

Local Load Management, eng

00.999.3070/

**HEIDELBERG**



## A Local Load Management

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# 1 Local Load Management

## 1.1 Introduction

The "Energy Control" wallbox charging station is used for charging plug-In-hybrid or electric vehicles. Several "Energy Control" wallboxes can be operated on the system network. This enables the monitoring of power distribution of up to 16 wallboxes.

In the following documentation, these "Energy Control wallboxes" are only called wallboxes.

For local load management, several wallboxes are networked with one another via a RS485 bus. These wallboxes divide the available total current equally. An external control system is not necessary here. For this local load management, the person putting it into service must not worry about the communication between the wallboxes. Only the notes about the configuration and installation of the wallboxes must be heeded.

## 1.2 Checklist

All of the points listed below are necessary for a trouble-free installation and start-up:

- Selection of leader wallbox,
- Setting of the number of follower wallboxes (in the leader wallbox),
- Setting of the maximum system current (in the leader wallbox),
- Configuration of the lock function (in the leader wallbox),
- Selection of the number of follower wallboxes (in the leader wallbox),
- Setting of the bus ID (in each follower wallbox),
- Setting of the maximum and minimum charging current (in each wallbox),
- Wiring of the power supply and bus system, Avoid single-sided phase loading!
- Activation of the bus termination (in the first and last wallbox).

## 1.3 Prerequisites

In order to establish a system with local load management, at least two wallboxes are required. A maximum of 16 wallboxes can be networked. A hybrid or electric vehicle can be charged on each of these wallboxes. To have a reliable power supply, the overall output of the system must be configured such that at least 6 A is available for each wallbox. Otherwise, load requests, in the event of an overload for a requested output, will be delayed until the current charging process has completed, and free capacity is available.



**Note**

The documentation "Safety instructions," "Installation instructions," and "Operating manual" for the "Energy Control" wallbox must be read carefully and heeded.

These documents are available online:  
<https://wallbox.heidelberg.com/>



**Caution - Single-sided phase load**

If in a system network of wallboxes (with load management), several vehicles should be charged single-phased at the same time, this can generate an unfavorable current distribution between the phases.

Therefore, the wallboxes must be connected with alternating phase sequence.

First wallbox L1, L2, L3.

Second wallbox L2, L3, L1.

Third wallbox L3, L1, L2.

Fourth wallbox again L1, L2, L3, etc.

**1.4 Bus topology**

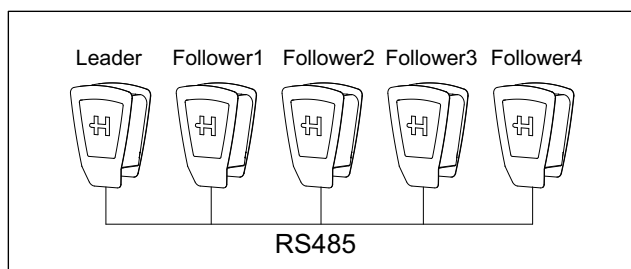


Fig. 1 Example: bus system with 5 participants

The bus system used to connect the wallboxes is a RS485 field bus. Modbus-RTU is used as the protocol. The system consists of a wallbox that is configured as leader and at least one wallbox that is configured as follower. Up to 15 wallboxes configured as follower can communicate with the leader wallbox.

The physical position of the leader wallbox can be selected at will.

The total current available is distributed by the leader across the whole system. A minimum charge current (default 6 A) and a maximum charge current (default 6 A) is preconfigured for each wallbox.

The follower wallboxes switch into standby status when they are not used. The wallbox configured as leader does not switch into standby status.

If communication between the follower wallbox and the leader wallbox is aborted it or cannot be established, the charging process will not be started or it will be aborted.

**1.5 Examples of the distribution of the load power**

The following examples depict the distribution strategy of the power supply. In a system network of 5 wallboxes, a maximum of 32 A is available through the power supply. The wallboxes are pre-set with  $I_{max}$  16 A and  $I_{min}$  6 A. The total charging current (32 A) is distributed equally. A vehicle that has finished the charg-

ing process, but remains connected to the wallbox still has 6 A made available to it (e.g. for auxiliary heating).

1.5.1 Example 1

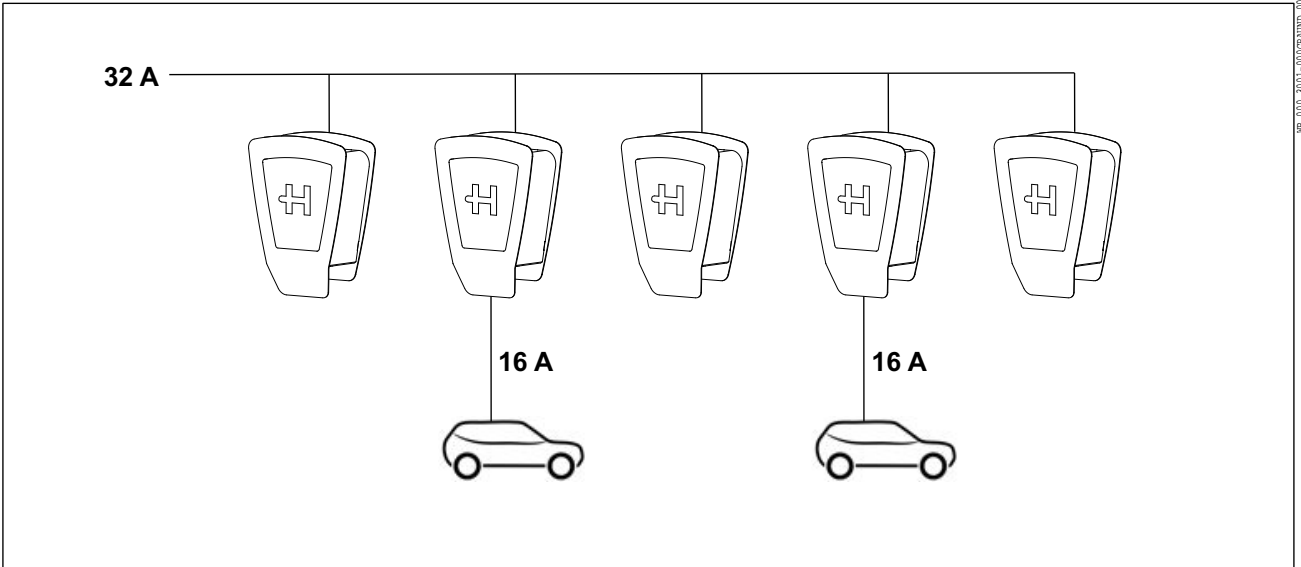


Fig. 2 Both vehicles are charged with 16 A apiece.

1.5.2 Example 2

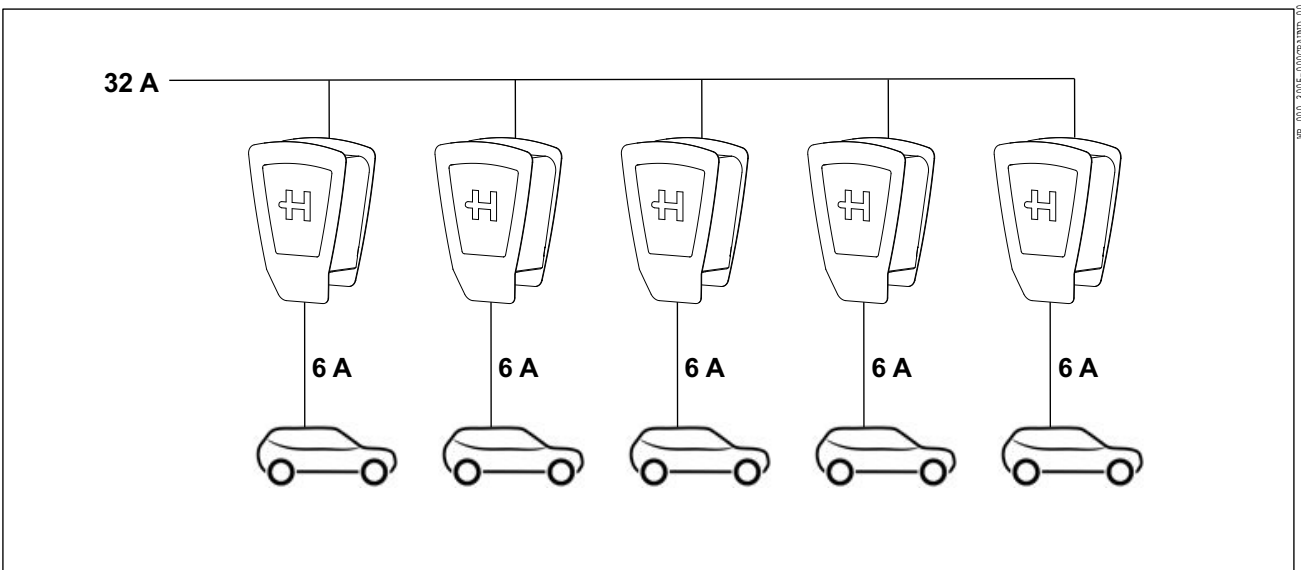


Fig. 3 All five vehicles are charged with 6 A apiece.

1.5.3 Example 3

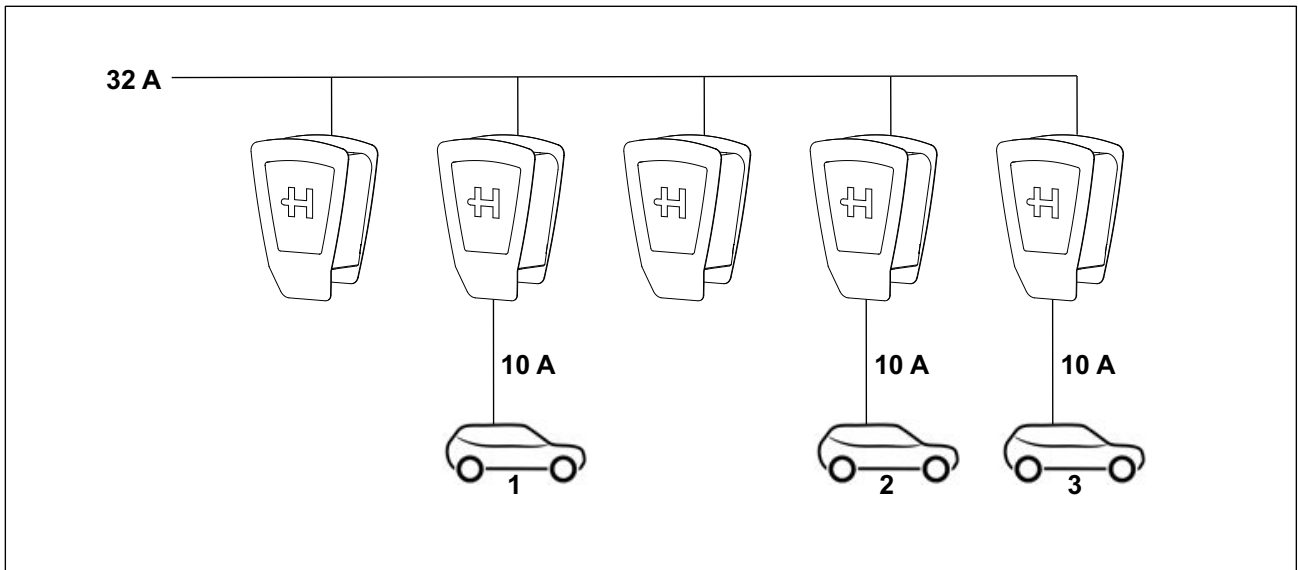


Fig. 4 The three vehicles are charged with 10 A apiece.

1.5.4 Example 4

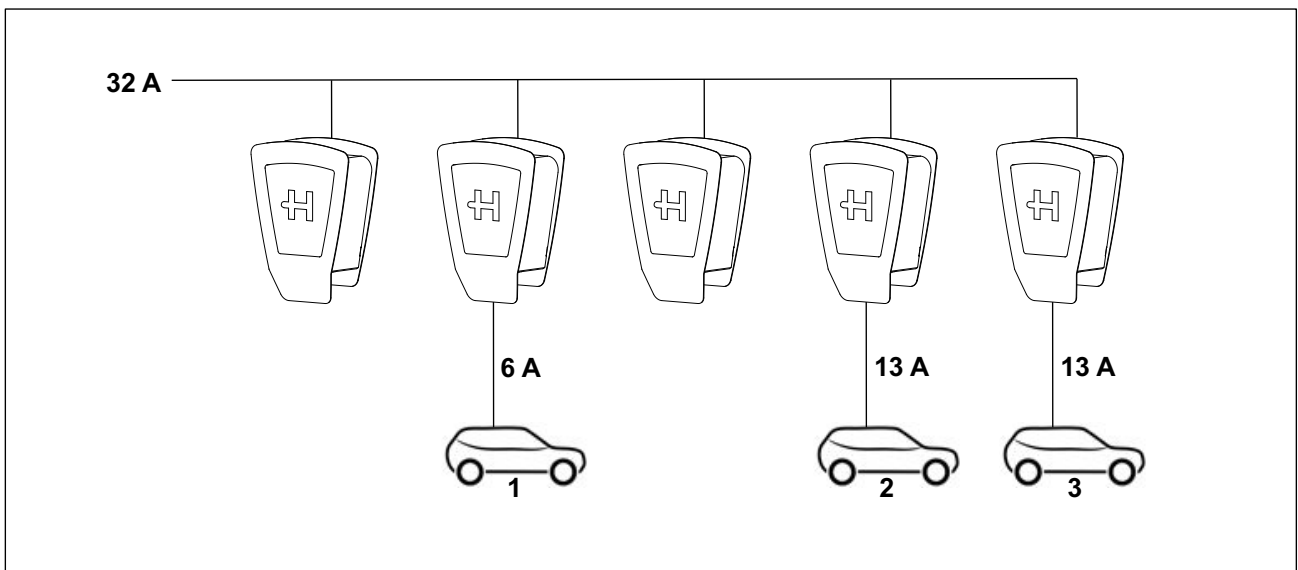


Fig. 5 Vehicle 1 has completed the charging process, but 6 A is still available to it in order to cover any possible need (e.g. auxiliary heating/cooling). Vehicles 2 and 3 are now charged with 13 A.



1.5.5 Example 5

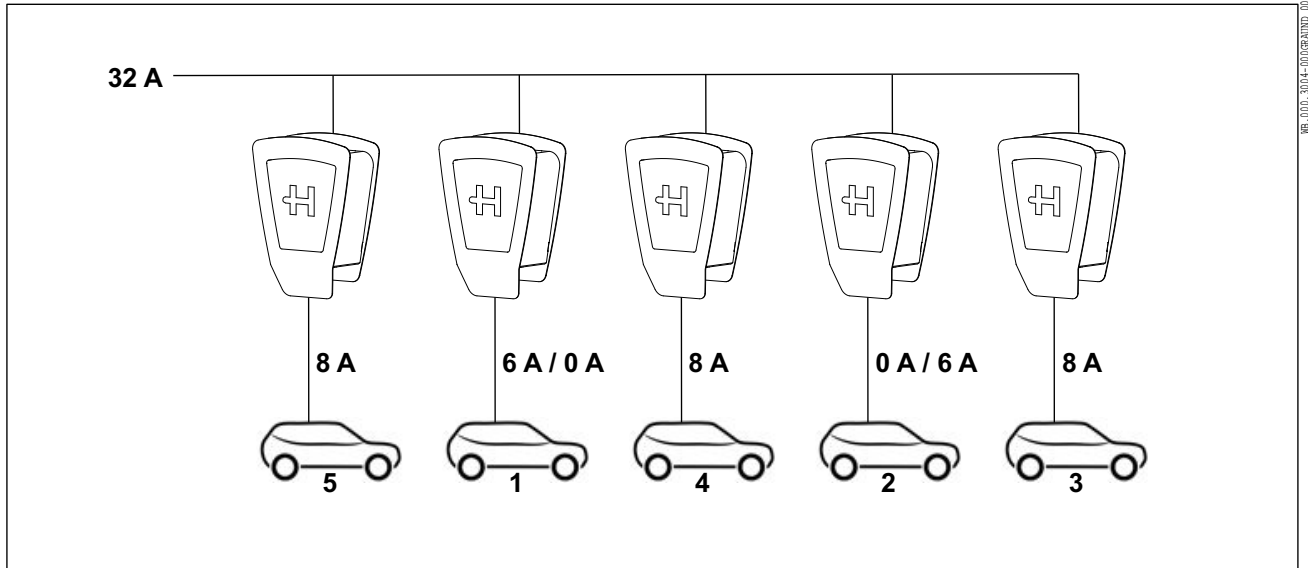
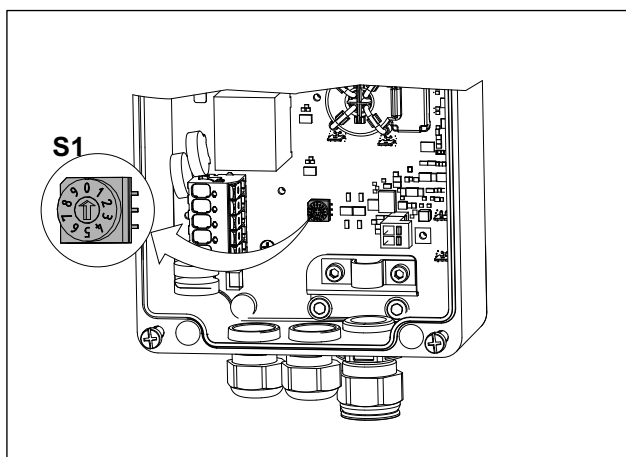


Fig. 6 Vehicles 1 and 2 have completed the charging process and receive alternately (every 12 min) 6 A in order to cover any possible need (e.g. auxiliary heating/cooling). Vehicles 4 and 5 are added to this. The charging current for the vehicles 3, 4 and 5 is now 8 A apiece.

1.6 Configuration of the wallboxes

In order to operate the system network of wallboxes, the individual wallboxes must be preconfigured. This configuration is done with various rotary and microswitches.

1.6.1 Configuration of maximum charging current (per wallbox)



The rotary switch S1 is used to set the maximum charging current from 6 to 16 A.

0	6 A (default setting, delivery state)
1	8 A
2	10 A
3	12 A
4	14 A
5 ... 9	16 A

Fig. 7 Rotary switch S1

**1.6.2 Overview of the rotary and microswitches**

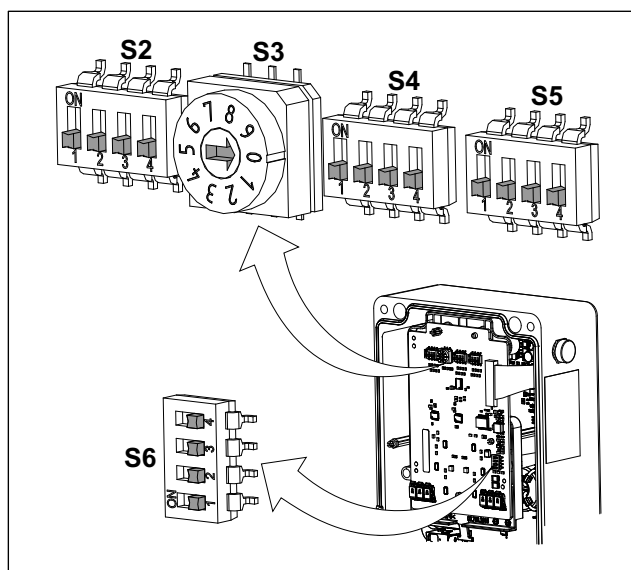


Fig. 8 All rotary and microswitches in OFF position

- S2** Setting for maximum system current (in leader wallbox only)
- S3** Setting for minimum charging current
- S4** In leader wallbox: Setting for number of followers
- S4** In follower wallbox: Setting for each bus ID
- S5** Setting for leader or follower, front illumination, lock
- S6** Bus termination ON/OFF

**1.6.3 S3, configuration of minimum charging current (per wallbox)**

With the rotary switch S3 (Fig. 8), you can set the minimum charging current from 6 to 16 A.

- 0** 6 A (default setting, delivery state)
- 1** 8 A
- 2** 10 A
- 3** 12 A
- 4** 14 A
- 5 ... 9** 16 A

If there is less than the set current available for the wallbox in question, no charging will take place.

**1.6.4 S5/4, configuration as leader wallbox**

The leader setting is made using the S5/4 microswitch (Fig. 8).

S5/4	
ON	Leader
OFF	Follower

Tab. 1

**1.6.5 S4, configuration of the number of follower wallboxes (in leader wallbox)**

The number of follower wallboxes is specified through the setting of the microswitches S4/1 to S4/4 (Fig. 8).

Follower wallboxes	S4/1	S4/2	S4/3	S4/4
No follower	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	OFF
3	OFF	OFF	ON	ON
4	OFF	ON	OFF	OFF
5	OFF	ON	OFF	ON
6	OFF	ON	ON	OFF
7	OFF	ON	ON	ON
8	ON	OFF	OFF	OFF
9	ON	OFF	OFF	ON
10	ON	OFF	ON	OFF
11	ON	OFF	ON	ON
12	ON	ON	OFF	OFF
13	ON	ON	OFF	ON
14	ON	ON	ON	OFF
15	ON	ON	ON	ON

Tab. 2

**1.6.6 S2, configuration of maximum system current (in leader wallbox)**

The maximum current quantity in the system is specified via the setting of the microswitches S2/1 to S2/4 (Fig. 8).

Current	S2/1	S2/2	S2/3	S2/4
10 A	OFF	OFF	OFF	OFF
16 A	OFF	OFF	OFF	ON
20 A	OFF	OFF	ON	OFF
25 A	OFF	OFF	ON	ON
32 A	OFF	ON	OFF	OFF
35 A	OFF	ON	OFF	ON
40 A	OFF	ON	ON	OFF
50 A	OFF	ON	ON	ON
63 A	ON	OFF	OFF	OFF
80 A	ON	OFF	OFF	ON
100 A	ON	OFF	ON	OFF
125 A	ON	OFF	ON	ON
160 A	ON	ON	OFF	OFF
200 A	ON	ON	OFF	ON

Current	S2/1	S2/2	S2/3	S2/4
224 A	ON	ON	ON	OFF
250 A	ON	ON	ON	ON

Tab. 3

### 1.6.7 S5/1, setting of front illumination (all wallboxes)

The front illumination setting is made with the S5/1 microswitch (Fig. 8).

The illumination behavior only affects status messages.

Error messages always light up steadily.

This setting is only effective if a vehicle is connected.

S5/1	
ON	Front illumination lights up steadily
OFF	Front illumination goes out after 5 min.

Tab. 4

### 1.6.8 S5/3, configuration of locking function (in leader wallbox)

The wallbox has an input on which the wallbox can be locked with an external switching element (key switch or similar, see installation instructions). The switch S5/3 can be used to specify whether this lock influences only the leader wallbox or all wallboxes.

S5/3	
OFF	Only the leader wallbox is locked
ON	All wallboxes are locked

Tab. 5

The switch S5/2 is not required for the leader wallbox. The switch must be set to OFF.

### 1.6.9 S5/4, configuration as follower wallbox

The follower setting is made using the S5/4 microswitch (Fig. 8).

The switches S5/1, S5/2 and S5/3 are not required for all follower wallboxes. These switches must be on OFF.

S5/4	
OFF	Follower
ON	Leader

Tab. 6

The switch S5/2 is not required for the leader wallbox.  
The switch must be set to OFF.

**1.6.10 S4, configuration of bus ID for the individual follower wallboxes**

The microswitches of S4 (Fig. 8) are used to assign the bus ID of the follower wallboxes from 1 to 15. To be observed:

- no duplicate bus IDs may be assigned,
- the bus ID must start with 1 for the first follower wallbox.

Bus-ID	S4/1	S4/2	S4/3	S4/4
Leader only	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	OFF
3	OFF	OFF	ON	ON
4	OFF	ON	OFF	OFF
5	OFF	ON	OFF	ON
6	OFF	ON	ON	OFF
7	OFF	ON	ON	ON
8	ON	OFF	OFF	OFF
9	ON	OFF	OFF	ON
10	ON	OFF	ON	OFF
11	ON	OFF	ON	ON
12	ON	ON	OFF	OFF
13	ON	ON	OFF	ON
14	ON	ON	ON	OFF
15	ON	ON	ON	ON

Tab. 7

**1.7 Installation of the bus system**

A screened bus line (e.g. CAT6a) must be used for the cabling of the bus system. The total length of the field bus may not exceed 500 m. It must be ensured that the shields of the bus lines are attached securely to the shield supports provided.

The bus system can be installed in two different ways:

1.7.1 Bus system in line wiring

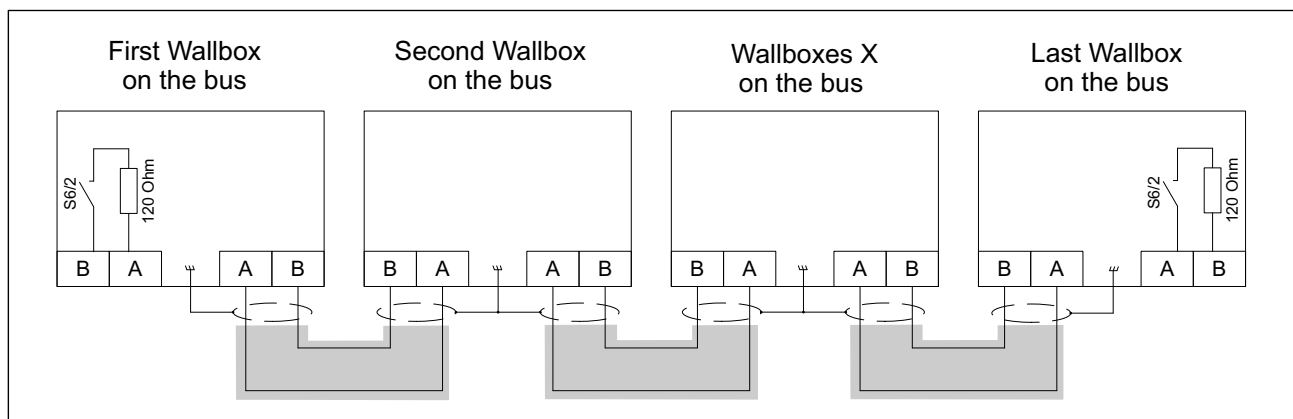


Fig. 9 Example of a line wiring

For the line wiring, the bus line is laid directly from one to the next wallbox. Only two wires are used for each bus line.

Only one bus line is connected to the first and last wallbox.

All other wallboxes have two bus lines routed to them (Fig. 10).

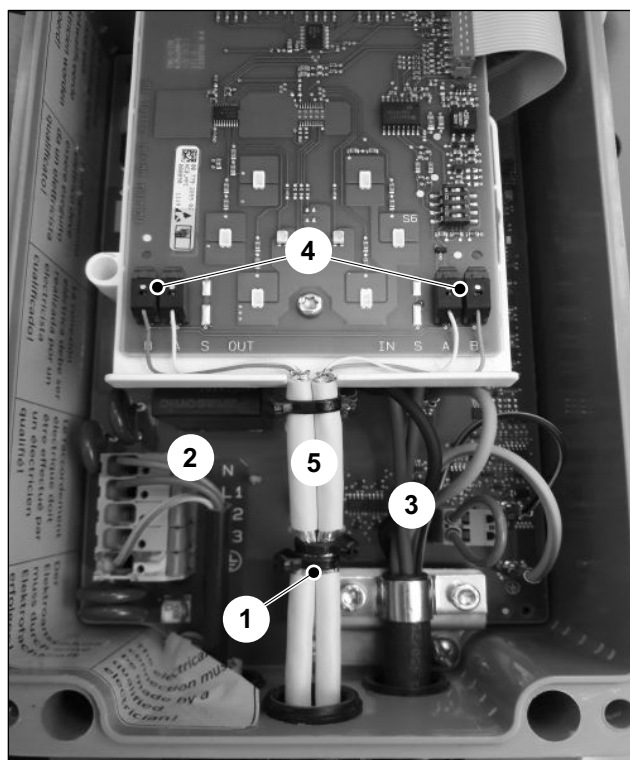


Fig. 10 Line routing for line wiring

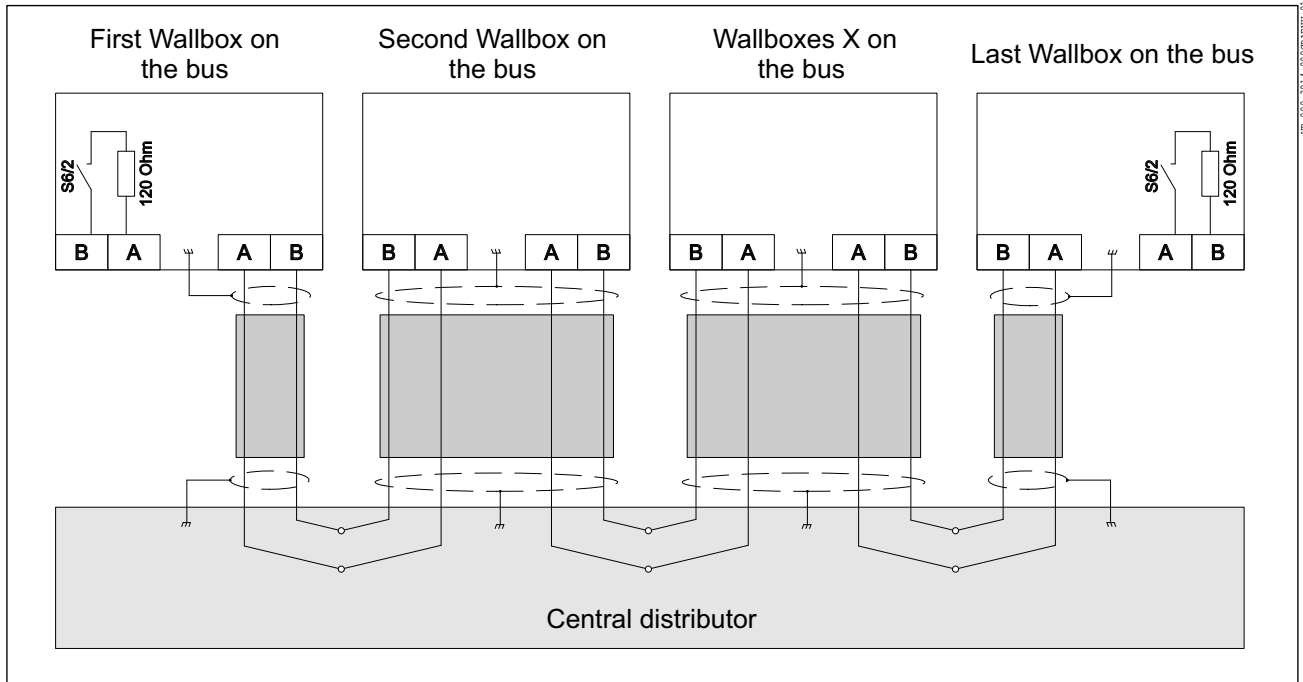
- 1 Shield support for the bus lines
- 2 Connection of power supply
- 3 Wires of the charging cable
- 4 Terminals for bus wires
- 5 Bus jacking

The individual wires of the power supply (Fig. 10/2) and of the charging cable (Fig. 10/3) should be laid at the greatest possible distance from the bus lines.

1. Strip approx. 7 cm insulation from the bus lines.
2. Expose the respective screen for the bus lines approx. 6 cm before the jacket end for approx. 15 mm.
3. Fasten the exposed shields to the shield support with one or two cable ties (Fig. 10/1).
4. Strip two individual wires approx. 8 mm and connect these to the appropriate terminals (Fig. 10/4).
5. Cut the single wires not used off at the jacket end.

The bus lines must be jacketed between the shield support and connection board (Fig. 10/5).

1.7.2 Bus system with central wiring in distributor



NF\_000\_3014\_000ABRD\_01

Fig. 11 Example of central wiring

With central wiring, one bus line is routed from each wallbox to a central distributor. There, the bus lines must be wired using terminal strips.

With central wiring, four wires are used for each bus line. Exception: first and last wallbox in the system network. There, only two wires are used.

The shields of the individual bus lines must be connected in the central distributor.

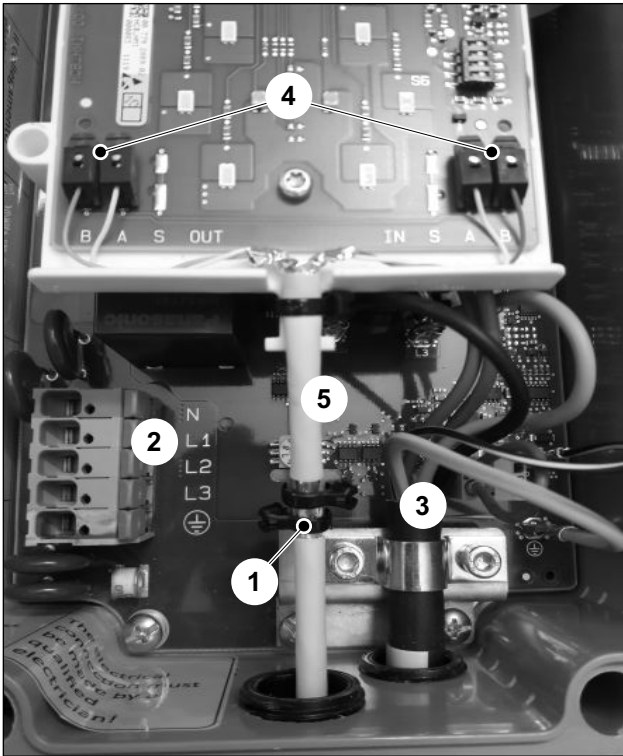


Fig. 12 Line routing for central wiring

- 1 Shield support for the bus line
- 2 Connection of power supply
- 3 Wires of the charging cable
- 4 Terminals for bus wires
- 5 Bus jacketing

The individual wires of the power supply (Fig. 12/2) and of the charging cable (Fig. 12/3) should be laid at the greatest possible distance from the bus lines.

1. Strip approx. 7 cm insulation from the bus line.
2. Expose the shield of the bus line approx. 6 cm before the jacket end for approx. 15 mm.
3. Fasten the exposed shield to the shield support with one or two cable ties (Fig. 12/1).
4. Strip two individual wires approx. 8 mm apiece and connect these to the appropriate terminals (Fig. 12/4)
5. Cut off the individual wires not used at the jacket end.

The bus line must be jacketed between the shield support and connection board (Fig. 12/5).

### 1.7.3 S6/2, configuration, bus termination

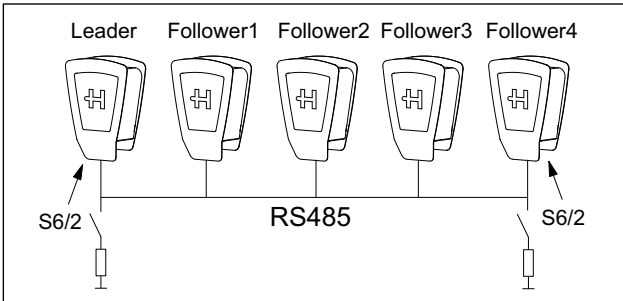


Fig. 13 Connecting the bus terminating resistors

The first and last wallbox on the RS485 bus must be connected with a terminating resistor. It is irrelevant here, if the wallbox is a leader or a follower wallbox.

This happens by connecting an installed terminating resistor via the microswitch S6/2 (Fig. 8) on the appropriate wallbox.

The switches S6/1, S6/3 and S6/4 are not used. These switches must be on OFF.

S6/2	
OFF	Bus termination inactive
ON	Bus termination active

Tab. 8

## 1.8 Checking load management

Once all the wallboxes have been electrically checked (see safety instructions, "Installation and checks"), properly configured and connected, the load management can then be put into operation.

► **Note**

During checking of the load management, no vehicle must be connected to any of the wallboxes.



- Connect the power supply for the wallboxes, starting with the leader -wallbox.
- The front illumination of each wallbox lights up for 5 min and then goes out.
- The load management is now ready for operation.

1.8.1 Diagnosis of load management via front illumination

In the event of a fault, e.g. communication error between leader wallbox and the corresponding follower wallbox, the front illumination flashes.

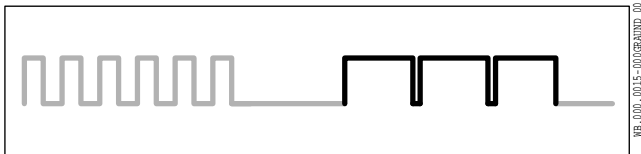


Fig. 14 Fault display

**Six times flashing white, pause, three times flashing blue (90% on, 10% off), pause**

This flashing sequence means that there is a communication error between the leader wallbox and the corresponding follower wallbox.

- Check the correct execution of the bus installation.

After the fault has been eliminated and a self-test, the front illumination lights up white. The vehicle can request the charging process.

If the fault is still there, please contact the hotline.

1.8.2 Contact address/Customer Sales Representative

Hotline: +496222 82 2266

E-mail: wallbox@heidelberg.com

1.9 Table for checking configuration of leader wallbox

You can enter all relevant configuration/installation information in the following tables.

Distribu- tor	F	L1	L2	L3	FI	Wallbox number	S1 $I_{max}$	S2 $I_{sysmax}$	S3 $I_{min}$	S4 Number of follow- ers	S5/3 Lock	S5/4 Leader/ Follower	S6/2 Bus ter- mination
		L1	L2	L3								1	

Tab. 9

1.10 Table for checking configuration of follower wallboxes

Distribu- tor	F	L1	L2	L3	FI	wallbox number	S1 $I_{max}$	S2 $I_{sysmax}$	S3 $I_{min}$	S4 Bus-ID	S5/3 Lock	S5/4 Leader/ Follower	S6/2 Bus ter- mination
		L2	L3	L1				0		1	0	0	
		L3	L1	L2				0		2	0	0	
		L1	L2	L3				0		3	0	0	
		L2	L3	L1				0		4	0	0	

Distribu- tor	F	L1	L2	L3	FI	wallbox number	S1 $I_{\max}$	S2 $I_{\text{sysmax}}$	S3 $I_{\min}$	S4 Bus-ID	S5/3 Lock	S5/4 Leader/ Follower	S6/2 Bus ter- mination
		L3	L1	L2				0		5	0	0	
		L1	L2	L3				0		6	0	0	
		L2	L3	L1				0		7	0	0	
		L3	L1	L2				0		8	0	0	
		L1	L2	L3				0		9	0	0	
		L2	L3	L1				0		10	0	0	
		L3	L1	L2				0		11	0	0	
		L1	L2	L3				0		12	0	0	
		L2	L3	L1				0		13	0	0	
		L3	L1	L2				0		14	0	0	
		L1	L2	L3				0		15	0	0	

Tab. 10