# ESC series
## epic power Supercapacitor Converter

The ESC series is a family of bidirectional DC to DC converters with supercapacitors that can be used in a broad number of applications. They provide high efficiency in both directions of operation without any maintenance due to the long-expected life of supercapacitors. There are several possibilities of embedded software:

- to save energy (Energy Recovery System – ERS)
- to reduce the peak power (PeaK Shaving – PKS)
- to be an uninterruptible power supply for drives (Fast Emergency Supply – FES)
- act as an electronic counterweight (Electronic CounterWeight – ECW)

Several ESC can be connected in parallel to reach higher power and energy storage.

### KEY FEATURES
- Wide range of operation
- No maintenance
- Autonomous operation
- Fast reaction
- High efficiency
- Power scalable
- Self protected (Overcurrent, overvoltage, overtemperature)

### TYPICAL APPLICATIONS
- Lifts
- Cranes
- AGVs & Shuttles
- Industrial machines
- Solar irrigation
- VFD drives
- Microdip UPS

## ELECTRICAL SPECIFICATIONS

| Model | ESC-060kJ-ERS | ESC-060kJ-PKS | ESC-060kJ-FES | ESC-060kJ-ECW |
|---|---|---|---|---|
| Peak power | 6.3 [kW] | 5 [kW] | 5 [kW] | 5 [kW] |
| Nominal Discharging power | 6.3 [kW] | 5 [kW] | 5 [kW] | 2 [kW] by default (from 0.5 to 3kW under request) |
| Nominal Charging power | 6.3 [kW] | 0.5 [kW] by default (from 0.5 to 3kW under request) | 0.5 [kW] by default (from 0.5 to 3kW under request) | 2 [kW] by default (from 0.5 to 3kW under request) |
| High side voltage | 500-800 Vdc (nominal power) | | | |
| High side current (max) | 12 Amps | | | |
| Fuses included | Fast-acting (gPV) ; 1000 Vdc 15A | | | |
| Energy available | 60 kJ = 60000 Ws = 16.6 Wh | | | |
| Max. efficiency | 98 % | | | |
| Stand-by | <3 W | | | |
| Control supply | Self-powered | | | |

## GENERAL SPECIFICATIONS

| Item | Description |
|---|---|
| Operating temperature | -10 to 40 ºC |
| Storage temperature | -10 to 70 ºC |
| Cooling | Air cooled (Fans only ON when needed) |
| Maintenance | No electrolytic capacitors in DC links (Long life FILM capacitors)<br>Fan replacement >70000 h |

## REGULATIONS

| Directive | Standards |
|---|---|
| Low Voltage Regulations (LVD): European directive 2014/35/UE | UNE-EN 50178:1998. Electronic equipment for use in power installations |
| Electromagnetic Compatibility Regulations (EMC): European directive 2014/30/UE, | UNE-EN 12015:2014. Electromagnetic compatibility - Product family standard for lifts, escalators and moving walks – Emission<br>UNE-EN 12016:2014. Electromagnetic compatibility - Product family standard for lifts, escalators and moving walks – Immunity |

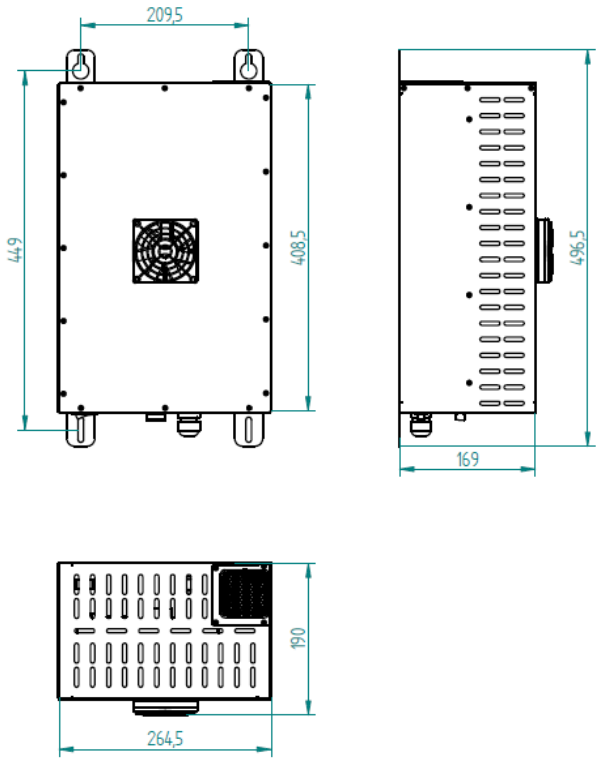
## MECHANICAL SPECIFICATIONS

| Model | ESC-060kJ-ERS | ESC-060kJ-PKS | ESC-060kJ-FES | ESC-060kJ-ECW |
|---|---|---|---|---|
| Size | Size 1* | | | |
| Weight | 14 kg | | | |
| Enclosure | IP 20 | | | |

*. See mechanical dimensions

## MECHANICAL DIMENSIONS

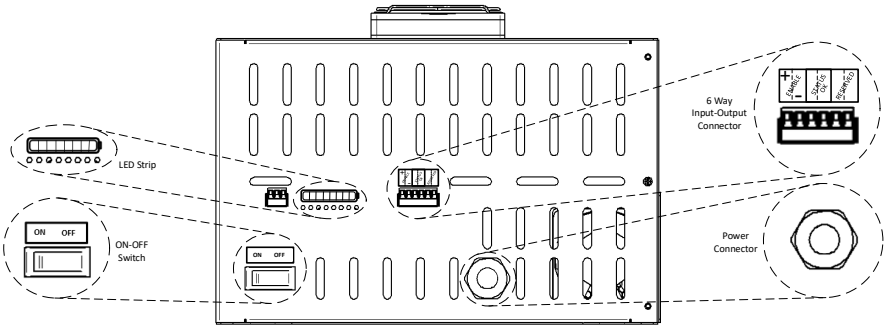
SIZE 1




SIZE 1

## ELECTRICAL CONNECTIONS

### ESC-060KJ BOTTOM WITH CONNECTORS AND TERMINALS




### 6 WAY INPUT/OUTPUT CONNECTOR DESCRIPTION

| Model | ESC-060kJ-ERS | ESC-060kJ-PKS | ESC-060kJ-FES | ESC-060kJ-ECW |
|---|---|---|---|---|
| ESC Enable Input:<br>Terminal 1-2<br>Optocoupled input (24 V dc max) | Closed / Short-circuited: ESC is enabled<br>Open / 24 Vdc: ESC is disabled | | | |
| Status OK Output:<br>Terminal 3-4<br>Free-potential relay output | Closed / Short-circuited: ESC is working correctly<br>Open: ESC is not ready to work or disabled | | | |
| Discharge Enable Input:<br>Terminal 5-6<br>Optocoupled input (24 V dc max) | Reserved | Closed / Short-circuited: ESC discharges supercapacitors | Reserved | Closed / Short-circuited: ESC discharges supercapacitors |

### POWER CONNECTOR DESCRIPTION

The ESC converters include a 2m lenght 4mm2 three-wire (P+, N-, Earth) cable for the connection to the DC bus

### LED INFORMATION

| Normal operation | Colour code |
|---|---|
| Off | LEDs off |
| Disabled | LEDs move gradually from left to right very fast |
| First pre-charge | One LED will move from left to right showing the status of the pre-charge |
| Enabled / No power transfer | One or several LEDs blink showing the state of charge of the supercapacitors |
| Transferring power | One or several LEDs are ON showing the state of charge of the supercapacitors |

*In case any errors are found please contact epic power

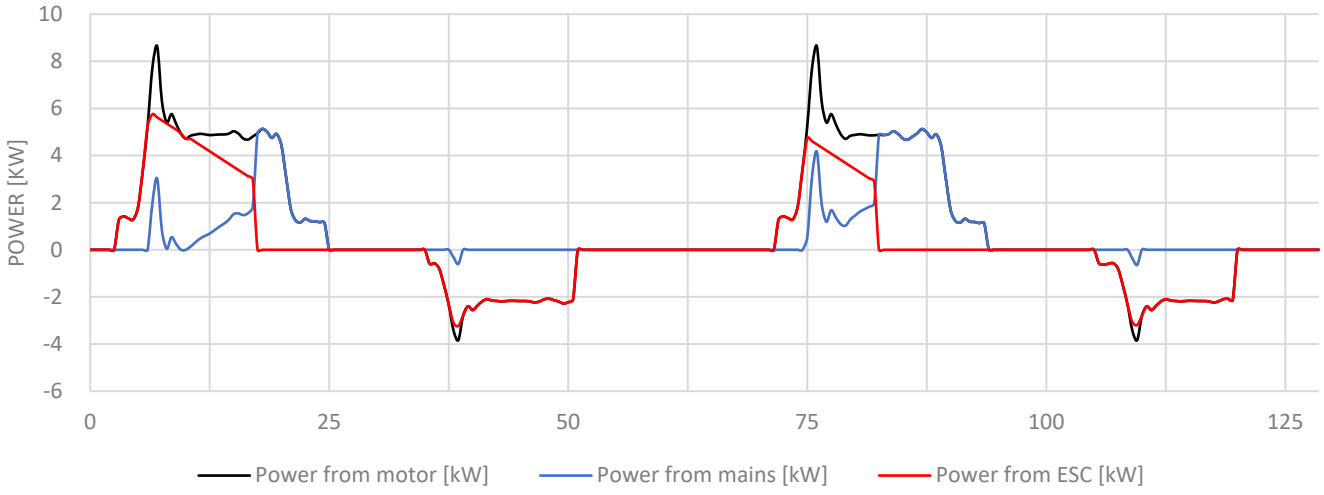
| Errors* | Colour Code |
|---|---|
| Error 1 | ○○○●○○○● |
| Error 2 | ○○○●○○●○ |
| Error 3 | ○○○●○○●● |
| Error 4 | ○○○●○●○○ |
| Error 5 | ○○○●○●○● |
| Error 6 | ○○○●○●●○ |
| Error 7 | ○○○●○●●● |
| Error 8 | ○●●●●●●● |

## OPERATION OF ESC CONVERTERS

Depending on the application, different embedded software are available.

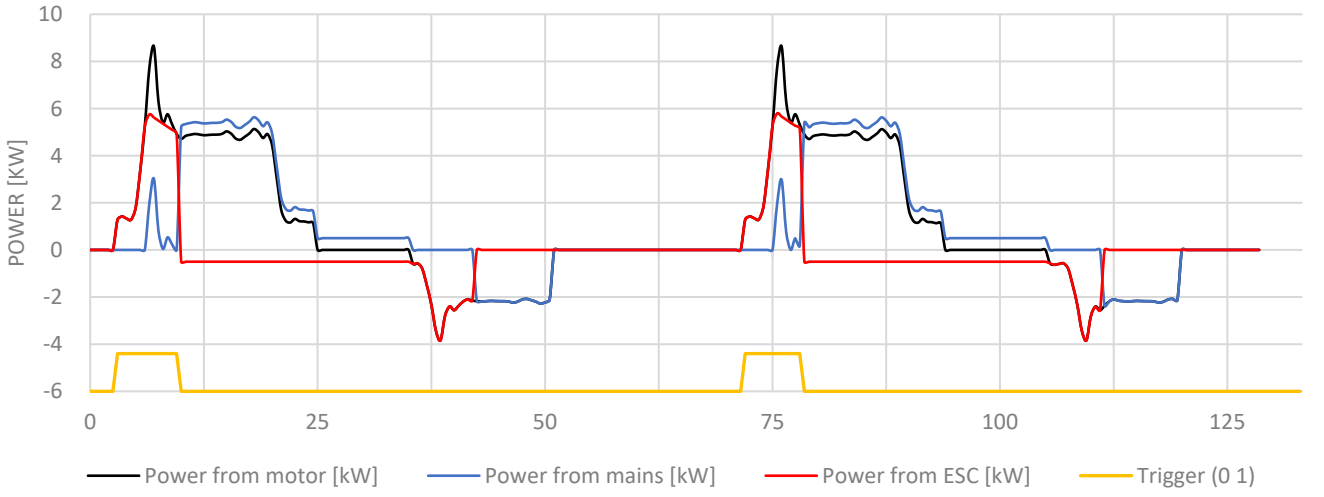
### ESC-060KJ-ERS

The ERS (Energy Recovery) version is an optimized solution for high cyclic industrial applications that recovers the braking energy. The ERS monitors the voltage in the DC link and automatically absorbs energy when surpasses certain voltage. The energy is always returned to the drive after it's been stored if the operation voltage in the DC link is below the voltage limit. The use of the ERS doesn't implies the removal of a VFD braking resistor. That must be done considering the rest of the elements and the safety in the installation.
Here below a graph depicting power and voltage:



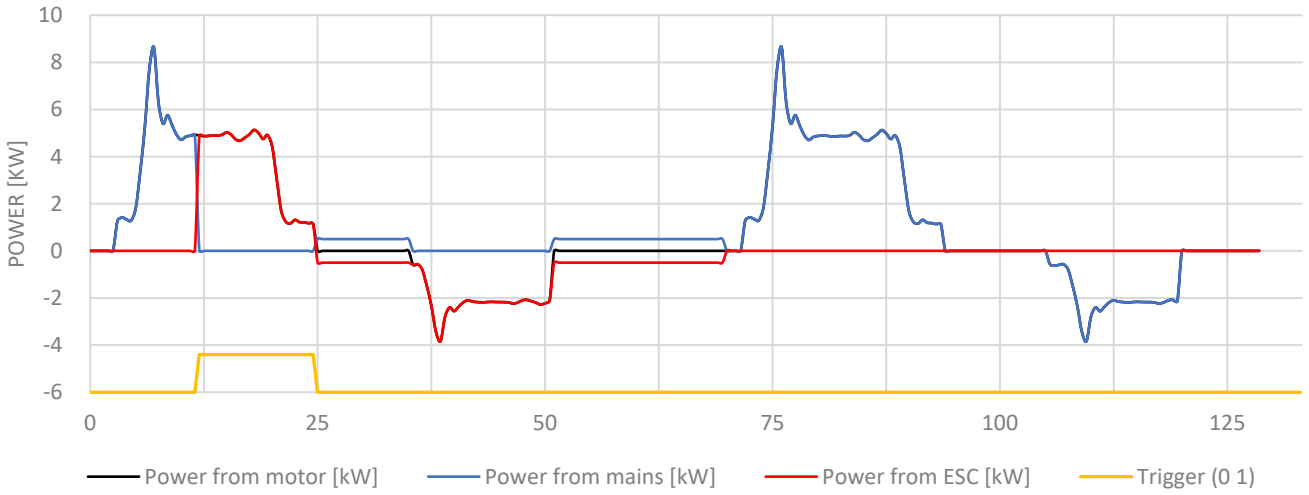

### ESC-060KJ-PKS

The PKS (PeaK Shaving) version is a DC/DC converter with supercapacitors that receives commands from the installation controller to discharge the supercapacitors at the maximum rate for some seconds. The PKS starts absorbing energy from the mains when the trigger is off to have the supercapacitors fully charged for the next triggered event. The PKS also detects when there is braking energy from the motor and if the supercapacitors are not fully charged it'll absorb all the power possible.
The installation of the PKS version can reduce the VFD mains required power but must always be controlled to discharge when desired.
Here below a graph depicting power and voltage:



## ESC-060KJ-FES

The FES (Fast Emergency Supply) version is a solution especially design to avoid a sudden and uncontrolled stop in industrial VFD. The FES monitors the DC link of the drive all the time and feeds the DC link in case the VFD loses the supply from the mains. The operation is immediate so the VFD doesn't detect the power failure and can finish the task being performed in a safe way.
The FES charges automatically the supercapacitors after the mains come back to the installation at a very low rate. If the motor is generating the FES can detect the regeneration and charging the supercapacitors at maximum power.
The operation is automatic and there is no need of external communication with a controller.
Here below a graph depicting power and voltage:




## ESC-060KJ-ECW

The ECW (Electronic CounterWeight) integrates a power limitation in the discharge. The DC/DC converter discharges the supercapacitors when it's triggered but with a maximum power defined in factory. The recharge is done after the trigger signal is off. The ECW can charge at a specific limited power but it also detects when there is generation from the motor and absorbs the maximum power in that situation.
The operation of this DCDC converter with supercapacitor enables the continuous reduction of the power consumption in a fixed value.
For the optimal dimensioning, clients and epic power engineers must discuss the different values of charging and discharging power in the unit.
Here below a graph depicting power and voltage: