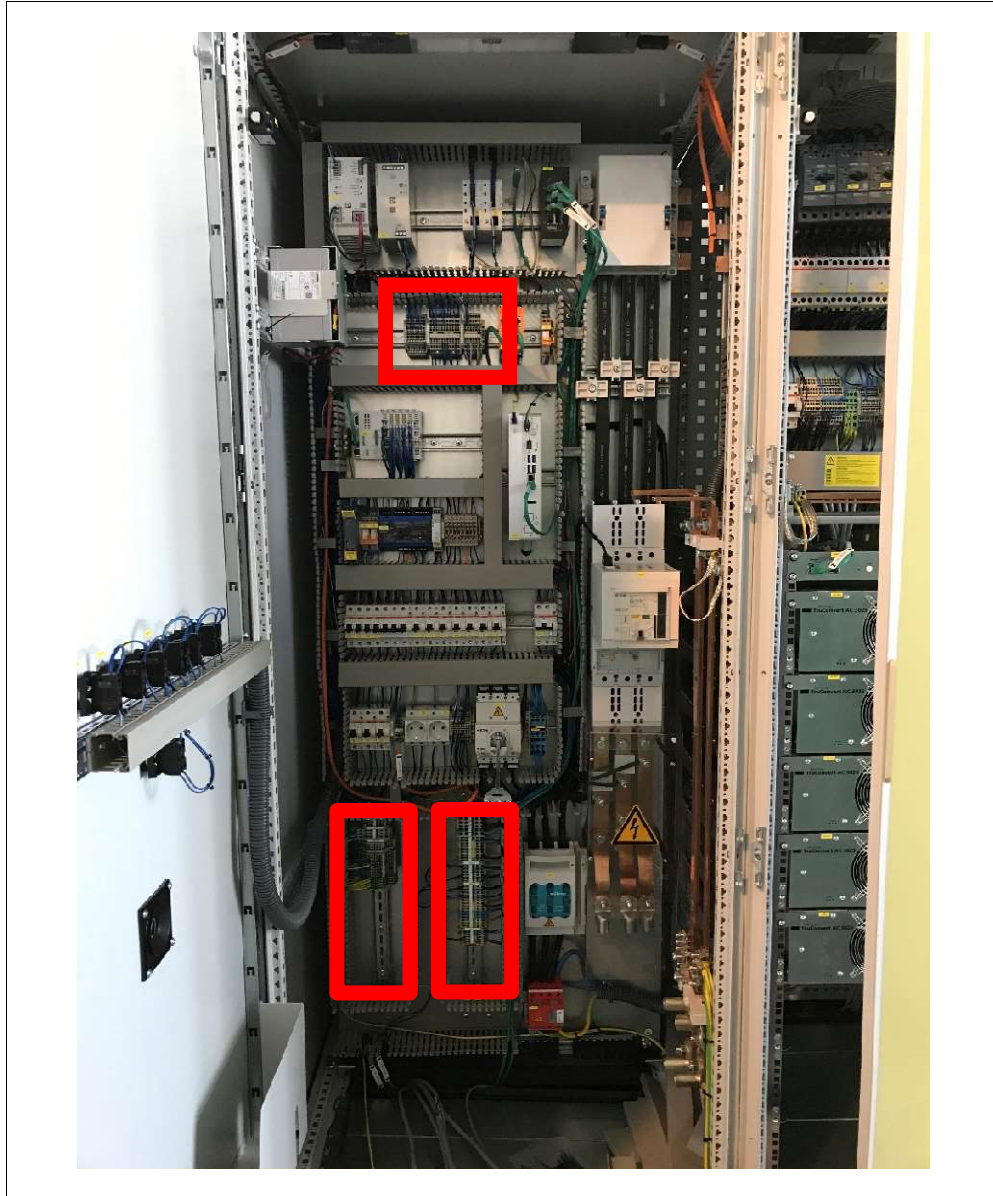


*Illustration 12: Cable harness (cabinet no. 3)*

The lines are then guided into cabinet no. 1 from below through the base plate and positioned on the terminal strips.



*Illustration 13: Laid wires in cabinet no. 1*



*Illustration 14: Overview of terminal blocks and network connections (cabinet no. 1)*

## 3.5.5.2 Connecting the busbars

Connect the conductors L1, L2, L3, N and PE between cabinets no. 1 and no. 2. The position of the busbars is indicated in the following figure.

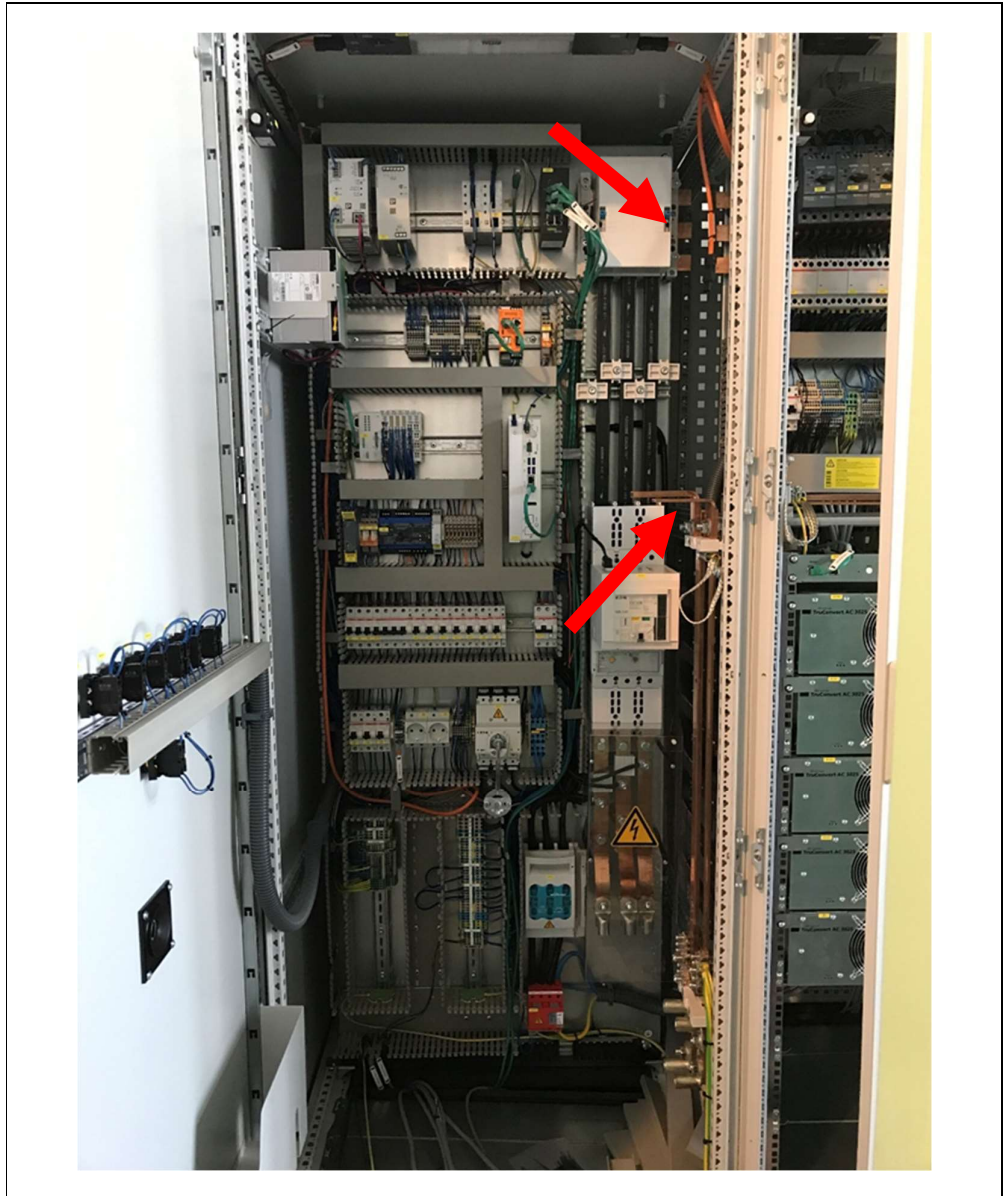
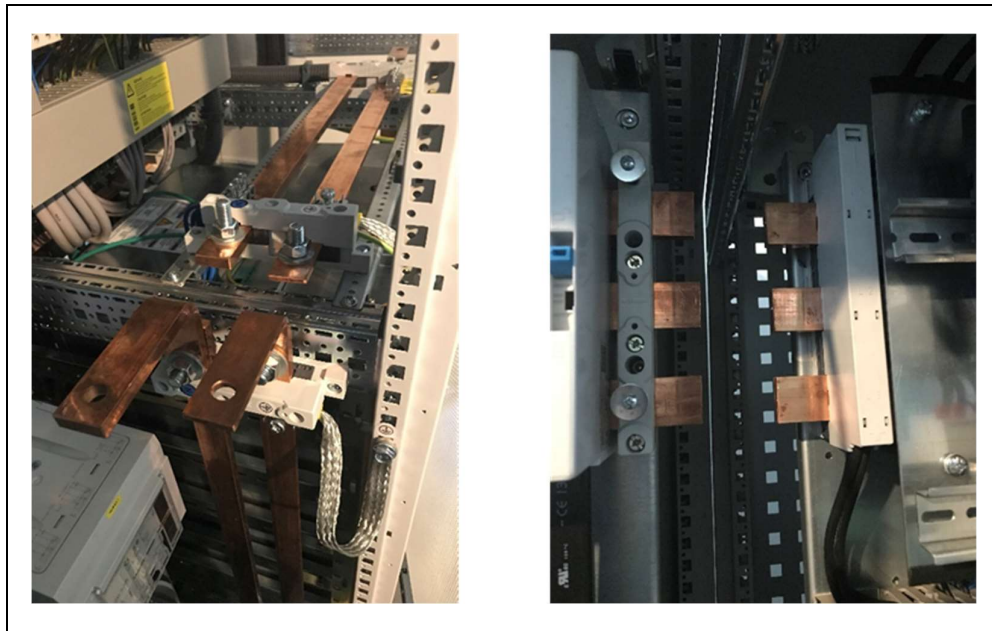


Illustration 15: Busbars L1, L2, and L3 (top) and N and PE (bottom)

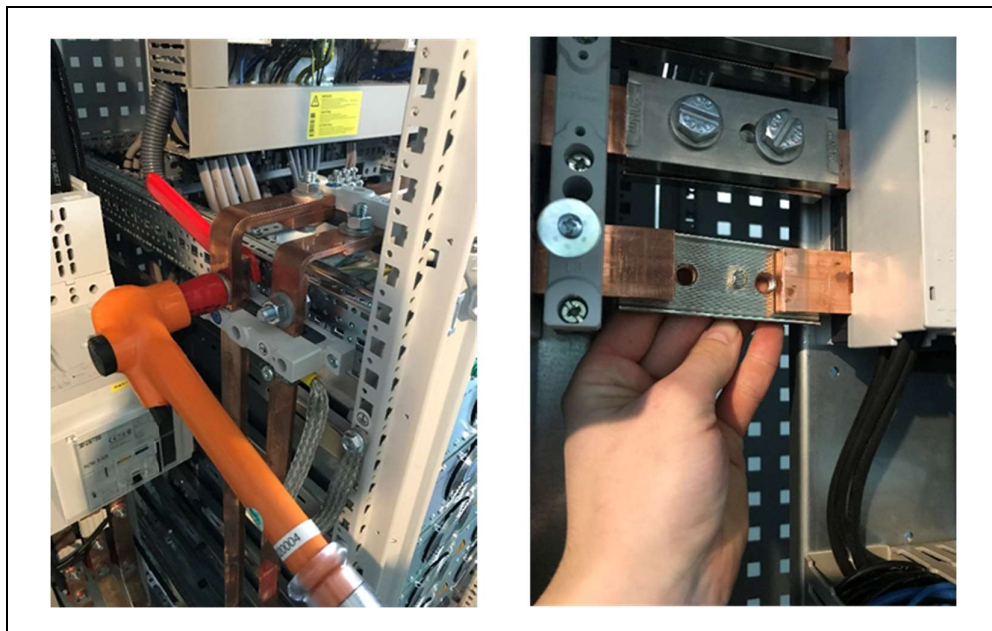


*Illustration 16: Busbars N and PE (left) and L1, L2, and L3 (right)*

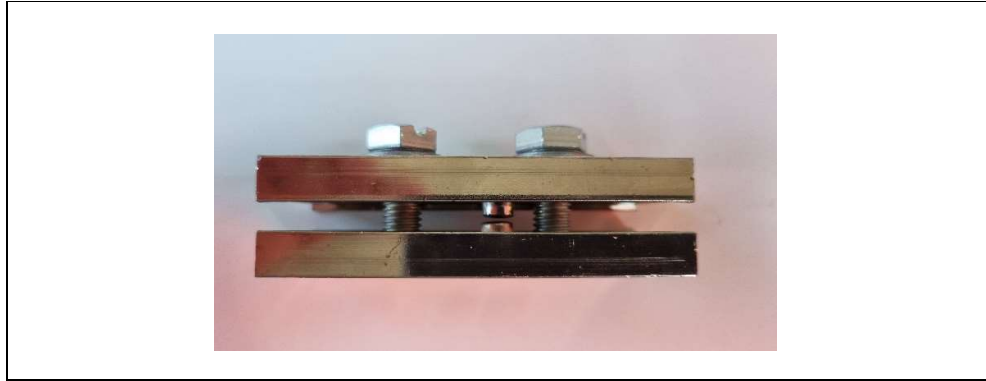
Busbars N and PE must be connected to the pre-assembled, angled copper busbars (torque 25 Nm).

Conductors L1, L2 and L3 must be connected using straight busbar connectors. One half shell of the connector is connected at the back of the busbar, and one at the front. The half shells are then clamped together using the screws (torque 20 Nm).

It is important to be aware that the lugs on the connectors must be on top of each other in the case of 10 mm busbars and next to each other in the case of 5 mm busbars.

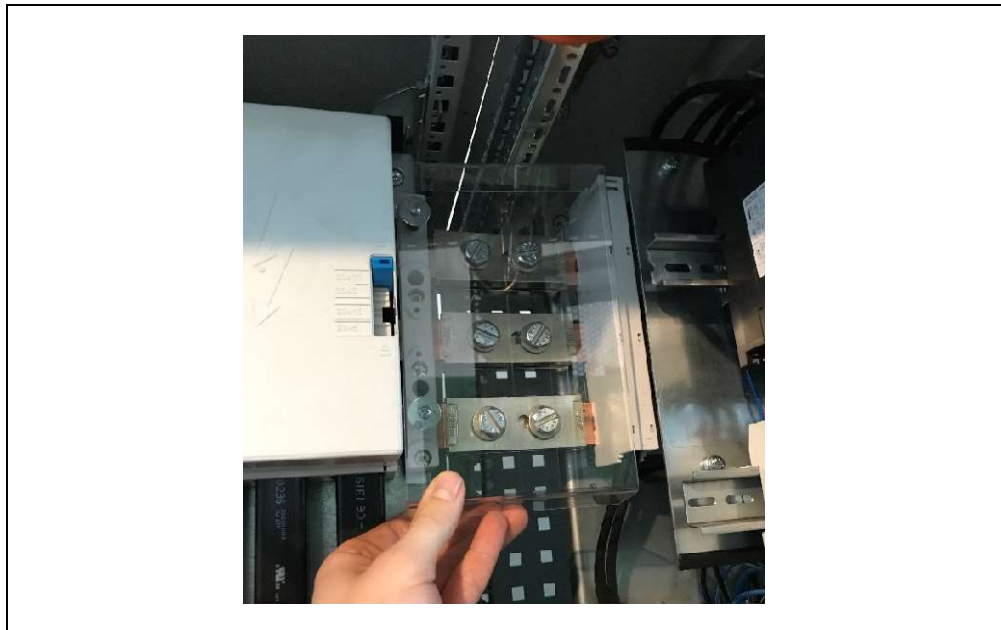


*Illustration 17: Busbar connectors N and PE (left) and L1, L2 and L3 (right)*



*Fig. 18 Top view of the busbar connectors*

Plexiglas touch protection is then screwed onto the busbars at the top of the cabinet using two screws.



*Illustration 19: Touch protection for L1, L2 and L3*

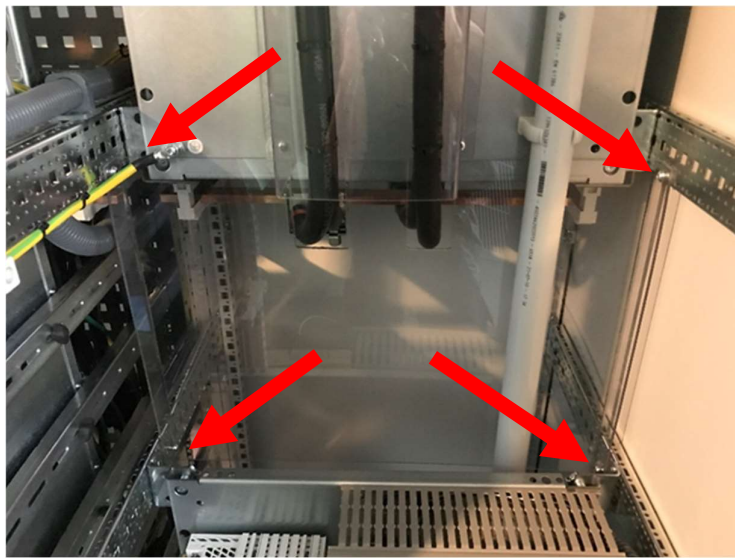
Connect the conductors DC+, DC- and PE between cabinet no. 2 or 3 (depending on system scaling) and cabinet no. 4.

The PE busbar is screwed onto an angled copper busbar (torque 25 Nm).



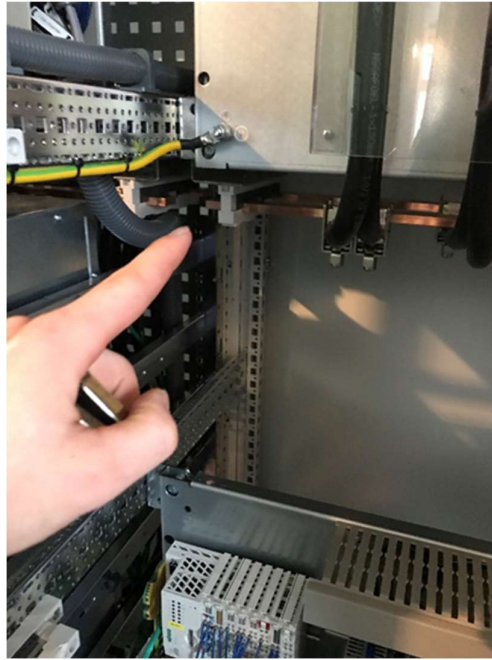
*Illustration 20: PE busbar in cabinet no .3*

To connect the DC+ and DC- busbars, start by releasing the touch protection via the four screws.

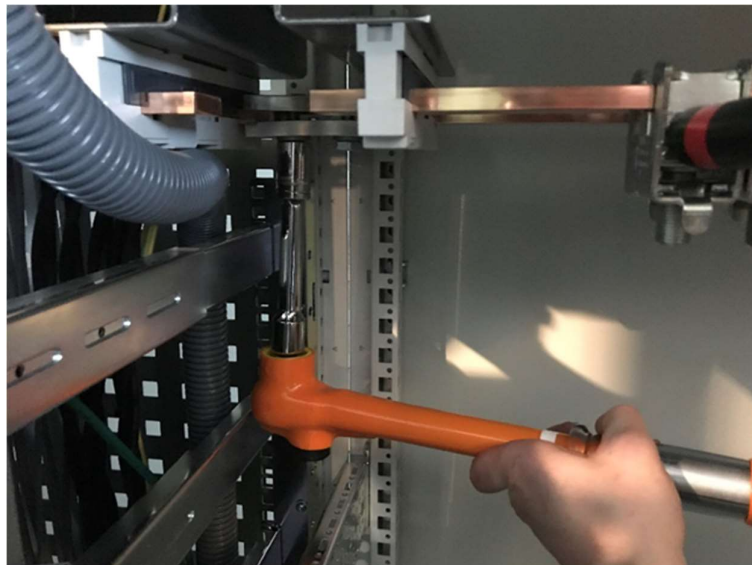


*Illustration 21: Dismantling the protective grille*

Conductors DC+ and DC- must be connected using straight busbar connectors. One half shell of the connector is connected at the back of the busbar, and one at the front. The half shells are then clamped together using the screws (torque 20 Nm).



*Illustration 22: DC+ and DC- busbar in cabinet no. 3*

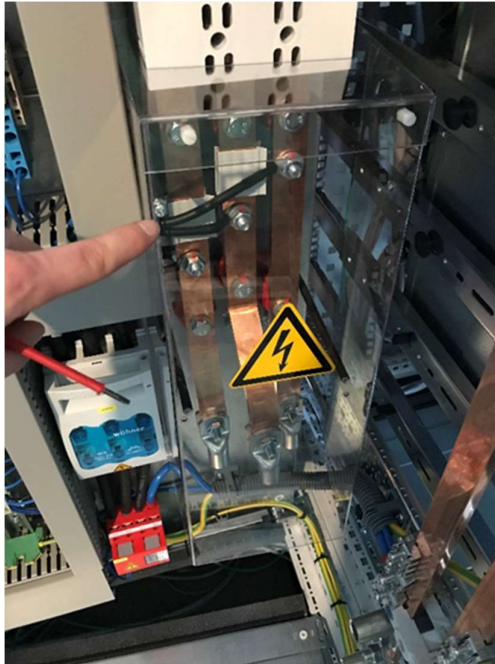


*Illustration 23: Connecting and tightening busbars*

The touch protection (plexiglas) then needs to be re-attached.

## 3.5.5.3 AC connection

The system connection can be established with a maximum of two cable systems with a maximum cross-section of 240 mm<sup>2</sup>. The bending radius of the cable type must be observed. To establish the AC connection for the battery storage system, start by removing the plexiglas touch protection. This exposes the three busbars, to which the three phases L1, L2 and L3 must be connected from left to right (torque 40 Nm).



*Illustration 24: Touch protection for AC connections L1, L2 and L3*

The AC cable is also inserted into cabinet no. 1 via the base plate.



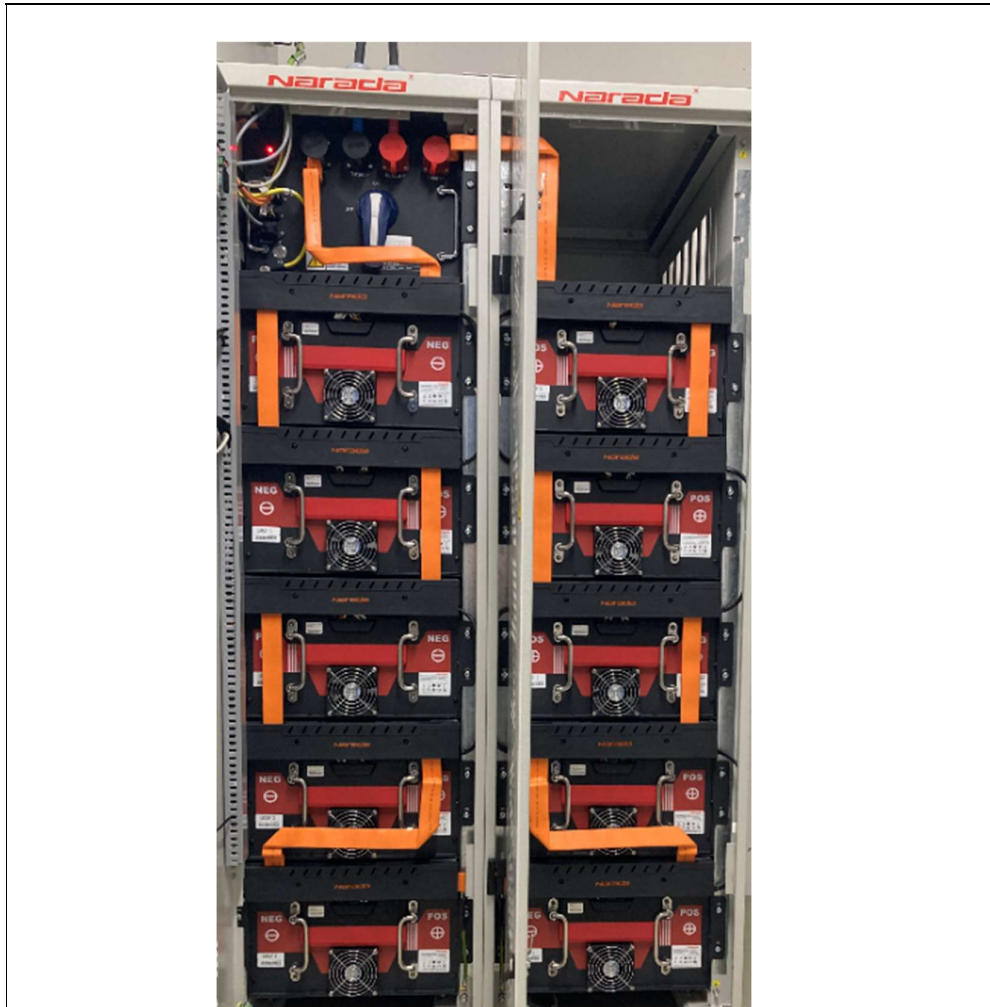
*Illustration 25: AC connections L1, L2 and L3 in cabinet no. 1*

Wires N and PE are screwed in at the right-hand side of housing no. 1 (torque 40 Nm).



*Illustration 26: AC connectors N and PE in cabinet no. 1*

## 4 Appendix



*Illustration 27: Example NARADA Rack*



*Illustration 28: Example installation*



*Illustration 29: Example rack connection*



*Illustration 30: Position of the temperature sensor*



*Illustration 31: Position of the temperature sensor 2*



*Illustration 32: Example cable routing with 2-4 racks*

## 5 Acronyms

AC	Alternating current
BAMS	Battery administration management system
BAU	Battery administration unit
BBMS	Bank battery management system
BCU	Battery cluster management unit
BMS	Battery management system
BMU	Battery management unit
BPU	Battery protection unit
CCCV	Constant current constant voltage
DC	Direct current
DI	Digital input
DNS	Domain name system
EMS	Energy management system
HMI	Human machine interface
IBU	INTILION Battery Unit
ICU	INTILION Control Unit
IP	Ingress protection
IPC	Industrial PC
LTE	Long-term evolution
NBO	Network building operation
NPO	Network parallel operation
NS protection	Network and system protection
PFC	WAGO-branded PLC
PGU	Power generation unit
PLC	Programmable logic controller
PPE	Personal protective equipment
RBMS	Rack battery management system
SoC	State of charge
SoH	State of health
TCP/IP	Transmission Control Protocol/Internet Protocol
UCS	Universal Configuration Software
UCTE	Union for the Co-ordination of Transmission of Electricity
UPS	Uninterruptible power supply
VDE	German electrotechnology association
WLE	Work on live equipment