IPM1301, IPM1401, IPM1511

Integrated power module for charge controller

Illustration: similar

IPM1xx1_D00498_00_M_XXEN/01.2026

BENDER

Table of contents

1 General information

1.1 How to use the manual

ADVICE
This manual is intended for qualified personnel working in electrical engineering and electronics! Part of the device documentation in addition to this manual is the enclosed supplement "Safety instructions for Bender products".

ADVICE
Read the operating manual before mounting, connecting and commissioning the device. Keep the manual within easy reach for future reference.

1.2 Indication of important instructions and information

DANGER
Indicates a high risk of danger that will result in death or serious injury if not avoided.

WARNING
Indicates a medium risk of danger that can lead to death or serious injury if not avoided.

CAUTION
Indicates a low-level risk that can result in minor or moderate injury or damage to property if not avoided.

ADVICE
Indicates important facts that do not result in immediate injuries. They can lead to malfunctions if the device is handled incorrectly.

Information can help to optimise the use of the product.

1.3 Service and Support

Information and contact details about customer service, repair service or field service for Bender devices are available on the following website: https://www.bender.de/en/service-support.

1.4 Training courses and seminars

Regular face-to-face or online seminars for customers and other interested parties:

https://www.bender.de/en/know-how/seminars

1.5 Delivery conditions

The conditions of sale and delivery set out by Bender GmbH & Co. KG apply. These can be obtained in printed or electronic format.

1.6 Inspection, transport and storage

Check the shipping and device packaging for transport damage and scope of delivery. In the event of complaints, the company must be notified immediately. Please use the contact form at the following address: https://www.bender.de/en/service-support/take-back-of-old-devices/.

When storing the devices, observe the information under Environment / EMC in the technical data.

1.7 Warranty and liability

Warranty and liability claims for personal injury and property damage are excluded in the case of:

- improper use of the device
- incorrect mounting, commissioning, operation and maintenance of the device
- Failure to observe the instructions in this operating manual regarding transport, commissioning, operation and maintenance of the device
- unauthorised changes to the device made by parties other than the manufacturer
- non-observance of technical data
- Repairs carried out incorrectly
- the use of accessories or spare parts that are not provided, approved or recommended by the manufacturer
- Catastrophes caused by external influences and force majeure
- Mounting and installation with device combinations not approved or recommended by the manufacturer

This operating manual and the enclosed safety instructions must be observed by all persons working with the device. Furthermore, the rules and regulations that apply for accident prevention at the place of use must be observed.

1.8 Disposal of Bender devices

Abide by the national regulations and laws governing the disposal of this device.

Bender GmbH & Co. KG is registered in the waste from electrical and electronic equipment (WEEE) register under the WEEE number: DE 43 124 402. For more information on the disposal of Bender devices, refer to https://www.bender.de/en/service-support/take-back-of-old-devices/

1.9 Safety

If the device is used outside the Federal Republic of Germany, the applicable local standards and regulations must be complied with. In Europe, the European standard EN 50110 applies.

DANGER

Risk of fatal injury due to electric shock!

Touching live parts of the system carries the risk of:

- *Electrocution due to electric shock*
- *Damage to the electrical installation*
- *Destruction of the device*

Before installing the device and before working on its connections, make sure that the installation is de-energised.

Observe the rules for working on electrical systems.

2 Device-specific safety instructions

CAUTION
Sharp-edged terminals
Cut injuries
Handle enclosure and terminals with care.

WARNING
Relay contacts can heat up to 100 °C
Burns
Only touching the charge controller when it is de-energised and has cooled down.

ADVICE
To ensure protection against high surface temperatures, charging cables in accordance with DIN EN 50620 must be used.

The maximum permissible contact temperature of the housing and the supply cables must be designed in accordance with DIN EN IEC 61439-1. Tests must be carried out to determine the surface temperatures to be expected during operation.

Cable cross-sections must be specified in accordance with DIN EN IEC 61851-1 and DIN IEC 62955 in order to avoid overtemperatures.

ADVICE
The Ethernet shield and the USB shield of the charge controller ICC1314 are directly connected to PE. This must be taken into account in the test!

ADVICE
HV test: L1 is coupled to PE via a protective circuit and with approximately 80 kΩ.
Above 500 V, a leakage current flows to PE.

Test voltages above AC 1000 V/1 s are not permissible!

3 Function

3.1 Intended use

The IPM1xx1 integrated power module, referred to as power module in the following, is a component for the set-up of Mode 3 charging stations for electric vehicles (EV). It is intended exclusively for use with Bender charge controllers as an accessory. Any other use than that described in this manual is regarded as improper.

This document is to be used together with the manual D00520 for the following charge controllers:

Type	Part No.	Link to manual
ICC1314-Connect Plus	B94060073	

The charge controller ICC1314 is a variant of the charge controller ICC1324.

3.2 Device features

- 22 kW power relay
- Surge Protection Device (SPD)
- integrated DC power supply
- integrated residual current transformer for DC fault current monitoring
- integrated temperature sensors
- 20-pole connector for connection to the charge controller by using a connection cable
- PE monitoring
- integrated residual direct current monitoring module with residual current transformer for DC residual current monitoring (external RCD type A required)
- Relay for phase connection and phase switching
- Load current measurement using up to three external current transformers
- Varistor health monitoring, rotary field detection, phase detection and power frequency measurement

3.3 Functional description

The power module is an assembly that expands the functional range of the charge controller. The assembly combines many individual components of a Mode 3 charging unit.

A connection to the charge controller via a 20 pole connection cable, enables the power module to combine important components of an AC charging system that are required by standards according to IEC 61851-1.

The integrated monitoring of the DC residual current means that an RCD type A in the charging system is sufficient.

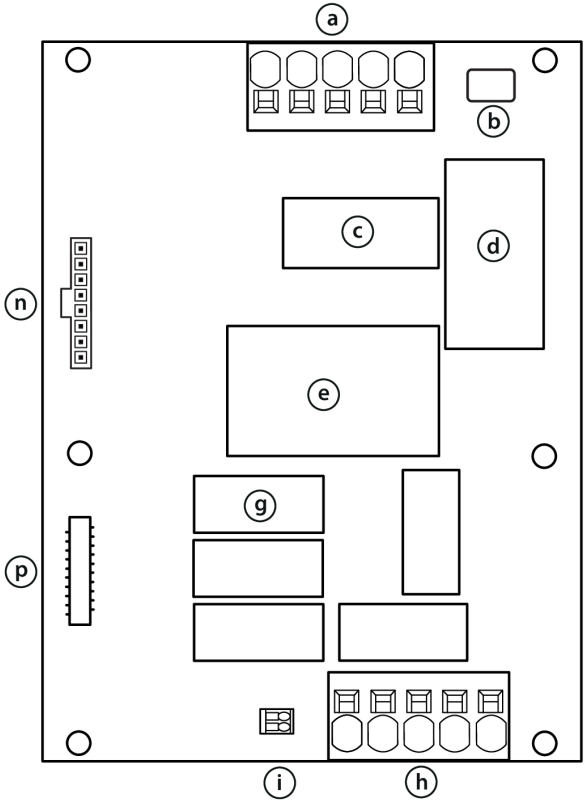
Integrated changeover and cut-in relays allow the charging power to be distributed as needed to either individual phases, or multiple phases in the case of a multiphase connection.

3.3.1 General functions

- The device includes an integrated DC power supply. This is supplied via the AC mains connection. No additional power supply is required.
- The device can be used for charging systems with up to 22 kW of charging capacity. The charge controller controls the charging process in the charging system and thereby the main relay of the power module.
- The measuring current transformer is wired in such a way that the PE connection can be monitored in the direction of the infrastructure.
- Monitoring of the 1- or 3-phase system includes varistor health (status of the overvoltage protection (SPD)), rotating field detection, phase detection and mains frequency measurement.
- The device supplements the charge controller with additional temperature sensors for recording the current PCB temperature. Based on these, the charge controller can adjust the charge current depending on the temperature. *(Reference to chapter "Load current and cooling control (temperature monitoring))" in the ICC1314 manual)*
- Normally required monitoring of the weld check is integrated in the main relay and is analysed by the integrated controllers. For the phase cut-in relays and phase changeover relays, the weld check is also monitored by the integrated controllers.
- The load current of the individual phases can be monitored with up to three externally connectable current transformers.
- The integrated phase switching relays and phase changeover relays allow the charging power to be distributed as required to individual or multiple phases with a multi-phase connection (depending on the variant).

ADVICE
The status of the internal SPD and all relays is constantly monitored. In the event of a fault, repairs must be carried out by trained specialist personnel.

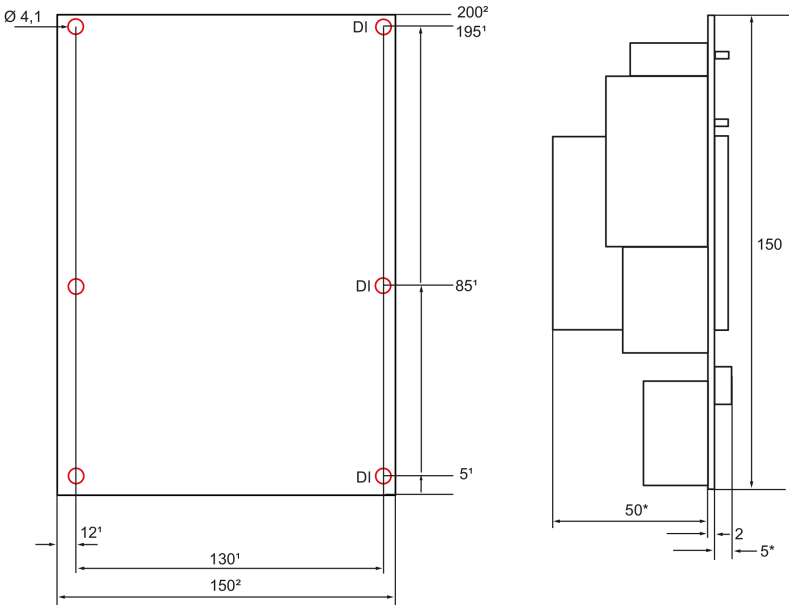
3.4 Device view



a Network connection AC
b Power supply AC 230 V (in compliance with calibration law)
c Residual current transformer
d 12 V power supply unit
e Main relay / 62955 relay
g Relay matrix
h Connection charging cable with type 2 plug
i Data line charging cable (CP) Type 2 plug
n 3 x current transformer connection for load current measurement
p 20 pole charge controller connection

4 Dimensions and mounting

Dimension diagram



Dimensions in mm

* max.

1 ± 0.1 mm (recommended mounting dimensions of the manufacturer's housing: ± 0.2 mm)

2 ± 0.5 mm (recommended mounting dimensions of the manufacturer's housing: ± 0.25 mm)

- or all other dimensions according to DIN ISO 2768-f

Red markings: possible fixing points

Recommendation for fastening:

- *Pan head screws: 6 x M 3.0 or max. Ø 3.5 mm*

CAUTION

Incorrect mounting of the PCB

Mechanical stresses (tilting) of the PCB

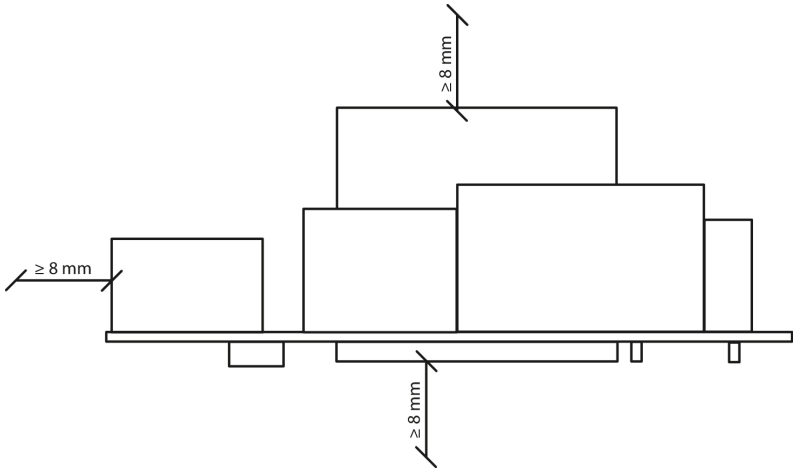
When mounting, ensure that the PCB is mounted flush with the surface.

ADVICE

DI: *These screw connection points have* **double insulation** *(distance to other positions or devices > 8 mm)*

When manufacturing the charging station, ensure that an enclosure with protection class IP44 is used (DIN EN IEC 61439-7).

Recommended distances to other positions and devices



Minimum distance between this area of the charge controller and all other positions or devices in an IT or TN network.

5 Connection

5.1 Connection conditions

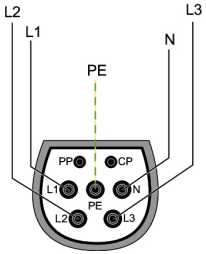
DANGER
System parts may be live
(integrated power module and charging station up to 230 V / 400 V)
Electric shock
Before touching system parts, ensure that it has been de-energised.

Information:

- *PE is connected to "GND"; reference level for Control Pilot (CP communication) must be at the same level as the power supply (IEC 61851 series of standards)*
- *Lay lines only inside the charging system*
- *do not lay lines parallel to power lines*
- *Cable lengths (except Modbus, Ethernet, Power IN, residual current transformer and charging cable): < 3 m*
- *the mains connection must be protected by a residual current device (RCD type A) that is correctly dimensioned for the possible and desired charging power*
- *the mains connection must be equipped with overcurrent protection device that are correctly dimensioned for the possible and desired charging power.*
- *the charge controller is connected to the power module by using a connection cable (not included in the scope of delivery)*
- *A distance of ≥ 8 mm between live parts and the connection cable must be maintained (for further information, see "Tabular data", page 18).*
- *the connection cable only fits onto the connector in one direction; plug in the connector carefully*
- *CP and PP are not generated or provided by the power module. The relevant wires are connected to terminal i.*

5.2 Connection plug connections

Type 2 plug

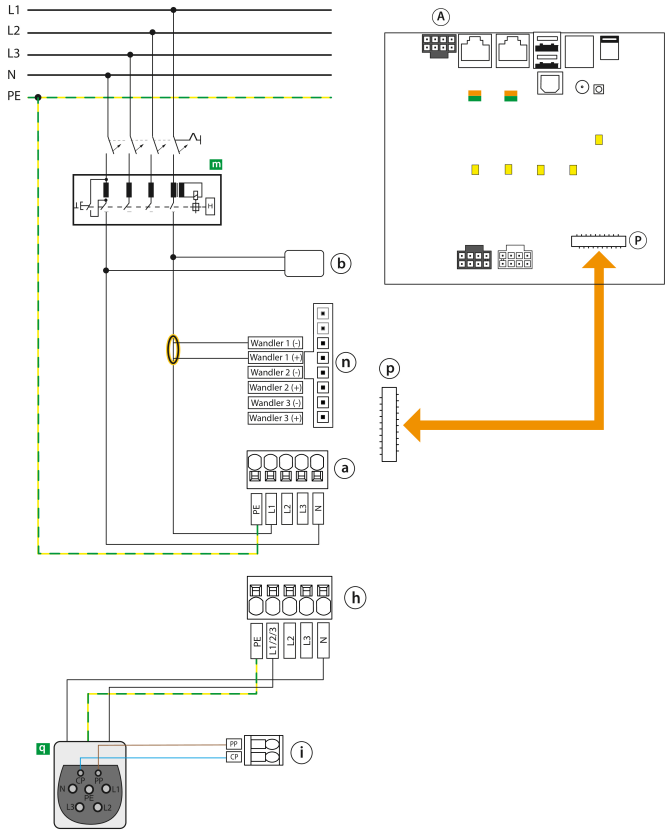


ADVICE
When the charging cable is firmly connected, the connection to PP and to an actuator is not required.

5.3 Connection type 2 plug

The following wiring diagrams illustrate the wiring options of the power module to the ICC1314 charge controller.

5.3.1 Single-phase connection

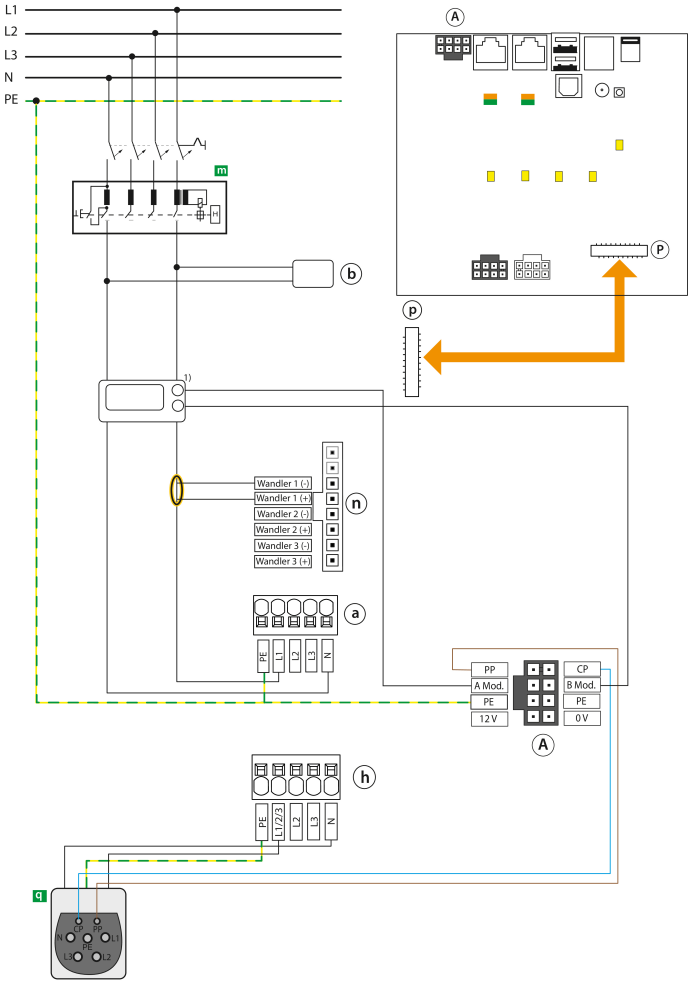


Legend for both connection options

A*	PE, Modbus meter, CP, PP	i	Data line charging cable (CP) Type 2 plug
P*	Connection charge controller 20 pole	p	Connection charge controller 20 pole
a	Network connection AC	n	3 x current transformer connection
b	Power supply AC 230 V (in compliance with calibration law)	m	RCD type A
h	Charging cable connection with type 2 plug	q	Type 2 plug or permanently connected charging cable

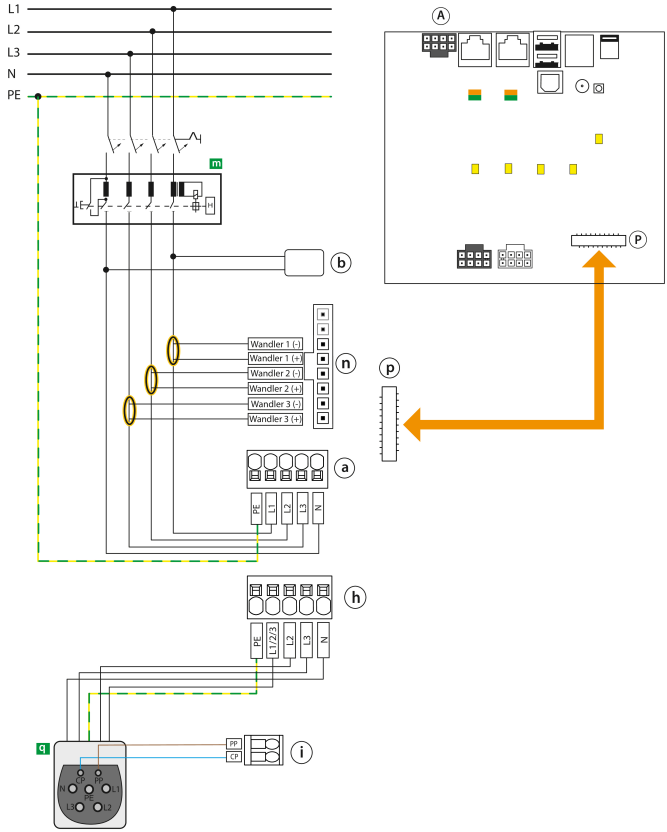
* concerns ICC1314

Single-phase connection with meter



1) Meter

5.3.2 Three-phase connection

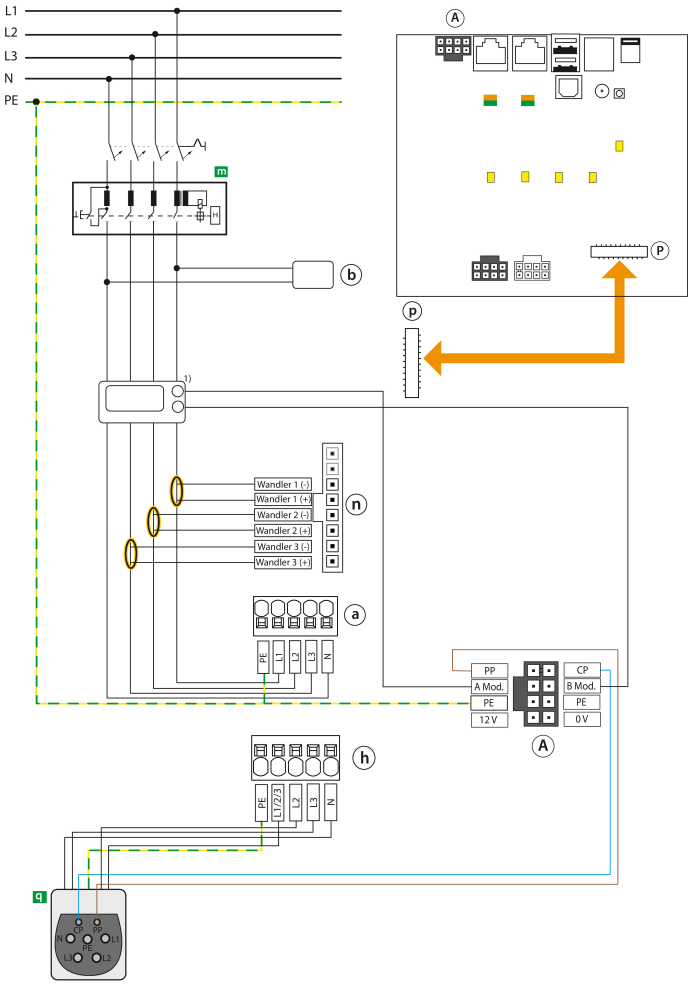


Legend for both connection options

A*	PE, Modbus meter, CP, PP	i	Data line charging cable (CP) Type 2 plug
P*	Connection charge controller 20 pole	p	Connection charge controller 20 pole
a	Network connection AC	n	3 x current transformer connection
b	Power supply AC 230 V (in compliance with calibration law)	m	RCD type A
h	Charging cable connection with type 2 plug	q	Type 2 plug or permanently connected charging cable

* concerns ICC1314

Three-phase connection with meter



1) Meter

6 Commissioning

The power module must be connected to a suitable charge controller that supports the operation of the module. To avoid malfunctions and voltage failures, only use the approved connection cables (see chapter "Tabular data", page 18).

The following settings must be configured in the ICC1314 charge controller:

1. Selection of the Power-Board
   Power-Board → IPM1511 or IPM1301 or IPM1401
2. Main relay setting for welding detection
   Subchapter Weld-Check → Activate Weld-Check 230 V with PE-Monitoring

7 Technical Data

7.1 Tabular data

Insulation coordination acc. to IEC 60664-1 or IEC 60664-3

Rated voltage	250 V
Overvoltage category at input (terminal a, b)	III
Overvoltage category at output (terminal h)	II
Pollution degree	2
Rated impulse voltage	6 kV
Operating altitude AMSL	≤ 2000 m

AC network connection, single-phase / three-phase (terminal block a (L1, L2, L3, N, PE))

Nominal voltage	220…230 V / 400 V
Nominal voltage tolerance	198…253 V / 343…438 V
max. Charging current	1 x 32 A / 3 x 32 A
max. Charging power	7.3 kW / 22 kW
Frequency	50 Hz
max. power consumption	16 W
Self-consumption IPM1511 + ICC1314 (State C, HMI140)	8.1 W
Short-circuit current carrying capacity	
I_{nc}	3 kA
I^2t	50 kA^{2}s
I_p (IEC 62955)	1.85 kA
I^2t (IEC 62955)	4.5 kA^{2}s

Connection, type 2-socket AC single-phase / three-phase (terminal block h (L1, L2, L3, N, PE))

Nominal voltage	220…230 V / 400 V
max. Charging current	1 x 32 A / 3 x 32 A
max. Charging power	7.3 kW / 22 kW
Frequency	50 Hz

Connection charging release and external Measuring current transformer: (terminal block n)

max. current per transformer	40 A
Winding ratio	1:1000
Cable lenght	< 2 m
internal load resistance	10 Ω

Cable lengths/ cable types

Terminal blocks a and h	
Connection type	Push-wire terminal
Connection data*	
rigid/ flexible	2.5…16 mm²
flexible with ferrule without plastic sleeve	2.5…16 mm²
flexible with ferrule with plastic sleeve	2.5…10 mm²
Stripping length	18 mm
Charging cable length max. (terminal h)	< 10 m

* depends on the power capacity connected to the power module

Connection charge controller p	
Permissible connection plug/ connector system*	Micromatch
Connection cable length	< 0.3 m

* can be ordered seperatly (see chapter "Ordering information")

- The plug-in system on the IPM board an on the charge controller can withstand 5 plugging cycles.
- The plug on the connection cable is intended for single insertion.

Terminal block i	
Connection type	Push in terminal
rigid/ flexible	0.2…1.5 mm²
flexible with ferrule without plastic sleeve	0.25…1.5 mm²
flexible with ferrule with plastic sleeve	0.25…0.75 mm²
Stripping length	8 mm

used plug connectors

Terminal b	JST B2P3 -VH
Terminal i	(Weidmüller LSF-SMT 3.50/02)
Terminal n	Molex Nano-Fit™ 1x8 105311-1108

Environment

Operating temperature	-25…+65 °C*
Classification of climatic conditions acc. to IEC 60721	
stationary use (IEC 60721-3-3)	3K22

Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K21
Classification of mechanical conditions acc. to IEC 60721	
stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12

* At high temperatures, depending on the enclosure design, the charging current may be reduced or switched off.

Other

Protection class	IP00
Weight	ca. 750 g

7.2 Standards and approvals

The IPM1xx1 has been developed in compliance with the following standards:

- IEC 62955
- DIN EN IEC 61851-1
- DIN EN IEC 61851-21-2
- DIN EN IEC 61439-1
- DIN EN IEC 61439-7
- IEC 62196-2
- EN 50620

7.3 Declarations of conformitiy

EU Declaration of conformity

The device is in compliance with the following directives:

- Low Voltage Directive (2014/35/EU)
- Directive on Electromagnetic Compatibility (2014/30/EU)

UK Declaration of Conformity

The device is in compliance with the following regulations:

- Electromagnetic Compatibility Regulations 2016
- Electrical Equipment (Safety) Regulations 2016

7.4 Ordering data

Type	Phase switching	Phase connection	Load current measurement	Article no.	Manual no.
IPM1511	x	x	x	B94060064	D00498
IPM1301	-	-	-	B94060062	
IPM1401	-	x	-	B94060065	

Connection kit	Contents / Quantity	Article no.
Connection cable for IPM	Length 0.2 m/ 0.3 m	on request

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