

CEAG Battery Cabinets

Mounting and Operating Instructions CEAG Battery Cabinets

Target group, part 1: Qualified electricians acc. to DIN VDE 0105, part 1

Target group, part 2: Electrical instructed persons



EATON

Powering Business Worldwide

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Important Notes

1 General Information

1.1 Description of Symbols

Important safety notes are marked with symbols in these instructions.

These stated notes have to be observed essentially.

WARNING!

Risk of Injury or Death! Signifies notes which, when not observed, can cause impairment of health, (steady) injury or death.

ATTENTION! **DAMAGE TO PROPERTY!**

Signifies notes which, when not observed, can cause damage to property and even the collapse of the system.

NOTE!

Includes important hints and advice that is important for failure-free operation.

1.2 Information regarding these instructions

These operating instructions show the safe and proper handling of the battery. The stated safety notes and instructions as well as the local accident prevention- and safety regulations have to be observed.

Before working with the battery, the instructions have to be read carefully, especially the chapter "Safety instructions".

1.3 Further Applicable Documents

In the battery systems, components from other manufacturers are mounted (batteries). These purchasing – components are checked according to danger evaluation by the manufacturer. They declare the compliance of the construction with the European and national regulations.

1.4 Liability and Guarantee

All information and notes in these instructions are compiled according to the valid regulations, the state of the art, our long-standing knowledge and experience.

Keep the instructions near to the battery system, accessible for every person working with the battery and at all times.

Read the instructions carefully before working on and with the battery!

1.5 Copyright Protection

All information from the contents, text, drawings, pictures and further representations are protected with regard to copy-right.

1.6 Spare Parts

Only use original spare parts from the manufacturer.

ATTENTION!

Wrong or faulty spare parts can cause damage, failure or collapse of the system. Take care to ensure the same charging state when changing the battery blocs.

When using unapproved spare parts, all guarantee, service, damage and liability claims are forfeited.

RECOMMENDATION:

Not more than 25% of the battery packs of a battery set should be replaced. Therefore with 18 packs not more than 5 packs should be replaced.

When 50% of the expected service life is exceeded and single battery packs fail, the complete set should be replaced.

1.7 Recycling

Lead-acid batteries are recyclable products. Recognising the need to be involved in the whole life-cycle of a battery and to protect the environment, EXIDE Technologies factories recycle used lead.

Contact your CEAG Notlichtsysteme representative who will advise you on this matter.

This is also valid for used blocks.

For the transport of used accumulators special regulations set out, so it is recommended to commission

a special transport or trade company for issuing the freight documents and packing this material!!

2 Safety

The battery is designed and built in conformity with the latest technical rules at the time of its development and production, so it is safe to operate. Danger may be presented by the battery, if it will be used for other than the intended purpose and by unskilled personnel.

For any operation on the batteries, from storage to recycling, the following safety rules should be observed:

- Read the „Installation Instructions“ and „Operating Instructions“ of stationary closed lead acid batteries carefully.
- Do not smoke.
- Even when disconnected, a battery remains charged. The metal parts of the battery are always electrically active.
- Use insulated tools.

- Never place tools on the batteries (metal tools are particularly dangerous).
- Check the starting torque of the block connector when the bolted assembly is insecure (see Appendix).
- Never lift the cells / monoblocs at the terminals.
- Avoid shocks.
- Never use synthetic cloth or sponge to clean the cells / monoblocs. Use water (wet cloth) without additives.
- Discard metallic items like watches or jewelry.

2.1 Intended Use

Battery cabinets are exclusively for power supply to an emergency lighting system.

The operating safety can only be guaranteed by intended use of the battery cabinet / battery racks.

! ATTENTION!

Every use beyond or different than the intended purpose is prohibited, and therefore not in accordance with regulations! Battery cabinets are exclusively for emergency – power supply.

2.2 Contents of Operating Instructions

Every person, ordered to work with the battery, has to read the instructions carefully to understand them before work begins. This takes also place when the person has already worked with a similar kind of battery or was instructed by the manufacturer.

2.3 Changes and Modifications to the Battery

To avoid danger and to assure optimum performance, changes and modifications to the battery are not allowed, except when the manufacturer has approved them.

2.4 Responsibility of the Operator

Keep the instructions near to the battery system, accessible for every person working with the battery and at all times.

Battery must be in a proper and safe condition when using it. Battery has to be checked for intactness before using it.

Adhere to the information of the instructions completely!

2.5 Personnel Requirements

Only authorised and skilled personnel are allowed to work on and with the battery. The personnel must have received instructions regarding the existing danger.

Skilled personnel refers to those with expert training, with knowledge and experience as well as knowledge of the relevant regulations. He should be able to evaluate his work and recognize the presence of danger.

Personnel without the necessary knowledge must be trained.

2.6 Operational Safety

Observing the stated safety instructions and regulations can avoid damage to property and people when working with the battery.

2.7 Personal Protective Equipment

When working on and with the battery it is necessary to wear:



Protective Clothes Close fitting protective clothes (low tensile strength, no wide arms, no rings and further jewelry, etc.).



Safety Boots Boots electrostatic conductive according to EN 345.



Safety Goggles For protecting the eyes and the face.



Protective Gloves For protecting the skin.

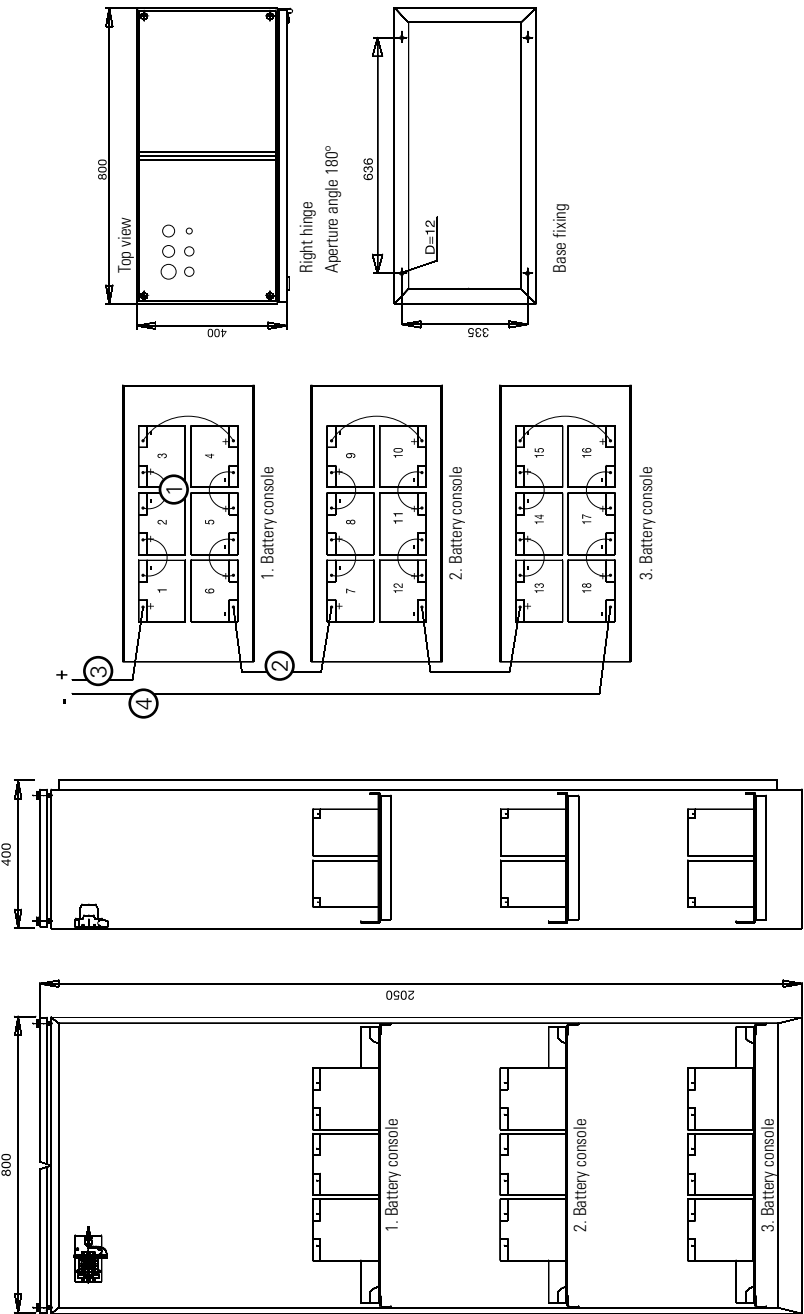
2.8 Danger caused by the Battery

The battery was subjected to a danger analysis. Therefore the construction and design of the battery meets the actual state of the art. With proper handling the battery is operationally safe.



3 Technical Data / Battery Installation

3.1 Standard - Battery Cabinets
3.1.1 Standard - Battery Cabinet 23.3 Ah

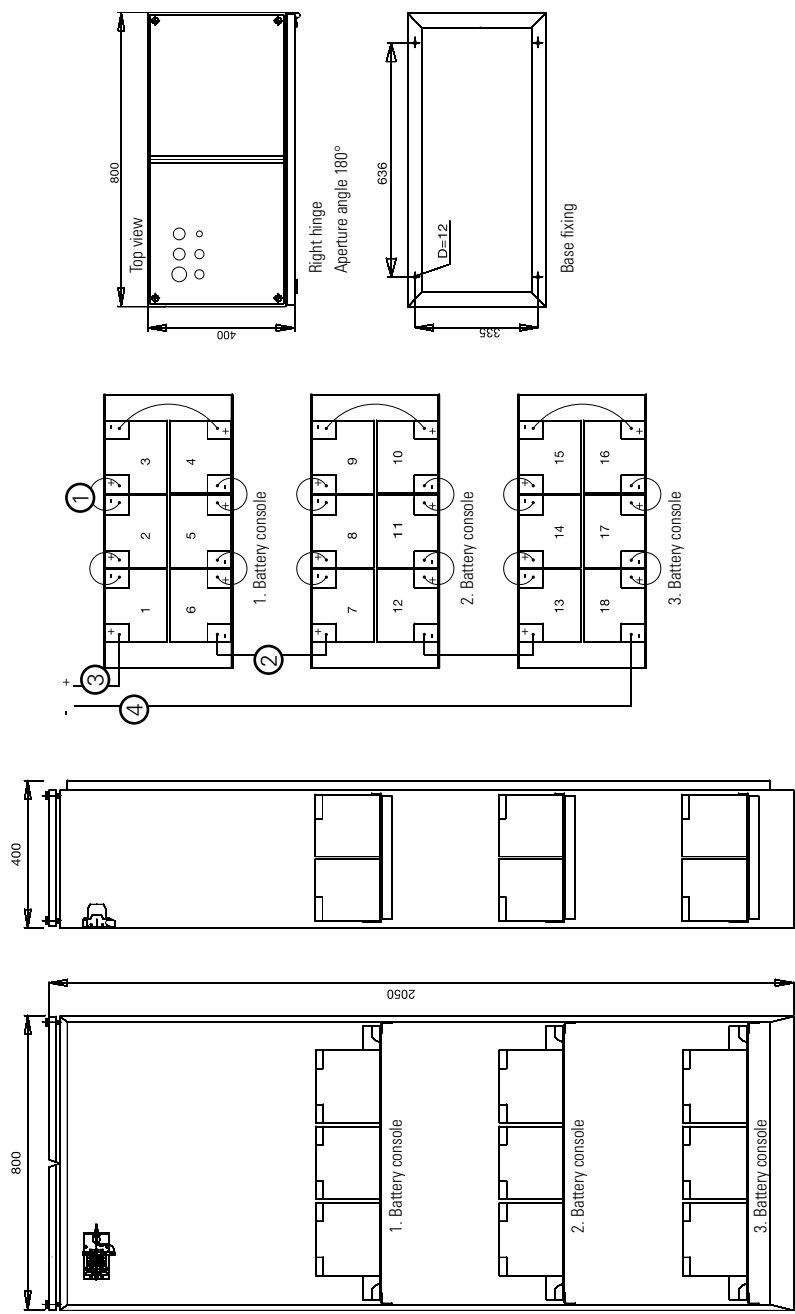


For interconnection see chapter „Circuit Diagrams“

Wiring Set 4 0071 346 779 included			
No.	Length	Number	
1	300 mm	15	
2	1000 mm	2	
3	800 mm	1	
4	2000 mm	1	

Technical Data	
Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 23.3 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	168 x 127 x 174
final pole	M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	295 kg
Dimensions in mm (W x H x D)	800 x 2050 x 400
Order no. batterie bloc	40066070461
Protection calss	IP 20

3.1.2 Standard-Battery Cabinet 32 Ah



For interconnection see chapter „Circuit Diagrams“

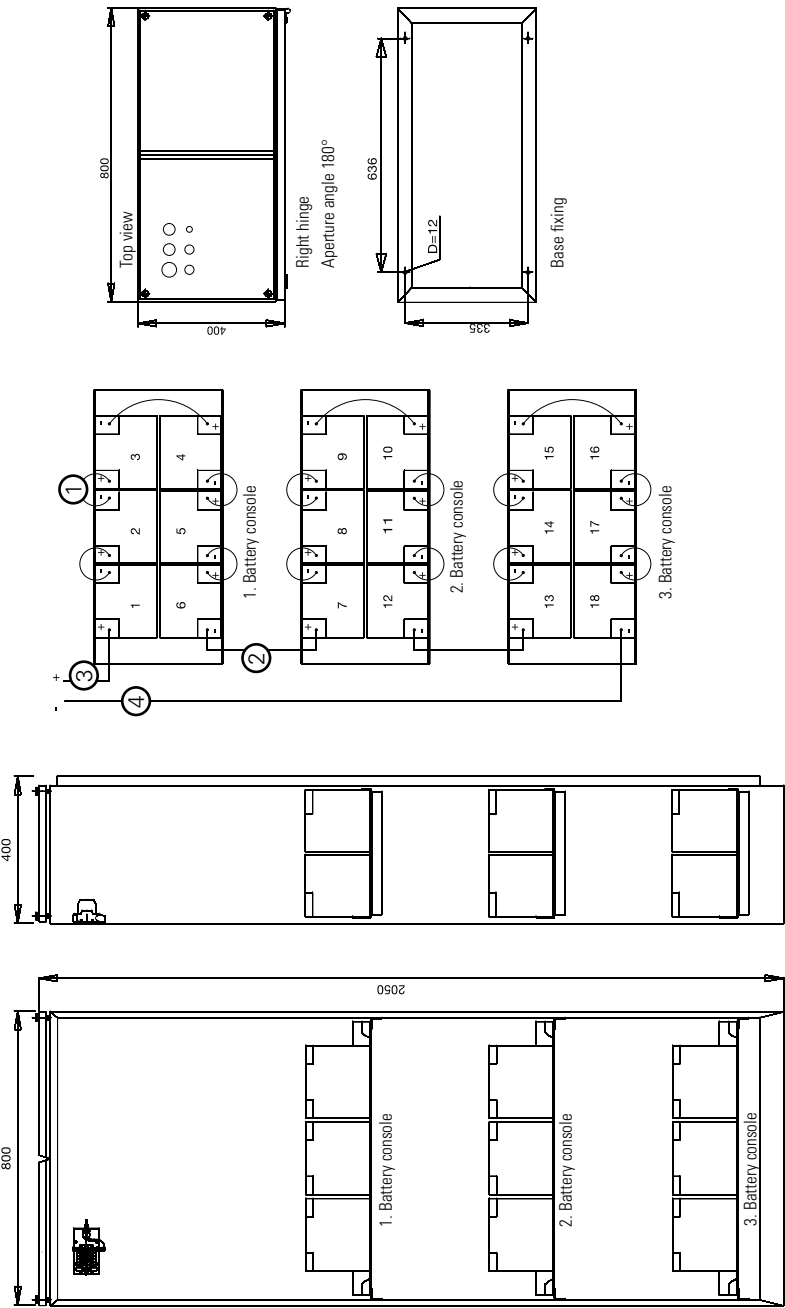
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 32 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	198 x 168 x 175
final pole	M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	370 kg
Dimensions in mm (W x H x D)	800 x 2050 x 400
Order no. batterie bloc	40066070116
Protection calss	IP 20

Wiring Set 4 0071 346 779 included

No.	Length	Number
1	300 mm	15
2	1000 mm	2
3	800 mm	1
4	2000 mm	1

3.1.3 Standard-Battery Cabinet 39.8 Ah



For interconnection see chapter „Circuit Diagrams“

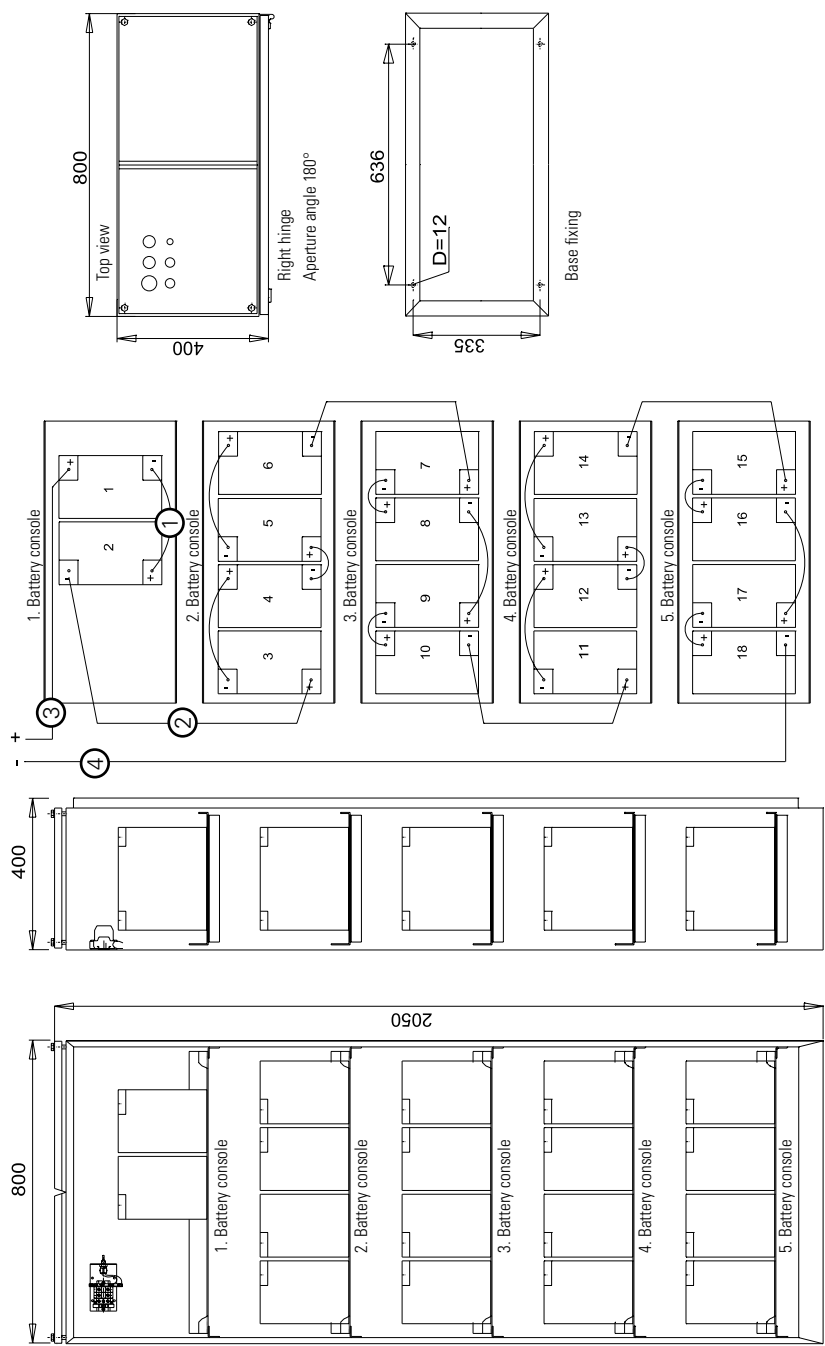
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 39.8 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	200 x 169 x 176
final pole	M-M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	388 kg
Dimensions in mm (W x H x D)	800 x 2050 x 400
Order no. batterie bloc	4006041395
Protection calss	IP 20

Wiring Set 4 0071 346 779 included

No.	Length	Number
1	300 mm	15
2	1000 mm	2
3	800 mm	1
4	2000 mm	1

3.1.4 Standard-Battery Cabinet 50.4 Ah



For interconnection see chapter „Circuit Diagrams“

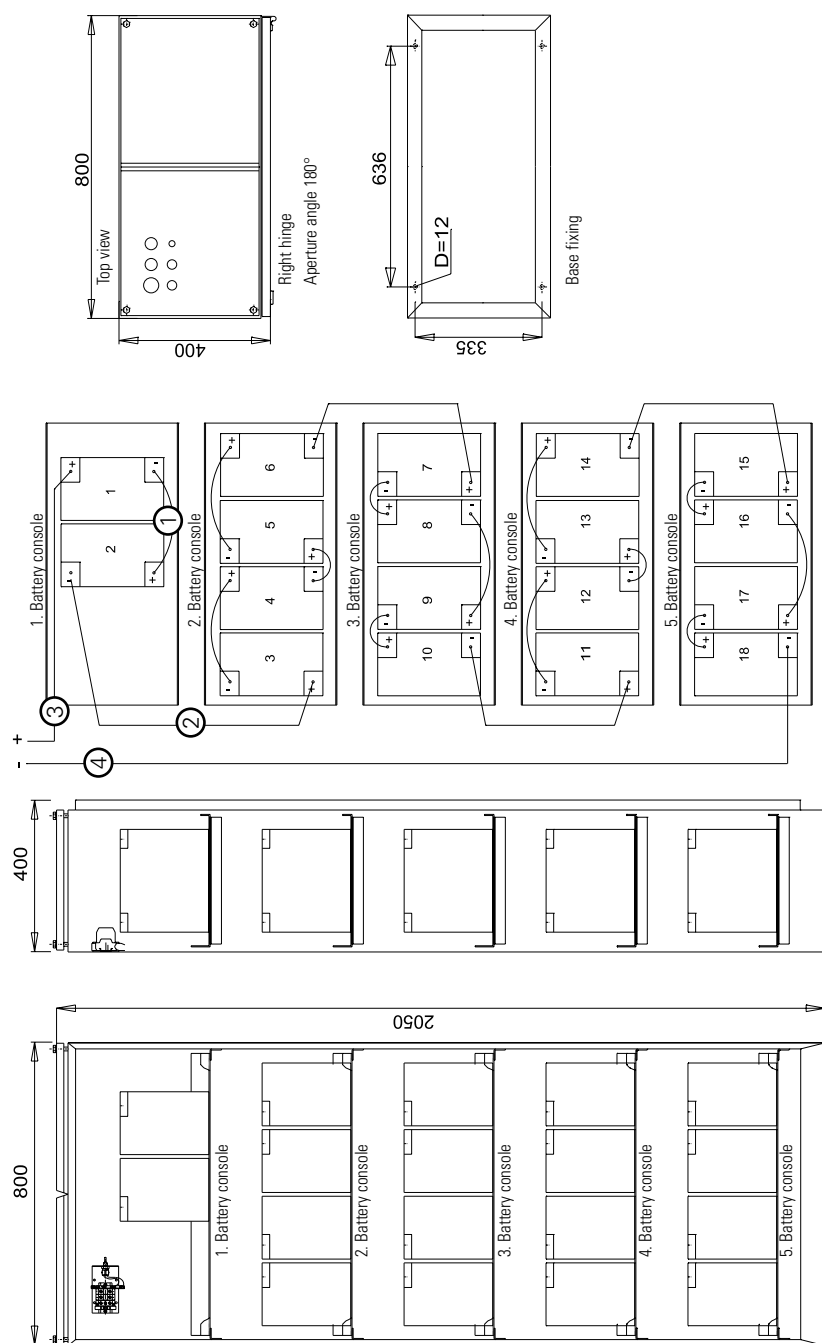
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 50.4 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	220 x 172 x 235
final pole	F-M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	495 kg
Dimensions in mm (W x H x D)	800 x 2050 x 400
Order no. batterie bloc	40066070917
Protection calss	IP 20

Wiring Set 4 0071 347 446 included

No.	Length	Number
1	360 mm	13
2	800 mm	4
3	800 mm	1
4	2000 mm	1

3.1.5 Standard-Battery Cabinet 53.7 Ah



For interconnection see chapter „Circuit Diagrams“

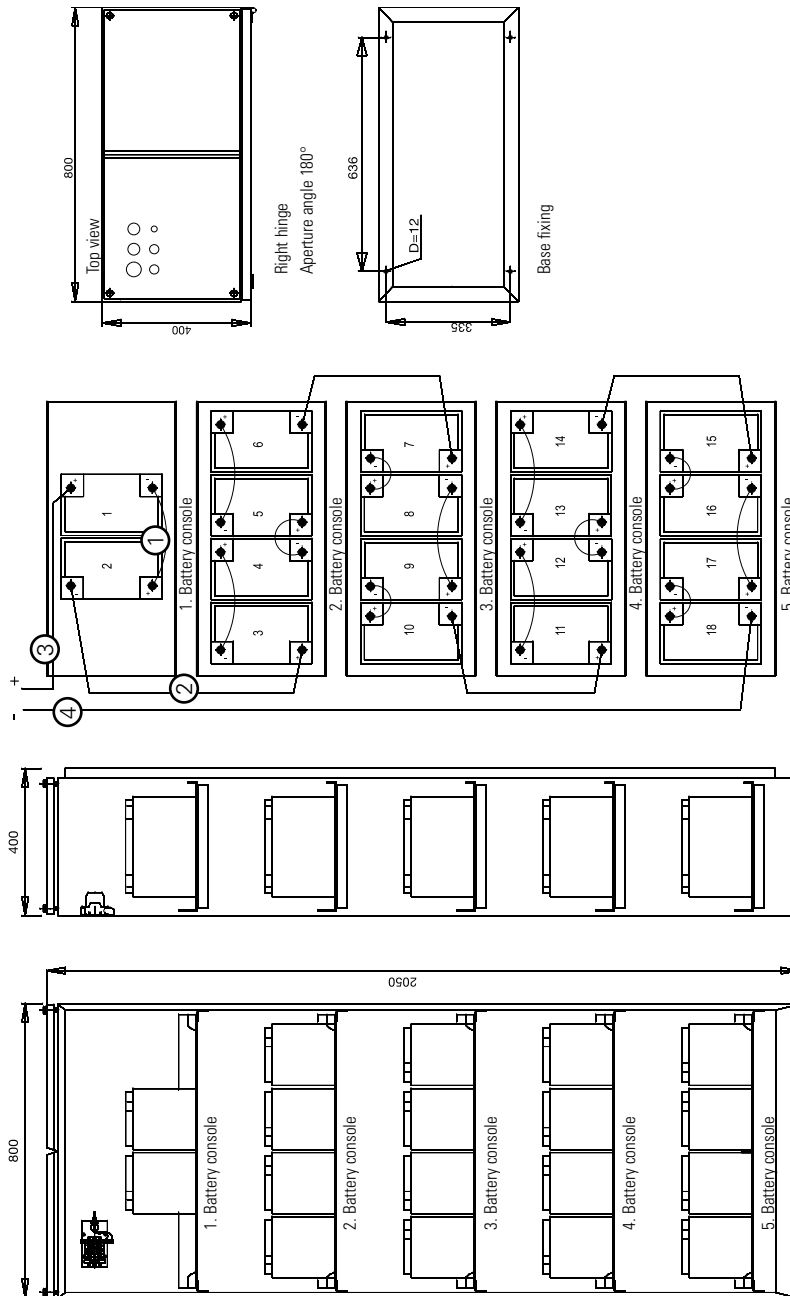
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 53.7 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	220 x 172 x 235
final pole	F-M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	549 kg
Dimensions in mm (W x H x D)	800 x 2050 x 400
Order no. batterie bloc	40066070901
Protection class	IP 20

Wiring Set 4 0071 347 446 included

No.	Length	Number
1	360 mm	13
2	800 mm	4
3	800 mm	1
4	2000 mm	1

3.1.6 Standard-Battery Cabinet 66.2 Ah



For interconnection see chapter „Circuit Diagrams“

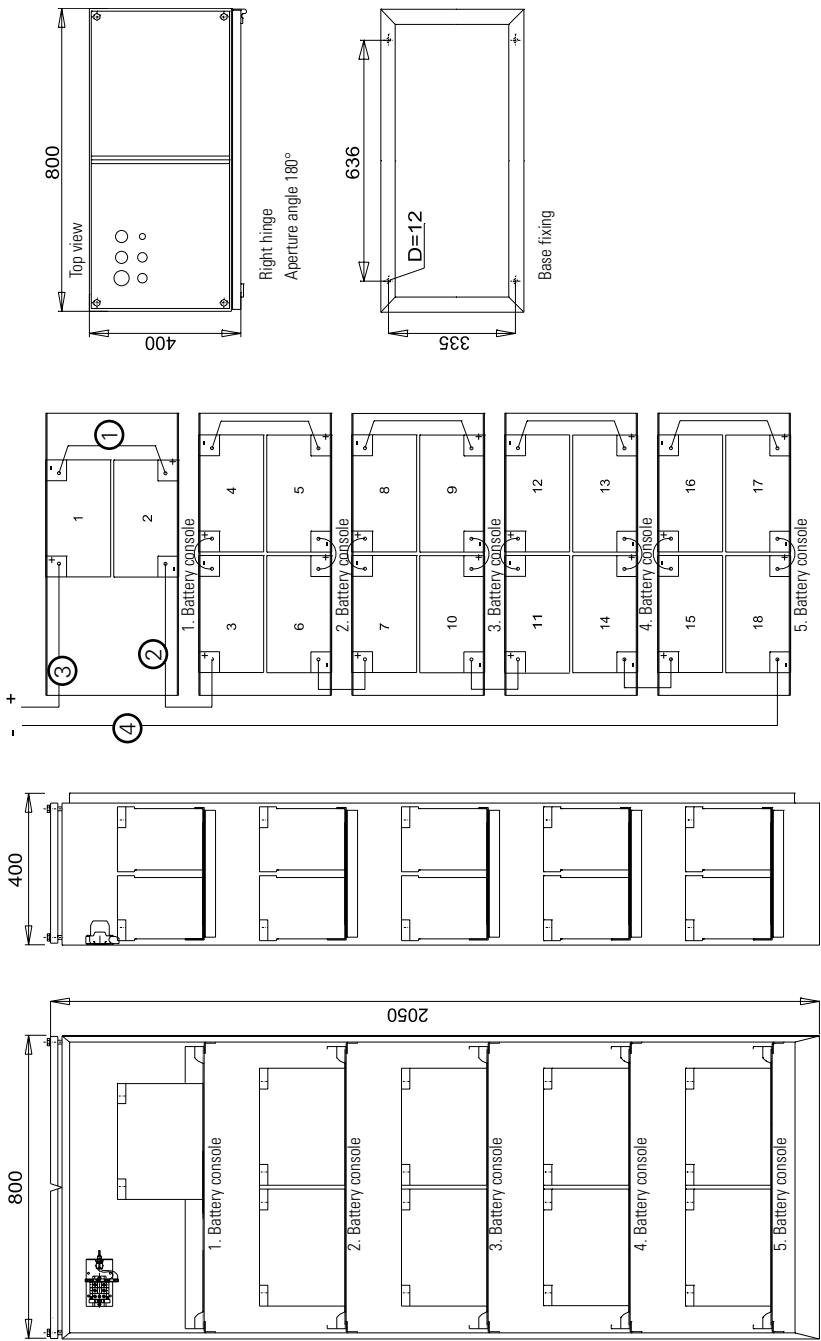
Wiring Set 4 0071 346 778 included

No.	Length	Number
1	440 mm	13
2	800 mm	4
3	800 mm	1
4	2000 mm	1

Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 66.2 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	260.5 x 171 x 239
final pole	M-M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	672 kg
Dimensions in mm (W x H x D)	800 x 2050 x 4000
Order no. batterie bloc	40066070902
Protection calss	IP 20

3.1.7 Standard-Battery Cabinet 85.7 Ah



For interconnection see chapter „Circuit Diagrams“

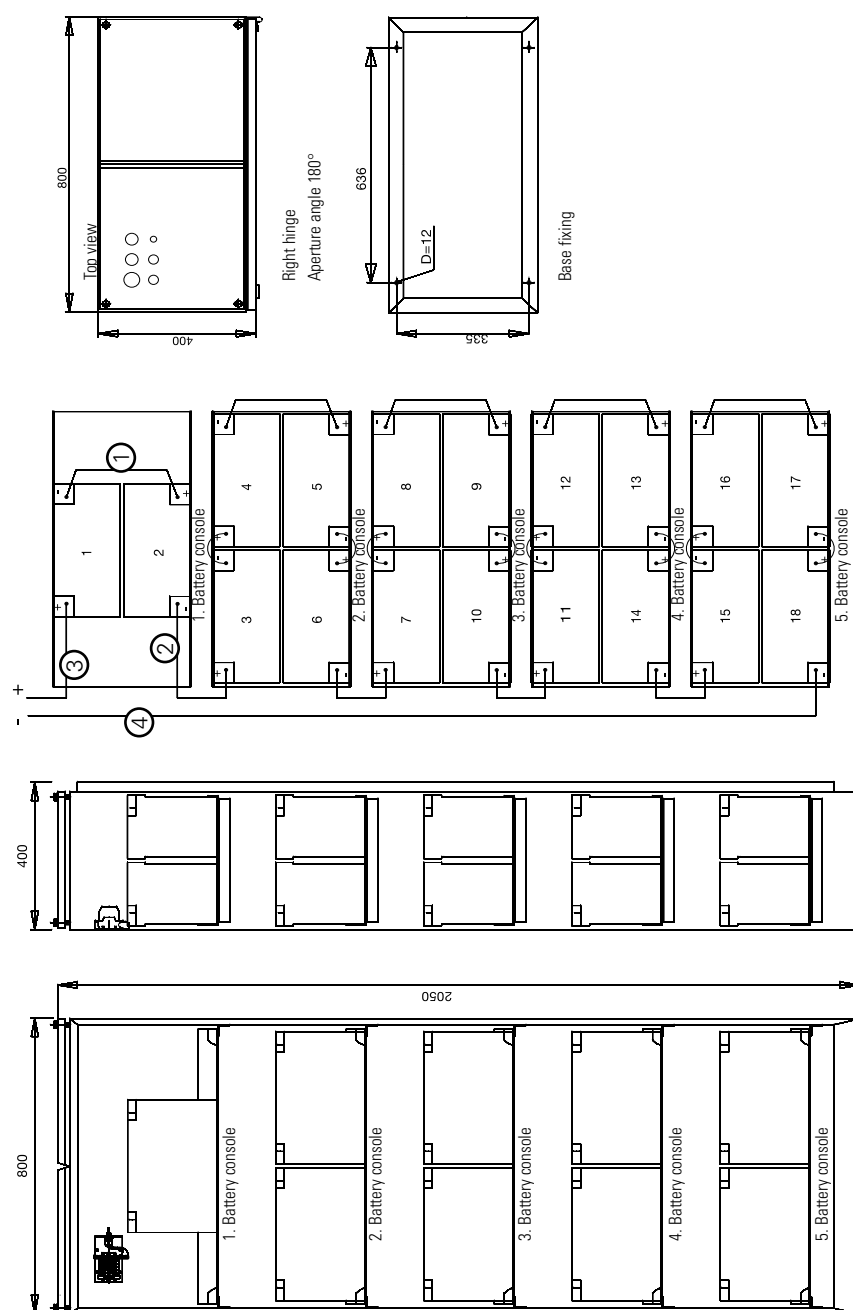
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 85.7 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	309 x 172 x 239
final pole	M-M8
Supply terminals	max. 35 mm²
Weight incl. Batteries	685 kg
Dimensions in mm (W x H x D)	800 x 2050 x 400
Order no. batterie bloc	40066070918
Protection caiss	IP 20

Wiring Set 4 0071 360 230 included

No.	Length	Number
1	350 mm	13
2	800 mm	4
3	800 mm	1
4	2000 mm	1

3.1.8 Standard-Battery Cabinet 89.4 Ah



For interconnection see chapter „Circuit Diagrams“

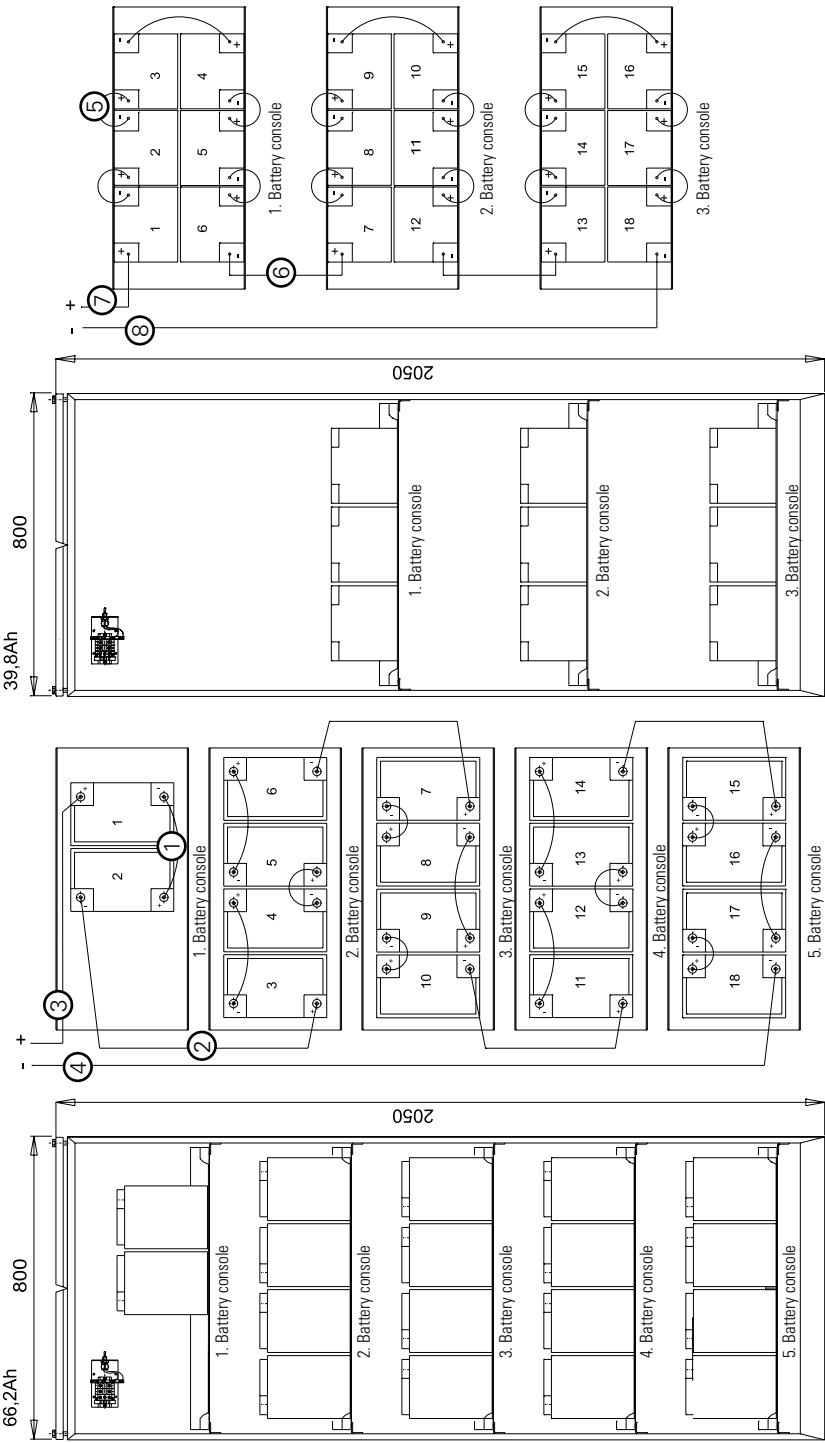
Wiring Set 4 0071 360 230 included

No.	Length	Number
1	350 mm	13
2	800 mm	4
3	800 mm	1
4	2000 mm	1

Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 89.4 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	307.5x 171 x 239
final pole	M6
Supply terminals	max. 35 mm ²
Weight incl. Batteries	750 kg
Dimensions in mm (W x H x D)	800 x 2050 x 400
Order no. batterie bloc	40066070821
Protection calss	IP 20

3.1.9 Standard-Battery Cabinet 106 Ah



For interconnection see chapter „Circuit Diagrams“

Standard-Battery Cabinet 106 Ah

The battery cabinets 106 Ah will be built of two parallel connected cabinets 39.8 and 66.2 Ah by using the battery distribution panel (40071360203) according to mounting circuit diagram.

Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 106 Ah
Rated voltage of all batteries	216 V
Number of all batteries	36 á 12 V
Battery dimensions in mm (W x H x D) 39.8 Ah	200 x 169 x 176
Battery dimensions in mm (W x H x D) 66.2 Ah	260.5 x 171 x 239
final pole	M-M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	1060 kg
Dimensions in mm (W x H x D)	2 x (800 x 2050 x 400)
Order no. of battery bloc 39.8 Ah	40066041395
Order no. of battery bloc 66.2 Ah	40066070902
Protection calss	IP 20

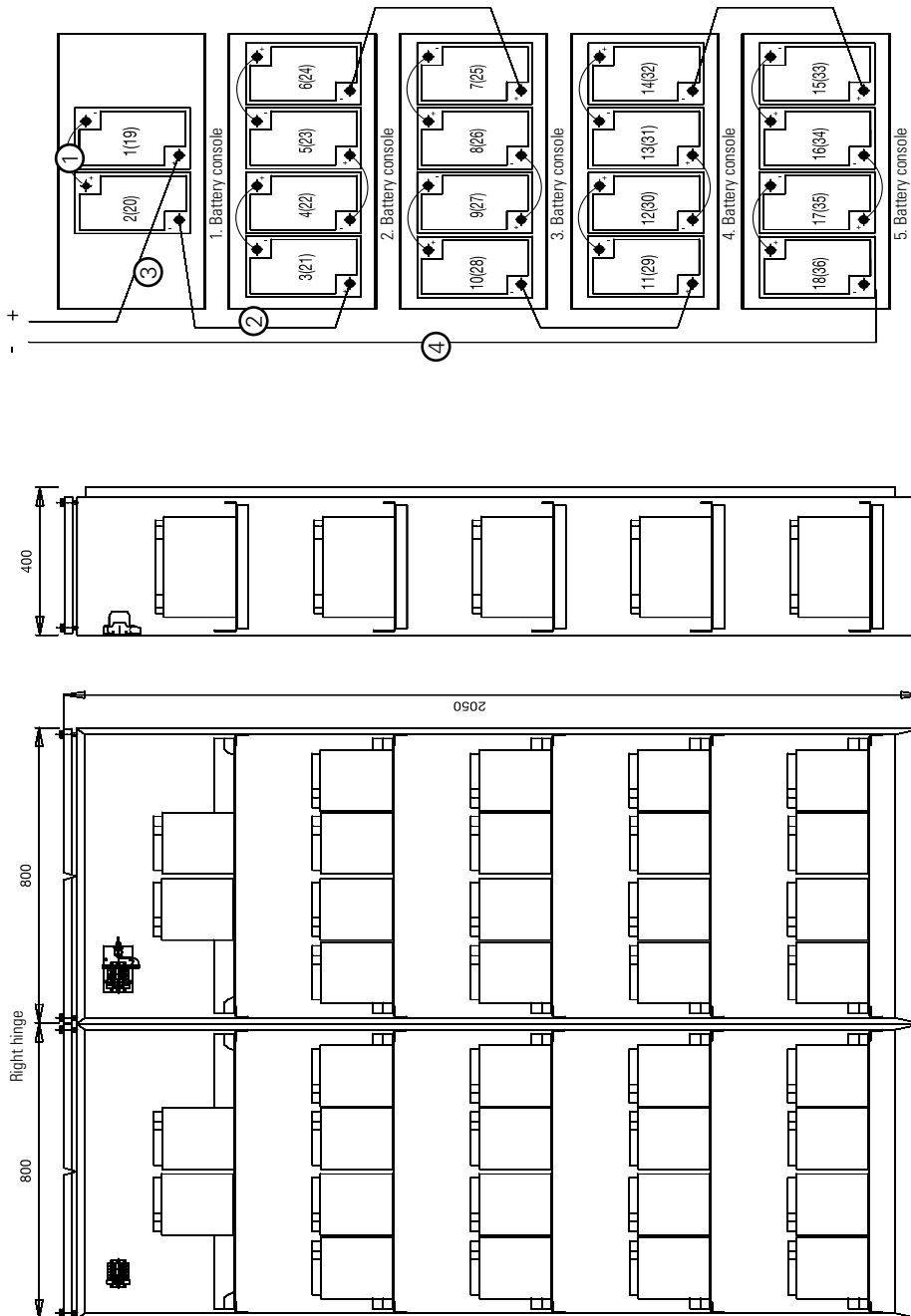
Wiring Set 4 0071 346 778 included

No.	Length	Number
1	440 mm	13
2	800 mm	4
3	800 mm	1
4	2000 mm	1

Wiring Set 4 0071 346 779 included

No.	Length	Number
5	300 mm	15
6	1000 mm	2
7	800 mm	1
8	2000 mm	1

3.1.10 Standard-Battery Cabinet 118 Ah



For interconnection see chapter „Circuit Diagrams“

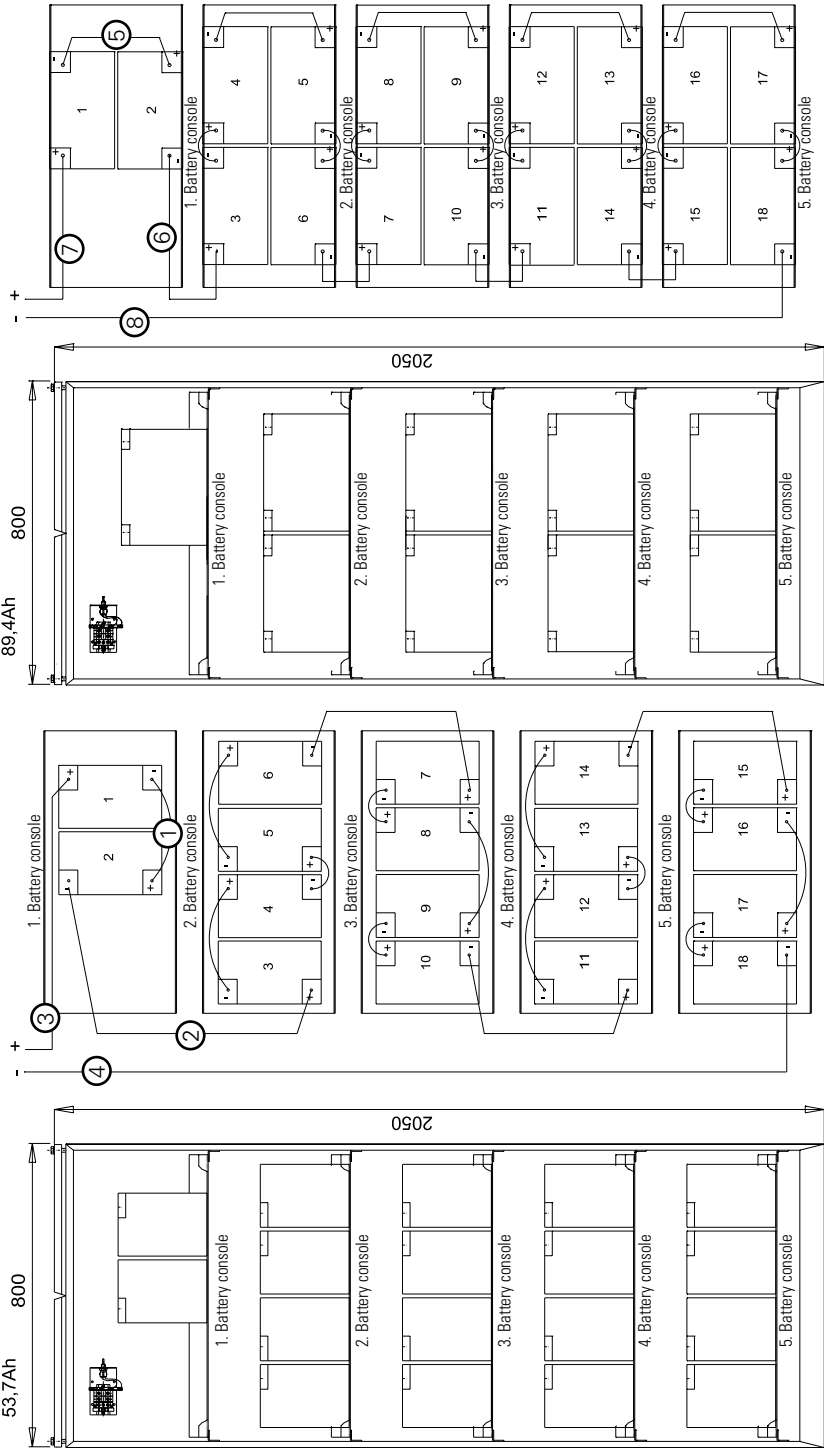
Wiring Set 4 0071 346 775 included

No.	Length	Number
1	350 mm	26
2	800 mm	8
3	800 mm	2
4	2000 mm	2

Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	6 V / 118 Ah
Rated voltage of all batteries	216 V
Number of all batteries	36 á 6 V
Battery dimensions in mm (L x W x H)	272 x 166 x 190
final pole	M8
Supply terminals	max. 35 mm ²
Weight incl. Batteries	1200 kg
Dimensions in mm (W x H x D)	2 x (800 x 2050 x 400)
Order no. batterie bloc	40066070466
Protection calss	IP 20

3.1.11 Standard-Battery Cabinet 143.1 Ah



For interconnection see chapter „Circuit Diagrams“

Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 143.1 Ah
Rated voltage of all batteries	216 V
Number of all batteries	36 á 12 V
Battery dimensions in mm (W x H x D)	220 x 172 x 235
Battery dimensions in mm (W x H x D)	89.4 Ah 307.5 x 171 x 239
final pole	F-M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	1300 kg
Dimensions in mm (W x H x D)	2 x (800 x 2050 x 400)
Order no. of battery bloc 53.7 Ah	40066070901
Order no. of battery bloc 89.4 Ah	40066070821
Protection calss	IP 20

Standard-Battery Cabinet 143.1 Ah
The battery cabinets 143.1 Ah will be built of two parallel connected cabinets 53.7 and 89.4 Ah by using the battery distribution panel (40071360203) according to mounting circuit diagram.

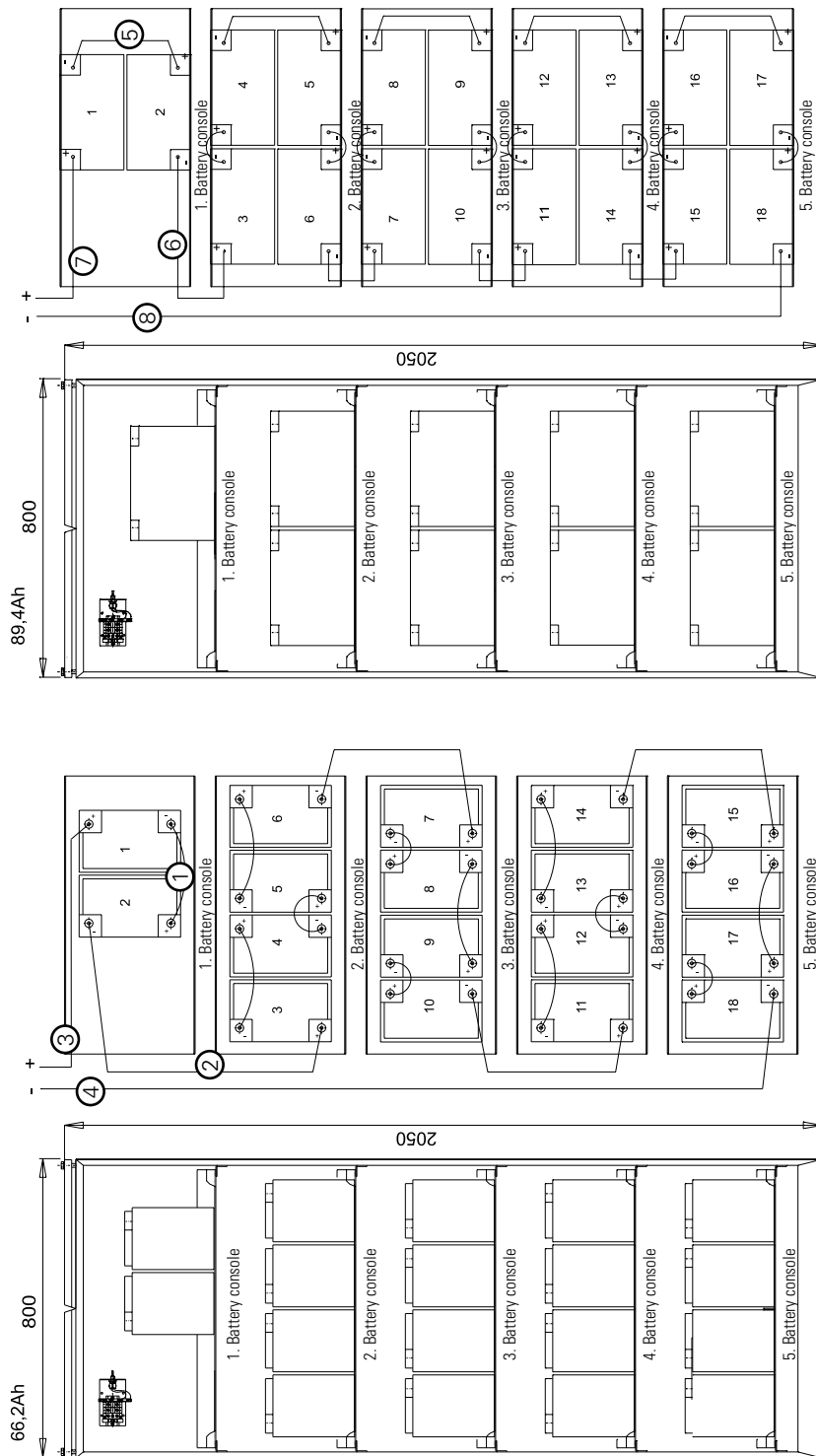
Wiring Set 4 0071 347 446 included

No.	Length	Number
1	360 mm	13
2	800 mm	4
3	800 mm	1
4	2000 mm	1

Wiring Set 4 0071 360 230 included

No.	Length	Number
5	350 mm	13
6	800 mm	4
7	800 mm	1
8	2000 mm	1

3.1.12 Standard-Battery Cabinet 155.6 Ah



For interconnection see chapter „Circuit Diagrams“

Wiring Set 4 0071 346 778 included

No.	Length	Number
1	440 mm	13
2	800 mm	4
3	800 mm	1
4	2000 mm	1

Wiring Set 4 0071 360 230 included

No.	Length	Number
5	350 mm	13
6	800 mm	4
7	800 mm	1
8	2000 mm	1

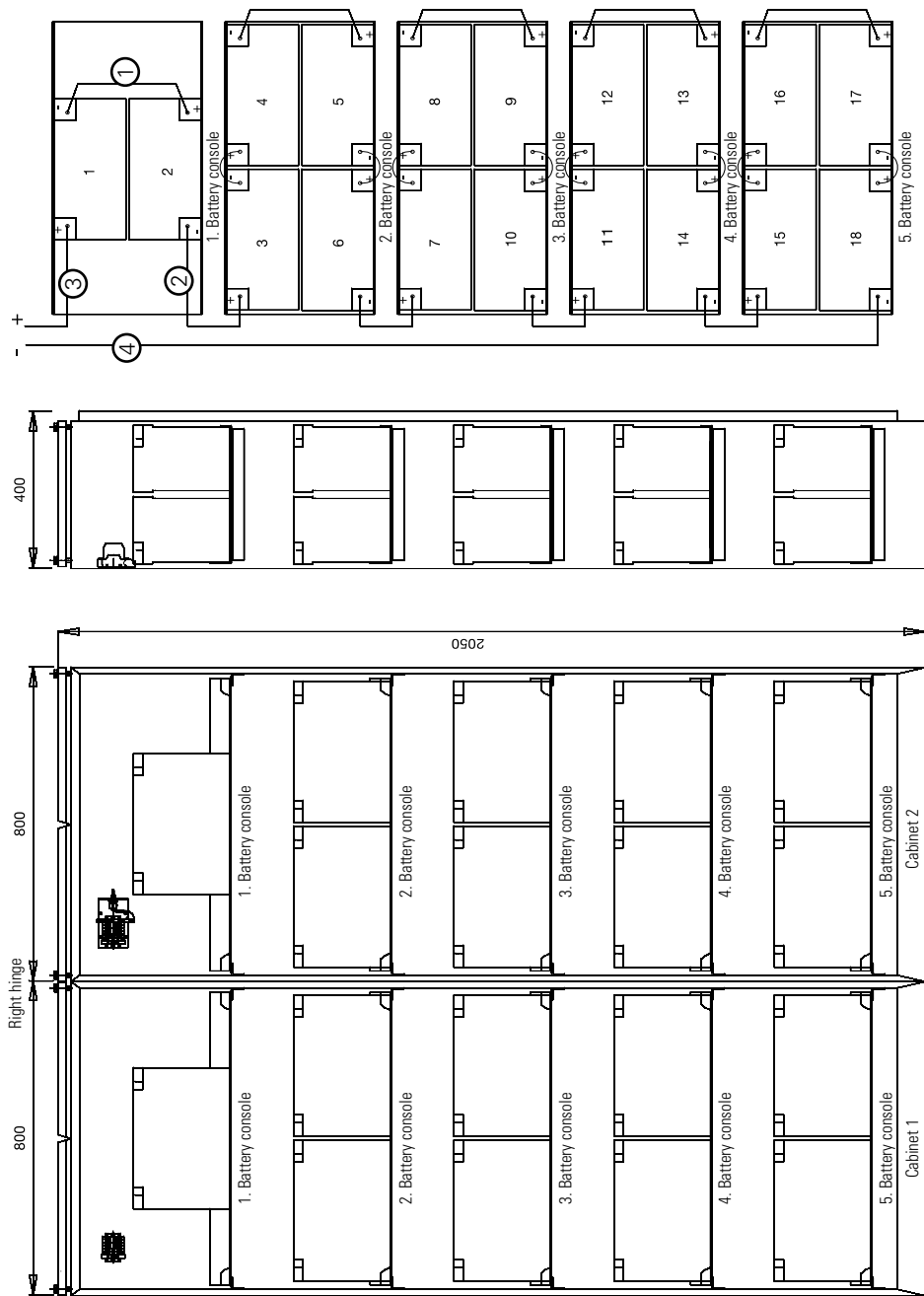
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 155.6 Ah
Rated voltage of all batteries	216 V
Number of all batteries	36 á 12 V
Battery dimensions in mm (W x H x D)	260.5 x 171 x 239
Battery dimensions in mm (W x H x D)	307.5 x 171 x 239
final pole	M-M6
Supply terminals	max. 35 mm ²
Weight incl. Batteries	1422 kg
Dimensions in mm (W x H x D)	2 x (800 x 2050 x 400)
Order no. of battery bloc 66.2 Ah	40066070902
Order no. of battery bloc 89.4 Ah	40066070821
Protection class	IP 20

Standard-Battery Cabinet 155.6 Ah

The battery cabinets 155.6 Ah will be built of two parallel connected cabinets 66.2 and 89.4 Ah by using the battery distribution panel (40071360203) according to mounting circuit diagram.

3.1.13 Standard-Battery Cabinet 178.8 Ah



For interconnection see chapter „Circuit Diagrams“

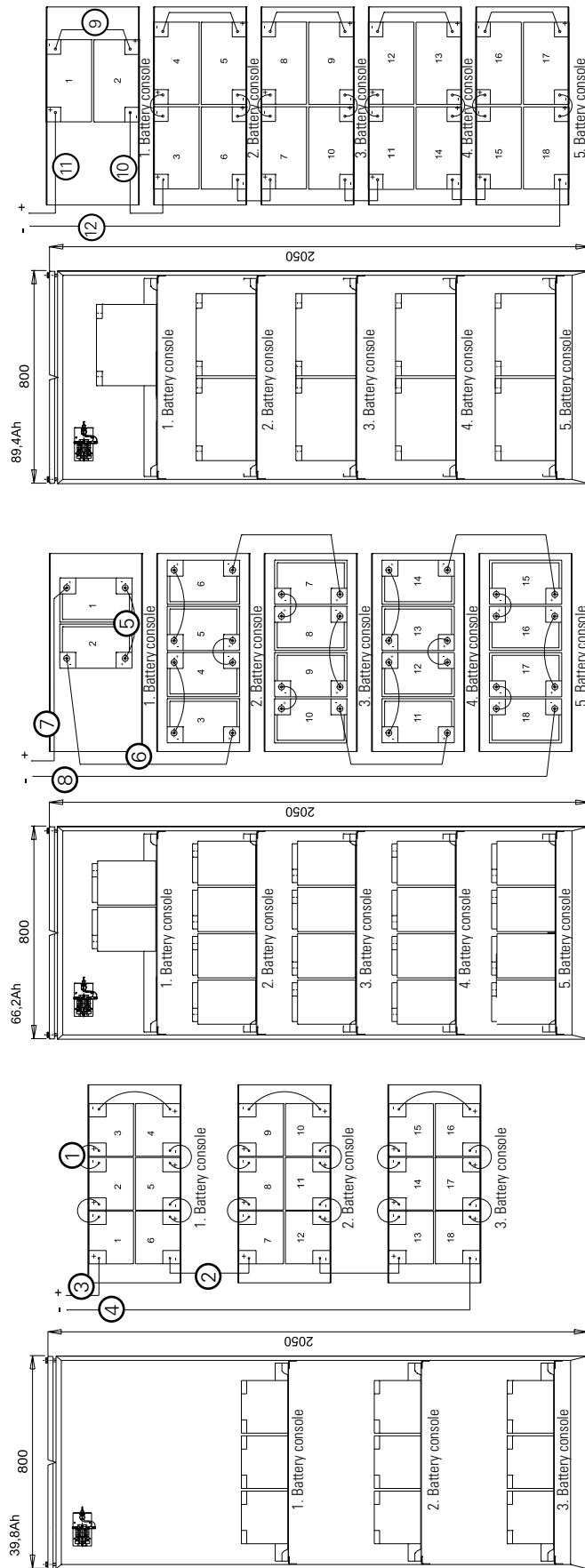
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 89.4 Ah
Rated voltage of all batteries	216 V
Number of all batteries	36 á 12 V
Battery dimensions in mm (W x H x D)	307.5 x 171 x 239
final pole	M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	1500 kg
Dimensions in mm (W x H x D)	2 x (800 x 2050 x 400)
Order no. of battery bloc	40066070821
Protection calss	IP 20

2 x Wiring Set 4 0071 360 230 included

No.	Length	Number
1	350 mm	13
2	800 mm	4
3	800 mm	1
4	2000 mm	1

3.1.14 Standard-Battery Cabinet 195.4 Ah



For interconnection see chapter „Circuit Diagrams“

Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 195.4 Ah
Rated voltage of all batteries	216 V
Number of all batteries	54 á 12 V
Battery dimensions in mm (L x W x H) 39.8 Ah	200 x 169 x 176
Battery dimensions in mm (L x W x H) 66.2 Ah	260.5 x 171 x 239
Battery dimensions in mm (L x W x H) 89.4 Ah	307.5 x 171 x 239
Final pole	M-M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	1810 kg
Dimensions in mm (W x H x D)	3 x (800 x 2050 x 400)
Order no. of battery bloc 39.8 Ah	40066041395
Order no. of battery bloc 39.8 Ah	40066070902
Order no. of battery bloc 89.4 Ah	40066070821
Protection class	IP 20

Standard-Battery Cabinet 195.4 Ah

The battery cabinets 195.4 Ah will be built of three parallel connected cabinets 39.8, 66.2 and 89.4 Ah by using the battery distribution panel (40071360204) according to mounting circuit diagram.

Wiring Set 4 0071 346 779 included

No.	Length	Number
1	300 mm	15
2	1000 mm	2
3	800 mm	1
4	2000 mm	1

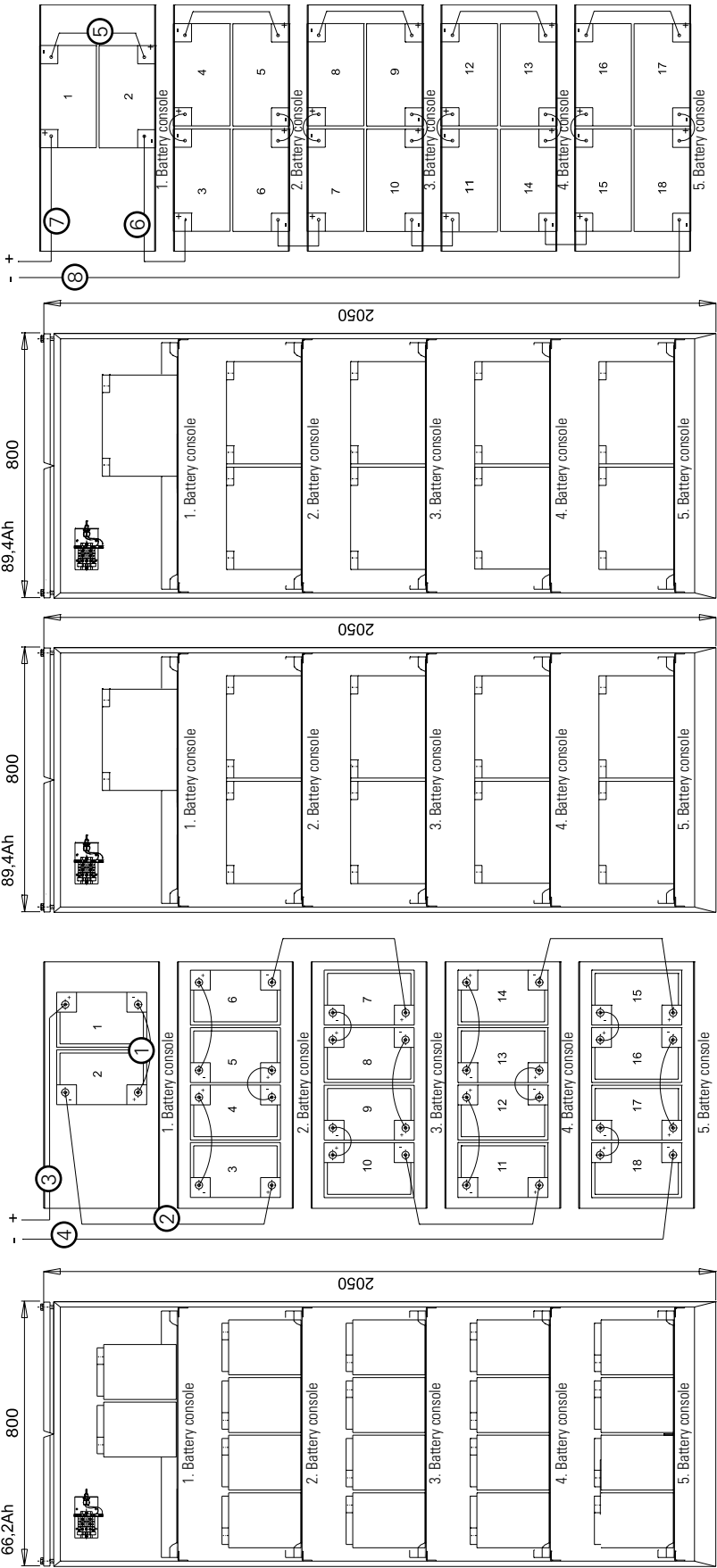
Wiring Set 4 0071 346 778 included

No.	Length	Number
5	440 mm	13
6	800 mm	4
7	800 mm	1
8	2000 mm	1

Wiring Set 4 0071 360 230 included

No.	Length	Number
9	350 mm	13
10	800 mm	4
11	800 mm	1
12	2000 mm	1

3.1.15 Standard-Battery Cabinet 245 Ah



For interconnection see chapter „Circuit Diagrams“

Standard-Battery Cabinet 245 Ah
The battery cabinets 245 Ah will be built of three parallel connected cabinets 66.2 and 2 x 89.4 Ah by using the battery distribution panel (40071360204) according to mounting circuit diagram.

Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 245 Ah
Rated voltage of all batteries	216 V
Number of all batteries	54 á 12 V
Battery dimensions in mm (L x W x H) 66.2 Ah	260.5 x 171 x 239
Battery dimensions in mm (L x W x H) 89.4 Ah	370.5 x 171 x 239 Ah
Final pole	M-M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	2172 kg
Dimensions in mm (W x H x D)	3 x (800 x 2050 x 400)
Order no. of battery bloc 39.8 Ah	40066070902
Order no. of battery bloc 89.4 Ah	40066070821
Protection class	IP 20

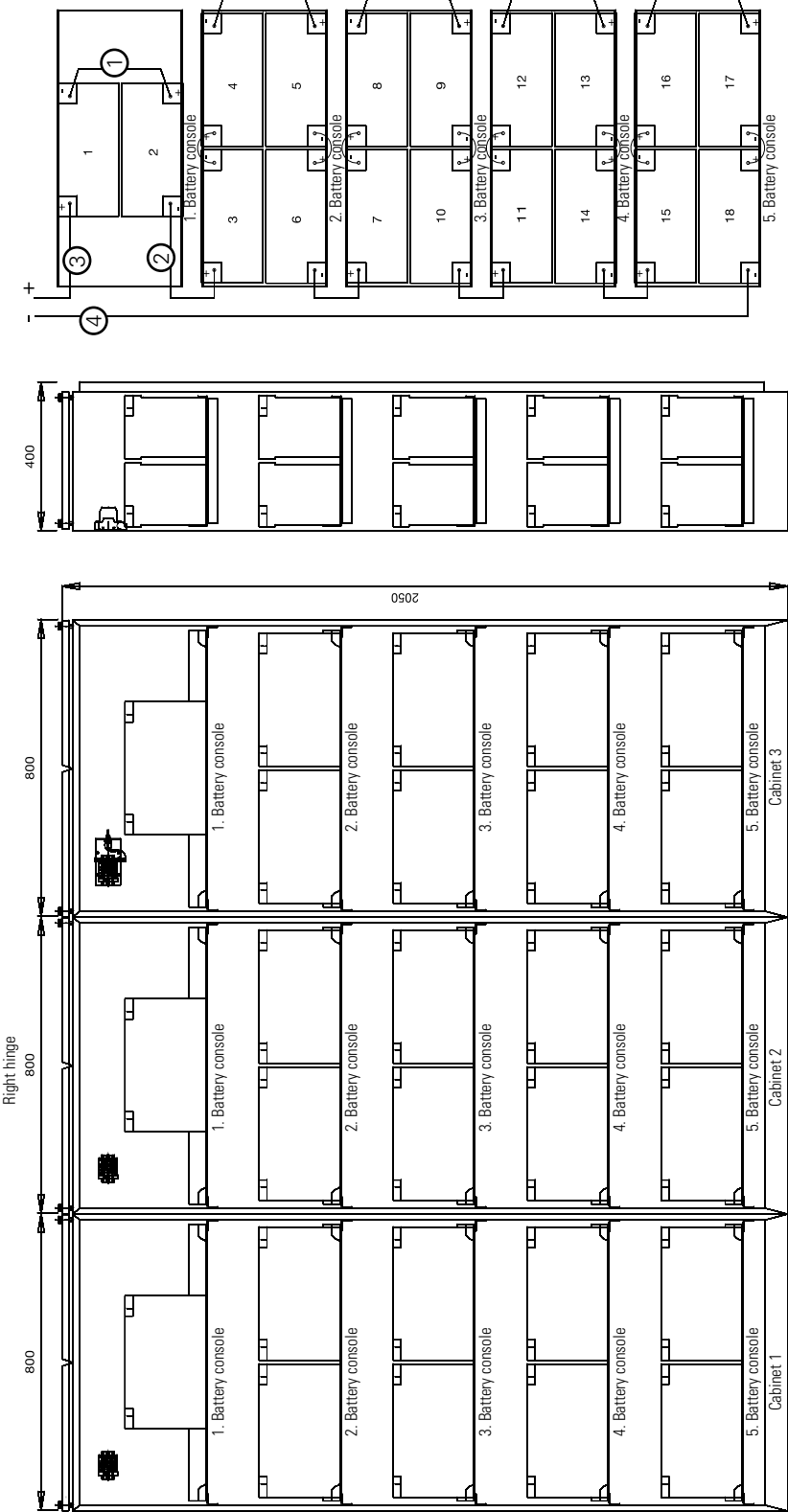
Wiring Set 4 0071 346 778 included

No.	Length	Number
1	440 mm	13
2	800 mm	4
3	800 mm	1
4	2000 mm	1

2 x Wiring Set 4 0071 360 230 included

No.	Length	Number
1	350 mm	13
2	800 mm	4
3	800 mm	1
4	2000 mm	1

3.1.16 Standard-Battery Cabinet 268.2 Ah



For interconnection see chapter „Circuit Diagrams“

Technical Data

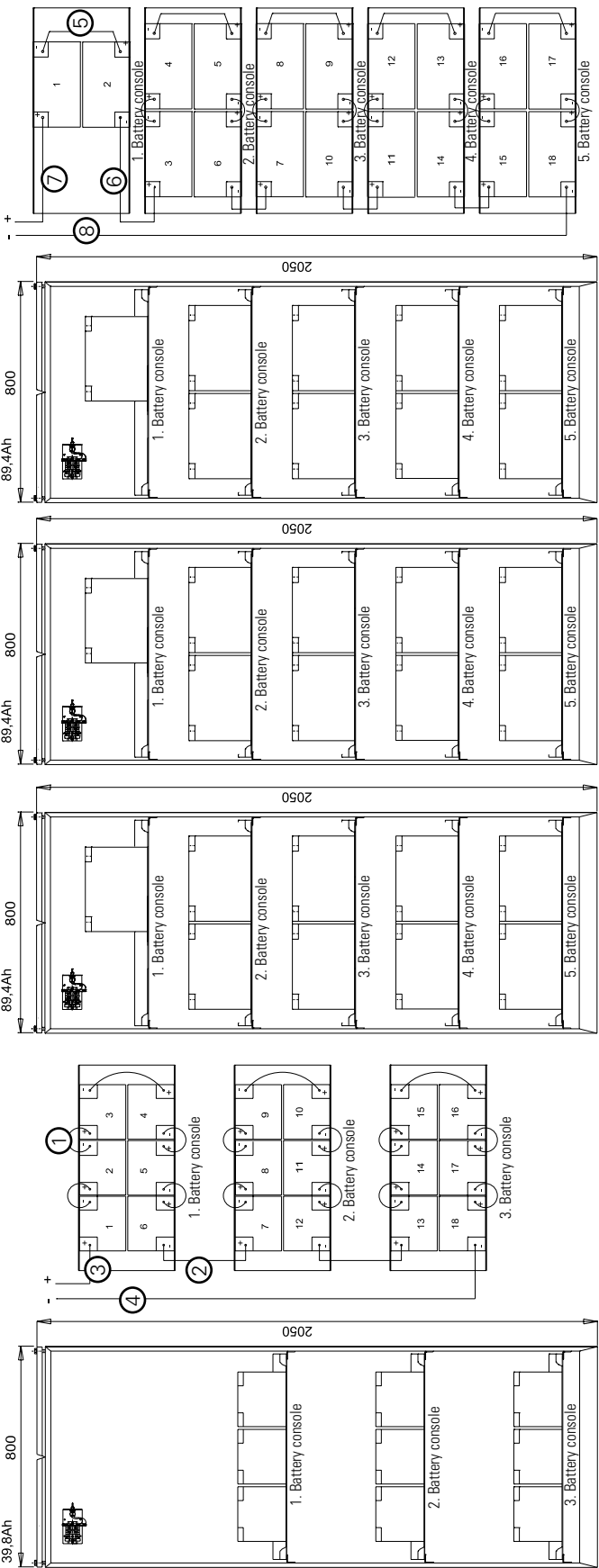
Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 89.4 Ah
Rated voltage of all batteries	216 V
Number of all batteries	54 á 12 V
Battery dimensions in mm (L x W x H)	307.5 x 171 x 239
Final pole	M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	2250 kg
Dimensions in mm (W x H x D)	3 x (800 x 2050 x 400)
Order no. of battery bloc	40066070821
Protection class	IP 20

3 x Wiring Set 4 0071 360 230 included

No.	Length	Number
1	350 mm	13
2	800 mm	4
3	800 mm	1
4	2000 mm	1

Standard-Battery Cabinet 268.2 Ah
The battery cabinets 268.2 Ah will be built of three parallel connected cabinets 89.4 Ah by using the battery distribution panel (40071360204) according to circuit diagram.

3.1.17 Standard-Battery Cabinet 308 Ah



For interconnection see chapter „Circuit Diagrams“

Standard-Battery Cabinet 308 Ah
The battery cabinets 308 Ah will be built of four parallel connected cabinets 39.8, and 3 x 89.4 Ah by using the battery distribution panel (40071360205) according to mounting circuit diagram.

Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 308 Ah
Rated voltage of all batteries	216 V
Number of all batteries	72 á 12 V
Battery dimensions in mm (L x W x H) 39.8 Ah	200 x 169 x 176
Battery dimensions in mm (L x W x H) 89.4 Ah	307.5 x 171 x 239
Final pole	M-M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	2638 kg
Dimensions in mm (W x H x D)	4 x (800 x 2050 x 400)
Order no. of battery bloc 39.8 Ah	40066041395
Order no. of battery bloc 89.4 Ah	40066070821
Protection calss	IP 20

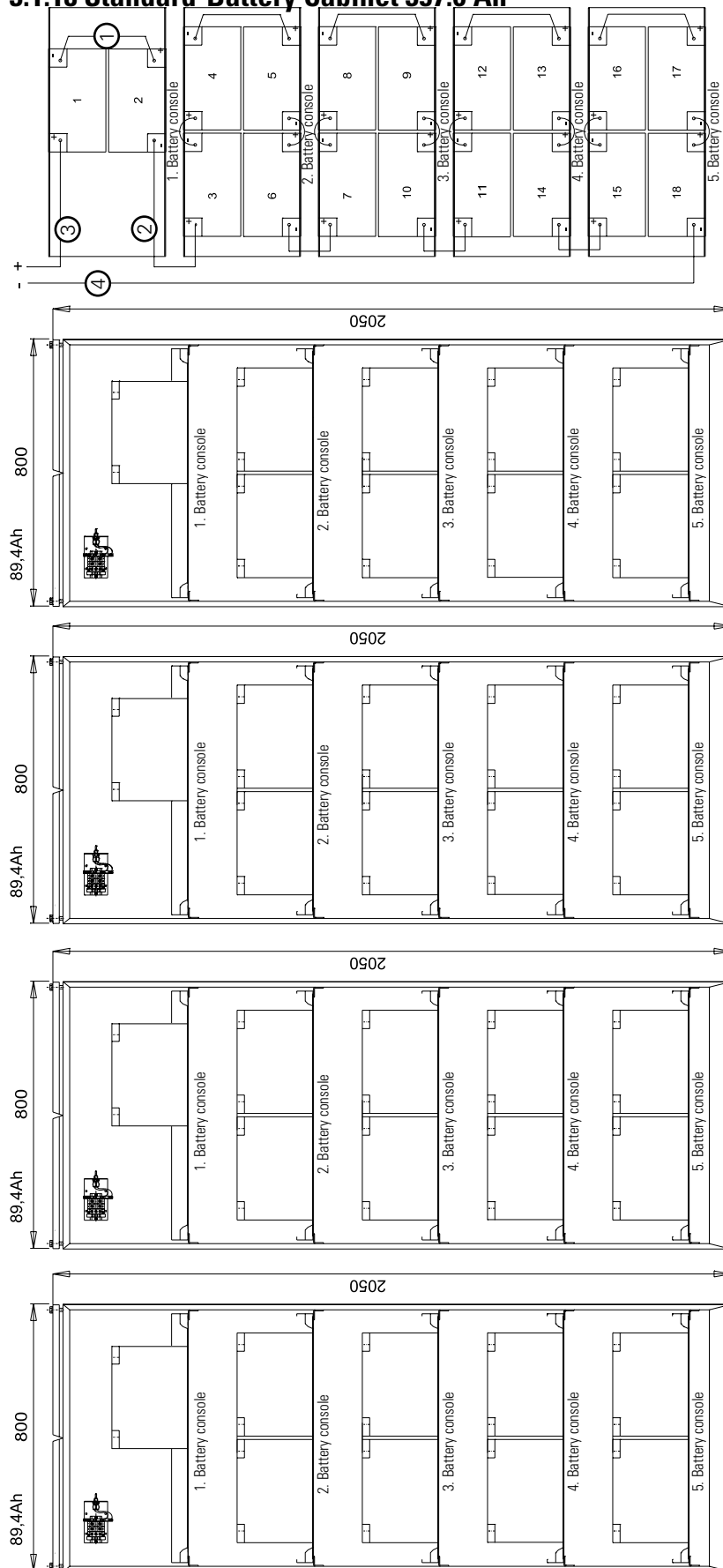
Wiring Set 4 0071 346 779 included

No.	Length	Number
1	300 mm	15
2	1000 mm	2
3	800 mm	1
4	2000 mm	1

Wiring Set 4 0071 360 230 included

No.	Length	Number
1	350 mm	13
2	800 mm	4
3	800 mm	1
4	2000 mm	1

3.1.18 Standard-Battery Cabinet 357.6 Ah



For interconnection see chapter „Circuit Diagrams“

Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 357.6 Ah
Rated voltage of all batteries	216 V
Number of all batteries	72 á 12 V
Battery dimensions in mm (L x W x H)	307.5 x 171 x 239
Final pole	M6
Supply terminals	max. 35 mm ²
Weight incl. Batteries	3000 kg
Dimensions in mm (W x H x D)	4 x (800 x 2050 x 400)
Order no. batterie bloc	40066070821
Protection class	IP 20

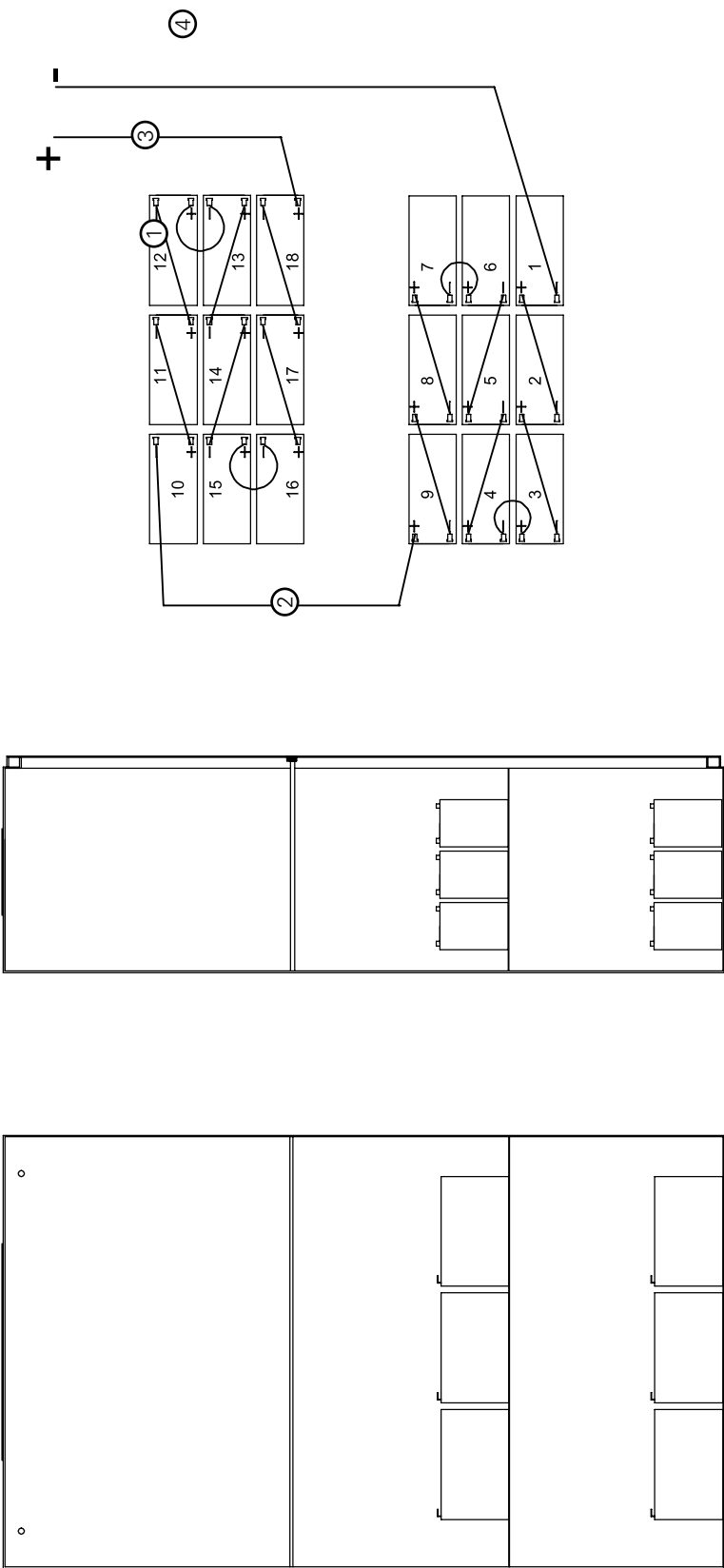
Standard-Battery Cabinet 357.6 Ah

The battery cabinets 357.6 Ah will be built of four parallel connected cabinets 89.4 Ah by using the battery distribution panel (40071360205) according to mounting circuit diagram.

4 x Wiring Set 4 0071 360 230 included

No.	Length	Number
1	350 mm	13
2	800 mm	4
3	800 mm	1
4	2000 mm	1

3.2 Compact-Battery Cabinets 2C3
3.2.1 With battery set 5.5 Ah



For interconnection see chapter „Circuit Diagrams“

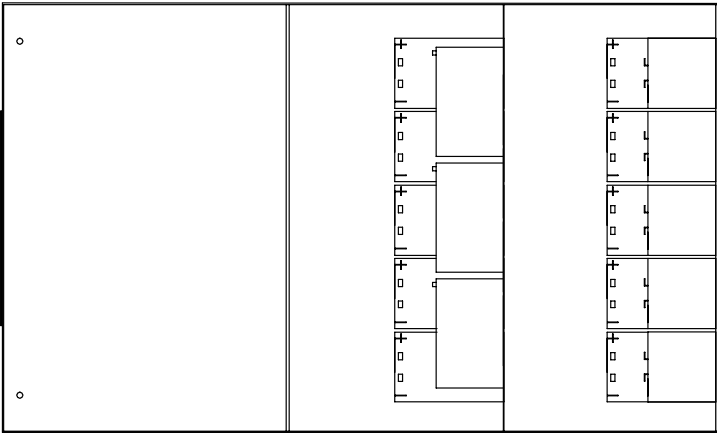
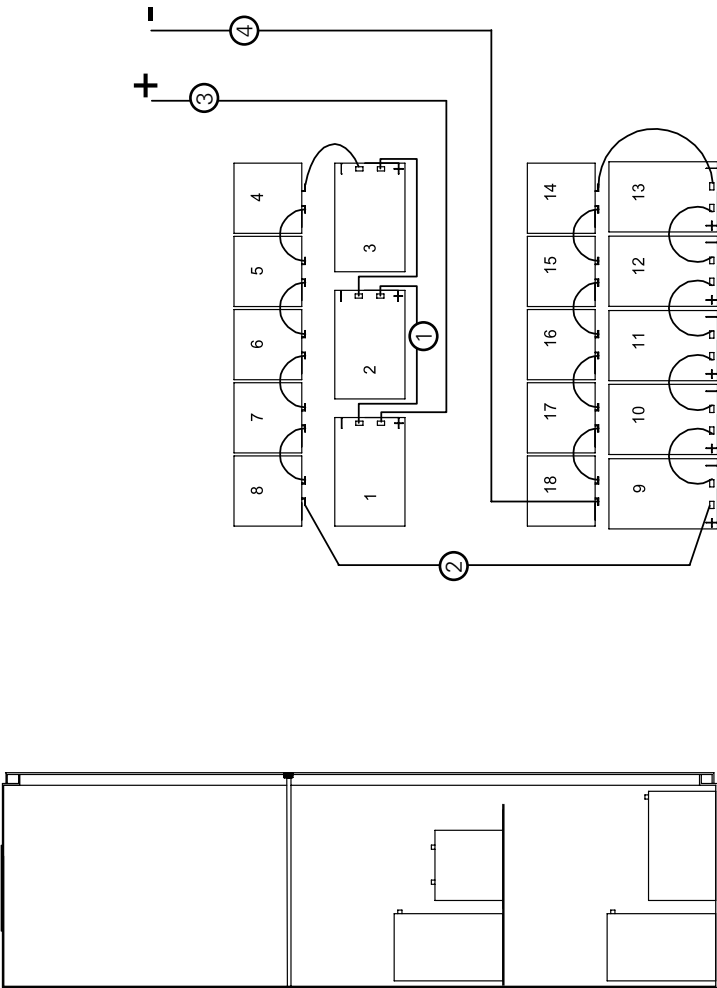
Wiring Set 4 0071 346 005 included

No.	Length	Number
1	240 mm	15
2	900 mm	2
3	600 mm	1
4	1300 mm	1

Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 5.5 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	152 x 65.5 x 98
Connectors	SR-6.3 mm (Faston)
Supply terminals	max. 35 mm²
Weight incl. Batteries	100 kg
Dimensions in mm (W x H x D)	600 x 1000 x 300
Order no. batterie bloc	4006079643

3.2.2 With battery set 8.5 Ah / 11.6 Ah



For interconnection see chapter „Circuit Diagrams“

Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 8.5 Ah / 11.6 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	152 x 98 x 98
Connectors	SR-6.3 / 4.8 mm (Faston)
Supply terminals	max. 35 mm²
Weight incl. Batteries	120 kg / 123.6 kg
Dimensions in mm (W x H x D)	600 x 1000 x 300
Order no. batterie bloc 8.5 Ah	40066079644
Order no. batterie bloc 11.6 Ah	40066071147

Wiring Set 4 0071 346 005 included, 8.5 Ah

No.	Length	Number
1	240 mm	15
2	900 mm	2
3	600 mm	1
4	1300 mm	1

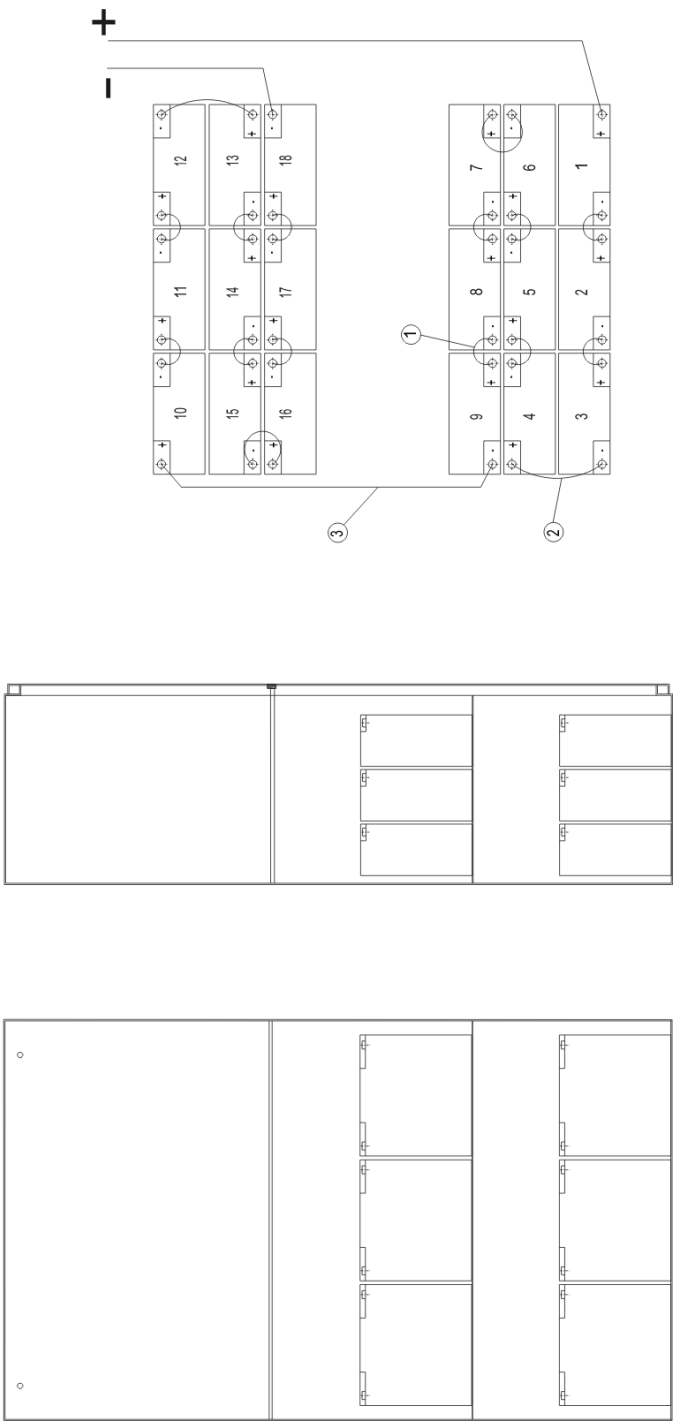
ATTENTION!

Use at connection of the plus and minus pole devices benefits the Faston plug adapter at the 11,6 Ah battery blocks. The Faston plug adapter (40071347668) are with the devices attached.

Wiring Set 4 0071 346 048 included, 11.6 Ah

No.	Length	Number
1	240 mm	15
2	900 mm	2
3	600 mm	1
4	1300 mm	1

3.2.3 With battery set 18 Ah



For interconnection see chapter „Circuit Diagrams“

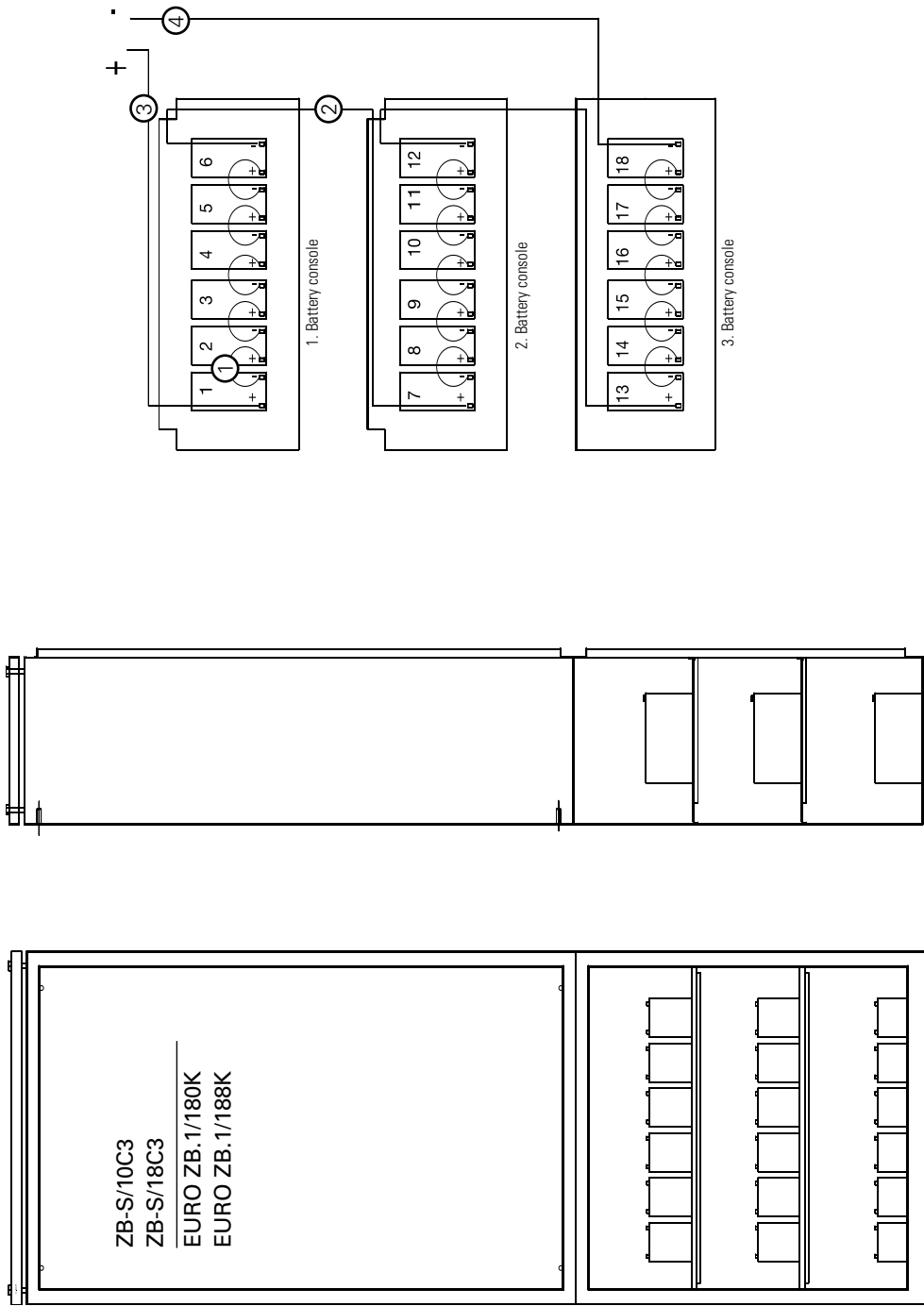
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 18 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	181 x 76 x 167
Connectors	M5
Supply terminals	max. 35 mm²
Weight incl. Batteries	220 kg
Dimensions in mm (W x H x D)	600 x 1000 x 350
Order no. batterie bloc	4006071594

Wiring Set 40071362068 included

No.	Length	Number
1	100 mm	14
2	200 mm	2
3	500 mm	1

3.3 Compact-Battery Cabinets 10C3, 18C3
3.3.1 With battery set 5.5 Ah



For interconnection see chapter „Circuit Diagrams“

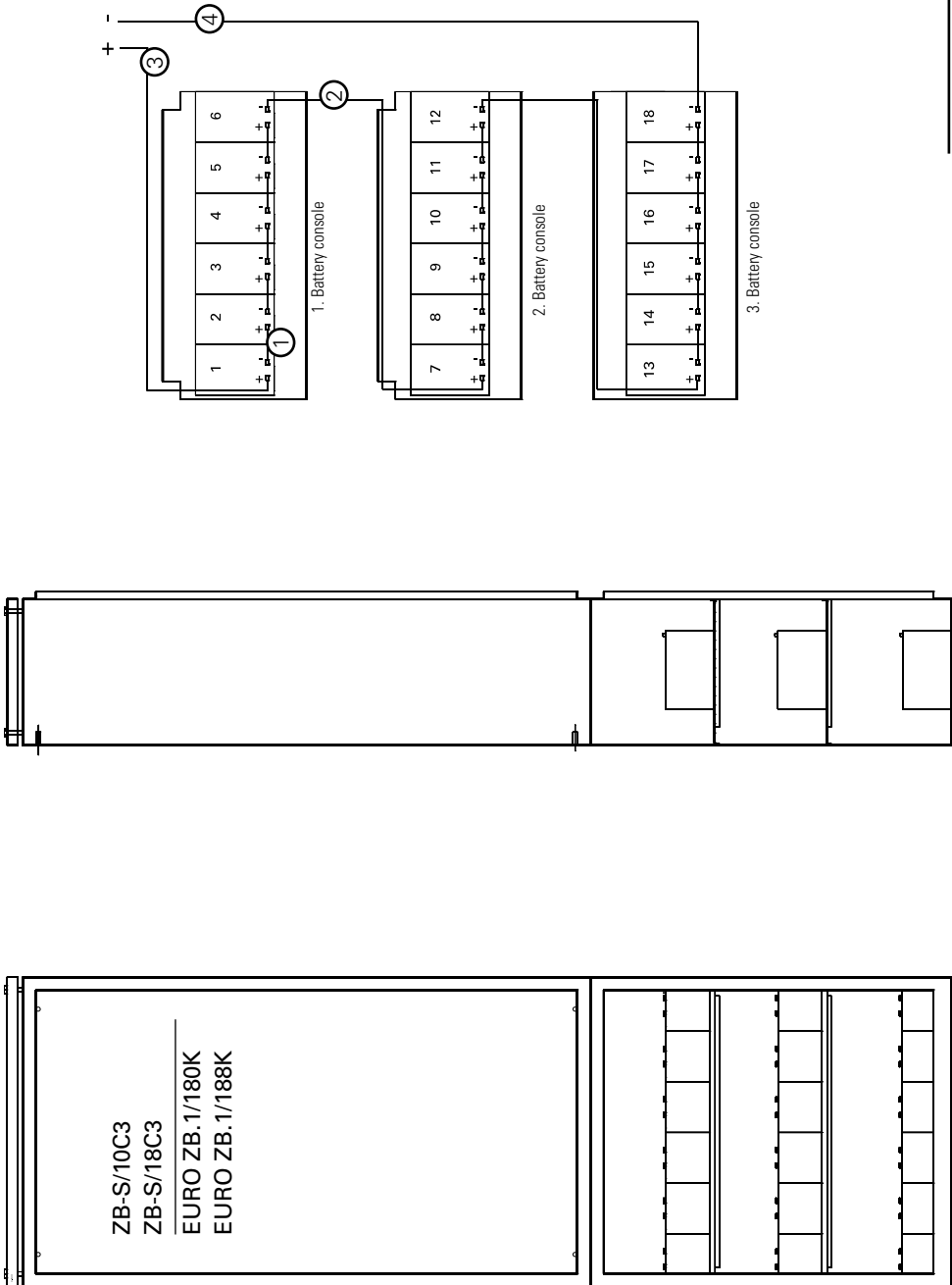
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 5.5 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 ± 12 V
Battery dimensions in mm (L x W x H)	152 x 65.5 x 94.5
Connectors	6.3 mm (Faston)
Supply terminals	max. 35 mm²
Weight incl. Batteries	150 kg
Dimensions in mm (W x H x D)	600 x 1800 x 350
Order no. batterie bloc	40066079643

Wiring Set 4 0071 346 005 included

No.	Length	Number
1	240 mm	15
2	900 mm	2
3	600 mm	1
4	1300 mm	1

3.3.2 With battery set 8.5 Ah / 11.6 Ah



For interconnection see chapter „Circuit Diagrams“

Technical Data

Type of battery (C10; 1.8 V/Z, +20 °C)	12 V / 8.5 Ah / 11.6 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	152 x 98 x 94.5
Connectors 8.5 Ah / 11.6 Ah	6.3 / 4.8 mm (Faston)
Supply terminals	max. 35 mm²
Weight incl. Batteries 8.5 Ah / 11.6 Ah	170 kg / 173.6 kg
Dimensions in mm (W x H x D)	600 x 1800 x 350
Order no. batterie bloc 8.5 Ah	40066079644
Order no. batterie bloc 11.6 Ah	40066071147

Wiring Set 4 0071 346 005 included 8.5 Ah

No.	Length	Number
1	240 mm	15
2	900 mm	2
3	600 mm	1
4	1300 mm	1

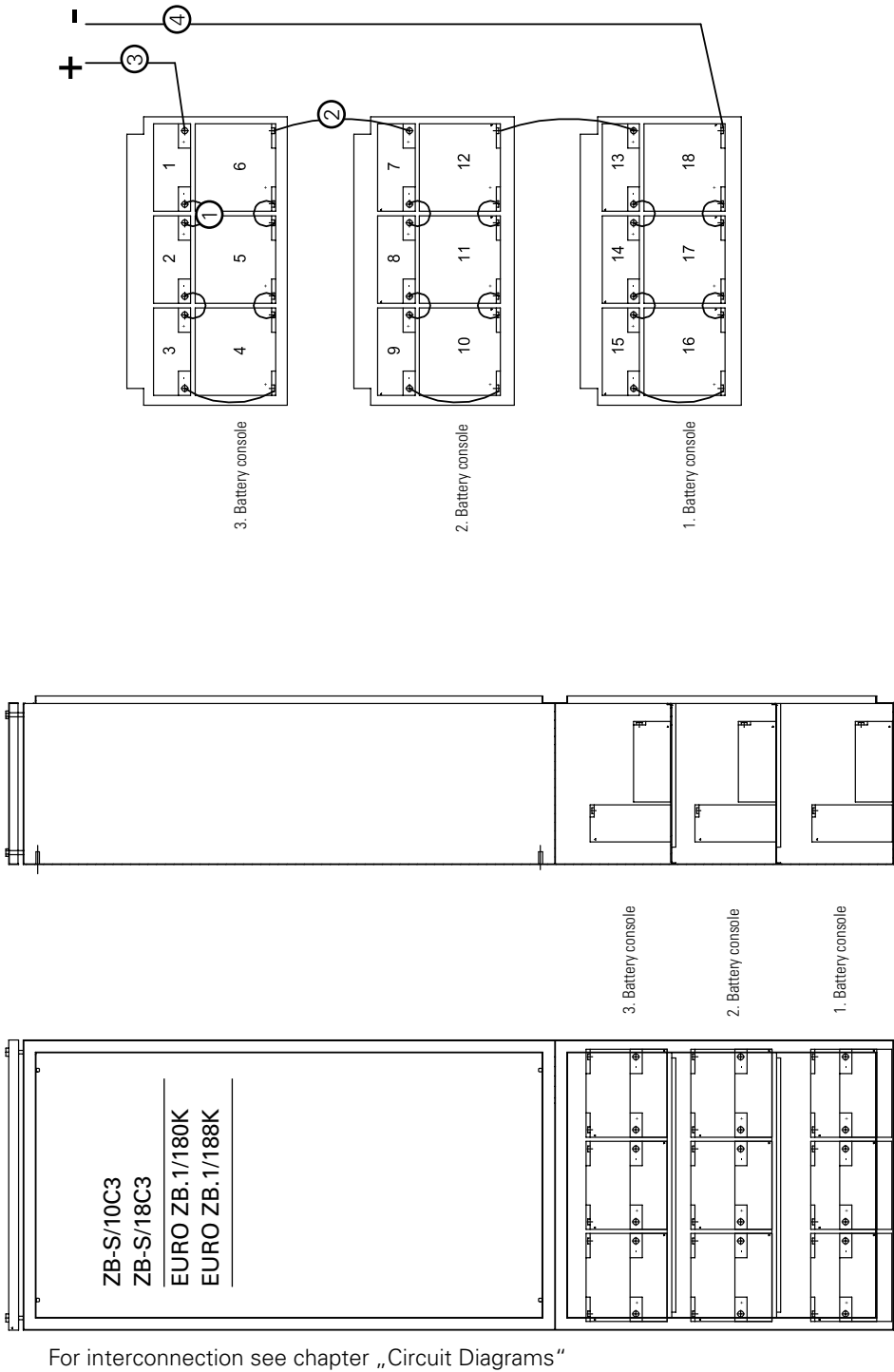
Wiring Set 4 0071 346 048 included, 11.6 Ah

No.	Length	Number
1	240 mm	15
2	900 mm	2
3	600 mm	1
4	1300 mm	1

ATTENTION!

Use at connection of the plus and minus pole devices benefits the Faston plug adapter at the 11,6 Ah battery blocks. The Faston plug adapter (40071347668) are with the devices attached.

3.3.3 With battery set 18 Ah



For interconnection see chapter „Circuit Diagrams“

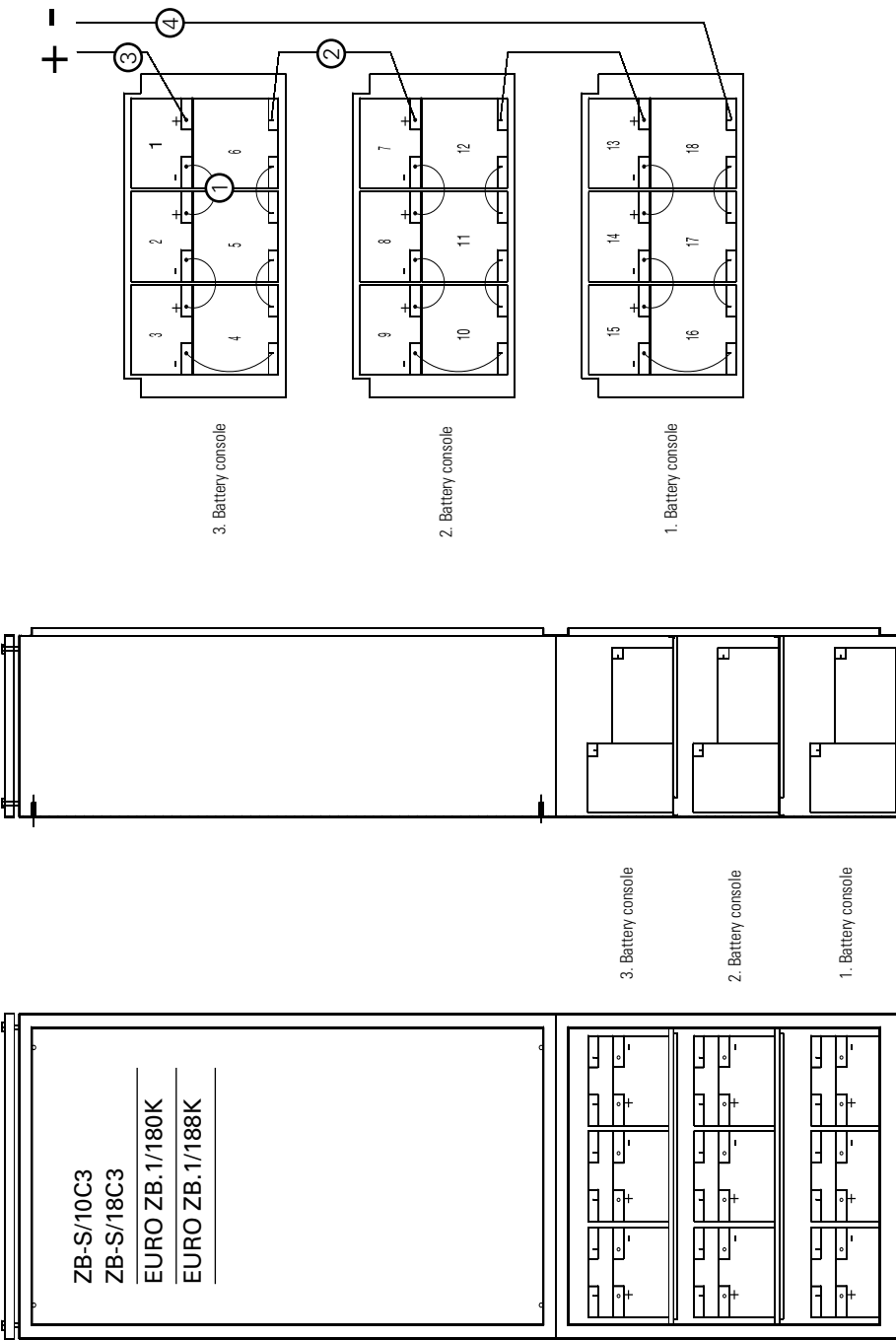
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 18 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	181 x 75 x 167
final pole	M5
Supply terminals	max. 35 mm²
Weight incl. Batteries	220 kg
Dimensions in mm (W x H x D)	600 x 1800 x 350
Order no. batterie bloc	40066071594

Wiring Set 40071362067 included

No.	Length	Number
1	300 mm	15
2	1000 mm	2
3	800 mm	1
4	2000 mm	1

3.3.4 With battery set 23.3 Ah



For interconnection see chapter „Circuit Diagrams“

Technical Data

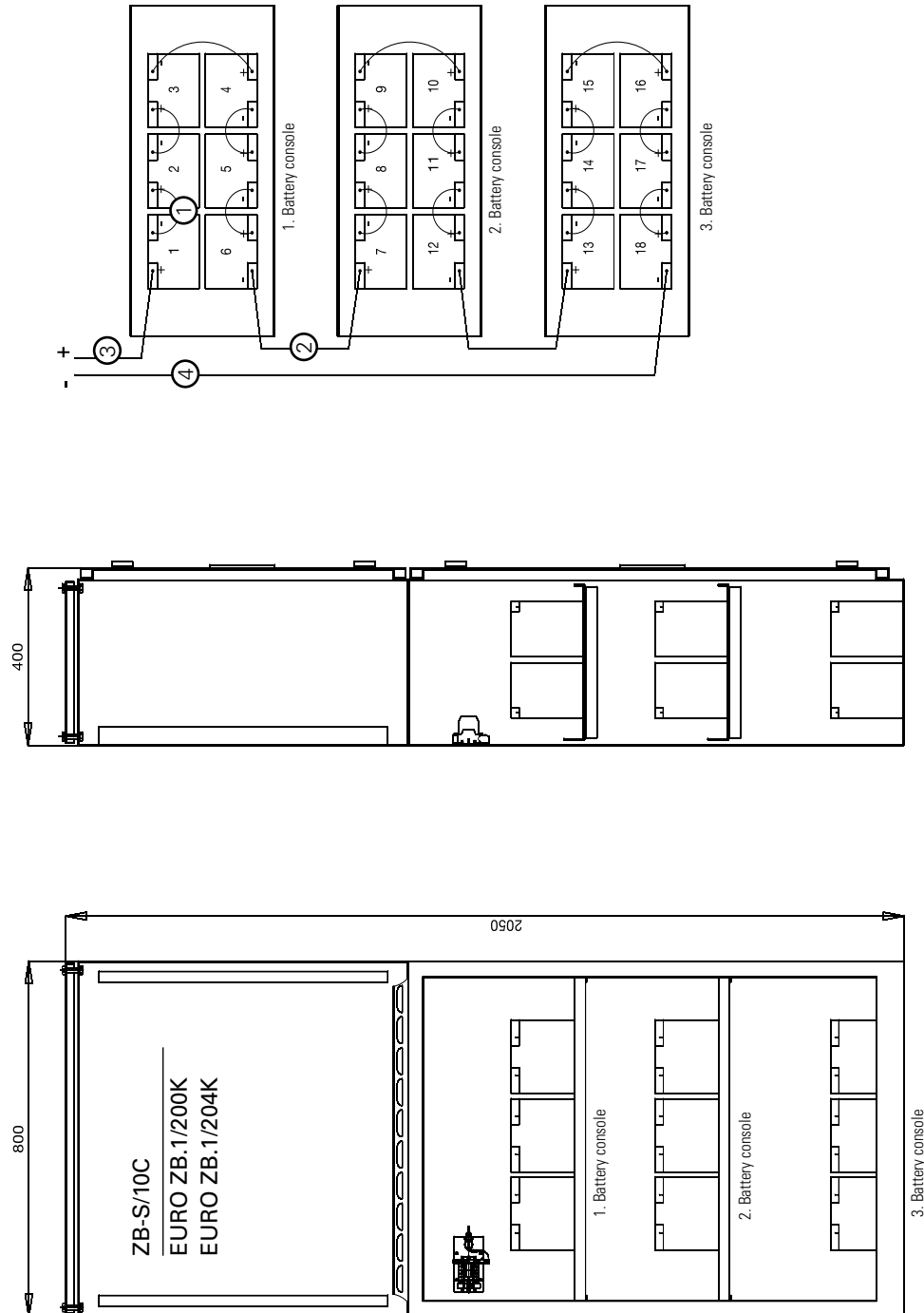
Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 23.3 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	168 x 127 x 174
final pole	M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	250 kg
Dimensions in mm (W x H x D)	600 x 1800 x 350
Order no. batterie bloc	40066070461

Wiring Set 4 0071 346 779 included

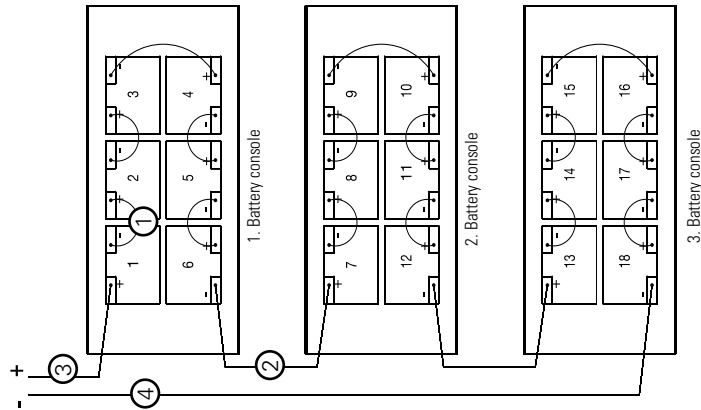
No.	Length	Number
1	300 mm	15
2	1000 mm	2
3	800 mm	1
4	2000 mm	1

3.4 Compact-Battery Cabinets 10C

3.4.1 With battery set 23.3 Ah



For interconnection see chapter „Circuit Diagrams“



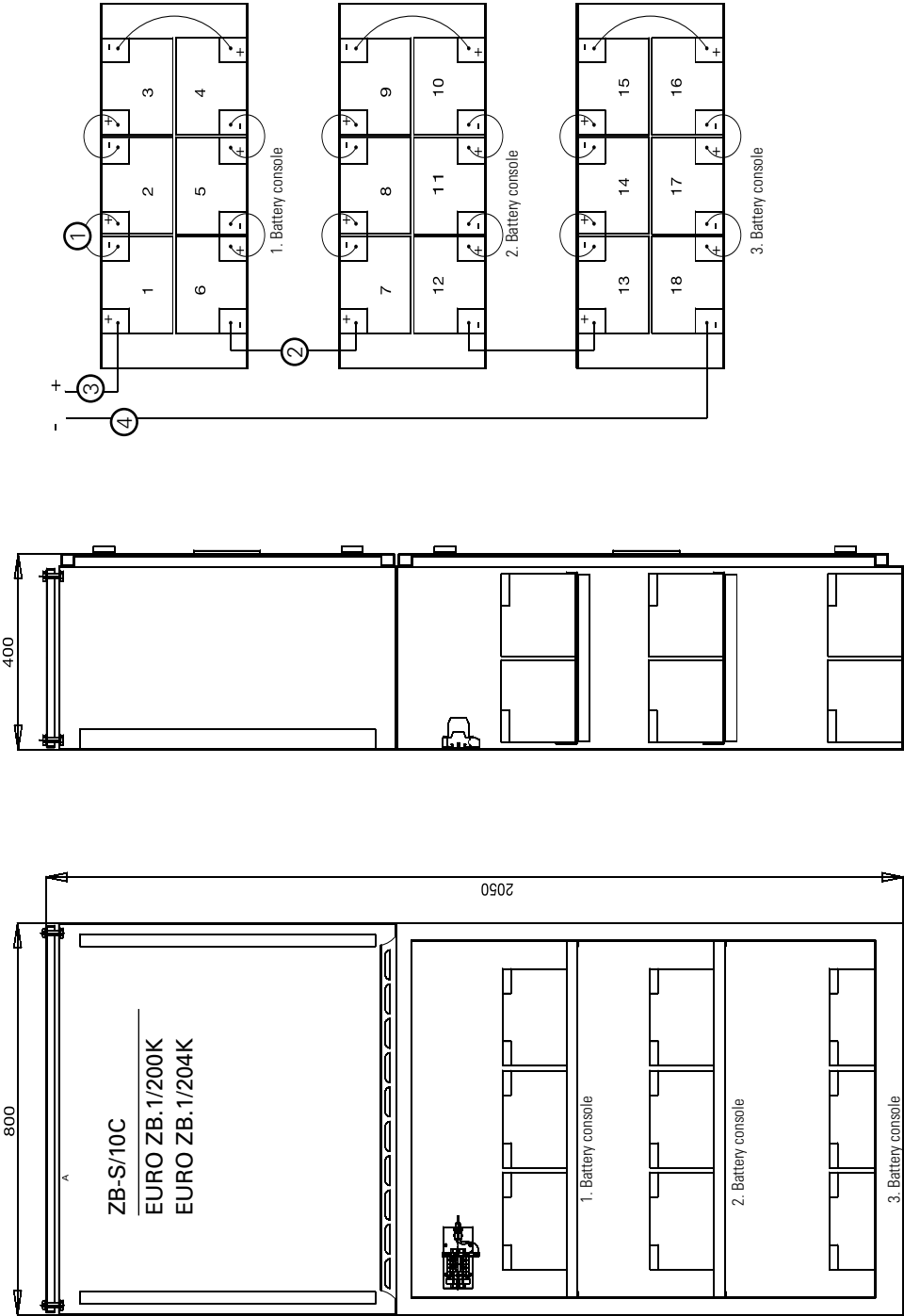
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 23.3 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	168 x 127 x 174
final pole	M6
Supply terminals	max. 35 mm ²
Weight incl. Batteries	295 kg
Dimensions in mm (W x H x D)	800 x 2050 x 400
Order no. batterie bloc	40069070461

Wiring Set 4 0071 346 779 included

No.	Length	Number
1	300 mm	15
2	1000 mm	2
3	800 mm	1
4	2000 mm	1

3.4.2 With battery set 32 Ah



For interconnection see chapter „Circuit Diagrams“

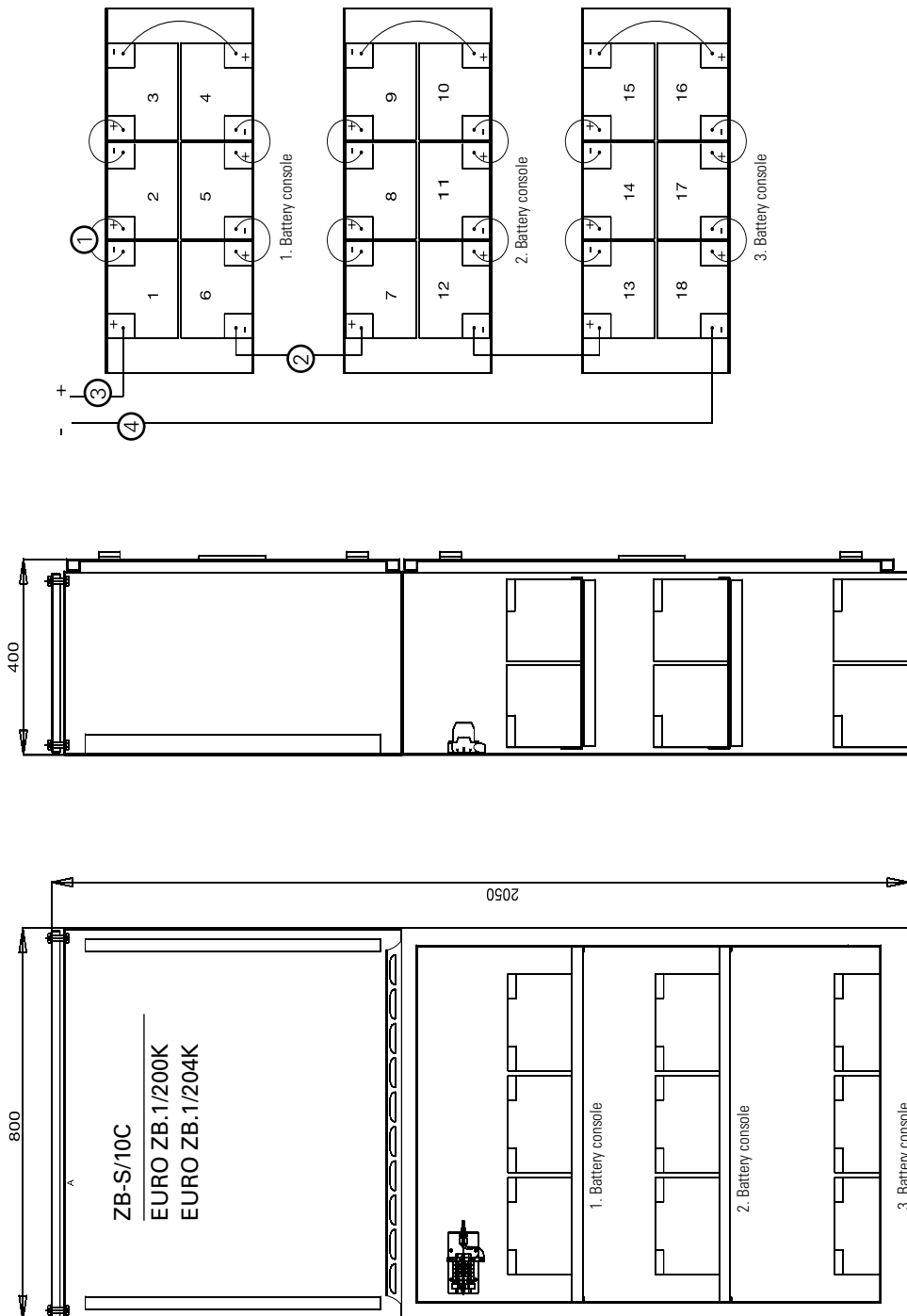
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 32 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	198 x 168 x 175
final pole	M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	400 kg
Dimensions in mm (W x H x D)	800 x 2050 x 400
Order no. batterie bloc	40066070116

Wiring Set 4 0071 346 779 included

No.	Length	Number
1	300 mm	15
2	1000 mm	2
3	800 mm	1
4	2000 mm	1

3.4.3 With battery set 39.8 Ah



For interconnection see chapter „Circuit Diagrams“

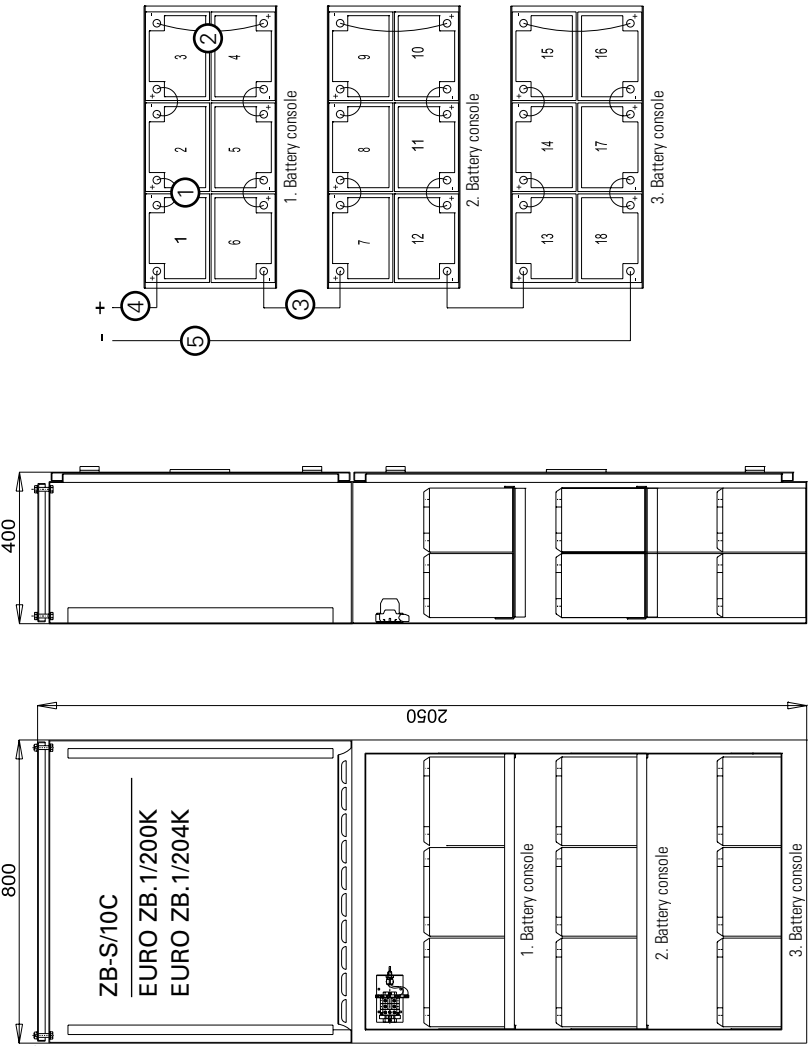
Wiring Set 4 0071 346 779 included

No.	Length	Number
1	300 mm	15
2	1000 mm	2
3	800 mm	1
4	2000 mm	1

Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 39.8 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	200 x 169 x 176
final pole	M-M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	409 kg
Dimensions in mm (W x H x D)	800 x 2050 x 400
Order no. batterie bloc	40066041395

3.4.4 With battery set 50.4 Ah



For interconnection see chapter „Circuit Diagrams“

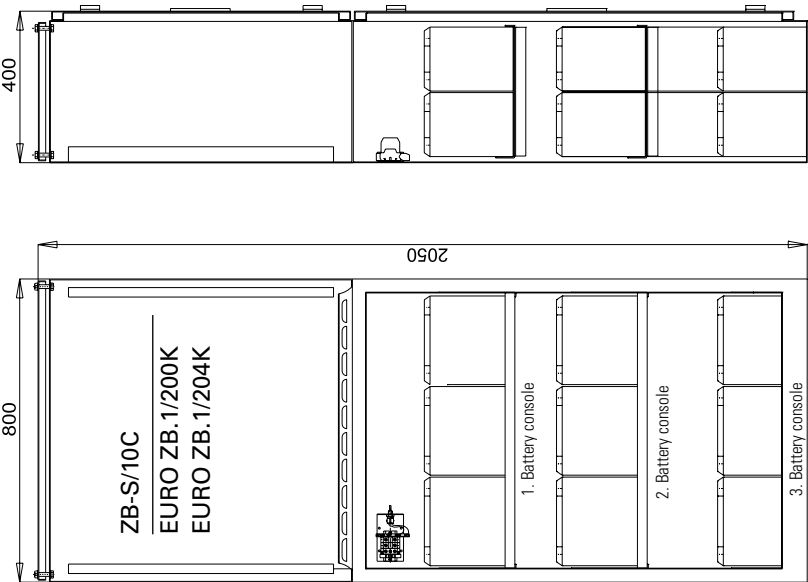
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 50.4 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	220 x 172 x 235
final pole	F-M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	495 kg
Dimensions in mm (W x H x D)	800 x 2050 x 400
Order no. batterie bloc	40066070917

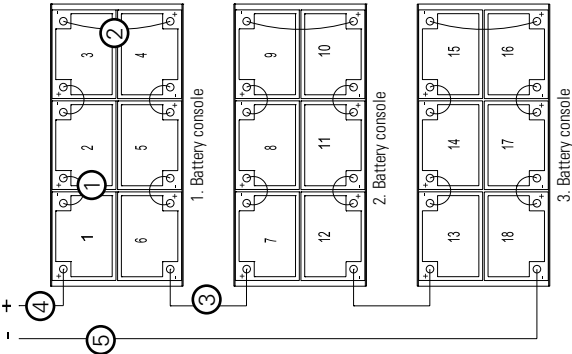
Wiring Set 4 0071 347 449 included

No.	Length	Number
1	300 mm	12
2	440 mm	3
3	700 mm	2
4	300 mm	1
5	1200 mm	1

3.4.5 With battery set 53.7 Ah



For interconnection see chapter „Circuit Diagrams“



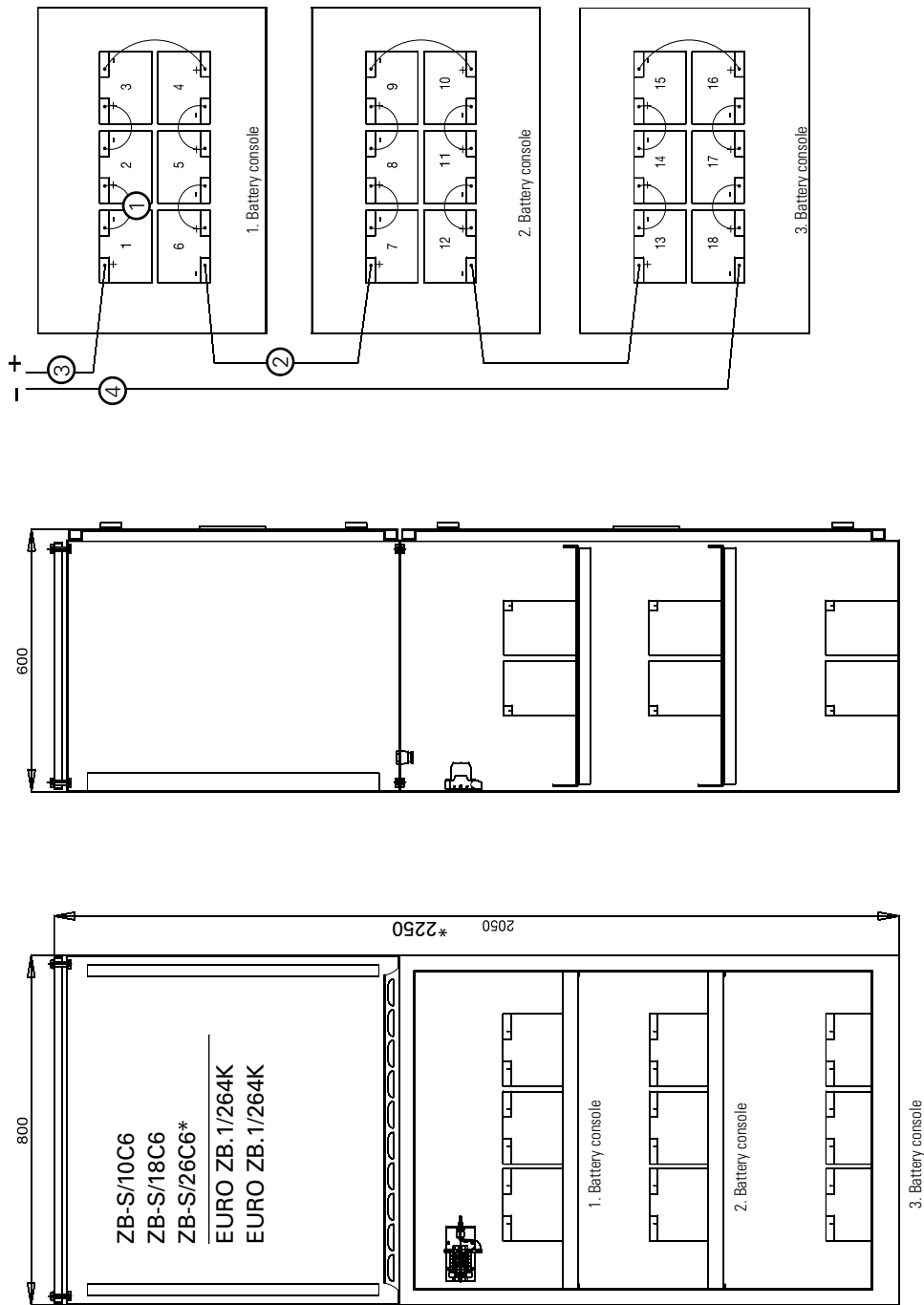
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 53.7 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	220 x 172 x 235
final pole	F-M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	519 kg
Dimensions in mm (W x H x D)	800 x 2050 x 400
Order no. batterie bloc	40066070901

Wiring Set 4 0071 347 449 included

No.	Length	Number
1	300 mm	12
2	440 mm	3
3	700 mm	2
4	300 mm	1
5	1200 mm	1

3.5 Compact-Battery Cabinets 10C6, 18C6, 26C6
3.5.1 With battery set 23.3 Ah



For interconnection see chapter „Circuit Diagrams“

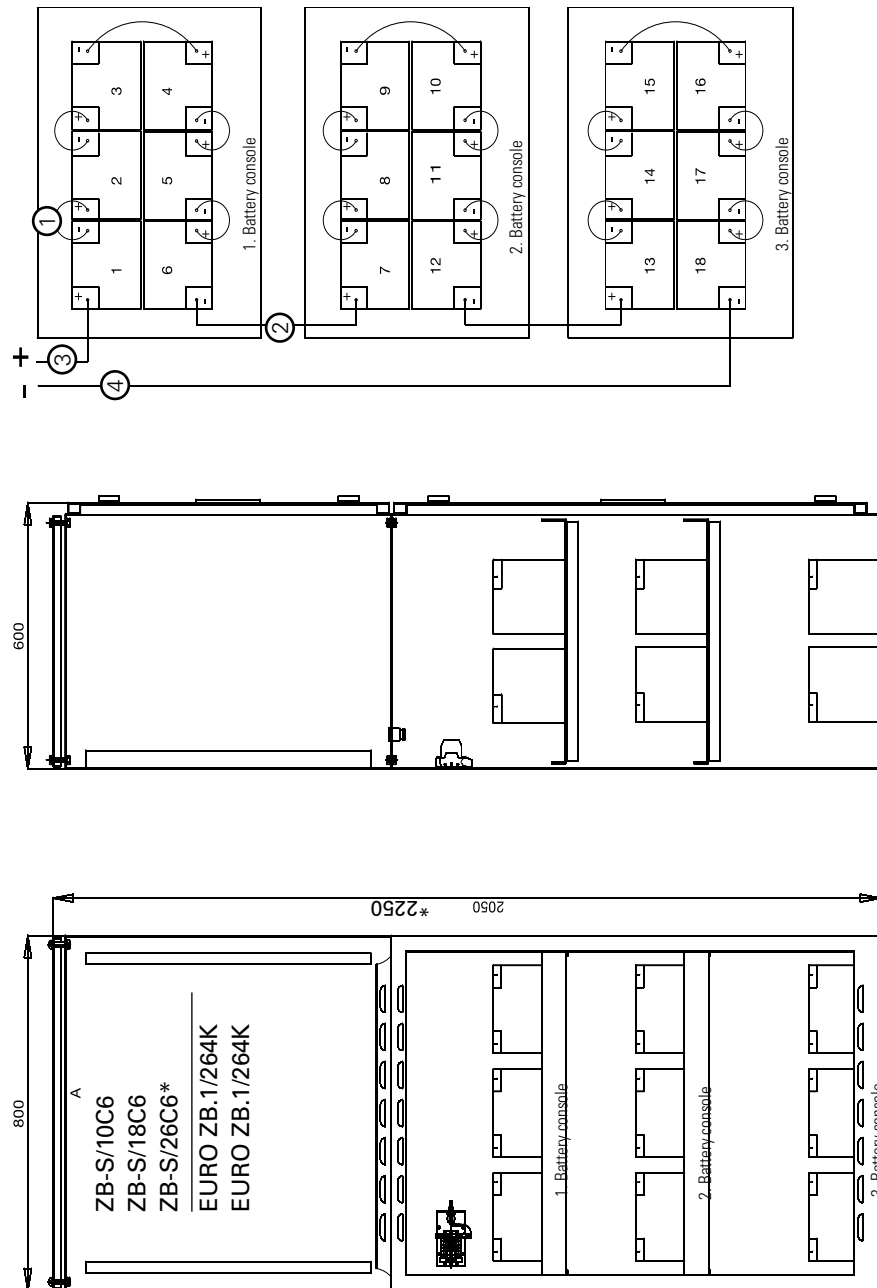
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 23.3 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	168 x 127 x 174
final pole	M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	320 kg
Dimensions in mm (W x H x D)	800 x 2050 x 600 (800x2250x600 for ZB-S/26C6)
Order no. batterie bloc	40066070461

Wiring Set 4 0071 346 779 included

No.	Length	Number
1	300 mm	15
2	1000 mm	2
3	800 mm	1
4	2000 mm	1

3.5.2 With battery set 32 Ah



For interconnection see chapter „Circuit Diagrams“

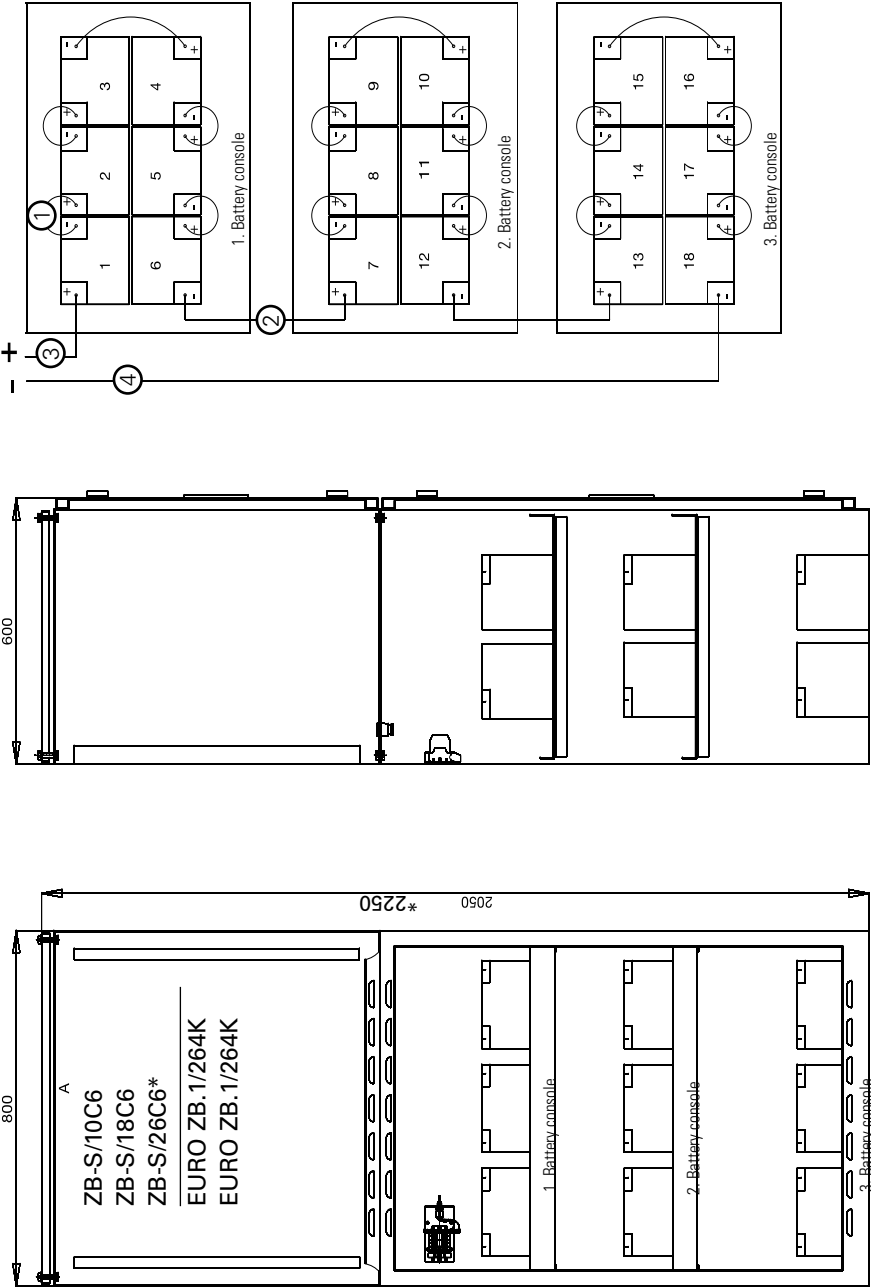
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 32 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	198 x 168 x 175
final pole	M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	400 kg
Dimensions in mm (W x H x D)	800 x 2050 x 600 (800x2250x600 for ZB-S/26C6)
Order no. batterie bloc	40066070116

Wiring Set 4 0071 346 779 included

No.	Length	Number
1	300 mm	15
2	1000 mm	2
3	800 mm	1
4	2000 mm	1

3.5.3 With battery set 39.8 Ah



For interconnection see chapter „Circuit Diagrams“

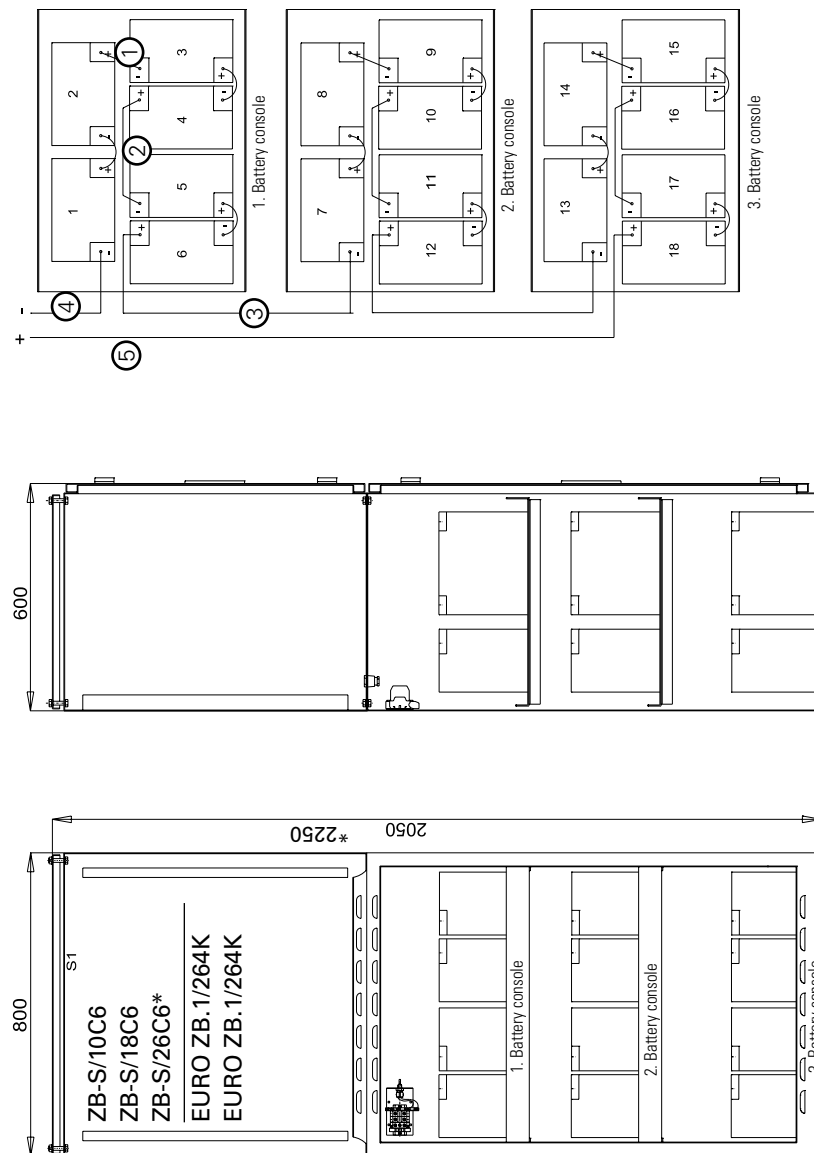
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 39.8 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	200 x 169 x 176
final pole	M-M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	409 kg
Dimensions in mm (W x H x D)	800 x 2050 x 600 (800x2250x600 for ZB-S/26C6)
Order no. batterie bloc	40066041395

Wiring Set 4 0071 346 779 included

No.	Length	Number
1	300 mm	15
2	1000 mm	2
3	800 mm	1
4	2000 mm	1

3.5.4 With battery set 50.4 Ah



For interconnection see chapter „Circuit Diagrams“

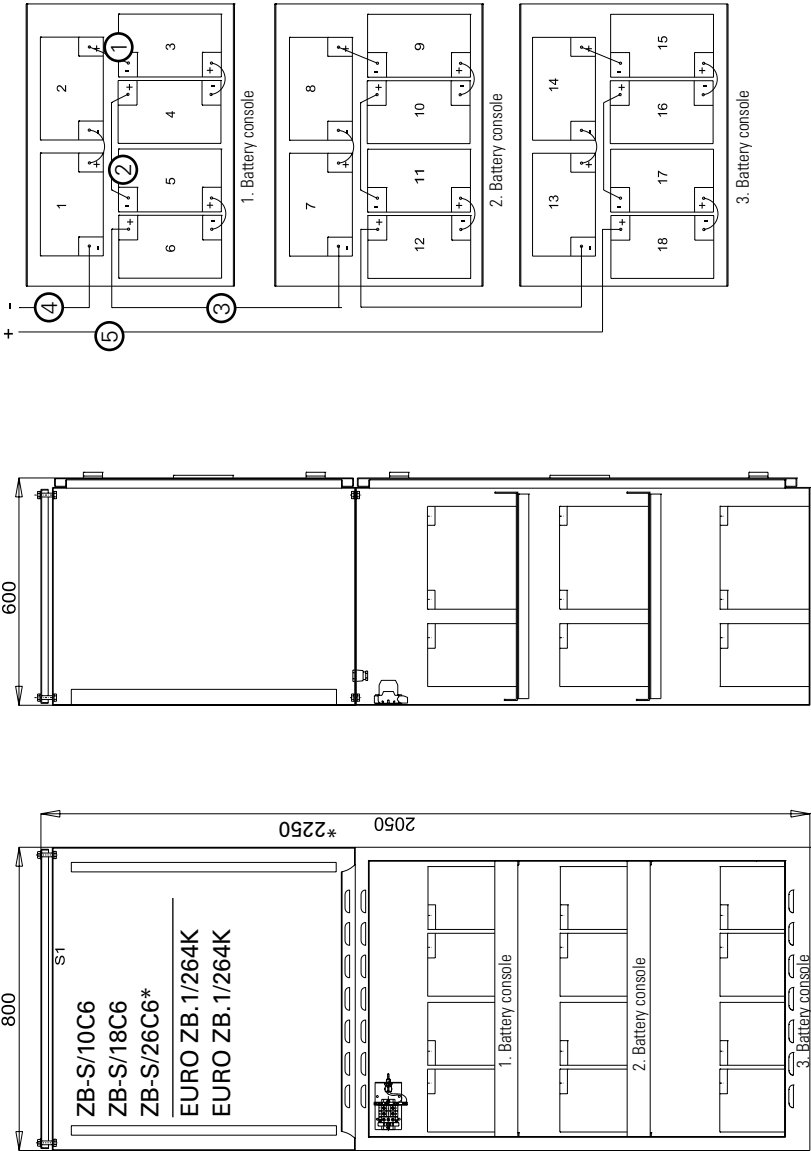
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 50.4 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 à 12 V
Battery dimensions in mm (L x W x H)	220 x 172 x 235
final pole	F-M6
Supply terminals	max. 35 mm ²
Weight incl. Batteries	505 kg
Dimensions in mm (W x H x D)	800 x 2050 x 600 (800x2250x600 for ZB-S/26C6)
Order no. batterie bloc	40066070917

Wiring Set 4 0071 347 449 included

No.	Length	Number
1	300 mm	12
2	360 mm	3
3	1000 mm	2
4	400 mm	1
5	1400 mm	1

3.5.5 With battery set 53.7 Ah



For interconnection see chapter „Circuit Diagrams“

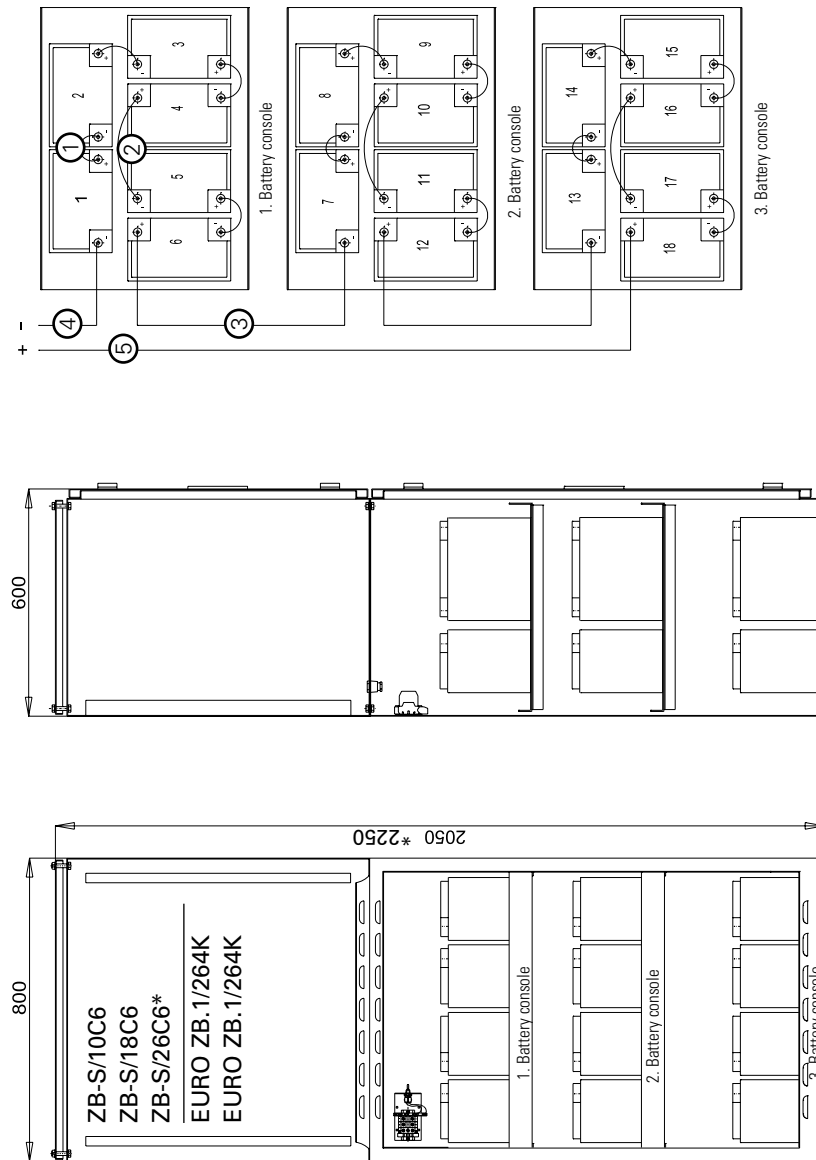
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 53.7 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 à 12 V
Battery dimensions in mm (L x W x H)	220 x 172 x 235
final pole	F-M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	559 kg
Dimensions in mm (W x H x D)	800 x 2050 x 600 (800x2250x600 for ZB-S/26C6)
Order no. batterie bloc	40066070901

Wiring Set 4 0071 347 449 included

No.	Length	Number
1	300 mm	12
2	360 mm	3
3	1000 mm	2
4	400 mm	1
5	1400 mm	1

3.5.6 With battery set 66.2 Ah



For interconnection see chapter „Circuit Diagrams“

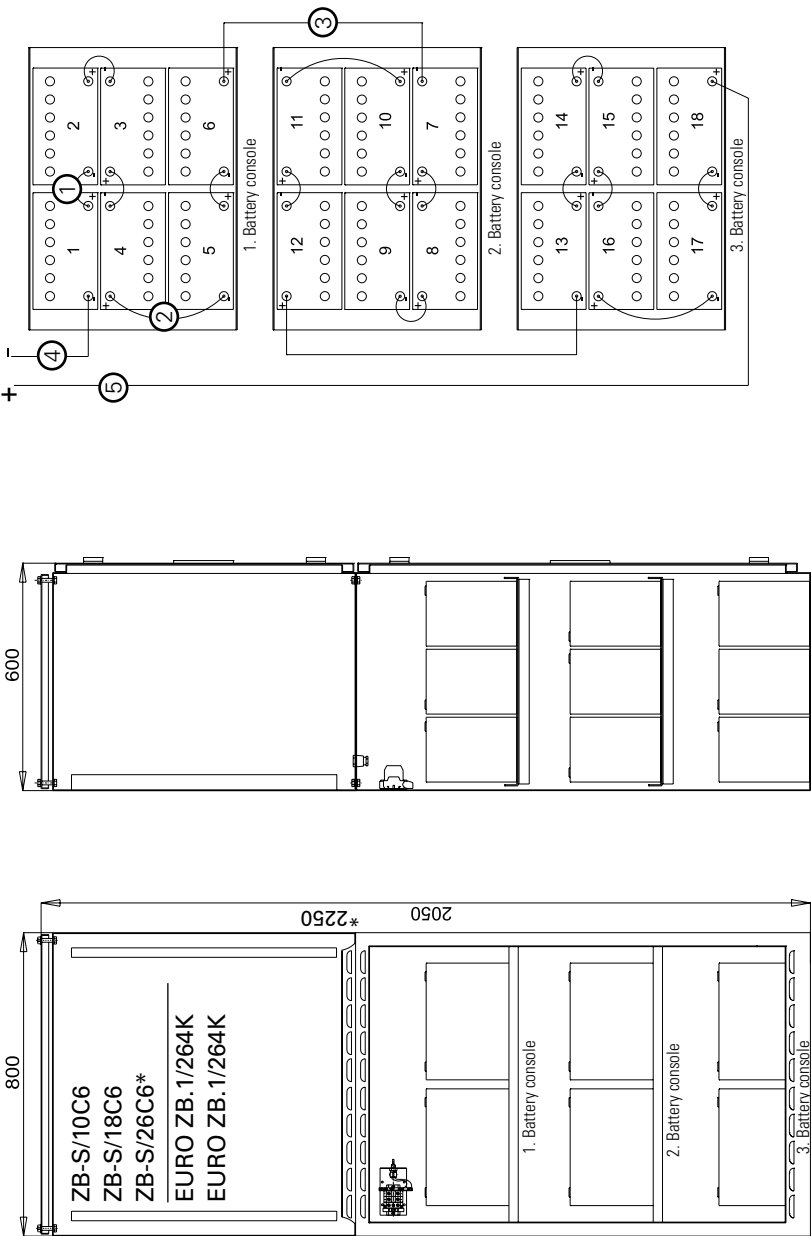
Technical Data

Type of battery (C10; 1.8 V/°C; +20 °C)	12 V / 66.2 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	260.5 x 171 x 239
final pole	M-M6
Supply terminals	max. 35 mm ²
Weight incl. Batteries	672 kg
Dimensions in mm (W x H x D)	800 x 2050 x 600 (800x2250x600 for ZB-S/26C6)
Order no. batterie bloc	40066070902

Wiring Set 4 0071 346 819 included

No.	Length	Number
1	300 mm	12
2	440 mm	3
3	1000 mm	2
4	400 mm	1
5	1400 mm	1

3.5.7 With battery set 85.7 Ah



For interconnection see chapter „Circuit Diagrams“

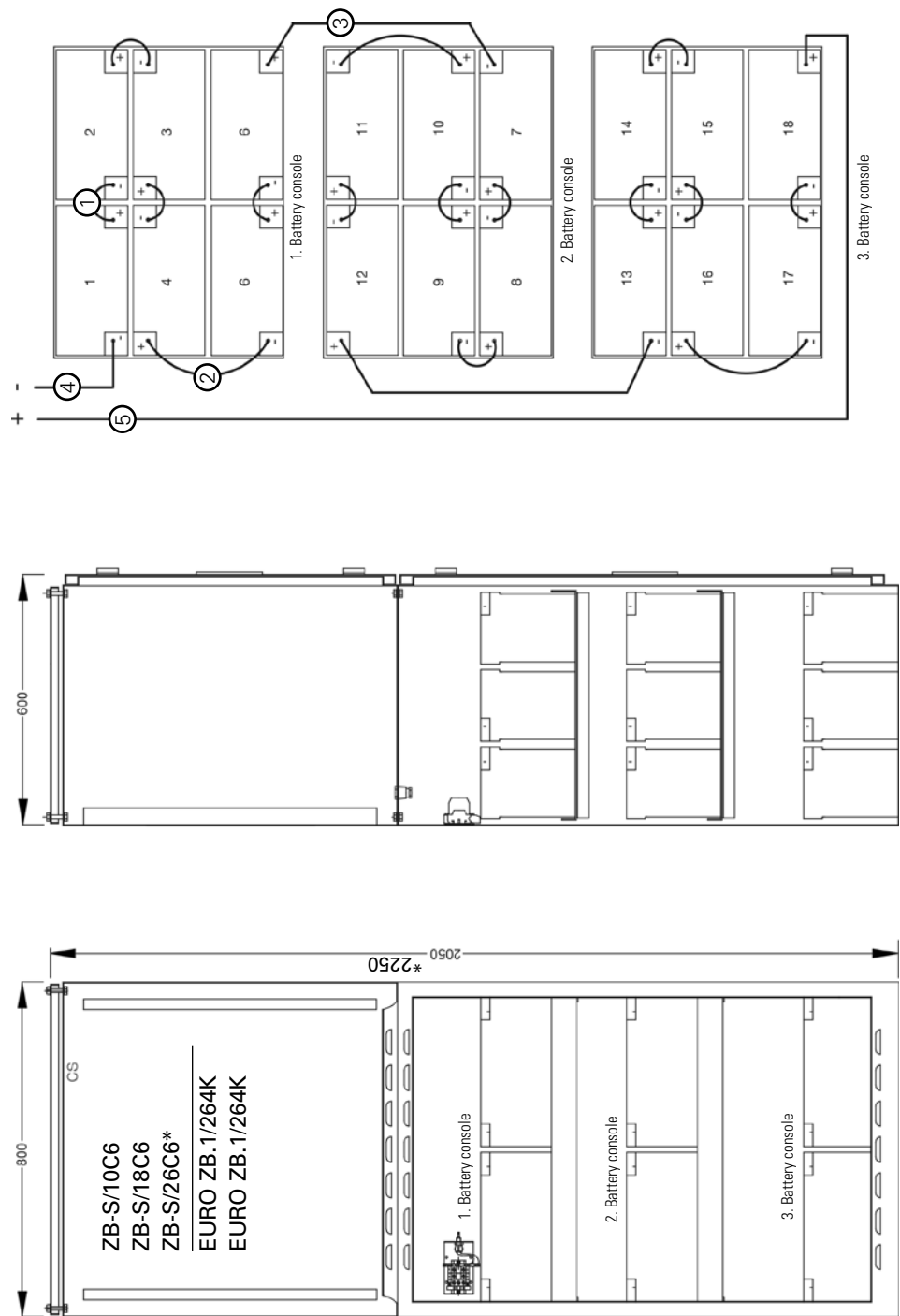
Technical Data

Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 85.7 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 à 12 V
Battery dimensions in mm (L x W x H)	309 x 172 x 239
final pole	M-M8
Supply terminals	max. 35 mm²
Weight incl. Batteries	685 kg
Dimensions in mm (W x H x D)	800 x 2050 x 600 (800x2250x600 for ZB-S/26C6)
Order no. batterie bloc	40066070918

Wiring Set 4 0071 360 231 included

No.	Length	Number
1	300 mm	12
2	360 mm	3
3	1500 mm	2
4	400 mm	1
5	1800 mm	1

3.5.8 With battery set 89.4 Ah



For interconnection see chapter „Circuit Diagrams“

Technical Data

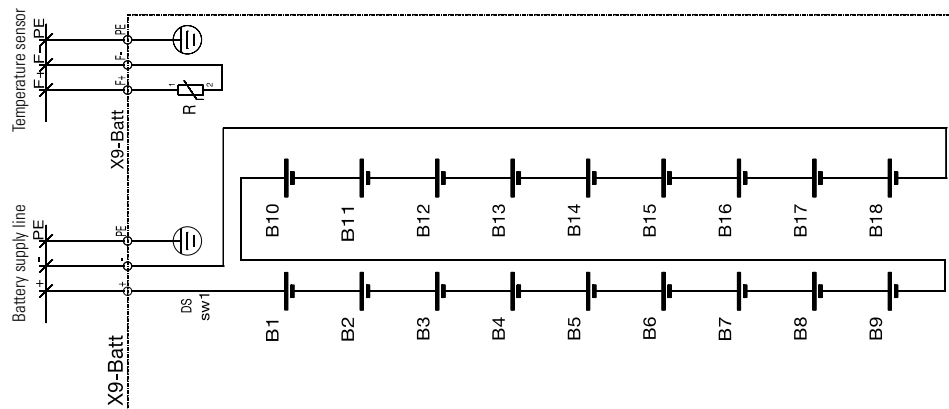
Type of battery (C10; 1.8 V/Z; +20 °C)	12 V / 89.4 Ah
Rated voltage of all batteries	216 V
Number of all batteries	18 á 12 V
Battery dimensions in mm (L x W x H)	307.5 x 171 x 239
final pole	M6
Supply terminals	max. 35 mm²
Weight incl. Batteries	750 kg
Dimensions in mm (W x H x D)	800 x 2050 x 600
Order no. batterie bloc	40066070821

Wiring Set 4 0071 360 231 included

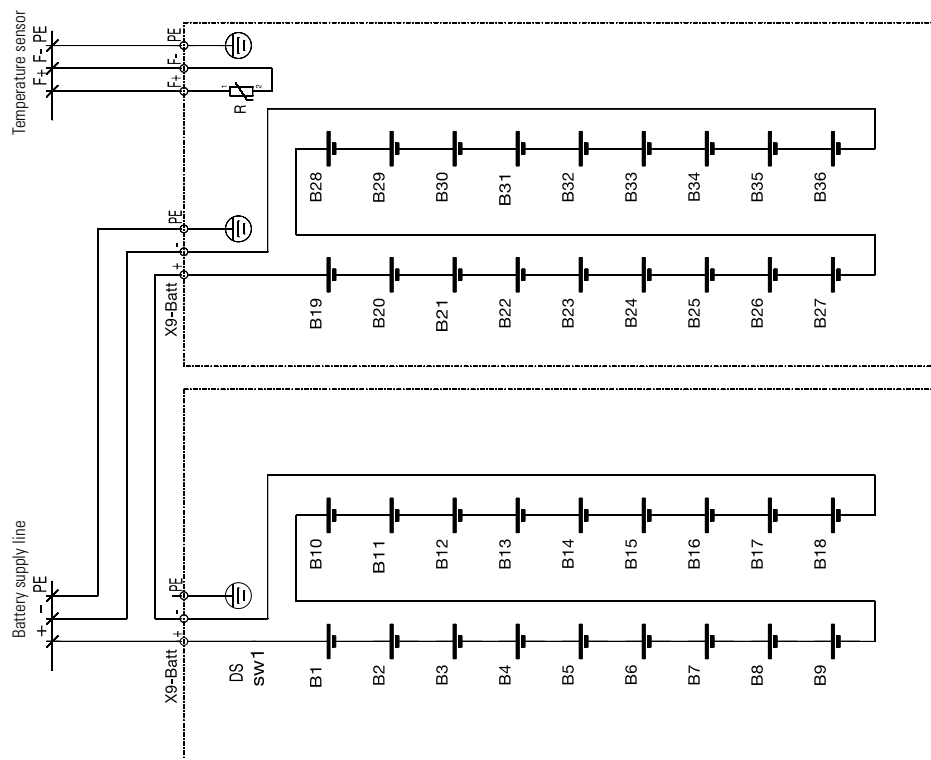
No.	Length	Number
1	300 mm	12
2	360 mm	3
3	1500 mm	2
4	400 mm	1
5	1800 mm	1

4 Circuit Diagrams

4.1 Wiring 5.5 Ah to 89.4 Ah



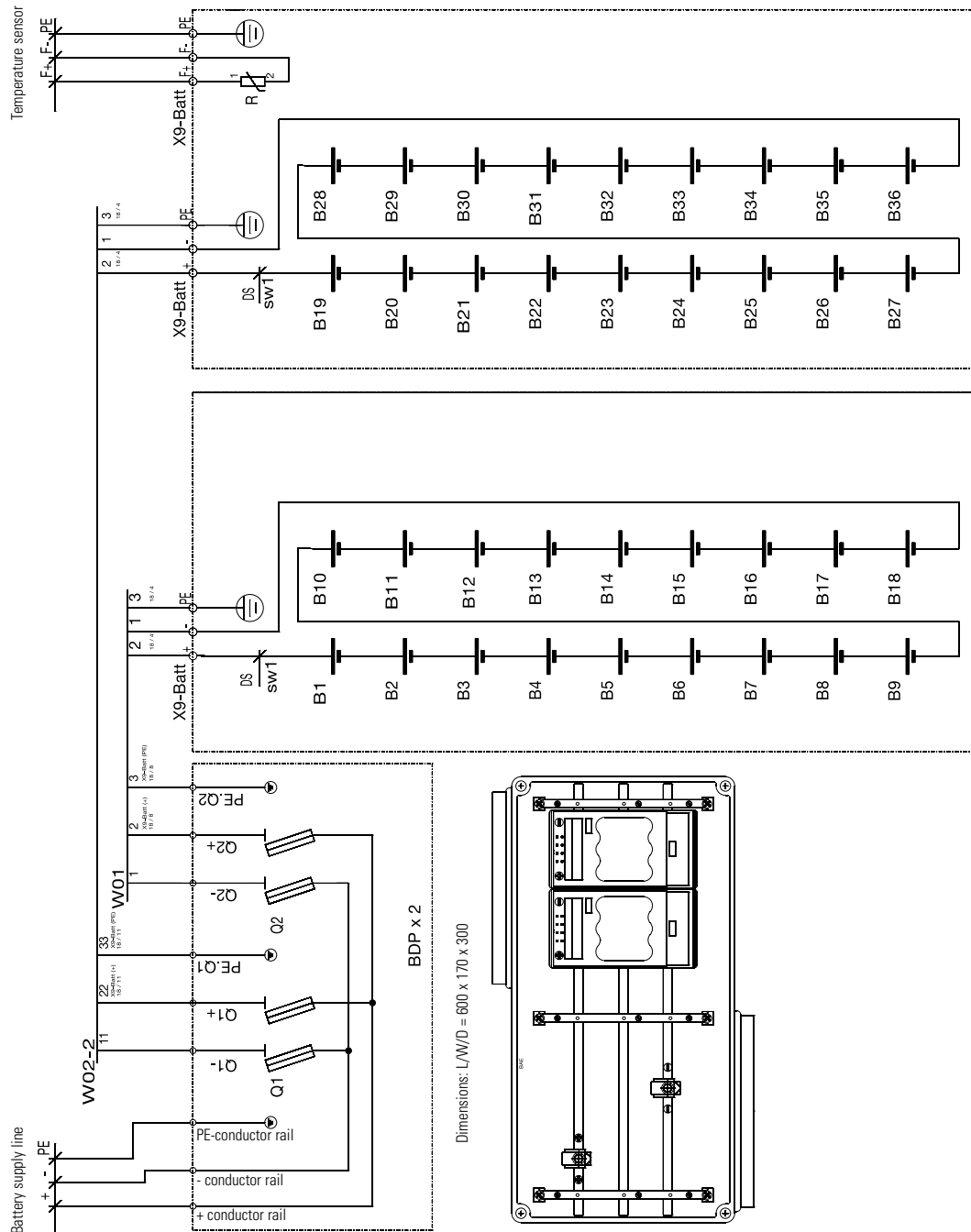
4.2 Wiring 118 Ah



IMPORTANT NOTE!

Only one temperature sensor per charger has to be installed.
A series- or parallel connection of the temperature sensor
can cause an improper charging of the battery.

4.3 Wiring 106 Ah, 143.1 Ah, 155.6 Ah, 178.8 Ah



Battery Distribution Panel

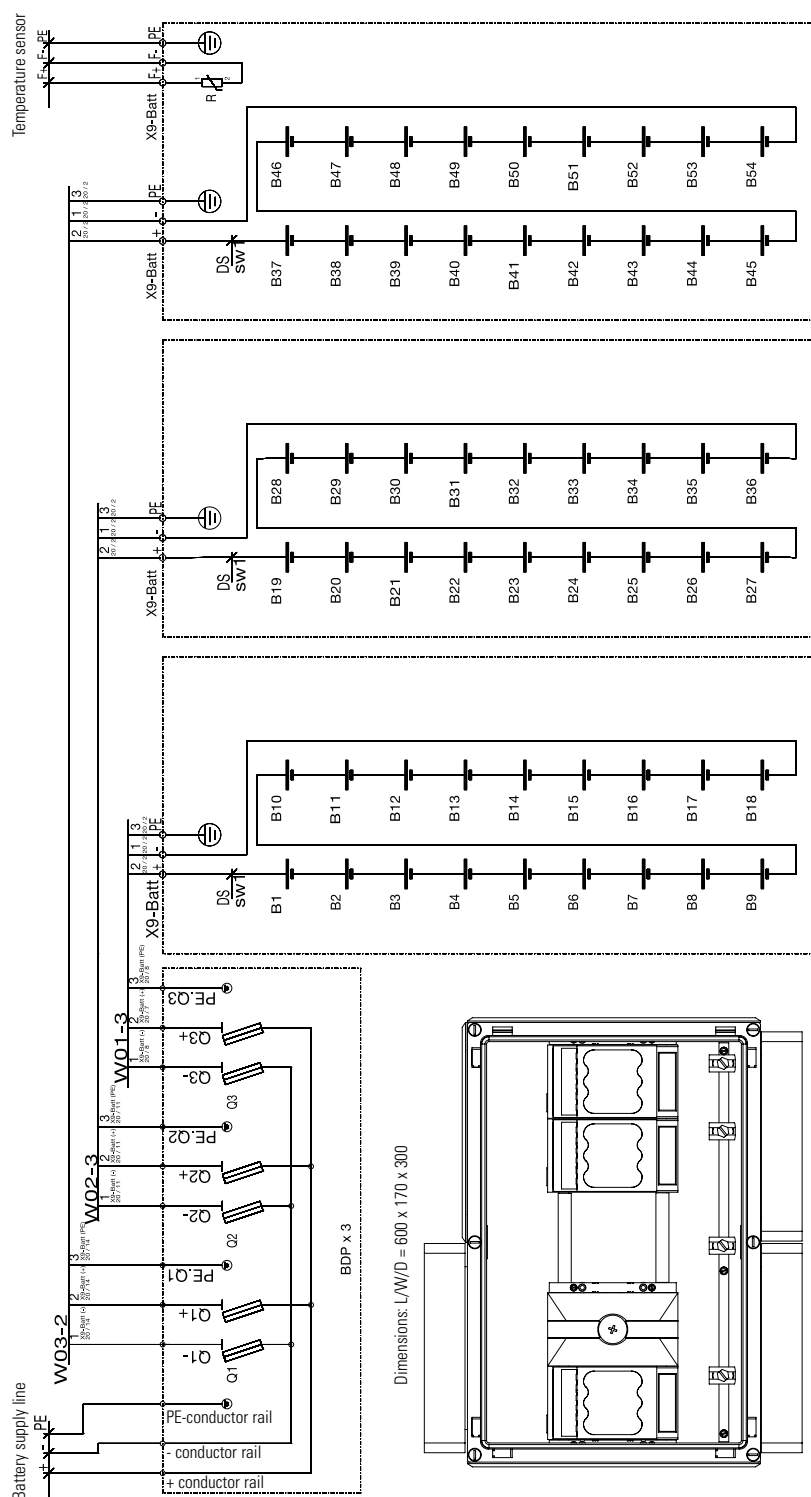
see separate installation instruction 30080001443

IMPORTANT NOTE!

Only one temperature sensor per charger has to be installed.
A series- or parallel connection of the temperature sensor
can cause an improper charging of the battery.

4 Circuit Diagrams

4.4 Wiring 195.4 Ah, 245 Ah, 268.2 Ah



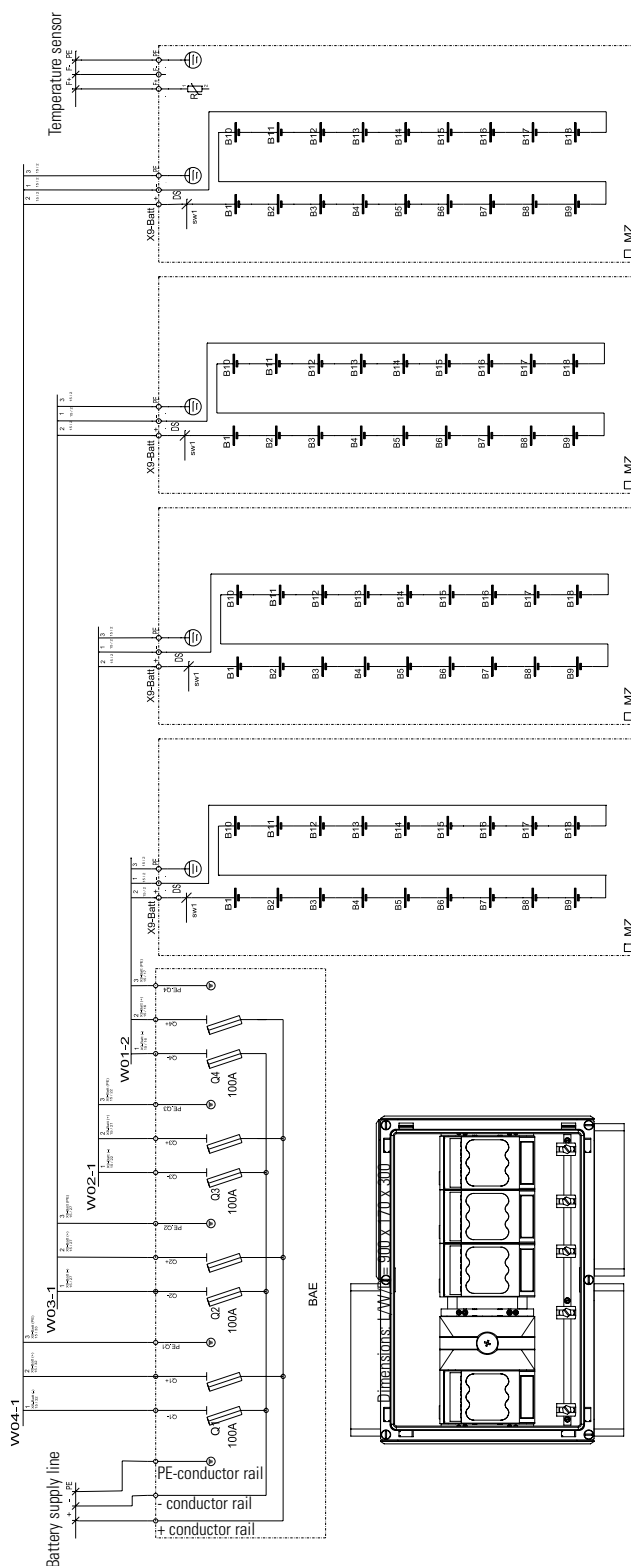
Battery Distribution Panel

see separate installation instruction 30080001443

IMPORTANT NOTE!

Only one temperature sensor per charger has to be installed.
A series- or parallel connection of the temperature sensor
can cause an improper charging of the battery.

4.5 Wiring 308 Ah, 357.6 Ah



Battery Distribution Panel

see separate installation instruction 30080001443

IMPORTANT NOTE!

Only one temperature sensor per charger has to be installed. A series- or parallel connection of the temperature sensor can cause an improper charging of the battery.

5 Transport, Packaging and Storage

5.1 Safety Notes

WARNING! RISK OF INJURY!

There is a risk of injury when transporting or loading due to falling parts.

ATTENTION! **DAMAGE TO PROPERTY!**

Batteries will be destroyed or damaged by improper transport.

- The following safety notes have to be observed:
- Never lift loads over person's head.
- Always move battery with great care and attention.
- Only use lifting accessories and hoisting devices with enough loading capacity.

5.2 Carriage by land of closed lead acid batteries

Monoblocs have to be transported standing upright.

Batteries with no damage do not have to be transported as hazardous material (In Germany according to "Hazardous Material Regulation for Street –ADR- and for Train –RID-").

They have to be protected against short circuits, slipping, falling and damage.

Blocs can be stockpiled adequately by securing on the pallets (ADR or RID). It is forbidden to stack one pallet above the other.

Blocs with leaky or damaged containers have to be packed and transported as hazardous material of class 8, UN-no. 2794.

5.3 Carriage by sea of closed lead acid batteries

The following type series are not hazardous material according to IMDG, because they fulfill the IATA-clause A 67:

Sonnenschein A 400

Marathon

Sprinter

5.4 Carriage by air of closed lead acid batteries

The following type series are not hazardous material according to IATA-clause A67:

Sonnenschein A400

Marathon Sprinter

5.5 Abbreviations

ADR: The European Agreement Concerning the International Carriage of Dangerous Goods by Road (covering most of Europe)

RID: Regulations concerning the International Carriage of Dangerous Goods by Rail (covering most of Europe, parts of North Africa and the Middle East)

IMDG: The International Maritime Dangerous Goods Code

IATA: The International Air Transportation Association (world-wide)

ICAO: Civil Aviation Organization's Technical Instructions for the Safe Transport of Dangerous Goods by Air

5.6 Transport Inspection

Check delivery on receipt for completeness and for transport damages, immediately.

If external damage is detected do not accept the delivery, except under protest.

5.7 Packaging

If no return – agreement exists for packing material separate it according to type and size for further use.

ATTENTION!

Packing material has to be recycled in an environmentally friendly way and according to the local provisions governing disposal. If necessary, commission special recycling company.

- Components will be identified on the basis of number and type of blocs or on the basis of a battery drawing.
- It is forbidden to stack one pallet above another.
- Observe notes for handling printed on the packing material.
- Avoid damage during transport for breakable products by marking them.

5.8 Requirements and Preconditions

Avoid and remove dirt and dust on the surfaces.

The storage location should fulfill the following functions:

- Shelter the cells / monoblocs from harsh weather and risk of flooding.
- Protect the batteries against any overheating risk induced by direct or indirect exposure to sun radiation.
- Storage rooms for batteries should be clean, dry, frost-free and neat.
- Protect the batteries from any risk of electric shock resulting from shortcircuiting by metallic items or conductive dust.
- Avoid any risk caused by dropping objects onto cell / monoblocs or by dropping the cell / monobloc itself.

5.9 Storage Conditions

- The temperature has an impact on the self- discharge rate (see fig. 1 and 2).
- Storage on a pallet wrapped in plastic material is authorised. It is not recommended however in rooms where the temperature fluctuates significantly, or if high relative humidity can cause condensation under the plastic cover. With time, this condensation can cause a whitish hydration on the poles and lead to high self-discharge by leakage current.
- It is forbidden to stack one pallet above the other

- Avoid storing unpacked cells / monoblocs on sharp-edged supports.
- It is recommended to have the same storage conditions within a batch, pallet or room.

5.10 Storage

Keep packages closed up to mounting and observe the external marked arrangement and storage notes. Store packages under the following conditions:

- Not to be stored outside
- Keep dry and dust-free

In the interests of users the time of storage should be as short as possible.

5.11 Time of Storage

The maximum time of storage is 12 months with temperatures of 20°C. Higher temperatures cause a higher self-discharge and shorten the intervals between the chargings.

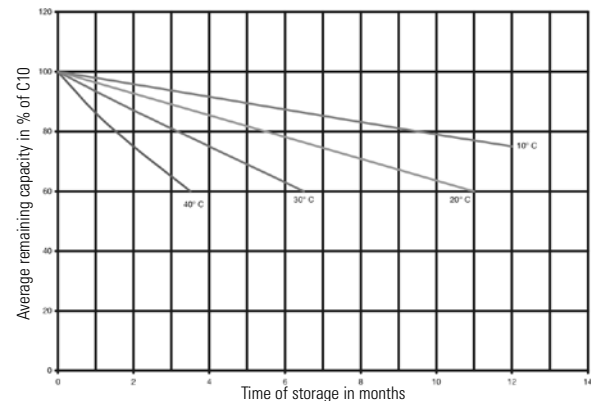


Fig. 1: Sprinter – remaining capacity in % of C10 versus time of storage with different temperatures

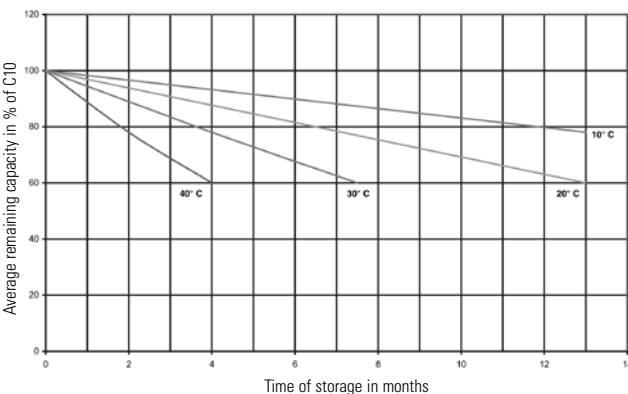


Fig. 2: Marathon – remaining capacity in % of C10 versus time of storage with different temperatures

5.12 Measures during Storage

Appropriate inventory turnover based on FIFO - method ("First In- First Out") will result in a higher operating quality of the products.

If the battery casings must be cleaned (prior to their installation) never use solvents or abrasives. Use water (wetcloth) without additives.

For extended storage periods it is recommended to check the „open-circuit“ voltage at the following intervals:

- storage at 20°C: after a storage period of 6 months, then every 3 months afterwards.
- storage at 30°C: after a storage period of 4 months, then every 2 months afterwards.

When measured „open circuit“ voltage is < 2,11 V/C, battery has to be recharged.

Trickle charging*) should be considered necessary when the measured open circuit voltage (OCV) is < 2,11 V/C.

*)Trickle charging means continuous charge at a low rate, approximately equivalent to the internal losses of the battery and suitable to maintain the battery in a fully charged state. It can be carried out either by IU-charging (=float charging) or I-charging (constant charging) with limited current.

Trickle charging mode during storage

Constant charging (IU-charging)

Tempe- rature	Max. voltage per cell	Min. voltage per cell	Max. current	Charging time at max. voltage
20 °C	2,38 V	2,27 V	0,2 C ₁₀	24 h
25 °C	2,35 V	2,25 V	0,2 C ₁₀	24 h
30 °C	2,32 V	2,22 V	0,2 C ₁₀	24 h

chart 1: Value for constant voltage charging (Marathon L)

Constant charging (IU-charging)

Temper- ature	Max. voltage per cell	Min. voltage per cell	Max. current	Charging time at max. voltage
20 °C	2,40 V	2,29 V	0,2 C ₁₀	24 h
25 °C	2,37 V	2,27 V	0,2 C ₁₀	24 h
30 °C	2,35 V	2,25 V	0,2 C ₁₀	24 h

chart 2: Value for constant voltage charging (Sprinter)

Depending on the chargers the charging time shall be extended by 24 hours for every 0,04V less than the maximum voltage, in which the „minimum voltage“ is still the lower limit.

For temperatures < 15 °C it is recommended to charge the battery 20 hours.

6 Installation

6.1 Safety Notes

⚠ WARNING! RISK OF INJURY!

Improper mounting and installation can cause serious personal injury and / or material damage. This work must only be performed by authorised, skilled and adequate personnel who have received instructions providing information on the device and in observance of the local safety regulations.

- Ensure there is enough free moving space.
- Ensure orderliness and cleanliness at the working place. Loose tools lying around are dangerous!

6.2 Battery rooms, Ventilation and General requirements

General: This is a guideline only and consists of abridgements from national and international standards and guidelines. See EN 50272-2 for further information. Also, observe "Operating Instructions" and "Installation Instructions".

6.2.1 Temperature

- AGM-batteries are developed to be operated within a wide temperature range -15°C and +55°C.
- The battery-room temperature should be between +10°C and +30°C.
- The optimum operating temperature is the nominal temperature of 20°C.
- Higher temperatures reduce the lifetime. Above 40°C there is a risk of „thermal runaway effects“
- Lower temperatures reduce the available capacity and prolong the recharge time.
- Below approx. -8°C there is a risk of freezing, depending on the depth of discharge. On the other hand it is possible to use the batteries at lower temperatures, under specific conditions.
- The battery temperature effects the available capacity.
- The difference of temperature between the cells / monoblocs in one battery-line has to be under 5 °C (5 Kelvin).

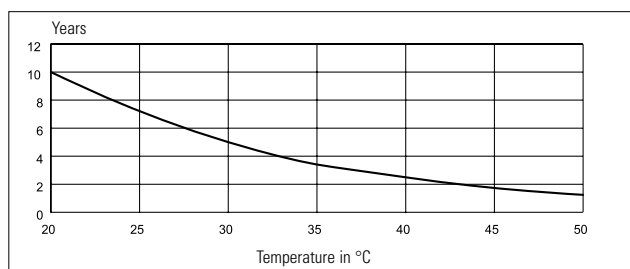


Fig. 1: Sprinter – Life utility versus temperature

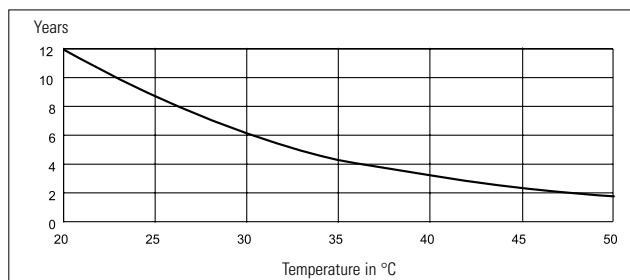


Fig. 2: Marathon – Life utility versus temperature

6.2.2 Room dimensions and Surface conditions

Floors shall be reasonably level and able to support the battery weight.

From EN 50272-2: "...The floor area for a person standing within arm's reach of the battery shall be electrostatic dissipative in order to prevent electrostatic charge generation. The resistance to a groundable point measured to IEC 61340-4-1 shall be less than 10 MOhm.

Conversely the floor must offer sufficient resistance R for personnel safety. Therefore the resistance of the floor to a groundable point when measured in accordance with IEC 61340-4-1 shall be:

- for battery nominal voltage 500 V: 50 kOhm R 10 MOhm and
- for battery nominal voltage > 500 V: 100 kOhm R 10 MOhm

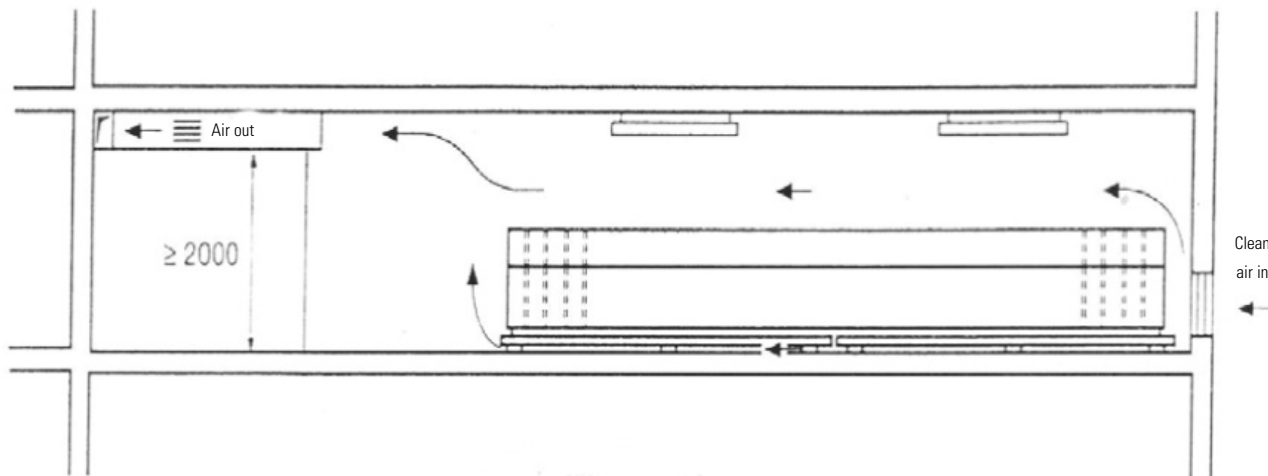
Note 1:

To make the first part of the requirement effective, personnel shall wear anti-static footwear when carrying out maintenance work on the battery. The footwear shall comply with EN 345.

Note 2:

Arm's reach: 1.25 m distance (Definition of arm's reach see HD 384.4.41)..."

Room inlets and outlets: The layout for air circulation should be as shown below:



6.2.3 Ventilation

Battery rooms must be vented acc. to EN 50 272-2 in order to dilute gas (hydrogen and oxygen) released by charging and discharging and to avoid explosions. Therefore, the electrical installation must not be "EX" protected. It must be designed for wet room conditions.

Do not install batteries in airtight enclosures.

Spark generating parts must have a safety distance to cell or bloc openings (valves at closed batteries) as specified in EN 50272-2.

Heaters with naked flames or glowing parts or devices are forbidden. Heater temperature must not exceed 300°C.

6 Installation

6.2.3.1 Ventilation requirements

Ventilation of electrical rooms

Dimensions of ventilation acc. to EN 50272-2.

The minimum air flow rate for ventilation of a battery location or compartment shall be calculated by the following formula:

$$Q = 0.05 \times n \times I_{\text{gas}} \times \text{CN} \times 10^{-3} \text{ [m}^3/\text{h]}$$

Q = needed air volume flow in m³/h

0.05 = fixed factor

n = no. of accumulator cells

I_{gas} = current in mA per Ah, fits 8 mA per Ah for Iboost with VRLA batteries

CN = capacity C10 for lead acid at 20 °C

Example for needed air volume flow of ZB-S with 155.6 Ah lead acid battery:

$$Q = 0.05 \times n \times I_{\text{gas}} \times \text{CN} \times 10^{-3}$$

$$Q = 0.05 \times 108 \times 8 \times 155.6 \times 10^{-3} \text{ m}^3/\text{h}$$

$$Q = 6.72 \text{ m}^3/\text{h}$$

In order to ensure the air volume flow of 6.72 m³/h, the air inlets and outlets in the electrical distribution room must have the following min. cross-sections acc. to EN 50272-2.

Vent cross-section of the air inlets and outlets:

$$A \bullet 28 \times Q$$

$$A \bullet 28 \times 6.72 \text{ m}^3/\text{h}$$

$$A \bullet 188.21 \text{ cm}^2$$

The required vents in the F90 walls must be guarded by fire protection measures, e.g. F90 fire shutters.

As the calculation shows, the use of even the largest battery does not require an elaborate technical ventilation (e.g. explosion protected fans).

Due to the installed maintenance-free, sealed lead acid gas recombination batteries no further special constructional requirements such as a floor resistant to electrolytes or a floor covering (tiles) etc. have to be met.

VRLA valve regulated lead acid monobloc batteries can operate in any position. Except on top.

Calculation of ventilation of electrical rooms acc. EN 50272-2 (calculated for boost charge!):

Battery capacity C10 at 1.8 V/Z and +20 °C [Ah]	5.5	8.5	11.6	18.0	23.3	32.0	39.8	50.4	53.7	66.2	85.7	89.4	106.0	118.0	143.1	155.6	178.8	195.4	245.0	268.2	308.0	357.6
Air volume flow req. for the ventilation of the place of installation [m ³ /h]	0.24	0.37	0.50	0.78	1.01	1.38	1.72	2.18	2.32	2.86	3.70	3.86	4.58	5.10	6.18	6.72	7.72	8.44	10.58	11.59	13.31	15.45
Vent cross-section of the air inlets and outlets of the place of installation [cm ²]	6.6	10.3	14.03	21.77	28.2	38.7	48.1	61.0	65.0	80.1	103.7	108.1	128.2	142.7	173.1	188.2	216.3	236.4	296.3	324.4	372.6	432.5

Chart 9

6.2.3.2 Close vicinity of the battery

From EN 50272-2: "...In the close vicinity of the battery the dilution of explosive gases is not always secured. Therefore a safety distance extending through air must be observed within which sparking or glowing devices (max. surface temperature 300°C) are prohibited. The dispersion of explosive gas depends on the gas release rate and the ventilation close to the source of release.

6.2.4 Electrical requirements (protection, insulation, resistance, etc.)

To prevent a build-up of static electricity when handling batteries, clothing/materials, safety boots and gloves are required to have a surface resistance 10⁸ Ohm and an insulation resistance of 10⁵ Ohm.

From EN 50272-2: "...To be resistant against environmental influences, like temperature, wetness, dust, gases, vapours and mechanical loads, the minimum insulation resistance between the battery's circuit and other local conductive parts should be greater than 100 Ohm/V (of battery nominal voltage) corresponding to a leakage current < 10 mA."

Note:

„Before an inspection separate the battery system from the fix installation and check if there is a dangerous voltage between the battery and its rack or cabinet. ...“

With battery system > DC 120 V the rack or cabinet made of metal has to be connected to a protective conductor or there is a protection insulation against the battery and the mounting location. (Chapter 5.2 in EN 50272-2)

This insulation must withstand 4000 V for one minute.

Note:

Protection against direct and indirect touching can be used for battery units with a rated voltage ≤ DC 120 V. In this case the requirements of metallic battery racks and cabinets are not valid (acc. to 5.2 in EN 50272-2).

Touch protection must be provided for all active parts at voltages > 60 V DC with insulation, covers and distance.

6.2.5 Installation

Batteries shall be installed in clean, dry locations. They must be secured against falling items and dirt.

6.3 Preparations

Check each cell/ monobloc separately by measuring the open circuit voltage.

2 Volt cell: U 2.11 V

6 Volt monobloc: U 6.33 V

12 Volt monobloc: U 12.66 V

- When measuring the open circuit voltage pay attention to polarity (perhaps wrong mounting)
- If CEAG Notlichtsysteme GmbH has supplied drawings for the installations, the cells / monoblocs should be installed accordingly.
- Check that the battery racks are stable and horizontal. For the shelf assemblies from 4 levels and 2 rows or 5 levels and 3 rows, the assembly should be anchored with the building.
- The racks or cabinets should provide adequate ventilation above and below to allow the heat produced by the batteries and their charging system to escape. The distance between cells or monoblocs shall be approx. 10 mm, at least 5 mm.

6.4 Mounting

For mounting use insulated tools. It is recommended to protect yourself by wearing rubber gloves, protection glasses and clothes (incl. safety boots). Remove any metal objects such as watches or any other items of jewelry, especially in the case of installation in a cabinet (see also chapter 2).

Mount the supplied terminal covers to the battery connectors for isolating the battery terminals.

The connections should be tightened by means of an insulated torque wrench, set to the following:

- G-M5 terminal: 5 ± 1 Nm
- M6 male screw terminal: 6 ± 1 Nm
- M6 female screw terminal: 11 ± 1 Nm
- M8 male screw terminal: 8 ± 1 Nm
- M8 female screw terminal: 20 ± 1 Nm
- M12 male screw terminal: 25 ± 1 Nm
- Inch 10-32x0.425: 6 ± 1 Nm

After installation work is completed, lightly coat the connection surfaces with the terminal grease supplied.

This prevents corrosion but is not mandatory.

Check total battery voltage, which should correspond to the number of monoblocs connected in series. The open circuit voltage of single cells should not vary from each other by more than 0.02 V among each other. For monobloc – batteries the following maximum differences are allowed:

- 6 V- monobloc: 0.04 V
- 12 V- monobloc: 0.05 V

Install the provided terminal covers to insulate the battery poles.

6.5 Parallel Arrangements

Preconditions and features for 2 to 10 strings in parallel:

- The connector cables for positive and negative terminals of each battery string must have the same length.

- The minimum cable size for the end connectors of a string is 25 mm²/100 Ah string capacity.
- The end-connector cables must be placed on a copper bar with at least 100 mm²/100 Ah string capacity with the shortest possible distance.
- It is a must to have a circuit breaker for each string or every two strings.
- The strings must all have the same number of cells and temperature.

If these requirements are fulfilled paralleling of up to 10 strings is possible. All battery performance data have to be applied to the end terminal of each string.

Also, the type of lead-acid batteries may differ as long as the requested charging voltage (Vpc) per string is fulfilled.

First every single string has to be pre assembled. Then check, if strings have the same state of charge, and therefore a similar open circuit voltage, before connecting them in parallel.

6.6 Operation Positions for AGM Cells and Monoblocs

The following figures show the possible operation positions for valve regulated lead acid AGM cells and monoblocs in conservation-charging operation.

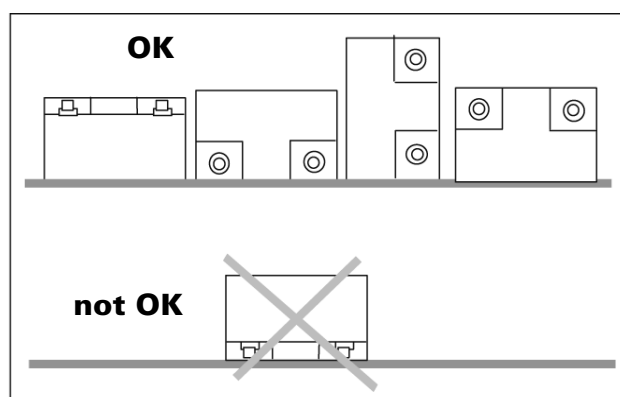


fig. 3: operation positions for AGM monoblocs

7 Commissioning

Further information about operating can be found in the operating instructions for ZB-S, No. 40071860179.

8 Operating

8.1 Safety Notes

⚠ WARNING! RISK OF INJURY!

Improper mounting and installation can cause serious personal injury and / or material damage. This work must only be performed by authorised, skilled and adequate personnel who have received instructions providing information on the device and in observance of the local safety regulations.

- Before work begins:
- Before work on the battery begins check its completeness and technical correctness.
- Ensure there is enough free moving space.

⚠ ATTENTION!

Please do not stick the battery block numbers over the battery block valve cover.

During operation:

- When failures arise first of all switch battery off and protect against reengagement.

When working on and with the battery it is necessary to wear:

- Safety boots which protect against falling parts and against slipping on non – anti – slip floor.

9 Maintenance

9.1 Safety Notes

⚠ WARNING! RISK OF INJURY!

Improper maintenance work can cause serious personal injury and / or material damage. This work has to be performed only by authorised, skilled and adequate personnel who have received instructions providing information on the device and in observance of local safety regulations.

9.2 Maintenance

⚠ ATTENTION! MATERIAL DAMAGE!

Never use a synthetic cloth or sponge to clean cells / monoblocs. Use water (wet cloth) without additives.

9.2.1 General Items and Checks (acc. to Operating Instructions/Appendix)

Periodic inspections and maintenance are necessary regarding:

- charge voltage and current settings,
- the discharge conditions,
- the temperature levels,

- the storage conditions,
- the cleanliness of the battery and equipment
- and other conditions relevant to safety issues and battery's service life (battery room ventilation, for example).

Periodic discharges can be used to assess the available operating endurance, to detect faulty cells/monoblocs and ageing symptoms of the battery, in order to consider battery replacement in due time.

VRLA (Valve-Regulated Lead-Acid Batteries) batteries do not require topping-up with water. That's the reason why they were called "maintenance-free". Pressure valves are used for sealing and cannot be opened without destruction. Therefore, they are defined as "Valve-Regulated" lead-acid batteries (VRLA-batteries).

Even if VRLA-batteries are called "maintenance-free" they sometimes need inspection (see "Operating Instructions" for details):

At least every 6 months measure and record:

- Battery voltage
- Voltage of several cells/blocs (approx. 20%)
- Surface temperature of several cells/blocs
- Battery-room temperature

Annual visual check:

- bolted assemblies (checking unsecure bolted assemblies to adjust them)
- Battery rack and accommodation ventilation

If the cell/bloc voltages differ from the average float charge voltage by more than a specified +/- tolerance as stated in table 7 or if the surface temperature difference between cells/blocs exceeds 5 K, the service agent should be contacted.

Operation since	6-V-monoblocs	12-V-monoblocsk
	6.81 V	13.62 V
< 6 months	6.60 - 7.19 V	13.33 - 14.16 V
> 6 months	6.64 - 7.16 V	13.38 - 14.11 V

chart 7: Valid range of conservation charging voltage

9.2.2 Cleaning of Batteries

It is not allowed to open valves and covers.

Never use a synthetic cloth or sponge to clean the cells and plastic parts of the battery. Use water (wet cloth) without additives.

After cleaning the battery cover has to be dried, e. g. with compressed air or cleaning cloth.

10 Failures

10.1 Reaction to Failure

Further information about failures can be found in the operating instructions for ZB-S, No. 40071860179.

11 Spare parts

Only use original spare parts from the manufacturer.

ATTENTION!

Wrong or faulty spare parts from other manufacturers can cause serious damage to the battery. Ensure the same charging state when changing the battery blocs.

RECOMMENDATION:

not more than 25% of the battery packs of a battery set should be replaced. Therefore with 18 packs not more than 5 packs should be replaced.

When 50% of the expected service life is exceeded and single battery packs fail, the complete set should be replaced

11.1 Ordering Spare Parts

Please state the following when ordering spare parts:

– order number– rated capacity –type

In case of complaints you need a RMA- number from us. For further information see www.ceag.de!

81700849

Operating Instruction Stationary valve regulated lead-acid batteries

Nominal data

- Nominal voltage U_N : 2.0V x number of cells
- Nominal capacity $C_N = C_{10}; C_{20}$: 10 h; 20 h discharge (see type plate on cells/blocks and technical data in these instructions)
- Nominal discharge current $I_N = I_{10}; I_{20}$: $C_N / 10 \text{ h}; C_N / 20 \text{ h}$
- Final discharge voltage U_f : see technical data in these instructions
- Nominal temperature T_N : 20° C; 25° C

Battery type: _____ Number of cells/blocks: _____
 Assembly and CE marking by: _____ GNB order no.: _____ date: _____
 Commissioned by: _____ date: _____
 Security signs attached by: _____ date: _____



- Observe these Instructions and keep them located near the battery for future reference! Work on the battery should only be carried out by qualified personnel!



- Do not smoke!
- Do not use any naked flame or other sources of ignition. Risk of explosion and fire!



- While working on batteries wear protective eye-glasses and clothing.
- Observe the accident prevention rules as well as EN 50272-2 and EN 50110-1.



- Any acid splashes on the skin or in the eyes must be flushed with plenty of water immediately. Then seek medical assistance. Spillages on clothing should be rinsed out with water.



- Explosion and fire hazard, avoid short circuits.
- Avoid electrostatic charges and discharges/sparks!



- Electrolyte is very corrosive. In normal working conditions contact with electrolyte is impossible. If the cell or block container is damaged do not touch the exposed electrolyte because it is corrosive.



- Cells and blocks are heavy! Make sure they are installed securely. Always use suitable handling equipment for transportation!
- Handle with care because cells/blocks are sensitive to mechanical shock.
- Do not lift or pull up cells/blocks on the poles.



- Caution! Metal parts of the battery are always alive, therefore do not place items or tools on the battery!



- Keep children away from batteries.

Non-compliance with operating instructions, installations or repairs made with other than original accessories and spare parts or with accessories and spare parts not recommended by the battery manufacturer or repairs made without authorization (e. g. opening of valves) render the warranty void.



Spent batteries have to be collected and recycled separately from normal household wastes (EWC 160601). The handling of spent batteries is described in the EU Battery Directive (2006/66/EC) and their national transitions (UK: HS Regulation 1994 No. 232, Ireland: Statutory Instrument No. 73/2000). Contact your supplier to agree upon the recollection and recycling of your spent batteries or contact a local and authorized Waste Management Company.

Stationary valve regulated lead acid batteries do not require topping-up water. Pressure valves are used for sealing and cannot be opened without destruction.

AGM-Type	10-32x0,425	G-M5	F-M6	M-M6	M-M8	F-M8
Marathon L/XL	--	--	11 Nm	6 Nm	8 Nm	20 Nm
Marathon M/M-FT	6 Nm	--	11 Nm	6 Nm	--	--
Sprinter P/XP	--	--	11 Nm	6 Nm	8 Nm	--
Sprinter S	--	--	11 Nm	--	--	--
Powerfit S200/S300	--	5 Nm	5 Nm	--	--	--
Powerfit S500	--	--	--	6 Nm	8 Nm	--

1. Start Up

Check all cells/blocks for mechanical damage, correct polarity and firmly seated connectors. Torques as shown in table 1 apply for screw connectors.

Before installation the supplied rubber covers should be fitted to both ends of the connector cables (pole covers).

Control of insulation resistance:

New batteries: > 1M Ω

Used batteries: > 100 Ω /Volt

Connect the battery with the correct polarity to the charger (pos. pole to pos. terminal). The charger must not be switched on during this process, and the load must not be connected. Switch on charger and start charging following instruction no. 2.2.

2. Operation

For the installation and operation of stationary batteries EN 50 272-2 is mandatory.

Battery installation should be made such that temperature differences between individual units do not exceed 3 degrees Celsius (Kelvin).

2.1 Discharge

Discharge must not be continued below the voltage recommended for the discharge time. Deeper discharges must not be carried out unless specifically agreed with the manufacturer. Recharge immediately following complete or partial discharge.

2.2 Charging

All charging must be carried out according to DIN 41773 (IU-characteristic with limit values: I-constant: $\pm 2\%$; U-constant: $\pm 1\%$).

Depending on the charging equipment, specification and characteristics alternating currents flow through the battery. Alternating currents and the reaction from the loads may lead to an additional temperature increase of the battery, and strain the electrodes with possible damages (see 2.5) which can shorten the battery life. Depending on the installation charging (acc. to EN 50272-2) may be carried out in following operations.

a.) Standby Parallel Operation

Here, the load, battery and battery charger are continuously in parallel. Thereby, the charging voltage is the operation voltage and at the same time the battery installation voltage. With the standby parallel operation, the battery charger is capable, at any time, of supplying the maximum load current and the battery charging current. The battery only supplies current when the battery charger fails. The charging voltage should be set **acc. to table 2** measured at the end terminals of the battery.

	Float voltage [Vpc]	Nominal temp. [° C]
Marathon L/XL	2.27	20
Marathon M/M-FT	2.27	25
Sprinter P/XP	2.27	25
Sprinter S	2.27	25
Powerfit S200/S300	2.27	20
Powerfit S 500	2.27	20
A 400/FT	2.27	20
A 500	2.30	20
A 600	2.25	20
A 700	2.25	20

Table 2: Float voltage

To reduce the charging time a boost charging stage can be applied in which the charging voltage **acc. to table 3** can be adjusted (standby-parallel operation with boost recharging stage). Automatic change over to charging voltage **acc. to table 2** should be applied.

	Voltage on boost charge stage [Vpc]	Nominal temp. [° C]
Marathon L/XL	2.35-2.40	20
Marathon M/M-FT	2.35-2.40	25
Sprinter P/XP	2.35-2.40	25
Sprinter S	2.35-2.40	25
Powerfit S200/S300	2.35-2.40	20
Powerfit S 500	2.35-2.40	20
A 400/FT	2.37-2.40	20
A 500	2.40-2.45	20
A 600	2.35-2.40	20
A 700	2.35-2.40	20

Table 3: Voltage on boost charging stage

b.) Buffer operation

With buffer operation the battery charger is not able to supply the maximum load current at all times. The load current intermittently exceeds the nominal current of the battery charger. During this period the battery supplies power. This results in the battery not fully charged at all times. Therefore, depending on the load the charge voltage must be set **acc. to table 4**. This has to be carried out in accordance with the manufacturers instructions.

	Voltage in buffer operation [Vpc]	Nominal temp. [° C]
Marathon L/XL	2.29-2.32	20
Marathon M/M-FT	2.29-2.32	25
Sprinter P/XP	2.29-2.32	25
Sprinter S	2.29-2.32	25
Powerfit S200/S300	2.29-2.32	20
Powerfit S 500	2.29-2.32	20
A 400/FT	2.29-2.32	20
A 500	2.30-2.35	20
A 600	2.27-2.30	20
A 700	2.27-2.30	20

Table 4: Charge voltage in buffer operation

c.) Switch-mode operation

When charging, the battery is separated from the load. The charge voltage of the battery must be set **acc. to table 3** (max. values). The charging process must be monitored. If the charge current reduces to less than 1.5 A / 100 Ah C₁₀, the mode switches to float charge **acc. to item 2.3** or it switches after reaching the voltage value **acc. to table 3**.

d.) Battery operation (charge-/discharge operation)

The load is only supplied by the battery. The charging process depends on the application and must be carried out in accordance with the recommendations of the battery-manufacturer.

2.3 Maintaining the full charge (float charge)

Devices complying with the stipulations under DIN 41773 must be used. They are to be set so that the average cell voltage is **acc. to table 2**.

2.4 Equalizing charge

Because it is possible to exceed the permitted load voltages, appropriate measures must be taken, e.g. switch off the load. Equalizing charges are required after deep discharges and/or inadequate charges. They can be carried out with 2.40 Vpc (A 500: 2.45 Vpc) for up to 48 hours and with unlimited current. The cells / bloc temperature must never exceed 45° C. If it does, stop charging or revert to float charge to allow the temperature to drop.

2.5 Alternating currents

When recharging up to 2.40 Vpc under operation modes 2.2 the actual value of the alternating current is occasionally permitted to reach 10 A (RMS) / 100 Ah C₁₀. In a fully charged state during float charge or standby parallel operation the actual value of the alternating current must not exceed 5 A (RMS) / 100 Ah C₁₀.

2.6 Charging currents

The charging currents are not limited during standby parallel operation or buffer operation without recharging stage. The charging current should range between the values given in **table 5** (guide values).

In cycling operation, the maximum current values as shown in **table 5** must not be exceeded.

	Charging current
Marathon L/XL	10 to 35 A per 100Ah
Marathon M/M-FT	10 to 35 A per 100Ah
Sprinter P/XP	10 to 35 A per 100Ah
Sprinter S	10 to 35 A per 100Ah
Powerfit S 200/S 300	10 to 35 A per 100Ah
Powerfit S 500	10 to 35 A per 100Ah
A 400/FT	10 to 35 A per 100Ah
A 500	10 to 35 A per 100Ah
A 600	10 to 35 A per 100Ah
A 700	10 to 35 A per 100Ah

Table 5: Charging currents

2.7 Temperature

The recommended operation temperature range for lead acid batteries is 10° C to 30° C (best: nominal temperature ± 5K). Higher temperatures will seriously reduce service life. Lower temperatures reduce the available capacity. The absolute maximum temperature is 55° C and should not exceed 45° C in service. All technical data refer to a nominal temperature of 20° C and 25° C respectively.

2.8 Temperature related charge voltage

The temperature related adjustment has to be carried out **acc. to the following figures 1 to 5**. An adjustment of the charge voltage must not be applied within a specified temperature range as shown in **table 6**.

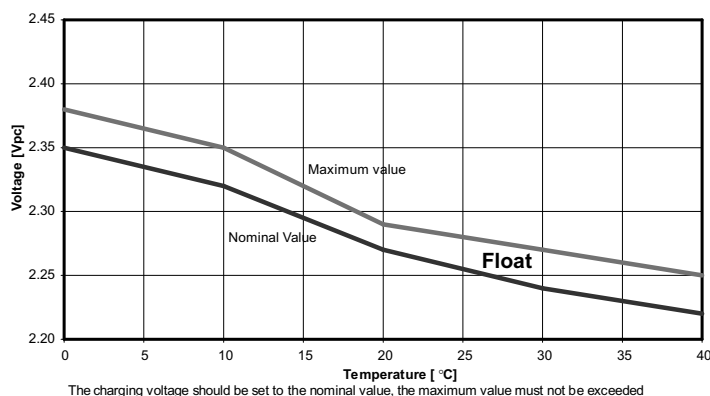


Fig. 1: Marathon L/XL and Powerfit S; charging voltage vs. temperature

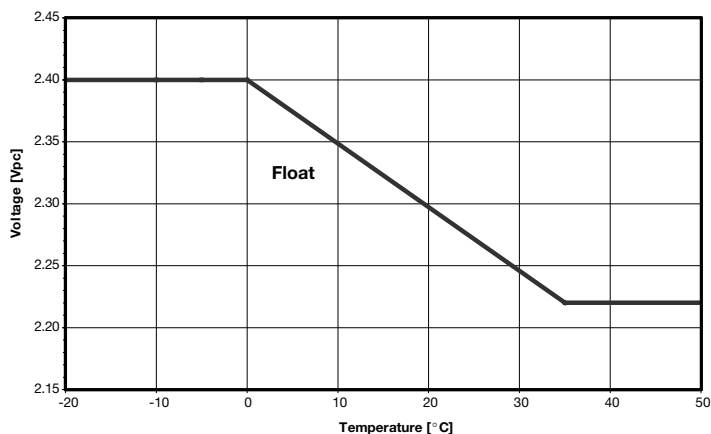


Fig. 2: Marathon M/M-FT, Sprinter P/XP, Sprinter S; charging voltage vs. temperature

2.9 Electrolyte

The electrolyte is diluted sulphuric acid and fixed in a glass mat for AGM products or in a gel for Sonnenschein products.

3. Battery maintenance and control

Keep the battery clean and dry to avoid creeping currents. The cleaning should be carried out acc. to the information leaflet „Cleaning of batteries“ published by ZVEI (German Electrical and Electronic Manufacturer Association, Working Group „Industrial Batteries“). Plastic parts of the battery, especially containers, must be cleaned with pure water without additives.

At least every 6 month measure and record:

- Battery voltage
- Float voltage of several cells/blocks
- Surface temperature of several cells/blocks
- Battery-room temperature

Annual measurement and recording:

- Battery voltage
- Float voltage of all cells / blocks
- Surface temperature of all cells/blocks
- Battery-room temperature
- Insulation-resistance acc. to DIN 43539 part1

	2V	4V	6V	8V	12V
Marathon L	+0.2/-0.1	--	+0.35/-0.17	--	+0.49/-0.24
Marathon XL	--	--	+0.35/-0.17	--	+0.49/-0.24
Marathon M/M-FT	--	--	+0.35/-0.17	--	+0.49/-0.24
Sprinter P/XP	--	--	+0.35/-0.17	--	+0.49/-0.24
Sprinter S	--	--	+0.35/-0.17	--	+0.49/-0.24
Powerfit S200/S300	--	--	+0.35/-0.17	--	+0.49/-0.24
Powerfit S 500	--	--	+0.35/-0.17	--	+0.49/-0.24
A 400/FT	--	--	+0.35/-0.17	--	+0.49/-0.24
A 500	+0.2/-0.1	+0.28/-0.14	+0.35/-0.17	+0.40/-0.20	+0.49/-0.24
A 600	+0.2/-0.1	--	+0.35/-0.17	--	+0.49/-0.24
A 700	--	+0.28/-0.14	+0.35/-0.17	--	--

Table 7: Criteria for voltage measurements

5. Faults

Call the service agents immediately if faults in the battery or the charging unit are found. Recorded data as described in item 3. must be made available to the service agent. It is recommended that a service contract is taken out with our agent.

If the cell or block voltage differ from the average float charge voltage by more than the values given in table 7, or if the surface temperature difference between cells / blocks exceeds 5K, the service agent should be contacted.

Deviations of the battery voltage from the value given in **table 2** (acc. to the number of cells) must be corrected.

Annual visual check:

- Screw-connections
- Screw-connections without locking devices have to be checked for tightness
- Battery installation and arrangement
- Ventilation

4. Tests

Tests have to be carried out according to IEC 60896-21, DIN 43539 part 1. Special instructions like DIN VDE 0107 and EN 50172 have to be observed.

Capacity test

In order to make sure the battery is fully charged IU-charge methods as shown in **table 8** can be applied depending on the different battery types.

The current available to the battery must be between 10 A / 100 Ah C₁₀ and 35 A / 100 Ah C₁₀.

	Option 1	Option 2
Marathon L/XL	2.27 Vpc ≥ 72 hours	2.40 Vpc ≥ 16 h (max. 48h) followed by 2.27 Vpc ≥ 8h
Marathon M/M-FT	2.27 Vpc ≥ 72 hours	2.40 Vpc ≥ 16 h (max. 48h) followed by 2.27 Vpc ≥ 8h
Sprinter P/XP	2.27 Vpc ≥ 72 hours	2.40 Vpc ≥ 16 h (max. 48h) followed by 2.27 Vpc ≥ 8h
Sprinter S	2.27 Vpc ≥ 72 hours	2.40 Vpc ≥ 16 h (max. 48h) followed by 2.27 Vpc ≥ 8h
Powerfit S 200/S 300	2.27 Vpc ≥ 72 hours	2.40 Vpc ≥ 16 h (max. 48h) followed by 2.27 Vpc ≥ 8h
Powerfit S 500	2.27 Vpc ≥ 72 hours	2.40 Vpc ≥ 16 h (max. 48h) followed by 2.27 Vpc ≥ 8h
A 400/FT	2.27 Vpc ≥ 72 hours	2.40 Vpc ≥ 16 h (max. 48h) followed by 2.27 Vpc ≥ 8h
A 500	2.30 Vpc ≥ 72 hours	2.45 Vpc ≥ 16 h (max. 48h) followed by 2.30 Vpc ≥ 8h
A 600	2.25 Vpc ≥ 72 hours	2.40 Vpc ≥ 16 h (max. 48h) followed by 2.25 Vpc ≥ 8h
A 700	2.25 Vpc ≥ 72 hours	2.40 Vpc ≥ 16 h (max. 48h) followed by 2.25 Vpc ≥ 8h

Table 8: Preparation for capacity test (voltage values refer to the nominal temperature. In case of temperatures other than the nominal values see item 2.8)

6. Storage and taking out of operation

To store or decommission cells/blocks for a longer period of time they should be fully charged and stored in a dry frost-free room.

To avoid damage the following charging methods can be chosen:

1. Annual refreshing charge acc. to item 2.4. Gel-batteries A400, A500, A600 and A700 can be stored without refreshing charge for maximum 24 months at 20°C. At average ambient temperatures of more than the nominal temperature shorter intervals can be necessary.

2. Float charging as detailed in 2.3.

7. Transport

Cells and blocks must be transported in an upright position. Batteries without any visible damage are not defined as dangerous goods under the regulations for transport of dangerous goods by road (ADR) or by railway (RID). They must be protected against short circuits, slipping, upsetting or damaging. Cells/blocks may be suitable stacked and secured on pallets (ADR and RID, special provision 598). It is prohibited to staple pallets.

No dangerous traces of acid shall be found on the exteriors of the packing unit.

Cells/blocks whose containers leak or are damaged must be packed and transported as class 8 dangerous goods under UN no. 2794.

In case of air transport, batteries which are part of any equipment must be disconnected at their terminals, and the terminals must be protected against short-circuits. This is in order to avoid the risk of any incidents like fire etc.

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