



ELECTRIC DRIVES
FOR EVERY DEMAND



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

- Asynchronous generators with slip-ring rotor
- Asynchronous generators with squirrel-cage rotor
- Synchronous generators (electrically energised)
- Permanent-magnet synchronous generators (medium-/high-speed)
- Output range: 1 to 8 MW
- Voltage range: 690 to 13 800 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 prerequisite 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
- 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

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.

Technical data	Asynchronous Slip-ring rotor	Asynchronous squirrel-cage rotor	Custom solution: Asynchronous hybrid	Synchronous electrically energised	PM medium-speed	PM high-speed
Output	3.6 MW	4.1 MW	3.5 MW	3.7 MW	3.8 MW	2.7 MW
Voltage	950 V	750 V	3 300 V	800 V	720 V	690 V
Current	1 994 A	2 x 1 760 A	681 A	2 x (3 x 479 A)	2 x 1 600 A	2 x 1 150 A
Frequency	50 Hz	47.8 Hz	34.7 Hz	68.1 Hz	75 Hz	110 Hz
Power factor	0.94	0.9	0.9	0.93 *	-0.95	0.98
Nominal speed	1 200 rpm	1 440 rpm	524 rpm	1 362 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	1 120	560
Protection	IP 54/IP 55	IP 54/IP 55	IP 54/IP 55	IP 54/IP 55	IP 54/IP 55	IP 54/IP 55
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



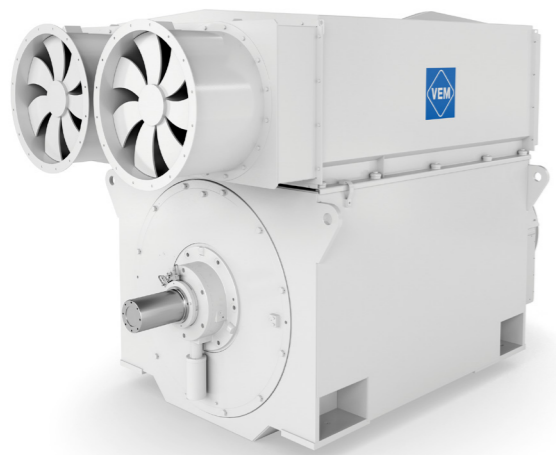


Asynchronous generators,
double-fed induction generators (DFIG)

Synchronous generators, brushless excitation

3.6 MW (type: DASAA 6329-6U)

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



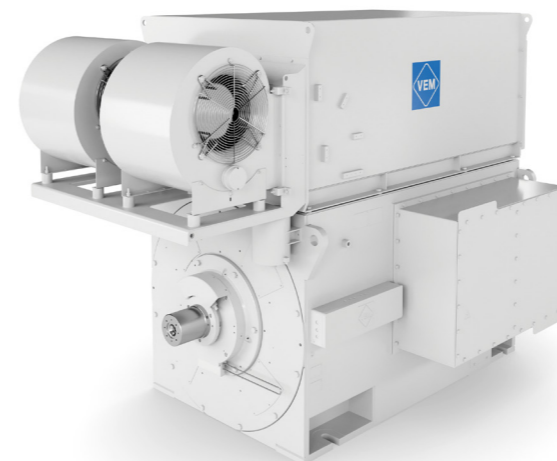
6.5 MW (type: DAMAK 8032-6WF)

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



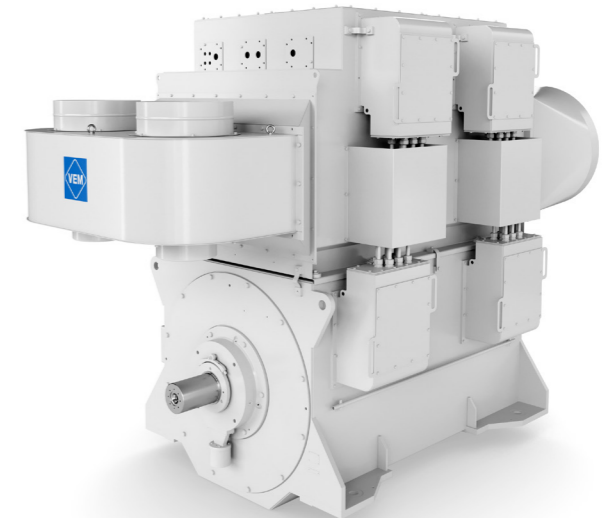
2.5 MW (type: DRSYZ 5623-6USW)

Air-air cooling
Voltage: 690 V
Speed: 1 650 rpm
Frequency: 82.5 Hz



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.



Product examples

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

Example:

- Built-on unit for yaw drives
- 3.7 kW
 - Voltage: 690 V Y
 - Speed: 1 200/1 800 rpm
 - Frequency: 50/60 Hz
 - Type of cooling IC 411
 - Brake motor

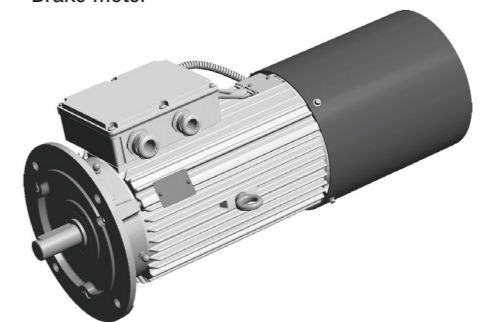


Motors for pitch drives

- 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



Motors in cooling systems

We supply motors for the cooling systems of gearboxes, generators, transformers and other electrical components:

- Output range up to 7.5 kW
- Corrosion resistance for offshore cooling systems
- Cold start at temperatures down to -30 °C
- Special voltage
- Pole-changing

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 2 200 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)
- Type of construction IM B3 according to DIN/IEC
- 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

VEM GmbH

Pirnaer Landstraße 176
01257 Dresden
Germany

VEM Sales

Low voltage department
Fon +49 3943 68-3127
Fax +49 3943 68-2440
E-Mail: low-voltage@vem-group.com

High voltage department
Fon +49 351 208-3237
Fax +49 351 208-1108
E-Mail: high-voltage@vem-group.com

Drive systems department
Fon +49 351 208-1154
Fax +49 351 208-1185
E-Mail: drive-systems@vem-group.com

VEM Service

Fon +49 351 208-3237
Fax +49 351 208-1108
E-Mail: service@vem-group.com

www.vem-group.com