Elektro-Automatik GmbH

自动式电池充电器系列
Automatic Battery Charger Series

BCI 800 R

12V / 24V / 48V
320W / 640W / 1000W / 1500W

BCI 812-20R :	27 150 401
BCI 824-10R :	27 150 402
BCI 848-05R :	27 150 403
BCI 824-20R :	27 150 404
BCI 848-10R :	27 150 405
BCI 812-40R :	27 150 406
BCI 812-60R :	27 150 407
BCI 824-40R :	27 150 408
BCI 824-60R :	27 150 409
BCI 848-40R :	27 150 410

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安全说明

- 本电池充电器仅能给符合产品规格的电池或电池组（并联或串联）充电。如无其他说明，则最大充电电流等同于额定电流！
- 请不要连接不可充电池！
- 连接电池前请先关闭产品！
- 电池连接线的直径必须符合产品的额定输出电流。
- 请不要给产品带来任何损坏，不要将金属元件插入通风槽，不要阻挡通风槽！
- 必须由专业受训人员执行市电连接。
- 只可选用合适的连线，按照通用安全措施，将产品与市电连接起来。
- 避免直接接触太阳光和湿气。
- **产品在使用接口卡时，必须将插槽盖盖上！**

安全警告

- 给电池充电时，电池可能会产生高度易燃气体。请随时保证足够的空气流通，并严格禁止在电池周围出现明火和火花。

一般信息

简介

BCI 800 R系列微处理器控制电池充电器，专门设计成墙挂式结构，640W以下型号以空气对流为冷却方式，640W以上则以风扇冷却。

本产品专门给不同铅性电池、锂电池/锂离子聚合物或镍镉/镍氢电池充电。具有多个充电阶段，还有温度补偿阶段，对电池进行快速、完整、细致的充电。本产品配有12个充电配置文件，可根据电池规格修改大部分参数。

将插拔式数字接口卡（USB, RS232, CAN或以太网（LAN））插入插卡槽，从而在电脑上远程控制或监控产品，以及修改充电配置文件参数。

此外，本产品还有一电源模式，在该模式下，输出电压和电流完全可调。

电源输出端有短路保护和过载保护。为保护负载，产品还有过压保护（OVP）功能。出现过温（OT）时，电源输出关闭，直至温度冷却，又自动打开。

目检

收到本产品后，请检查是否有外观受损痕迹。如有，请不要操作本产品，应立即联系您的供应商。

更换内部保险丝

下列适用于640W以下型号：

电源保险丝装于产品内部。打开产品前，先将它与市电完全断开。

必须是接受过危险知识和安全规则训练的技术人员才可在打开的产品上操作。

要替换保险丝，需先松开前盖螺丝，小心地取下盖。保险丝就在主板上，位于左手边。

供应清单

1 x 电池充电器

1 x 印刷版使用说明书

1 x 电源线

1 x 温度传感器 LM335Z (10mV/K)

安装

组装

本产品设计成墙挂式结构。安装时需按空气顺着通风槽流出的方式安装。注意产品的上方和下方应保留一定空间（至少15cm），以保证足够的冷却效果。并行安装2类外壳产品（见“技术规格”章节）时，建议留20cm距离，以便安插外接卡。

与市电的连接

本系列所有型号都具有正向PFC（功率因素校正）和宽范围输入电压。可在90V至264VAC输入电压，以及45Hz至65Hz频率下工作。

按照前板丝印将电源线连到3位端子上（型号为：Phoenix Combicon GMSTB 2,5/3-ST-7,62）。仅受训技术人员方可执行。必须使用适当直径的电源线，因为本产品无电源开关。电源输入端由一标准5x20mm保险丝保护，它装于产品内部（1类外壳产品）或前方（2类外壳产品）。

连接电池

可将一个或多个电池连接到产品前板“Battery”指定端子上。

想要获得好的充电结果，充电用连线的直径和长度非常重要。

故我们建议使用下列直径的连线：

充电电流	线长 **0 - 1.5m**	线长 **1.5 - 4m**
0 - 20A	6mm²	10mm²
20 - 40A	16mm²	25mm²
40 - 60A	25mm²	35mm²

应避免使用长于4m的连线，如果实在不可避免，请用更大直径的线来补偿。

功能描述

注意：下面蓝色标注的名称在电池配置文件下都可调。

充电程序

注意！不能给不良电池（U_{BatAct} = <U_{BatNom}）充电！

I. 锂电池

锂电池的充电程序按照I-U-U特性进行，当电池完全充满后就自动停止。也可见下图。

充电第一步为**预充**，并以较小的输出电流I_{PC}充电。预充对过放电池非常有效，能缓慢修复电池并缓和地充电。

一旦充电电压上升至$U_{PC,END}$，或达到充电阶段的最大时间$t_{PC,END}$，充电程序即转为**普通充**。

在普通充阶段，电池的充电电平决定最大充电电流I_{CHARGE}。恒流时，电池电压会上升，如果到达U_{CHARGE}，充电以恒压继续，直至电流下降至I_A阀值以下。此时认为电池已充满，充电自动停止。如果充电电流降低至I_A以下前就到达时间t_A，充电会终止，但电池可能未充满。如果定义了错误的充电参数或电池不良，这种情况可能会发生。

注意！锂电池无温度补偿，即使有电池温度过温或欠温监控。

II. 镍镉/镍氢电池

镍性电池的充电程序按照I-U-U特性进行，当电池完全充满后自动停止。也可见下图。

充电第一步为**预充**，并以较小的输出电流I_{PC}充电。预充对过放电池非常有效，能缓慢修复电池并缓和地充电。

一旦充电电压上升至$U_{PC,END}$，或者达到充电阶段的最大时间$t_{PC,END}$，充电程序即转为**快充**，电流为I_{CHARGE}。在快充阶段，电池电压会持续上升。测量的最高电压值作为压差ΔUa的参考值。这个差距决定电池电压何时再次下降至电池充满点。如果超过ΔUa定义值，则认为电池已满，充电自动停止。

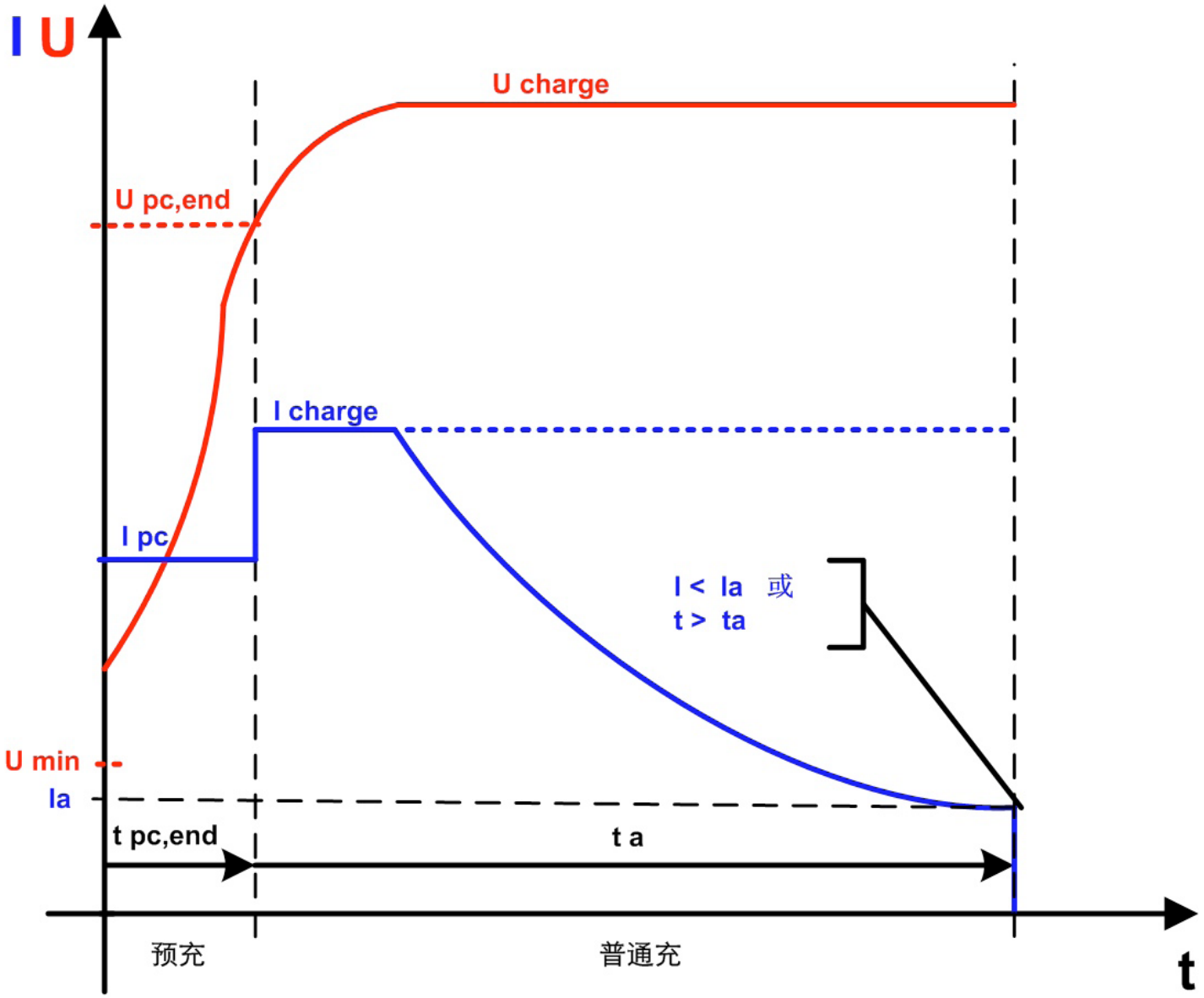


图1.锂电池的充电特性

给镍镉电池充电时，电池温度非常重要，并需监控。电池表面温度的变化可能超过一定水平。故必须使用并安装一个温度传感器。开始充电时，测量开始温度。如果温差超过$\Delta T\ a,max$，或它在一分钟内上升并超过$\Delta T/\Delta t\ a$，充电即终止。电池容量另外进行监控。如果因某个原因到达1,3 Q，即电池容量的130%，可能会过早终止充电。如果在电池配置文件已正确设置电池容量，它会防止电池过热。

注意！如果在无温度传感器的情况下开始了充电，就不会有以高值为C单位的随温快充功能。

III. 铅性电池

铅性电池的充电程序按照I-U-U特性进行，但电池完全充满后不会自动停止。也可见下图。

预充期间，电池以较小的输出电流I_{PC}充电。当充电电压上升至$U_{PC,END}$，或达到$t_{PC,END}$时间，充电程序将转为**快充**，电流I_{CHARGE}恒定。

充电电压持续上升至U_{CHARGE}或达到该阶段最大充电时间$t_{CC,END}$时，充电程序就转为**普通充**，此时电压恒定，直到充电电流下降至I_A阀值以下才变化。接着充电器转至最后一个充电阶段--**涓充**。该阶段的充电电压为$U_{TRICKLE}$，除非手动停止它，它会永久地给电池充电。

可在电池位置文件下激活在预充阶段对单节电池的监控。这个功能为监控电池电压的变化。如果电压上升低于$\Delta U/\Delta t$，充电即终止，且认为电池不良。

可用温度传感器（如果连接了）监测电池在整个充电过程中的温度。普通和涓充阶段的充电电压随电池温度给予补偿。

一般建议用带温度补偿的充电。如果未连接温度传感器，可在电池配置文件下设定充电电压。

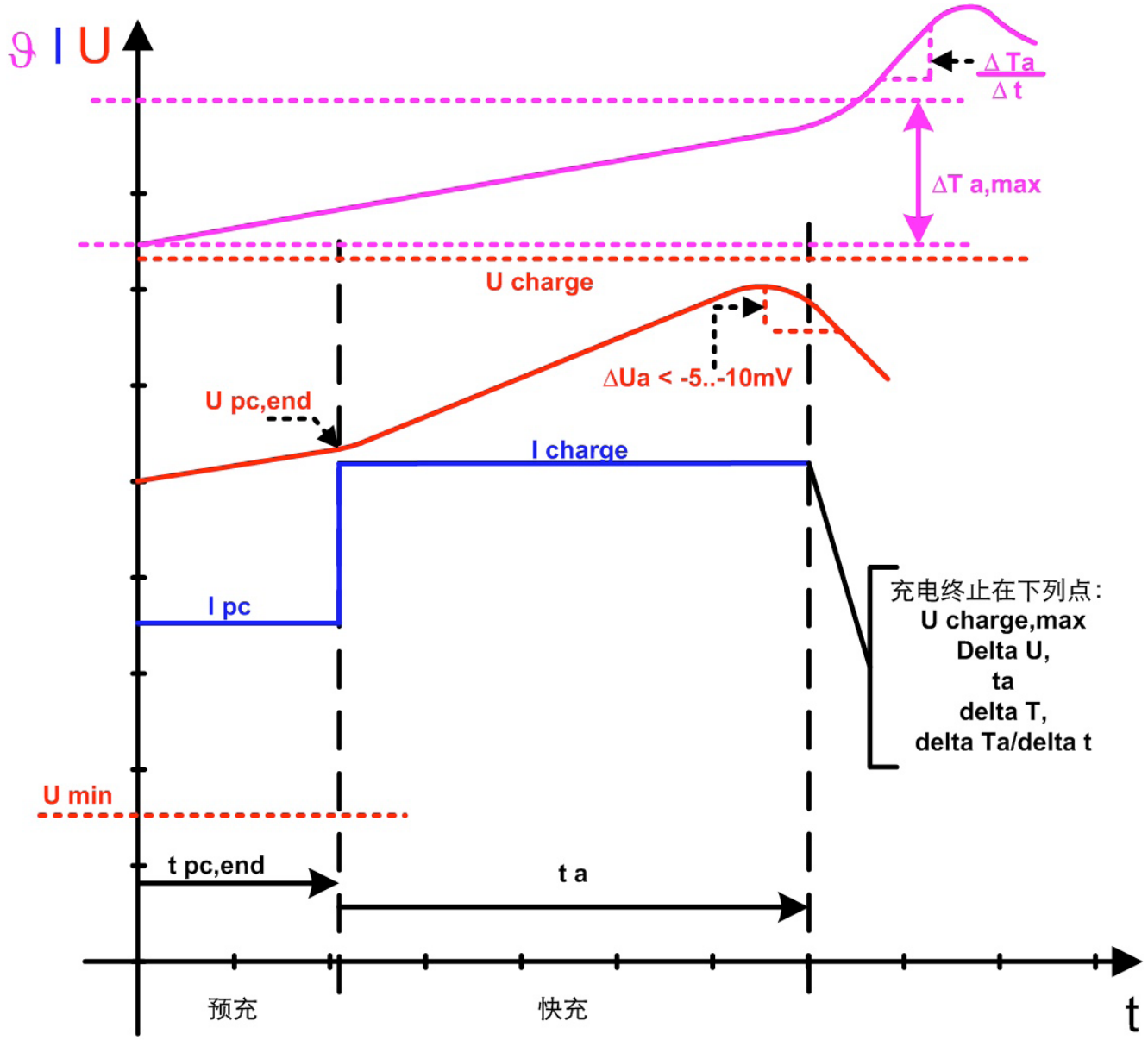


图2.镍性电池的充电特性

温度传感器

给电池充电时建议使用温度补偿，以防止危险气体的释放。没有温度补偿器时，以电池配置文件下定义的充电电压给电池充电，它对应的是25°C的环境温度。锂电池没有温度补偿。温度传感器仅作温度监测用。

传感器直接接到模拟接口的1和6脚，并贴在电池本体上。如果在电池配置文件下激活温度传感器的使用，开始充电时就进行感测。

随附的传感器为LM335，或使用类似型号KTY81/210。在产品设置下必须选择传感器型号。

T stop, min至**T stop, max**的温度范围适用于温度监测。当电池温度超过这个范围，充电即终止且产品报告一错误。当前阶段（如：t_{CHARGE}）的内部阶段计时器也终止，但是显示器上的总充电时间会继续记录。一旦温度再次回到允许范围内，充电又继续。

第二个温度范围定义何时温度补偿才生效。超出这个范围，但仍然在总温度范围内，也不再补偿充电电压。

充电电压的补偿按电池配置文件下定义的温度系数值（每节电池为mV/Kelvin）执行。该值在普通和涓充阶段是分开调整的。

远程感测

要补偿负载线上的压降，产品前板还有一远程感测输入端。按正确极性连线到此，感测电池的电压。远程感测端可补偿多达2V的电压。

不用该感测输入端时，就让它空着，不用连跳线到输出端。

电源模式

若选择“**Power Supply**”，本产品还可当电源用。于是以恒压操作（CV）或恒流（CC）进行操作。且可在0...100%额定范围内调节输出电压和电流。

另外，在产品设置菜单下可定义一过压保护阀值**OVP PS mode U**= (0...110% U_{Nom})。

该模式适合并联待机操作。

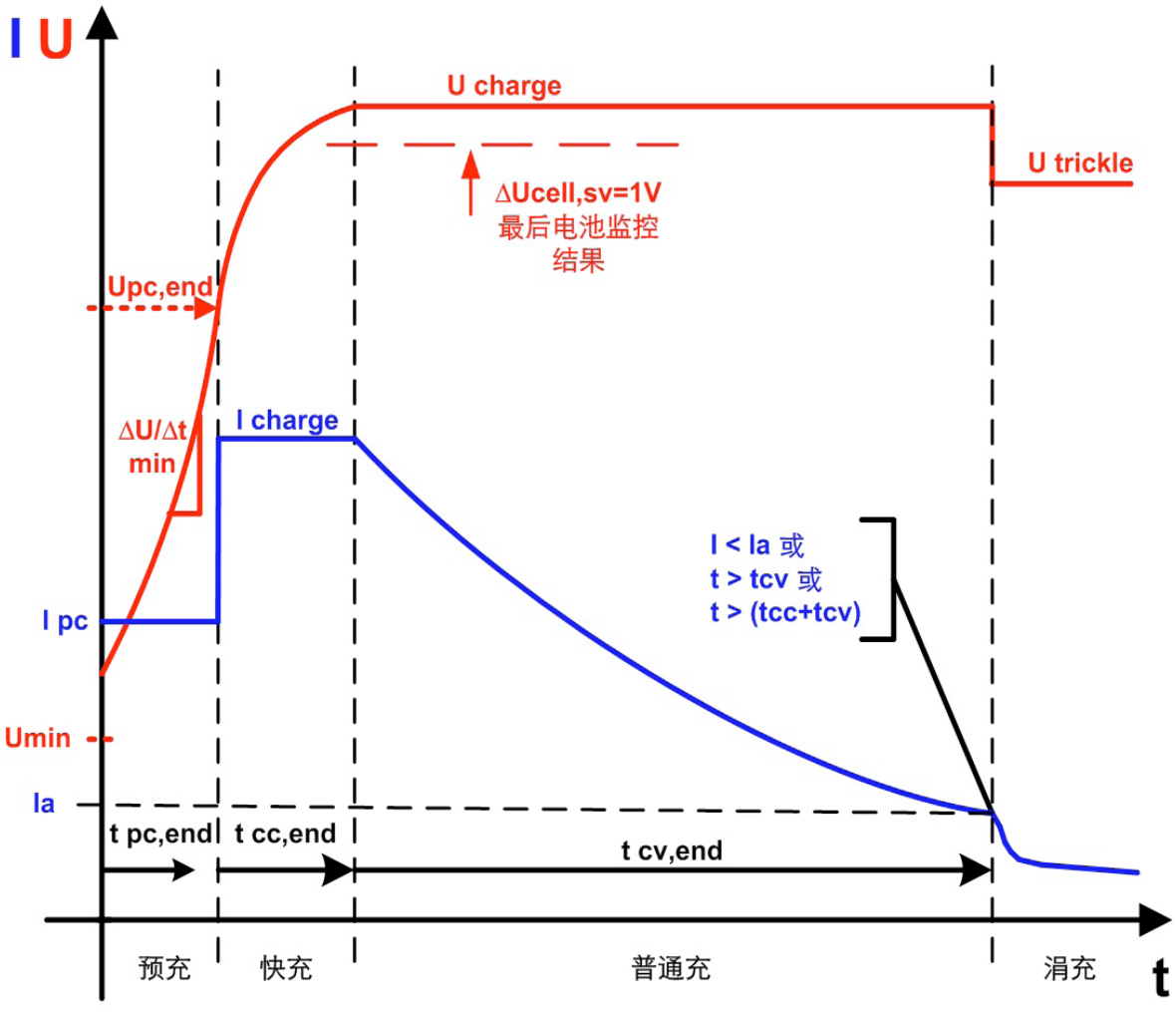


图3.铅性电池的充电特性

过压保护 (OVP)

本系列所有型号都有过压保护电路，过压保护值设为U_{Nenn}的110%。举例：如果充电器型号为BCI 812，U_{Nenn}为16V，那么最大OVP阀值为17,6V。

Power Supply模式和Battery Charger模式下的可调阀值不同。

在**Power Supply mode**下，为0...110% U_{Nenn}整个范围。

在**Battery Charger mode**下，从内部附加给实际输出电压的1V...10V的偏移值，把它设为OVP阀值。但是最大OVP仍然固定为110%的U_{Nenn}。

举例：如果16V产品输出4,2V（锂电池）电压，OVP偏移值设为10V，那OVP在约14,2V时激活。反之，如果输出电压为10V，则OVP在约17,6V时激活。

如遇过压错误，不论是因内部故障或外部原因引起，电源输出即刻关闭，且以文本或报警符号显示出来，也通过模拟接口的第9脚（Error）指示出来。OV错误消失后，输出再次打开，并又开始充电。

过温 (OT)

本系列所有型号还有内温监控功能。如遇过热，电源输出暂时关闭，直至冷却后又自动打开。充电只是被暂停，但未停止。该错误以文本或报警符号，以及模拟接口的第9脚（Error）指示出来。

其它错误

任何错误都以其对应符号或错误信息，以及模拟接口的第9脚（Error）指示出来。下面为可能检测到的错误源（也可见下面的“错误和报警”了解详情）：

- 连接了完全过放或不良的电池
- 温度传感器失效（连接线断裂或其它）
- 连接了错误电压的电池
- 单节电池短路
- 不同的产品和通讯错误

电池监控

可检测电池端的反接和错误电压。如果电池反接或电池电压太低，将阻止充电。且该状况以错误显示于显示屏上。

模拟接口

本系列装于1类外壳产品的前板或2类外壳的右边有一12脚模拟接口，可用它来监控产品状态，以及远程启动/停止充电程序。也可见“模拟接口”了解更多详情。

数字接口卡

本系列1类外壳产品的前板或2类外壳的右边还装一可插拔式接口卡的插槽。通过这些接口卡，客户利用定制软件或随附产品的工具可监测和控制产品。

这些卡可连接USB，RS232或CAN。

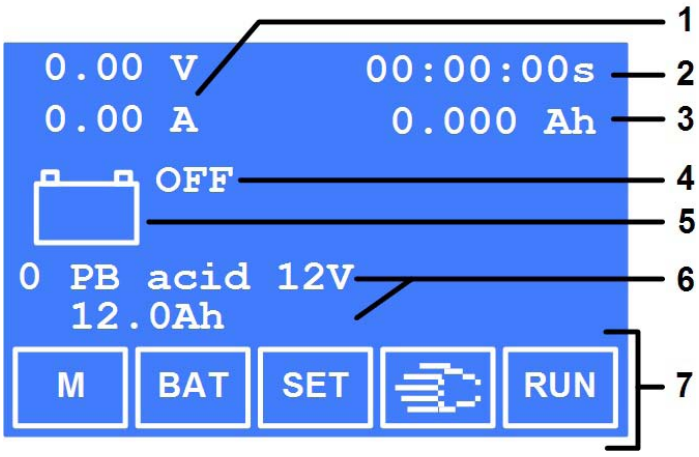
通讯协议随时可用，用户可用它创建指定控制应用。详情见接口卡用户说明书的描述。

电源断电时的状态

本充电器专为工业用途设计。这表示，它可在电源断电后仍能自动继续工作。断电恢复后，它也恢复到最后输出状态（PS模式），或继续给电池充电（BC模式）。该功能在产品设置菜单下默认为激活状态，也可在此处设置成停用。

操作

显示



1. 实际值（电流和电压）
2. 充电过程总用时
3. 以Ah为单位，已经充入电池内的电量
4. 两行状态显示区
5. 充电水平指示
6. 带重要数据的所选电池配置文件
7. 实际按钮条布局

简介

本产品的操作与用模拟或数字接口进行的远程控制是分开的，它通过显示器下方的五个按钮完成。

这些按钮相互有多种功能，通过按钮上的符号或缩写在显示器上描绘出来（见“显示器”的第7项）。

按钮功能概述

ADJ 更改所选设定或转为调节数值。

确认显示器上已被用户获知的报警。如果报警原因不再出现，它会清除报警缓冲区和报警信息。

BAT 进入电池配置文件。

选择一数值或菜单项目。

提交数值或设定。

ESC 未提交更改值前终止。退出当前菜单水平。

EXT 退出LOCAL模式，激活模拟或数字接口卡的外部控制。

激活LOCAL模式。

M 进入设置菜单。

更改选定数值。

OFF 关闭输出。

ON 打开输出（仅在电源模式下）

移动光标至选定数值的任何数位，以便直接更改小数位。

RUN 如果所有必须条件都符合，开始充电或继续充电。

STOP 暂停充电。

SET 直接进入当前选定电池配置文件（未充电时）或转为选定数值/设定的编辑模式。

VIEW 选充电过程中显示当前选定电池配置文件的设置。不可更改。

EDIT 选定电池配置文件的编辑模式。

USE 为下个充电阶段提交选定电池配置文件。

U 设置输出电压（电源模式）

I 设置输出电流（电源模式）

菜单：产品设置

这个菜单引导用户定义模拟接口信号，各种数字接口（仅当有需求时）的通讯参数，以及其他相关功能的设置。

注意：只有当输出关闭时才可更改。

功能：

1. 菜单导航

M + ↓ ↑

2. 激活菜单项目

M + ↓ ↑ + ↵

3. 更改设定

M + ↓ ↑ + ↵ + ↓ ↑ + SET

用 ↵ 提交或用 ESC 终止。

承下页...

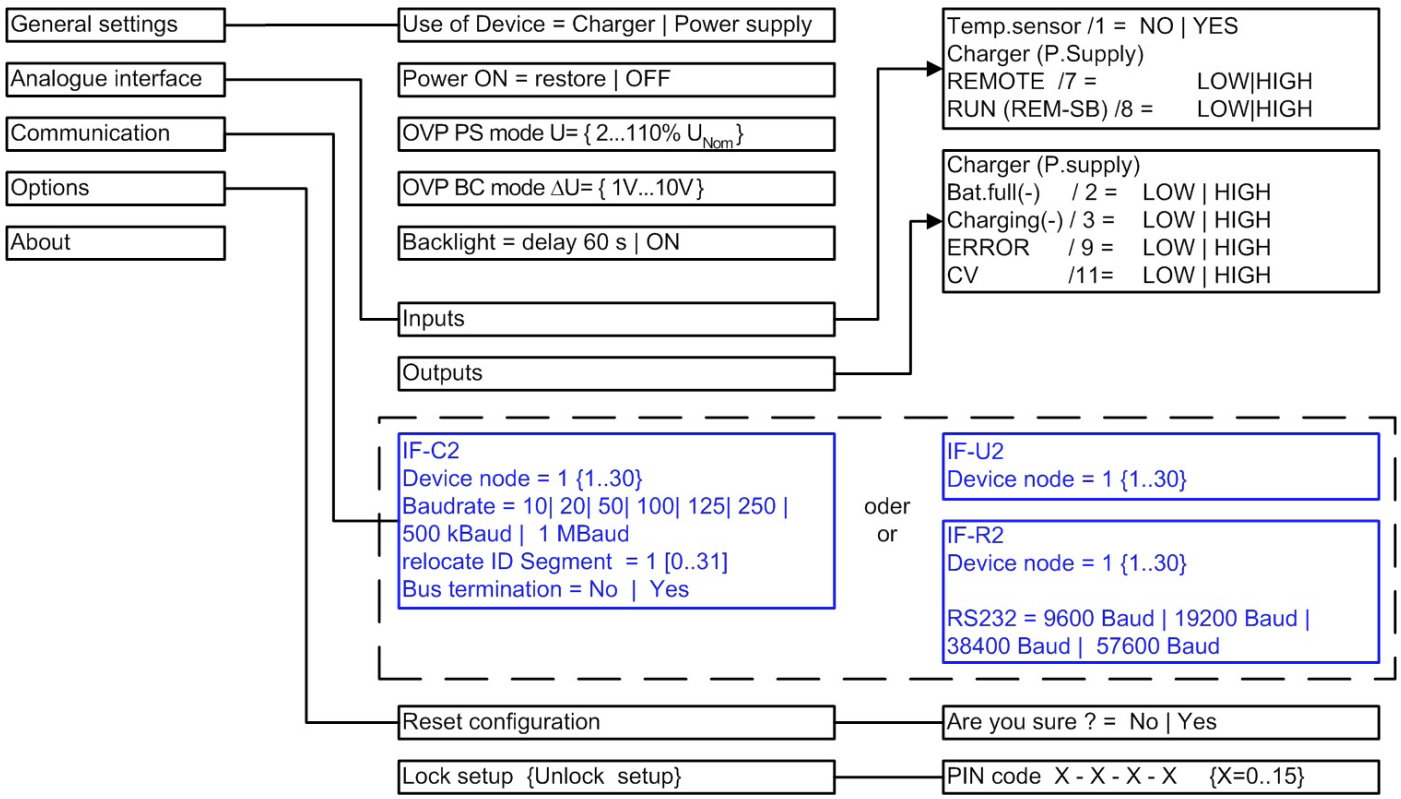


图 4. “产品设置”菜单结构

注意：

- ()括号内的名称仅与电源模式下的功能有关。
- 一个设置后面的号码，例如：“/7”，表示对应12脚模拟端子的引脚。

解释如下：

菜单项	参数	含义
General settings		
Use of device	Charger	产品当充电器用
	Power Supply	产品当电源用
Power ON	restore	断电恢复后恢复输出状态
	OFF	断电恢复后输出仍关闭
Backlight	delay 60s	按下按钮60s后，显示器背光灯关闭。每次按按钮时亮
	ON	背光常亮。
Analogue interface		
Temp.sensor /1	NO	未使用温度传感器
	LM335A	使用了LM335A
	KTY81-210	使用了KTY81-210
Remote /7	LOW	远程控制时Pin = low
	HIGH	远程控制时Pin = high
Charge(Rem-SB) /8	LOW	远程控制时Pin = low
	HIGH	远程控制Pin = high
Bat.full /2	LOW	“电池已满”引脚的信号 = low
	HIGH	“电池已满”引脚的信号 = high
Charging /3	LOW	“充电...”引脚的信号 =low
	HIGH	“充电...”引脚的信号 = high
ERROR /9	LOW	“错误”引脚的信号 = low
	HIGH	“错误”引脚的信号 =high
CV /11	LOW	引脚信号为low = CV, high = CC
	HIGH	引脚信号为low = CC, high = CV
Communication		
Device node	1...30	产品节点，产品地址
IP	0...255	产品IP地址 (仅针对F-E2)
GW	0...255	网关 (仅针对IF-E2)
SNM	0...255	子掩码 (仅针对IF-E2)
RS232	div.	IF-R2波特率的设定
Baudrate	div.	IF-C2波特率的设定
relocate ID seg	0...31	给CAN ID选择地址段(仅针对IF-C2)
Bus termination	YES	总线端开 (IF-C2)
	NO	总线端定关 (IF-C2)
Options		
Reset configuration		如果选择YES并提交后，所有设置恢复为默认设定，包括电池配置文件
Lock setup		在设置菜单下用一4位PIN码锁定设置
Unlock setup		再次输入这个4位PIN码解锁设置
About		显示产品型号和生产商

关于设定的重要提示：

- 若未使用模拟接口，应将“Remote /7”和“Charge (Rem-SB) /8”设为LOW，因为默认为“high”。
- ″Power ON = OFF″设定会导致产品在停电恢复后不再继续充电或再次打开输出。

菜单：“电池配置文件的选择”

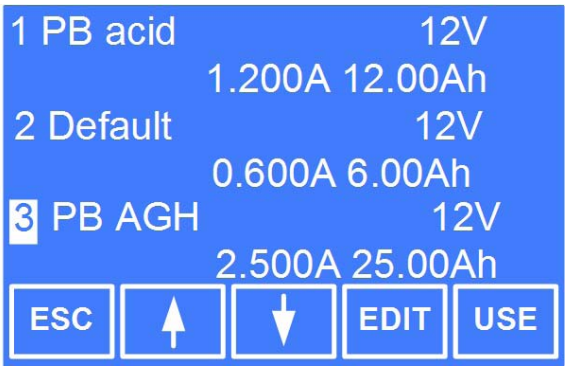
所有配置文件都可修改，但是电池类型分配如下：

Profile 1 - 6: 各种铅性电池

Profile 7-10: 各种锂电池

Profile 11-12: 各种镍性电池

概述：



功能：

1. 选择电池配置文件并应用于

2. 修改电池配置文件

3. 浏览电池配置文件

4. 更改电池配置文件下的数值

用  更改。更改完后，用  提交或用  终止。

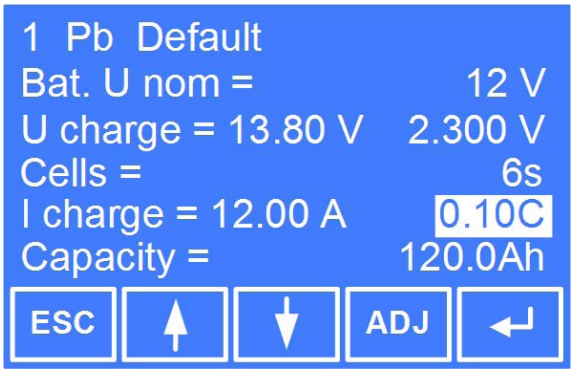
电池配置文件

用户应根据电池需要修改选定电池配置文件！这里的充电电流非常重要。

各个配置文件的项目基本一样。仅仅几个电池具体参数不一样。所有可调节数值都与充电特性有关，并对应电池类型。也可参考“充电程序”章节。

重要：配置文件被分为**两个子文件**：

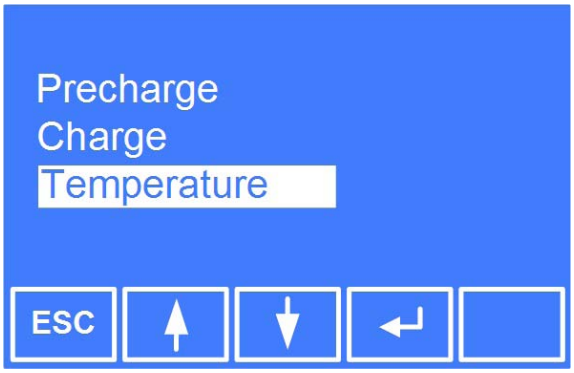
A) 主要电池参数。可用 BAT 按钮进入，并用 EDIT 编辑：



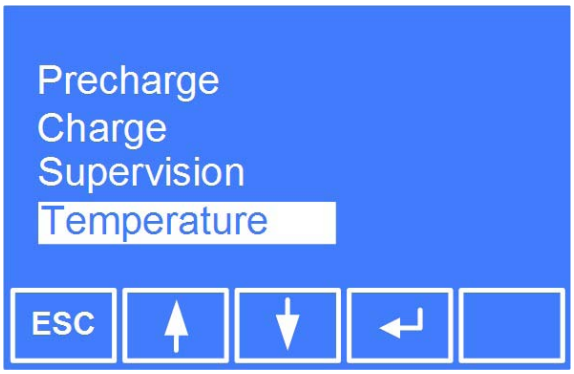
1. Zeile	文件号，电池类型，名称（最多10个字节）
Bat. U nom	电池额定电压（对于Pb电池）(不可调)
Cell U nom	单节电压（对于Ni/Li电池）（范围：见**U charge**）
U charge	单节电池正常充电电压 (范围：2.150V...2.650V) (Pb范围：2.150V...2.650V) (Ni范围：0.800V...1.900V) (Li范围：2.000V...4.200V)
Cells	每个电池的节数 (范围：1...XXs) [1]
I charge	充电电流（以C为单位） (范围：0.1...x.xC) [2]
Capacity	电池容量 (范围：1.0Ah...xAh) [3]

提示：充电电流**I charge**以C进行调节。该值直接与调节的电池容量相关。它适用：举例，假设电池容量为120Ah，那么1C = 120A。建议按电池生产商的规格书规定和使用充电电流。

B) 子参数，如不同充电阶段下的温度，单节电压，或充电电流。用 SET 按钮进入：



<- Li/Ni



<- Pb

另外区分旨在使参数更清晰，并分开与子参数的联系。

关于本产品支持的三种电池类型的不同参数，请见下页。

1 “s”表示这些单体电池是串联的
2 上限值根据调节后容量和产品的额定电流而变化
3 上限值根据调节后充电电流和产品的额定电流而变化

铅性电池的配置文件

括号内的数值定义设定范围

Precharge setup	Bat.U min = {0.00V...75%U_{Bat}}	充电时所需最低电池电压
	I pc = {0.000C...0.350C}	预充电流（以C为单位）（举例：100Ah的电池电 -> 1C = 100A）
	Bat.U pc, end = {Bat.U min...Ucharge}	预充终止电压
	t pc, end = {0:00h...99:59h}	预充最长时间
Normal charge setup	t cc, end = {0:00h...99:59h}	转为涓充的电流阀值（以C为单位）
	I a = {0.000C...0.350C}	快充最长时间
	t cv, end = {0:00h...99:59h}	普通充最长时间
	Bat. U trickle = {Upc, end...Ucharge}	涓充电压
Cell supervision	Cell super vision = YES | NO	打开/关闭单节电池监控
	Bat. dU/dt min = {0.000V...1.000V}/min	充电停止的单节电池监控范围
Temperature	Tstop = {-30.0°C…+15°C} {30°C...85°C}	电池充电的绝对温度范围
	T(TC) = {-20.0°C…+15°C} {30°C...50°C}	温度补偿范围
	TC charge = {-30.0mV...0.0mV}/K	普通充时的温度补偿
	TC trickle = {-30.0mV...0.0mV}/K	涓充时的温度补偿

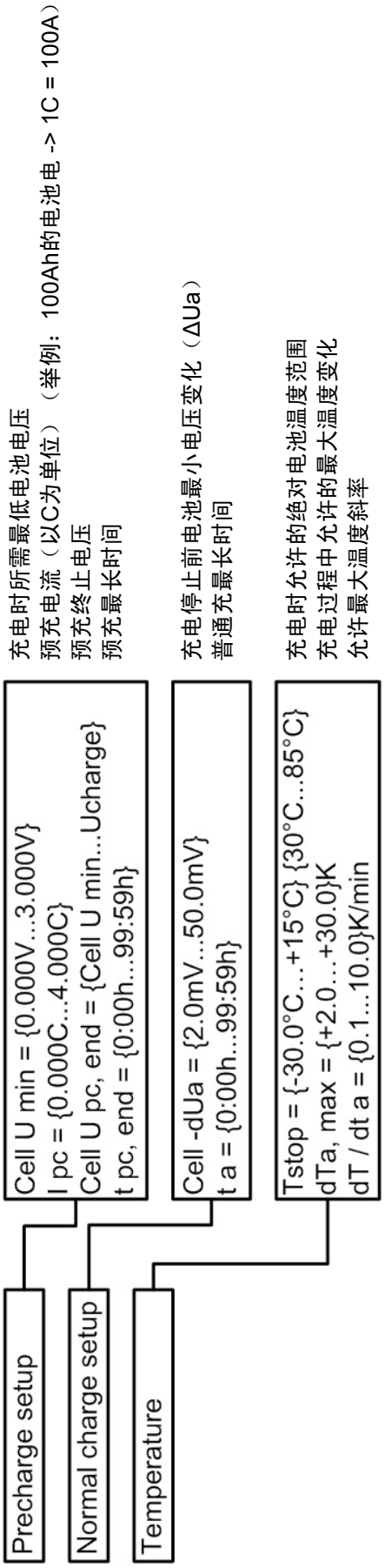
锂电池的配置文件

括号内的数值定义设定范围

Precharge setup	Cell Umin = {0.000V...Cell Upc,end}	充电时所需最低电池电压
	I pc = {0.000C...0.500C}	预充电流（以C为单位）（举例：100Ah的电池电 -> 1C = 100A）
	Cell Upc, end = {Cell Umin...Ucharge}	预充终止电压
	t pc, end = {0:00h...99:59h}	预充最长时间
Normal charge setup	t a = {0:00h...99:59h}	普通充最长时间
	I a = {0.000C...9.999C}	充电停止的电流阀值（以C为单位）
Temperature	Tstop = {-30.0°C…+15°C} {30°C...85°C}	电池充电时的绝对温度范围

镍性电池的配置文件

括号内的数值定义设定范围



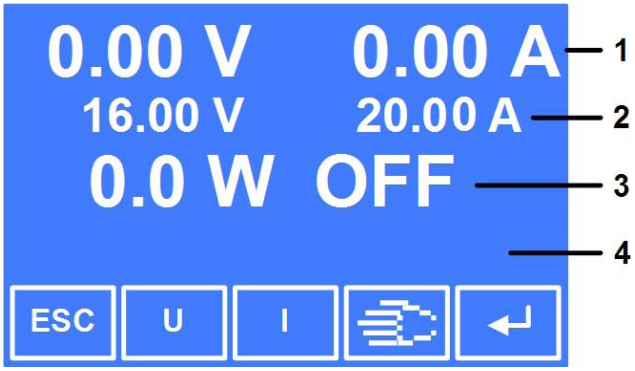
当电源来操作

本充电器还可当电源操作，可对全范围的输出电压(0...100% U_{Nenn})和电流(0...100% I_{Nenn})调节。而且，在产品设置下可预设过压保护阀值。

请按下列步骤转至电源模式：

M -> General settings + ↵ -> Use of Device + ADJ -> Power supply + ↵

主显示界面将变为：



第1行　实际电压和电流
第2行　设定电压和电流
第3行　实际功率，输出状态和报警符号/缩写
第4行　产品状态文本

用 U 或 I 按钮选择要调节的设定电压或设定电流。显示器会换到调节模式，并颠倒选定的小数位：

然后，用 − 和 + 按钮增加或减少小数位上的值。用 ↹ 按钮移动光标。用 ↵ 提交数值，于是产品就设定该数值。在提交数值前用 ESC 可终止。

过压阀值的调节需要先进入产品设置菜单。请见“菜单：产品设置”章节。

给产品供电

本产品没有电源开关功能。当将其接到市电时，即刻开始工作。

关断市电后，产品存储最后状态（选定的模式，输出状态），以便电源恢复后它自动跳入该状态。故它可在被打断后，如：断电等，继续工作。

电池电压和充电电流

本电池充电器只允许给符合产品规格的电池，即输出电压，充电。最大充电电流等同于I_{Nenn}。

注意！连接或断开电池前，必须检查充电是否已停止。

开始充电

按下 RUN 按钮即开始充电。然后电池按照选定的电池配置文件以及相应的充电特性被充电，如“充电程序”所描述。显示屏以下列状态文本指示实际充电阶段：

Precharge	预充阶段（所有类型电池）
Normal charge	普通充阶段（所有类型电池）
Trickle charge	涓充阶段（铅性电池）

注意！充电前必须选择合适的电池配置文件！建议修改电池配置文件，以符合电池生产商指定规格参数！

停止充电

按下 STOP 按钮，充电随时被暂停。然后用 RUN 按钮又可继续，或用 OFF 停止。此时输出关闭，计时停止。显示器直到开始下个充电才变化。显示器以总用时和电池充电，将最后充电过程的总和显示出来。另外，状态文本Charging finished指示出该状态。

使用模拟接口

模拟接口可远程监控产品输出值（电压和电流）和状态（错误）。还可开始或停止充电。

监控输出端以0...10V电压代表产品的0...100%额定值。

也可将温度传感器连到模拟接口。适合使用带26 – 20 AWG线的夹子，且连线剥皮至少10mm。

关于模拟接口的引脚分布和电平请看下页表格。

错误消息和报警

产品当充电器操作时，会在显示器上以全状态文本显示错误和报警。而在电源模式，报警被缩写，且只以报警符号指示出来。也可见下页表格。

若要继续让产品工作，用户必须确认报警。按下 ⚠ 按钮即可。如果报警原因不再存在，报警符号从显示器上清除，且从内部报警缓冲区删除该消息。

通过数字接口也可读出报警缓冲区信息。

注意：报警信息仅以代码存储于内部报警缓冲区。见下表。

报警也能以信号在模拟接口的9引脚上显示出来。见章节“模拟接口”。

在充电器模式下的显示	在电源模式下的显示	代码	含义
Charger overvoltage	**OV**	**01**	过压错误
Charger overtemp.	**OT**	**02**	产品内部出现过温错误
Charger system error	**SYS**	**03**	系统错误
CAN communication error	**CAN**	**20**	CAN-通讯错误
Bat. temp out of range		**37**	电池温度太高
Bat. temp out of range		**38**	电池温度太低
Bat.voltage out of range	**Ub>**	**39**	电池电压太高
Bat. deeply discharged		**40**	电池电压太低
Cell fault in battery		**41**	单节电池短路或不良
Temp.sensor fault		**42**	温度传感器未连接或不良
Reverse polarity	**-Ub**	**43**	电池反接
No battery detected		**44**	未连接电池（仅针对充电器模式）

关于上述清单的一些解释：：

• No battery detected 在充电器模式下只要无电池连接就会显示这个(电池电压= 0V）。

• Bat. deeply discharged 指示出连接的电池要么过放了、不良，或者电池电压错误。

• 如果在产品处于电源模式时连接一电池，会像充电器模式下一样监控电池电压，并报告相应错误。

模拟接口

技术规格

引脚	名称	类型[1]	描述	电平	电气参数
1	Temp. sensor	AI	温度传感器	正极连接器	
2	Battery full	DO	充电完成/涓充	在产品设置菜单下电平可由用户自行定义 U_{Low}<1V, U_{High}>4V	U_{Max} = 30V, I_{Max} = 20mA 准集电极上拉至Vcc [2]
3	Charging	DO	充电激活	在产品设置菜单下电平可由用户自行定义 U_{Low}<1V, U_{High}>4V	
4	VMON	AO	实际值：电压	0…10V相当于0…100%的U_{Nom}	I_{max} = +2mA时，精确度为0.1%， 对AGND有短路保护
5	CMON	AO	实际值：电流	0…10V相当于0…100%的I_{Nom}	
6	AGND		模拟信号地		针对CMON, VMON,温度传感器
7	REMOTE	DI	远程控制激活	在产品设置菜单下电平可由用户自行定义 U_{Low}<1V, U_{High}>4V	U_{max} = 30V I_{Max} = -1mA，5V时
8	RUN / REM-SB	DI	电源模式：电源输出关闭 电池模式：启动/停止充电	在产品设置菜单下电平可由用户自行定义 U_{Low}<1V, U_{High}>4V	
9	ERROR	DO	一般错误输出	在产品设置菜单下电平可由用户自行定义 U_{Low}<1V, U_{High}>4V	U_{Max} = 30V, I_{Max} = 20mA 准集电极上拉至Vcc [2]
10	DGND		数字信号地		用来控制和监控信号
11	CV	DO	恒压操作	在产品设置菜单下电平可由用户自行定义 U_{Low}<1V, U_{High}>4V	U_{Max} = 30V, I_{Max} = 20mA 准集电极上拉至Vcc [2]
12	Vcc	AO	辅助电压	12…16V	I_{Max} = 24mA 对DGND有短路保护

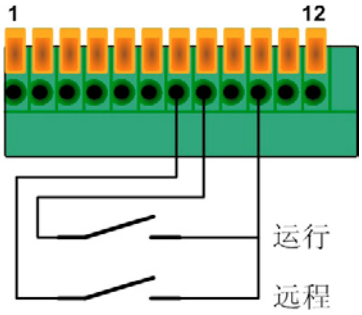
1) AO = 模拟输出，DI = 数字输入，DO = 数字输出

2) 12V...15V

模拟接口的应用

开始/停止充电或打开/关闭输出

数字输入脚(DI)



电源模式：引脚8 („REM-SB “)用来打开或关闭电源输出。在该模式下，输出可激活或不激活远程控制，比如：紧急关闭。

注意！如果产品设为LOCAL模式，该功能不工作！

充电器模式：用引脚8（“RUN”）开始远程充电前，要求将产品设为远程控制（引脚7“REMOTE”）。

在产品设置菜单下，用户可定义模拟接口7和8引脚的逻辑电平。开始充电后，如果引脚8的逻辑电平被颠倒，充电暂停。再次颠倒引脚8的电平将继续进行充电等。只有通过颠倒引脚7的电平退出远程控制后，才完全停止充电。

参考点为数字地（DGND）。

注意！转至远程控制时，如果引脚8的逻辑电平已被设成与“RUN”定义电平一样的值，则立即开始充电。

监控产品状态

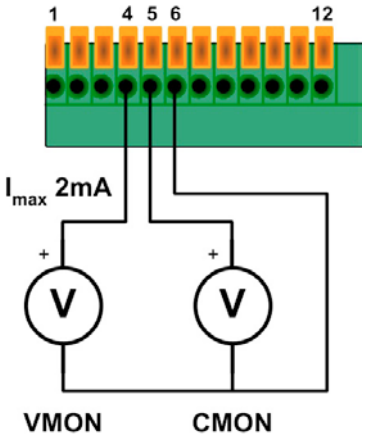
数字输出脚（2，3，9和11）为准集电极输出脚，带一上拉至Vcc的电阻。最大输入电压不可超过30V，且最大输入电流不能超过20mA。允许增加继电器。

注意，当输出脚以信号发出信息时，可为“high”，也可为“low”。这可在产品设置菜单下对模拟接口进行定义，菜单项目为Analogue interface -> Outputs。这些引脚仅将电流下降至DGND，但不输出。

参考点为数字地（DGND）。

监控电压和电流

模拟输出脚 (AO)

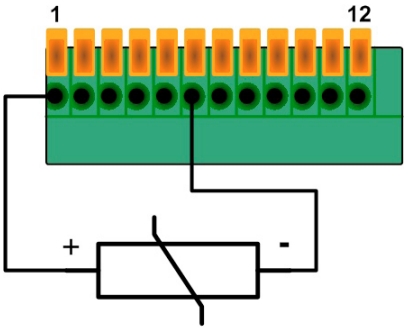


模拟监控输出脚输出0....10V电压，它对应额定值的0....100%。

参考点为模拟地（DGND）。

温度传感器输入脚

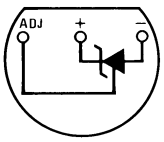
模拟输出脚 (AO)



温度传感器

温度传感器根据电池温度改变充电电压。

随附产品的传感器为LM335，引脚分布如下图所示。请根据接线图按正确极性进行连接。



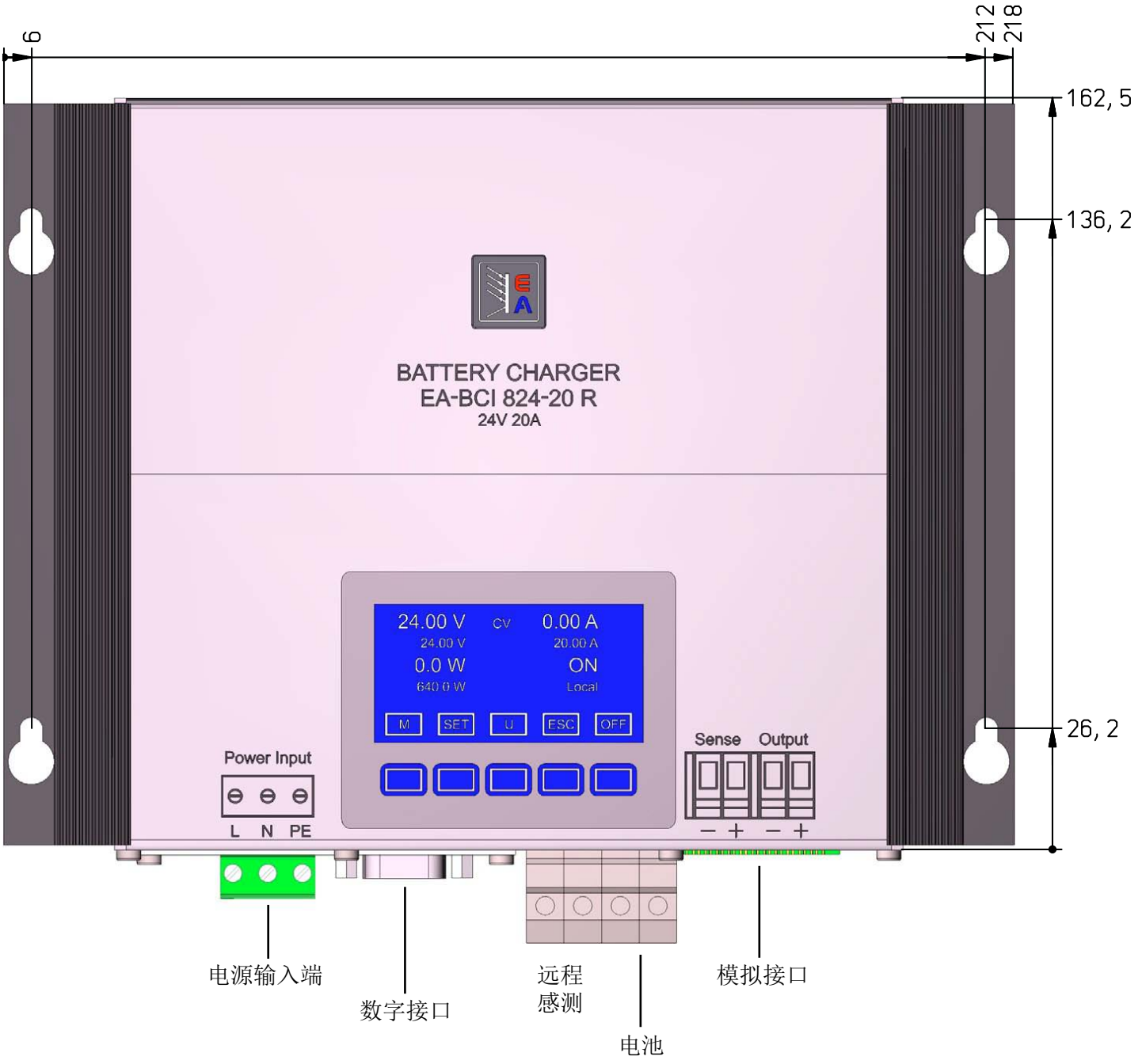
底视图：引脚“ADJ”不用。

技术规格

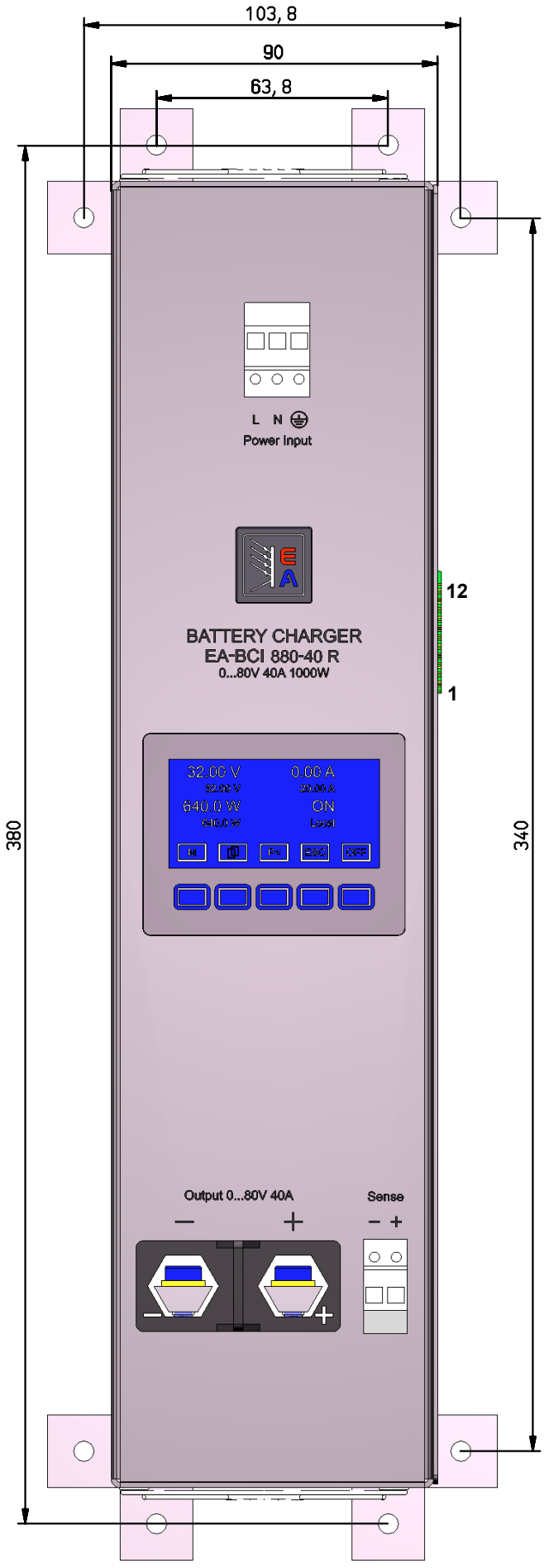
	BCI 812-20R	BCI 812-40R	BCI 812-60R	BCI 824-10R	BCI 824-20R
电源输入					
输入电压	90…. 264V	90…. 264V	90…. 264V	90…. 264V	90…. 264V
输入频率	45…. 65Hz	45…. 65Hz	45…. 65Hz	45…. 65Hz	45…. 65Hz
功率因数值	>0. 99	>0. 99	>0. 99	>0. 99	>0. 99
230V时输入电流	1. 6A	3. 4A	4. 8A	1. 6A	3. 2A
100V时输入电流	3. 8A	8A	11. 4A	3. 8A	7. 5A
输入保险丝	M6. 3A	T10A	T16A	M6. 3A	T10A
输出 - 电压					
电池电压U_{Bat}	12V	12V	12V	24V	24V
可调范围	0…. 16V	0…. 16V	0…. 16V	0…. 32V	0…. 32V
PS模式下OVP调节范围	0. 24. . . 17. 6V	0. 24. . . 17. 6V	0. 24. . . 17. 6V	0. 64. . . 35. 2V	0. 64. . . 35. 2V
BC模式下OVP调节范围 ΔU	1. . . 10V	1. . . 10V	1. . . 10V	1. . . 10V	1. . . 10V
带载10…90%时的稳定度	<0. 05%	<0. 05%	<0. 05%	<0. 05%	<0. 05%
±10% ΔU_{IN}时的稳定度	<0. 02%	<0. 02%	<0. 02%	<0. 02%	<0. 02%
纹波	<40mV_{PP}	<70mV_{PP}	<70mV_{PP}	<40mV_{PP}	<40mV_{PP}
带载10-100%的调整	<2ms	<2ms	<2ms	<2ms	<2ms
输出 - 电流					
额定电流	20A	40A	60A	10A	20A
带载0…100% ΔU_{OUT}时的稳定度	<0. 15%	<0. 15%	<0. 15%	<0. 15%	<0. 15%
±10% ΔU_{IN}时的稳定度	<0. 05%	<0. 05%	<0. 05%	<0. 05%	<0. 05%
纹波	<50mA_{PP}	<100mA_{PP}	<100mA_{PP}	<50mA_{PP}	<50mA_{PP}
输出 - 功率	0	0	0	0	0
额定功率	320W	640W	960W	320W	640W
U_{IN}<150V时的额定功率	320W	640W	960W	320W	640W
其它					
工作温度	0…. 50° C	0…. 50° C	0…. 50° C	0…. 50° C	0…. 50° C
储存温度	-20…. 70° C	-20…. 70° C	-20…. 70° C	-20…. 70° C	-20…. 70° C
相对湿度	<80%	<80%	<80%	<80%	<80%
尺寸 (WxHxD)	218x84x163mm	90x360x240mm	90x360x240mm	218x84x163mm	218x84x163mm
重量	2. 3kg	6. 5kg	6. 5kg	2. 3kg	2. 3kg
外壳类型	1	2	2	1	1
产品编号	27150401	27150406	27150407	27150402	27150404
安全标准	EN 60950				
EMC标准	EN 61000-6-4, EN 61000-6-2, EN 550022 等级B				
过压等级	等级 II				
保护等级	等级 I				

	BCI 824-40R	BCI 824-60R	BCI 848-05R	BCI 848-10R	BCI 848-40R
电源输入					
输入电压	90…. 264V	90…. 264V	90…. 264V	90…. 264V	90…. 264V
输入频率	45…. 65Hz	45…. 65Hz	45…. 65Hz	45…. 65Hz	45…. 65Hz
功率因数值	>0. 99	>0. 99	>0. 99	>0. 99	>0. 99
230V时输入电流	4. 8A	7. 5A	1. 6A	3. 2A	7. 5A
100V时输入电流	11. 4A	11. 4A	3. 8A	7. 5A	11. 4A
输入保险丝	T16A	T16A	M6. 3A	T10A	T16A
输出 - 电压					
电池电压U_{Bat}	24V	24V	48V	48V	48V
可调范围	0…. 32V	0…. 32V	0…. 65V	0…. 65V	0…. 65V
PS模式下OVP调节范围	0. 64. . . 35. 2V	0. 64. . . 35. 2V	1. 3. . . 71. 5V	1. 3. . . 71. 5V	1. 3. . . 71. 5V
BC模式下OVP调节范围 ΔU	1. . . 10V	1. . . 10V	1. . . 10V	1. . . 10V	1. . . 10V
带载10…90%时的稳定度	<0. 05%	<0. 05%	<0. 05%	<0. 05%	<0. 05%
±10% ΔU_{IN}时的稳定度	<0. 02%	<0. 02%	<0. 02%	<0. 02%	<0. 02%
纹波	<70mV_{PP}	<100mV_{PP}	<40mV_{PP}	<40mV_{PP}	<100mV_{PP}
带载10-100%的调整	<2ms	<2ms	<2ms	<2ms	<2ms
输出 - 电流					
额定电流	40A	60A	5A	10A	40A
带载0…100% ΔU_{OUT}时的稳定度	<0. 15%	<0. 15%	<0. 15%	<0. 15%	<0. 15%
±10% ΔU_{IN}时的稳定度	<0. 05%	<0. 05%	<0. 05%	<0. 05%	<0. 05%
纹波	<100mA_{PP}	<100mA_{PP}	<50mA_{PP}	<50mA_{PP}	<100mA_{PP}
输出 - 功率					
额定功率	1000W	1500W	320W	650W	1500W
U_{IN}<150V时的额定功率	1000W	1000W	320W	650W	1000W
其它					
工作温度	0…. 50° C	0…. 50° C	0…. 50° C	0…. 50° C	0…. 50° C
储存温度	-20…. 70° C	-20…. 70° C	-20…. 70° C	-20…. 70° C	-20…. 70° C
相对湿度	<80%	<80%	<80%	<80%	<80%
尺寸 (WxHxD)	90x360x240mm	90x360x240mm	218x84x163mm	218x84x163mm	90x360x240mm
重量	6. 5kg	6. 7kg	2. 3kg	2. 3kg	6. 7kg
外壳类型	2	2	1	1	2
产品编号	27150408	27150409	27150403	27150405	27150410
安全标准	EN 60950				
EMC标准	EN 61000-6-4, EN 61000-6-2, EN 550022 等级 B				
过压等级	等级 II				
保护等级	等级 I				

1类外壳:


6
212
218
162, 5
136, 2
26, 2
BATTERY CHARGER
EA-BCI 824-20 R
24V 20A
24.00 V
CV
0.00 A
24.00 V
20.00 A
0.0 W
ON
640.0 W
Local
M
SET
U
ESC
OFF
Power Input
L N PE
Sense
Output
− + − +
电源输入端
数字接口
远程
感测
电池
模拟接口

2类外壳：


103, 8
90
63, 8
L N
Power Input
12
1
BATTERY CHARGER
EA-BCI 880-40 R
0...80V 40A 1000W
32.00 V
0.00 A
640.0 W
ON
380
340
Output 0...80V 40A
Sense
电源输入端
模拟接口
数字接口
电池
远程感测

About

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Safety instructions

- The battery charger must only charge batteries or battery chains (parallel or series connected) that match the device specifications. The maximum charging current is identical to the nominal current if not otherwise specified
- Do not connect batteries that are not rechargeable!
- Switch device off before connecting batteries!
- The cross section of the battery cable has to match the nominal current of the device.
- Avoid any damage to the device, do not insert metal parts through the slots, do not obstruct the slots!
- Mains connection must only be done by trained technical personnel.
- Mains connection only with appropriate leads and under adherence of common safety measures.
- Avoid direct sunlight and humidity.
- **The cover of the card slot must be attached if the device is operated with interface card!**

Warning

- When charging batteries, highly flammable gas can emerge from the batteries. Always take care for sufficient ventilation and strictly avoid open fire and spark formation in the proximity of the batteries.

General

Introduction

The microcontroller controlled battery chargers of the BCI 800 R series are designed for wall mount and work with an airflow based cooling at models with up to 640W output power or a fan cooling at models with output power higher than 640W.

They are intended to charge different type of lead batteries, Lithium batteries and Nickel batteries. The multi-stage, temperature compensating charging procedure allows fast, complete and careful charging of the batteries. The devices feature 12 charging profiles, which allow battery-specific modification of the most parameters.

A slot for retrofittable, digital interface cards (USB, RS232 or CAN) enables supervision or remote control of the device, as well as modification of the charging profile parameters by means of a PC.

Furthermore, the devices feature a power supply mode where the output voltage and current becomes fully adjustable.

The power output is short-circuit-proof and overload-proof. For protection of the loads, the devices also feature an overvoltage protection (OVP) circuit. At an overtemperature (OT) event, the power output will be switched off until the unit has cooled down and automatically switch on again.

Visual check

After receipt, the unit has to be checked for signs of physical damage. If any damage is found, the unit may not be operated. Also contact your dealer immediately.

Replacing the internal fuse

Applies to all models **up to 640W**:

The main fuse is located inside the device. Before opening the device, completely disconnect it from mains.

Working on the open device must only be done by trained technical personnel which is instructed about the dangers and safety regulations.

In order to replace the fuse, unscrew the front cover plate and remove it precautiously. The fuse is located on the main PCB, on the left-hand side.

Scope of delivery

1 x Battery charger unit

1 x Printed user manual

1 x Mains connector

1 x Temperature sensor LM335Z (10mV/K)

Installation

Mounting

The device is designed for wall mount. It is required to mount it in a way that allows unimpeded air flow through the ventilation slots. Take care for plenty of space (at least 15cm) below and above the device in order to ensure proper cooling. Models of housing type 2 (see section „Technical specifications“) are recommended to leave a distance of 20cm for the extension cards, if mounted side-by-side.

Mains connection

All models are equipped with an active PFC (power factor correction) and a wide range input. It can be operated at AC input voltages from 90V to 264V and mains frequencies of 45Hz up to 65Hz.

The connection is done with the included 3pole plug (Phoenix Combicon GMSTB 2,5/3-ST-7,62) according to the print on the front plate. It must only be carried out by trained technical personnel. Main focus lies on an appropriate cross section of the mains lead, as well as the fact that the device does not feature a power switch. The mains input is fused by a standard 5x20mm fuse which is located inside the unit (housing type 1) or on the front (housing type 2).

Battery connection

The battery or batteries are connected to the designated terminal „Battery“ on the front.

The cross section AND the length of the charging cables are very important for good results.

We recommend to use following cross sections:

Charging current	Cable length 0 - 1.5m	Cable length 1.5 - 4m
0 - 20A	6mm²	10mm²
20 - 40A	16mm²	25mm²
40 - 60A	25mm²	35mm²

Cable lengths of more than 4m should be avoided or, if not avoidable, compensated by even bigger cross sections.

Functional description

Note: below names given in blue are adjustable in the battery profiles.

Charging procedures

***Attention!** Defective batteries (U_{Bat} < U_{Min}) must not be charged!*

I. Lithium batteries

The charging procedure for Lithium batteries follows an I-U characteristics with automatic stop when the battery is fully charged. Also see figure below.

The first charging phase is a **precharge** phase with reduced output current I_{PC}. The precharge is very effective for heavily discharged batteries, providing the possibility to prepare them gently for the charging.

After the charging voltage has risen to $U_{PC,END}$ or after a max. phase time $t_{PC,END}$, the device changes to **normal charge**.

During normal charge, the charging level of the battery defines the charging current, which can be max. I_{CHARGE}. During the constant current charge the battery voltage will rise and if it reaches U_{CHARGE}, the charging continues with constant voltage until the charging current sinks below the threshold I_A. After this the battery is considered as fully charged and the charging stops automatically. If time t_A has elapsed before the charging current has decreased below I_A, then the charging will be aborted and the battery is possibly not fully charged. This can happen if wrong charging parameters have been defined or if the battery is defective.

Attention! There is no temperature compensation for Lithium batteries. The battery temperature is supervised for over- or undertemperature, though.

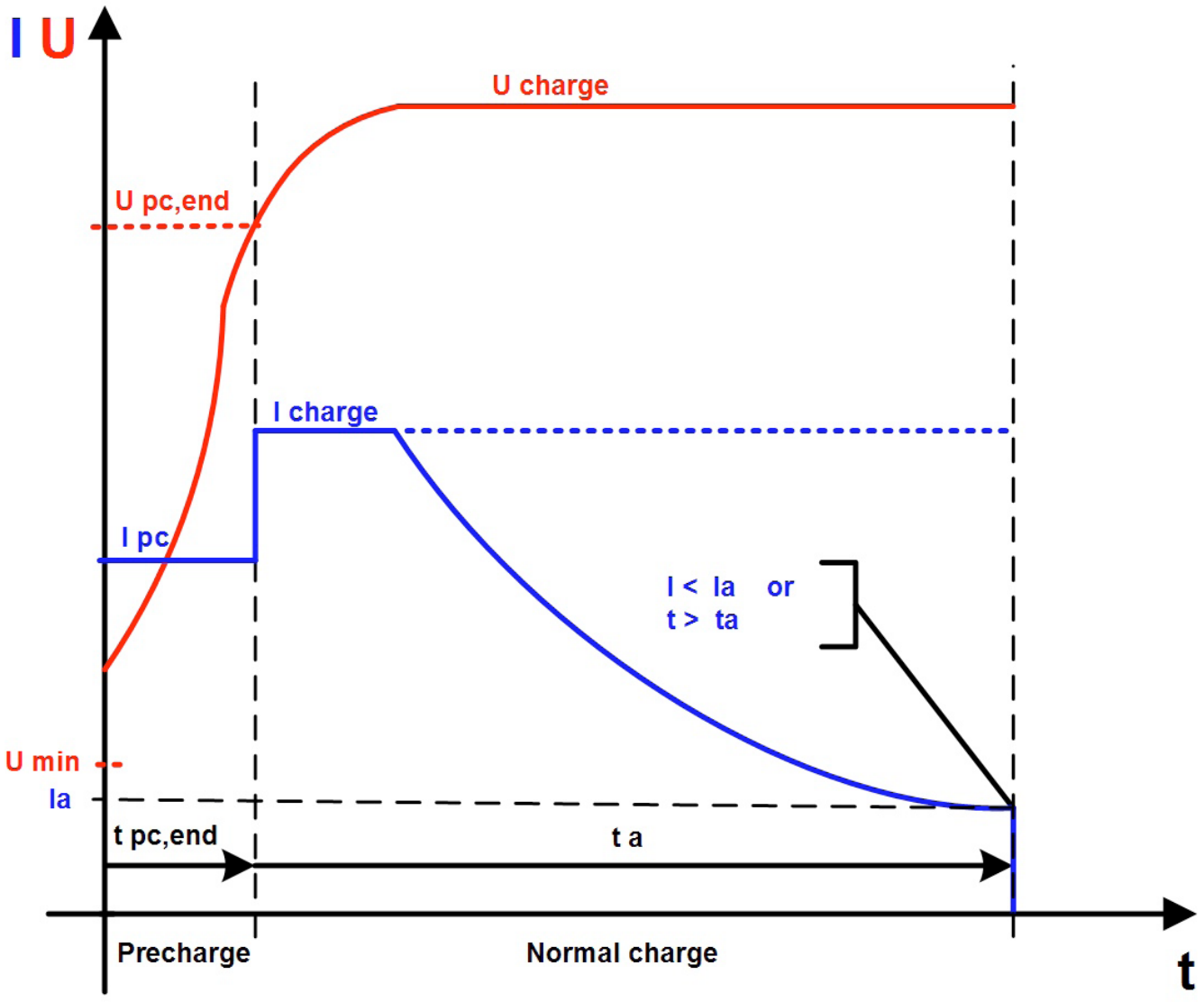


Figure 1. Charging characteristics for Lithium batteries

II. Nickel Cadmium / Nickel metal hydride batteries

The charging procedure for Nickel batteries follows an I-U characteristics with automatic stop when the battery is fully charged. Also see figure below.

The first charging phase is a **precharge** phase with reduced output current I_{PC}. The precharge is very effective for heavily discharged batteries, providing the possibility to prepare them gently for the charging.

After the charging voltage has risen to $U_{PC,END}$ or time $t_{PC,END}$ is exceeded, the device changes to **boost charge** with current I_{CHARGE}. During the boost charge the battery voltage will continuously rise. The highest measured value serves as as reference for the determination of voltage difference Δ**Ua**. This difference results when the battery voltage sinks again at the point where the battery is fully charged. If the defined value Δ**Ua** is exceeded, the battery is considered as fully charged and the charging stops automatically.

When charging Nickel batteries, the battery temperature is very important and has to be supervised. Changes of the battery surface temperature may not exceed a certain level. Thus is imperative to use and install a temperature sensor. At the start of the charging, the start temperature is measured. If the temperature difference exceeds the value Δ**T a,max** or if it rises within a minute so that value Δ**T/**Δ**t a** is exceeded, the charging is aborted. The battery capacity is additionally supervised. A premature abort will happen if 1.3 Q is reached for any reason, i.e. 130% of the battery capacity. Given, that the battery capacity was correctly set in the battery profile, this will prevent the battery from overheating.

Attention! In case the charging is started without temperature sensor, there can't be a temperature-depending fast charge with high C value.

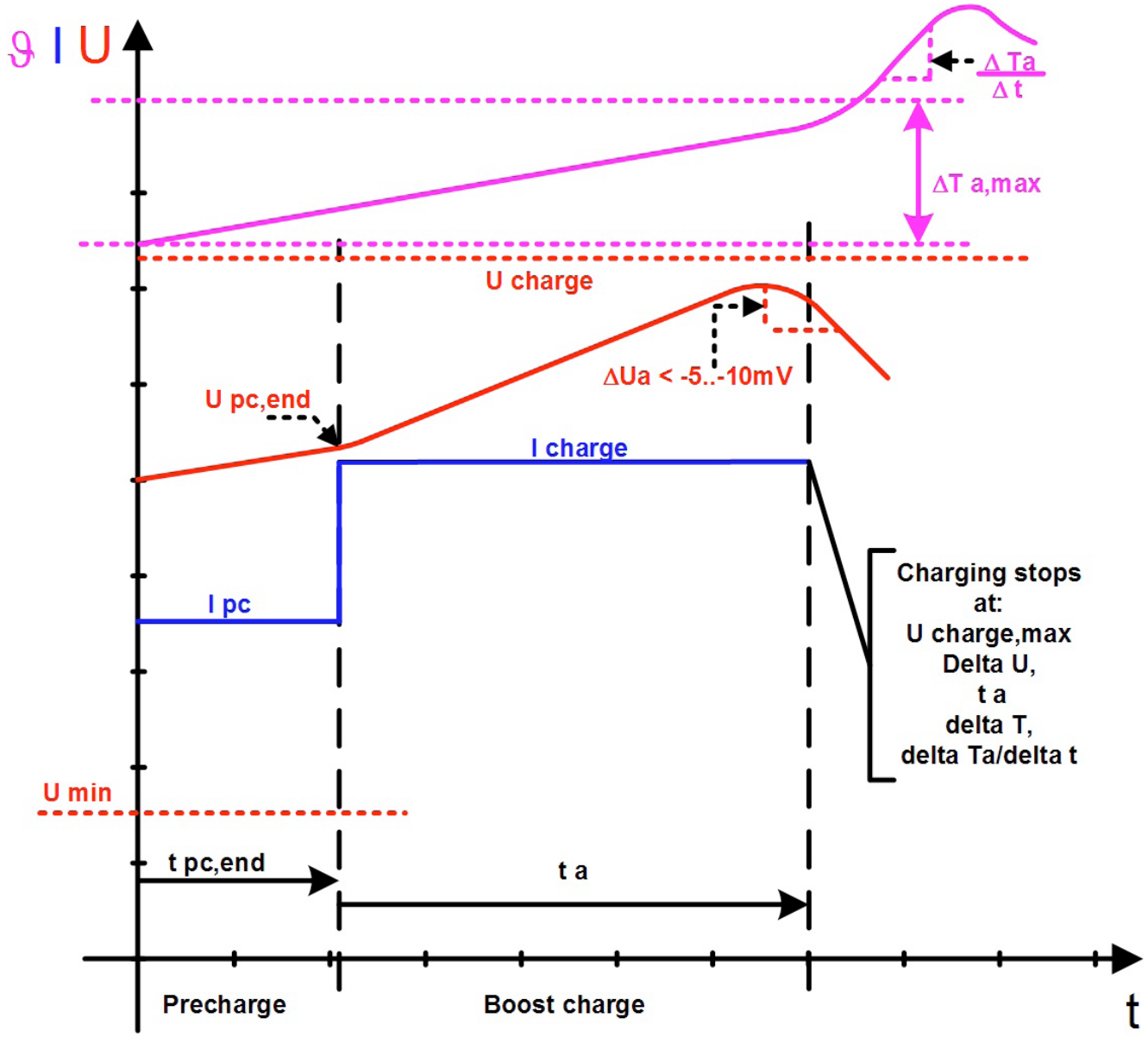


Figure 2. Charging characteristics for Nickel batteries

III. Lead batteries

The charging procedure for lead batteries follows an I-U-U characteristics without automatic stop when the battery is fully charged. Also see figure below.

During the **precharge** phase the battery is charged with reduced output current I_{PC}. After the charging voltage has risen to $U_{PC,END}$ or time $t_{PC,END}$ is exceeded, the device changes to **boost charge** with constant current I_{CHARGE}. During the boost charge the battery voltage will continuously rise.

After the charging voltage has risen further to U_{CHARGE} or after a max. phase time $t_{CC,END}$, the device changes to **normal charge**. This will charge the battery with constant voltage until the charging current sinks below the threshold I_A. Then the charger will change to the last charging phase, the **trickle charge**. This phase runs with charging voltage $U_{TRICKLE}$ until manually stopped and keeps the battery permanently charged.

A cell supervision for the precharge phase can be activated in the battery profile (also see „Menu: Battery profile“). This feature supervises battery voltage changes. If the battery voltage increase is lower than $\Delta U/\Delta t$, the charging will be aborted and the battery is considered as defective.

During the entire charging procedure the battery temperature can be supervised by the temperature sensor (if connected). The charging voltages of normal and trickle charge phases are then compensated depending on the battery temperature.

It is always advised to charge with temperature compensation. If the temperature sensor is not connected, the charging voltages will be set as defined in the battery profile(s).

Temperature sensor

It is recommended to use temperature compensation when charging batteries, in order to prevent dangerous gassing. Without the temperature sensor the batteries are charged with the defined charging phase voltages in the battery profile, which correspond to an ambient temperature of 25°C. Lithium batteries are not temperature compensated. Here the sensor just serves for temperature supervision.

The sensor is directly connected to pins 1 and 6 of the analogue interface and has to be attached to the battery body. If the use of a temperature sensor has been activated in the battery profile, it is detected and used when the charging is started.

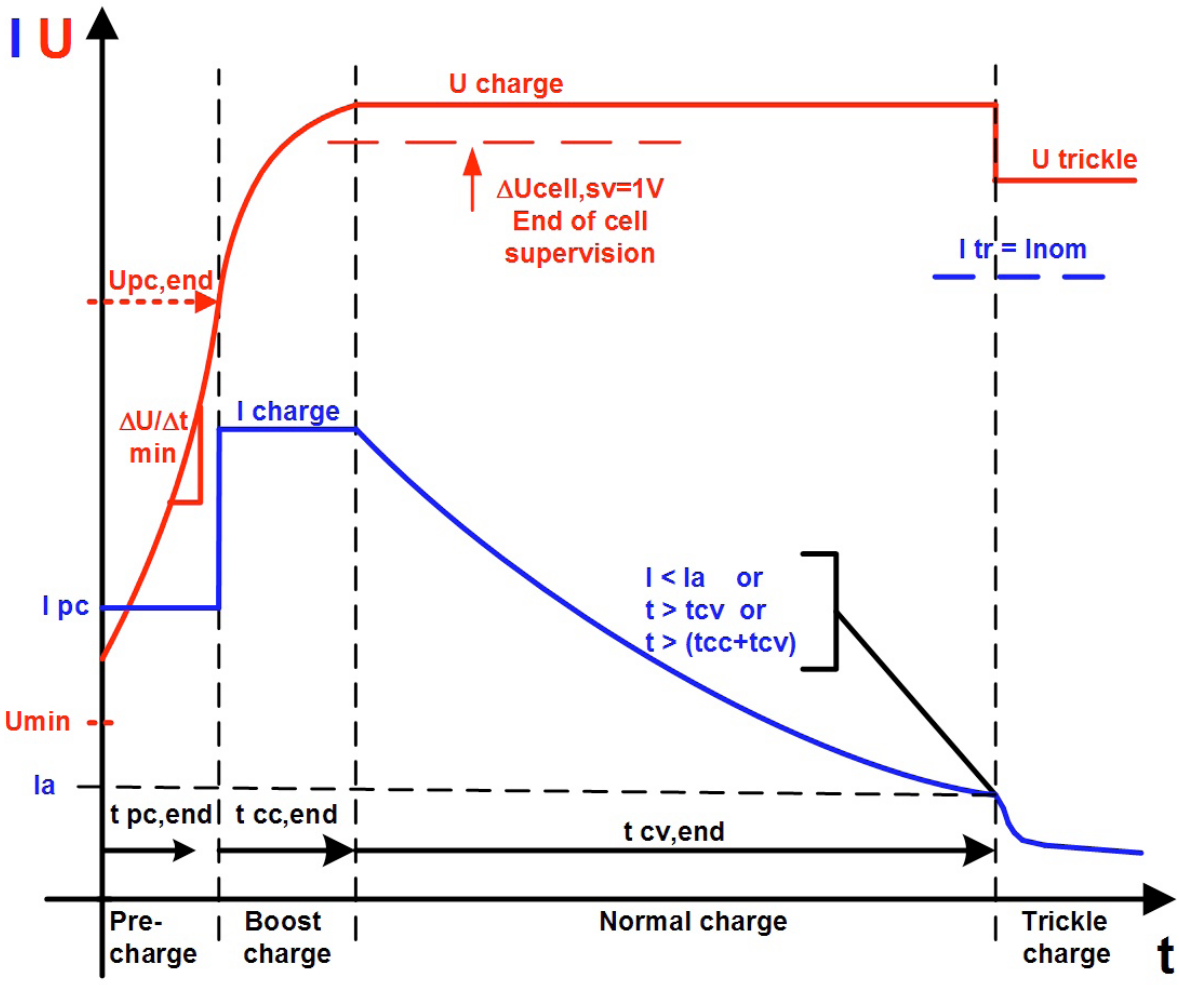


Figure 3. Charging characteristics for lead batteries

The included sensor LM335 or the similiar type KTY81/20 can be used. The type has to be selected in the device setup.

The temperatur range **T stop, min** to **T stop, max** applies for temperature supervision. At battery temperatures beyond this range, the charging halts and the device reports an error. The internal phase time counter for the current phase, like for t_{CHARGE}, is also halted, but the total charging time in the display continues. As soon as the temperature is within the allowed range again, the charging continues.

The second temperature range defines the when temperature compensation is effective. Beyond this range, which is always a part of the total temperature range, the charging voltage is not furtherly compensated.

The compensation of the charging voltage is done with the defined temperature coefficient value in the battery profile (mV/Kelvin and per cell). This value is seperately adjustable for normal and trickle charge.

Remote sense

In order to compensate voltage drops along the load leads, the device features remote sense inputs on the front. Here the sensed voltage from the battery is connected with correct polarity. Remote sense can compensate up to 2V.

When not using the sense inputs, they just remain open. It is not required to bridge them to the output.

Power Supply mode

The device can be used as power supply, if set to **Power Supply** in the device setup. It will then either work in constant voltage operation (CV) or constant current operation (CC). The output voltage and current become adjustable from 0...100% nominal values.

Additionally, an overvoltage protection threshold **OVP PS mode U=** (0...110% U_{Nom}) can be defined in the device setup.

This mode is suitable for parallel standby operation.

Overvoltage protection (OVP)

All models feature an overvoltage protection circuit with a threshold that is defined as 110% U_{Nom}. For example, if the charger model is a BCI 812 with 16V U_{Nom}, then the max. OVP threshold is 17.6V.

The threshold is differently adjusted for Power Supply and Battery Charger mode.

In **Power Supply mode**, it is the total range of 0...110% U_{Nom}.

In **Battery Charger mode**, it is an offset of 1V...10V that is internally added to the actual output voltage and set as OVP threshold. But the max. OVP still lies at 110% U_{Nom}.

Example: if the output voltage of a 16V device is 4.2V and the OVP offset is set to 10V, the OVP becomes active above 14.2V. Otherwise, if the output voltage was 10V, then the OVP would become active at above 17.6V.

In case of an overvoltage condition, whether caused by an internal defect or by external reasons, the power output is switched off and the alarm is displayed as text or by an alarm symbol and also by pin 9 (ERROR) of the analogue interface. After the OV condition is gone, the output can be switched on resp. the charging can be started again.

Overtemperature (OT)

All models also feature an internal temperature supervision. In case of overheating, the power output will be temporarily switched off until the device has cooled down, and then automatically switch on again. Charging is only paused, but not stopped. The condition is indicated in the display by a text or an alarm symbol, and by pin 9 (ERROR) of the analogue interface.

Other errors

Any error is indicated in the display by a symbol or by an error message and also by pin 9 (ERROR) of the analogue interface. Following error sources can be detected (see also „Errors and Alarms“ below for details):

- Connection of a totally discharged or defective battery
- Temperature sensor failure (broken wire etc.)
- Battery with wrong voltage
- Cell short-circuit
- Various device and communication errors

Battery supervision

The battery terminal is supervised for false polarity and wrong battery voltage. In case the battery was connected with false polarity or the battery voltage is too low the charging is inhibited to start. The condition is also indicated as error on the display.

Analogue interface

All models feature a 12 pin analogue interface on the front (housing type 1) or on the right side (housing type 2) of the device. It can be used to monitor the device condition, as well as to remotely start/stop the charging procedure. Also see section „The analogue interface“ for futher details.

Digital interface cards

The device features a slot for pluggable, retrofittable interface cards that is accessible on the front (housing type 1) or on the right side (housing type 2). These cards can be used to supervise and control the device with either customer designed software or with the included tool.

There are cards for USB, RS232, CAN or Ethernet (LAN, with additional USB).

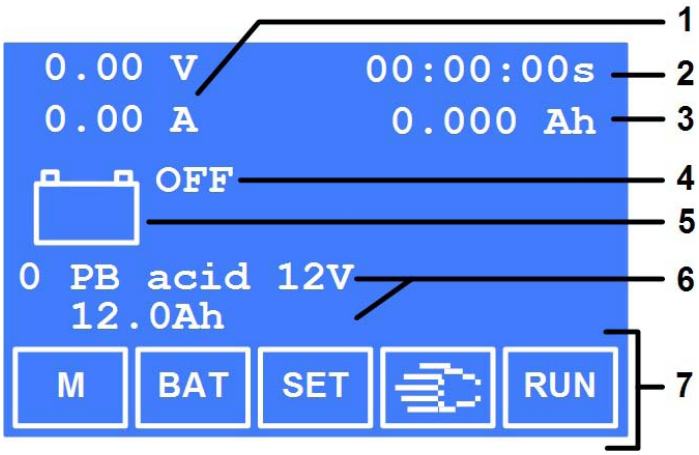
The communication protocol is open and enables the user to create custom control applications. It is described in the user manual of the interface cards.

Behaviour at mains blackout

The charger is designed for industrial use. It means, it can automatically continue to work after a mains blackout. After a blackout, it can restore the last output state (in PS mode), or continue to charge the battery (in BC mode). This feature is activated by default and can be deactivated in the device setup.

Handling

The display



1. Actual values (current and voltage)
2. Total time of the charging procedure
3. Charge in Ah, that has been put into the battery
4. Two-line status field
5. Charging level indication
6. Selected battery profile with some important data
7. Actual key strip layout

Introduction

The handling of the device is, apart from remote control with analogue or digital interface, done with the five pushbuttons beneath the display.

These buttons have interactively varying assignments, which are depicted in the display above the buttons by symbols or abbreviations (item 7 in „The display“) .

Overview of the button functions

ADJ — Change the selected setting or switch to adjust a value.

Confirms that alarms shown in the display have been acknowledged by the user. This will flush the alarm buffer and the alarms in the display if no alarm reason is present anymore.

BAT — Accesses the battery profile.

Select a value or menu item.

Submits values or settings.

ESC — Aborts without submission of changes. Exits the current menu level.

EXT — Exits LOCAL mode and enables EXTernal control by analogue or digital interface.

Activates LOCAL mode.

M — Accesses the setup menu.

− + — Change the selected value.

OFF — Switches output off.

ON — Switches output on (only in Power Supply mode)

Moves the cursor to any digit of the selected value in order to change decimal places directly.

RUN — Starts the charging, if all necessary conditions are fulfilled (see below) or continues it.

STOP — Pauses the charging.

SET — Direct access to the currently selected battery profile (when not charging) or switches to edit mode of a selected value/setting.

VIEW — Displays the settings of the currently selected battery profile when charging. No modifications possible.

EDIT — Edit mode for the selected battery profile.

USE — Submits the selected battery profile from the for the next charging.

U — Set output voltage (Power Supply mode)

I — Set output current (Power Supply mode)

Menu: Device setup

This menu lets the user define settings for the signals of the analogue interface, communication parameters for the various digital interfaces (only where required) and other device related features.

Note: Changes are only possible if the output is off.

Actions:

1. Navigate in the menu

M + ↓ ↑

2. Activate menu items

M + ↓ ↑ + ↵

3. Change settings

M + ↓ ↑ + ↵ + ↓ ↑ + SET

then submit with ↵ or abort with ESC.

Continued on next page...

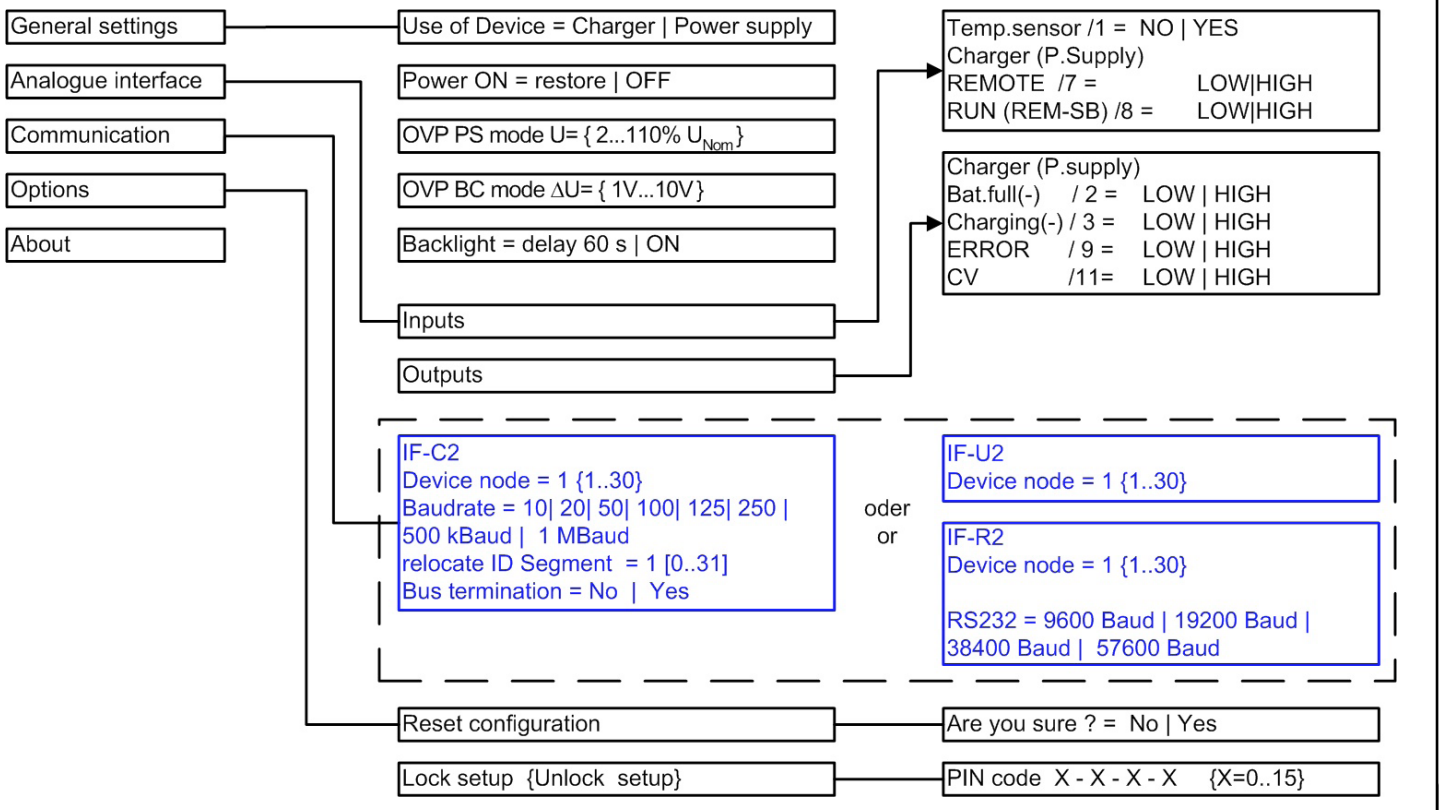


Figure 4. Menu structure „Device setup“

Notes:

- Names in brackets () are related to functions in Power Supply mode only.
- The number behind a setting, eg. „/7“, indicates the corresponding pin of the 12 pole analogue terminal.

Explanations:

Menu item	Parameter	Meaning
General settings		
Use of device	Charger	Device will work as charger
	Power Supply	Device will work as power supply
Power ON	restore	Output condition will be restored after mains return
	OFF	Output will always be off after mains return
Backlight	delay 60s	Display backlight will switch off after a delay of 60s. Switches on with every buttonpress
	ON	Backlight permanently on
Analogue interface		
Temp.sensor /1	NO	Temperature sensor is not used
	LM335A	Type LM335A is used
	KTY81-210	KTY81-210 is used
Remote /7	LOW	Remote control at pin = low
	HIGH	Remote control at pin = high
Charge(Rem-SB) /8	LOW	Start charging at pin = low
	HIGH	Start charging at pin = high
Bat.full /2	LOW	Pin signalises „Battery full“ = low
	HIGH	Pin signalises „Battery full“ = high
Charging /3	LOW	Pin signalises „Charging...“ = low
	HIGH	Pin signalises „Charging...“ = high
ERROR /9	LOW	Pin signalises „Error“ = low
	HIGH	Pin signalises „Error“ = high
CV /11	LOW	Pin signalises low = CV, high = CC
	HIGH	Pin signalises low = CC, high = CV
Communication		
Device node	1...30	Device node, device address
IP	0...255	Device IP (only IF-E2)
GW	0...255	Gateway (only IF-E2)
SNM	0...255	Subnet mask (only IF-E2)
RS232	div.	Baud rate setting at IF-R2
Baudrate	div.	Baud rate setting at IF-C2
relocate ID seg	0...31	Select address segment for CAN ID (only IF-C2)
Bus termination	YES	Bus termination on (only IF-C2)
	NO	Bus termination off (only IF-C2)
Options		
Reset configuration		All settings are restored to default, including the battery profile, if YES is selected and submitted
Lock setup		Locks the settings in the setup menu with a 4 digit PIN
Unlock setup		Unlock setup by entering PIN again
About		Displays device type and manufacturer

Important notes about the settings:

- „Remote /7“ and „RUN (Rem-SB) /8“ should remain set to LOW if the analogue interface is not used, because they are high by default
- Setting „Power ON = OFF“ will result in the device not continue charging or switching output on after a mains blackout

Menu: „Battery profile selection“

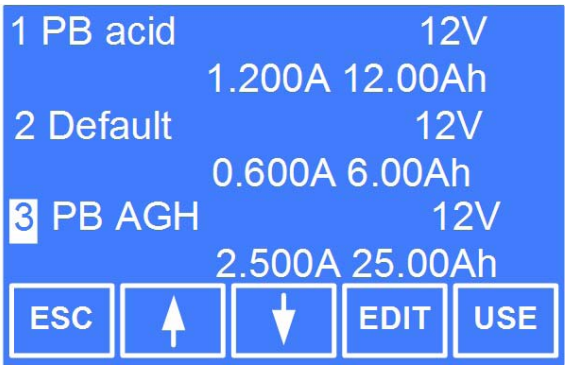
All profiles are modifiable, but the battery type is assigned like this:

Profiles 1 - 6: Lead batteries, various types

Profiles 7-10: Lithium batteries, various types

Profiles 11-12: Nickel batteries, various types

Overview:



Actions:

1. Select battery profile for use

BAT + ↓ ↑ + USE

2. Modify battery profile

BAT + ↓ ↑ + EDIT

3. Navigate in the battery profile

BAT + ↓ ↑ + EDIT + ↓ ↑

4. Change value(s) in the battery profile

BAT + ↓ ↑ + EDIT + ↓ ↑ + ADJ

then change with + −. When finished, submit with ↵ or abort with ESC.

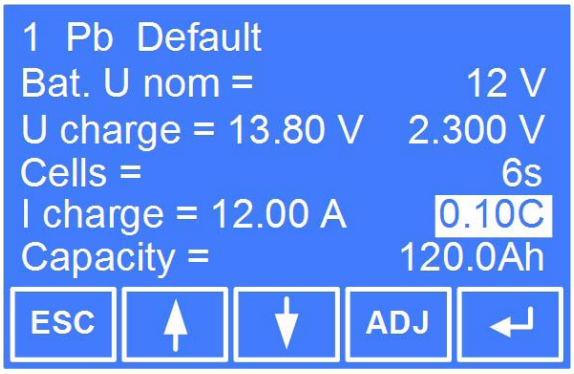
The battery profiles

The selected battery profile should be modified by the user to fit the requirements of the battery! The charging current is very important here.

The profiles items are almost identical. They only differ in some battery-specific parameters. All adjustable values are related to the charging characteristics and the corresponding battery type. Also see section „Charging procedures“.

Important: the profiles are seperated into **two sub-profiles**:

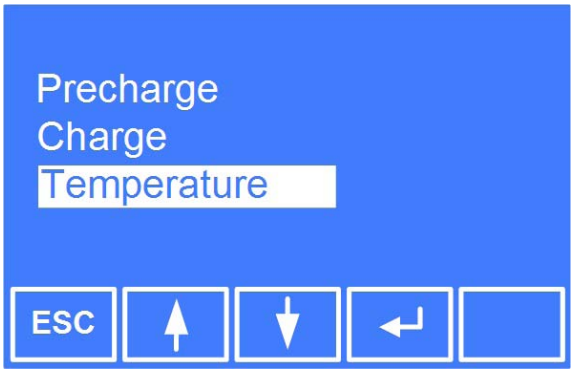
A) The main battery parameters. Accessible via the button BAT and then EDIT:



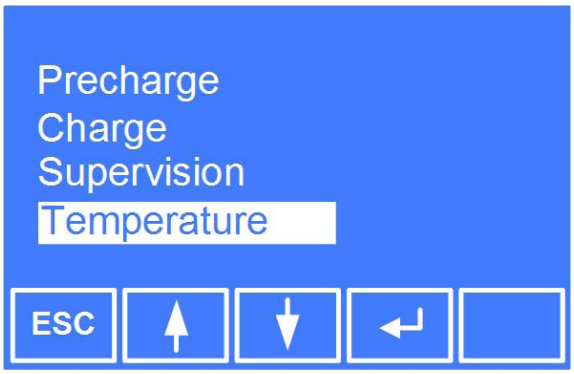
1. Line	Profile number, battery type, name (maximum 10 characters)
Bat. U nom	Battery nominal voltage (at Pb) (not adjustable)
Cell U nom	Cell voltage (at Ni/Li) (Range: see Ucharge)
U charge	Normal charge voltage of battery/cell (Range Pb: 2.150V...2.650V) (Range Ni: 0.800V...1.900V) (Range Li: 2.000V...4.200V)
Cells	Number of cells per battery (Range: 1...XXs) [1]
I charge	Charging current (in C) (Range: 0.1...x.xC) [2]
Capacity	Battery capacity (Range: 1.0Ah...xAh) [3]

Note: the charging current **I charge** is adjusted in C. This value is directly depending on the adjusted battery capacity. It applies: if, for example, a battery capacity of 120Ah is given, then 1C = 120A. The recommended charging current is mostly given by the battery manufacturer in the datasheet and should be used here.

B) The subparameters like temperatures, cell voltage, or charging currents for the different charging phases. Accessible via the button SET:



<- **Li/Ni**



<- **Pb**

The additional seperation is used to gain clarity and divides the subparameters by affiliation.

For the three supported battery types, different parameters result. See the next the pages.

1 The „s“ indicates that the cells are connected in series
The upper limit varies depending on the cell voltage and the nominal voltage of the device

2 The upper limit varies depending on the adjusted capacity and the nominal current of the device

3 The upper limit varies depending on the adjusted charging current and the nominal current of the device

Battery profile for lead batteries

Values in brackets define the setting range

Precharge setup	Bat.U min = {0.00V...75%U_{Bat}}	Minimum battery voltage required for charging
	I pc = {0.000C...0.350C}	Precharge current (in C) (Example: Battery with 100Ah -> 1C = 100A)
	Bat.U pc, end = {Bat.U min...Ucharge}	Precharge end voltage
	t pc, end = {0:00h...99:59h}	Precharge maximum time
Normal charge setup	t cc, end = {0:00h...99:59h}	Current threshold for change to trickle charge (in C)
	I a = {0.000C...0.350C}	Boost charge maximum time
	t cv, end = {0:00h...99:59h}	Normal charge maximum time
	Bat. U trickle = {Upc, end...Ucharge}	Trickle charge voltage
Cell supervision	Cell super vision = YES | NO	Cell supervision on/off
	Bat. dU/dt min = {0.000V...1.000V}/min	Cell supervision threshold for charging stop
Temperature	Tstop = {-30.0°C…+15°C} {30°C...85°C}	Absolute temperatur range for battery charging
	T(TC) = {-20.0°C…+15°C} {30°C...50°C}	Temperature compensation range
	TC charge = {-30.0mV...0.0mV}/K	Temperature compensation for normal charge
	TC trickle = {-30.0mV...0.0mV}/K	Temperature compensation for trickle charge

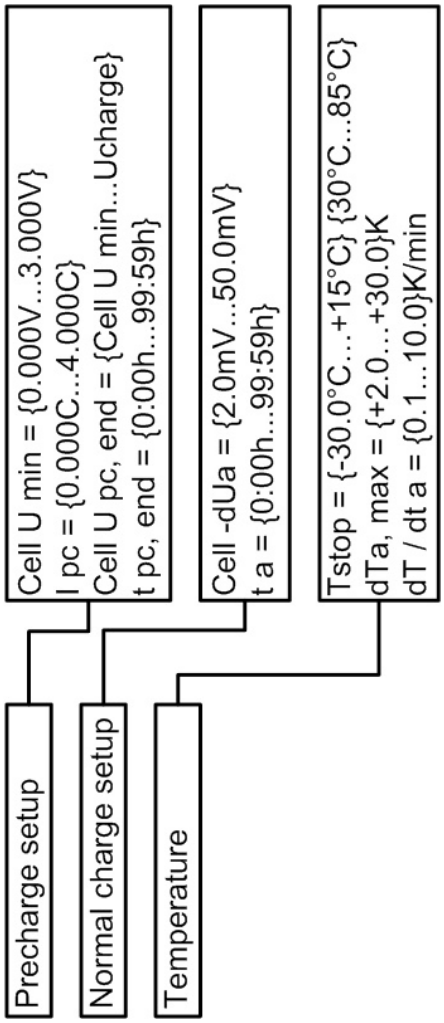
Battery profile for Lithium batteries

Values in brackets define the setting range

Precharge setup	Cell Umin = {0.000V...Cell Upc,end}	Minimum battery voltage required for charging
	I pc = {0.000C...0.500C}	Precharge current (inC) (Example: Battery with 100Ah -> 1C = 100A)
	Cell Upc, end = {Cell Umin...Ucharge}	Precharge end voltage
	t pc, end = {0:00h...99:59h}	Precharge maximum time
Normal charge setup	t a = {0:00h...99:59h}	Normal charge maximum time
	I a = {0.000C...9.999C}	Charging current threshold for charging stop (in C)
Temperature	Tstop = {-30.0°C…+15°C} {30°C...85°C}	Absolute temperature range for battery charging

Battery profile for Nickel batteries

Values in brackets define the setting range



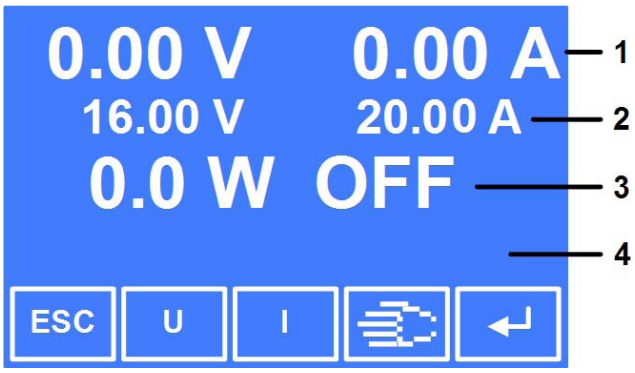
Operation as Power Supply

The charger can also be operated as a power supply with fully adjustable output voltage (0...100% U_{Nom}) and adjustable output current (0...100% I_{Nom}). Furthermore, the overvoltage protection threshold can be predefined in the device setup.

Switching to power supply mode is done like this:

M -> **General settings** + ↵ -> **Use of Device** + ADJ -> **Power supply** + ↵

The main display will change to:



1. Line	Actual values of voltage and current
2. Line	Set values for voltage and current
3. Line	Actual values of power, output condition and alarm symbols/abbreviations
4. Zeile	Device condition text

The buttons U or I are used to select either the voltage set value or the the current set value for adjustment. The display will change to adjustment mode and invert the selected decimal place:

After this, the buttons − and + are used to increase or decrease the decimal place's value.

With the button the cursor is moved. submits the value and the device will set it. Abort with ESC without submitting the value.

For the adjustment of the overvoltage threshold it is required to access the device setup menu. See section „Menu: Device setup“.

Powering the device

The device does not feature a power switch. When connecting it to mains, it is immediately ready to work.

After switching mains off the device stores the last state (selected mode, output condition) in order to restore it automatically at the next start. Thus it can continue to work after an interruption like a blackout etc.

Battery voltages and charging currents

The battery charger only allows to charge batteries that meet the device‘s specifications regarding output voltage. The maximum charging current is equal to I_{Nom}.

***Attention!** Before connecting or disconnecting batteries it is imperative to check if charging has been stopped.*

Starting a charging

The charging is started by pushing button RUN. The battery will then be charged according to the selected battery profile and with the corresponding charging characteristics, as depicted in section „Charging procedures“. The display will indicate the actual charging phase by a status text:

Precharge	Precharge phase (all types)
Normal charge	Normal charge phase (all types)
Trickle charge	Trickle charge phase (lead only)

Attention! It is imperative to select the proper battery profile before charging! It is also recommendend to modify the battery profile to meet the specifications given by the battery manufacturer!

Stopping a charging

By pushing the button STOP the charging is paused at any time. The charging can then either be continued with button RUN or aborted with OFF. The output is then switched off and the time count stops. The display remains until a new charge is started. This is used to display sort of a summary for the last charging procedure with total time and battery charge. Furthermore, the status text **Charging finished** indicates the condition.

Using the analogue interface

The analogue interface allows to monitor the device‘s output values (voltage and current) and the condition (errors) remotely. It can also start or stop a charging.

The monitor outputs represent the nominal values of the device from 0...100% with voltages of 0...10V.

The temperature sensor is also connected to the analogue interface. The clamps are suitable for 20 - 26 AWG wires, dismantled at least 10mm.

See the table below for pin assigment and levels.

Error messages and alarms

While the device is operated as charger, errors and alarms are indicated with a full status text in the display. In Power Supply mode, the alarms are abbreviated and indicated by an alarm symbol. Also see table on the next page.

In order to continue working with the device, alarms have to be acknowledged by the user. This is done by pushing the button . If the cause of the alarm is not present anymore, the alarm display is cleared and the alarm is deleted from the internal alarm buffer.

The alarm buffer can also be read out via a digital interface.

Note: Alarms are only put into the internal alarm buffer as a code number. See table below.

Alarms are also put out as signal on the analogue interface, pin 9. See section „The analogue interface“.

Display in Charger mode	Display in Power Supply mode	Code	Description
Charger overvoltage	**OV**	**01**	Overvoltage error
Charger overtemp.	**OT**	**02**	Overtemperature error in the device
Charger system error	**SYS**	**03**	System error
CAN communication error	**CAN**	**20**	CAN communication error
Bat. temp out of range		**37**	Battery temperature too high
Bat. temp out of range		**38**	Battery temperature too low
Bat.voltage out of range	**Ub>**	**39**	Battery voltage too high
Bat. deeply discharged		**40**	Battery voltage too low
Cell fault in battery		**41**	Cell short-circuited or defective
Temp.sensor fault		**42**	Temperature sensor missing or defective
Reverse polarity	**-Ub**	**43**	Battery connect with reverse polarity
No battery detected		**44**	No battery connected (only in charger mode)

Some explanations about the list:

- **No battery detected** is displayed in charger mode as long as no battery is connected (battery voltage = 0V).
- **Bat. deeply discharged** indicates that the connected battery is either deeply discharged, defective or just of wrong nominal voltage.
- If a battery is connected while the device is in Power Supply mode, the battery voltage is supervised like in Battery Charger mode and related errors are reported.

The analogue interface

Technical specifications

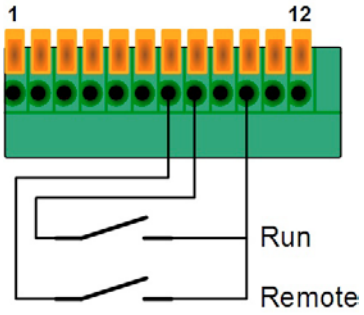
Pin	Name	Type[1]	Description	Level	Electrical specifications
1	Temp. sensor	AI	Temperature sensor	Positive connector	
2	Battery full	DO	Charging done / Trickle charge	Level is user-defineable in device setup U_{Low}<1V, U_{High}>4V	U_{Max} = 30V, I_{Max} = 20mA Quasi open collector with pull-up to Vcc 2
3	Charging	DO	Charging active	Level is user-defineable in device setup U_{Low}<1V, U_{High}>4V	
4	VMON	AO	Actual value: voltage	0….10V corresponds to 0….100% of U_{Nom}	Accuracy 0.1% at I_{Max} = +2mA Short-circuit-proof against AGND
5	CMON	AO	Actual value: current	0….10V corresponds to 0….100% of I_{Nom}	
6	AGND		Reference for analogue signals		For CMON, VMON, Temp.sensor
7	REMOTE	DI	Activate remote control	Level is user-defineable in device setup U_{Low}<1V, U_{High}>4V	U_{max} = 30V I_{Max} = -1mA at 5V
8	RUN / REM-SB	DI	PS mode: Power output off Bat mode: Run/Stop charging	Level is user-defineable in device setup U_{Low}<1V, U_{High}>4V	
9	ERROR	DO	General error output	Level is user-defineable in device setup U_{Low}<1V, U_{High}>4V	U_{Max} = 30V, I_{Max} = 20mA Quasi open collector with pull-up to Vcc [2]
10	DGND		Reference for digital signals		For control and monitoring signals
11	CV	DO	Constant voltage operation	Level is user-defineable in device setup U_{Low}<1V, U_{High}>4V	U_{Max} = 30V, I_{Max} = 20mA Quasi open collector with pull-up to Vcc [2]
12	Vcc	AO	Auxiliary voltage	12….16V	I_{Max} = 24mA Short-circuit-proof against DGND

1) AO = Analogue output, DI = digital input, DO = digital output
2) 12V...15V

Applications of the analogue interface

Charging start/stop or output on/off

Digital inputs (DI)



In Power Supply mode: Pin 8 („REM-SB“) is used to switch the power output off or on. In this mode, the output can be used whether the remote control is active or not, like for an emergency off.

Attention! Does not work if the device is set to LOCAL mode.

In Battery Charger mode: Before the charging can be started remotely by pin 8 („RUN“), the device is required to be set into remote control (pin 7, „REMOTE“).

In the device setup for the analogue interface, the user can define the logical levels for pin 7 and 8. After the charging is started and the logical level of pin 8 is inverted, the charging is paused. Another level inversion at pin 8 will continue etc. The charging is only fully stopped after the remote control is left by reverting the level of pin 7.

Reference is digital ground (DGND).

Caution! When switching to remote control and if the logical level of pin 8 is already set to the same level as defined for „RUN“ (in the device setup), then the charging will start immediately.

Monitoring the device condition

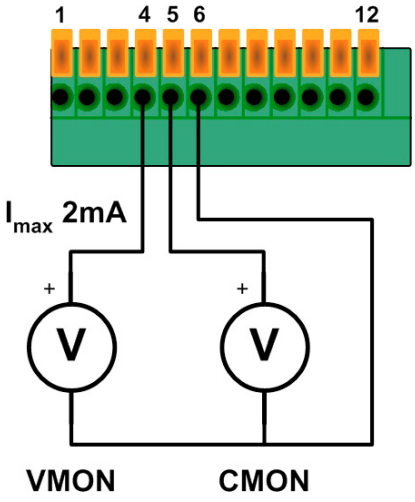
The digital outputs (pins 2, 3, 9 and 11) are quasi open collector outputs with a pull-up resistor to Vcc. The maximum input voltage must not exceed 30V and the maximum input current must not exceed 20mA. Relays are allowed.

Note, that the outputs can be „high“ or „low“ when signalising their dedicated signal. This is defined in the device setup for the analogue interface, at item Analogue interface -> Outputs. The pins can only sink current to DGND, not put out.

Reference is digital ground (DGND).

Monitoring voltage and current

Analogue outputs (AO)

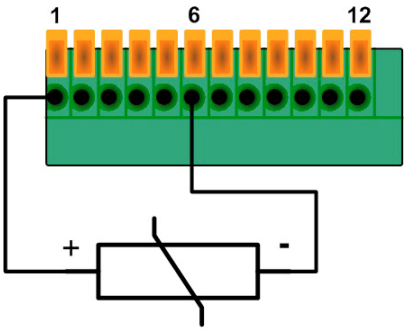


The analogue monitoring outputs put out 0...10V which corresponds to 0...100% of the nominal values.

Reference is analogue ground (AGND).

Temperature sensor input

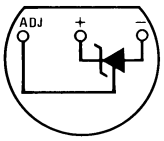
Analogue output (AO)



Temperature sensor

The temperature sensor alters the charging voltage according to the temperature of the battery.

The included sensor is a LM335, pin assigment as shown below. Always connect with correct polarity according to the wiring scheme.



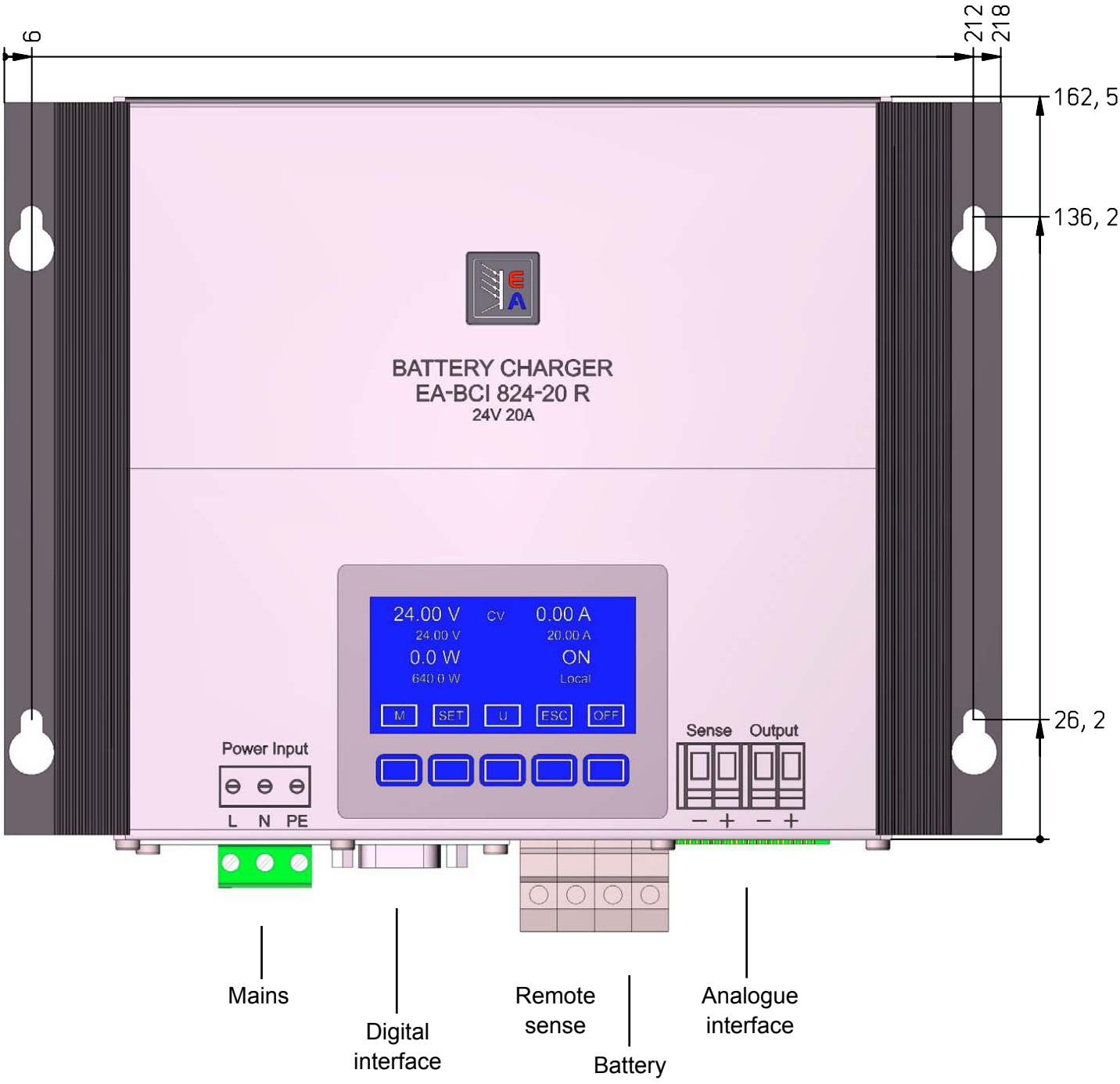
Bottom view. Pin „ADJ“ is not used.

Technical specifications

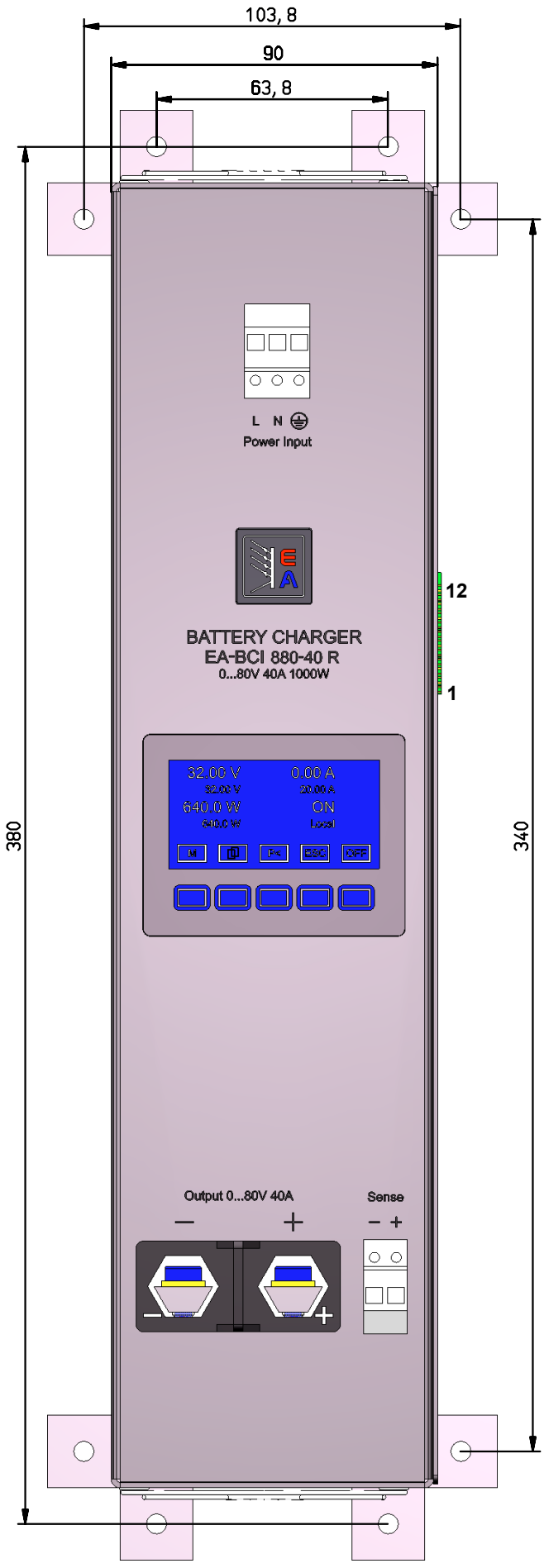
	BCI 812-20R	BCI 812-40R	BCI 812-60R	BCI 824-10R	BCI 824-20R
Mains input					
Input voltage	90….264V	90….264V	90….264V	90….264V	90….264V
Frequency	45….65Hz	45….65Hz	45….65Hz	45….65Hz	45….65Hz
Power factor correction	>0.99	>0.99	>0.99	>0.99	>0.99
Input current at 230V max.	1.6A	3.4A	4.8A	1.6A	3.2A
Input current at 100V max.	3.8A	8A	11.4A	3.8A	7.5A
Fuse	M6.3A	T10A	T16A	M6.3A	T10A
Output - Voltage					
Battery voltage U_{Bat}	12V	12V	12V	24V	24V
Adjustable range	0….16V	0….16V	0….16V	0….32V	0….32V
OVP adjustment PS mode	0.24...17.6V	0.24...17.6V	0.24...17.6V	0.64...35.2V	0.64...35.2V
OVP adjustment BC mode ΔU	1...10V	1...10V	1...10V	1...10V	1...10V
Stability at 10-90% load	<0.05%	<0.05%	<0.05%	<0.05%	<0.05%
Stability at ±10% Δ U_{In}	<0.02%	<0.02%	<0.02%	<0.02%	<0.02%
Ripple	<40mV_{PP}	<70mV_{PP}	<70mV_{PP}	<40mV_{PP}	<40mV_{PP}
Regulation 10-100% load	<2ms	<2ms	<2ms	<2ms	<2ms
Output - Current					
Nominal current	20A	40A	60A	10A	20A
Stability at 0-100% Δ U_{Out}	<0.15%	<0.15%	<0.15%	<0.15%	<0.15%
Stability at ±10% Δ U_{In}	<0.05%	<0.05%	<0.05%	<0.05%	<0.05%
Ripple	<50mA_{PP}	<100mA_{PP}	<100mA_{PP}	<50mA_{PP}	<50mA_{PP}
Output - Power	0	0	0	0	0
Nominal power	320W	640W	960W	320W	640W
Nominal power at U_{IN} <150V	320W	640W	960W	320W	640W
Miscellaneous					
Operation temperature	0….50°C	0….50°C	0….50°C	0….50°C	0….50°C
Storage temperature	-20….70°C	-20….70°C	-20….70°C	-20….70°C	-20….70°C
Humidity	<80%	<80%	<80%	<80%	<80%
Dimensions (WxHxD)	218x84x163mm	90x360x240mm	90x360x240mm	218x84x163mm	218x84x163mm
Weight	2.3kg	6.5kg	6.5kg	2.3kg	2.3kg
Housing type	1	2	2	1	1
Article No.	27150401	27150406	27150407	27150402	27150404
Safety	EN 60950				
EMC standards	EN 61000-6-4, EN 61000-6-2, EN 550022 Klasse B				
Overvoltage category	Class II				
Protection class	Class I				

	BCI 824-40R	BCI 824-60R	BCI 848-05R	BCI 848-10R	BCI 848-40R
Mains input					
Input voltage	90….264V	90….264V	90….264V	90….264V	90….264V
Frequency	45….65Hz	45….65Hz	45….65Hz	45….65Hz	45….65Hz
Power factor correction	>0.99	>0.99	>0.99	>0.99	>0.99
Input current at 230V max.	4.8A	7.5A	1.6A	3.2A	7.5A
Input current at 100V max.	11.4A	11.4A	3.8A	7.5A	11.4A
Fuse	T16A	T16A	M6.3A	T10A	T16A
Output - Voltage					
Battery voltage U_{Bat}	24V	24V	48V	48V	48V
Adjustable range	0….32V	0….32V	0….65V	0….65V	0….65V
OVP adjustment PS mode	0.64...35.2V	0.64...35.2V	1.3...71.5V	1.3...71.5V	1.3...71.5V
OVP adjustment BC mode ΔU	1...10V	1...10V	1...10V	1...10V	1...10V
Stability at 10-90% load	<0.05%	<0.05%	<0.05%	<0.05%	<0.05%
Stability at ±10% Δ U_{In}	<0.02%	<0.02%	<0.02%	<0.02%	<0.02%
Ripple	<70mV_{PP}	<100mV_{PP}	<40mV_{PP}	<40mV_{PP}	<100mV_{PP}
Regulation 10-100% load	<2ms	<2ms	<2ms	<2ms	<2ms
Output - Current					
Nominal current	40A	60A	5A	10A	40A
Stability at 0-100% Δ U_{Out}	<0.15%	<0.15%	<0.15%	<0.15%	<0.15%
Stability at ±10% Δ U_{In}	<0.05%	<0.05%	<0.05%	<0.05%	<0.05%
Ripple	<100mA_{PP}	<100mA_{PP}	<50mA_{PP}	<50mA_{PP}	<100mA_{PP}
Output - Power					
Nominal power	1000W	1500W	320W	650W	1500W
Nominal power at U_{IN} <150V	1000W	1000W	320W	650W	1000W
Miscellaneous					
Operation temperature	0….50°C	0….50°C	0….50°C	0….50°C	0….50°C
Storage temperature	-20….70°C	-20….70°C	-20….70°C	-20….70°C	-20….70°C
Humidity	<80%	<80%	<80%	<80%	<80%
Dimensions (WxHxD)	90x360x240mm	90x360x240mm	218x84x163mm	218x84x163mm	90x360x240mm
Weight	6.5kg	6.7kg	2.3kg	2.3kg	6.7kg
Housing type	2	2	1	1	2
Article No.	27150408	27150409	27150403	27150405	27150410
Safety	EN 60950				
EMC standards	EN 61000-6-4, EN 61000-6-2, EN 550022 Klasse B				
Overvoltage category	Class II				
Protection class	Class I				

Housing type 1:



Housing type 2: BC 812-40



Mains

Analogue interface

Digital interface

Battery
Remote sense

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