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AN001
This application note describes the UPS function capabilities of ERS P3k in case of power blackout

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Application Note - AN001

ERS P3K connection and operation for UPS mode

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Introduction

The main function of the *ERS P3K* device is that of recovering the energy generated by a lift when it goes up empty or comes down full loaded. The Plug & Save control strategy by epic power allows such a function after an extremely simple installation: two power wires (**INV DC**) must be connected to the DC-bus available in every lift-inverter and another two additional power wires (**ULP**) plus three signal wires (**ULS**) must be connected to the ultracapacitor-based energy storage module, see Fig. 1.
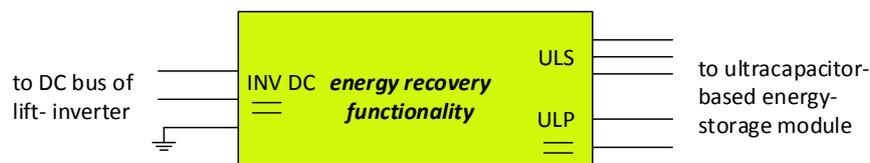
Fig. 1. Simple connections for basic ERS P3K operation as energy recovery system

Thanks to this control strategy the ERS P3K can be easily installed in any inverter-based traction lift. The key point is that the ERS P3K does not require to be communicated with the lift control so it admits any type of control configuration.

In order to achieve energy recovery functionality an ultracapacitor-based energy-storage system must be included. Thus, if enough energy is available, it is possible to offer Uninterruptible Power Source (UPS) functionality. The way each lift-installer provides the UPS solution will depend on local regulations, customer requirements and its own know-

how, so a large variety of different architectures are used. Because of that it becomes difficult to offer a standard plug & save general UPS solution based on the energy storage capabilities of the ERS P3K. Anyway, a thorough analysis of different architectures has led epic power to a UPS proposal that will cover almost all possible lift-UPS requirements.

ERS+UPS connections overview

Fig. 2 shows the available connections at the ERS with the UPS functionality. Next tables show the description of each connecting port:

Energy recovery functionality	
Port	**Description**
INV DC	Power connection of the ERS with the motor inverter DC bus. It supports bidirectional power flow. Additional earth connection with the motor inverter earth assures required EMI-EMC compatibility
ULP	Power connection of the ERS with the ultracapacitor-based energy storage system. It supports bidirectional power flow.
ULS	Signal connection of the ERS with the ultracapacitor module. It is supports NTC temperature monitoring and overvoltage signaling. Compatible with MAXWELL 48V/80F and EPIC-POWER UCS product family.

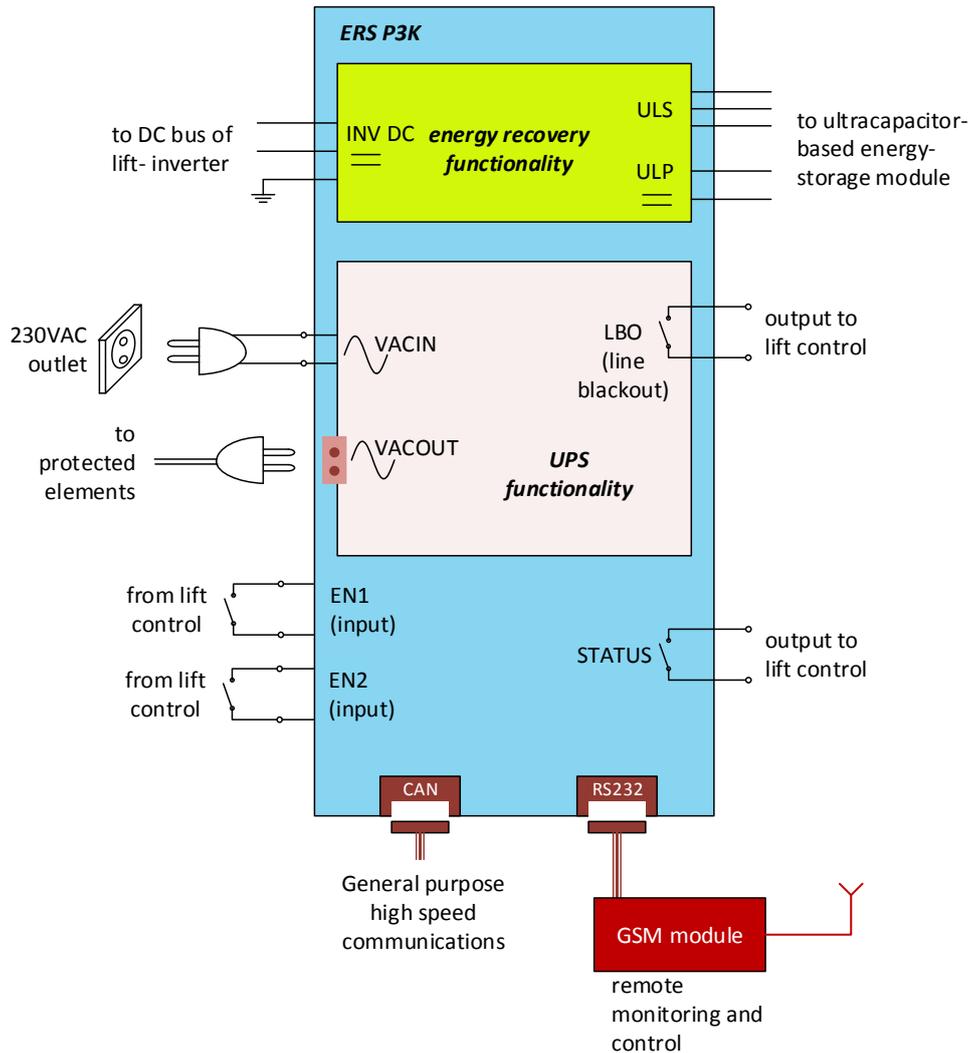| UPS functionality	
Port	**Description**
VACIN	Power 230V AC input. It is required for line voltage monitoring and blackout detection.
VACOUt	Power 230V AC output. It is used to feed all the critical subsystems that must keep operation during blackout occurrences. In normal operation it is fed from the VACIN input, and during blackout operation it is fed from the energy stored at ultracapacitors.
LBO	Relay type signal output. It is used to communicate to the lift control that a line blackout is happening so the control can go intoo UPS-rescue mode.

Fig. 2. ERS+UPS device

General purpose ports	
Port	**Description**
EN1, EN2	Enable inputs. Two separate inputs assure redundancy in this safety-related function. If the device is enabled, both Energy recovery and UPS functionalities are allowed. If the device is not enabled, Energy recovery functionality is not allowed, that is, the motor inverter is not energized, but the UPS functionality is allowed in such a way that the lift control can operate.
STATUS	Relay type signal output. If everything is OK it is set to ON state. Otherwise it is set to off state.

General purpose ports (continued)	
Port	**Description**
CAN	CAN communication port. It offers different access levels depending on the type of operator. Among other variables it is possible to know inner temperatures, total amount of recovered energy, voltage at ultracapacitor module and it is also possible to take control over the ERS (turn off, stanby and so on). It can be connected to a M2M architecture.
RS232	The same functionalities as CAN module. Additionally it supports connection to the GSM communication module by EPIC-POWER. Thanks to this module it is possible to monitor and control the ERS remotely by a cellular phone through SMS messages. The GSM module should be ordered separately and with prior information of enabled phone numbers.

ERS+UPS operation modes

Depending on the input variables and on the line voltage level different operation modes are possible.

Inputs/line-voltage			Outputs/actions		
EN1/EN2	**VACIN**	**VACOUT**	**INVERTER ENERGIZED**	**STATUS**	**LBO**
0/0	0V	230VAC	NO	OK	1
0/0	230VAC	230VAC	NO	OK	0
1/1	0v	230VAC	YES	OK	1
1/1	230VAC	230VAC	YES	OK	0
0/1 or 1/0	X	0V	NO	FAIL	0
INNER FAIL		0V	NO	FAIL	0

ERS+UPS operation requirements

The implantation of the UPS functionality requires the knowledge of the maximum simultaneous power and overall energy consumption of the subsystems to be protected. This way it is possible to match with one of the available VACOUT voltage source inverters and to determine the size of the additional (if required) ultracapacitor capacitance.

Please contact epic power sales department at sales@epicpower.es with the information about power and energy requirements as well as ackowledgement of controller compatibility with the input and output to control signals. This information needs to be sent to epic power at least 8 weeks in advance to delivery. In the case the proposed UPS architecture does not match with customer requirements, epic power can develop, upon request, a better adapted solution.

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