

iE Convert

125 kW DC/DC Buck/boost converter

Data sheet



Improve
Tomorrow



1. iE Convert

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1. iE Convert

1.1 About the iE Convert 125 kW DC/DC converter

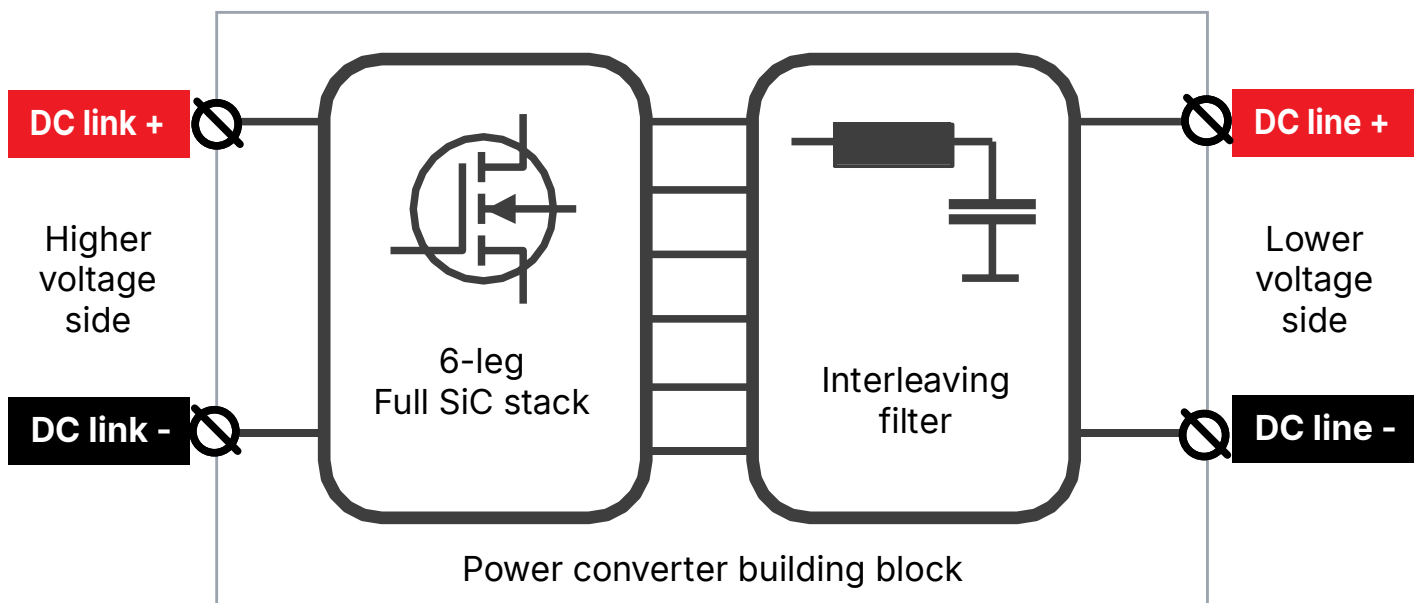
The iE Convert 125 kW DC/DC converter is a bidirectional buck or boost power converter that regulates a variable DC input voltage to a constant, controlled DC output voltage. The DC output voltage may be either higher or lower than the input.

In high-voltage applications, such as marine DC microgrids, electric vehicles, aerospace systems, and industrial power supplies, buck-boost converters are critical for maintaining voltage stability across a wide range of operating conditions. This includes transient events, fluctuating power sources, or changing load demands. The converter dynamically adjusts its duty cycle and switching behaviour to ensure that the output voltage remains within tight tolerances.

The iE Convert uses SiC module power switching technology. This results in a more compact design with a very high efficiency. The iE Convert is liquid cooled.

Power converter electrical diagram

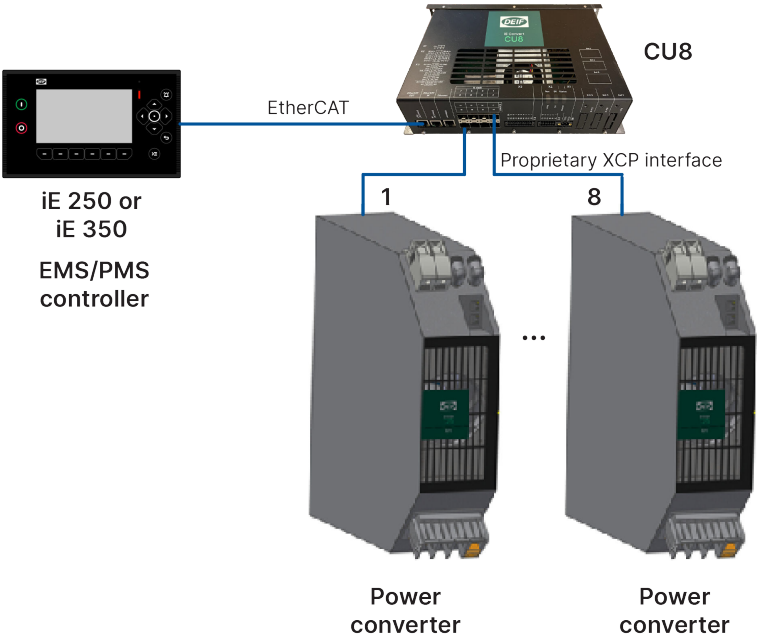
This electrical diagram shows the operation and parts of the power converter.



1.1.1 Power converter control

The power converter building blocks are controlled by a CU8 controller. One CU8 controller controls up to eight iE Convert power converters. For one CU8 controller, the power converters can be in two groups, which have different applications. The CU8 controller allows the power converters to run in parallel, which allows higher power capacity and/or redundancy.

For easy connectivity and configuration, you can connect the CU8 controller to a DEIF controller. For energy/power management (EMS/PMS) functions, and connections to external interfaces, you can use a DEIF iE 250 or iE 350 controller. If you want to use a PLC, you can use the DEIF iE 250, iE 350, or iE 650 PLC. Alternatively, you can use another EMS/PMS controller or PLC brand.



More information
See the **CU8 controller Data sheet**.

1.1.2 Flexible packages

DEIF supply

| | Package A Components | Package C Complete IP2X sets |
|---|-------------------------|---------------------------------|
| Tested power stacks, filters, capacitor boards, chokes, and so on | ● | |
| With covers | | ● |
| Assembled and tested power converter building blocks | | ● |
| Reference designs | ● | ● |

Customer responsibilities

| | Package A Components | Package C Complete IP2X sets |
|--|-------------------------|---------------------------------|
| Assemble the power converter building blocks | ● | |
| I/O test the power converter building blocks | ● | |
| Suitable containment | ● | |
| Connection to a chiller | ● | ● |
| Energy management system* | ● | ● |
| Protection products* | ● | ● |

NOTE * The DEIF energy management system and protection products are recommended.

1.1.3 Software versions

The information in this document relates to software version:

| Software | Details | Version |
|----------|----------------|---------|
| CU8* | CU8 controller | 1.x.x |

NOTE * The CU8 writes application software to the power converters.

1.1.4 Easy configuration

Select the power converter building blocks that your application(s) require. You can then use the CU8 controller to select the power converter application(s) and the parameters.

For faster and easy integration, you can use a DEIF iE 250 or iE 350 controller for energy/power management (EMS/PMS). For PLC control, you can use the DEIF iE 250, iE 350 or iE 650 PLC.

1.2 Functions and features

| | Functions |
|---------------------|--|
| Bidirectional | <ul style="list-style-type: none"> Buck: Decrease voltage from DC link to DC line* Boost: Increase voltage from DC line to DC link* |
| Modularity | Connect up to eight power converters for higher capacity |
| Redundancy | Supports individual power converters, and clusters of power converters <ul style="list-style-type: none"> Example: A CU8 controller with two groups of power converters Example: Redundant/parallel systems, each with a CU8 controller and two groups of power converters |
| Features | Very dynamic FPGA-based control loop Battery charging and discharging |
| Applications | Battery energy storage system (BESS) |
| Local control | Optional multi-line display with function keys (for example, using iE 250) |
| Other DEIF products | One-click integration |

NOTE * The recommended difference between the DC line and DC link is 50 V or more.

1.3 Application examples



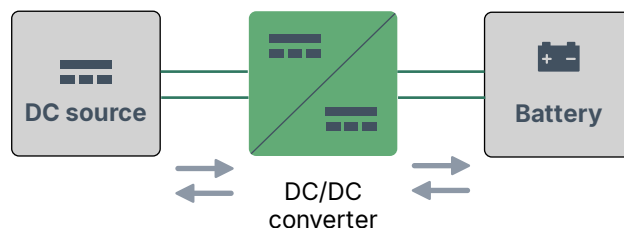
More information

See the [iE Convert Land Application Guide](#) and the [iE Convert Marine Application Guide](#) for more application examples.

Battery systems

The power converter converts DC busbar power to DC to charge the battery. When power is required from the battery, the power converter converts battery DC power to the DC busbar voltage.

The battery increases the system efficiency, since it can be charged using excess power. The battery also increases the system robustness, since it can discharge when demand surges.



2. Technical specifications

2.1 Electrical specifications

| | 850 V DC | 1500 V DC |
|--|---|---|
| Efficiency | Peak efficiency (stack and filter): 99 % | Peak efficiency (stack and filter): 99 % |
| Power | 125 kW (at nominal voltage) | 125 kW (at nominal voltage) |
| DC link (higher voltage side, continuous input/output) | | |
| Nominal voltage | 800 V | 1350 V |
| Operating voltage | 150 to 850 V | 350 to 1500 V |
| Maximum voltage | 950 V (transient) | 1500 V (transient) |
| Current | 163 A | 93 A |
| Maximum DC link ripple voltage | < 2 % RMS (at 20 kHz switching frequency) | < 2 % RMS (at 20 kHz switching frequency) |
| DC link-side capacitance (inside the converter) | 126 µF | 52 µF |
| DC line (lower voltage side, continuous input/output) | | |
| Nominal voltage | 700 V | 1250 V |
| Operating voltage | 100 to 800 V | 300 to 1450 V |
| Current | 156 to 208 A | 96 to 119 A |
| DC line-side capacitance (inside the converter) | 126 µF | 52 µF |
| Auxiliary supply | | |
| Auxiliary supply | Voltage range: 12 to 36 V DC Nominal voltage: 24 V DC Power: 45 W Connector: D-sub | Voltage range: 12 to 36 V DC Nominal voltage: 24 V DC Power: 45 W Connector: D-sub |
| Standby power consumption (zero power output) | < 30 W | < 30 W |

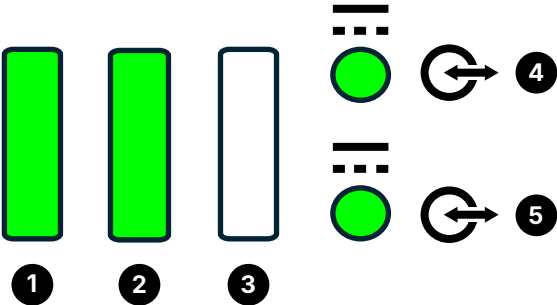
2.2 Alarms and protections

| Protections |
|----------------------------------|
| Hardware over-current trip |
| Hardware over-voltage trip |
| Inverter temperature protection |
| Inverter temperature trip |
| Short circuit protection |
| External temperature measurement |
| Software over-current trip |

| Protections |
|----------------------------------|
| Software over-voltage trip |
| Coolant leak |
| Voltage and load change response |

2.3 HMI and display

Power converter LEDs



| No. | Name | Function |
|-----|-----------------|--|
| 1 | Auxiliary power | Green: Power OK OFF: No power |
| 2 | Converter | Green: Converter OK OFF: Converter not running |
| 3 | Error | Red: Error OFF: No error |
| 4 | DC link | Green: DC link OK OFF: No DC link voltage input |
| 5 | DC line | Green: DC line OK OFF: No DC line voltage input |

CU8 controller LEDs



| Name | Function |
|-------------------------|--|
| Controller front | |
| Status LED | Green: Status OK |
| Safety chain LED | Green: Safety chain in okay, and RCM okay. Orange: Safety chain in okay, and RCM not okay. Orange: Safety chain in not okay, and RCM not okay. |
| EtherCAT status | Green: Okay Green and orange flashing: Transmission error Red: Not okay OFF: Initialising |

| Name | Function |
|---|--|
| EtherCAT | Red: Transmission error |
| Communication connections | |
| EtherCAT connection (RJ45) | Green: Connection OK |
| Ethernet connection (RJ45) | Green: Connection OK Yellow: Activity |
| SFP+ connection (Enhanced small form-factor pluggable) | Green Red |

Using an iE 7 display

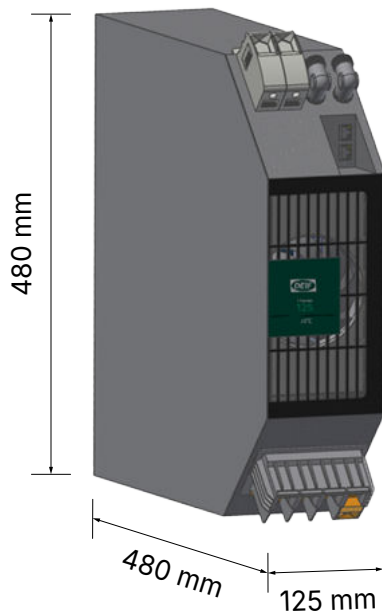
If you connect iE 250 or iE 350 to the CU8, you can use the iE 7 (the display for iE 250 or iE 350) to view the operation of the power converter(s). This configuration fulfils cybersecurity requirements.

CU8 controller display

You can connect a display to the CU8. This configuration does not fulfil cybersecurity requirements.

2.4 Dimensions and weight

iE Convert 125 DC/DC



| Dimensions and weight | |
|-----------------------------|------------------------------|
| Power converter (W x H x D) | 125 mm x 480 mm x 480 mm |
| Cabinet | 19" rack mount, 600 mm depth |
| Weight | ~40 kg |

2.5 Mechanical specifications

| Mechanical | |
|---|----------------|
| DC link | Busbars |
| DC line | Busbars |
| Input to control auxiliary power supply | Terminal block |

| Mechanical | |
|-----------------------------------|---------------------|
| Safety chain | 2 inputs, 2 outputs |
| Breaker control | 2 digital outputs |
| Design life | 10 years |
| Mean time between failures (MTBF) | 40000 hours |

2.6 Environmental specifications

| Operating conditions | |
|----------------------|--|
| Ambient temperature | -20 to 60 °C, with derating over 50 °C |
| Altitude | 0 to 2000 m, with derating from 1500 m |
| Humidity | 95 % relative humidity, non-condensing |

| Storage conditions | |
|---------------------|--|
| Ambient temperature | -20 to 70 °C |
| Altitude | Maximum 3000 m |
| Humidity | 95 % relative humidity, non-condensing |

| Coolant | |
|---------------------------|---|
| Type | Antifrogen N-water mix: 25:75 |
| Flow rate | < 10 litres/minute for each power converter |
| Maximum inlet temperature | 40 °C, with derating above 35 °C (1 % per °C) |
| Minimum inlet temperature | 20 °C |
| Pressure | Maximum: 3 bar Pressure drop: < 1.5 bar |
| Connectors | ½", female quick connectors |

| Ratings | |
|-----------------------|--------|
| Protection degree | IP2X |
| Pollution degree | II |
| Over-voltage category | III |
| Noise | <63 dB |

2.7 Communication specifications

CU8 to iE 250/iE 350/iE 650 (or another controller)

| Connections | Protocols |
|---|---|
| <ul style="list-style-type: none"> Ethernet CAN bus | <ul style="list-style-type: none"> EtherCAT CANopen Modbus RTU Modbus TCP |

Power converter building blocks to CU8

| Connection | Protocol |
|-------------|---------------------------|
| Fiber optic | Proprietary XCP interface |

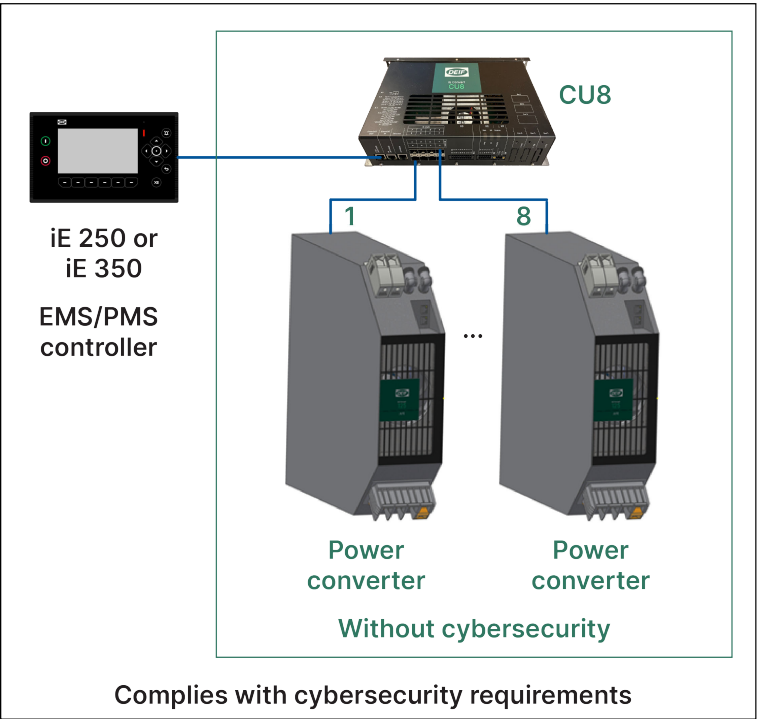
2.8 Approvals

| Standards |
|--|
| UL 1741 Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources |
| Marine: DNV, ABS, LR, BV, CCS, KR, RINA and NK1 |
| Land: CE to 61800-5-1 |

NOTE Refer to www.deif.com for the most recent approvals.

2.9 Cybersecurity

The power converters and the CU8 controller do not include cybersecurity features. However, if these are used with an iE 250, iE 350 or iE 650 to interface to the CU8, the whole system complies with cybersecurity requirements.

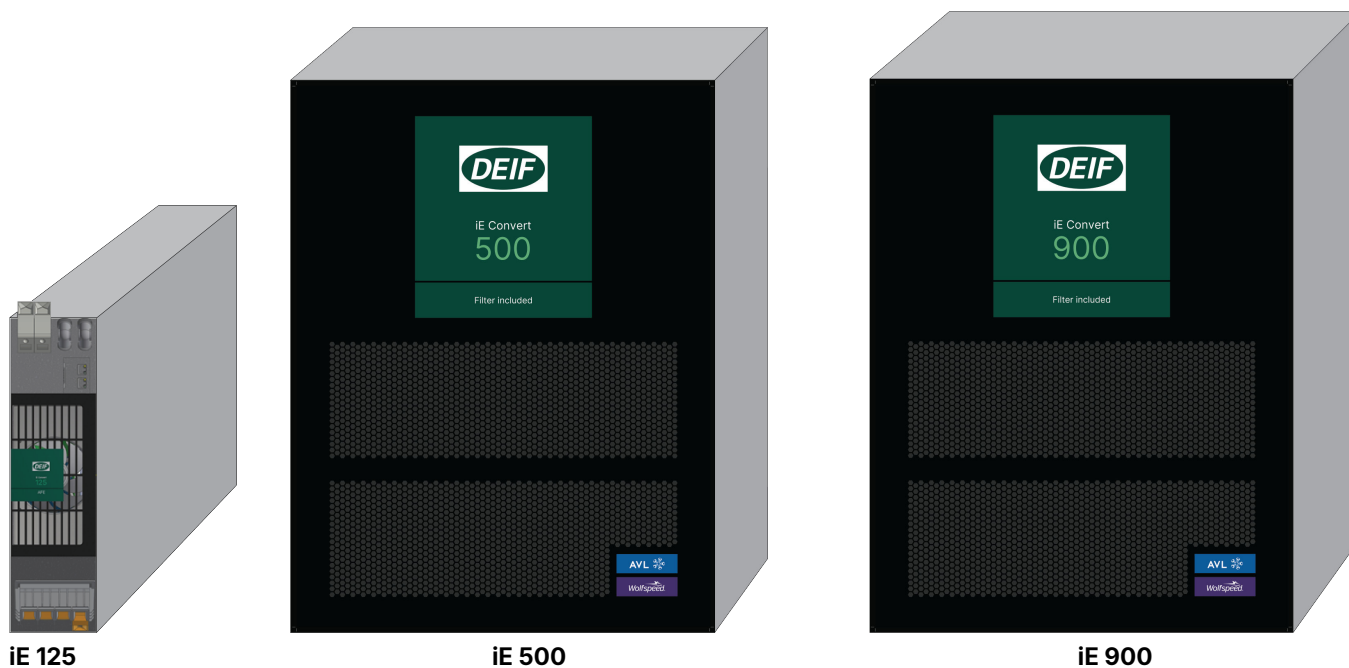


3. Compatible products

3.1 iE Convert power converters

iE Convert power converters are available for a range of specifications and applications.

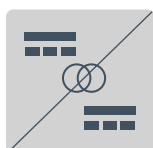
Modules



Applications



AC/DC
AFE



DC//DC
Galvanically isolated



AC/DC
Drive



DC/DC
Buck/boost

Voltage ratings

| Maximum 850 V DC | | Maximum 1500 V DC | |
|------------------|-----------------|-------------------|-----------------|
| 350 to 850 V DC | 208 to 520 V AC | 850 to 1500 V DC | 400 to 690 V AC |

3.2 Compatible equipment

Controllers with power management and cybersecurity

- iE 250 www.deif.com/products/ie-250
- iE 350 www.deif.com/products/ie-350
- iE 250 Marine www.deif.com/products/ie-250-marine
- iE 350 Marine www.deif.com/products/ie-350-marine

Controllers with power management

- iE 150 www.deif.com/products/ie-150
- iE 150 Marine www.deif.com/products/ie-150-marine
- AGC 150 www.deif.com/products/agc-150-generator

- AGC-4 Mk II www.deif.com/products/agc-4-mk-ii

PLCs with cybersecurity

- iE 250 PLC www.deif.com/products/ie-250-plc/
- iE 350 PLC www.deif.com/products/ie-350-plc/
- iE 650 PLC www.deif.com/products/ie-650-plc/

Isolation monitoring

- DC networks, ADL-111Q96 www.deif.com/products/adl-111q96
- AC networks, AAL-2 www.deif.com/products/aal-2

DC voltage measurement

iE Measure

Protection relays

Medium voltage relays, MVR-200 series www.deif.com/products/mvr-200-series/

Other equipment

DEIF has a wide variety of other equipment that is compatible. Here are some examples:

- **Synchrosopes**
 - **CSQ-3** (www.deif.com/products/csq-3)
- **Battery chargers/power supplies**
 - **DBC-1** (www.deif.com/products/dbc-1)
- **Current transformers**
 - **ASK** (www.deif.com/products/ask-asr)
 - **KBU** (www.deif.com/products/kbu)
- **Transducers**
 - **MTR-4** (www.deif.com/products/mtr-4)

4. Legal information

4.1 Disclaimer and copyright

Preliminary information

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