

## Reduced life cycle costs of the 22 kW innoelectric on-board charger due to efficient charging technology



Efficiency is one of the most important aspects in the development of the products of innoelectric AG. This factor not only influences the value, durability and stability of a charger, but also contributes significantly to reducing the end customer's life cycle costs (TCO). During the development process of the 22 kW innoelectric on-board charger, innoelectric paid special attention to the efficiency behavior during the entire charging process. An important factor here was that the efficiency level across the entire power range is over 94 percent. The maximum efficiency level is over 96 percent. The innoelectric On-Board Charger thus represents the benchmark as a charger in the power class up to 22 kW.

Manufacturers and users of commercial vehicles in particular benefit from the highly efficient results, which lead to lower life cycle costs. This can be illustrated by an use case, in which **the innoelectric On-Board Charger with 96 % efficiency** compares with a similar charger that has **only an efficiency of 93 %**.

### Low lifecycle costs of the On-Board Charger – an Use Case

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A manufacturer of municipal vehicles with 66 kWh battery capacity integrates in his vehicles the innoelectric On-Board Charger with 96 % efficiency at 22 kW or use as alternative another device with 93 % efficiency. There is therefore a difference in power loss of 3 %. The municipal vehicles are in operation 300 days a year and are recharged daily, corresponding to 300 times a year. The charging cycle is 3 hours, as a remaining battery capacity of approx. 6 kW is assumed at the start of each charging process.

With a 3% efficiency advantage, which the innoelectric On-Board Charger has over the alternative device, 2 kWh are already saved per charging process. At an electricity price of EUR 0.20 per kilowatt hour, this is EUR 0.40, which the customer saves for each three-hour charging process. So if the vehicle is charged on 300 days per year, **savings of up to EUR 120 per year and vehicle** are achieved. This saving is achieved solely through the higher efficiency of the on-board charger. With increasing battery capacities, the savings potential also increases equivalently.

## Example calculation for a commercial vehicle

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Savings due to the high degree of efficiency of the innoelectric On-Board Charger	Calculation
Savings in power dissipation at a difference of 3 % in charging efficiency	$22 \text{ kWh} * 3 \% = 0.66 \text{ kWh}$
Effective power saving with 3 hours charging time	$0,66 \text{ kWh} * 3 \text{ h} = \text{approx. } 2 \text{ kWh}$ Savings per charging process
Cost saving with 3 hours charging time and a cost of EUR 0.20 per kWh	$2 \text{ kWh} * \text{EUR } 0.20 = \text{EUR } 0.20$ Savings per charging process
Savings with 300 charging processes of 3 hours each per year	$\text{EUR } 0.40 * 300 \text{ Charging cycles per year} = \text{EUR } 120$ Savings per year and per vehicle

## What makes the innoelectric On-Board Charger that efficient?

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The consistently high efficiency reduces power dissipation in the device and thus also heat generation. The energy drawn from the mains for the charging process is therefore used in the best possible way to charge the battery in the most efficient way - it arrives exactly where it is needed.

The high degree of efficiency is made possible by several components. On the one hand, the sophisticated concept of the internal circuit design ensures optimum heat distribution in the charger. The highly efficient architecture of the on-board charger results in a compact product size, low charging losses and a minimal load on the cooling system. On the other hand, semiconductors based on silicon carbide technology enable the excellent efficiency of the on-board charger. This modern technology is the reason why the installed semiconductors work significantly more efficiently than comparable components.

**Note:** Our use case analysis does not take into account any further possible savings in the overall "vehicle" system that can be achieved due to the higher efficiency. These are to be considered depending on the application. Here, too, support is provided by innoelectric.

Further information about the innoelectric On-Board Charger can be found at [www.innoelectric.ag](http://www.innoelectric.ag).

Do you have questions about our products or do you need a concrete offer? Please contact us by e-mail to [sales@innoelectric.ag](mailto:sales@innoelectric.ag). We will be glad to assist you.