EPC 18k 870i

Bidirectional DC/DC converters - isolated series

The EPC 18k 870i from the isolated series of bidirectional DC/DC converters by epic power offers great power density along ultra-high efficiency in both directions and galvanic isolation, ensuring an effective energy flow with minimal power losses. Designed with the latest technology, this power converter offers a wide voltage range that makes it compatible with multiple industrial applications.

KEY FEATURES

- Wide voltage range
- Voltage Droop Control
- Voltage and current control
- Soft-start from 0 V
- MPPT from PV
- CAN communication
- Galvanic isolation
- Embedded protections (Over – current / voltage / temperature)
- High efficiency
- Power-scalable by parallelization
- Rack and wall-mounting enclosure
- Compact design

TYPICAL APPLICATIONS

- Power supply
- Smart grids
- Battery charger
- Energy storage systems
- Energy recovery
- Hydrogen generation
- Battery hybridization
- Solar panels - MPPT

This isolated DC/DC converter offers scalability and improved system reliability thanks to a modular parallelization approach to power conversion that allows higher power outputs and installation in compact spaces. The converter integrates CAN communication, enabling precise control modes while also measuring all the relevant operational parameters.

OVERALL, THE EPC 18k 870i FROM THE ISOLATED SERIES OF BIDIRECTIONAL DC/DC CONVERTERS PROVIDES HIGH EFFICIENCY, FLEXIBILITY, SCALABILITY AND CONTROL, MAKING IT SUITABLE FOR A BROAD RANGE OF APPLICATIONS IN THE NEW ENERGY TRANSITION.

ELECTRICAL SPECIFICATIONS

Model	EPC 18k 870i
Max power	18 kW
LVDC Nominal Current	200 A
HVDC Nominal Current	23 A
High Side Voltage range(operation)*	650 V – 950 V (optional from 0 -950)*
Low Side Voltage range(operation)	0 V – 90 V
Max High/Low Side Voltage (withstand without transfer)	1000 V
Max. efficiency	98.08 %
Digital control self-powered from	Low Side Voltage (optional version from Low and High side: EPC 18k 870iHL
Control Modes	Voltage Control, Current Control, Power Control, MPPT (PV mode) and Voltage Droop Control available for both sides (LVDC Side and HVDC Side)

* From 0V to 650V, derating may apply.

GENERAL SPECIFICATIONS

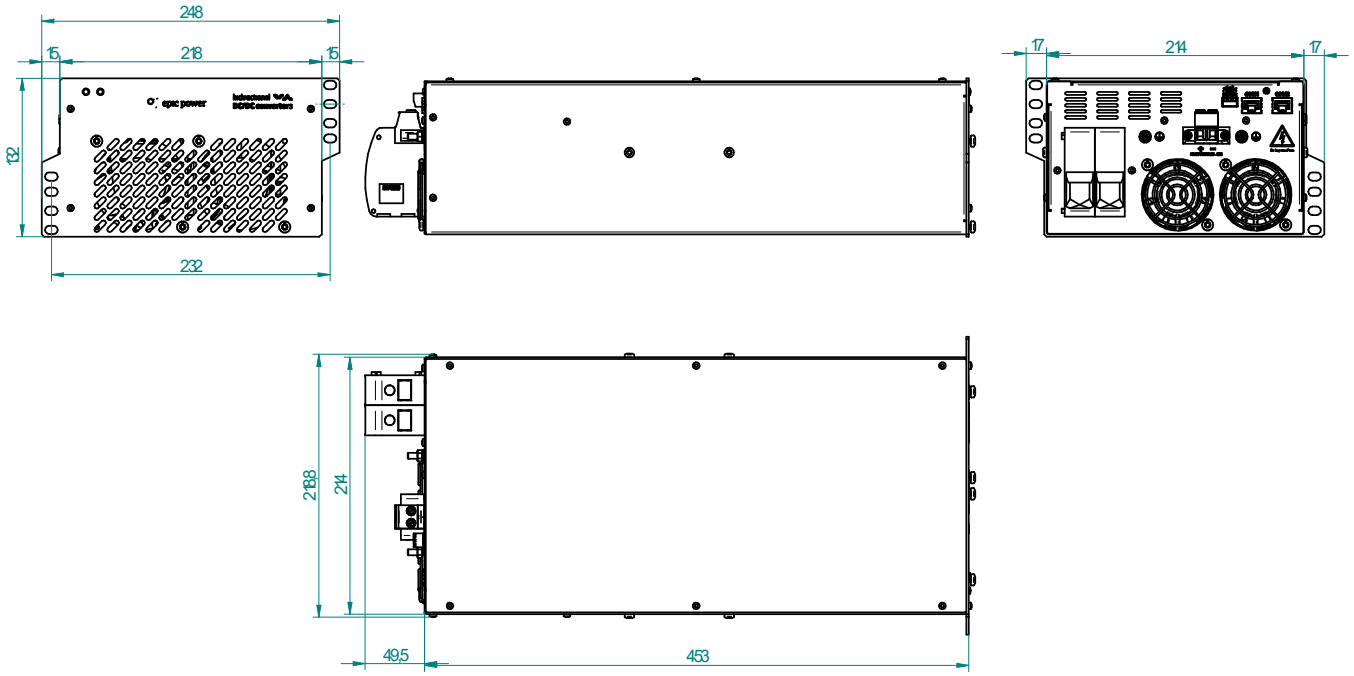
Item	Description
Operating temperature	-10 ºC to 50 ºC (derating can be applied over 40 ºC) **
Storage temperature	-30 ºC to 70 ºC
Cooling	Air cooled (Fans only ON when needed)
Maintenance	No electrolytic capacitors in DC links (Long life FILM capacitors) Fan replacement >70000 hours

**optional from -30ºC if necessary for the application

REGULATIONS

Directive	Standards
Low Voltage Regulations (LVD): European directive 2014/35/UE	EN 62477-1:2012, A11:2014,A1:2017,A12:2021. Safety requirements for power electronic converter systems and equipment
	EN 62109-1:2010. Safety of power converters for use in photovoltaic power systems
Electromagnetic Compatibility Regulations (EMC): European directive 2014/30/UE,	EN IEC 61000-6-2:2019. Electromagnetic compatibility (EMC) -- Part 6-2
	EN IEC 61000-6-4:2019. Electromagnetic compatibility (EMC) -- Part 6-4
Restriction of hazardous substances: European directive 2011/65/UE	EN IEC 63000:2018. Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances
UL/CSA	UL 1741:2021 Ed. 3 - Inverters, converters, controllers and interconnection system equipment for use with distributed energy resources.
	CSA C22.2#107.1:2016 Ed. 4 - Power Conversion Equipment

MECHANICAL DIMENSIONS



EPC 18K 870I: OVERALL DIMENSIONS- 3U HALF RACK

MECHANICAL SPECIFICATIONS

Model	EPC 18k 870i
Size *	214 x 132 x 463 mm
Weight	9.75 kg
Enclosure	3U Half-rack 19"
IP rating	IP20

*. See mechanical dimensions or ask for a 3D file

ELECTRICAL CONNECTIONS

EPC 18K 870I: PERIPHERICAL AND POWER CONNECTORS

	INPUTS FROM CONTROLLER
IN AUX	Reserved Input for custom applications
ENABLE	Enable DC/DC
COMMON	Common from inputs signals
Pluggable Terminal Block with M2 screw - Würth Elektronik – MPN: 691361300003 Notes: Optocoupled input. Do not apply voltage	

	COMMUNICATIONS
COM1	CAN Network
COM2	CAN Network
Connector: RJ45	

	POWER CONNECTORS
+ HVDC	Positive High Voltage Side
+ LVDC	Positive Low Voltage Side
- HVDC	Negative High Voltage Side
- LVDC	Negative Low Voltage Side
LVDC Power Connector: Terminal block available for wiring. 95mm² (3/0 AWG) cable is recommended. HVDC Power Connector: Pluggable HVDC connector. 6mm² (10 AWG) cable is recommended.	

COMMUNICATIONS AND CONTROL MODES

Item	Description
Protocol	CAN 2.0B compatible hardware
Data rate	Typical 125 kbps
Frame Format	Extended frame (29 bits)
Endianness	Little Endian

Depending on the application, several kinds of controls for both High Voltage Side and Low Voltage Side are available:

CURRENT CONTROL MODES (XSCC)

The user would set the current reference for the HVDC side if HSCC is selected, or for the LVDC side if LSCC is the selected mode. Positive current is defined as charging current, whereas negative current is defined as discharging current. To avoid errors during charging and discharging processes, there is a signal that sets the current direction. Slew rate can be configured too.

POWER CONTROL MODES (XSPC)

These modes work the same as Current Control Modes. The user must set the power reference, which will act upon high side if HSPC mode is selected, or on low side if LSPC is the one selected. Slew rate can be configured, as mentioned above for xSCC.

VOLTAGE CONTROL MODES (XSVC)

In these modes, the user will set the HVDC side voltage reference in HSVC mode, or they will set the voltage reference for LVDC side if they chose LSVC instead. The non-regulated DC bus can be protected configuring voltage limits and a hysteresis cycle.

PHOTOVOLTAIC MODES (XSPV)

The EPC converter performs an MPPT tracking algorithm in the HVDC side if the user sets HSPV mode, or in the LVDC side if they set LSPV mode. In any case, the control side chosen must be the one connected to the solar panels. Meanwhile, the user-set voltage reference will be applied over the non-solar side. Also, the same protective limits as xSVC can be configured for the solar side.

VOLTAGE DROOP CONTROL MODES (XSVDC)

The Voltage Droop Control is used in DC systems, particularly in distributed generation and microgrids, to allow multiple power sources to share the load efficiently without the need for communication between them. It is based on the relationship between voltage and current.

A “droop” curve is established, which relates the output voltage of a power source to the current it supplies. As the current increases, the output voltage decreases according to a predefined slope. This way, power is adjusted automatically according to this curve. This method ensures that the load is shared evenly among the sources. Voltage Droop Control has three key advantages: simplicity (no communication is required between power sources), stability (allowing automatic load sharing), and flexibility (can adapt to changes in load and the number of power sources connected to the system).

To configure the Voltage Droop Control, the integrator must only select the following parameters shown in the graph. This definition follows CurrentOS Foundation standards:

- U_{nom}: Nominal voltage of the application or middle voltage point of the deadband.
- U_{db}: Deadband range in voltage. The converters will not transfer power in any direction as the voltage is not providing information for the converters to operate.
- U_2: Voltage at which the converters will be transferring full power discharging the energy source towards the DC bus they are regulating. If the voltage has reached that point, the DC bus is demanding full power.
- U_3: Voltage at which the converters will be transferring full power, discharging the DC bus they are regulating towards the energy sink.