Adaptable for wind turbines between 1 MW and 3 MW

Open architecture and design
- Based on components manufactured by globally recognized suppliers and available from distributors in China
- Full component documentation and service operations training available
- Service operations can be carried out by wind farm operator

Reliable design increasing availability
- No external fans subject to wear out in harsh climates
- Use of maintenance-free ultracapacitors eliminates biannual replacement of batteries and prevents acid and toxic fume impact on other components
- Condition monitoring of ultracapacitor
- Maintenance-free lightning protection

Operating even if grid power is not stable
- The ultracapacitor is used to ensure continued operation at power failure (low voltage ride through).

Safety brake systems – reducing stress on blades and drive train
- Redundant design regarding drive and encoders enables the system to move blades feather position limiting stress on blades - even if a single axle drive should become defect.
- Watchdog function ensures that the wind turbine is stopped in case communication with main controller fails

Full operation under all climate conditions: -40°C to +50°C, dust, moisture, and lightning
- Ultracapacitors provide power for startup at very low temperatures
- Special coating on printed circuit boards
- Hub controller cabinets manufactured to ensure IP54 or IP65 compliance
- The combination of components selected for cold climate and heating elements assure rapid start-up even at a temperature of -40°C and immediate start-up above -25°C.
Electrical Pitch System

Details of control cabinet

Customizable to different PLC brands

Strikesorb lightning protection

Service friendly assembly

Customizable to Harting, Roxtec or cable gland connectors
Details of drive cabinet

- Cooling by means of conduction and/or convection technology
- Heating elements and ultracapacitor monitor
- Strikesorb lightning protection
- Service friendly assembly
- Customizable to Harting, Roxtec or cable gland connectors
**AC servo motor**

Contained in a closed housing; unlike the AC induction motor the AC servo motor does not need a fan for cooling of windings. The peak torque of the AC servo motor is available from zero to maximum speed.

**Servo motor drive**

Industry leading drive adapted to fit wind turbine harsh mechanical and wide temperature requirements. Delivers peak current 3 times rated current for 1.5 MW turbine. Cooled by means of conductive and convective cooling technologies. Programmable in high level language.

**Limit switch**

Robust construction and the use of high quality, corrosion resistant materials, precision finishing and protection class IP 67 according to IEC 60529 guarantee trouble-free and reliable operation under the toughest conditions.

**Redundant 2nd absolute encoder for pitch system**

This compact absolute encoder is adapted specifically for use in electrical pitch systems. The encoder not only comprises its particularly rugged enclosure, but also rigid ball bearings suitable for running the shaft connected directly with pinion gear on the blade of a wind turbine.

**Blind hollow shaft pitch encoder for installation on motor**

To prevent magnetic field influence when installed at the pitch motor, the encoder uses optic reading technology. For easy mounting the encoders are offered with blind hollow shaft assembly directly on the motor shaft.

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**Data sheet**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
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</thead>
<tbody>
<tr>
<td>Mains power supply</td>
<td>3 x 400 V AC</td>
</tr>
<tr>
<td>Interface to turbine controller</td>
<td>Customizable to CANopen, Profinbus or other industry standard field bus system</td>
</tr>
<tr>
<td>Motor types supported</td>
<td>AC induction or servo</td>
</tr>
<tr>
<td>Continuous current for motor</td>
<td>24 Amp (upgradable to 48 Amp)</td>
</tr>
<tr>
<td>Peak current for motor</td>
<td>48 Amp (upgradable to 96 Amp)</td>
</tr>
<tr>
<td>Minimum ambient temperature for operation</td>
<td>Different choice of components and cooling method allows for operation in the range of -40°C to +50°C</td>
</tr>
<tr>
<td>Pitch acceleration</td>
<td>Software configurable</td>
</tr>
<tr>
<td>Gear ratio (blade bearing to drive motor)</td>
<td>Software configurable</td>
</tr>
<tr>
<td>Cabinet physical dimensions</td>
<td>Customizable to customer request</td>
</tr>
<tr>
<td>Connectors between cabinets</td>
<td>Customizable to customer request</td>
</tr>
<tr>
<td>Motor drive cooling method</td>
<td>Convection or upon request conduction by means of cold plate</td>
</tr>
</tbody>
</table>
Electrical Pitch System

for all climate conditions