

ELECTRIC DRIVES

Solutions for wind energy

Generators, yaw and pitch drives

Machines for wind turbines

VEM supplies branch-specific asynchronous and synchronous generators with outputs up to 8 MW – for both onshore and offshore applications. The expertise bundled in our project calculation and design departments enables us to tailor the wind turbine generators to individual requirements. One example for such custom solutions is the integration of an asynchronous generator and gearbox into a single compact unit (hybrid drive).

The portfolio for wind turbine applications is rounded off with brake motors for use as yaw and pitch control drives. Further products for the wind power segment include low-voltage machines for oil circulation, hydraulic and cooling systems.

Our generator portfolio for wind energy applications

 \cdot Asynchronous generators with slip-ring rotor

- \cdot Asynchronous generators with squirrel-cage rotor
- \cdot Synchronous generators (electrically energised)
- Permanent-magnet synchronous generators (medium-/high-speed)
- Output range: 1 to 8 MW
- Voltage range: 690 to 13800 V
- Frequencies: 50/60 Hz and converter-fed operation
- · Types of cooling: Air-air, air-water, water jacket

You can rely on the benefits of VEM wind turbine generators

- High proportion of in-house manufacturing, as the pre-requisite for fast and flexible response to customer wishes
 Tailored solutions to accommodate local site conditions
 Load and bearing lifetime ratings in compliance with Det Norske Veritas-Germanischer Lloyd (DNV-GL), TÜV
 Optimum efficiency, also in partial load range, and low-noise machine operation
 Dimensions adapted to the specific nacelle design using a 3D CAD system
 Consistently high insulation resistance of the
- form-wound coil
- \cdot Optimised for operation on a voltage converter
- Rotor winding designed for high rates of voltage rise in converter-fed operation
- · Ready for UL/CSA certification

PM **Technical data** Asynchronous Asynchronous **Custom solution:** Synchronous PM Slip-ring rotor squirrel-cage rotor Asynchronous electrically medium-speed high-speed hybrid energised 3.6 MW 4.1 MW 3.5 MW 3.7 MW 3.8 MW 2.7 MW Output Voltage 950 V 750 V 3 300 V 800 V 720 V 690 V Current 1994 A 2 x 1 760 A 681 A 2 x (3 x 479 A) 2 x 1 600 A 2 x 1 1 50 A 50 Hz 47.8 Hz 34.7 Hz 68.1 Hz 75 Hz 110 Hz Frequency 0.93 * 0.9 0.9 -0.95 0.98 Power factor 0.94 Nominal speed 1200 rpm 1440 rpm 524 rpm 1362 rpm 375 rpm 1 650 rpm Efficiency 96.8% 97.6% 97.0% > 98.0% 98.3% > 98.0% Shaft height 630 630 1 000 630 560 1 1 2 0 IP 54/IP 55 Protection Construction IM 1001 IM 1001 IM 5210 IM 1101 IM 9101 IM 1001 Type of cooling IC 6A1A6 IC 6A1A6 IC 4A6W7 IC 6A1A6 IC 7A1W7 IC 6A1A6



* Passive rectifier operation

Important to know: Testing performed on in-house test beds serves to confirm that our machines meet all relevant quality demands. Modern equipment and a team of experienced and highly qualified staff ensure that prescribed tests are implemented in full compliance with the industry standards.

VEM is certified to DIN EN ISO 9001 and has acquired extensive experience with the test requirements of national and international certification organisations.

With our system test bed, we are able to simulate a complete drive train and can thus test also the performance of an overall system.

Asynchronous generators, double-fed induction generators (DFIG)

3.6 MW (type: DASAA 6329-6U)

Air-air cooling Voltage: 950 V Speed: 1 200 rpm Frequency: 50 Hz



6.5 MW (type: DAMAK 8032-6WF)

Air-water cooling Voltage: 6 600 V Speed: 1 170 rpm Frequency: 50 Hz



2.5 MW	(type:	DRSYZ	5623-6L	JSW)
Air-air co	poling			

Voltage: 690 V
Speed: 1 650 rpm
Frequency: 82.5 Hz
Frequency: 82.5 Hz

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Synchronous generators, brushless excitation

Up to 4 MW (type: DRSYZ 6325-6US)

Air-air cooling Voltage: 765 V Speed: 1 362 rpm Frequency: 68.1 Hz



VEM products

Brake motors for yaw and pitch drives

Providing access to a full range of three-phase machines, VEM also supplies low-voltage drives for wind turbines. Our three-phase asynchronous brake motors promise exceptional reliability, durability and effectiveness. They are suitable for universal applications thanks to a wide scope of possible modifications. We are similarly able to offer powerful solutions for high-reduction precision gearboxes, where particularly exacting demands are to met with regard to torque and speed. We have already been manufacturing such high-performance brake motors for reduction gearboxes for many years, for example as actuators in yaw control drives. Our drives are to be found in use all over the world - in both onshore and offshore wind turbines.



Motors for yaw drives

- · Output range up to 7.5 kW
- · Design according to DIN EN 60034 (IEC 72)
- · Robust, low-vibration design
- · Built-on twin-face brake
- Protection type IP 55
- · Thermal class F

Built-on unit for yaw drives

- · Speed: 1 200/1 800 rpm
- · Frequency: 50/60 Hz

Motors in cooling systems

We supply motors for the cooling systems of gearboxes, generators, transformers and other electrical components: \cdot Output range up to 7.5 kW

- · Corrosion resistance for offshore cooling systems
- · Cold start at temperatures down to -30 °C

Product examples

Motors for pitch drives

- · Output range up to 7.5 kW
- · Including position or speed encoder, special windings, condensate drain and built-on twin-face brake
- · Design according to DIN EN 60034 (IEC 72)
- · Special paint finish (cathodic dip coating) for offshore use

Example:

Built-on unit for pitch drives

- · 5.3 kW
- · Voltage: 360 V D
- · Speed: 2 300 rpm
- · Frequency: 78 Hz
- · Type of cooling IC 411
- Brake motor

Technical data

Output range: 1.5 to 8 MW

Voltage: 690 V to 6 600 V, 10 000 V and higher upon request

Speed: 650 to 2200 rpm (further speed ranges upon request)

Type of cooling:

Air-air cooling (IC 611 – IC 666)
Air-water cooling (IC 81 W7, IC 86 W7)

Features:

- · Design according to DIN EN 60034 (IEC 72)
- \cdot Type of construction IM B3 according to DIN/IEC
- \cdot Robust, low-vibration design
- · Protection types IP 23, IP 54, IP 55
- Insulation system VEMoDUR-VPI-155: vacuum-press impregnation (VPI), thermal class F insulation systems VPI, thermal class H possible
- · Energy-efficient and environment-friendly
- · Wide scope of possible modifications

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