Energy pack type IEP

Product documentation

Voltage nominal:	50.4 V
Energy:	12 kWh

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HAWE HYDRAULIK

1 Overview of energy pack type IEP

Energy packs, also called rechargeable battery packs, consist of multiple battery modules linked together in a parallel or serial circuit. They act as universally usable electrical energy stores. In a parallel circuit, the energy packs can be expanded to form a battery system in order to reach the machine's desired range.

The energy pack type IEP consists of linked-up lithium ion cells. The integrated battery management system (BMS) continuously monitors the battery's condition. This protects the battery from excessive charge and deep discharge, excessive or insufficient temperature and excessive current. It performs balancing and optimises the battery's service life.

Energy packs type IEP can be used as individual rechargeable batteries for direct connection with an industrial connector. Alternatively, they can be used as exchangeable batteries by means of a tried-and-tested quick-change system. Communication with the battery charger and read-out of battery and log data is handled via CAN bus. The energy packs are available both as low-voltage (< 60 V DC) and as high-voltage (> 60 V DC) versions.

Energy pack type IEP

Features and benefits

- Very high energy density
- Protection class IP 65 when plugged in
- Sturdy aluminium housing
- Integrated heat management (active heater)
- Wake-up via 12-V signal, switch or external CAN command

Intended applications

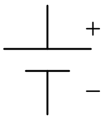
- Traction battery
- Mobile work machines
- Off-highway applications
- HGV-mounted equipment
- Mobile electric power supply

Software/parametrisation

The battery management system's various different configurable parameters enable optimal adjustment to the relevant application. These adjustments can be performed by HAWE at the factory in cooperation with the customer. Examples include settings such as CAN bus baud rate or maximum and minimum voltage.

2 Available versions

Circuit symbol



Ordering example

IEP 014 -CP -AA -001 -H -C 001 -01 -00

2.9 "Mechanical auxiliary functions"

2.8 "Electrical auxiliary functions"

2.7 "BMS parameter set"

2.6 "BMS type"

2.5 "Heat management"

2.4 "Housing type including plug"

2.3 "Cell type"

2.2 "Cell configuration"

2.1 "Cells in series (nominal voltage)"

Basic type

2.1 Cells in series (nominal voltage)

Type	Nominal voltage (V)	U_{min} (V)	U_{max} (V)	recommended voltage range (V)
IEP 014	50,4	35	58.8	42 to 56

2.2 Cell configuration

Coding	Description
CP	Cell configuration

2.3 Cell type

Coding	Description
AA	NMCA cylindrical cell, high-capacity

2.4 Housing type including plug

Coding	Description
001	Exchangeable battery in extruded aluminium housing with quick-change plug

2.5 Heat management

Coding	Description
H	Electric heater, controlled by BMS

2.6 BMS type

Coding	Description
C	BMS type C

2.7 BMS parameter set

Coding	Description
001	Standard parameter set

2.8 Electrical auxiliary functions

Coding	Description
01	Stand alone

2.9 Mechanical auxiliary functions

Coding	Description
00	None

![HAWE HYDRAULIK]

3 Parameters

3.1 General data

<table>
<tr><td>Design</td><td>Self-contained energy store</td></tr>
<tr><td>Model</td><td>Extruded aluminium profile</td></tr>
<tr><td>Cell chemistry</td><td>Lithium NMCA</td></tr>
<tr><td>Installation position</td><td>Any; exception: installation not permitted if plug is on top</td></tr>
<tr><td>Protection class</td><td>IP 65 (when plugged in or with plug cover closed)</td></tr>
<tr><td>Vibration resistance</td><td>
<table>
<tr><td>Wave form</td><td>Sinusoidal</td><td></td></tr>
<tr><td>Logarithmic frequency input</td><td>Frequency:</td><td>Peak value/amplitude:</td></tr>
<tr><td></td><td>7 Hz - 18 Hz</td><td>1 g_n</td></tr>
<tr><td></td><td>18 Hz - 25 Hz</td><td>0.8 mm</td></tr>
<tr><td></td><td>25 Hz - 200 Hz</td><td>2 g_n</td></tr>
<tr><td>Frequency cycles per axis
(7 Hz - 200 Hz - 7 Hz)</td><td colspan="2">12</td></tr>
<tr><td>Tested axes</td><td colspan="2">3 fastening points on cell perpendicular to one another (1 must be perpendicular to front side)</td></tr>
<tr><td>Temperature</td><td colspan="2">20 ±5°C</td></tr>
<tr><td>Test duration per axis</td><td colspan="2">3 h</td></tr>
<tr><td>Test duration total</td><td colspan="2">9 h</td></tr>
</table>
</td></tr>
<tr><td>Temperatures</td><td>▪ Temperature range charge: 5 to 45°C, internal heater allows charging at low external temperatures (down to -20°C)
▪ Cell temperature range discharge: -20 to 55°C</td></tr>
<tr><td>Operating altitude</td><td>Max. 2000 m</td></tr>
<tr><td>Suitable for explosive atmosphere</td><td>No</td></tr>
<tr><td>Mating connector</td><td>Stäubli MultiContact</td></tr>
</table>

3.2 Weight

	IEP 014-CP	64.5 kg

3.3 Electrical data

Power output

	Value
Voltage nominal	50.4 V
Voltage maximal	58.8 V
Voltage minimal	35 V
Configuration (cells connected in series)	14S
Energy	12.0 kWh Gross capacity achieved by fully balanced pack in ex works condition.
Energy density at cell level	693 Wh/l
Thermal reservoir at 30°C temperature increase through discharge	8×10^7 A^2s
Cell temperature maximal	55°C
Recommended charge duration for optimum cycle life	4 h
Charge current duration, cell temperature < 45°C.	113.9 A
Charge current max., 30 s, max. 3 times per discharge, intervals of at least 1 min rest at lower than ± 80 A, cell temperature < 45°C.	227.8 A
Discharge current duration, cell temperature < 55°C.	220 A
Discharge current max., 30 s, max. 5 times per discharge, intervals of at least 30 s rest at lower than ± 80 A, cell temperature < 55°C.	400 A
Cell temperature discharge	-20 to 55°C
Cell temperature charge	5 to 45°C
Average heating rate	0.29°C/min

Low voltage (signal)

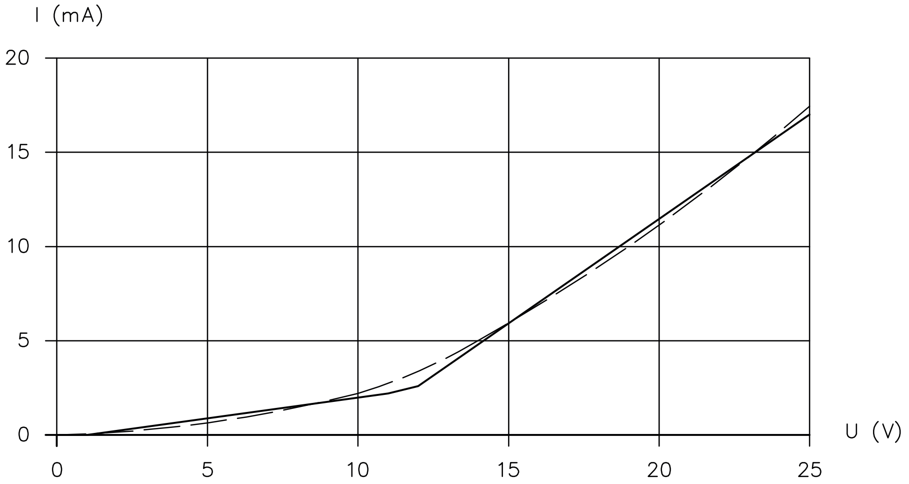
Inputs	Value
Start signal (terminal 15)	3.3 - 24 V (nominal)
Power consumption of relay, supplied internally by battery	1.6 W

Outputs	Value
CAN bus (standard)	500 kbit/s

Start signal voltage range

The start signal can be chosen within a range from 3.3 to 24 V. At 3.3 V, even brief and slight undervoltage may lead to the battery switching off. We therefore recommend at least 5 V of voltage. A voltage of 24 V may be exceeded up to 28 V for brief periods of less than 5 seconds only.

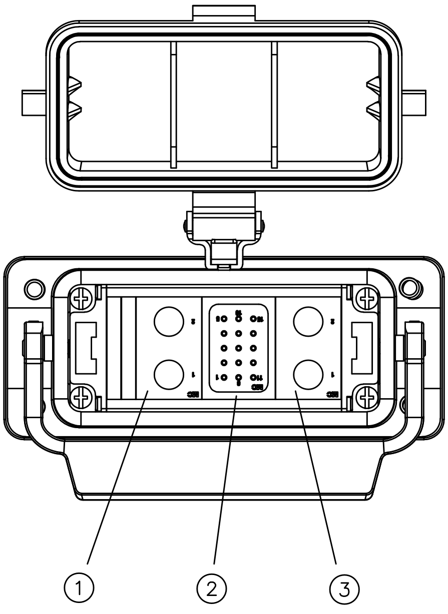
Start signal current consumption



U voltage of start signal (V); I current consumption (mA)

The unbroken line shows measured values at 25°C battery temperature. Other temperatures result in minor deviation.
The dashed line shows curve fitting for calculation of the current in mA:
$I = -5E\text{-}5\ x^4 + 0.0022\ x^3 - 0.0027\ x^2 + 0.1092\ x + 0.0946$

Plug assignment



1 Power module minus
2 Signal module
3 Power module plus

Pin	Name
1	Power Minus 1
2	Power Minus 2

Pin	Name
1	Power Plus 1
2	Power Plus 2

Pin	Name	
1	CAN L_{in}	CAN bus IN-OUT (daisy chain) 125 – 1000 kbit/s (default setting = 500 kbit/s) galvanically isolated
2	CAN H_{in}	
3	GND CAN_{in}	
4	CAN L_{out}	
5	CAN H_{out}	
6	GND CAN_{out}	
7	Start	Start signal terminal 15, + 3.3 up to + 24 V
8	Start return	Start signal terminal 15, GND
9	n.c.	
10	GND supply terminal 31	GND at BAT- potential for signals
11	Interlock batt	A bridge is expected on the vehicle side. To be arranged insulated from other contacts. The potential of the bridge is raised by the battery to ~ +12V above BAT-.
12	Interlock batt return	
13	3v3 perm.	For starting the battery via an ignition switch, this is connect-ed to pins 8 and 10. In addition a bridge is inserted between pin 13 and pin 7 on the vehicle side.
14	Interlock	Bridged to the battery inner side
15	Interlock return	

Integrated precharge

Precharge: The BAT+ relay is bridged with a 2 Ω resistance. This produces current flow charging the capacitors in the connected consumers, e.g. an inverter. When current flow undershoots the preset maximum at the end of the precharge phase, the BAT+ relay closes and precharging ends.

Default parameters

- Precharge time: 0.65 s
- Current at end of precharge time: < 2 A
  These parameters may be changed without notice during series production or be changed to match customer requirements.

> **DAMAGE**
> - The lower the current at the end of the precharge time, the lower also the wear on the relay contacts.
> - No more than 10 precharge operations may be performed or attempted within 10 minutes.

Two factors affect residual current at the end of the precharge time:

1. The connected capacity value. Experience has shown that the precharge facility's design can handle the reasonably expectable capacities.
2. Continuous current I_{DC} at the end of the precharge time.

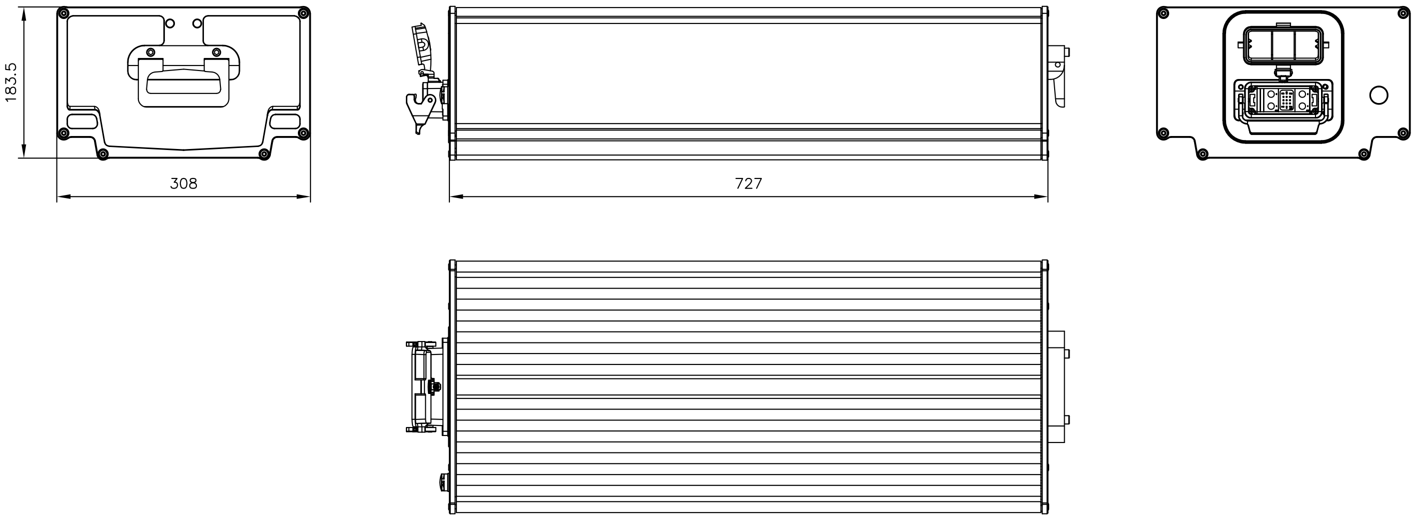
Typical causes for I_{DC}

- Consumers such as DC/DC converters are already attempting to supply power during pre-charging,. In this case, the power-up of the DC/DC converter has to be delayed so that it does not supply power until after pre-charging has finished (achieved for instance via an 'enable pin').
- Consumers with significant input capacities feature bleeder resistors (discharge resistors) that ensure input capacities are discharged when switched off. Their resistances are typically within the low kΩ range. Parallel circuits with multiple consumers will often result in significantly higher I_{DC}.

4 Dimensions

All dimensions in mm, subject to change.

IEP



5 Installation, operation and maintenance information

DAMAGE

Reference to other document

Assembly instructions for energy pack IEP B 6130

Available for this product: assembly instructions with notes on

- intended use,
- operating and maintenance,
- Assembly information

6 Other information

6.1 Accessories

Power harness IEP	Order number
Power harness IEP, 2.5 m, incl. signal cable	WBASZ44-99_HAR
For IEP without quick-change system, IP 65 when plugged in, Harting HAN 16B-HMC-gg-R-M40 housing, 4x1x25 mm² power cable, data cable 1x8x0.34 mm² Unitronic, not compatible with IEPC71 Cage (quick-change system)	

IEP Cage	Order number
IEPC71 Cage (quick-change system), quick-change clip, standard plug housing	MT5393
Mating connector for battery and plug housing included, accessories like PMA fittings and blanking plugs available separately, connects to power output in housing via copper rail	

NG3 battery charger	Order number
NG3 battery charger (3 kW), external charge IP 20, 230/48 V, 50/60 A	MT5271
Battery charger for charging battery outside of application, integrated AC/DC, mounted on carrier plate	

NG5 battery charger	Order number
NG5 battery charger (5 kW), external charge IP 20, 230/48 V, 100/120 A	MT5261
Battery charger for charging battery outside of application, integrated AC/DC, mounted on carrier plate	

SG3 battery charger	Order number
SG3 battery charger (3 kW), on-board charge IP 65, 230/48 V, 50/60 A, flying leads	ET5165
Battery charger for on-board charging, flying leads for installation in application via customer's power distribution unit (PDU, distributor box)	

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