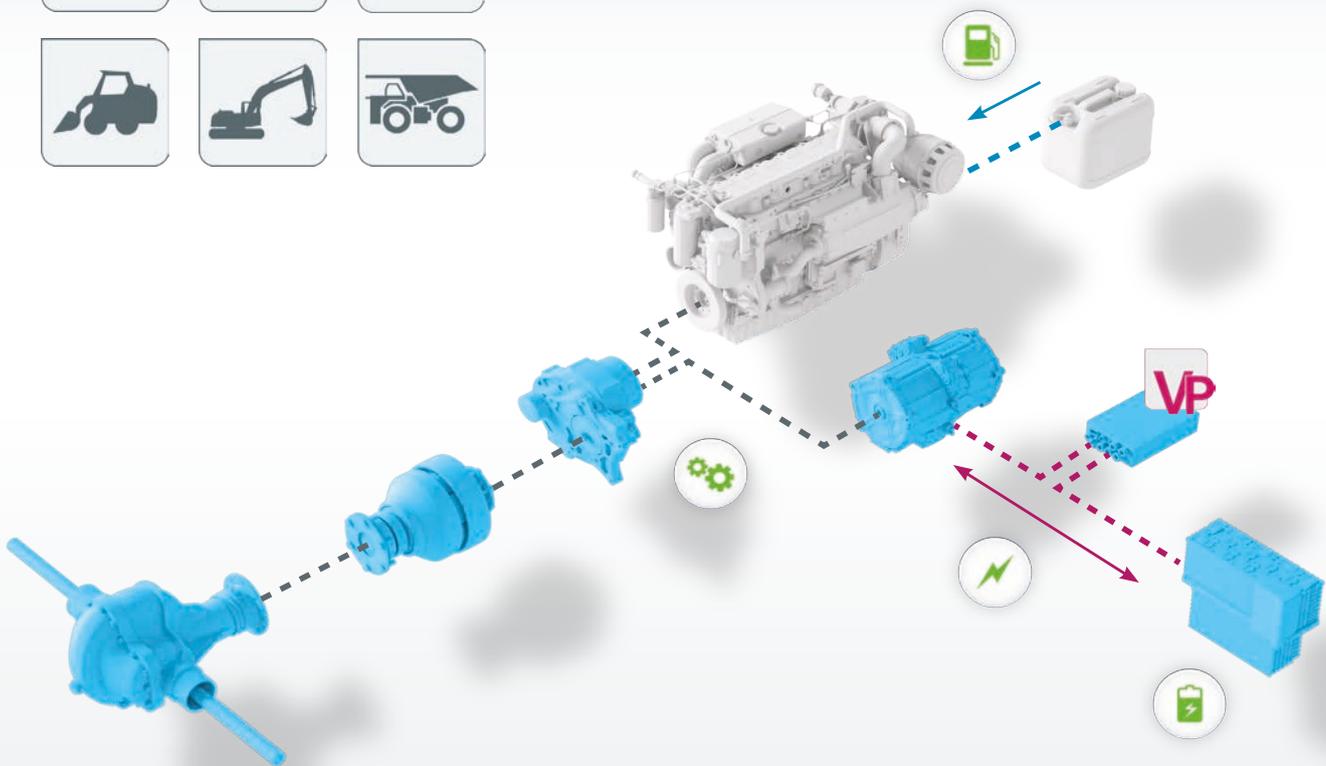


Drive systems in comparison

for maximum efficiency of your application

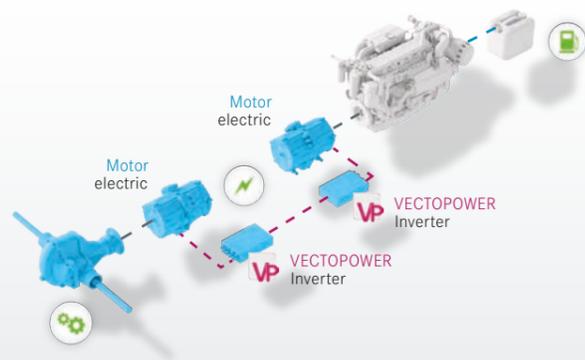


VECTOPOWER

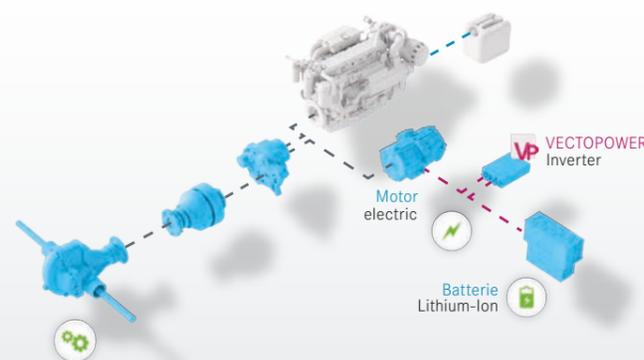
the heart of electric drive systems

Which technology is the best for use in commercial vehicles?

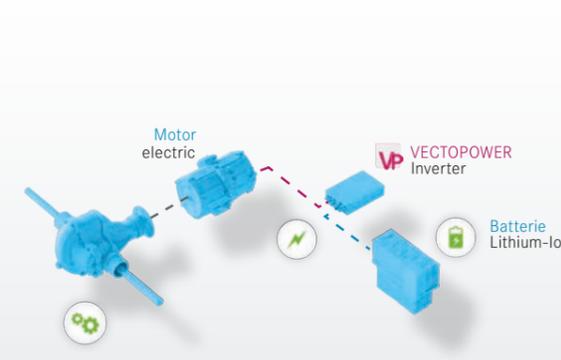
diesel-electric



hybrid



fully electric



Find the ideal drive system for your requirements

Optimized CO₂



How much can the emissions be reduced?

Recuperation



Is it worthwhile to recuperate energy during operation?

Optimized maintenance



How can the lifetime be optimized?

Optimized noise



How quiet is the application?

Range



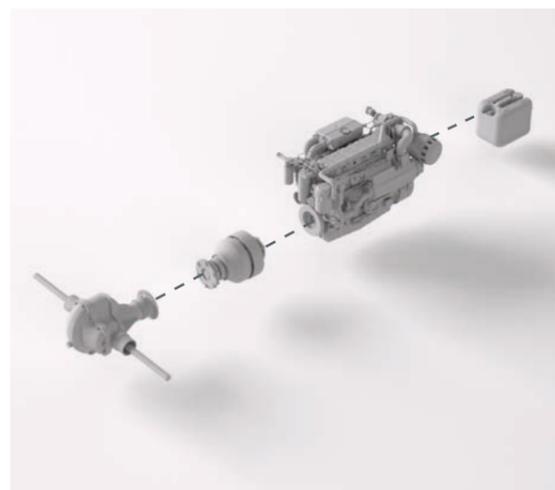
What is the maximum range that can be achieved?

Easy integration



How much space can be saved?

Why even consider something other than diesel?



Well-tuned combustion engines today achieve efficiencies of up to 50%. The technology is proven and widely used. Filling up is easy and the infrastructure is available. So why is electric mobility all of a sudden so popular?

Combustion engines have a huge disadvantage. The ideal efficiency is valid for just a very narrow operating point, usually at maximum power. So-called shell schemes for combustion engines show how high the efficiency is depending on load and speed and also reveal that at half load the efficiency falls to a quarter or even to just 15% and if the load is lower than it is even worse.

Hybrid systems try to balance this weakness. The combustion engine is supplemented by an electric drive system so that the combustion engine can run as much as possible at the ideal efficiency factor. And even though the additional energy conversion in hybrid systems means energy losses, in some applications up to 30% energy can be saved.

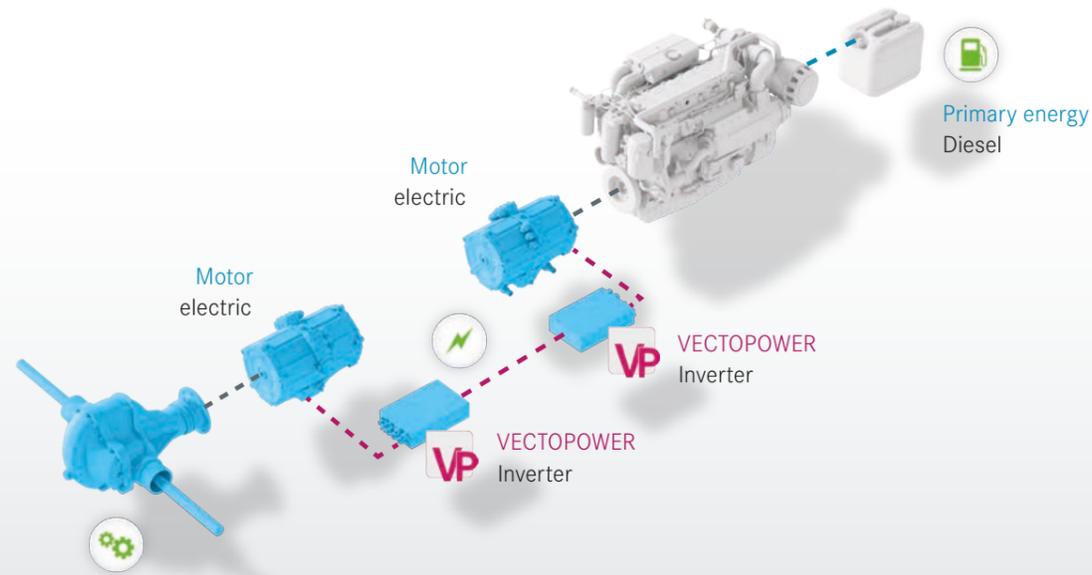
However, hybridisation also has limitations. All of the drive systems currently available has advantages and disadvantages. According to the requirements of the application it must be weighed up which drive system makes the most sense.

The decisive factor is the attunement to your application

We are happy to help you with this decision.

For a first impression we have summarized the differences between the individual drive systems on the following pages.

Diesel-electric with VECTOPOWER



Optimized CO₂



Recuperation



Range



Optimized maintenance



Optimized noise



Easy integration



Advantages when compared to diesel-hydraulic drives

- + less danger when defect
- + connection of electric devices
- + simple design, better maintenance
- + flexible load distribution in the system
- + better efficiency

Details of the system

Diesel-electric drive systems consist of one or more generators with combustion engine for creating electric energy and one or more electric consumers – usually several electric motors.

Unlike pure diesel drives diesel-electric drive solutions are mechanically decoupled and unlike hybrid solutions diesel-electric applications do not have an electric energy storage unit for the recuperated energy.

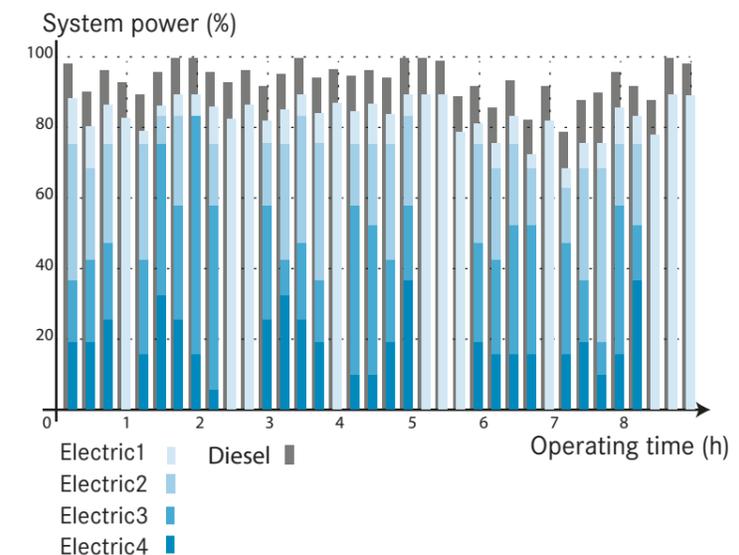
The main advantage is the avoidance of complicated baffles and distribution of the mechanical movement to the actual drives.

This makes sense if there are many drives with different power requirements.

The most common applications are diesel-electric locomotives, ships and very large trucks such as dumper trucks with payloads of up to 360 tonnes.

As electric drive systems become more and more common in commercial vehicles diesel-hydraulic systems in construction machines will also be electrified and will thus achieve a much higher degree of efficiency.

Example load profile



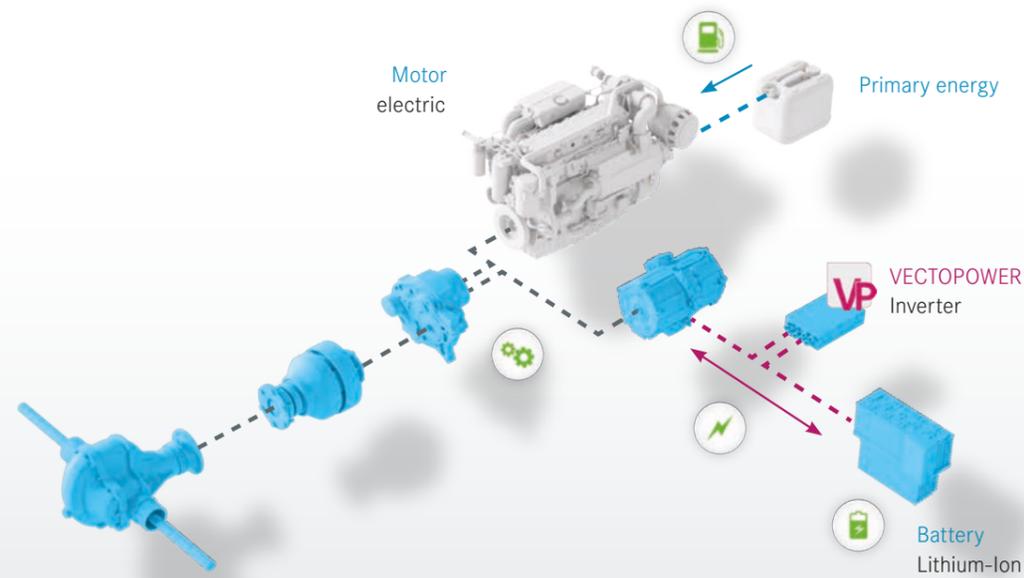
Inland waterway vessels



Dumper trucks

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online at: www.aradex.com

Hybrid with VECTOPOWER



Optimized CO₂



Recuperation



Range



Optimized maintenance



Optimized noise



Easy integration



Advantages compared to purely combustion drives

- + up to 30% more efficient
- + up to 80% of the braking energy is recuperated
- + better total efficiency
- + easier connection of electric auxiliary drives
- + short distances can be accomplished with the electric drive



Refuse collection vehicles

Details of the system

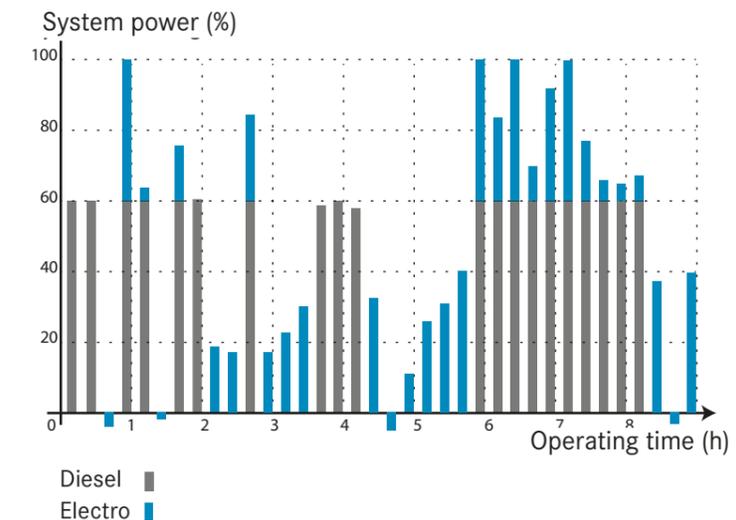
Hybrid drive systems comprise a generator with combustion engine, one or more electric drives and an additional electric energy storage unit. According to the design we differentiate between a parallel or serial hybrid drive. With parallel systems the combustion engine can also support the traction drive with mechanical energy. With serial systems the combustion engine is decoupled as in diesel-electric systems. The combustion engine functions only as a generator.

The main advantage is the possible maximisation of the operating time of the combustion engine as the most efficient operating point and therefore the increase in efficiency of the total system by up

to 30%. In partial load the electric motor with the better efficiency takes over.

The most common applications are those with load profiles that vary greatly, for instance refuse collection vehicles or public transit busses in inner cities which have many acceleration and braking sequences.

Example load profile



Heavy goods vehicles

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Fully electric with VECTOPOWER

Optimized CO₂



Recuperation



Range



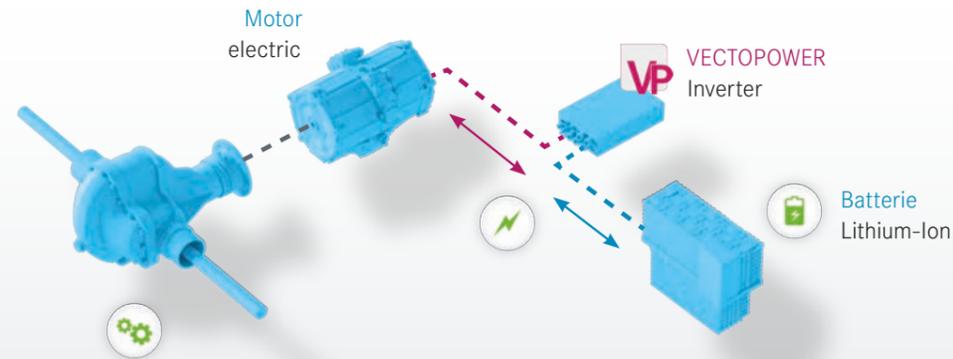
Optimized maintenance



Optimized noise



Easy integration



Advantages compared to pure combustion engines

- + extremely high efficiency
- + zero emissions
- + very quiet during operation
- + recuperation
- + long lifetimes
- + less maintenance



Fully electric public transit bus

Details of the system

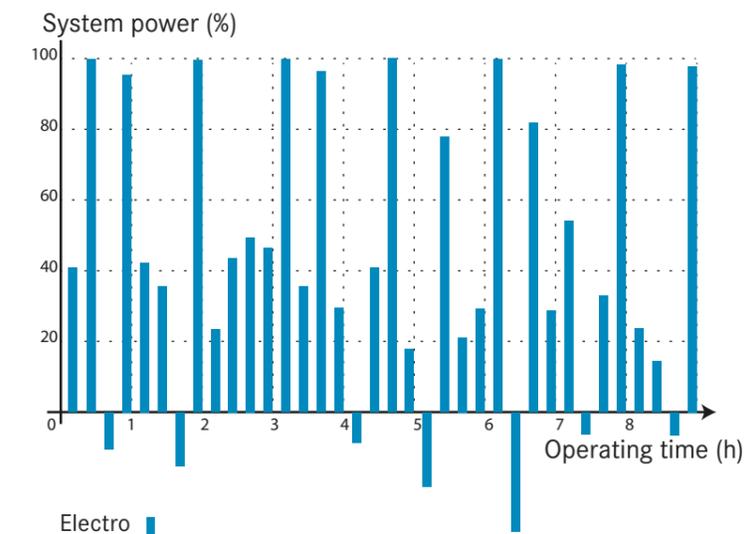
Full electric drive systems are split over an electric energy storage unit and one or more electric drives. Combustion engine, tank and gearbox can be completely dispensed with. This means that fully electric systems are easy to integrate and low in maintenance. The battery is charged via a charging device and electric socket. The special feature that full electric systems share with hybrid systems is recuperation. This means that during braking energy is recovered and feed back into the battery.

The main advantage is the extremely high efficiency even in partial load. When interacting with

modern inverters efficiency of up to 95% is possible. The most efficient and quiet drive systems today are fully electric.

Ideal areas of application are commercial vehicles such as public transit busses or delivery vehicles in inner cities. These vehicles have an extremely variable load profile with many acceleration and braking sequences and a predictable maximum range.

Example load profile



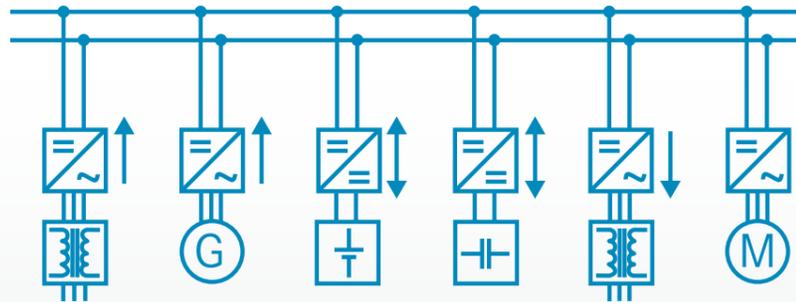
Delivery vehicle

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The most important strengths in brief



Flexible



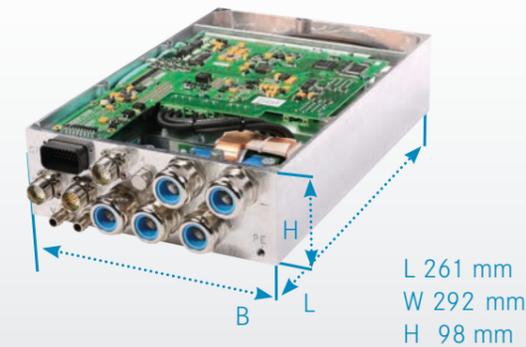
One VECTOPOWER for many applications

One of the biggest advantages of VECTOPOWER inverters is the variety of completely different applications that can be implemented with the same hardware.

- + traction drive for land, water or rail
- + battery simulation up to 1.6 MW
- + turbine applications up to 200,000 rpm

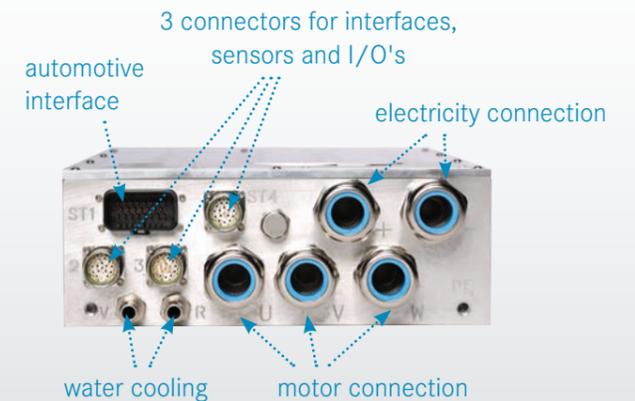
Max. power density

Maximum power density
up to 350 kVA in 10 litre housing



Maximum efficiency

It goes without saying that VECTOPOWER inverters have an efficiency of up to 98%



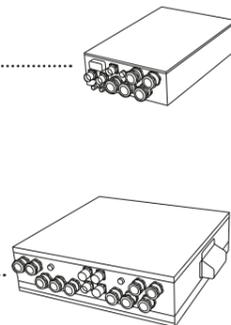
System solution

maximum power density

VP600-18W inverters are optimized for minimum dimensions with maximum power. In a housing of approx. 10 liters in size we implement peak power up to 477kVA.

maximum benefits

VP600-28W solutions combine the functions of two inverters in one compact housing. This makes design and installation of mobile applications much easier.



Energy management

Minimum setting times

Power requirements up to 1.6 MW can be implemented with minimum overshoots and shortest transfer times in less than 1 ms. This greatly reduces the costs for stabilising the DC link in the energy management of the total installation.

Example

System requirement and supply of a 500A current to a DC link and the execution by the VECTOPOWER inverter in its function as a DC/DC converter which extracts the energy from a super-cap. The 500A are achieved in less than 1ms.

Products & Know-How

- + battery protection
- + high-quality, certified inverter for a long lifetime even in tough conditions
- + highly efficient asynchronous motors even in partial load
- + intelligent energy management
- + numerous successful customer projects worldwide

ARADEx AG

ARADEx was founded in 1989 and is a pioneer in highperformance drive technology. We implemented the first PC-based CNC controller for industrial use.

Today, ARADEx is your single-source supplier for industrial automation and mobile applications and technological leader regarding accuracy and speed.



Interested?
Give us a call:

ARADEx AG
Ziegelwaldstr. 3
D-73547 Lorch
Tel.: +49 (0) 71 72 - 91 81 0



sales@aradex.com
www.aradex.com

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