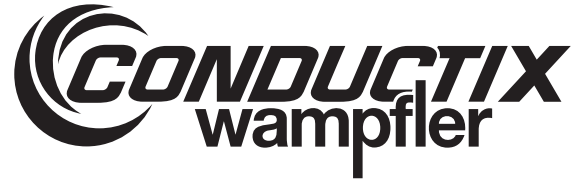


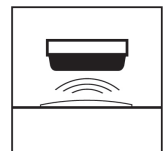
Technical Description



IPS 3.0

Inductive Power Supply

Item number	WNR
3289518	CWA-60692001



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Translation of the original
TNB_0083, 2, en_GB

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1 Information on the description

1.1 Revision history

Subject to changes We reserve the right to make changes to the information present in this document, which result from our constant effort to improve our products.

Version	Date	Comment/reason for change
1	11.2022	Corrections to content (based on TNB_0072)
2	01.2023	First released version

1.2 How to use and store the description

To work safely with the product, it is necessary to observe the safety notes and action instructions. All persons working with the product must have understood the user information in this description and apply it conscientiously. The operator must fulfil his duty of care and ensure that all persons working with the product have read and understood the user information and are implementing it.





This description forms part of the product and must be accessible to all persons working with the product at all times.

1.3 Applicable documents

The documents contained in the project documentation also apply if the device / system is part of a project-specific system plan.

Their own documentation applies to connected devices and components.

Technical documentations

Hardware	Related description
IPS 3.0 Inductive Power Supply	 TNB_0083_IPS30
ISP 3.0 Inductive Stationary Pad	 TNB_0073_ISP30_IMP30
IMP 3.0 Inductive Mobile Pad	
MPU 3.0 Mobile Power Unit	 TNB_0085_MPU30
Software	Related description
Wireless Charger 3.0 Web Interface	 SWB_0021_Wireless-Charger-Web-Interface_User_Admin



The documents are included in the scope of delivery of the respective device or can be downloaded from our website www.conductix.com.

1.4 Copyright protection

The contents, texts, drawings, pictures and other illustrations of this description are protected by copyright and subject to intellectual property rights. Any misuse is punishable by law.

Reproduction in whole or in part of this description is only permitted within the limits of the legal provisions of the copyright law. Any modification or shortening of the text is prohibited without the explicit written consent of Conductix-Wampfler Automation GmbH.

1.5 Illustrations

The illustrations that accompany this description have been purposely selected. They are provided for basic understanding and may differ from the actual design. No claims shall be accepted for possible discrepancies.

1.6 Brands

The popular names, trade names, production descriptions, etc. used in this description may constitute trademarks even without special designations and as such may be subject to legal requirements.

2 Warranty and liability

2.1 Warranty

The warranty only covers production defects and faulty components.

The manufacturer assumes no responsibility for damages caused during transport or unpacking. In no case and under no circumstances will the manufacturer be liable for defects or damages caused by misuse, incorrect installation or inadequate environmental conditions or from dust or corrosive substances.

Consequential damages are excluded from the warranty.

Should you have further questions regarding the warranty, please contact the supplier.

2.2 Limitation of liability

All information and notes in this description have been compiled taking into account the applicable standards and regulations, the state of the art and our many years of knowledge and experience.

Conductix-Wampfler Automation GmbH assumes no liability for damage and malfunctions during operation due to:

- Failure to comply with the description
- Non-intended use
- Use by untrained personnel
- Unauthorised alteration or modification
- Use of the product, despite negative transport inspection

Furthermore, Conductix-Wampfler Automation GmbH's warranty obligation will cease to exist in case of a failure to comply with the description.

3 Safety instructions

This section contains information on all safety aspects for optimum protection of personnel and for safe operation without malfunctions.

To prevent dangers, these notes must be read and followed by personnel. Only then can safe operation be guaranteed.

Of course, all legally applicable general safety and accident prevention regulations must be complied with.

Conductix-Wampfler Automation GmbH assumes no liability for damage or accidents that were caused by non-observance of these safety notes.

3.1 Warning concept

This description contains notes that must be observed for your own personal safety and to avoid property damage. Notes regarding your personal safety are highlighted by a warning triangle; notes regarding property damage do not have a warning triangle.

When several hazard levels occur, the warning always refers to the highest level. If a warning of injury to persons is indicated with a warning triangle, the same warning might include an additional warning of property damage.

3.1.1 Arrangement of warnings

If warnings refer to an entire section, they are placed at the beginning of the section (e.g. chapter start).





If warnings refer to a specific action instruction, they are placed in front of the respective action instruction.

3.1.2 Structure of warnings

- **SIGNAL WORD**
- ↳ Type of danger and its source
- ↳ Possible consequences, if not observed
- ↳ Danger avoidance measures
- ↳ Preventive measures

3.1.3 Signal words




Warnings are indicated using signal words based on hazard levels.

Signal word	Meaning
 	This combination of symbol and signal word indicates a possible dangerous situation that can result in death or serious injury if it is not avoided.
 	This combination of symbol and signal word indicates a possible dangerous situation that can result in material damage if it is not avoided.

3.1.4 Hazard symbols

Warnings of the groups 'danger' and 'warning' are content-based. They are presented with clear danger symbols.

Warnings of the 'caution' group do not have a specific danger symbol.

Warning signs	Type of danger
	Warning – high-voltage.
	Warning – non-ionising electromagnetic radiation.
	Warning – danger zone.

3.1.5 Suggestions and recommendations



This symbol indicates important information to help you handle the product.

3.2 Intended use

The device has been designed and constructed exclusively for the intended use described below.

The stationary power supply IPS 3.0 (Inductive Power Supply)

- is a device designed for use in commercial and industrial transport systems.
- is part of the 'Wireless Charger 3.0' inductive charging system for charging batteries in AGVs.
- provides the necessary power for inductive energy transmission.

The intended use includes compliance with all of the information in this manual and the associated documents.

Any use beyond that intended or other types of use are regarded as misuse.

3.3 Foreseeable incorrect use

Any use that goes beyond this description is forbidden.



⚠ WARNING!

Hazard from non-intended use!

Any use of the device other than and/or beyond the intended use can cause hazardous situations.

- Only use the device as intended.
- It is paramount to comply with all the specifications and permitted conditions at the place of use.
- Do not use the device in potentially explosive atmospheres.
- Do not operate the device in environments with harmful oils, gases, vapours, dusts, radiation, etc.



NOTICE!

Components of the charging system

The components of the charging system are coordinated with each other and form a system unit. Operation with third-party equipment leads to damage and failure of the system!

- The system is not compatible with devices from other manufacturers.
- Operate the system only with the components intended for it.

3.4 Modifications and alterations

For the purpose of avoiding hazards and for ensuring optimum performance, any modifications, additions, or alterations to the device require Conductix-Wampfler Automation GmbH's express consent.



⚠ WARNING!

Injury hazard from structural modifications!

Unauthorised technical modifications can cause bodily harm or material damage.

- Replace faulty devices.
- A faulty device should only be replaced by an identical device.

3.5 Responsibility of the operator

Responsibility of the operator

The device is used in an industrial environment. The operator of the device is therefore subject to statutory obligations regarding work safety.

In addition to the work safety instructions in this description, the safety, accident prevention and environmental regulations applicable to the area where the device is used must be complied with.

The following applies in particular:

- The operators must familiarise themselves with the applicable work safety regulations and must also determine the dangers that are posed by the particular work conditions at the location of use by means of a risk assessment. This must be realised in the form of operating instructions for operation.
- This description must be kept within easy reach of the device and be accessible to those persons working with it at all times.
- The specifications of the description must be adhered to fully and unconditionally!
- The device may only be operated when in a perfect and operationally safe condition. It must be checked for detectable defects prior to each time it is put into service.
- The owner must ensure that the responsibilities for activities performed on the device are clearly defined. Only sufficiently qualified personnel who are familiar with the operating instructions and safety instructions may work with and on the device.

3.6 Personnel and qualifications

The product / system belonging to this description may only be handled by personnel qualified for the respective task. This is done taking into account the descriptions associated with the particular task, especially the safety and warning information contained therein.

Due to their training and experience, qualified personnel are able to recognize risks and avoid possible hazards when dealing with this product / system.

Installation and commissioning



⚠ WARNING!

Danger posed by faulty installation and initial commissioning

The installation and initial commissioning of the device must be always performed by trained specialist personnel with sufficient experience. Mistakes during installation may lead to potentially fatal situations or considerable material damage.

- Have installation and initial commissioning carried out only by employees of the manufacturer or by trained personnel authorised by it.
- Have work on electrical components carried out by qualified electricians or persons instructed and supervised by a qualified electrician in accordance with the electrical engineering regulations.
- Whenever working on the device, disconnect it from the power supply and secure it against being switched on again.
- Prior to commissioning, make sure that all safety equipment is installed and functioning properly.

Electrical work



⚠ WARNING!

Danger to life from electrical current!

Contact with live parts poses an immediate danger to life.

Touching open terminals and wires can result in death or serious injury.

- Only have work on electrical components or operating equipment carried out by a qualified electrician.
- De-energise system parts to work on them.
- Check that all exposed components are de-energised before carrying out any work.
- Check that exposed system components are de-energised before carrying out any work on them.
- Do not open any covers during operation.
- Only carry out work on live parts under the supervision of a second person. The supervisor must be able to operate the emergency stop button or main switch in the event of an emergency.
- Some components of the device may still be live even after the system has been switched off. Be sure to follow the notes on their label when working on these components!
- Only use voltage-insulated tools.
- The device must be fitted with protective earth (PE) if connected directly to the mains.

Operation and maintenance



⚠ WARNING!

Injury hazard from insufficient qualification!

Improper handling can cause substantial bodily harm or material damage.

- Only allow the device to be operated and maintained by trained and instructed personnel.
- Only have work on electrical components carried out by a qualified electrician.

3.7 Special hazards

Electrical current



⚠ WARNING!

Live parts

Contact with live parts poses an immediate danger to life. Damage to the insulation or individual components can be life-threatening.

- In case of damage to the insulation, turn off power supply immediately.
- Check devices and connected components regularly. Any loose connections, damaged cables and insulations as well as all damages that could pose a risk to safety must be rectified immediately. Any faulty protection against accidental contact must be repaired immediately.
- Works on electric components may only be carried out by qualified electricians or persons instructed and supervised by a qualified electrician in accordance with the electro-technical regulations.
- Before carrying out any kind of work on the control system, make sure it is de-energised and secured against accidental reconnection.
- Always use insulated tools.

Electromagnetic field



⚠ WARNING!

Electromagnetic fields

Death or serious injuries

Electromagnetic fields can affect and interfere with pacemakers and defibrillators.

- If you carry a pacemaker, keep sufficient distance.
- Warn people wearing pacemakers before they get close.

3.8 Safety devices



⚠ WARNING!

Danger to life from non-functioning safety devices!

- Check the safety devices before starting work.
- Report faulty safety equipment.
- Have faulty safety equipment repaired.

4 Wireless Charger WC 3.0 - system overview

The wireless charger is a charging system with inductive energy transmission for contactless charging of batteries in AGVs.

The system is intended for industrial applications. Areas of application include unmanned transport systems in intralogistics, mobile robot applications and other automotive applications.

4.1 Components

The charging system is divided into stationary components, which form the primary side of the system, and mobile components, which form the secondary side of the system.

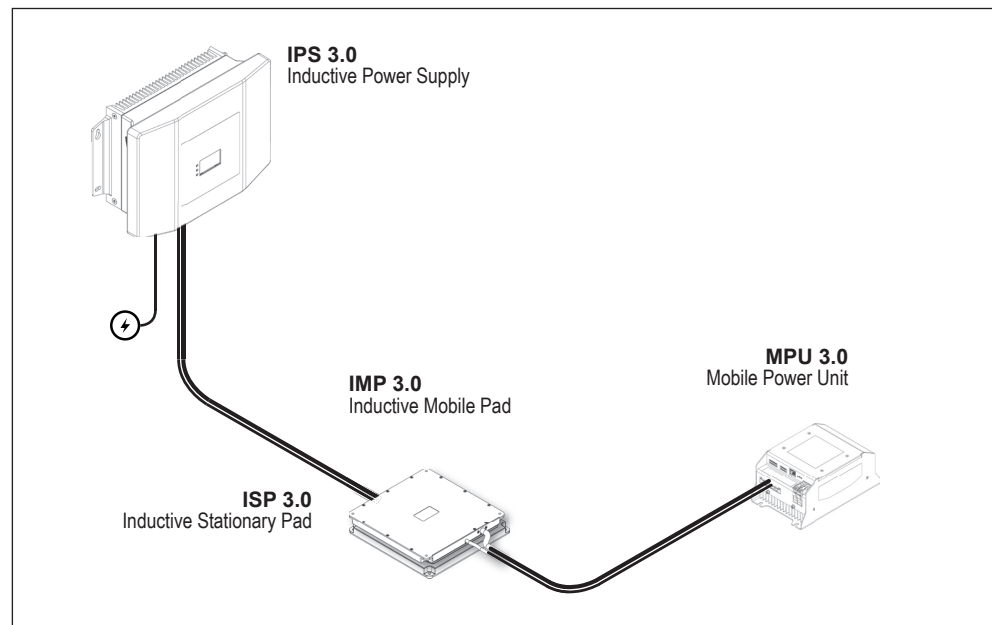


Fig. 1: WC 3.0 components (schematic representation)

Stationary components:

- Stationary power supply
IPS 3.0 - Inductive Power Supply
- Stationary charging pad
ISP 3.0 - Inductive Stationary Pad

Mobile components:

- Mobile charging pad
ISP 3.0 - Inductive Mobile Pad
- Mobile power supply
MPU 3.0 - Mobile Power Unit

4.2 How it works

How it works Charging is possible as soon as the mobile and stationary pad are positioned within a tolerance range of each other.

The charging process starts:

- Immediately in the *[Manual/Continuous]* configuration.
- or by the battery management system
- or by the system controller
- or by the mobile control unit (e.g. vehicle control system)

The charging process ends:

- at the command of the mobile control unit
- or at the command of the battery management system
- or at the command of the system controller
- or when the charging current falls below a specified level
- or when the vehicle is removed from its charging position *



*** Remove the vehicle from its charging position**

If the pads are removed from each other during a charging process, the system detects it as an error state. The charging process will be aborted with an error message.



End-of-charge voltage

If the charging process is not terminated by the software, the charging current is regulated down when the preset end-of-charge voltage is reached, but it is not switched off.



Automatic positioning

The pads cannot detect their position in relation to each other. Only the quality of the data signal is evaluated. The charging process can only be started if the signal is sufficiently stable.

Optimal positioning must be achieved by using suitable external equipment.

4.3 Control circuit

Control circuit The illustration shows the control circuit for inductive power transmission control.

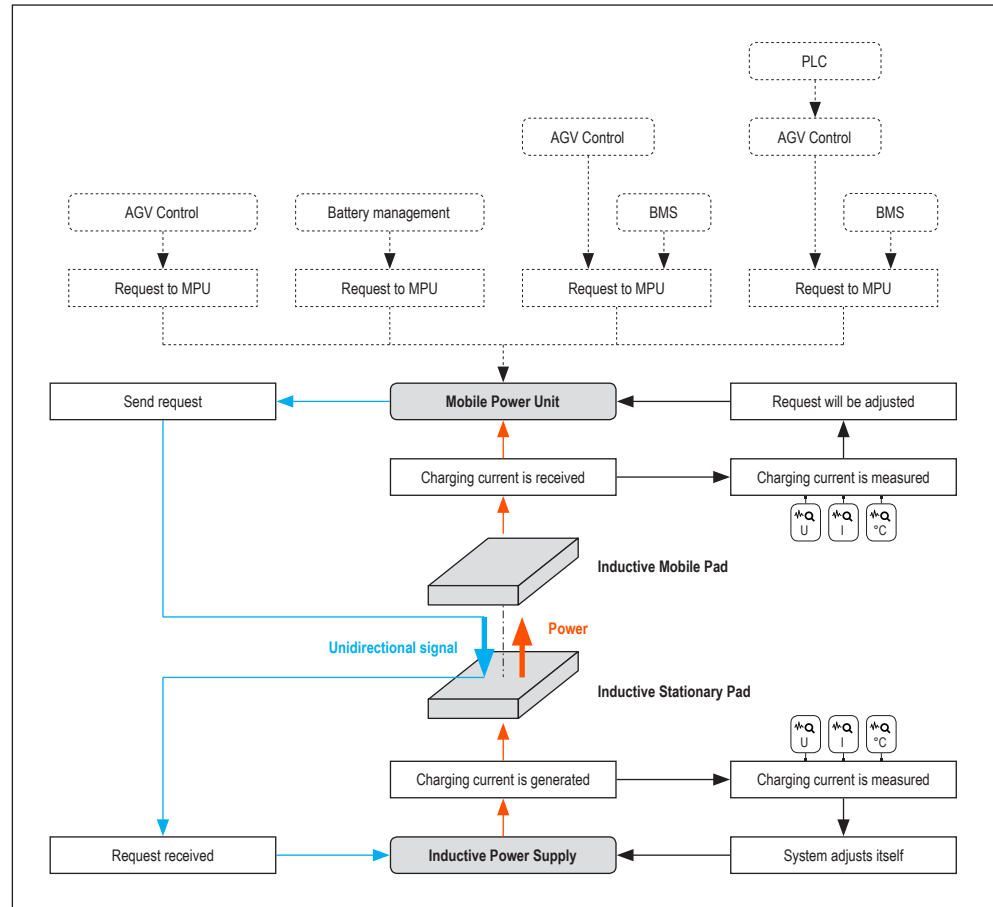


Fig. 2: Control circuit (simplified representation without external enabling processes at the IPS)

The MPU sends a request to the IPS via the pads to start the charging current. The request can be sent permanently or triggered by a control unit overriding the MPU.

The charging current starts as soon as the IPS receives the command and when all external enabling devices (safety switch or similar) are also enabled. The amount of charging current is specified by the MPU.

The MPU adjusts the demand from all external requests along with the measurands, such as voltage, current, temperature.

4.4 Controlling the charging process

The charging process is controlled according to 2 methods:

- Continuous charging
- Controlled charging

Continuous charging

Charging is continuous from switch-on to switch-off using preset values.

The charging current is adjusted by the MPU during the charging process. The adjustment is made depending on previously set specifications and taking measurands such as voltage, current and temperature into account.

Controlled charging

In this mode, the charging current is adjusted during the charging process. The charging process is controlled from switch-on to switch-off by a controller (BMS or AGV controller) upstream of the MPU and controlled by commands to the MPU.

Charging process controlled by:

- Battery management system and system controller
- Battery management system only
- System controller only
- AGV controller or similar only

	Continuous charging mode	Controlled charging mode, controlled by:			
		BMS	BMS+PLC	PLC	AGV controller
Communication	without	CAN	CAN+Ethernet	Ethernet	Ethernet
Condition for start	without	BMS enabling device=1	BMS enabling device=1 and Start by PLC	Start by PLC	Start by AGV controller
Condition to stop	Set voltage / current reached	BMS enabling device=0	BMS enabling device=0 or Stop by PLC	Stop by PLC	Stop by AGV controller
External enabling device	On	On	On	On	On
Start-stop switch	On	On	On	On	On
MPU settings	Settings via web server	Settings via BMS commands and defaults	Settings via BMS/PLC commands and defaults	Settings via PLC commands and defaults	Settings via AGV commands and defaults
Application	Automatic modes		PLC managed modes		
	non-communicating batteries & demos	for batteries with CAN communication	BMS-based charging adapted by the PLC	AGV controller-based charging	AGV controller-based charging
Batteries without communication	yes	no	no	yes	

4.4.1 Charging process - Continuous

Overview

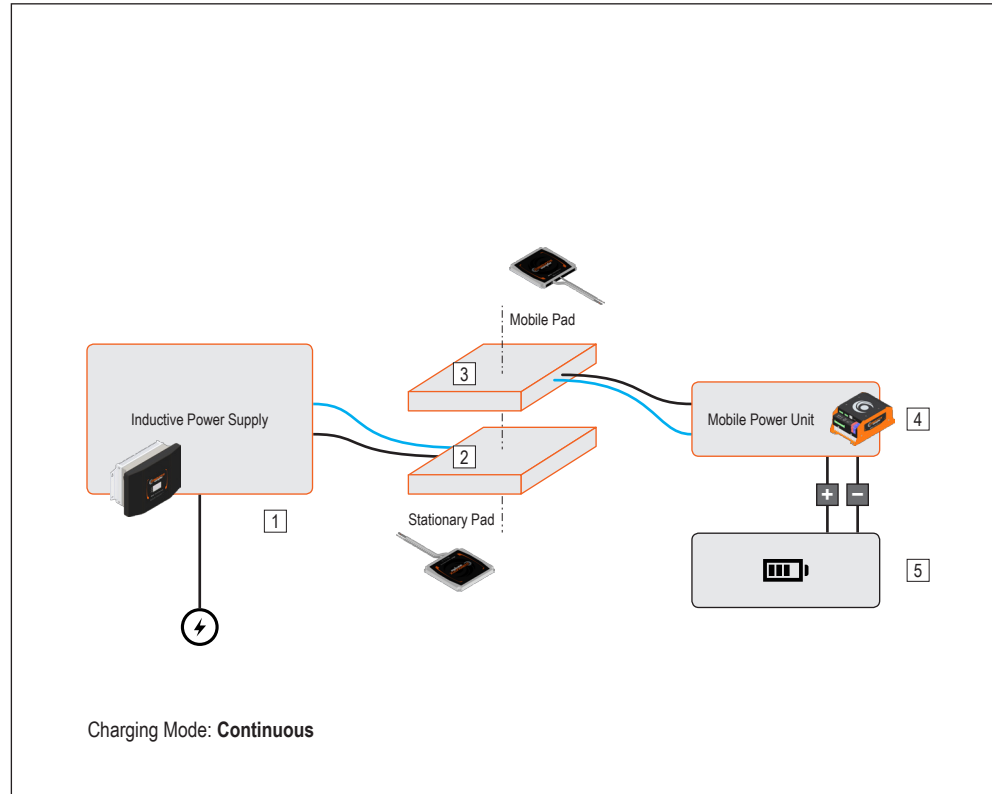


Fig. 3

- 1 IPS - Inductive Power Supply
- 2 ISP - Inductive Stationary Pad
- 3 IMP - Inductive Mobile Pad (AGV)
- 4 MPU - Mobile Power Unit (AGV)
- 5 Battery (AGV)

4.4.2 Charging process - controlled by BMS controller

Overview

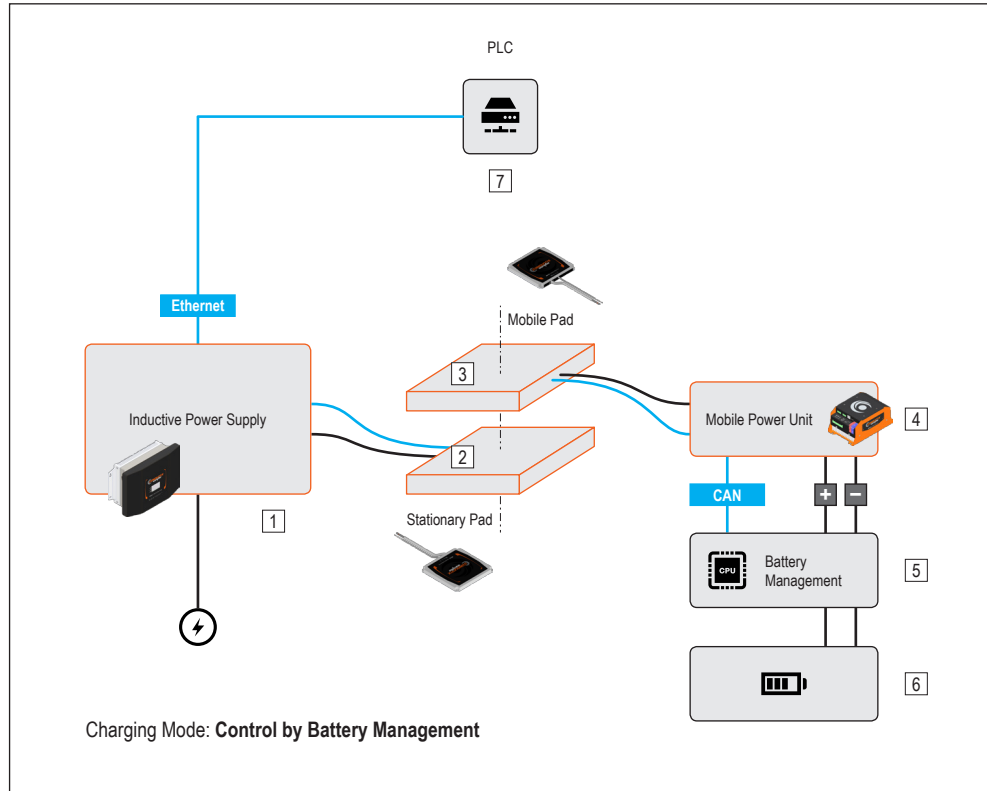


Fig. 4

- 1 IPS - Inductive Power Supply
- 2 ISP - Inductive Stationary Pad
- 3 IMP - Inductive Mobile Pad (AGV)
- 4 MPU - Mobile Power Unit (AGV)
- 5 Battery management (AGV)
- 6 Battery (AGV)
- 7 PLC

4.4.3 Charging process - controlled by BMS and PLC

Overview

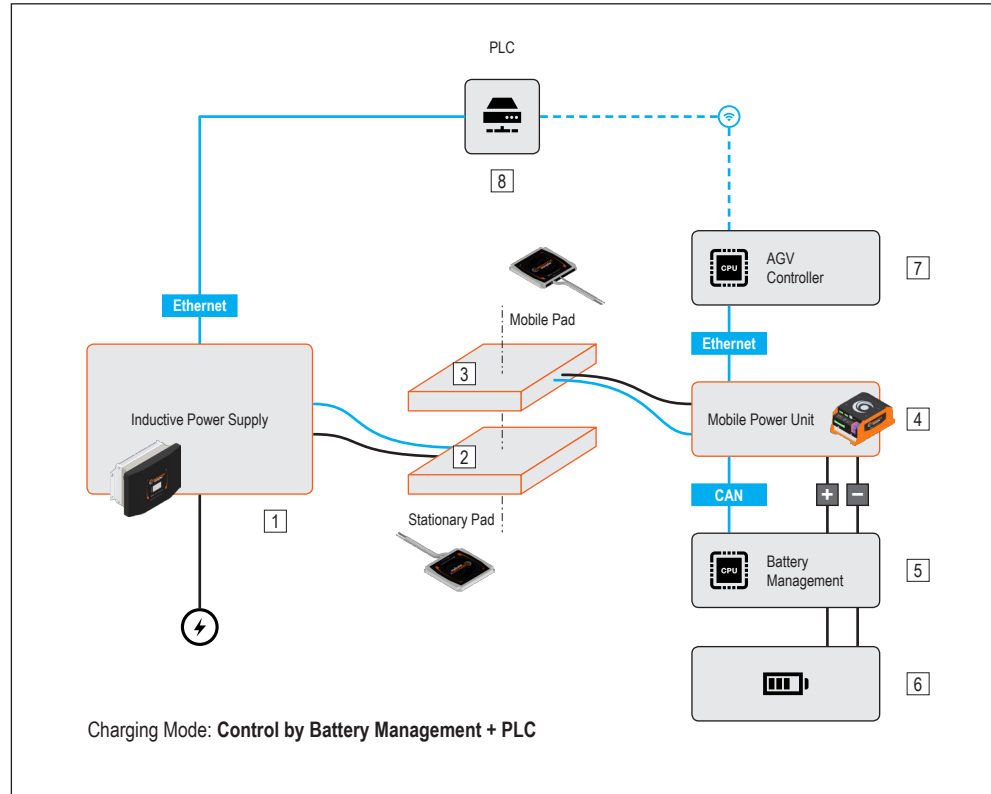


Fig. 5

- 1 IPS - Inductive Power Supply
- 2 ISP - Inductive Stationary Pad
- 3 IMP - Inductive Mobile Pad (AGV)
- 4 MPU - Mobile Power Unit (AGV)
- 5 Battery management (AGV)
- 6 Battery (AGV)
- 7 Vehicle control (AGV)
- 8 PLC

4.4.4 Charging process - controlled by PLC

Overview

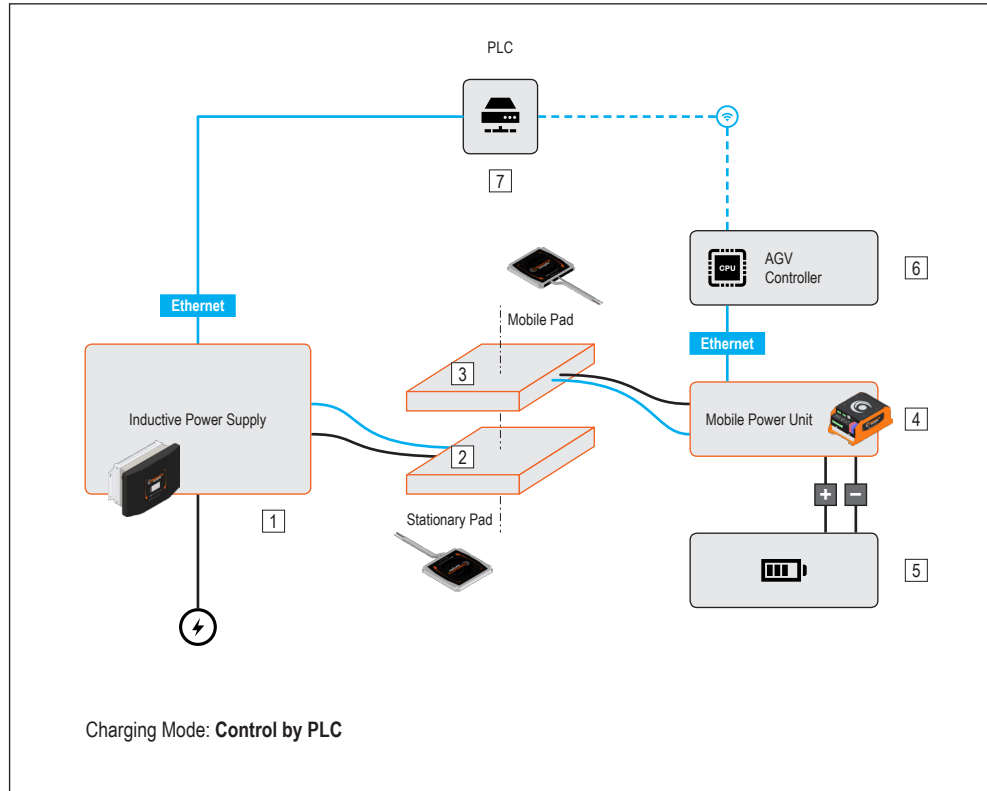


Fig. 6

- 1 IPS - Inductive Power Supply
- 2 ISP - Inductive Stationary Pad
- 3 IMP - Inductive Mobile Pad (AGV)
- 4 MPU - Mobile Power Unit (AGV)
- 5 Battery (AGV)
- 6 Vehicle control (AGV)
- 7 PLC

4.4.5 Charging process - controlled by AGV controller

Overview

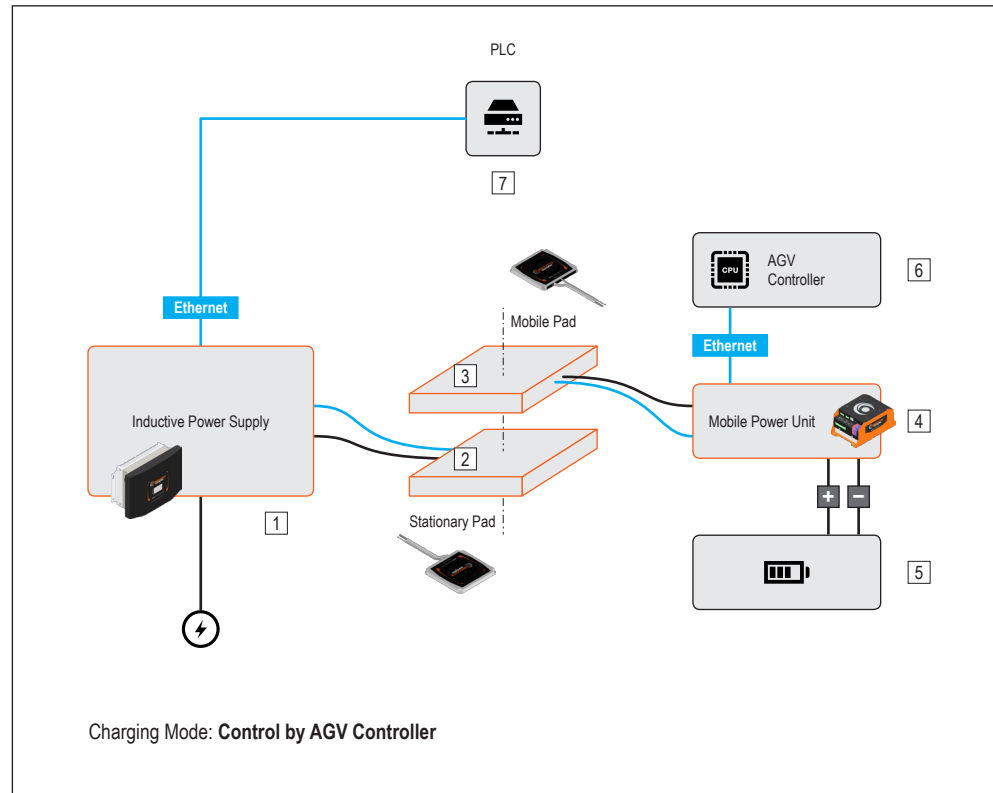


Fig. 7

- 1 IPS - Inductive Power Supply
- 2 ISP - Inductive Stationary Pad
- 3 IMP - Inductive Mobile Pad (AGV)
- 4 MPU - Mobile Power Unit (AGV)
- 5 Battery (AGV)
- 6 Vehicle control (AGV)
- 7 PLC

4.5 Enable commands for charging process

It is possible to combine the start of the charging process at the IPS with defined enable commands. Depending on the parametrisation, these can be limit switches or similar items or else enable commands from the system controller via Ethernet.

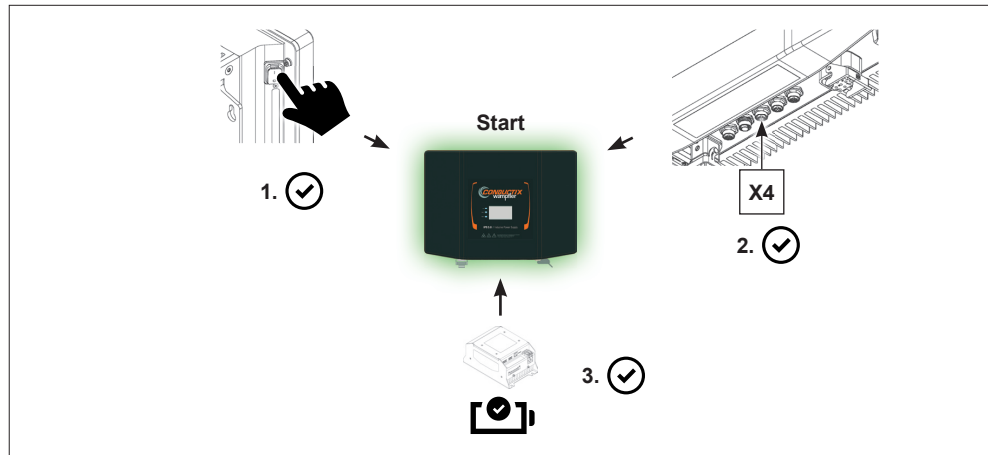


Fig. 8

4.6 Inductive communication

Communication via the pads is unidirectional from the MPU to the IPS. In doing so, the MPU constantly sends a power transfer request.

If the pads are aligned with each other within the tolerances, high signal strength and signal quality ensure continuous communication.

The signal strength deteriorates if the pad positions deviate more from each other. Below a preset threshold, the system evaluates the signal strength as no longer sufficient. The charging process will then be aborted.

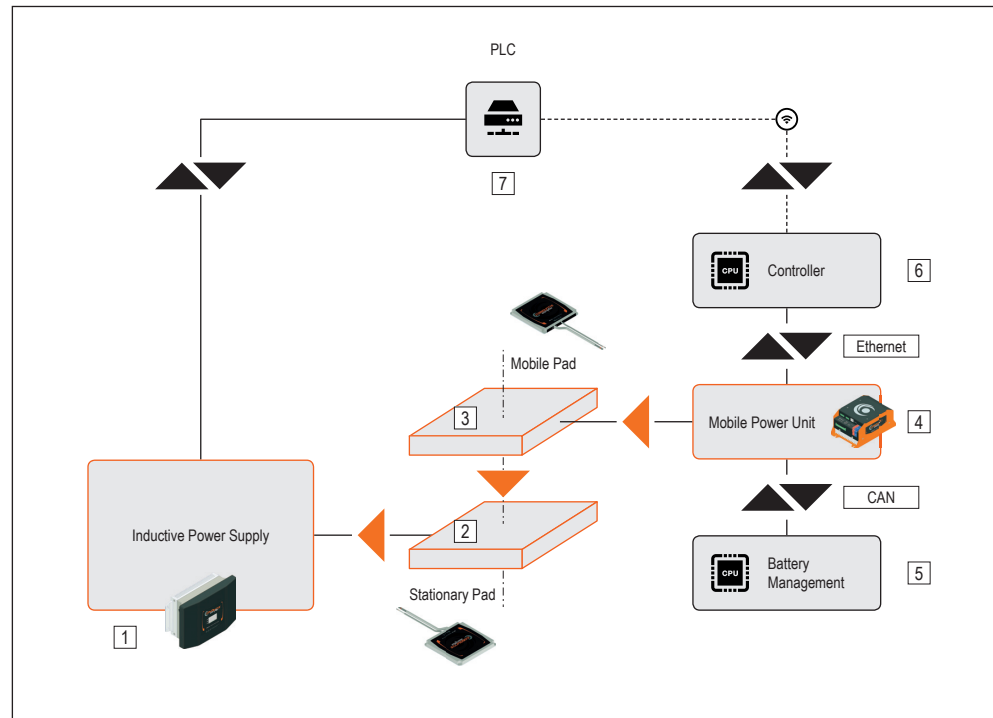


Fig. 9: Inductive communication

- 1 Inductive Power Supply
- 2 Inductive Stationary Pad
- 3 Inductive Mobile Pad (AGV)
- 4 Mobile Power Unit (AGV)
- 5 Battery management (AGV)
- 6 Vehicle control (AGV)
- 7 PLC

5 Product description

5.1 Structure

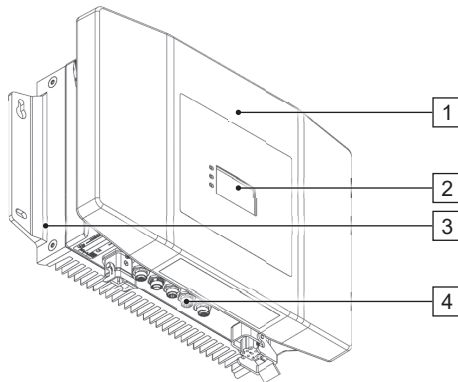


Fig. 10: IPS 3.0

- 1 Housing
- 2 Display and status LEDs
- 3 Heat sink with holder
- 4 Electrical connections

5.2 Function

The IPS 3.0 inductive supply module converts the single-phase mains voltage into a medium-frequency alternating current for the ISP 3.0 stationary charging pad.

A digital control system ensures the optimum level and frequency of the output current at each operating point (charging voltage, charging current, distance and offset of the pads).

The available interfaces are listed in the connection descriptions.

5.3 Type label

The following figure shows the layout of a device type label.

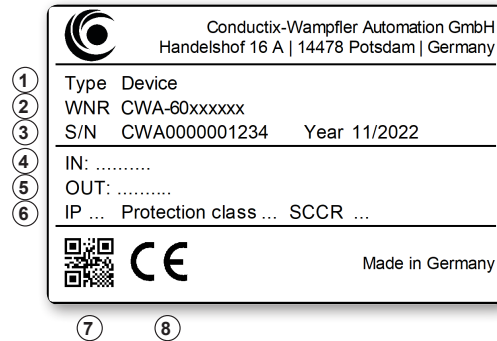


Fig. 11: Device type label

- 1 Model name
- 2 WNR item number
- 3 Serial number, year of construction
- 4 Input data
- 5 Output data
- 6 Protection type, protection class, short-circuit current
- 7 QR-Code (serial number)
- 8 CE marking

5.4 Scope of delivery

5.4.1 Device

IPS 3.0 - Scope of delivery

Name	Item number	WNR	Scope of delivery	Number
IPS 3.0	3289518	CWA-60692001	Basic device IPS 3.0	1
Inductive Power Supply			Power connector for X1: Han 3M with Han Q5/0-F crimp socket insert	1

5.4.2 Product sets

WCS 3.0 - Scope of delivery

Name	Item number	WNR	Scope of delivery	Number
WCS 3.0 Set	3289517	CWA-60690001	IPS 3.0 Inductive Power Supply	1
Wireless Charger Stationary Set			ISP 3.0 Inductive Stationary Pad	1

TNB_0083, 2, en_GB

**WCM 3.0 -
Scope of
delivery**

Name	Item number	WNR	Scope of delivery	Number
WCM 3.0 Set	3276340	CWA-60690000	MPU 3.0 Mobile Power Unit	1
Wireless Charger Mobile Set			IMP 3.0 Inductive Mobile Pad	1

6 Transport and storage

6.1 Transport



NOTICE!

Transport

Incorrect or improper transport may cause damage to the device.

- Only trained personnel are allowed to transport the device.
- If necessary, use suitable transport aids.
- Transport the devices with utmost care.
- Observe the symbols on the packaging.
- Do not remove packaging and transport securing devices until you are ready to start with the installation.

6.2 Transport inspection

Check the delivery for completeness and transport damage upon receipt.

Proceed as follows in case of any apparent damage:

- Refuse to accept the delivery or accept it only conditionally. Take note of the extent of the damage and write it down on the carrier's transport documents or delivery note.
- Initiate a complaints process and report the incident to the supplier. If Conductix-Wampfler Automation is your direct supplier you will find our contact information in this document.
↳ *Chapter 'Customer service and addresses' on page 83*



Claims for damages

Claim any defect as soon as it becomes apparent. Damages can only be claimed within the applicable claim periods.

6.3 Storage



NOTICE!

Storage

Incorrect or improper storage may cause damage to the device.

- Cover connections with protective caps during storage.
- Avoid mechanical stress and vibrations.
- Store in a dry and dust-free location.
- Regularly check the condition of the stored device.
- Keep environmental conditions as specified in the technical information.
- Keep the storage temperature as specified in the technical information.

7 Mechanical installation

Objective	This section provides details on the mechanical installation. Electrical installation is possible following successful mechanical installation.
Responsible party	<p>The system integrator (e.g. system builder, operator) is responsible for trouble-free and safe installation. As the contact person, he responds to all the fitter's queries regarding safe-to-use equipment; e.g.:</p> <ul style="list-style-type: none">■ Fire protection■ Electrical equipment■ Ladders and scaffolding■ Requirements for assembly tools■ Lifting and transportation
Required personnel	<p>Due to their training and experience, only qualified and appropriately instructed personnel are able to correctly assess the respective initial situation, identify risks and avoid hazards.</p> <p>Personnel required for installation:</p> <ul style="list-style-type: none">■ Adequately qualified fitter
Required personal protective equipment	<p>The person responsible must ensure that the personnel under his responsibility are wearing the required personal protective equipment. The required personal protective equipment satisfies the requirements for the work to be carried out and all the requirements demanded by the scope of work.</p> <p>Personal protective equipment that fulfils its intended purpose:</p> <ul style="list-style-type: none">■ protects its wearer from injury;■ reduces the seriousness and severity of potential injuries. <p>Wear:</p> <ul style="list-style-type: none">■ Work protection clothing■ Safety shoes■ Protective gloves■ Protective goggles
Safety in the work area	<ul style="list-style-type: none">■ Note the safety signs in the area around the system.■ Pay attention to the safety notes in additional applicable documentation (supplier documents).



Work safety

Pay attention to company and task-specific work safety regulations, as well as the country-specific legal and safety regulations applicable at the location of use.



Wear additional protective equipment

As an employee, you wear protective equipment supplied by the area supervisor. If work tasks have been delegated only temporarily, then you also wear any protective equipment that has become additionally required.

Special hazards



⚠ WARNING!

Live parts

Contact with live parts poses an immediate danger to life.

- Disconnect the power supply of the device before mechanically and electrically installing the device.
- Take the necessary measures to ensure that the power supply of the device cannot be switched on again unintentionally.



⚠ WARNING!

Live parts

If the device is installed in switch cabinets, there is an immediate danger to life in the event of contact with live parts.

- Switch off the power supply for the switch cabinet when performing any work on the device, and safeguard it against being switched on again.
- Work on electrical components may only be carried out by qualified electricians or persons instructed and supervised by a qualified electrician in accordance with the electrical engineering regulations.

7.1 Installation location and position

Installation location

The IPS is intended for fixed assembly on a sufficiently dimensioned support structure (e.g. wall) or in a control cabinet.

Installation position

The IPS is intended for vertical assembly.

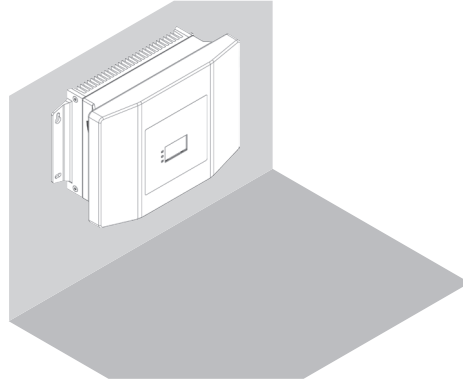


Fig. 12: IPS 3.0 installation position

The following factors should be considered for the assembly location:

- Sufficient air circulation
↳ *Chapter 'Open spaces and cooling' on page 38*
- Accessibility of the connections
- Legibility of the display
- Cable length to ISP

7.2 Open spaces and cooling

The IPS heats up during the charging process. The heat generated is dissipated to the ambient air via the integrated heat sink.

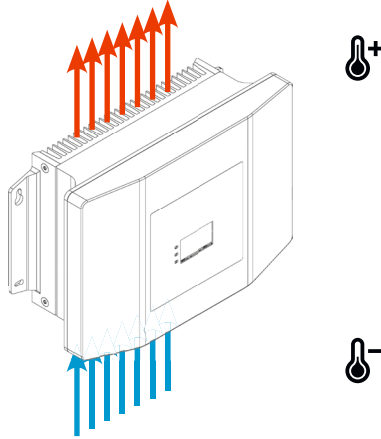


Fig. 13: Air circulation in vertical installation position

It is necessary to maintain sufficient clearance for passive air circulation around the IPS.

NOTICE!



Passive cooling under high load

Passive cooling under high load is sufficient if:

- The device is installed in a vertical installation position.
- Air can circulate without restrictions.
- Ambient temperature does not exceed 30 °C.
- No external heat source in the immediate vicinity.



Temperature monitoring on the heat sink

The device is equipped with a temperature control on the heat sink. If the device heats up too much when charging, the charging current is reduced. If the temperature continues to rise despite reduced charging current, the charging process is aborted and a fault message is displayed.

7.3 Installation

NOTICE!



Dampen impacts and vibrations

If the device is subjected to impermissible heavy impacts or vibrations, the amplitude and acceleration must be attenuated by means of appropriate measures.

- Use vibration-damping and vibration-eliminating systems.

Fixing points

The IPS must be assembled at the fixing points provided.

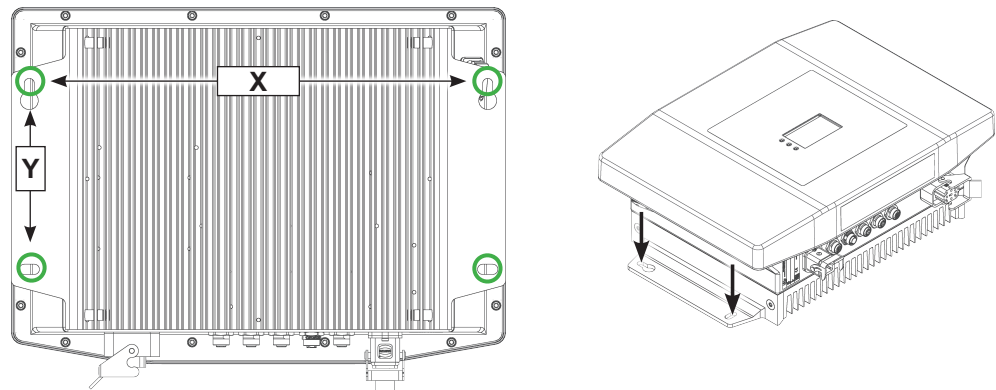


Fig. 14: IPS 3.0 fixing points

Data	Value	Unit
Hole distance (X)	380	mm
Hole distance (Y)	154	mm
Fixing points top 2 x keyhole	∅ 8,5	mm
Fixing points below 2 x slotted hole	∅ 8,5	mm



Detailed device drawings

You will find detailed device drawings in the appendix to this description.

8 Electrical installation

Objective	This section provides details on the electrical installation. Commissioning is possible following successful electrical installation.
Responsible party	<p>The system integrator (e.g. system builder, operator) is responsible for trouble-free and safe electrical installation. As the contact person, he responds to all the fitter's queries regarding safe-to-use equipment; e.g.:</p> <ul style="list-style-type: none">■ Fire protection■ Electrical equipment■ Ladders and scaffolding■ Requirements for assembly tools
Required personnel	<p>Due to their training and experience, only qualified and appropriately instructed personnel are able to correctly assess the respective initial situation, identify risks and avoid hazards.</p> <p>Personnel required for electrical installation:</p> <ul style="list-style-type: none">■ Qualified electrician■ Adequately qualified fitter under the direction and supervision of a qualified electrician
Required personal protective equipment	<p>The person responsible must ensure that the personnel under his responsibility are wearing the required personal protective equipment. The required personal protective equipment satisfies the requirements for the work to be carried out and all the requirements demanded by the scope of work.</p> <p>Personal protective equipment that fulfils its intended purpose:</p> <ul style="list-style-type: none">■ protects its wearer from injury;■ reduces the seriousness and severity of potential injuries. <p>Wear:</p> <ul style="list-style-type: none">■ Work protection clothing■ Safety shoes■ Protective gloves■ Protective goggles
Safety in the work area	<ul style="list-style-type: none">■ Note the safety signs in the area around the system.■ Pay attention to the safety notes in additional applicable documentation (supplier documents).

**Work safety**

Pay attention to company and task-specific work safety regulations, as well as the country-specific legal and safety regulations applicable at the location of use.

**Wear additional protective equipment**

As an employee, you wear protective equipment supplied by the area supervisor. If work tasks have been delegated only temporarily, then you also wear any protective equipment that has become additionally required.

Special hazards**⚠ WARNING!****Live parts**

Contact with live parts poses an immediate danger to life.

- Disconnect the power supply of the device before mechanically and electrically installing the device.
- Take the necessary measures to ensure that the power supply of the device cannot be switched on again unintentionally.

**⚠ WARNING!****Live parts**

If the device is installed in switch cabinets, there is an immediate danger to life in the event of contact with live parts.

- Switch off the power supply for the switch cabinet when performing any work on the device, and safeguard it against being switched on again.
- Work on electrical components may only be carried out by qualified electricians or persons instructed and supervised by a qualified electrician in accordance with the electrical engineering regulations.

8.1 Electrical connections

8.1.1 Connection overview

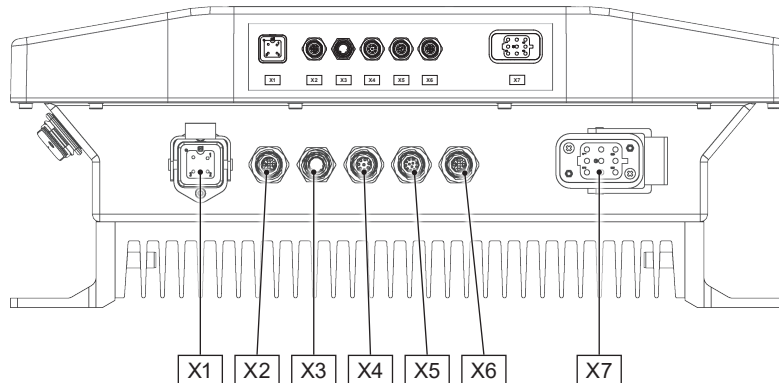


Fig. 15: IPS 3.0 connections

Connection	Designation	Connect to:
X1	Supply	Mains + PE
X2	CAN bus	<i>not available, intended for later use</i>
X3	Ethernet	External Ethernet device, e.g. PLC, service PC
X4	Enable	External enable device
X5	Inputs/outputs	Switches/sensors
X6	ISP Signal	Inductive Stationary Pad - Data
X7	ISP Power	Inductive Stationary Pad - Power

8.1.2 Pin configuration



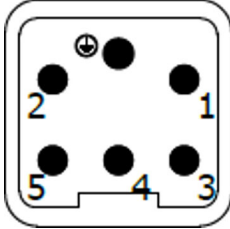
Detailed connection diagrams

Below you will find a compact overview of the individual connections and their pin assignment.

You will find detailed connection diagrams in the appendix to this description.

8.1.2.1 X1 - Feed

X1 pin assignment
Feed

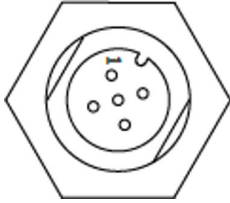
Connection type	Connection image	Pin	Signal
Harting Han 3M with Han Q5/0-M crimp male insert		1	L1
		2	nc
		3	nc
		4	nc
		5	N/L2
		PE	PE
Connector (included)	Harting Han 3M with Han Q5/0-F crimp socket insert		

8.1.2.2 X2 - CAN bus



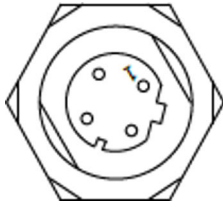
Function currently unavailable! Intended for future applications!

X2 pin assignment
CAN bus

Connection type	Connection image	Pin	Signal
M12, 5-pin, socket, A-encoded		1	
		2	
		3	
		4	
		5	
		SH	

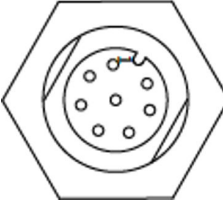
8.1.2.3 X3 - Ethernet

X3 pin assignment
Ethernet

Connection type	Connection image	Pin	Signal
M12, 4-pin, socket, D-encoded		1	TX + (Transmit +)
		2	TX - (Transmit -)
		3	RX + (Receive +)
		4	RX - (Receive -)
		SH	Shielding

8.1.2.4 X4 - Enabling device

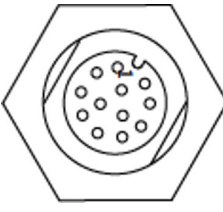
X4 pin assignment
Enabling device

Connection type	Connection image	Pin	Signal
M12, 8-pin, socket, A-encoded		1	24V_OUT
		2	GND_OUT
		3	SI_GND_IN
		4	SI_24V_IN
		5	nc
		6	nc
		7	nc
		8	nc
		SH	Shielding

↪ Chapter 'External enable device' on page 57

8.1.2.5 X5 - Inputs/Outputs

X5 pin assignment
Inputs/Outputs


Connection type	Connection image	Pin	Signal
M12, 12-pin, socket, A-encoded		1	24V
		2	GND
		3	IN1
		4	IN2
		5	OUT1
		6	OUT2
		7	OUT3

**X5 pin assignment
Inputs/Outputs**

		8	OUT4
		9	OUT5
		10	GND
		11	nc
		12	nc
		SH	Shielding

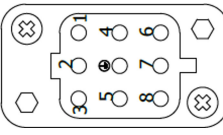
8.1.2.6 X6 - ISP-Signal

**X6 pin assignment
ISP-Signal**

Connection type	Connection image	Pin	Signal
M12, 4-pin, socket, A-encoded		1	Target+
		2	Target-
		3	GND
		4	ISP_Temp

8.1.2.7 X7 - ISP-Power

**X7 pin assignment
ISP-Power**

Connection type	Connection image	Pin	Signal	
Harting Han compact with Q8/0-F crimp socket insert		1	AC1	
		2	AC2	
		3	AC1	
		4	AC2	
		5	AC1	
		6	AC2	
		7	Br+	Bridge contacts for connector veri- fication
		8	Br-	

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9 Commissioning

The device is delivered in a configured state. No further settings required.

After proper mechanical and electrical installation, the device is ready for use.

Settings or changes to the configuration are made on the Wireless Charger web interface.



Reference

For information about the wireless charger web interface, please refer to the corresponding description:

- *SWB_0021_Wireless-Charger-Web-Interface*

The description is part of the project documentation and can be downloaded from www.conductix.com.

10 Operation

Objective	This section explains the work steps required by the operator.
In daily operation	<p>In daily operation the system is used in automated fashion, so that:</p> <ul style="list-style-type: none"> ■ The safety of personnel is ensured. ■ Workflows and functions are monitored using control system technology. ■ Trained users are supported in ongoing processes at regular intervals.
Responsible party	<p>The operator, or supervisory personnel appointed by him, is responsible for a safe and seamless workflow. As the contact person, he responds to all the personnel's queries regarding safe-to-use equipment; e.g.:</p> <ul style="list-style-type: none"> ■ Fire protection ■ Electrical equipment
Required personnel	<p>Due to their training and experience, only qualified and appropriately instructed personnel are able to correctly assess the respective initial situation, identify risks and avoid hazards.</p> <p>Personnel required for everyday operation:</p> <ul style="list-style-type: none"> ■ Qualified and appropriately instructed operating personnel ■ Qualified and appropriately instructed maintenance personnel
Required personal protective equipment	<p>The person responsible must ensure that the personnel under his responsibility are wearing the required personal protective equipment. The required personal protective equipment satisfies the requirements for the work to be carried out and all the requirements demanded by the scope of work.</p> <p>Personal protective equipment that fulfils its intended purpose:</p> <ul style="list-style-type: none"> ■ protects its wearer from injury; ■ reduces the seriousness and severity of potential injuries. <p>Wear:</p> <ul style="list-style-type: none"> ■ Work protection clothing ■ Safety shoes ■ Protective gloves ■ Protective goggles
Safety in the work area	<ul style="list-style-type: none"> ■ Only work when protection and monitoring equipment are active. ■ Pay attention to the safety signs at the work station and its immediate vicinity. ■ Only load load-bearing machinery within the permitted limits. ■ Secure goods to be transported against loss.

**Work safety**

Pay attention to company and task-specific work safety regulations, as well as the country-specific legal and safety regulations applicable at the location of use.

**Wear additional protective equipment**

As an employee, you wear protective equipment supplied by the area supervisor. If work tasks have been delegated only temporarily, then you also wear any protective equipment that has become additionally required.

Special hazards**⚠ WARNING!****Hazardous voltages on ports and cables**

Open electrical components

- Do not pull plugs carrying voltage.
- Do not contact open cables.

10.1 Switching the device on and off

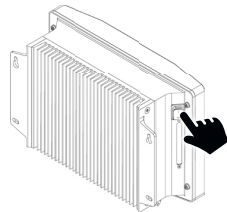


Switch on/off the IPS

The IPS does not have an on/off switch. The IPS is switched on and off via the connected power supply.

10.1.1 Switching on the device

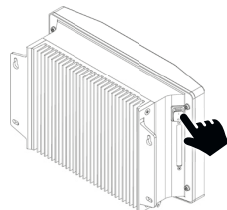
1. Switch on the power supply for the IPS.
⇒ Boot process starts.
2. Boot process successfully completed and Start/Stop switch of the IPS is set to [I]
⇒ The IPS is ready for operation.
3. Boot process successfully completed and Start/Stop switch of the IPS is set to [O]
⇒ The IPS goes into Warning mode. Inverter error is displayed.
4. Set Start/Stop switch of the IPS to [I]



⇒ The IPS is ready for operation.

10.1.2 Switching off the device

1. Set the Start/Stop switch of the IPS to [O].



⇒ The IPS goes into Warning mode.

2. Switch off the power supply for the IPS.
⇒ The IPS is switched off.

10.2 Displays

The various operating modes of the device and the display of information and messages are displayed via::

- the status LEDs on the front of the device
- the backlight of the device (when activated)
- the display (text + display illumination)

10.2.1 Status LEDs

There are three status LEDs next to the display to indicate different operating modes. The LEDs light up in different colours according to the operating mode.

The status LED 'Error' is lit in red or orange.

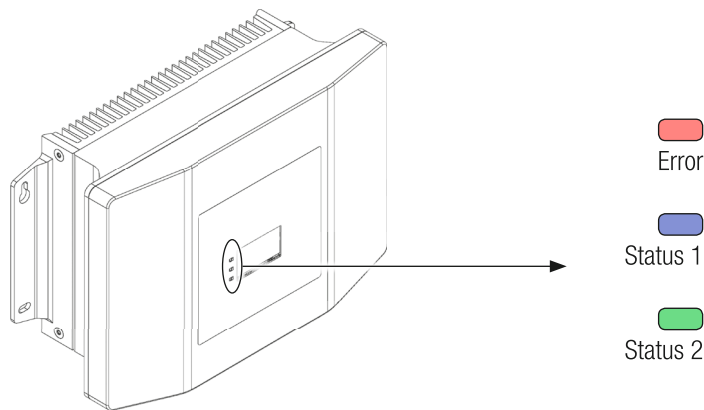


Fig. 16: IPS 3.0 status LEDs

Meaning of colours

LED	Colour		Meaning
Error	■ Red	Flashing	Operation disrupted
	■ Amber	Steady light	Warning pending
Status 1	■ Blue	Flashing	IPS in charging mode
Status 2	■ Green	Steady light	IPS on standby

10.2.2 Backlight

The IPS is equipped with a device backlight. It lights up in different colours to give a visual indication of operating states.



The backlight is adapted to the colour modes of the display.
 ↪ Chapter 'Display' on page 52

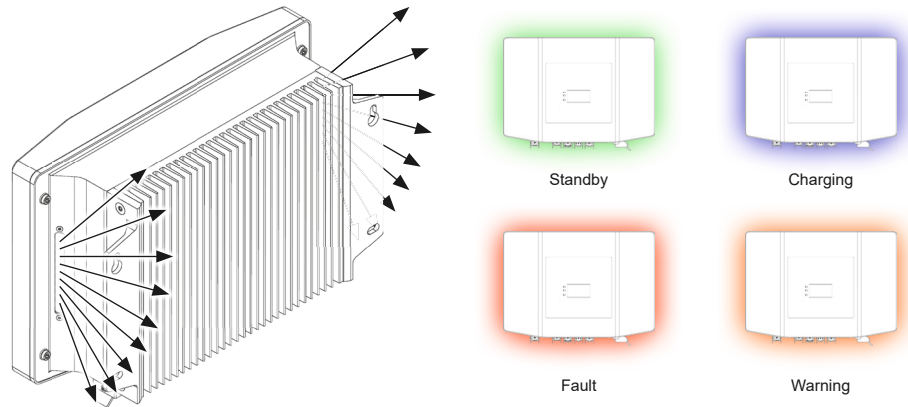


Fig. 17: IPS 3.0 device backlight

Meaning of colours

Backlight Colour	Light mode	Meaning
Green	Steady light	IPS on standby
Blue	Pulsating	IPS in charging mode
Amber	Steady light	Warning pending ■ Charging process continues, possibly with reduced power.
Red	Pulsating	Operation disrupted / fault pending ■ Charging process is aborted.

10.2.3 Display

The display is arranged centrally. Different messages and information are shown on the display. In addition, the background colour of the display changes according to the operating mode.

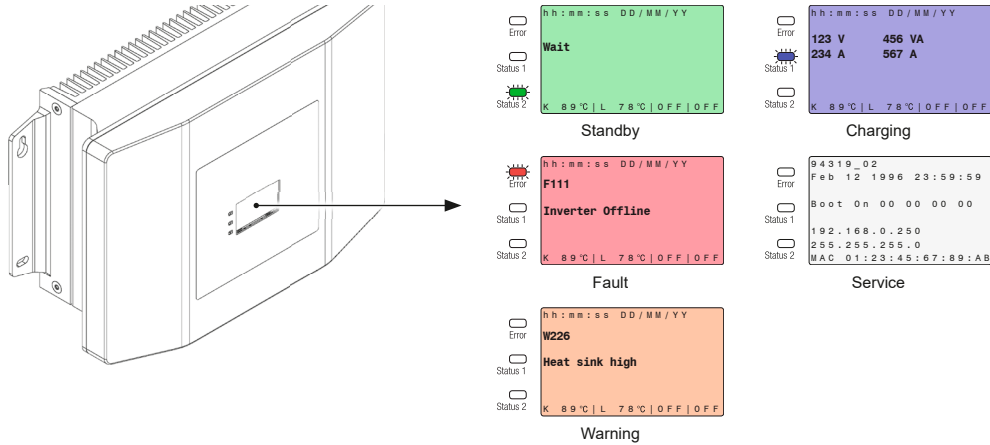


Fig. 18: IPS 3.0 display

Meaning of colours

Colour	Display	Meaning
Green		IPS on standby
Blue		IPS in charging mode
Amber		Warning pending ■ Charging process continues, possibly with reduced power.
Red		Operation disrupted / fault pending ■ Charging process is aborted.
White		IPS in service mode

10.2.3.1 Display mode - Standby

The IPS is in "Standby" display mode:

- after the device is switched on and has booted.
- if there is no fault message.
- if no charging process has started.

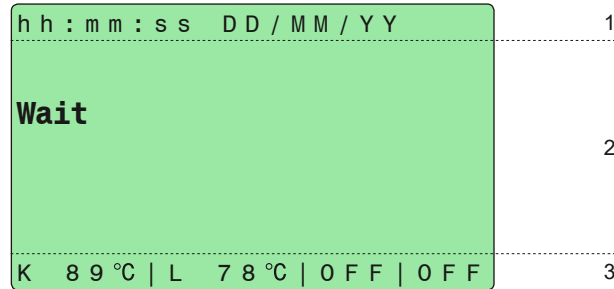


Fig. 19: Standby display mode

- 1 System time/date
- 2 Display text
- 3 Heat sink temperature | Pad temperature | Switch status | Status of external release

10.2.3.2 Display mode - Charging

As soon as a charging process starts, the IPS switches to the "Charging" display mode.

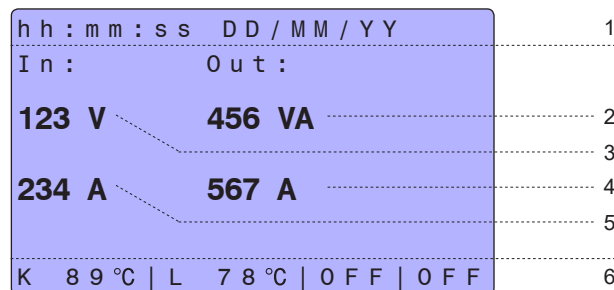


Fig. 20: Charging display mode Page 1

- 1 System time / date
- 2 Output power
- 3 Mains voltage
- 4 Output current / output frequency (alternating display)
- 5 Input current / mains frequency (alternating display)
- 6 Heat sink temperature | Pad temperature | Switch status | Status of external release

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10.2.3.3 Display mode - Warning

If the device is not ready for operation without a clear error, it is in warning mode.

h h : m m : s s D D / M M / Y Y	1
W226	
Heat sink high	2
K 8 9 °C L 7 8 °C O F F O F F	3

Fig. 21: Warning display mode

- 1 System time/date
- 2 Warning number/description
- 3 Heat sink temperature | Pad temperature | Switch status | Status of external release



Detailed information about the warnings!

🔗 Chapter 'Warning indicators' on page 63

10.2.3.4 Display mode - Fault

As soon as the IPS detects a fault, the display switches to "Fault" mode. Any charging process in progress will be aborted. After the fault has been rectified, the IPS switches back to the "Standby" or "Charging" display mode.

h h : m m : s s D D / M M / Y Y	1
F111	2
Inverter Offline	3
K 8 9 °C L 7 8 °C O F F O F F	4

Fig. 22: Fault display mode

- 1 System time/date
- 2 Error number
- 3 Error description
- 4 Heat sink temperature | Pad temperature | Switch status | Status of external release

**Detailed information about the faults!**

↳ Chapter 'Fault indicators' on page 65

10.2.3.5 Display mode - Service

During a service access, the IPS switches to the "Service" display mode..

Während eines Servicezugriffs wechselt das IPS in den Modus 'Service'. Information (e.g. software status, IP addresses, etc.) for the commissioning engineer, operator and service technician is displayed here.

```
9 4 3 1 9 _ 0 2
F e b 1 2 1 9 9 6 2 3 : 5 9 : 5 9

B o o t O n 0 0 0 0 0 0 0 0

1 9 2 . 1 6 8 . 0 . 2 5 0
2 5 5 . 2 5 5 . 2 5 5 . 0
M A C 0 1 : 2 3 : 4 5 : 6 7 : 8 9 : A B
```

Fig. 23: Service display mode

10.3 Operating modes

The IPS does not require any other active control during normal operation. Charging processes start and end automatically.

The charging process is controlled according to 2 methods:

- Continuous charging
- Controlled charging

Continuous charging

Charging is continuous from switch-on to switch-off using preset values.

The charging current is adjusted by the MPU during the charging process. The adjustment is made depending on previously set specifications and taking measurands such as voltage, current and temperature into account.

Controlled charging

In this mode, the charging current is adjusted during the charging process. The charging process is controlled from switch-on to switch-off by a controller (BMS or AGV controller) upstream of the MPU and controlled by commands to the MPU.

Charging process controlled by:

- Battery management system and system controller
- Battery management system only
- System controller only
- AGV controller or similar only

10.4 Charging process

10.4.1 Starting the charging process

Starting the charging process

The following prerequisites must be met to start the charging process:

1. - Start-Stop switch is On
2. - Enabling device at X4 is On (switch or similar)
3. - MPU sends request

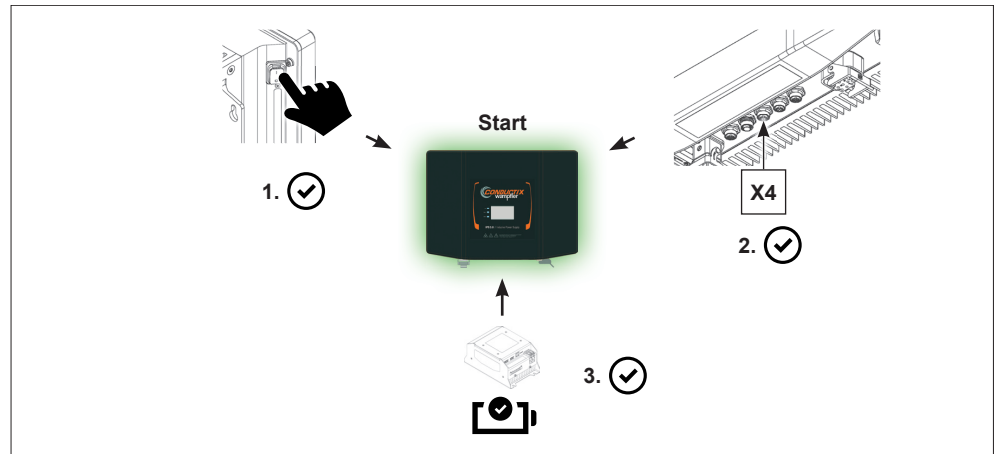


Fig. 24: Starting the charging process

The charging process stops as soon as one prerequisite is interrupted.

10.4.2 External enable device

A suitable circuit function for enabling the charging process must be connected to input X4. Connect suitable components (switches or similar) according to the connections for X4 shown in the circuit diagram (Fig. 25).

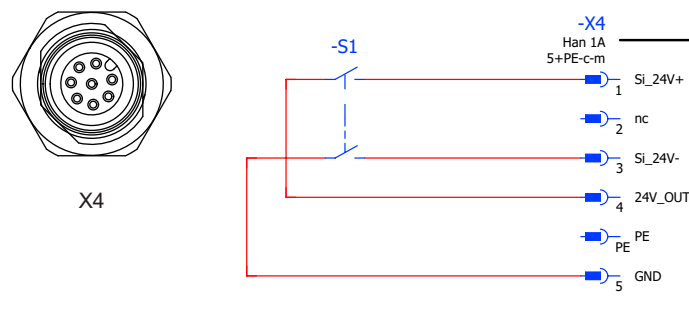


Fig. 25: Circuit for enabling device at X4



Bypass external enabling device

If the use of external enabling devices is not intended, an enabling connector can be connected to X4 of the IPS. This connector is equipped with a circuit that simulates the external enabling device.

The enabling connector can be ordered as an option.

Please contact our service or sales department:

📍 Chapter 'Customer service and addresses' on page 83

10.4.3 Automatic adjustment of the primary current

The control of the charging process is divided between the MPU and the IPS. The MPU determines a primary current requirement from the target/actual values of the charging voltage and charging current and transmits this to the IPS. The IPS controls the level of the primary current with the self-determined optimal frequency.

During the start-up phase, the system controls itself up to the maximum charging power.

Data	Value	Unit
Power transmission ▶ Start	5	s
Power transmission ▶ 100 %	Max. 30	s

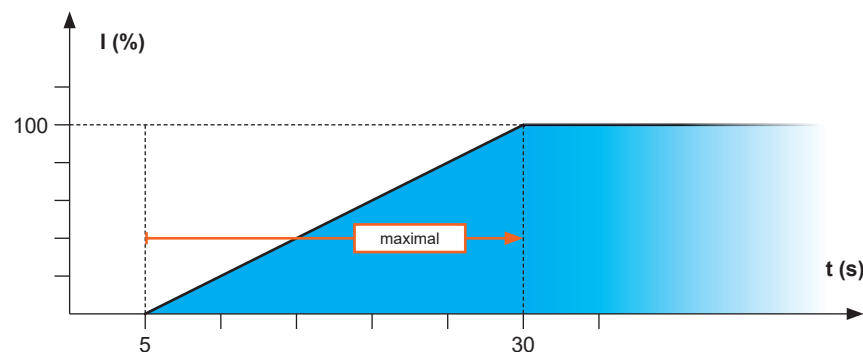


Fig. 26: Time until maximum charging power

10.4.4 Temperature generation during the charging process

All system components are equipped with temperature controls. The temperatures at the heat sinks and the coils of the pads are detected and evaluated.

A warning message is output when the temperatures are above normal. A fault message is displayed if the temperatures are too high.

If the temperatures in the warning messages on one of the components are exceeded, the charging current is reduced (derating). If the temperature continues to rise despite reduced charging current, the charging process will be aborted. A fault message is output.

IPS temperature control

Data	Value	Unit
Warning message ▶ High temperature at heat sink ▶ Charging current will be reduced ↪ 'W226' on page 63	85	°C
Fault message ▶ Temperature too high at heat sink ▶ Charging process will be aborted ↪ 'F226' on page 71	90	°C

ISP temperature control

Data	Value	Unit
Warning message ▶ High temperature at coil ▶ Charging current will be reduced ↪ 'W225' on page 63	80	°C
Fault message ▶ Temperature too high at coil ▶ Charging process will be aborted ↪ 'F225' on page 71	85	°C

IMP temperature control

Data	Value	Unit
Warning message ▶ High temperature at coil ▶ Charging current will be reduced	80	°C
Fault message ▶ Temperature too high at coil ▶ Charging process will be aborted	85	°C

MPU temperature control

Data	Value	Unit
Warning message ▶ High temperature at heat sink ▶ Charging current will be reduced	85	°C
Fault message ▶ Temperature too high at heat sink ▶ Charging process will be aborted	90	°C

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10.4.5 Power reduction with temperature increase

Derating

During the charging process, all connected components heat up. The heating depends on the operating time, the transmitted power, the charging current and the installation conditions (possibility of heat dissipation).

All components are assigned a maximum temperature in the respective configuration settings. If this temperature is exceeded in the event of an error, the charging process is switched off and an error message is displayed.

The charging process is prevented from stopping due to overtemperature by means of derating. The power gets reduced already at a temperature value below the maximum.

For every K of temperature increase above the warning value, the output is reduced by 20 %.

Charging process switch-off due to overtemperature is excluded by a linear reduction of the permissible maximum current from a warning threshold that is 5 K below the limit temperature.

Temperature		Power reduction	Maximum current
$[T_{max}] - 5 \text{ K}$	Warning		60 A
$[T_{max}] - 4 \text{ K}$	Warning	20 %	48 A
$[T_{max}] - 3 \text{ K}$	Warning	40 %	36 A
$[T_{max}] - 2 \text{ K}$	Warning	60 %	24 A
$[T_{max}] - 1 \text{ K}$	Warning	80 %	12 A
$[T_{max}] - 0 \text{ K}$	Error Charging process switch-off	100 %	0 A

10.4.6 Power reduction in case of pad displacement



Stable 3 kW power

If the pads are aligned with each other within the maximum deviation (working range), the continuous power transmission is guaranteed.

Deviations from the working range lead to power losses and can cause system failures.

11 Faults

Fault and warning indicators are shown as a numerical code and an explanatory text on the display or the web interface.

Marking:

Fxxx - Fault

Wxxx - Warning

When a fault or warning occurs, certain status LEDs ([↪ Chapter 'Status LEDs' on page 50](#)) as well as the backlight ([↪ Chapter 'Backlight' on page 51](#)) also change colour.

Error log

An error log is stored on the devices.

The error logs can be viewed, saved and downloaded via the web interface.

IPS warnings

IPS warnings

W225	Elevated ISP temperature	↪ 'W225' on page 63
W226	Elevated heat sink temperature	↪ 'W226' on page 63
W227	Low RTC battery voltage	↪ 'W227' on page 64
W228	No safety enable device	↪ 'W228' on page 64
W229	Start/Stop switch off	↪ 'W229' on page 64

IPS faults

IPS faults

F110	No configuration	↪ 'F110' on page 65
F111	Inverter offline	↪ 'F111' on page 65
F113	Inverter configuration not possible	↪ 'F113' on page 65
F120	No safety enable device	↪ 'F120' on page 66
F121	Start/Stop switch off	↪ 'F121' on page 66
F210	Excess current at inverter	↪ 'F210' on page 66
F211	Short circuit at the inverter	↪ 'F211' on page 67
F212	Gate driver not ready	↪ 'F212' on page 67
F213	No safety enable device	↪ 'F213' on page 67
F214	Mains voltage too low	↪ 'F214' on page 68
F215	Activation current limitation/start-up	↪ 'F215' on page 68
F216	Activation current limitation/operation	↪ 'F216' on page 68
F217	Parameter not defined	↪ 'F217' on page 69
F218	Parameter value out of range	↪ 'F218' on page 69
F219	Parameter cannot be described	↪ 'F219' on page 69
F220	Internal communication disrupted	↪ 'F220' on page 69


IPS faults

F221	Internal communication disrupted	↪ 'F221' on page 70
F222	Intermediate circuit voltage too low	↪ 'F222' on page 70
F223	Mains frequency too low	↪ 'F223' on page 70
F224	Pilot line	↪ 'F224' on page 71
F225	ISP excess temperature	↪ 'F225' on page 71
F226	Heat sink excess temperature	↪ 'F226' on page 71
F227	Excess voltage at the power output	↪ 'F227' on page 72

11.1 Warning indicators


W225

IPS - Inductive Power Supply

Warning	W225	
Display text	High ISP temperature	
LED	Error	 Orange/flashing
Code	Charging-Pad Temperature Warn	
Description	Elevated ISP temperature	
Cause	Ambient conditions prevent sufficient passive cooling.	
Effect	Control of the output power at the IPS.	
	The output power at the IPS is reduced until it falls below the set threshold value again.	
	Error F225 appears if the temperature continues to rise. ↳ 'F225' on page 71	
Solution	If the value falls below the set threshold again, the warning resets automatically.	


W226

IPS - Inductive Power Supply

Warning	W226	
Display text	High heat sink temperature	
LED	Error	 Orange/flashing
Code	Heat-Sink Temperature Warn	
Description	Elevated IPS heat sink temperature	
Cause	Heat sink is covered	
	Ambient conditions prevent sufficient passive cooling	
	External ventilation is too low	
	External ventilation failure	
Effect	Control of the output power at the IPS.	
	The output power at the IPS is reduced until it falls below the set threshold value again.	
	Error F226 appears if the temperature continues to rise. ↳ 'F226' on page 71	
Solution	If the value falls below the set threshold again, the warning resets automatically.	


W227

IPS - Inductive Power Supply

Warning	W227	
Display text	RTC battery low	
LED	Error	 Orange/flashing
Code	RTC Battery Low Voltage Warn	
Description	Low RTC battery voltage	
Cause	RTC battery voltage below preset threshold value	
Effect	None	
Solution	If the value falls below the set threshold again, the warning resets automatically.	


W228

IPS - Inductive Power Supply

Warning	W228	
Display text	No safety enable device	
LED	Error	 Orange/flashing
Code		
Description	Safety missing	
Cause	External safety enable device missing.	
Effect	IPS does not switch to charging mode.	
Solution	Close the safety circuit.	

W229


IPS - Inductive Power Supply

Warning	W229	
Display text	Start/Stop switch off	
LED	Error	 Orange/flashing
Code		
Description	Start missing	
Cause	Start/Stop switch is off.	
Effect	IPS does not switch to charging mode.	
Solution	Switch on the Start/Stop switch.	

11.2 Fault indicators


F110

IPS - Inductive Power Supply

Fault	F110	
Display text	No configuration	
LED	Error	 Red/flashing
Description	Invalid configuration	
Cause	The IPS has no configuration. There are no valid parameters in the flash memory.	
Effect	No system start possible.	
Solution	Program CPU flash memory. ↳ Customer support	


F111

IPS - Inductive Power Supply

Fault	F111	
Display text	Inverter offline	
LED	Error	 Red/flashing
Description	Inverter offline	
Cause	No communication between DSP and CPU. Internal bus error.	
Effect	No system start possible.	
Solution	↳ Customer support	


F113

IPS - Inductive Power Supply

Fault	F113	
Display text	Inverter configuration not possible	
LED	Error	 Red/flashing
Description	Wrong or invalid configuration.	
Cause	CPU cannot configure the inverter.	
Effect	No system start possible.	
Solution	Check software version of DSP and CPU.	


F120

IPS - Inductive Power Supply

Fault	F120
Display text	No safety enable device
LED	Error  Red/flashing
Description	External safety enable device missing.
Cause	External enable device not activated.
Effect	No system start possible.
	Running system stops.
Solution	Activate external enable device.


F121

IPS - Inductive Power Supply

Fault	F121
Display text	Start/Stop switch off
LED	Error  Red/flashing
Description	Start missing
Cause	Start/Stop switch is off.
Effect	No system start possible.
	Running system stops.
Solution	Switch on the Start/Stop switch.


F210

IPS - Inductive Power Supply

Fault	F210
Display text	Excess current at inverter
LED	Error  Red/flashing
Code	err_over_current
Description	If the MPU suddenly stops the charging process, the IPS cannot keep up with it quickly enough.
Cause	Excess current at inverter.
	Charging pads are not positioned correctly in relation to each other.
Effect	The charging process will be aborted.
	The charging process starts again when the error is no longer present.
Solution	Error is self-acknowledging when cause is rectified.


F211

IPS - Inductive Power Supply

Fault	F211	
Display text	Short circuit at the inverter	
LED	Error	 Red/flashing
Code	err_z3_inverter_short_circuit	
Description	Hardware threshold did not respond.	
Cause	Short circuit at the inverter.	
	Hardware error.	
Effect	No system start possible.	
	Running system stops.	
Solution	↳ Customer support	


F212

IPS - Inductive Power Supply

Fault	F212	
Display text	Gate driver not ready	
LED	Error	 Red/flashing
Code	err_z2_gate_driver_ready	
Description	Control of the power electronics not ready.	
Cause	Supply voltage missing.	
Effect	No system start possible.	
	Running system stops.	
Solution	↳ Customer support	


F213

IPS - Inductive Power Supply

Fault	F213	
Display text	No safety enable device	
LED	Error	 Red/flashing
Code	err_z1_hardware_release	
Description	Safety enable device (hardware) not available	
Cause	External enable device not activated.	
Effect	No system start possible.	
	Running system stops.	
Solution	Close safety enable device	


F214

IPS - Inductive Power Supply

Fault	F214	
Display text	Mains voltage too low	
LED	Error	 Red/flashing
Code	err_mains_voltage	
Description	Mains voltage error: Mains voltage too low	
Effect	No system start possible.	
	Running system stops.	
Solution	Check mains voltage	


F215

IPS - Inductive Power Supply

Fault	F215	
Display text	Activation current limitation/start-up	
LED	Error	 Red/flashing
Code	err_charging_resistor_voltage_relay	
Cause	System has started up consecutively too often.	
	Hardware error	
Effect	No system start possible.	
Solution	↳ Customer support	


F216

IPS - Inductive Power Supply

Fault	F216	
Display text	Activation current limitation/operation	
LED	Error	 Red/on/flashing
Code	err_charging_resistor_voltage_pfc	
Cause	System has started up consecutively too often.	
	Overheating of the pre-charging resistors.	
Effect	No system start possible.	
	Running system stops.	
Solution	↳ Customer support	


F217

IPS - Inductive Power Supply

Fault	F217	
Display text	Parameter not defined	
LED	Error	 Red/on/flashing
Code	err_param_does_not_exist	
Cause	Software error	
Effect	No system start possible.	
Solution	↳ Customer support	


F218

IPS - Inductive Power Supply

Fault	F218	
Display text	Parameter value out of range	
LED	Error	 Red/flashing
Code	err_param_value_out_of_range	
Effect	No system start possible.	
Solution	↳ Customer support	


F219

IPS - Inductive Power Supply

Fault	F219	
Display text	Parameter cannot be described	
LED	Error	 Red/flashing
Code	err_param_read_only	
Effect	No system start possible.	
Solution	↳ Customer support	


F220

IPS - Inductive Power Supply

Fault	F220	
Display text	Internal communication disrupted	
LED	Error	 Red/flashing
Code	err_can_message_type_not_defined	
Effect	No system start possible.	
	Running system stops.	
Solution	↳ Customer support	


F221

IPS - Inductive Power Supply

Fault	F221	
Display text	Internal communication disrupted	
LED	Error	 Red/flashing
Code	err_can_ext_message_type_not_defined	
Description	Internal communication error	
Effect	No system start possible.	
	Running system stops.	
Solution	↳ Customer support	


F222

IPS - Inductive Power Supply

Fault	F222	
Display text	Intermediate circuit voltage too low	
LED	Error	 Red/flashing
Code	err_dc_link_voltage_min	
Description	Intermediate circuit voltage too low	
Cause	Error in power factor correction.	
	Hardware error.	
Effect	No system start possible.	
	Running system stops.	
Solution	↳ Customer support	


F223

IPS - Inductive Power Supply

Fault	F223	
Display text	Mains frequency too low	
LED	Error	 Red/flashing
Code	err_mains_frequency_range	
Description	Network frequency outside the defined range.	
Effect	No system start possible.	
	Running system stops.	
Solution	Check mains voltage	


F224

IPS - Inductive Power Supply

Fault	F224	
Display text	Pilot line	
LED	Error	 Red/flashing
Code	err_output_charging_pump	
Description	Pilot line not plugged in.	
Effect	No system start possible.	
	Running system stops.	
Solution	Check output connector.	


F225

IPS - Inductive Power Supply

Fault	F225	
Display text	ISP excess temperature	
LED	Error	 Red/flashing
Code	err_temperature_loop_max	
Description	Excess temperature at inductive stationary pad.	
Cause	Passive cooling not possible.	
	Ambient temperature is too high.	
Effect	No system start possible.	
	Running system stops.	
Solution	↳ Customer support	


F226

IPS - Inductive Power Supply

Fault	F226	
Display text	Heat sink excess temperature	
LED	Error	 Red/flashing
Code	err_temperature_sink_max	
Description	Excess temperature at IPS heat sink.	
Cause	Passive cooling not possible.	
	Fan power too low.	
	Fan is faulty.	
	Ambient temperature is too high.	
Effect	No system start possible.	
	Running system stops.	
Solution	↳ Customer support	

F227

IPS - Inductive Power Supply

Fault	F227	
Display text	Excess voltage at the power output	
LED	Error	 Red/flashing
Code	err_voltage_max	
Description	Excessive voltage is measured at the power output.	
Cause	Faulty compensation of pads.	
	Frequency tracking cannot react fast enough to movements of the pads.	
Effect	No system start possible.	
	Running system stops.	
Solution	↳ Customer support	

12 Maintenance and cleaning

Personnel

Maintenance, cleaning and servicing must only be performed by trained and qualified personnel. Personnel who are to be trained or instructed are only allowed to perform activities under the constant supervision of a trained and qualified individual.



⚠ WARNING!

Danger to life from electrical current!

Contact with live parts poses an immediate danger to life.

- Disconnect the system from the power supply and secure it against being switched on again before servicing and cleaning the device.

12.1 Maintenance



NOTICE!

Mechanical loads may lead to device failure.

- Check the device for damage at regular intervals.
- Opening the device for testing purposes is not intended.

Service the device as follows:

- **Brackets**
 - Check for loose connections.
- **Connections**
 - Check for loose connections.
 - Check cable insulation.
 - Cover any ports not being used.
- **Indicators**
 - Remove soiling.
- **Recommended maintenance interval**
 - 6 months

12.2 Cleaning



NOTICE!

Damage to the device due to improper cleaning

- Do not use any cleaning agents, such as methylated spirits, or other cleaners!
- Do not clean with sharp objects!

Clean the device as follows:


- **Device**
 - Clean with dry cloths only.
- **Recommended cleaning intervals**
 - 6 months

13 Information on disposal and environmental regulations

If no return or disposal agreements exist, the individual components are to be properly dismantled and then separated and disposed of pursuant to current regulations or taken for recycling.

The device comprises electric and electronic components. Separate and dispose of them according to applicable provisions.

Follow the hazardous materials directive, in particular the regulations on handling hazardous materials.

 Materials designated for recycling are to be disposed of as per the respective recycling procedure.

14 Technical Data

14.1 Dimensions

Dimensions

Data	Value	Unit
Width	410	mm
Height (without connector)	285	mm
Depth	160	mm



Detailed device drawings

You will find detailed device drawings in the appendix to this description.

14.2 Weight

Weight

Data	Value	Unit
Weight	10	kg

14.3 Material

Material

Data	Value
Housing cover	Aluminium
Housing main body	Aluminium
Housing heat sink	Aluminium

14.4 Cooling

Data	Value
Cooling	Passive convection

14.5 Environmental conditions

Environmental conditions

Data	Value	Unit
Constant dry heat DIN IEC 60068-2-2	45	°C
Constant moist heat (93 %) DIN IEC 60068-2-78	40	°C
Cold DIN IEC 60068-2-1	-10	°C
Temperature change DIN IEC 60068-2-14	-10 ... 60	°C
Vibrations 5 ... 8 Hz DIN IEC 60068-2-6:2008	± 7.5	mm
Vibrations 8 ... 150 Hz DIN IEC 60068-2-6:2008	20	m/s ²
Vibrations 10 ... 58 Hz DIN IEC 60068-2-6	± 0.075	mm
Vibrations 58 ... 150 Hz DIN IEC 60068-2-6	10	m/s ²
Shock DIN IEC 60068-2-27	150	m/s ²
Repetitive shocks; storage and transport without packaging DIN IEC 60068-2-27	100	m/s ²
Shocks during operation DIN IEC 60068-2-27	50	m/s ²
Oscillation, broadband noise with temperature change 100 ... 150 Hz DIN IEC 60068-2-53	5.72	m/s ²
Impact DIN IEC 60068-2-75:1997	1	Nm
Free fall in transport packaging DIN IEC 60068-2-31:2008	≤1500	mm
Ambient temperature (non-condensing, no dew formation)	10 ... 45	°C
Storage temperature	10 ... 50	°C
Relative humidity (non-condensing)	≤ 80	%
Cooling	Passive convection (active as an option)	

TNB_0083, 2, en_GB

Data	Value	Unit
Maximum installation height above sea level	1000	m
Protection class	IP54	

14.6 Input data

Data	Value	Unit
Power supply	220 ... 277 ±10 %	V AC
Power supply	50/60	Hz
Mains	1 phase + PE	
Mains (US)	?	
Input current	16	A

External excess current protection

Data	Value	Unit
Supply voltage (X1:1-X1:2)	220 ... 277 ±10 %	V AC
Supply voltage (X1:1-X1:2)	47 ... 63	Hz
Mains phases (L+N+PE or L1+L2+PE)	1	
Connected load	3.3	kW
Input current	16	A
Recommended cross section of the mains supply cable	2.5	mm ²
Recommended cross section of the mains supply cable AWG 14	2.1	mm ²
External fuse for cable protection in live phase	20 max.	A

14.7 Output data

Data	Value	Unit
Output voltage	600	V AC
Output current	26	A
Continuous output power	3	kW

Data	Value	Unit
Maximum output power	3	kW
Frequency	85 - 130	kHz

14.8 Cable lengths and specifications

Overview

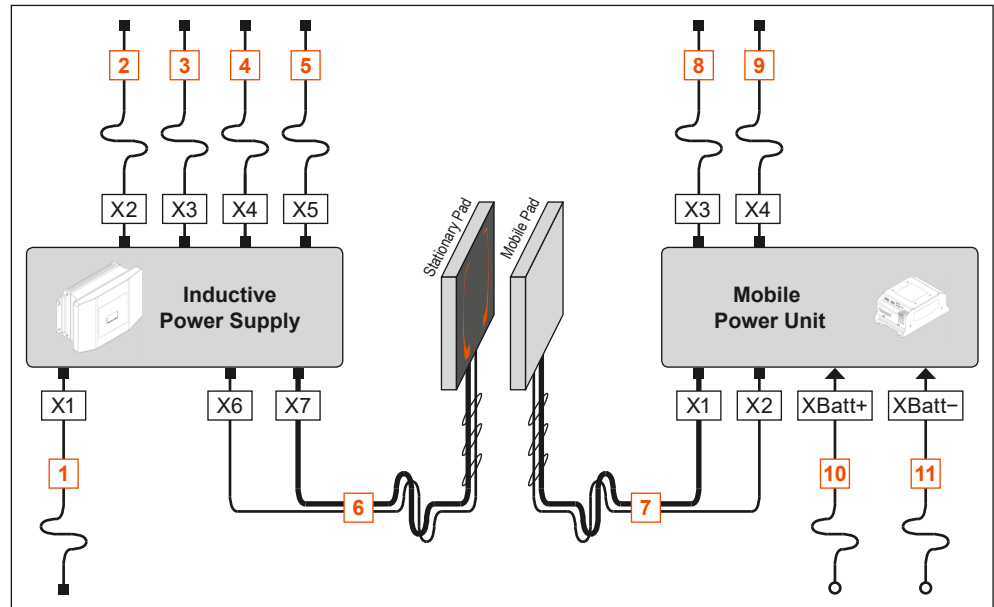


Fig. 27

	Connection	Description	Cable specifications	Cable length max.
Fig. 27/1	IPS/X1	Mains input	Mains connection cable according to DIN VDE/UL or other national standards Connection cross-section: 2.5 mm ² or AWG14 = 2.1 mm ²	
Fig. 27/2	IPS/X2	CAN bus	Data cable min. 2x2x0.5 mm ² , twisted in pairs, shielded	
Fig. 27/3	IPS/X3	Ethernet	Data cable min. CAT5e	
Fig. 27/4	IPS/X4	Enable e. g. external safety module	Signal cable according to DIN VDE/UL or other national standards	10 m

TNB_0083, 2, en_GB

	Connection	Description	Cable specifications	Cable length max.
Fig. 27/5	IPS/X5	Digital I/O	Signal cable, shielded according to DIN VDE/UL or other national standards	10 m
Fig. 27/6	IPS/X6	ISP data	Data cable (permanently installed on ISP) Unitronic FD Li2YCY (TP) A BE 2x2x0.34	10 m
	IPS/X7	ISP power	Power cable (permanently installed on ISP) LAPP CABLE PUR/PP A 6x2.5 BK	10 m
Fig. 27/7	MPU/X1	IMP power	Power cable (permanently installed on IMP) LAPP CABLE PUR/PP A 6x2.5 BK	1 m
	MPU/X2	IMP data	Data cable (permanently installed on IMP) Unitronic FD Li2YCY (TP) A BE 2x2x0.34	1 m
Fig. 27/8	MPU/X3	CAN bus optional: Fan output	Data cable min. 2x2x0.5 mm ² , twisted in pairs, shielded	
Fig. 27/9	MPU/X4	Ethernet	Data cable min. CAT5e	
Fig. 27/10	MPU/XBatt+	Battery plus	Battery cable max. 1x16 mm ²	1 m
Fig. 27/11	MPU/XBatt-	Battery minus	Battery cable max. 1 x 16 mm ²	1 m

14.9 Approvals and standards

Conformity	Devices made by Conductix-Wampfler Automation GmbH have been designed to comply with EU directives. Please contact Conductix-Wampfler Automation GmbH if you wish to obtain a copy of the EU Declaration of Conformity.
Standards	<p>The devices and the entire system are tested according to the following standards:</p> <p>Low Voltage Directive</p> <p>DIN EN IEC UL 61010-1 - Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements as a basis for</p> <p>DIN EN IEC 61010-2-201 - Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-201: Particular requirements for control equipment</p> <p>DIN EN IEC 62311:2008-09 - Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields</p> <p>EMC Directive</p> <p>DIN EN IEC 61000-6-2: 2019 - Generic standards – Immunity standard for industrial environments</p> <p>DIN EN IEC 61000-6-4: 2019 - Generic standards – Emission standard for industrial environments</p>

15 Customer service and addresses

Customer service

Our service team is available to provide technical information.

- **Conductix-Wampfler Automation - Service**

Phone: +49 331 887344-15 | Fax: +49 331 887344-19

E-mail: service.potsdam@conductix.com



Service forms

Service forms are available for download under www.conductix.com.

Please send completed service forms to service.potsdam@conductix.com.

Further contacts

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- www.conductix.com

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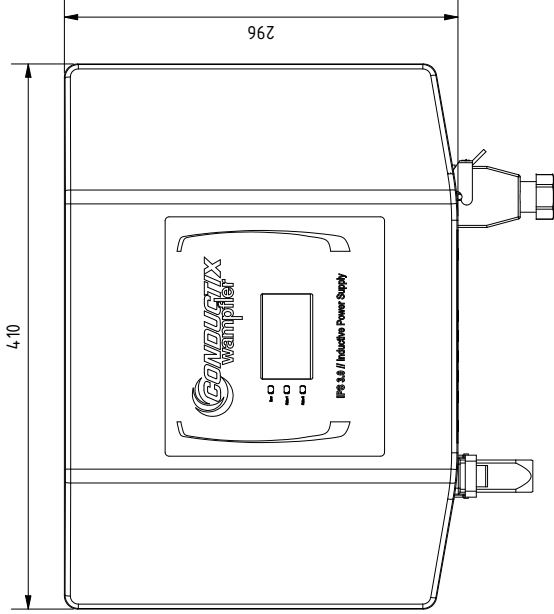
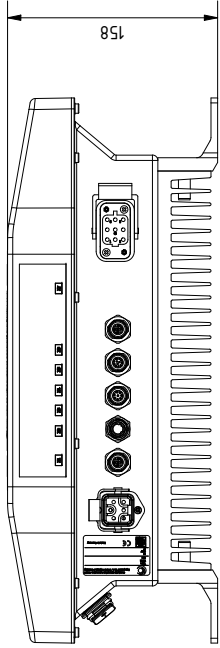
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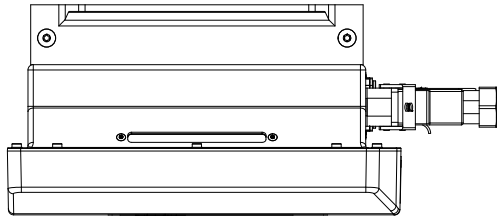
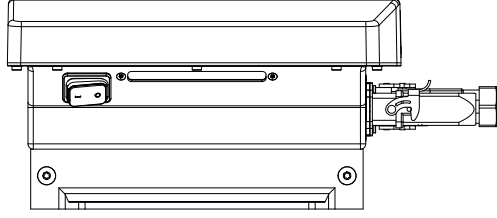
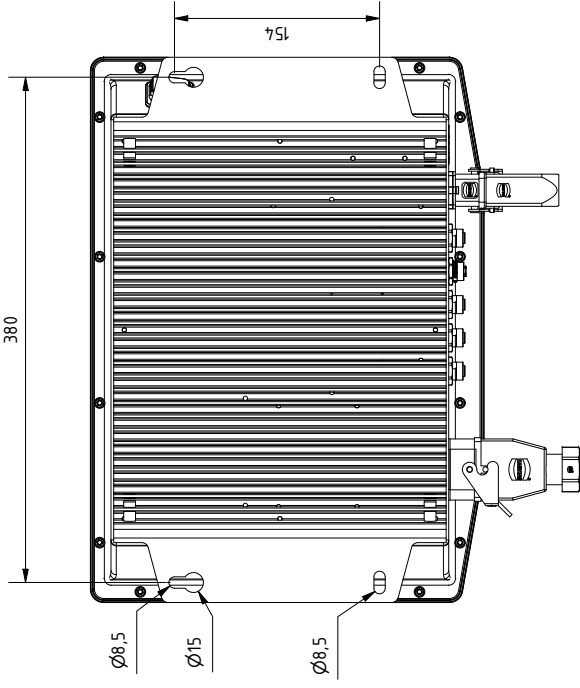
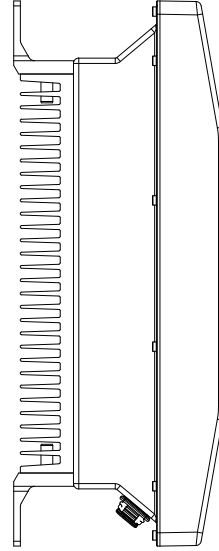
Warranty..... 9



Appendix



HAN C-99
HAN 08/0-M-c

HAN 3M-gg-M20
HAN 05/0-F-c



customer /	drawn by J.Christaller	date of drawing 15.11.2022	
	edited by	date of editing	
Conductix-Wampfler Automation GmbH Handelshof 16 A 14.4.78 Potsdam Germany www.conductix.com		type of document device drawing	status of document approved
		title, additional title Inductive Power Supply IPS 3.0, 3kW	material number 60692001
		rev. B	scale 1 : 4
		page A3	page 3/3

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End customer CxW-SMO
Location Worldwide
Plant AGV
Product Inductive Power Supply
Type IPS 3.0
WNR CWA-60692001
Item Number 3289518

Remarks:

[Connection diagram](#)

created on 01.12.2020

from F.Schleussner

Number of pages

Ind.	Modification	Date	Name	Status	Ed. by	Date	orig.	F.Schleussner	03.02.2023	G	Title page/cover sheet	Index


 End customer
 Location
 Plant

 CxW-SMO
 Worldwide
 AGV

 Product
 Type
 WNR

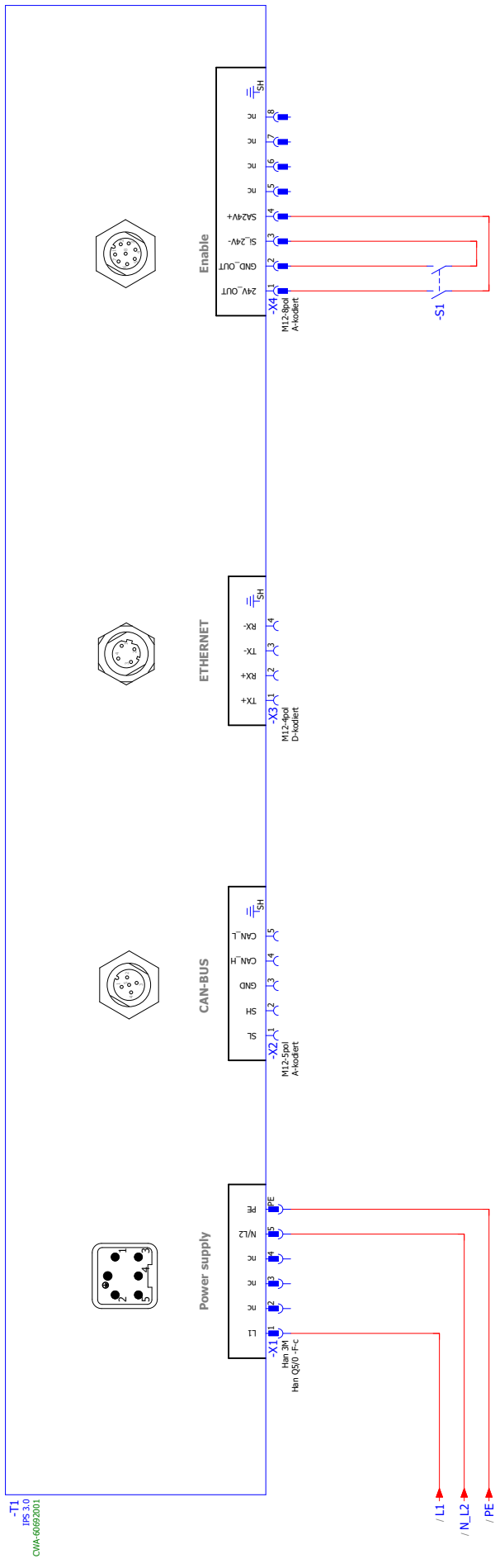
 Inductive Power Supply
 IPS 3.0
 CWA-60692001

 Item Number
 3289518

 Page
 1

=LJU +ST

=INF / 1



-T1
IPS 3.0
CWA-60692001

/L1
/N1,2
/PE

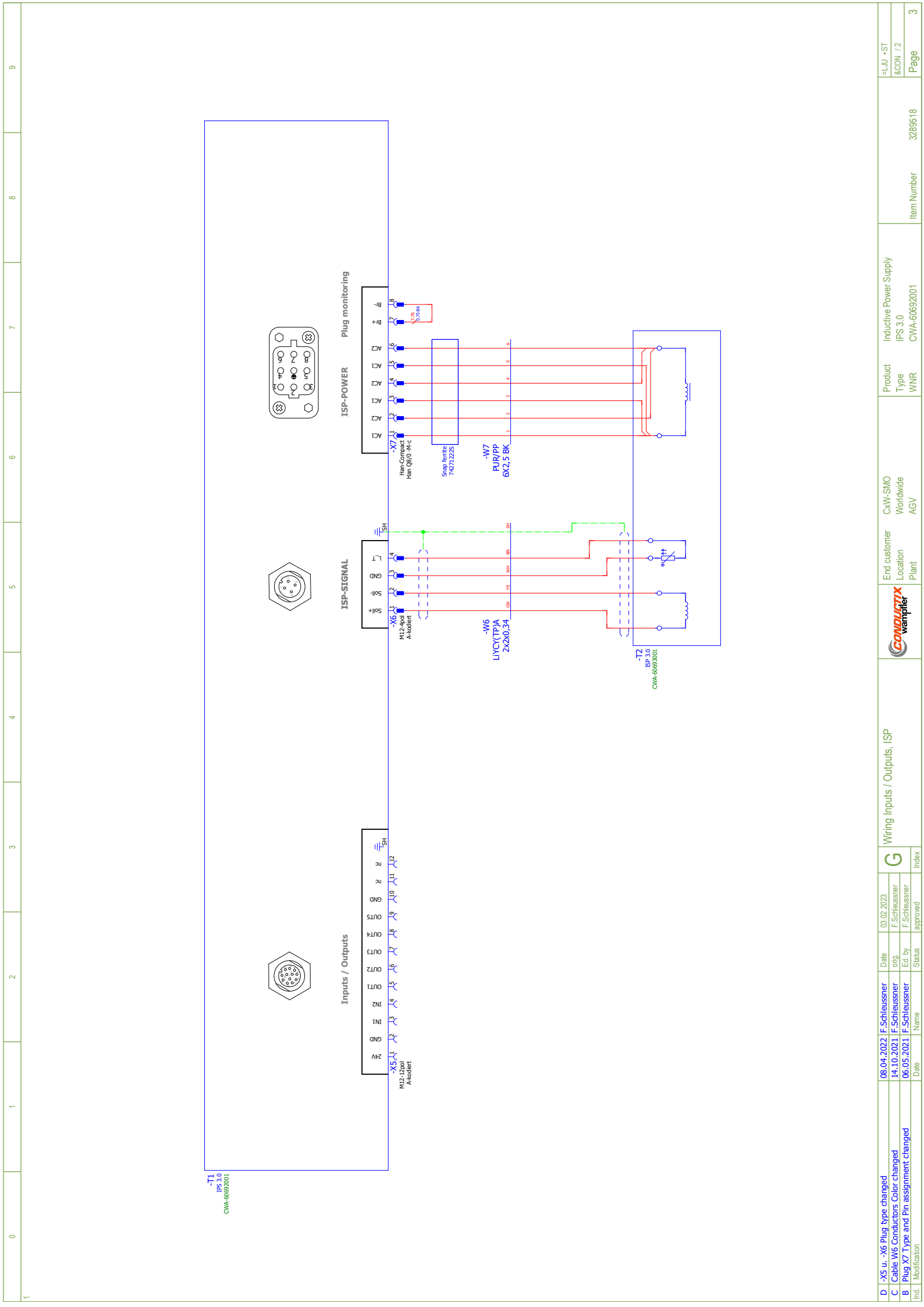
G	-X3 Pin assignment changed TX- <-> RX+	03.02.2023	F.Schleussner	03.02.2023	F.Schleussner	approved
F	-X1 Plug type + Pin assignment changed	03.11.2022	F.Schleussner	03.11.2022	F.Schleussner	approved
D	-X1, -X3 u. -X4 Plug type changed	08.04.2022	F.Schleussner	08.04.2022	F.Schleussner	approved
Ind.	Modification					

G	Wiring Power supply CAN, ETH, enable	03.02.2023	F.Schleussner	03.02.2023	F.Schleussner	approved
Ind.	Index					

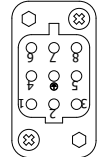
CONQUIPTX	End customer	Product Type	Inductive Power Supply	Item Number	3289518
Wampfler	Location	WNR	IPS 3.0		
	Plant	WANR	CWA-60692001		

CWA-SMO	Product Type	Inductive Power Supply	Item Number	3289518
Worldwide	WNR	IPS 3.0		
AGV	WANR	CWA-60692001		

F.LJU +ST	Page	2
&CON / 1		



-T1
IPS 3.0
CWA-60692001



0	1	2	3	4	5	6	7	8	9
<p>D -X5 u. -X6 Plug type changed C Cable W6 Conductors Color changed B Plug X7 Type and Pin assignment changed Ind. Modification</p>									
Date		08.04.2021		F.Schleussner		Date		03.02.2023	
orig.		14.10.2021		F.Schleussner		Location		Worldwide	
Ed. by		06.05.2021		F.Schleussner		Plant		AGV	
I Name		F.Schleussner		I Status		Product Type		WNR	
I Date		06.05.2021		F.Schleussner		Product Type		IPS 3.0	
I Status		approved		approved		Inductive Power Supply		CWA-60692001	
I Index		G		Index		Item Number		3289518	
I Page		3		Page		Item Number		3289518	
I Page		3		Page		Item Number		3289518	