

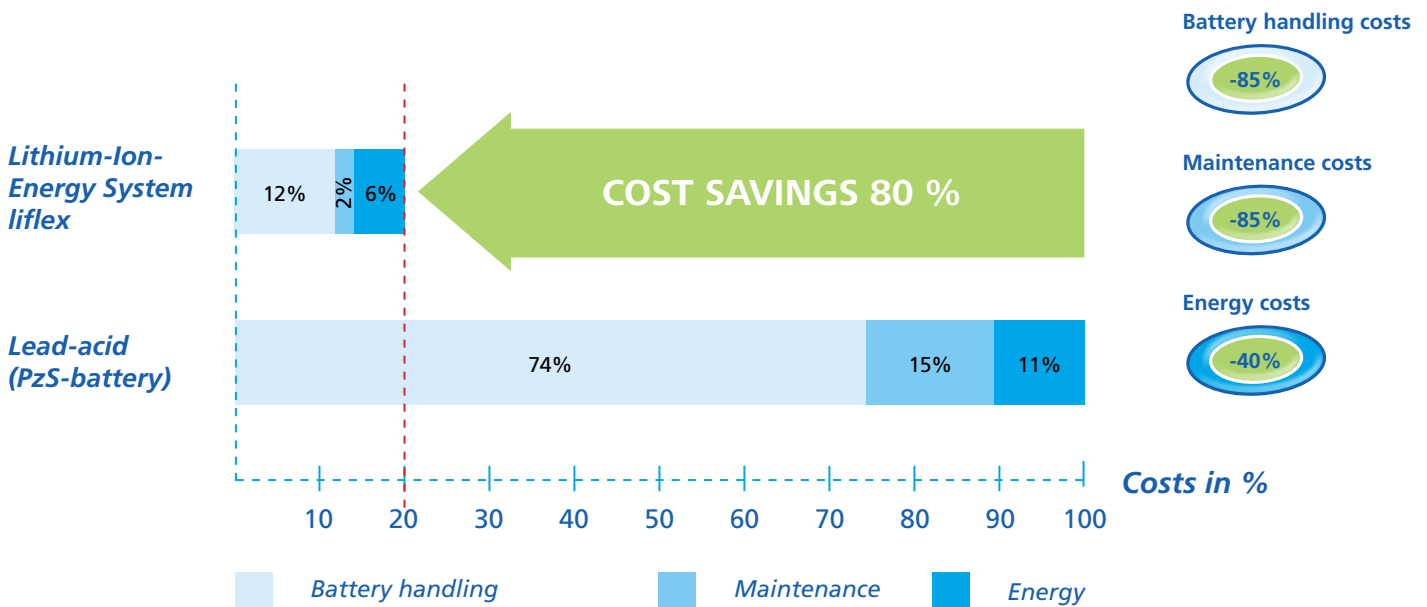
Nonstop in motion.
Solving intralogistical tasks
with *liflex*.



liflex.
Lithium-Ion-Energy Systems

- Significant reduction of total cost of ownership
- Great potential for optimisation of all intralogistics processes
- More efficient total system

Total Operating Costs Lead-acid (PzS-battery) versus Lithium



The calculation is based on the application example with a truck fleet of 25 vehicles (see p. 7). Only battery handling, maintenance and energy have been taken in account. According to the application there could be additional facts.



For traction applications

- Short down time of vehicles
- No maintenance of batteries any more
- Less need of infrastructure
- Energy saving
- Long battery life
- High reliability of intralogistics processes

liflex. What is liflex?

A modular lithium-ion energy system – economic, totally closed, maintenance free, emission free - as an innovative power source for electric trucks

- Available for a great part of 24V- and 48V-warehouse trucks
- Systems for higher voltages in preparation

How to use liflex?

- Integration into existing standard battery containers
- Fits directly, without any changes to the truck (Plug 'n Play)
- The counterweight is integrated into the container
- No changes in existing truck features in terms of stability and handling characteristics of the vehicle
- CAN communication possible (option)



powertron liflex.

HF-Charging Technology for liflex-Lithium-Ion-Energy Systems

CHARGER DATA

| Voltage | Charger | Mains voltage | Mains power rating | Mains current | Mains fuse (slow) | Power line & plug | Housing | Gross weight |
|---------|------------|---------------|--------------------|---------------|-------------------|-------------------|---------|--------------|
| V | V/A | V | kVA | A/Phase | A | mm ² | Type | ca. kg |
| 24V | E 24V/70A | E 230V | 1,9 | 8,8 | 10 | 1,5 Schuko | H2 | 19 |
| | E 24V/100A | E 230V | 2,8 | 12,2 | 16 | 1,5 Schuko | H3 | 38 |
| | D 24V/120A | D 400V | 3,7 | 5,4 | 16 | 1,5 CEE 16 | H3 | 46 |
| | D 24V/160A | D 400V | 4,9 | 7,7 | 16 | 1,5 CEE 16 | H3 | 56 |
| | D 24V/200A | D 400V | 6,2 | 8,9 | 16 | 1,5 CEE 16 | H3 | 56 |
| | D 24V/240A | D 400V | 7,4 | 10,7 | 16 | 1,5 CEE 16 | H4 | 87 |
| | D 24V/300A | D 400V | 9,3 | 13,3 | 16 | 1,5 CEE 16 | G40 | 110 |
| 48V | D 48V/120A | D 400V | 7,4 | 10,1 | 16 | 1,5 CEE 16 | H3 | 56 |
| | D 48V/200A | D 400V | 12,4 | 17,8 | 20 | 2,5 CEE 32 | H4 | 87 |
| | D 48V/240A | D 400V | 14,8 | 21,1 | 25 | 4,0 CEE 32 | G40 | 110 |
| | D 48V/300A | D 400V | 18,5 | 26,7 | 32 | 6,0 CEE 32 | G40 | 110 |

E 230V:
D 400V:
Ambient temperature:
Protection mode:

Single phase, 1 x 230V 50Hz (1/N/PE)
Three phase, 3 x 400V 50Hz (3/N/PE)
0° C to 40° C
IP 21

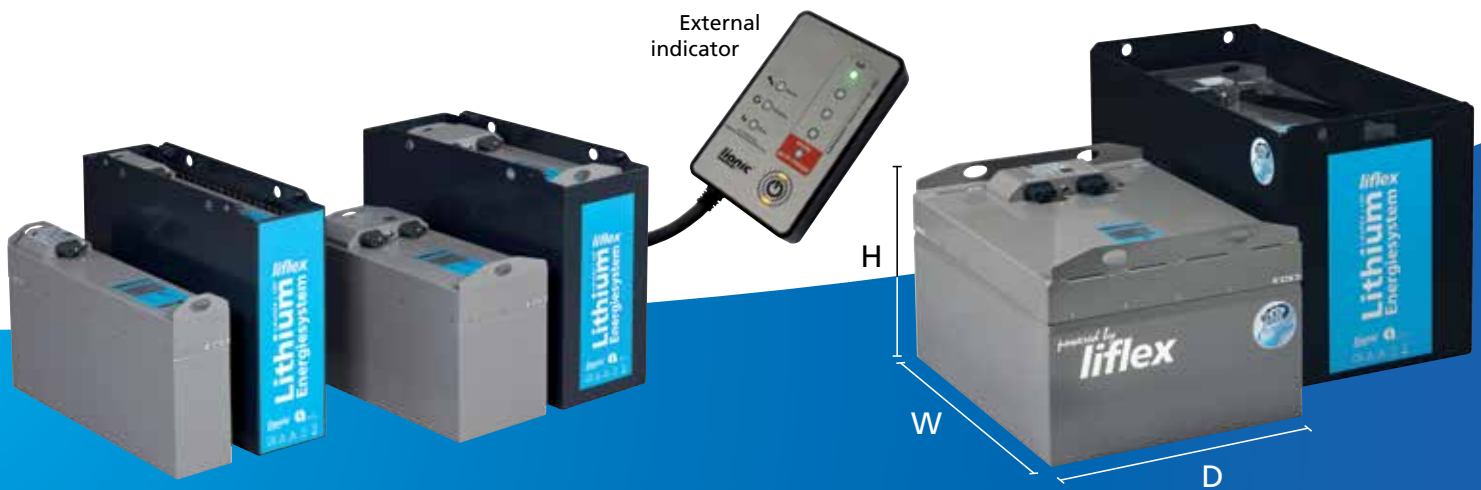
| Dim. (mm) | | | |
|-----------|--------|-------|-------|
| Housing | Height | Width | Depth |
| H2 | 360 | 450 | 200 |
| H3 | 560 | 520 | 260 |
| H4 | 960 | 520 | 260 |
| G40 | 660 | 575 | 615 |



SYSTEM DATA

| Voltage | Capacity | Power | Energy | Charger | Charging time | Battery socket | Housing without tray in tray | | | Weight |
|---------|----------|------------|--------|------------|---------------|----------------|------------------------------|------------|-------------|------------|
| | | | | | | | Width (mm) | Depth (mm) | Height (mm) | |
| V | Ah | Typ | kWh | V/A | ≤ h | A | | | | Approx. kg |
| 24V | 120 | 24V/3kWh | 3,1 | E 24V/70A | 2 | MRC 160 | 608 | 138 | 455 | 52 |
| | 240 | 24V/6kWh | 6,2 | D 24V/120A | 2 | MRC 160 | 608 | 202 | 455 | 86 |
| | 240 | 24V/6kWh-L | 6,2 | D 24V/120A | 2 | MRC 160 | 772 | 160 | 455 | 86 |
| | 360 | 24V/9kWh | 9,2 | D 24V/200A | 2 | DIN 320 | 608 | 296 | 455 | 125 |
| | 360 | 24V/9kWh-L | 9,2 | D 24V/200A | 2 | DIN 320 | 765 | 252 | 455 | 125 |
| | 480 | 24V/12kWh | 12,3 | D 24V/240A | 2 | DIN 320 | 772 | 306 | 455 | 165 |
| 48V | 240 | 48V/12kWh | 12,4 | D 48V/120A | 2 | DIN 320 | 775 | 315 | 470 | 175 |
| | 360 | 48V/18kWh | 18,4 | D 48V/200A | 2 | DIN 320 | 784 | 466 | 470 | 258 |
| | 480 | 48V/25kWh | 24,6 | D 48V/240A | 2 | DIN 320 | 784 | 614 | 470 | 330 |

Cell type: LFP / LiFePO₄ (Lithium iron phosphate)
 Operating temperature: 0° C to +40° C
 Storage temperature: -20° C to +35° C (max. 6 months in charged condition)



24V-liflex-240Ah-L
Without / with tray in tray

24V-liflex-360Ah
Without / with tray in tray

48V-liflex-480Ah
Without tray in tray

48V-liflex-360Ah
With tray in tray

STANDARD EQUIPMENT AND OPTIONS

| Type | | 24V liflex | | | | 48V liflex | | |
|------------------------|--|------------|----------------|----------------|-------|------------|-------|-------|
| Power | | 3kWh | 6kWh 6kWh-L | 9kWh 9kWh-L | 12kWh | 12kWh | 18kWh | 25kWh |
| Standard | IP 54 (only liflex-housing without plug connection) | ● | ● | ● | ● | ● | ● | ● |
| | External indicator | ● | ● | ● | ● | ● | ● | ● |
| | Data memory and read out via infrared interface InfraComm / CAN | ● | ● | ● | ● | ● | ● | ● |
| | Charge current plus (Charging time ≤ 2h) | | | ● | ● | | ● | ● |
| Option | Easy opportunity charge Version: Vertical - Horizontal - External | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | NEW! Energy Boost (Boost charge approx. 25% in 20 Min.) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | IP65 (only liflex-housing without plug connection) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | CAN/CANopen | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | Tray in tray Standard tray (RAL 7021) + additional weight | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | Adapter cable 80A/160A/320A | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | liflex-housing in stainless steel | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Tray in special colour | ○ | ○ | ○ | ○ | ○ | ○ | ○ | |

● Standard equipment
○ Option

Energy Boost – extra power during breaks



Easy opportunity charge



Economic efficiency calculation (ROI)

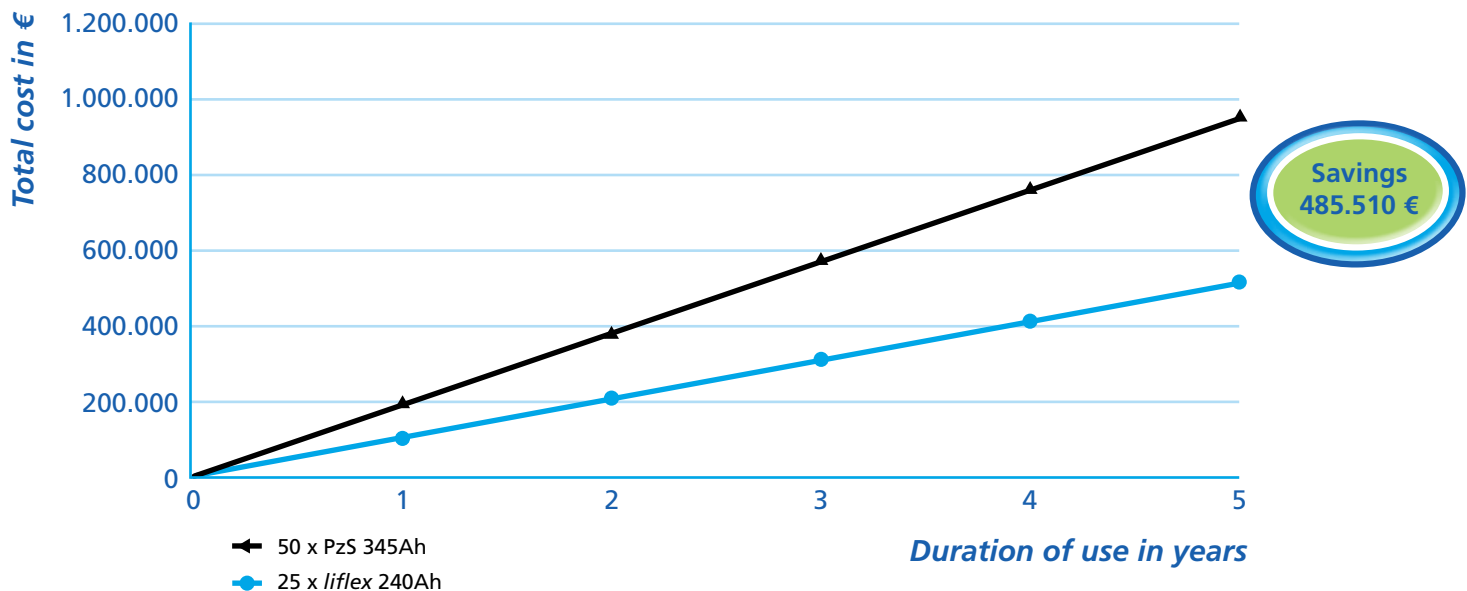
Application example



TRUCK FLEET WITH 25 VEHICLES, 2-SHIFT-OPERATION LEAD ACID (PzS-BATTERY) VERSUS LITHIUM

Truck: Pallet truck
 Use: 2-shift-operation
 Period of use: 8h per shift / 5 days per week / 240 days per year
 Lead acid battery: 2x PzS 24V / 345 Ah with battery change per truck
 liflex-Energy System: 1x 24V-liflex-240Ah with easy opportunity charge per truck

COST PERFORMANCE LEAD ACID (PzS-BATTERY) VERSUS LITHIUM



| Economic efficiency | | | Profitability | |
|---------------------------|-----------|-----------|-----------------------|-----------|
| | PzS | liflex | | |
| Investment | 97.050 € | 258.750 € | Additional investment | 161.700 € |
| Operating costs p.a. | 169.540 € | 34.800 € | | |
| Energy | 18.000 € | 11.050 € | | |
| Maintenance | 25.540 € | 3.750 € | | |
| Battery handling | 126.000 € | 20.000 € | | |
| Capital costs | 19.587 € | 57.225 € | | |
| Depreciation | 15.705 € | 46.875 € | | |
| Interest 8% | 3.882 € | 10.350 € | | |
| Total Costs p.a. | 189.127 € | 92.025 € | | |
| Cost savings p.a. | | 97.102 € | Return on investment | 200,3 % |
| Cost savings over 5 years | | 485.510 € | Pay off time in years | 1,67 |

* Calculation base: VDI 2695 (Calculation of operating cost for diesel and electrical fork-lift trucks)

**industrie automation
Energiesysteme AG**

Am Untergrün 6
D-79232 March/Freiburg
Germany

phone +49 (0) 7665 / 421-0
fax +49 (0) 7665 / 41782

www.industrie-automation.de
info@industrie-automation.de