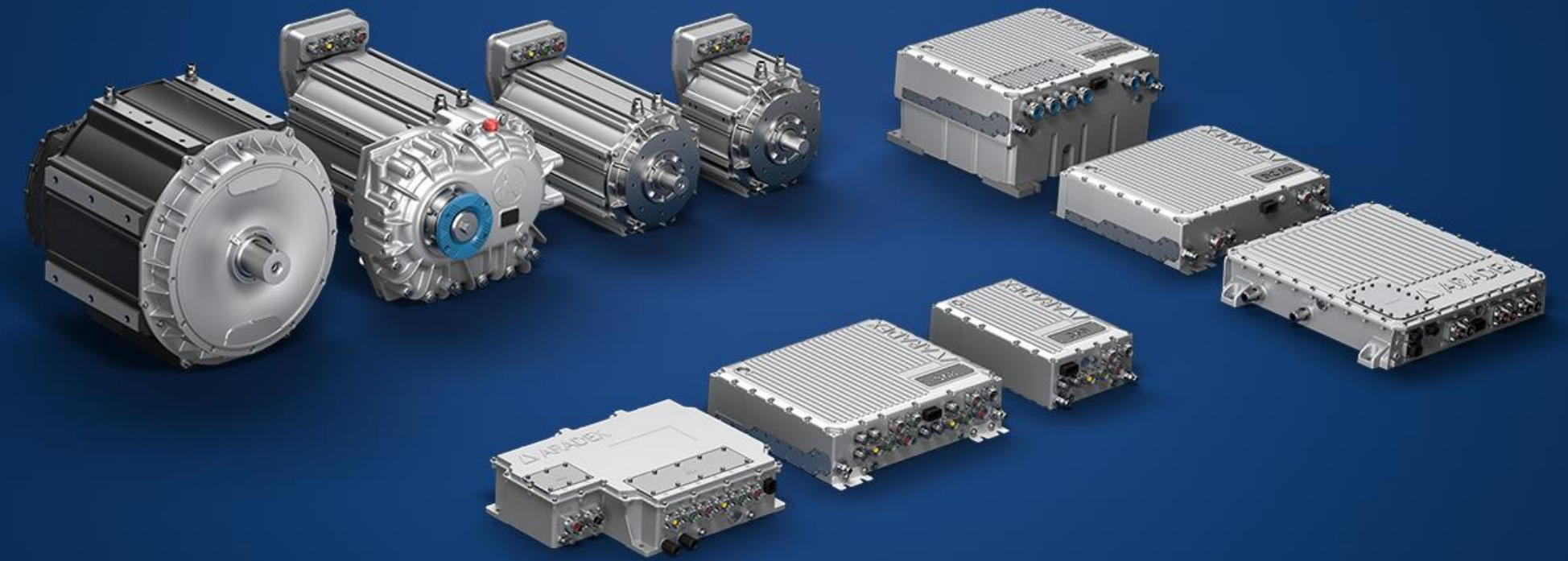


ARADEx: Company overview & off-highway applications solutions

We drive new energy for a greener future



** ASK FOR ON-HIGHWAY AND MARITIME VERSION

LAST EDITED: 2024-04-08

/ Content

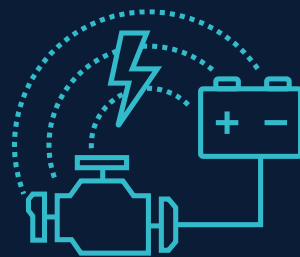
- I
INTRODUCTION
ARADEx and our role for electrified and hybridized drivetrains
- II
WHAT WE OFFER
HV components, software tools and engineering support
- III
OFF-HIGHWAY APPLICATIONS
Some representative examples of typical applications
- IV
CONTACT US
Contact us and challenge us with your applications

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



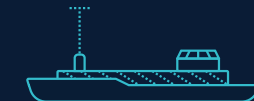
(Off-highway)

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

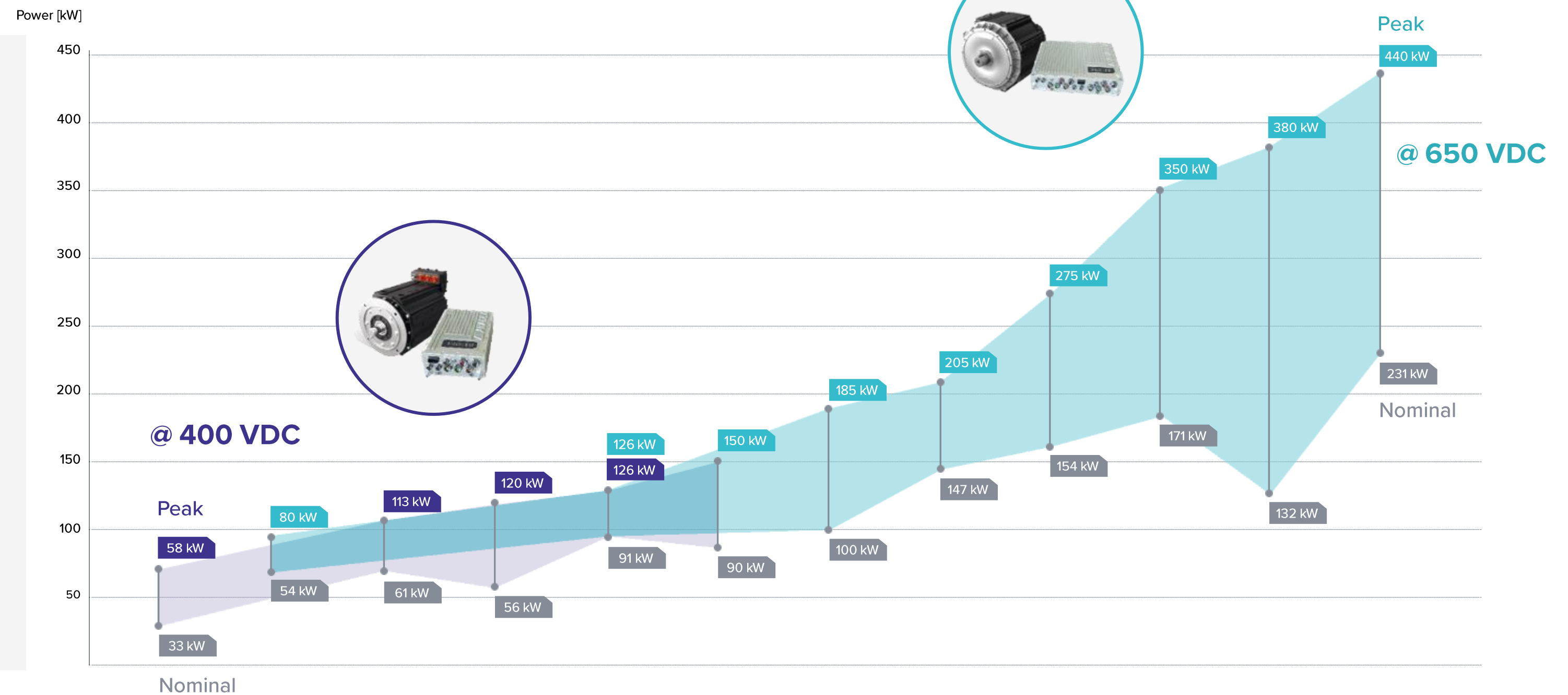


EVO-M1** (3 phase)

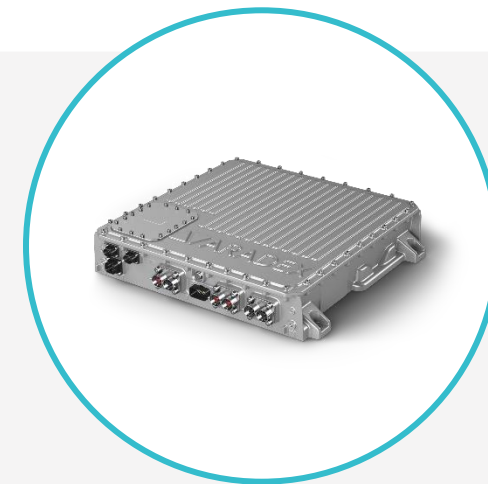
- **200-860 VDC** operation
- Up to **500 Arms** 60s-current
- SafeTorqueOff function
- For traction and auxiliary drives

/ 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)

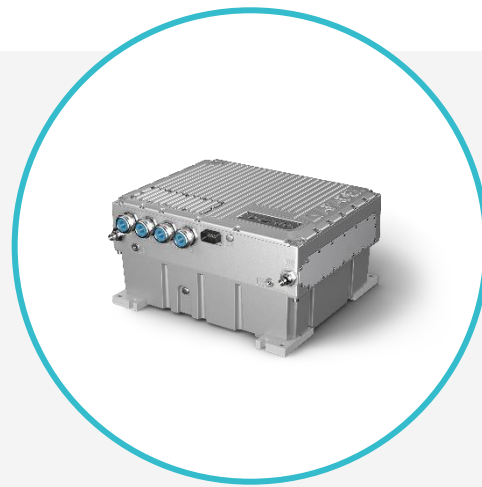
- Up to **500 ADC** cont. FC current
- Up to **180 kW** cont. power
- 530mm * 560mm * 120mm
- Weight about 30kg

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

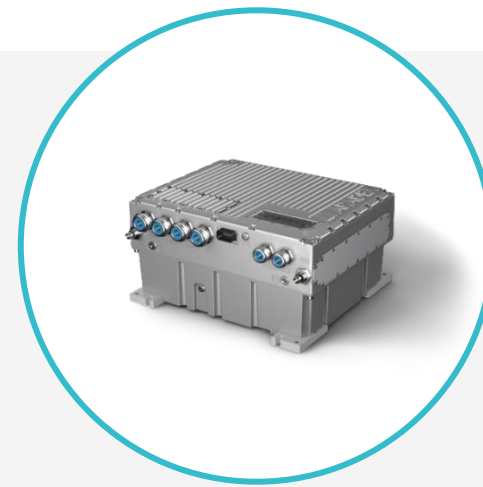
/ Series products:

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

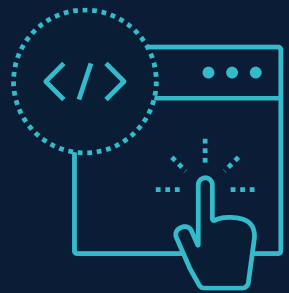


ANALYSER
Analyzing tool



/ 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

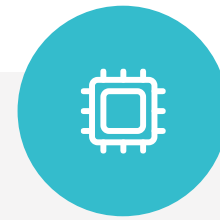
/ Engineering services

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

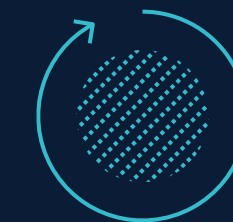
We recommend starting with joint workshop focussed on your application to learn more about the requirements. Together, we determine a rough structure and initial dimensioning of all power components. Together we define work packages, responsibilities, timing and project-related training.



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

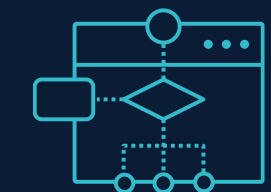


TO KEEP YOUR MACHINES RUNNING

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.



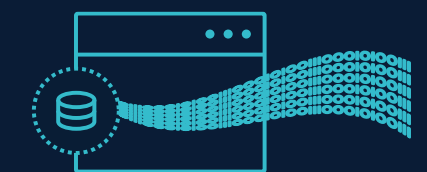
OSCILLOSCOPE



INTEGRATED PLC



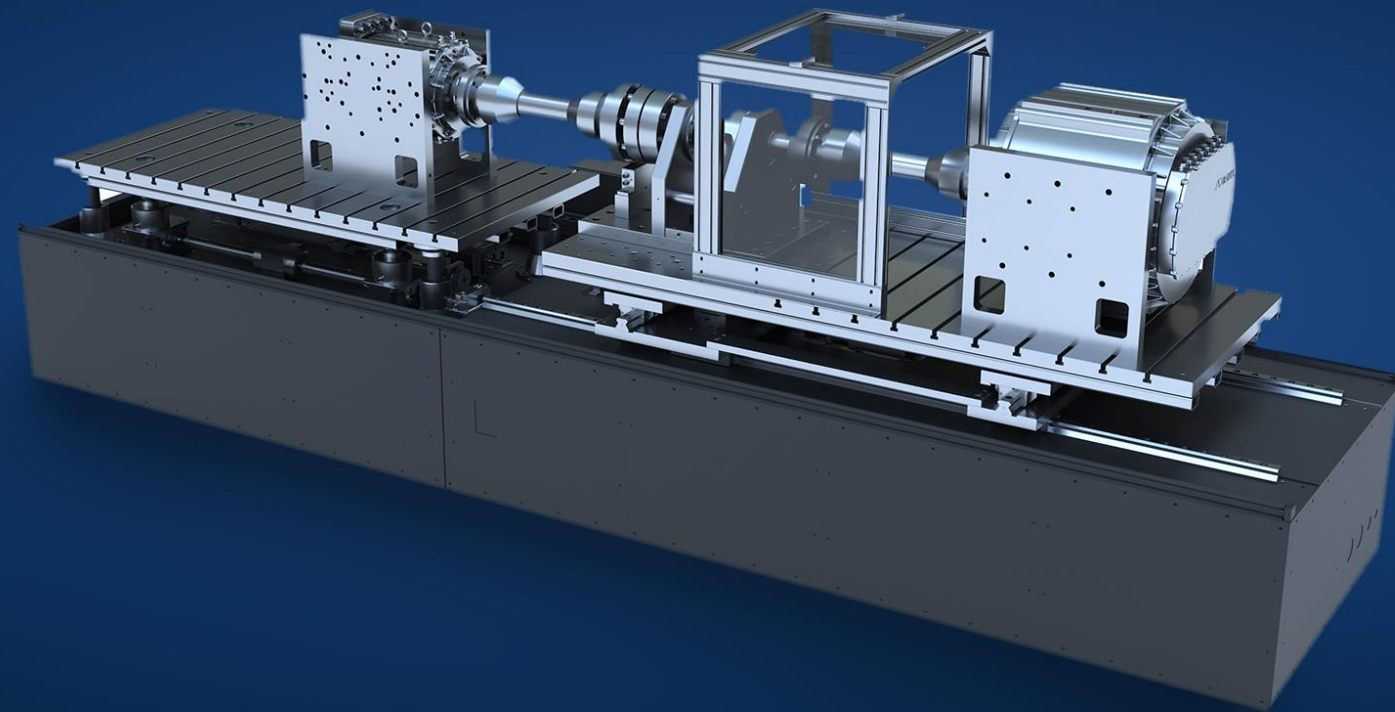
LOG FILES



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

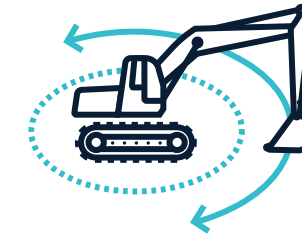


OFF-HIGHWAY APPLICATIONS

Some representative examples
of typical applications

/ Excavators

Hydraulics & Electrics



Electromechanical swing
With optimized jerk limitation



e-hydraulic boom
With energy recuperation



Enable new functions
Use "VirtualSensor" for optimized hydraulic boom

/ Wheel loaders

improved driveability



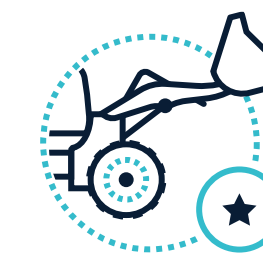
Slip control

Reducing tire wear & improving driveability



One-pedal-drive

Improved performance & reduced energy consumption

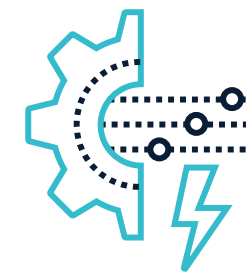


PLUS-e-hydraulics

Enhanced functions for shovel operation

/ Drilling machines

Perfectly controlled



Real-time power management

Regardless of the number of HV drives in a system



Flexible energy supply

Grid or genset, battery for power-shaving

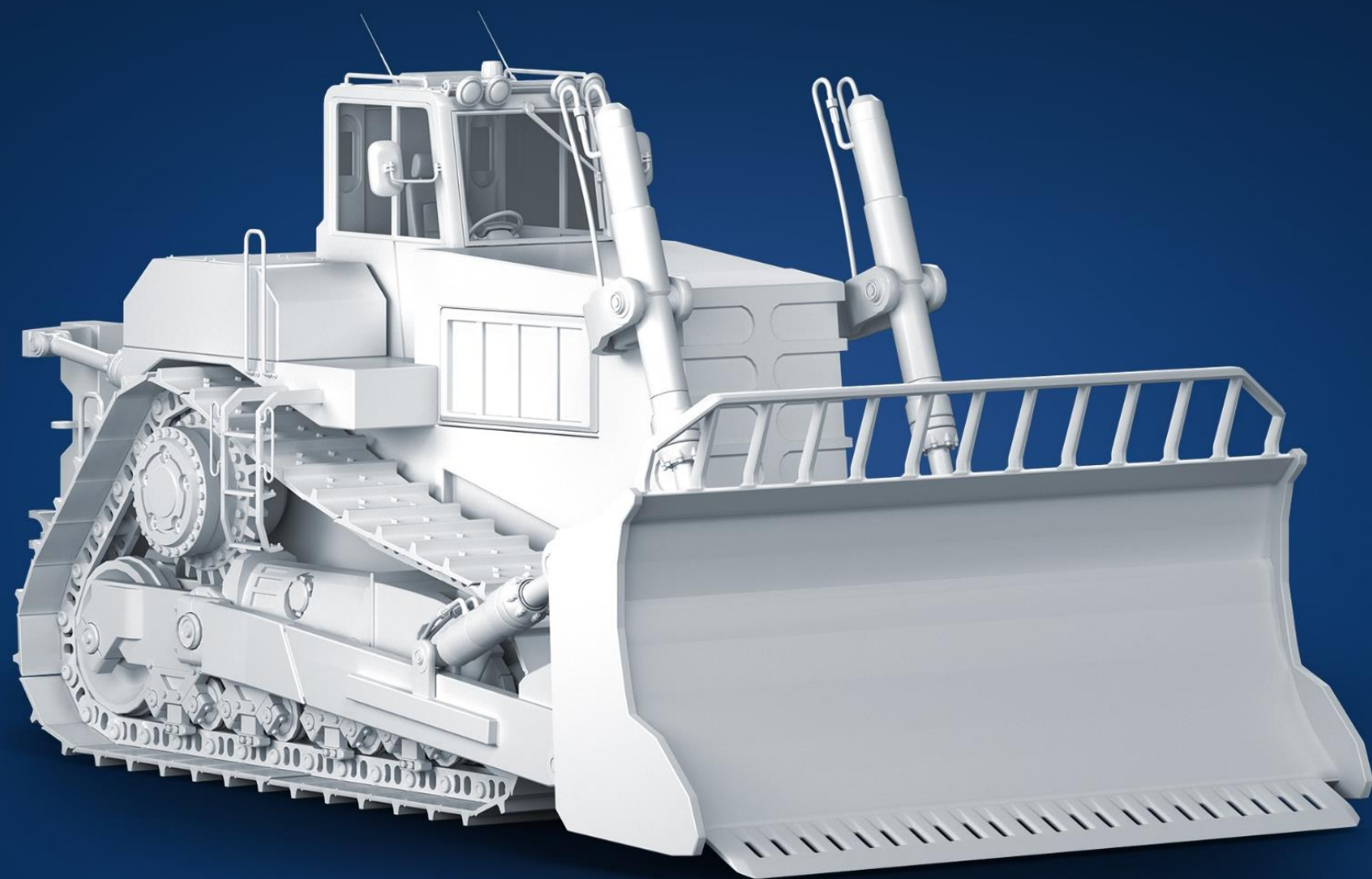


Virtual sensor technology

Torque measurement and optimized drilling

/ Dozers

Chain drive 2.0



Electromechanical chain drive

Reduced energy consumption



Reduced wear of chain

Drive-situation adaptable chain tension



Improved driveability

Improved movement on changing ground

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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