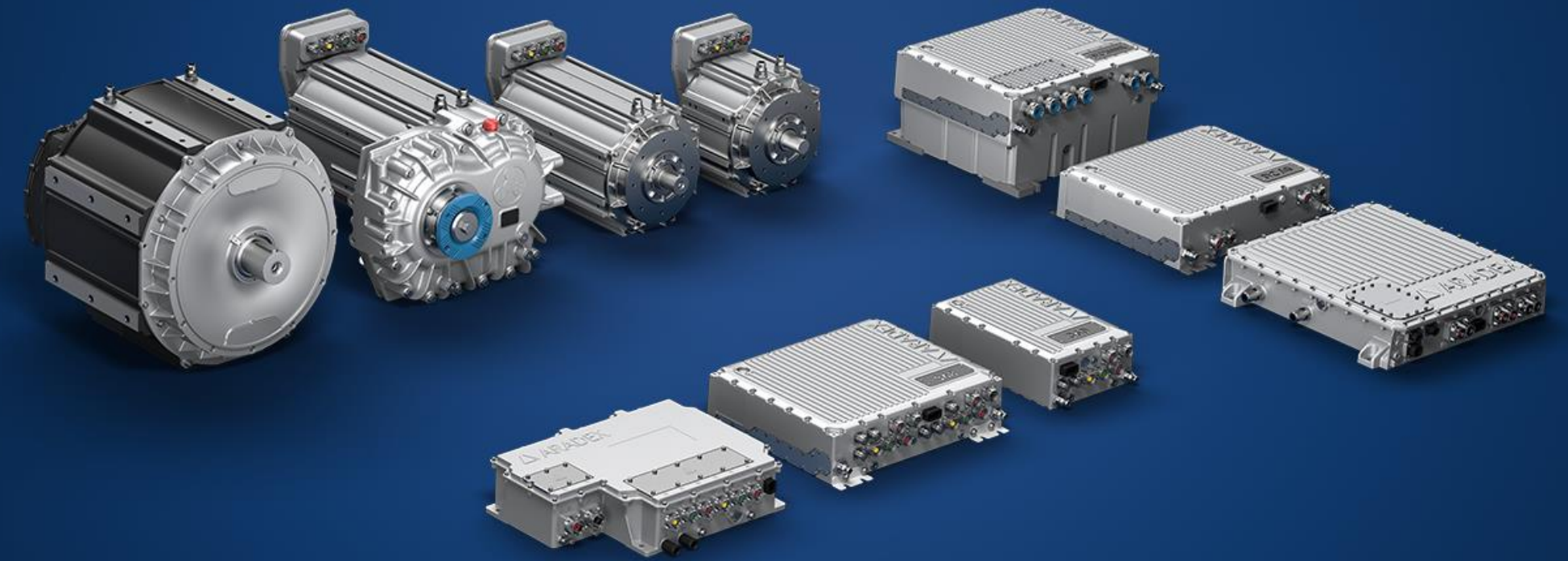


# ARADEx: Company overview & on-highway applications solutions

We drive new energy for a greener future



\*\* ASK FOR OFF-HIGHWAY AND MARITIME VERSION

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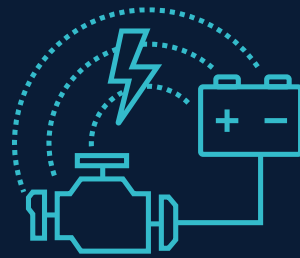
Contact us and challenge us with your applications

# INTRODUCTION

ARADEx and our role for electrified  
and hybridized drivetrains

# / We are ARADEX

Smart electrical and hybrid solutions for commercial vehicles, mobile working machines, and ships. We offer HV-DCDC, inverters, e-motors and accessories



## Multi energy supply

Modular subsystems which can be adapted to future demands. Battery, hybrids, hydrogen, cable.



## Matching e-motors

According to your application and requirements: direct drives, gearbox drives. PMSM or magnet-free motors.



## Mastering HV systems

Mastering interactions in high voltage systems. With our devices, matching accessories, and system knowledge.

# / ARADEX AG, Germany

## Application center(ed)



ARADEX is part of WEICHAI Power. At our headquarters in Lorch near Stuttgart, Germany, we focus completely on mobile high voltage products and their usage in your application:

- Development & Application
- Visitors & Training Center
- Test benches
- Service-Center, Production Warehouse

# / Application fields

Our main target markets are commercial vehicles, mobile working machines and maritime applications.

## (On-highway)

### COMMERCIAL VEHICLES



## (Off-highway)

### WORKING MACHINES



## (Maritime)

### SHIPS



# / Added value for you

## An overview



01

### **HARDWARE**

Broad portfolio of inverters, DC/DC converters, e-motors with gearboxes and more

02

### **SOFTWARE TOOLS**

Integrated commissioning, analyzing, development and diagnostics tools.

03

### **TECHNOLOGY MODULES**

Optional function modules for our inverters and DC/DC. Easy to adapt to your application.

04

### **ENGINEERING SERVICES**

Comprehensive package of services and support in all project phases.

# / Technology network

To support you



## Localized production

Production facilities in Europe and China



## Complementary products

Hydraulics, gearboxes, combustion engines...



## Prefect support

Optimal support of your projects




Power electronics, e-motors, software



WEICHAI Innovation Center: Science, R&D



Combustion engines for ships



WEICHAI Power: Combustion engines & NewEnergy



Gearboxes, differentials and more



Hydraulics: pumps, motors, valves



# / Future proof solution

## Modular and flexible HV system

### — 01

#### ENERGY SOURCE (Multi-Energy)

- Generator
- Fuel cell
- Cable
- SuperCap
- Battery
- Others



### — 02

#### CONVERSION (Motors & Inverters)

- Inverters
- DC/DC converters
- Electric motors



### — 03

#### APPLICATION (Application Specific)

- Wheel drives
- Chain drives
- Ship's propulsion
- Auxiliary drives
- E-hydraulics
- Customer-specific

(Power management in real-time directly by our inverters and DC/DCs)



# WHAT WE OFFER

HV components, software tools  
and engineering support

# / Hardware

## An overview

### ELECTRIC MOTORS



**& MORE**  
AVAILABLE  
PRODUCTS



- AC-induction
- PM-reluctance

### MOBILE INVERTERS



**& MORE**  
AVAILABLE  
PRODUCTS



- Double
- Single

### DC/DC CONVERTERS



**& MORE**  
AVAILABLE  
PRODUCTS



- For general purpose
- For fuel cells

# / Series products:

## Mobile multipurpose inverters



### SINGLE INVERTERS (3 phase)

- **200-840 VDC** operation
- Up to **480 Arms** 10s-current
- SafeTorqueOff function
- Multipurpose DC/AC



### DOUBLE INVERTERS (2\*3 phases)

- **200-840 VDC** operation
- Up to **900 Arms** 10s-current
- Dual versions **2\*450 Arms**
- SafeTorqueOff function



# / Series products:

## Mobile traction inverters



### EVO-M2 (2\*3 phases)

- **200-860 VDC** operation
- Up to **1000 Arms** 60s-current
- Dual versions **2\*500 Arms**
- SafeTorqueOff - in all cases

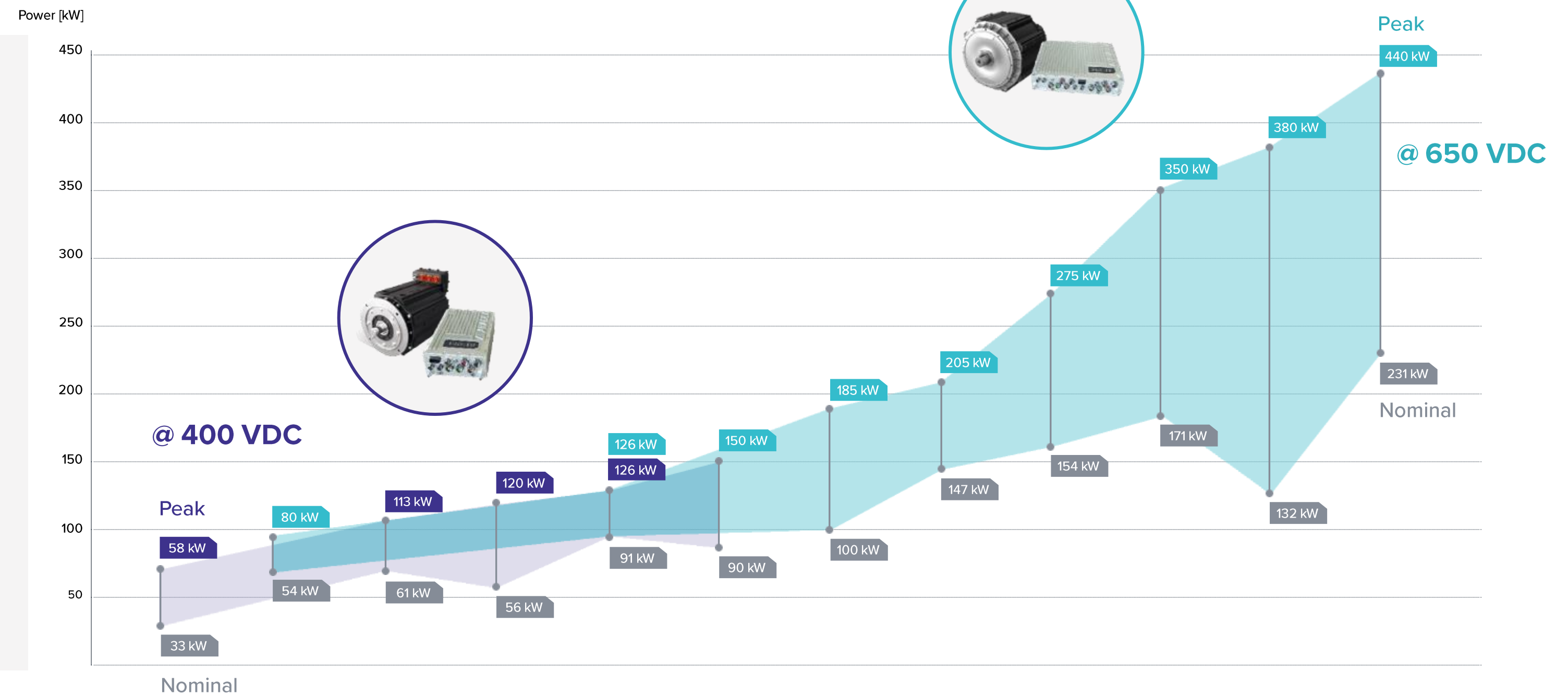


### EVO-M1\*\* (3 phase)

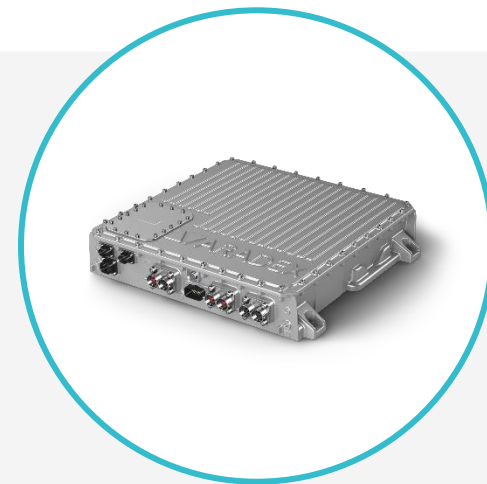
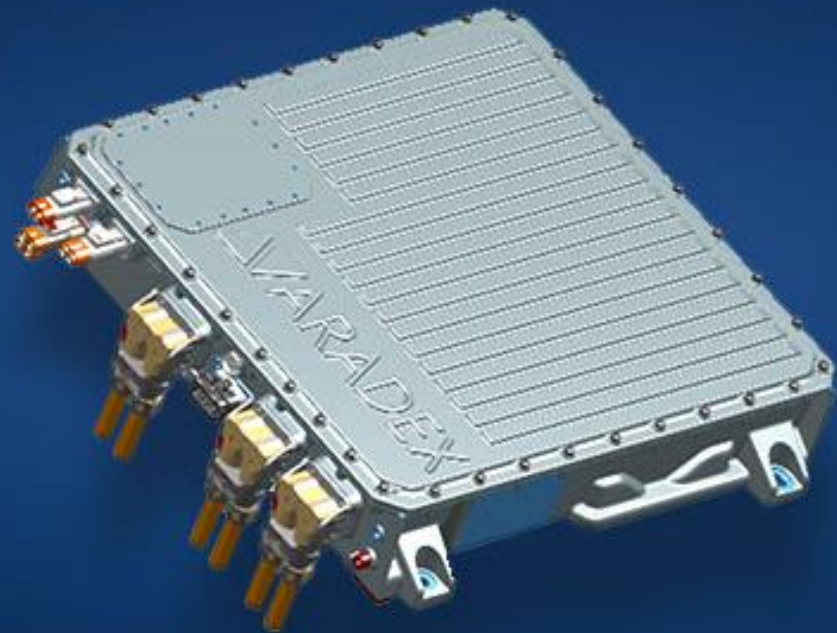
- **200-860 VDC** operation
- Up to **500 Arms** 60s-current
- SafeTorqueOff function
- For traction and auxiliary drives

# / Series products: Electric motors & inverters

- 30 kW up to 300 kW continuous power
- Up to 1200 kW continuous power with summation gear box
- **300 VDC** up to **860 VDC**



# / Series products: Fuel cell HV DC/DC



## FC/DC500 (Unidirectional HV-DC/DC)

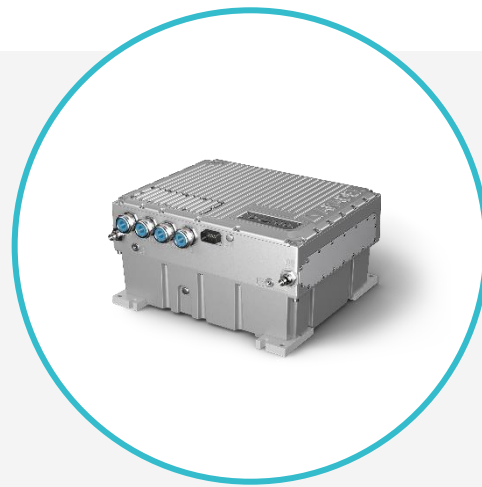
- Up to **500 ADC** cont. FC current
- Up to **180 kW** cont. power
- 530mm \* 560mm \* 120mm
- Weight about 30kg

## Your benefits (Perfect match for fuel cells)

- Step-up-ratio up to 1:7
- Full FC current @ **110..360 VDC**
- Efficiency 98,7% from **300** to **700 VDC**
- Auxiliary HV output

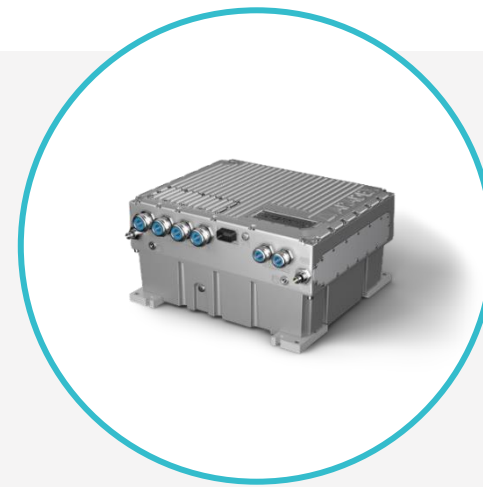
# / Series products:

## Multifunctional HV-DC/DC



### DC/DC 200 (bidirectional HV-DC/DC)

- Efficiency up to 99%
- **100 VDC** up to **800 VDC**
- Up to +/- **400 A** cont. current
- E.g. for SuperCaps or fuel cells



### DC/DC 200 (HL) (bidirectional HV-DC/DC)

- Efficiency up to 99%
- **100 VDC** up to **800 VDC**
- Up to +/- **400 A** cont. current
- E.g. for SuperCaps or fuel cells





# / Software tools

## An overview



VECTOSTUDIO  
**Development tool**



VEConfig  
**Commissioning tool**

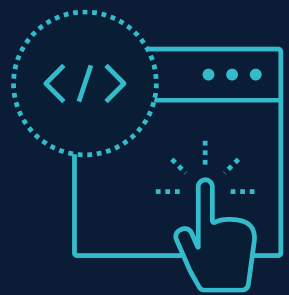


ANALYSER  
**Analyzing tool**



# / VECTOSTUDIO

## Development tool



### Perfectly adapted

Optimally tailored to our inverters and DC/DC



### Short development time

Based on libraries and best practice examples



### Combined development

Your team and ARADEx team can work together

## VECTOSTUDIO - YOUR IDE

The **Integrated Development Environment** is optimized for practical use in your projects. We develop it ourselves and our project engineers use it in their daily work.

# / VEConfig

## Commissioning tool



### Parameterization

Write and read out all parameters



### Functional updates

Updates of firmware and functional tech-modules



### Smart data logging

Read out oscilloscope files and logfiles

### POWERFUL COMPANION

VEConfig is made to be your universal companion for commissioning, diagnostics and maintenance. To connect inverters, DC/DC and even third-party controllers.

# / Analyser

## Analyzing tool



### Comfortable oscilloscope

Easy-to-use tools and functions included



### Flexible Input

Can also be used for third-party products



### Time-saving Output

Various export and print documentation functions

## SMART OSCILLOSCOPE

The Analyser is your all-in-one viewing tool for the data of the integrated real-time oscilloscope in all ARADEx inverters and DC/DC. Powerful and easy to use.

# / Technology modules

## An overview

Technology modules are made to co-work with your machine controller. Beneficial for all high-speed functions.



DIAGNOSTICS  
SUPPORT



POWER & VOLTAGE  
MANAGEMENT



HIGH-LEVEL DRIVE  
FUNCTIONALITY



SPECIAL  
FUNCTIONS



# / Diagnostics support

## For diagnostics & measurements

### DESCRIPTION

#### Common aspects

Made for all kind of diagnostics and generation of smart data.  
An often used basic function:  
The VirtualSensorTechnology as a platform to be adapted to your special application. All modules are made to work together with your machine controller.



### OUR MODULES

#### Constantly expanding

- **MultiDeviceAnalyser**
- **ContactoraAgingMonitoring**
- **VirtualSensor: to be adapted to your application**

### APPLICATION AREAS

#### Some examples



- The diagnostic functional modules can be used for nearly all kind of applications
- And they can be used for all kind of drives: propulsion, e-hydraulics, winches, auxiliary

# / Power & voltage management

## Real-time modules

### DESCRIPTION

#### Common aspects

In high-voltage and high-power electrical systems the control of power and voltage is of elementary importance. And often reaction times below 1 ms are necessary. Our power devices perfectly support your machine controller.



### OUR MODULES

#### Constantly expanding

- SmartDC
- ShortCircuitOvervoltage
- ExternalPrecharge
- AFE\_Boost

### APPLICATION AREAS

#### Some examples



- The diagnostic functional modules can be used for nearly all kind of applications
- They can be used for all kind of energy supply: pure battery, hydrogen, diesel-electric, hybrid, cable-supplied....

# / High-level drive functionality

## Especially for propulsion drives

### DESCRIPTION

#### Common aspects

All modules are focused to improve drives for wheel-based propulsion. Ask us for special solutions for chain drives and ship propeller. All machines implement the fast-reacting parts in combination with your machine controller.



### OUR MODULES

#### Constantly expanding

- **DynamicParameterAllocation**
- **SlipAvoidance**
- **OnePedalDrive**
- **MasterSlave**
- **SmartShortCircuitBraking**
- **AutomaticFieldWeakening**

### APPLICATION AREAS

#### Some examples



- Used for all kind of wheel-based vehicles and machines
- To improve drivability, especially on challenging underground
- To reduce wear of expensive tires



# / Special functions

## Specialized modules

### DESCRIPTION

#### Common aspects

As the name suggests: special functions are special. We are also happy to develop YOUR module. The VirtualSensor is a base to be adapted to your dedicated application. With your controller and your software.

### OUR MODULES

#### Expanding steadily

- VirtualSensor
- Open for your ideas.....

### APPLICATION AREAS

#### Sub title



- Redundant ship propulsion
- Dredge pumps and similar

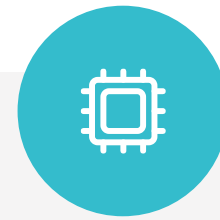
# / Engineering services

## An overview

We see our services as link between your applications and our products. To support you and to learn from your application.



TRAINING COURSES  
& WORKSHOPS



ELECTRICAL DESIGN  
& DIMENSIONING



COMMISSIONING  
& OPTIMIZATION



AFTER-SALES  
& MAINTENANCE



# / Training courses & workshops

## Matched to your demands

- 01 **Product training**  
Using VECTOPOWER
- 02 **Workshop**  
Analyzing your project
- 03 **Kick-Off**  
Starting your project



### HOW WE OFFER TO START

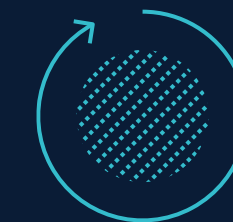
We recommend starting with joint workshop focussed on your application to learn more about the requirements. Together, we determine a rough structure and initial dimensioning of all power components. Together we define work packages, responsibilities, timing and project-related training.



FUNCTIONS



SAFETY



DIMENSIONING



SCHEDULE

# / Electrical design & conception

The launch of every successful project.

— 01 **Structural design**  
Of your application

— 02 **Dimensioning**  
Of all HV components

— 03 **Function & Safety**  
A first analysis



## SUPPORTING YOUR ENGINEERING

We can support in dimensioning of all HV components. For our inverters and HV-DC/DCs we can offer estimation of expectable lifetime especially for cyclic power demands. And we can support in using our products to realize new or improved functions and regarding to safety aspects.



DRIVE SYSTEM



POWER CONTROL



FUNCTIONS



PARTNERS

# / Commissioning & optimization

## For maximum results

- 01 **Commissioning**  
On site, digital, hybrid
- 02 **After sales**  
Service, maintenance
- 03 **Smart data**  
Improve your application



### POWERFUL TOOLS AND CARING TEAM

Our team of project engineers is dedicated to supporting you and your application. We also offer powerful tools for commissioning, diagnostics and more. In machines already in operation you can create valuable smart data: for example for future development steps for AI-based functions.



COMMISSIONING



WIZARD BASED



DIAGNOSTICS



SMART DATA

# / After sales & Maintenance

## To keep your machines running

- 01 **Support**  
On site & digital
- 02 **Make machine work**  
Spares & fast repair
- 03 **Tools**  
Powerful & smart

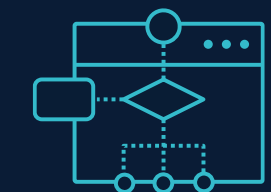


### TO KEEP YOUR MACHINES RUNNING

ARADEX inverters and DC/DC converters have always had integrated oscilloscope and log functions. They can be used for commissioning but also for various kinds of diagnostics and after-sales support. They can be used on site and digital over the distance. In real-time or by file-exchange. And supported by ARADEX.



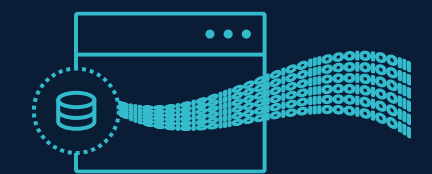
OSCILLOSCOPE



INTEGRATED PLC



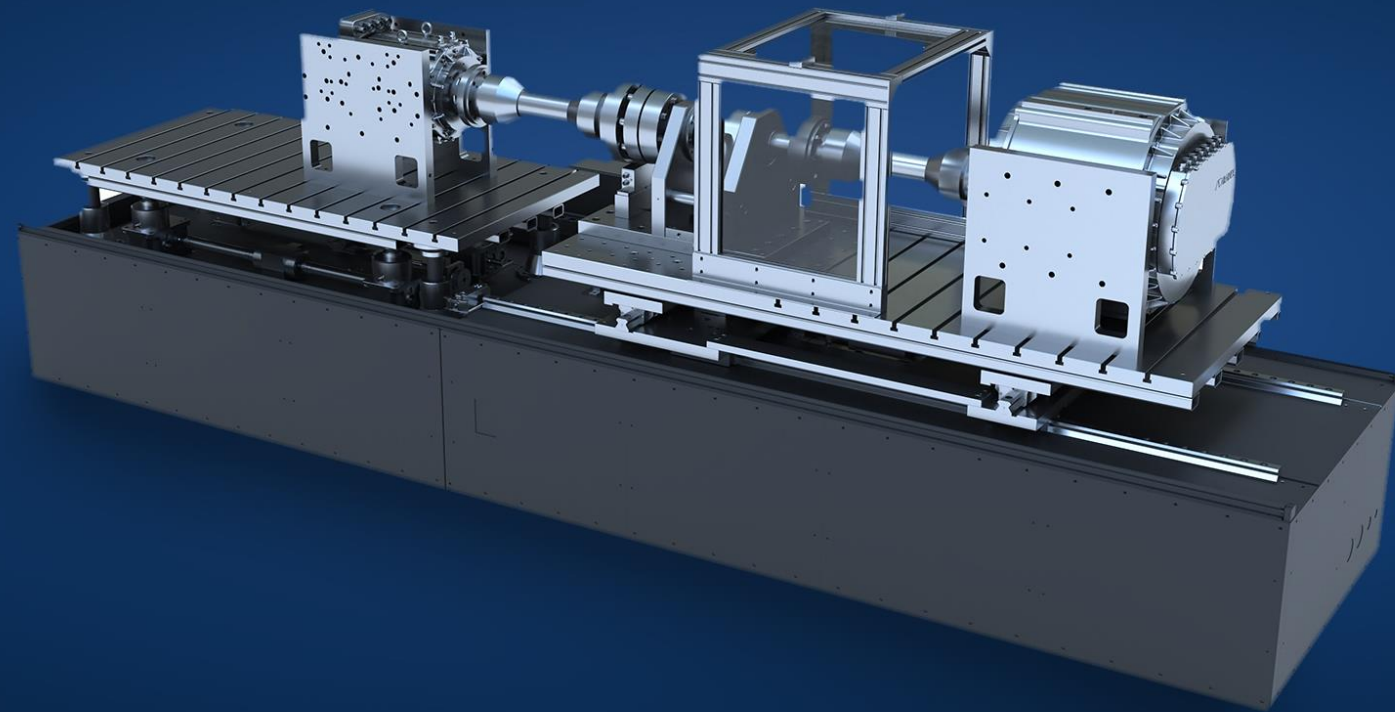
LOG FILES



DATA EXPORT

# / Test bench

For electric drivetrains optimization



Based on our experience with electric drive systems, we have designed and implemented our own test bench:

- For the further development of inverters and motors
- To validate third-party motors with our inverters
- Available for hire for validation of inverters and motors



# ON-HIGHWAY APPLICATIONS

Some representative examples  
of typical applications

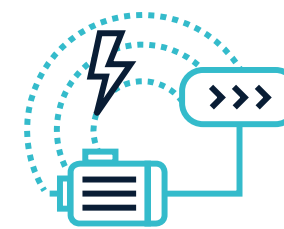


# / Buses & Trucks

Up to 44 t



// ON-HIGHWAY



### Direct drives

Motors for direct connection to cardan shaft



### Gearbox-based drives

Reducers with and without shiftability



### High efficiency

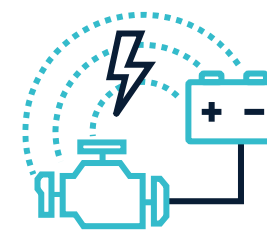
Long battery traveling range without charging

# / Garbage collection trucks

## Hydrogen & Battery



// ON-HIGHWAY



### Multi-energy concept

Fuel cell and battery combination



### Auxiliary drives

Garbage compaction by e-hydraulics



### Easy maintenance

AC-induction direct-cardan drive

# / Concrete pump trucks

## Supplied via cable



### Cable-to-grid

Pure electric operation in target area



### Silent operation

To work in silent areas and times



### Virtual sensor technology

Torque measurement for perfect operation

# / Dumpers

1200k W continuous



## 4 synchronized motors

For maximum power and redundancy



## Torque-Boost

High boost-torque even at zero speed



## Slip-control

Reduces wear on tires

## IV

# CONTACT US

Contact us and challenge us  
with your applications

# / Your main benefits

We offer more than drives.

**Supporting you is our DNA.  
Because your application is  
our focus, we create the ideal  
conditions for a successful  
cooperation.**

This is what you can expect from us:

- Application center(ed): products and people
- 15 years experience in mobile high voltage systems
- Robust products made for demanding use
- Perfect matching tools for best usability
- Maintenance and digitization made easy

# / Challenge us

## Review of your application




### **Challenge us with your application, your demands and your ideas!**

- Our engineers can calculate or support the project planning for your application.
- You receive the result as an electronic document: cornerstones of your project regarding electrification or hybridization including dimensioning done by our experienced project engineers.
- Contact our sales team for more information.

Thanks for your attention!

# Optimized usability and performance for the best e-mobility



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