



## Reference report: Electrified delivery vehicle

Parcel service uses delivery trucks with ARADEx electric motors. Elektrofahrzeuge Stuttgart (EFA-S) and ARADEx form a partnership to increase the efficiency of eco-friendly transporters and trucks.

### The key facts

- + Conversion of more than 50 trucks and transporters to purely electric drive
- + Optimum adaptation of motor and power electronics makes electromobility efficient
- + Recuperation capability up to 30 kW
- + Optimized for urban areas with a large share in the partial-load range
- + Used throughout Europe
- + Full-day use without recharging
- + Low-noise
- + Zero-emission: Motor does not emit any harmful substances such as CO<sub>2</sub>, fine dust, or soot
- + Can also be used during driving bans for air pollution control

### The project

Together, ARADEx and Elektrofahrzeuge Stuttgart (EFA-S), a company that specializes in the development, conversion, and production of cars and trucks with electric drives, have increased the efficiency of electrically driven transporters and trucks. In 2017, ARADEx supplied EFA-S with around 50 motors and inverters, which have been installed in the delivery vehicles of a worldwide parcel service. The vehicles with ARADEx technology are used daily in large European cities such as Düsseldorf, Cologne, Stuttgart, or Paris. By 2020, the customer wants to equip roughly one in four vehicles with new drive technology or alternative fuels. The reason for this is that the new, quiet, and zero-emission drive not only improves the carbon footprint of the parcel service but allows their trucks to drive without restriction even when there are driving bans for diesel vehicles or due to fine dust pollution.

## The challenge

For this eco-friendly solution to be economical as well, parcel delivery companies need vehicles that can complete their entire daily tour with one battery charge, without waiting at charging stations or taking detours to get there. At the same time, the drive train and batteries have to be compact enough that the purchasing costs and weight of the electric drive are low and the loading volume can remain the same.

## The solution

EFA-S has integrated ARADEX technology in three different vehicle types with a gross vehicle weight of up to 7.5 tons. After conversion from diesel to electric drive, the loading volume and gross weight both remain unchanged. A PM reluctance motor is used for each vehicle (type description on the right). The variant with a DC link voltage of 400 VDC was installed in all cases. The motors are adapted to the VECTOPOWER inverter type VP600-18W140-TR. The optimal adaptation ensures a highly efficient drive with an efficiency of more than 90 percent. Due to the combination of a high efficiency and the greatest possible energy recovery during braking and in overrun mode (recuperation of up to 30 kW), battery capacities of 57 kWh or 71 kWh are sufficient when using an uninterruptible power supply (UPS). "Because batteries represent the biggest cost factor in electromobility, optimum energy management is the key to profitability," says EFA-S managing director Bastian Beutel. The battery is charged at night when the vehicles are waiting for their new deployment the next morning. Due to the capacity of the ARADEX motors (torques fo 1150 Nm) they can directly drive the rear axle. This direct drive eliminates the need for a gearbox, saves weight and produces less wear. The drivers practically get a vehicle with automatic transmission, which implements speed changes via field weakening. Because the required programmable logic controller (PLC) is integrated in the inverter, a separate control unit for the accelerator is not necessary.



Electrical vehicles with ARADEX technology have been used in large European cities such as Düsseldorf, Cologne, Stuttgart, or Paris since 2017.

## ARADEX components used

### Inverter

Type VP600-18W140-TR  
Peak power: 320 kVA  
Voltage range: 30-770 VDC

### Motor for 7.5 ton vehicle

Type VM600M-18W0115-2  
Peak power: 111kW (400 VDC)  
180 kW (650 VDC)

### Motor for 3.5 ton vehicle

Type VM600M-18W0115  
Peak power: 80 kW (400 VDC)  
130 kW (650 VDC)

## Interested? Give us a call:

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