REpower Systems


# MM70

The reliable 2-megawatt power plant
with 70 meter rotor diameter

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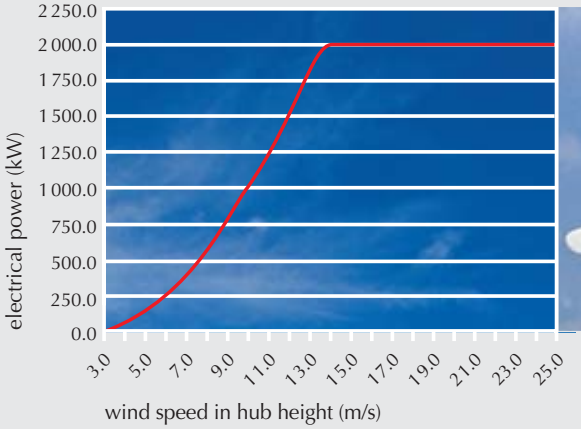
The MM series of wind turbines are based on the proven technological concept of the 1.5 megawatt MD series featuring a variable speed generator-converter system and electrical blade pitch system. Maximum reliability and maximum output also characterize the second generation of these powerful power plants. Due to its trend-setting technological concept and innovative detail solutions REpower wind turbines can be optimally integrated into the existing power network.

Taking all details into account the MM series offers excellent profitability over its whole life cycle.

With a swept area of 3,850 square meters and hub heights ranging between 65 and 80 meters, the MM70 is optimally designed for use in regions with particularly high wind speeds.

## Power curve

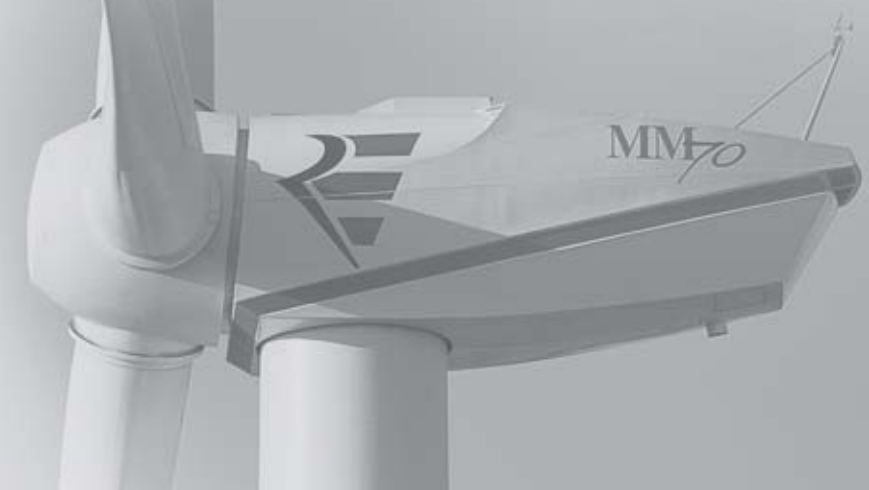



## Long-term reliability, high revenue and profitability

With REpower wind turbines you have decided in favour of advanced technology. To ensure that the value of this investment is maintained in the long term, we offer you holistic high-performance service concepts paired with superior technology of the highest quality.

With our Permanent-Monitoring-System we monitor your power plants 24 hours a day, every day of the year, guaranteeing short rapid response by our competent service teams. Furthermore, our powerful full service Packages, ISP and ISP+, are geared toward the long-term profitability of the wind farm over its entire life time.

For further information either see our specific information brochures or make arrangements for a personal meeting with one of our sales representatives.



# MM70

## Technical data

**Design**

| | |
|---|---|
| Rated power | 2,000 kW |
| Cut-in wind speed | 3.5 m/s |
| Rated wind speed | 13.5 m/s |
| Cut-out wind speed | 25.0 m/s |
| Type class | Up to IEC Ia |

**Rotor**

| | |
|---|---|
| Diameter | 70.0 m |
| Swept area | 3,850 $m^2$ |
| Rotational speed | 10.0 – 20.0 rpm (+16.0 %*) |

**Rotor blade**

| | |
|---|---|
| Length | 34.0 m |
| Design | GRP monocoque construction |

**Yaw system**

| | |
|---|---|
| Design | Four-point contact bearing with external teeth |
| Gearbox | Four drive motors |
| Stabilisation | Disc brake |

**Gearbox**

| | |
|---|---|
| Design | Planetary gear and two parallel gears (helical) |
| *or optionally* | Step planetary gear and one parallel gear (helical) |
| Ratio | i = approx. 90.0 |

**Electric system**

| | |
|---|---|
| Generator design | Four pole doubly fed asynchronous generator |
| Rated power | 2,000 kW |
| Rated voltage | 690 V |
| Rotational speed | 900 – 1,800 rpm (+16.5 %) |
| Generator protection class | IP 54 |
| Inverter | Pulse width modulated IGBT inverters |

**Control system**

| | |
|---|---|
| Principle | Pitch (blade angle) and generator speed control system |

**Tower**

| | |
|---|---|
| Design | Tubular steel tower |
| Hub heights | 65 / 80 m |

**Foundation**

Reinforced concrete foundation, adapted to site conditions

**Safety system**

- Independent electric fail-safe blade pitch systems
- Comprehensive temperature and rotational speed sensor system, incorporating redundancy
- Fully integrated zone concept for lightning protection
- Power transmission rails and shielded cables to protect man and machine
- Rotor holding brake with soft-brake function

* depending on the hub height

**Rotor bearing and rotor shaft**
- Spherical roller bearing with optimised, high performance bearing housing and permanent lubrication for maximum life
- Forged rotor shaft, made of high-grade steel, incorporating radii to relieve stress concentration

**Gearbox**
- Planetary gear and two parallel gears (helical) *or optionally* step planetary gear and one parallel gear (helical)
- Configuration according to REpower gearbox requirements with maximum requirements regarding life and running smoothness
- Optimised efficiency
- Torque support arm incorporated an elastomer bearing to decouple transient noise & vibration from the nacelle structure
- Low temperature level by efficient oil-cooling system
- Three-phase oil filtering system for maximum oil quality

**Holding brake**
- Reliable standstill of rotor by generously configured disc brake
- Protection of gearbox by soft-brake function





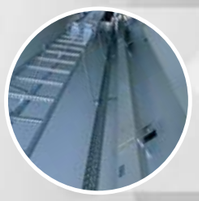
**Generator / inverter**
- Output-optimised variable speed range
- A maximum of 20 % only of the total power passes through the inverter, minimising losses and increasing efficiency
- Fully enclosed generator with air-air-heat exchanger
- Optimum temperature level in the generator even in the event of raised outer temperatures

**Lightning protection**
- Zone concept for lightning protection in line with IEC regulation with inner and outer lightning protection
- Outer lightning protection by blade receptors and lightning rod at anemometry mast
- Reliable protection of bearings by defined lightning conductor path
- GRP coupling to electrically isolate the generator system from the gearbox
- Over-voltage conductor to protect the electric system
- Reliable protection of generator by isolated bearing seats

**Azimuth**
- Four-point contact bearing with external teeth, driven by four large high-grade drive motors
- Holding brakes with fail-safe function by hydraulic pressure accumulator relieve the strain on the drives in idle position and stabilize the nacelle
- Minimum friction of the four-point contact bearing and ventilation of brakes in tracking

**Pitch system**
- Electric system requiring low maintenance
- High quality, large-scale dimensioned blade bearings with permanent track lubrication
- Spinner protected against climatic exposure by integrated deflector labyrinth
- Maximum reliability by two independent measuring systems providing redundant pitch angle measurement
- „Fail-safe“ system by independent control of each rotor blade

**Rotor hub**
- Radii in all corners facilitate a compact yet rigid and robust design
- Optimum integration of pitch drives
- Hub can be accessed comfortably and safely from within the nacelle, as opposed to only externally



**Conductor rail**
- Avoidance of interference radiation in the turbine
- Optimum protection in the case of a short-circuit or fire

**Tubular towers**
- Natural frequency of tower above rotary frequency of rotor – stiff design – guarantees minimum impact on tower and machine
- Utilisation of full speed range of turbine, as no frequency interaction
- Maximum component security by L-flange and use-optimised door section

**Environment**
- No leaking lubrication from hub or nacelle by
  - Labyrinth in the spinner,
  - Grease traps and oil sumps integrated into the machine carrier
  - Threshold edges in nacelle panelling and
  - Oil tray under azimuth tooth system
- Closed system for central lubrication of blade bearings
- Protection of man and machine by shielding all relevant cables and using conductor rails

**Service-friendliness**
- Sufficient space in nacelle for reliable service tuned to ergonomic requirements
- Weather-independent convenient access to the hub without leaving the nacelle
- Optimum accessibility of all components
- Enclosure of all rotating components guarantees safe & reliable service
- In the case of necessity, extensive dismantling possibilities within the turbine

# The REpower sales-teams are at your disposal.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| | 48/600 | 48/750 | MD70 | MD77 | MM70 | MM82 | 5M |
|---|---|---|---|---|---|---|---|
| Nominal power | 600 kW | 750 kW | 1,500 kW | 1,500 kW | 2,000 kW | 2,000 kW | 5,000 kW |
| Rotor diameter | 48.4 m | 48.4 m | 70.0 m | 77.0 m | 70.0 m | 82.0 m | 126.0 m |