



-power in control

# INSTALLATION AND OPERATION INSTRUCTIONS



## Pitch Battery Charger PBC



DEIF A/S · Frisenborgvej 33 · DK-7800 Skive  
Tel.: +45 9614 9614 · Fax: 9614 9615  
Info@deif.com · www.deifwindpower.com

Document no.: 4189360001 Rev.: D  
Date: 2017-01-06  
Language: EN-GB

## Disclaimer

The contents of this document are subject to revision without notice. DEIF A/S shall have no liability for any error or damages of any kind resulting from the use of this document.

The English version of this document is the original language, and always contains the most recent and up-to-date information about the product. Translations might not be updated at the same time as the English version. DEIF A/S does not take responsibility for the accuracy of the translations. The English version always takes precedence if there is any discrepancy.

## Trademarks

DEIF, power in control *DEIF* and *power in control* are registered trademarks of DEIF A/S

All trademarks are the properties of their respective owners.

## Copyright

© Copyright DEIF A/S. All rights reserved.

# Contents

<b>1. Introduction.....</b>	<b>4</b>
1.1 Revision history .....	4
1.2 Conventions.....	4
<b>2. Safety precautions .....</b>	<b>6</b>
2.1 Mechanical work.....	6
2.2 Electrical work.....	6
<b>3. Package content, required tools and handling .....</b>	<b>8</b>
3.1 Package content.....	8
3.1.1 Standard package content: .....	8
3.2 Required tools and accessories.....	8
3.3 Handling.....	8
<b>4. Mechanical mounting .....</b>	<b>9</b>
<b>5. Electrical connections .....</b>	<b>11</b>
5.1 Connection diagram.....	11
5.2 General recommendations .....	12
5.3 Connecting wires to X5.....	12
5.4 Connecting wires to X1, X2, and X4 .....	13
5.4.1 Special considerations for X4.....	13
5.5 Connecting wires to X3.....	14
<b>6. Operating the PBC.....</b>	<b>15</b>
6.1 Visual and electrical alarm.....	15
6.1.1 Common specifications .....	15
6.1.2 Variant dependent control specifications .....	15
6.2 Pitch application notes .....	16
6.2.1 Using the same PBC for multiple battery banks .....	16
6.3 Activating and deactivating the PBC .....	16
6.4 Troubleshooting .....	17
<b>7. Disposal of the PBC .....</b>	<b>18</b>
<b>8. Glossary .....</b>	<b>19</b>
8.1 Terms and abbreviations .....	19
8.2 Units .....	19

# 1. Introduction

This document describes how to install and operate the PBC. The document is intended for persons responsible for integration of the PBC in a pitch system, cabinet design, installation and operation. For detailed information about specifications and functions of the PBC, refer to PBC datasheet.

It is recommended to print this manual in colour in order to get most information out of the pictures and illustrations.



## 1.1 Revision history


Apart from editorial changes the following changes have been made in this revision:

Date	Revision	Changes
2017-01-06	D	The manual is converted to a generic manual, valid for all PBC variants. <ul style="list-style-type: none"> <li>• Product name changed to the generic “PBC” in order to cover all variants</li> <li>• Tools and accessories updated</li> <li>• X4 (Pt100) is optional depending on the variant.</li> <li>• Drilling drawing updated</li> <li>• Operation section added</li> </ul>
2016-12-01	C	Total revision of document content.
2012-12-14	B	New document
N/A	A	Not used

## 1.2 Conventions

The following conventions are used in this document:

Used in document	Description
	A yellow symbol that illustrates hazard type (this symbol is an example for general hazard). There are different types such as electrical, chemical and so on.
Danger!	A signal word used to indicate an imminently hazardous situation, which if not avoided, will result in death or serious injury. (ISO 3864)
Warning!	A signal word used to indicate an imminently hazardous situation, which if not avoided, could result in death or serious injury. (ISO 3864)
Caution!	A signal word used to indicate a potentially hazardous situation, which if not avoided, could result in minor or moderate injury. (ISO 3864)
	A blue symbol illustrates a need for mandatory action. In this example read instructions. Other types of blue symbols exist and always indicate mandatory action.

Used in document	Description
	A symbol used to draw attention to extra information or an action that is not mandatory
PBC-xxx-2	PBC-xxx-2 is a generic name for all variants of the Pitch battery charger

## 2. Safety precautions



### Attention

Company policy and local regulations regarding PPE must always be followed, regardless whether the PPE is shown in this manual or not.

International standards such as IEC 364 and any other relevant international or national standard regarding safety must be observed. Only qualified personnel who is fully capable of recognizing, understanding and judging the dangers of the task at hand may perform the work.

The installation and service of the units should only be handled by qualified persons, who are conscious of the risks involved.

Ensure that the grounded connection wire of the line is correctly connected to the line input of the unit. Load and service or measuring setup must be grounded, if possible, in order to protect the units and the persons working with them.

During normal operation, the persons working with the units must have no contact to dangerous voltages within the unit.

### 2.1 Mechanical work



### Use eye, hand and hearing protection

Use protection for eyes, hand and hearing, if the mounting holes for bolts and heat sink need to be made during production.



### Caution!

Assess the weight of the IMD (see datasheet) with regards to lifting and placing it in the designated location in the cabinet. Use lifting aid or a second person if necessary.

### 2.2 Electrical work



### Disconnect power

Ensure that all power is disconnected when working with the IMD, except for during commissioning and service.

**Danger!**

Risk of burns and electrical shock from short circuit, electrical arc and uninsulated wires. Live work is not permitted, except for during verification, commissioning, and service. Observe local regulation when working with electrical components.

**Danger!**


Risk of burns and electrical shock from short circuit, electrical arc and uninsulated wires. Commissioning and maintenance work on this device may only be carried out by a qualified electrician.

When the IMD has been powered, there is a risk of stored energy even when the power is disconnected. Wait 5 minutes after the power is disconnected and verify zero energy according to company procedures on the outputs before performing any work.

## 3. Package content, required tools and handling

### 3.1 Package content





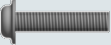

#### 3.1.1 Standard package content:

	Quantity	Description
	1	PBC battery charger

### 3.2 Required tools and accessories

The following required tools and accessories are not delivered with the PBC.

**Table 1** Required tools and accessories

	Tool or accessory	Torque	Used to
	Appropriate screwdriver for the selected 6 mm mounting screws	According to screws spec.	Fastening screws (M6).
	Flat Screwdriver 3 mm wide	N/A	Connect / disconnect wires.
	Wire insulation stripping tool	N/A	Strip wires insulation
	Press tool for ferrules	N/A	Press ferrules on wires.
	Ferrules (recommended)	N/A	Terminate wires to connectors (recommended, different size according to wire size).
	6	According to screws spec.	Fasten the PBC to the cabinet. Length depends on the cabinet structure.
	6	According to screws spec.	Fasten the PBC to the cabinet.

### 3.3 Handling

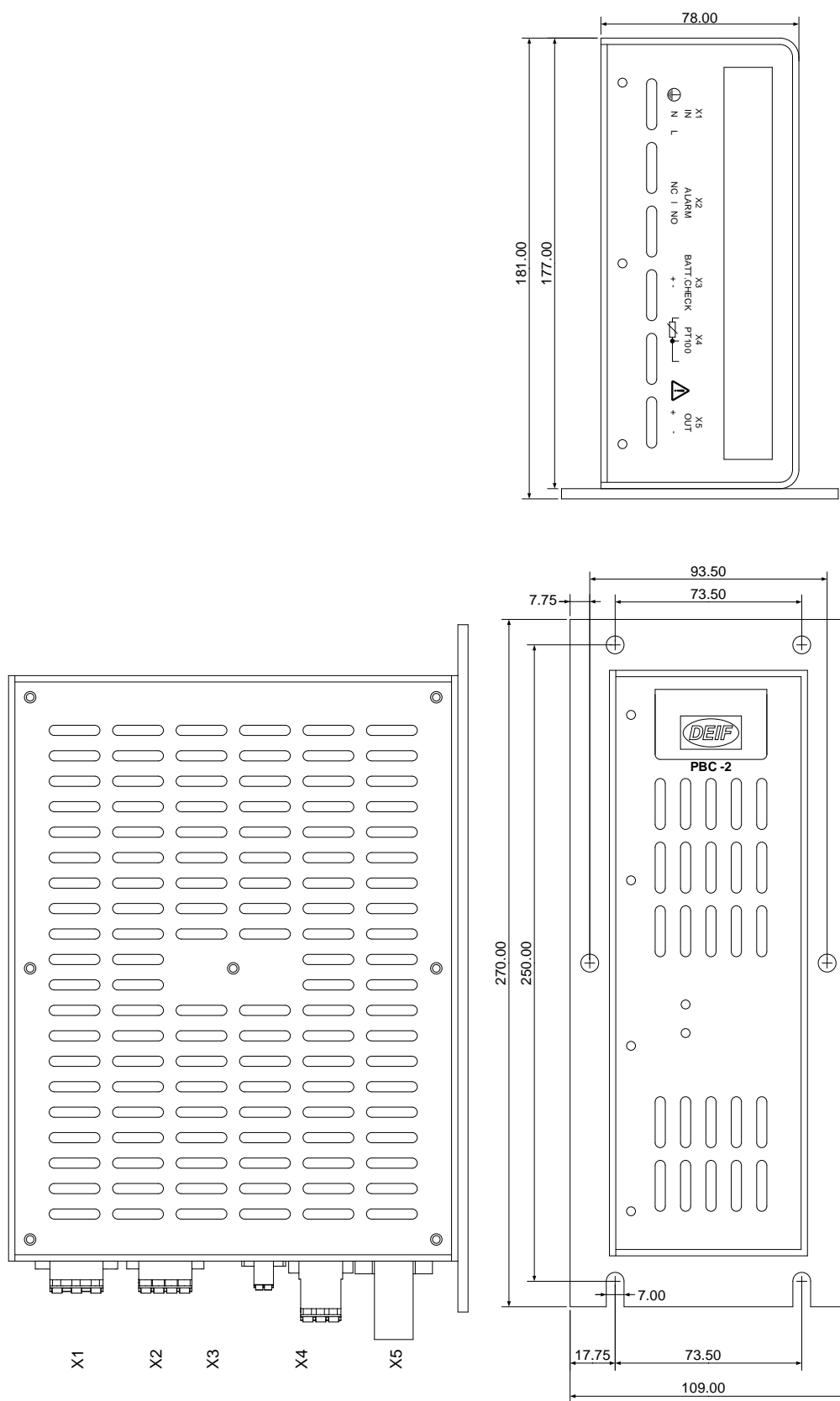


#### Attention

Sufficient care must be taken to protect the terminal against electrostatic discharges during the installation. Once the unit is installed and connected, these precautions are no longer necessary.



## 4. Mechanical mounting

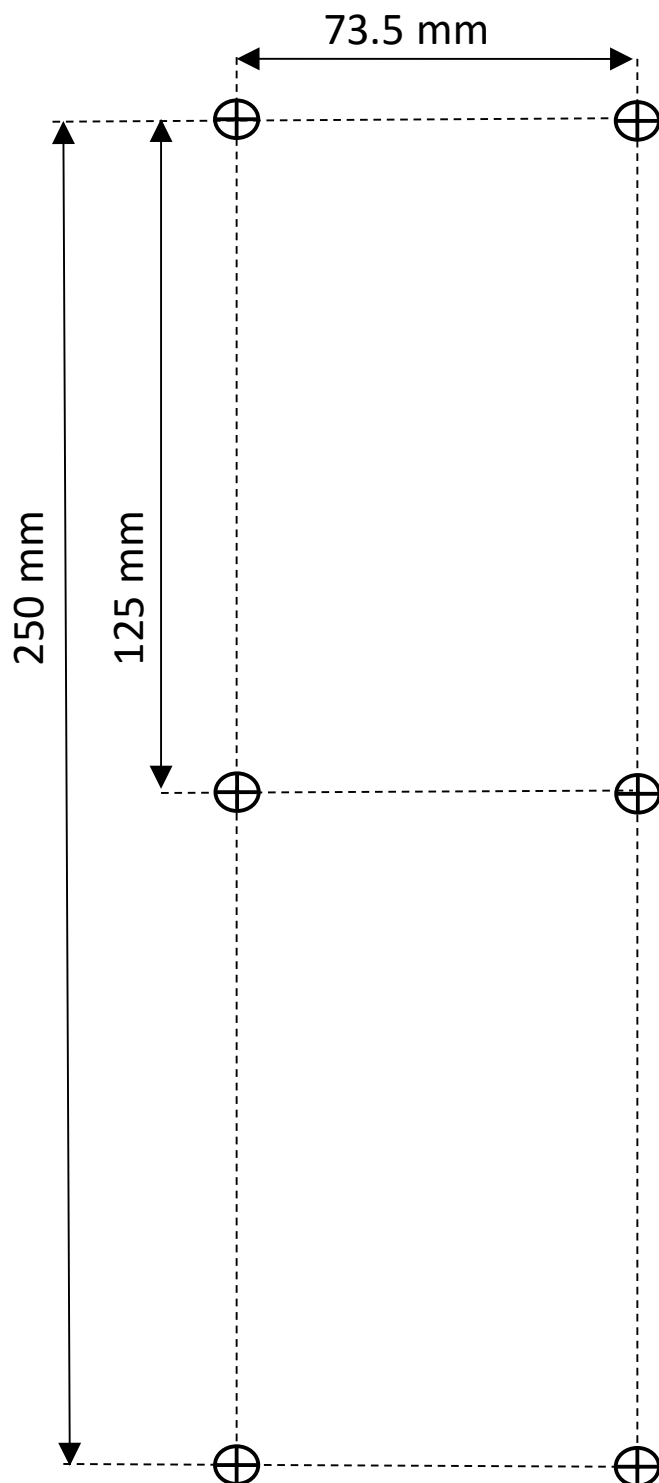


**Figure 1** PBC mechanical drawing

**Use eye, hand and hearing protection**

Use protection for eyes, hand and hearing, if the mounting holes for bolts need to be made during installation.

Drill six  $\varnothing 6$  mm holes according to [Figure 2](#) on page [10](#) and the cabinet drawings for mounting the PBC. Use 6 pcs. 6 mm screws and nuts to mount the PBC. Torque according to specification.

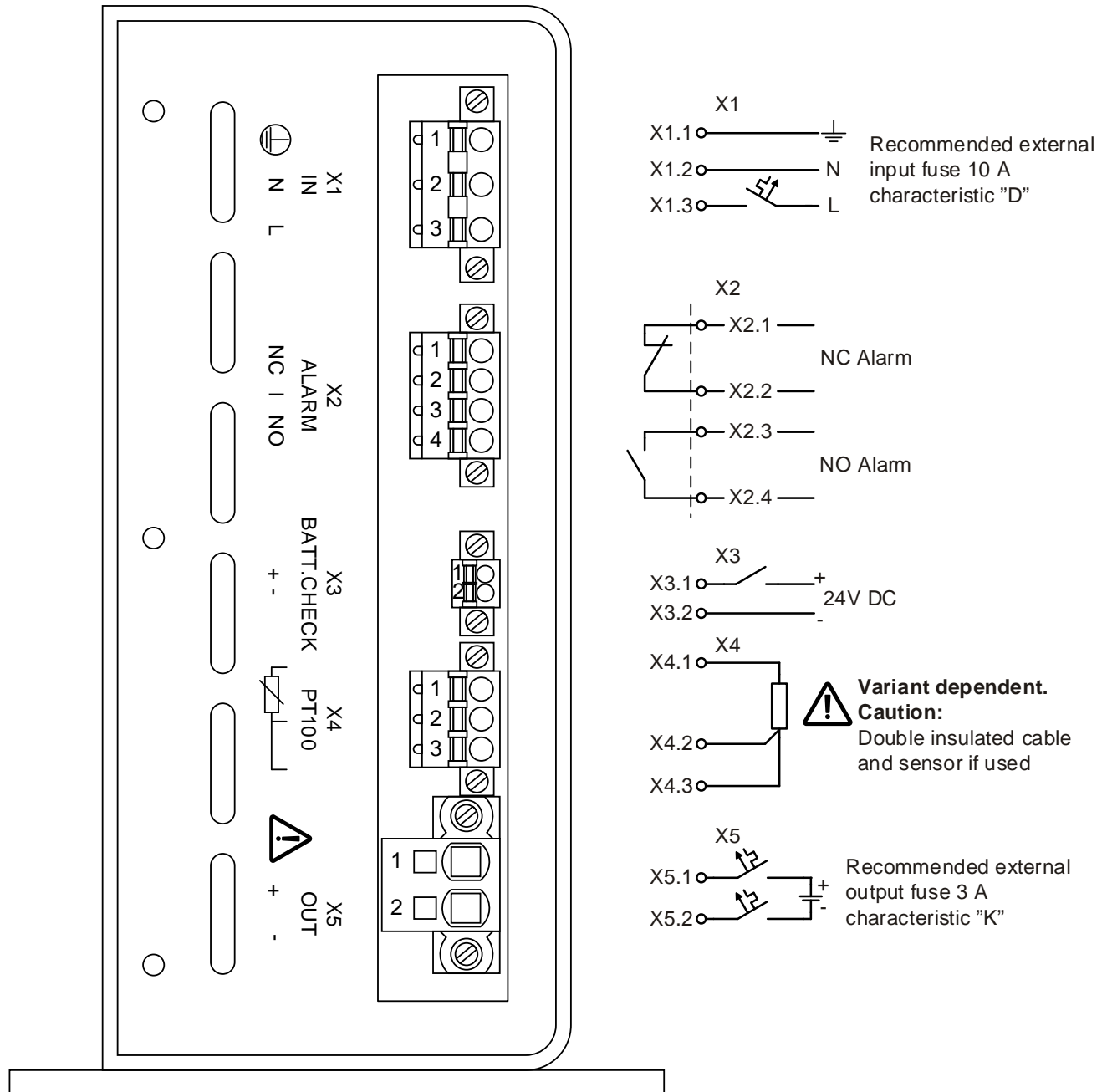


**Figure 2** PBC drilling drawing

# 5. Electrical connections

## 5.1 Connection diagram

The following figure shows the connections to the PBC.



**Figure 3** Connection diagram

Connect the wires to the PBC according to the wiring diagram.

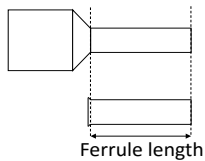


**Attention**

X4 (Pt100) connection is variant dependent. Not all variants are temperature controlled. Refer to PBC datasheet to verify whether X4 connections are applicable to the actual PBC . Not all connections are mandatory.

## 5.2 General recommendations

It is recommended to use ferrules on the wires before connecting it to the connector (see ferrule length in the technical data). The length of ferrule (termination sleeve) given in the technical data is the uninsulated part of the ferrule:



**Figure 4** Ferrule length definition

Follow the ferrule manufacturer instruction on how to use a ferrule.



### Attention

Ferrules are mandatory if multiple wires are connected to the same terminal.

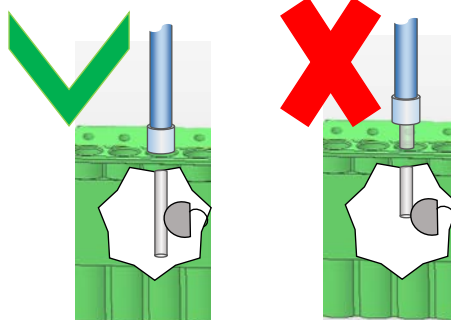
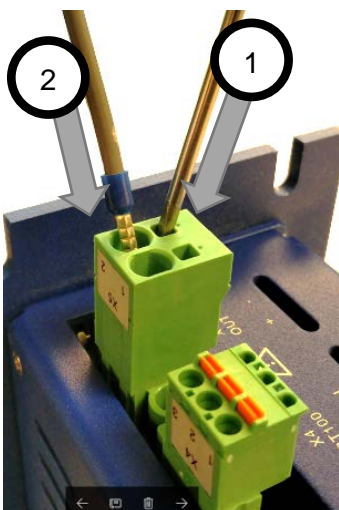
## 5.3 Connecting wires to X5

**Table 2** Technical data for X5 (Phoenix ISPC 5-7.62)

Conductor cross section flexible, without ferrule	0.2 – 6 mm <sup>2</sup>
Conductor cross section flexible, with ferrule without plastic sleeve	0.25 – 6 mm <sup>2</sup>
Conductor cross section flexible, with ferrule with plastic sleeve	0.25 – 4 mm <sup>2</sup>
Stripping length	15 mm
Ferrule length	Min. 15 mm

To connect wires to terminals:

1. Use a flat screwdriver and press the spring in as illustrated (pos.1)
2. Press the wire all the way in (pos.2).
3. Lift the screwdriver.



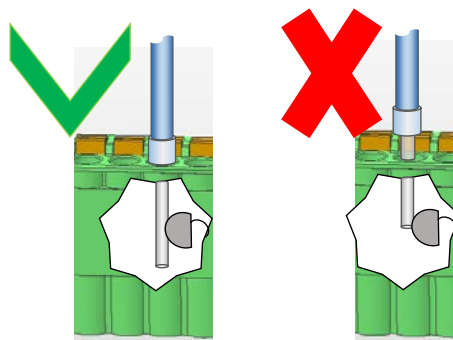
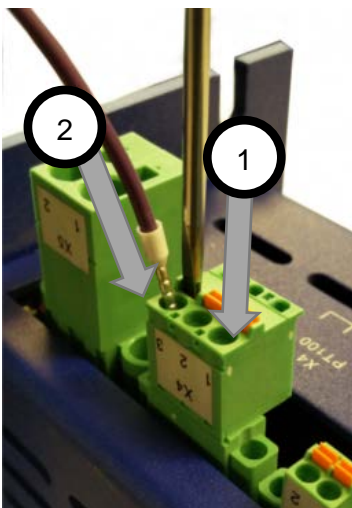
## 5.4 Connecting wires to X1, X2, and X4

**Table 3** Technical data for X1, X2, and X4 (Phoenix FKC 2.5-5.08)

Conductor cross section flexible, without ferrule	0.2 – 2.5 mm <sup>2</sup>
Conductor cross section flexible, with ferrule without plastic sleeve	0.25 – 2.5 mm <sup>2</sup>
Conductor cross section flexible, with ferrule with plastic sleeve	0.25 – 2.5 mm <sup>2</sup>
Stripping length	10 mm
Ferrule length	10 mm

To connect wires to terminals:

4. Use a flat screwdriver and press the spring in as illustrated (pos.1)
5. Press the wire all the way in (pos.2).
6. Lift the screwdriver.



### 5.4.1 Special considerations for X4



**Attention**

X4 (Pt100) connection is variant dependent. Not all variants are temperature controlled. Refer to PBC datasheet to determine whether X4 connections are applicable to the actual PBC.



**Attention**

The PT100 terminal (X4) is not galvanic insulated from the output X5, and therefore must be connected using double insulated shielded wire (Test voltage min. 4000V), and protect against direct contact.

**Info**

It is recommended to fasten the temperature sensor on one of the batteries, since batteries gets warmer during charge. Fastening the sensor on a battery will ensure optimal charging.

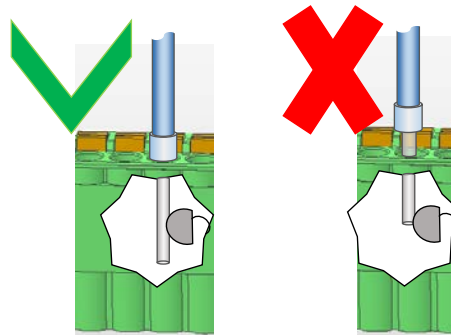
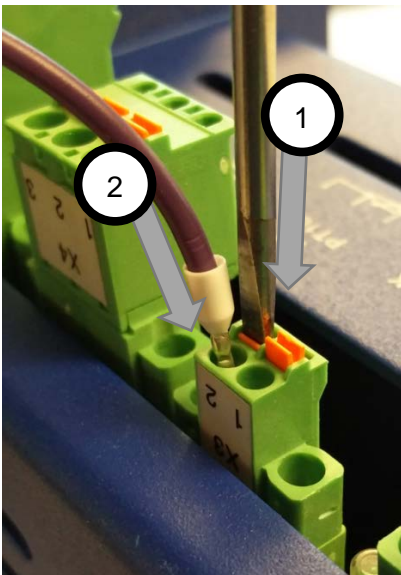
## 5.5 Connecting wires to X3

**Table 4** Technical data for X3 (Phoenix FMC 1.5-3.5)

Conductor cross section flexible, without ferrule	0.2 – 1.5 mm <sup>2</sup>
Conductor cross section flexible, with ferrule without plastic sleeve	0.25 – 1.5 mm <sup>2</sup>
Conductor cross section flexible, with ferrule with plastic sleeve	0.25 – 0.75 mm <sup>2</sup>
Stripping length	10 mm
Ferrule length	10 mm

To connect wires to terminals:

7. Use a flat screwdriver and press the spring in as illustrated (pos.1)
8. Press the wire all the way in (pos.2).
9. Lift the screwdriver.



## 6. Operating the PBC

The PBC product family contains the following variants:

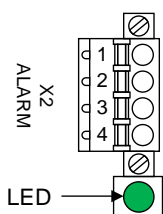
Product	Output voltage (nominal)	Output current	Temperature controlled
PBC-300-2	300 V DC	2 A DC	No
PBC-2	330 V DC	1.8 A DC	Yes
PBC-360-2	360 V DC	1.7 A DC	No
PBC-385t-2	385 V DC	1.54 A DC	Yes
PBC-425-2	425 V DC	1.5 A DC	No
PBC-450-2	450 V DC	1.35 A DC	No

The PBC is designed to operate without manual intervention, and is equipped with a visual and electrical indication/alarm that continuously monitors the battery or ultra-capacitors voltage (by measuring the PBC output voltage).

### 6.1 Visual and electrical alarm



#### 6.1.1 Common specifications

Alarm relay that indicates the state of the battery or ultra-capacitor's voltage. The relay is active when the battery or ultra-capacitor voltage is over the variant specific limit see section [6.1.2](#) on page [15](#).



#### Info

The green LED is a visual indication of the alarm relay state.

Green LED	 LED on: Alarm relay is active. The battery voltage is above the voltage limit
	 LED off: Alarm relay is not active. The battery voltage is under the voltage limit

#### 6.1.2 Variant dependent control specifications

Alarm relay (X2) battery/ultra-capacitor voltage limits:

PBC-300-2	Relay active if output $\leq$ 265 V DC.
PBC-2	Relay active if output $\leq$ 295 V DC.
PBC-360-2	Relay active if output $\leq$ 325 V DC.
PBC-385t-2	Relay active if output $\leq$ 344 V DC.
PBC-425-2	Relay active if output $\leq$ 395 V DC.
PBC-450-2	Relay active if output $\leq$ 420 V DC.

## 6.2 Pitch application notes

### 6.2.1 Using the same PBC for multiple battery banks

When using the same PBC for multiple battery banks follow the steps in the following procedure when changing battery bank:

1. Turn off the mains to PBC (X1) While the battery bank is still connected
2. Wait approximately 3 s (to allow discharge of PBC internal residual voltage)
3. Switch the output (X5) to the new battery bank
4. Wait 120s
5. Turn on the mains to PBC (X1)
6. Charge the battery bank for the selected time period
7. Repeat from step [1](#).

## 6.3 Activating and deactivating the PBC

### To activate the PBC:

1. Ensure that the batteries are connected
2. Ensure that the fuse to the batteries is not defect and that ant circuit breaker between the PBC and batteries is closed
3. Connect the PBC to mains

Depending on the batteries voltage, the Alarm relay and the green LED will be turned on. If the voltage is too low the LED and relay will be off, while the PBC is charging. Once the voltage reaches the specified level (see section [6.1.2](#) on page [15](#)) the relay and LED will be turned on.

### To deactivate the PBC:

1. Disconnect the mains from the PBC (X1) while the batteries are still connected
2. Allow 120 s in off position before reconnecting the mains



#### Info

Generally, the PBC will not sustain damage if the batteries are not connected during the switching of the mains (on or off). However, when cyclic switching is used, follow the procedure in section [6.2.1](#) on page [16](#).



## 6.4 Troubleshooting

Problem	Possible causes	Remedy
PBC with temperature control charges with a voltage that is too low	The Pt100 sensor is disconnected or defect	Check the sensor and wires. Replace if needed
	The Battery check input is high	Check the Battery check input (x3)
PBC with temperature control charges with a voltage that is too high	The Pt100 sensor is disconnected or defect	Check the sensor and wires. Replace if needed
The PBC does not charge	Mains input is missing	Ensure input voltage to the PBC
	An output overvoltage occurred and the PBC needs to be reset	Turn the PBC off for at least 30 s
The input fuse blows/disconnects	The PBC was turned off and on many times within a short time period.	Disconnect the mains from the PBC (X1) and wait 120 s before connecting it again

If none of the above solves the problem, contact your DEIF representative.

## 7. Disposal of the PBC



All products that are marked with the crossed-out wheeled bin (the WEEE symbol) are electrical and electronic equipment (EEE). EEE contains materials, components and substances that can be dangerous and harmful to people's health and to the environment. Waste electrical and electronic equipment (WEEE) must therefore be disposed of properly. In Europe, the disposal of WEEE is governed by the WEEE directive issued by the European Parliament. DEIF complies with this directive.

You must not dispose of WEEE as unsorted municipal waste. Instead, WEEE must be collected separately, to minimise the load on the environment, and to improve the opportunities to recycle, reuse and/or recover the WEEE. In Europe, local governments are responsible for facilities to receive WEEE. If you need more information on how to dispose of DEIF WEEE, please contact DEIF.

## 8. Glossary

### 8.1 Terms and abbreviations

LED	Light emitting diode
MCB	Main circuit breaker
PBC	Pitch battery charger, also a generic name for the whole product family

### 8.2 Units

Unit	Unit Name	Quantity name	US unit	US name	Conversion	Alternative units
A	ampere	Current				
°C	degrees Celsius	Temperature	°F	Fahrenheit	$T[^{\circ}C] = \frac{(T[^{\circ}F] - 32^{\circ}) \times 5}{9}$	
g	gram	Weight	oz	ounce	1 g = 0.03527 oz	
Hz	hertz	Frequency (cycles per second)				
kg	kilogram	Weight	lb	pound	1 kg = 2.205 lb	
m	metre	length	ft	foot (or feet)	1 m = 3.28 ft	
mA	milliampere	Current				
mm	millimetre	Length	in	inch	1 mm = 0.0394 in	
ms	millisecond	Time				
Nm	Newton metre	Torque	Lb-in	pound-force inch	1 Nm = 8.85 lb-in	
s	second	Time				
V	volt	Voltage				
V AC	volt (alternating current)	Voltage (alternating current)				
V DC	volt (direct current)	Voltage (direct current)				
W	watt	Power				