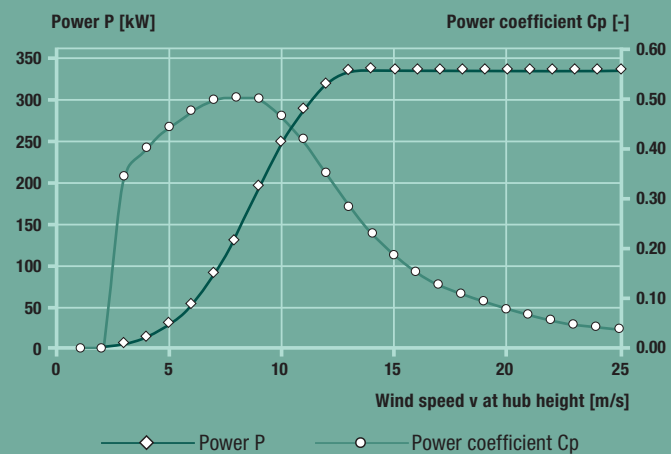




# E33

330 kW

## Calculated power curve



| Wind [m/s] | Power P [kW] | Power coefficient Cp [-] |
|------------|--------------|--------------------------|
| 1          | 0.0          | 0.00                     |
| 2          | 0.0          | 0.00                     |
| 3          | 5.0          | 0.35                     |
| 4          | 13.7         | 0.40                     |
| 5          | 30.0         | 0.45                     |
| 6          | 55.0         | 0.47                     |
| 7          | 92.0         | 0.50                     |
| 8          | 138.0        | 0.50                     |
| 9          | 196.0        | 0.50                     |
| 10         | 250.0        | 0.47                     |
| 11         | 292.8        | 0.41                     |
| 12         | 320.0        | 0.35                     |
| 13         | 335.0        | 0.28                     |
| 14         | 335.0        | 0.23                     |
| 15         | 335.0        | 0.18                     |
| 16         | 335.0        | 0.15                     |
| 17         | 335.0        | 0.13                     |
| 18         | 335.0        | 0.11                     |
| 19         | 335.0        | 0.09                     |
| 20         | 335.0        | 0.08                     |
| 21         | 335.0        | 0.07                     |
| 22         | 335.0        | 0.06                     |
| 23         | 335.0        | 0.05                     |
| 24         | 335.0        | 0.05                     |
| 25         | 335.0        | 0.04                     |

ρ = 1,225 kg/m<sup>3</sup>

For more information on the ENERCON power curve, please see the last page.



**Trademark note**  
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## Technical specifications E-33

|                   |                            |
|-------------------|----------------------------|
| Rated power:      | 330 kW                     |
| Rotor diameter:   | 33.4 m                     |
| Hub height:       | 37 m / 44 m / 49 m / 50 m  |
| Wind zone (DIBt): | WZ III                     |
| Wind class (IEC): | IEC/NVN IA and IEC/NVN IIA |

|                     |   |
|---------------------|---|
| <b>WEC concept:</b> | Gearless, variable speed<br>Single blade adjustment |
|---------------------|---|

### Rotor

|                       |   |
|-----------------------|---|
| Type:                 | Upwind rotor with active pitch control  |
| Rotational direction: | Clockwise   |
| No. of blades:        | 3   |
| Swept area:           | 876 m <sup>2</sup>  |
| Blade material:       | GRP (epoxy resin);<br>Built-in lightning protection   |
| Rotational speed:     | Variable, 18–45 rpm   |
| Pitch control:        | ENERCON single blade pitch system;<br>one independent pitch system per rotor<br>blade with allocated emergency supply |

### Drive train with generator

|               |  |
|---------------|--|
| Hub:          | Rigid                                  |
| Main bearing: | Tapered roller bearing pair            |
| Generator:    | ENERCON direct-drive annular generator |

### Grid feed:

ENERCON inverter

### Brake systems:

- 3 independent pitch control systems with emergency power supply
- Rotor brake
- Rotor lock

### Yaw system:

Active via yaw gear,  
load-dependent damping

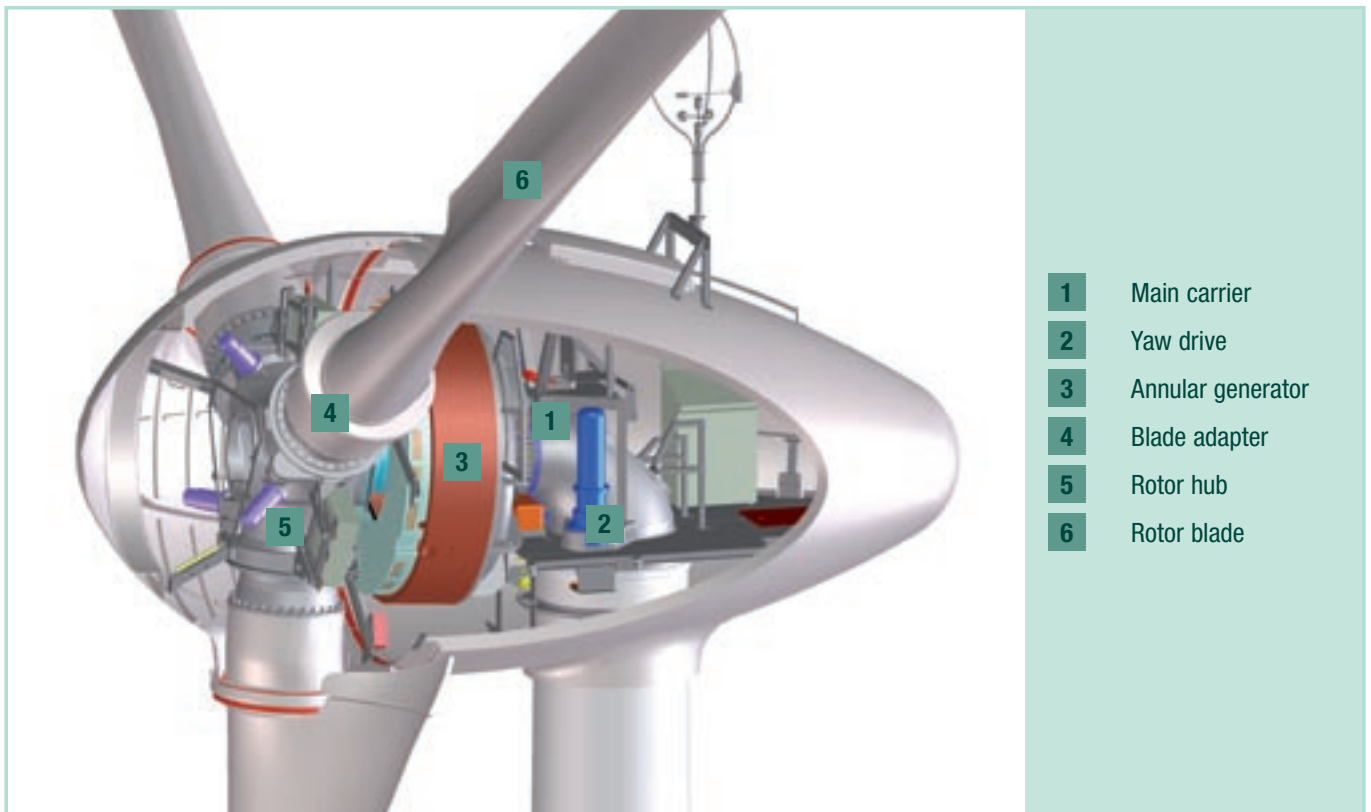
### Cut-out wind speed:

28–34 m/s  
(with ENERCON storm control\*)

### Remote monitoring:

ENERCON SCADA

\*For more information on the ENERCON storm control feature, please see the last page.



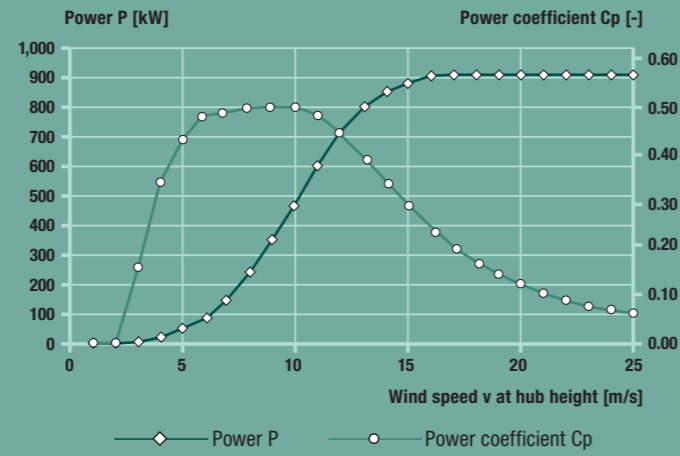
- 1** Main carrier
- 2** Yaw drive
- 3** Annular generator
- 4** Blade adapter
- 5** Rotor hub
- 6** Rotor blade

# E44

900 kW



## Calculated power curve



| Wind [m/s] | Power P [kW] | Power coefficient Cp [-] |
|------------|--------------|--------------------------|
| 1          | 0.0          | 0.00                     |
| 2          | 0.0          | 0.00                     |
| 3          | 4.0          | 0.16                     |
| 4          | 20.0         | 0.34                     |
| 5          | 50.0         | 0.43                     |
| 6          | 96.0         | 0.48                     |
| 7          | 156.0        | 0.49                     |
| 8          | 238.0        | 0.50                     |
| 9          | 340.0        | 0.50                     |
| 10         | 466.0        | 0.50                     |
| 11         | 600.0        | 0.48                     |
| 12         | 710.0        | 0.44                     |
| 13         | 790.0        | 0.39                     |
| 14         | 850.0        | 0.33                     |
| 15         | 880.0        | 0.28                     |
| 16         | 905.0        | 0.24                     |
| 17         | 910.0        | 0.20                     |
| 18         | 910.0        | 0.17                     |
| 19         | 910.0        | 0.14                     |
| 20         | 910.0        | 0.12                     |
| 21         | 910.0        | 0.11                     |
| 22         | 910.0        | 0.09                     |
| 23         | 910.0        | 0.08                     |
| 24         | 910.0        | 0.07                     |
| 25         | 910.0        | 0.06                     |

$\rho = 1.225 \text{ kg/m}^3$

For more information on the ENERCON power curve, please see the last page.

## Technical specifications E-44

Rated power: 900 kW  
 Rotor diameter: 44 m  
 Hub height: 45 m / 55 m / 65 m  
 Wind class (IEC): IEC/NVN IA

**WEC concept:** Gearless, variable speed  
 Single blade adjustment

**Rotor**  
 Type: Upwind rotor with active pitch control  
 Rotational direction: Clockwise  
 No. of blades: 3  
 Swept area: 1,521 m<sup>2</sup>  
 Blade material: GRP (epoxy resin);  
 Built-in lightning protection  
 Rotational speed: Variable, 12–34 rpm  
 Pitch control: ENERCON single blade pitch system;  
 one independent pitch system per rotor  
 blade with allocated emergency supply

### Drive train with generator

Hub: Rigid  
 Main bearing: Tapered roller bearing pair  
 Generator: ENERCON direct-drive annular generator

**Grid feed:** ENERCON inverter

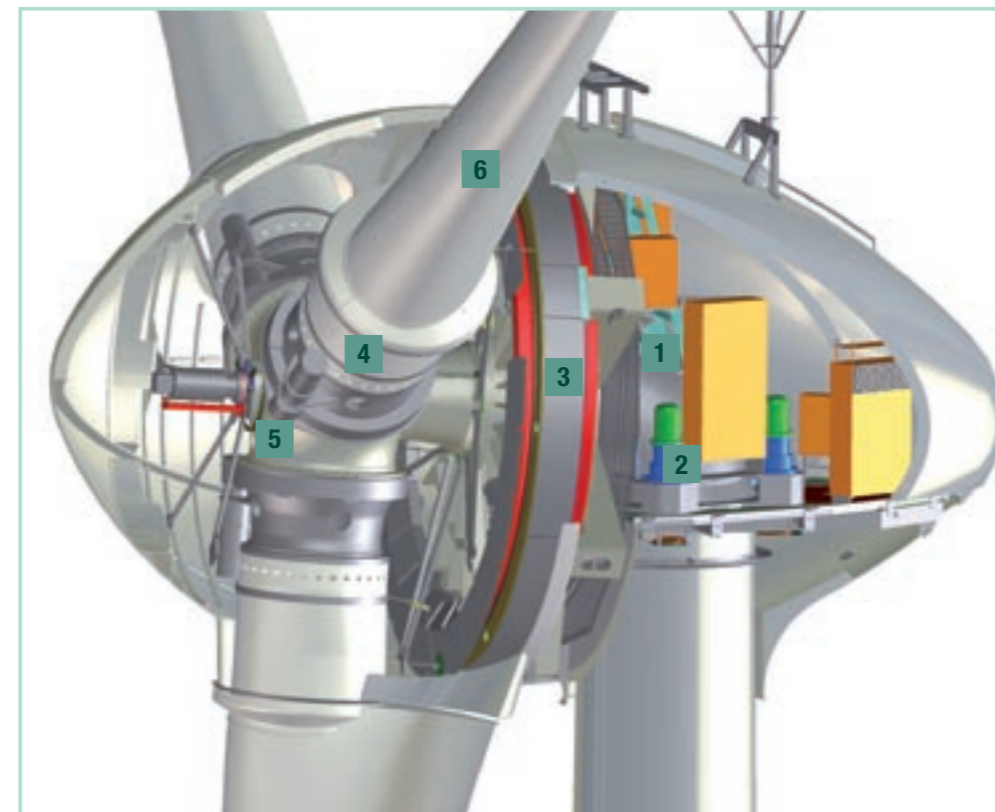
**Brake systems:** – 3 independent pitch control systems  
 with emergency power supply  
 – Rotor brake  
 – Rotor lock

**Yaw system:** Active via yaw gear,  
 load-dependent damping

**Cut-out wind speed:** 28–34 m/s  
 (with ENERCON storm control\*)

**Remote monitoring:** ENERCON SCADA

\*For more information on the ENERCON storm control feature, please see the last page.



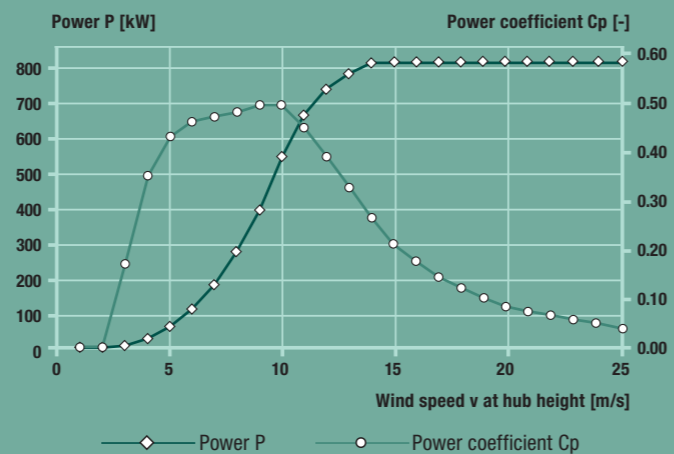
- 1 Main carrier
- 2 Yaw drive
- 3 Annular generator
- 4 Blade adapter
- 5 Rotor hub
- 6 Rotor blade

# E48

800 kW



## Calculated power curve



| Wind [m/s] | Power P [kW] | Power coefficient Cp [-] |
|------------|--------------|--------------------------|
| 1          | 0.0          | 0.00                     |
| 2          | 0.0          | 0.00                     |
| 3          | 5.0          | 0.17                     |
| 4          | 25.0         | 0.35                     |
| 5          | 60.0         | 0.43                     |
| 6          | 110.0        | 0.46                     |
| 7          | 180.0        | 0.47                     |
| 8          | 275.0        | 0.48                     |
| 9          | 400.0        | 0.50                     |
| 10         | 555.0        | 0.50                     |
| 11         | 671.0        | 0.45                     |
| 12         | 750.0        | 0.39                     |
| 13         | 790.0        | 0.32                     |
| 14         | 810.0        | 0.27                     |
| 15         | 810.0        | 0.22                     |
| 16         | 810.0        | 0.18                     |
| 17         | 810.0        | 0.15                     |
| 18         | 810.0        | 0.13                     |
| 19         | 810.0        | 0.11                     |
| 20         | 810.0        | 0.09                     |
| 21         | 810.0        | 0.08                     |
| 22         | 810.0        | 0.07                     |
| 23         | 810.0        | 0.06                     |
| 24         | 810.0        | 0.05                     |
| 25         | 810.0        | 0.05                     |

$\rho = 1.225 \text{ kg/m}^3$

For more information on the ENERCON power curve, please see the last page.

## Technical specifications E-48

Rated power: 800 kW  
 Rotor diameter: 48 m  
 Hub height: 50 m / 60 m / 75 m / 76 m  
 Wind zone (DIBT): WZ III  
 Wind class (IEC): IEC/NVN IIA

**WEC concept:** Gearless, variable speed  
 Single blade adjustment

**Rotor**  
 Type: Upwind rotor with active pitch control  
 Rotational direction: Clockwise  
 No. of blades: 3  
 Swept area: 1,810 m<sup>2</sup>  
 Blade material: GRP (epoxy resin);  
 Built-in lightning protection  
 Rotational speed: Variable, 16–31 rpm  
 Pitch control: ENERCON single blade pitch system;  
 one independent pitch system per rotor blade with allocated emergency supply

**Drive train with generator**  
 Hub: Rigid  
 Main bearing: Tapered roller bearing pair  
 Generator: ENERCON direct-drive annular generator

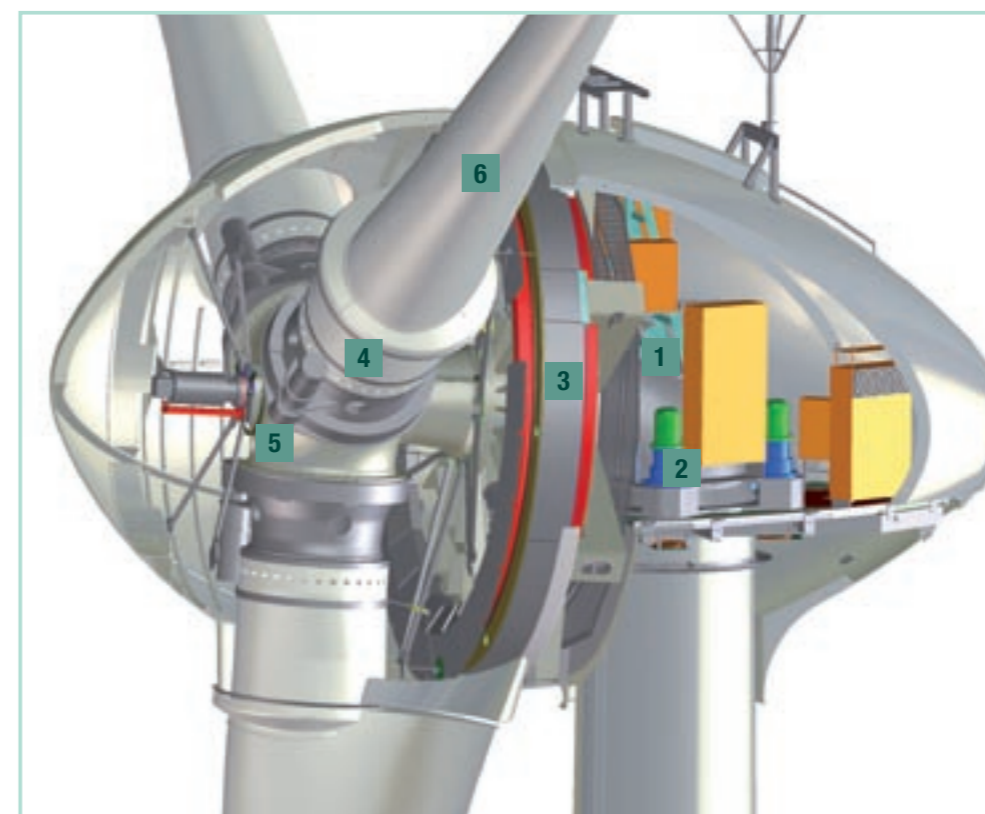
**Grid feed:** ENERCON inverter  
**Brake systems:** – 3 independent pitch control systems with emergency power supply  
 – Rotor brake  
 – Rotor lock

**Yaw system:** Active via yaw gear, load-dependent damping

**Cut-out wind speed:** 28–34 m/s (with ENERCON storm control\*)

**Remote monitoring:** ENERCON SCADA

\*For more information on the ENERCON storm control feature, please see the last page.



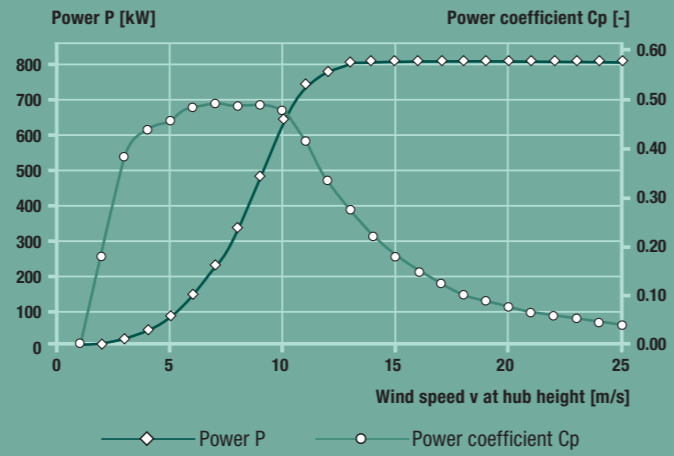
- 1 Main carrier
- 2 Yaw drive
- 3 Annular generator
- 4 Blade adapter
- 5 Rotor hub
- 6 Rotor blade

# E53

## 800 kW



### Calculated power curve



| Wind [m/s] | Power P [kW] | Power coefficient Cp [-] |
|------------|--------------|--------------------------|
| 1          | 0.0          | 0.00                     |
| 2          | 2.0          | 0.19                     |
| 3          | 14.0         | 0.39                     |
| 4          | 38.0         | 0.44                     |
| 5          | 77.0         | 0.46                     |
| 6          | 141.0        | 0.48                     |
| 7          | 228.0        | 0.49                     |
| 8          | 336.0        | 0.49                     |
| 9          | 480.0        | 0.49                     |
| 10         | 645.0        | 0.48                     |
| 11         | 744.0        | 0.42                     |
| 12         | 780.0        | 0.34                     |
| 13         | 810.0        | 0.27                     |
| 14         | 810.0        | 0.22                     |
| 15         | 810.0        | 0.18                     |
| 16         | 810.0        | 0.15                     |
| 17         | 810.0        | 0.12                     |
| 18         | 810.0        | 0.10                     |
| 19         | 810.0        | 0.09                     |
| 20         | 810.0        | 0.08                     |
| 21         | 810.0        | 0.06                     |
| 22         | 810.0        | 0.06                     |
| 23         | 810.0        | 0.05                     |
| 24         | 810.0        | 0.04                     |
| 25         | 810.0        | 0.04                     |

$\rho = 1.225 \text{ kg/m}^3$

For more information on the ENERCON power curve, please see the last page.

### Technical specifications E-53

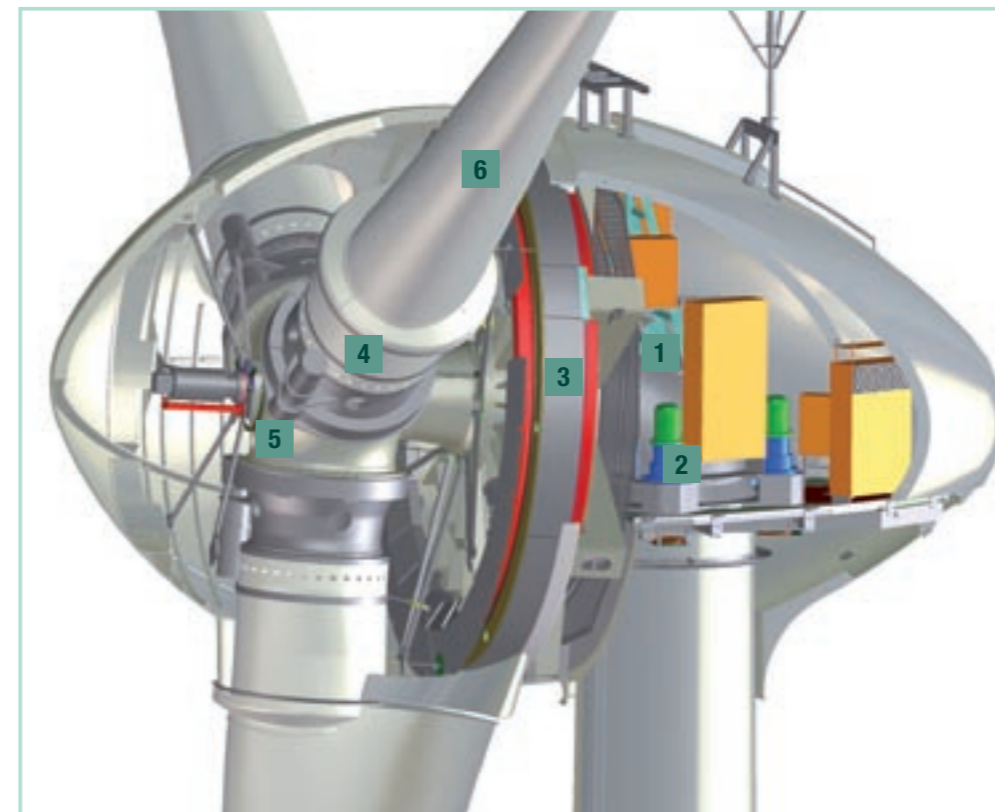
Rated power: 800 kW  
 Rotor diameter: 52.9 m  
 Hub height: 60 m / 73 m / 75 m  
 Wind zone (DIBT): WZ II exp  
 Wind class (IEC): IEC/NVN Class S  
 ( $V_{av} = 7.5 \text{ m/s}$ ,  $V_{ext} = 57 \text{ m/s}$ )

**WEC concept:** Gearless, variable speed  
 Single blade adjustment

**Rotor**  
 Type: Upwind rotor with active pitch control  
 Rotational direction: Clockwise  
 No. of blades: 3  
 Swept area: 2,198 m<sup>2</sup>  
 Blade material: GRP (epoxy resin);  
 Built-in lightning protection  
 Rotational speed: Variable, 12–28.3 rpm  
 Pitch control: ENERCON single blade pitch system;  
 one independent pitch system per rotor blade with allocated emergency supply

**Drive train with generator**  
 Hub: Rigid  
 Main bearing: Tapered roller bearing pair  
 Generator: ENERCON direct-drive annular generator  
**Grid feed:** ENERCON inverter  
**Brake systems:** – 3 independent pitch control systems with emergency power supply  
 – Rotor brake  
 – Rotor lock  
**Yaw system:** Active via yaw gear, load-dependent damping  
**Cut-out wind speed:** 28–34 m/s (with ENERCON storm control\*)  
**Remote monitoring:** ENERCON SCADA

\*For more information on the ENERCON storm control feature, please see the last page.



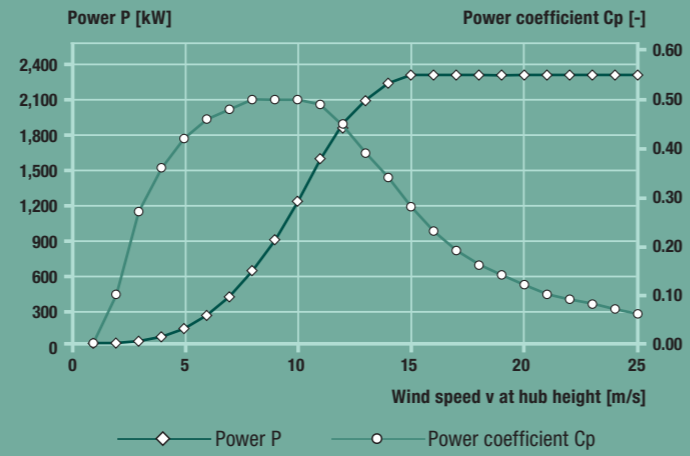
- 1 Main carrier
- 2 Yaw drive
- 3 Annular generator
- 4 Blade adapter
- 5 Rotor hub
- 6 Rotor blade

# E70

2,300 kW



## Calculated power curve



| Wind [m/s] | Power P [kW] | Power coefficient Cp [-] |
|------------|--------------|--------------------------|
| 1          | 0.0          | 0.00                     |
| 2          | 2.0          | 0.10                     |
| 3          | 18.0         | 0.27                     |
| 4          | 56.0         | 0.36                     |
| 5          | 127.0        | 0.42                     |
| 6          | 240.0        | 0.46                     |
| 7          | 400.0        | 0.48                     |
| 8          | 626.0        | 0.50                     |
| 9          | 892.0        | 0.50                     |
| 10         | 1,223.0      | 0.50                     |
| 11         | 1,590.0      | 0.49                     |
| 12         | 1,900.0      | 0.45                     |
| 13         | 2,080.0      | 0.39                     |
| 14         | 2,230.0      | 0.34                     |
| 15         | 2,300.0      | 0.28                     |
| 16         | 2,310.0      | 0.23                     |
| 17         | 2,310.0      | 0.19                     |
| 18         | 2,310.0      | 0.16                     |
| 19         | 2,310.0      | 0.14                     |
| 20         | 2,310.0      | 0.12                     |
| 21         | 2,310.0      | 0.10                     |
| 22         | 2,310.0      | 0.09                     |
| 23         | 2,310.0      | 0.08                     |
| 24         | 2,310.0      | 0.07                     |
| 25         | 2,310.0      | 0.06                     |

$\rho = 1.225 \text{ kg/m}^3$

For more information on the ENERCON power curve, please see the last page.

## Technical specifications E-70 E4

Rated power: 2,300 kW  
 Rotor diameter: 71 m  
 Hub height: 57 m / 64 m / 85 m / 98 m / 113 m  
 Wind zone (DIBt): WZ III  
 Wind class (IEC): IEC/NVN IA and IEC/NVN IIA

**WEC concept:** Gearless, variable speed  
 Single blade adjustment

**Rotor**  
 Type: Upwind rotor with active pitch control  
 Rotational direction: Clockwise  
 No. of blades: 3  
 Swept area: 3,959 m<sup>2</sup>  
 Blade material: GRP (epoxy resin);  
 Built-in lightning protection  
 Rotational speed: Variable, 6–21.5 rpm  
 Pitch control: ENERCON single blade pitch system;  
 one independent pitch system per rotor blade with allocated emergency supply

### Drive train with generator

Hub: Rigid  
 Main bearing: Double-row tapered/cylindrical roller bearings  
 Generator: ENERCON direct-drive annular generator

**Grid feed:** ENERCON inverter

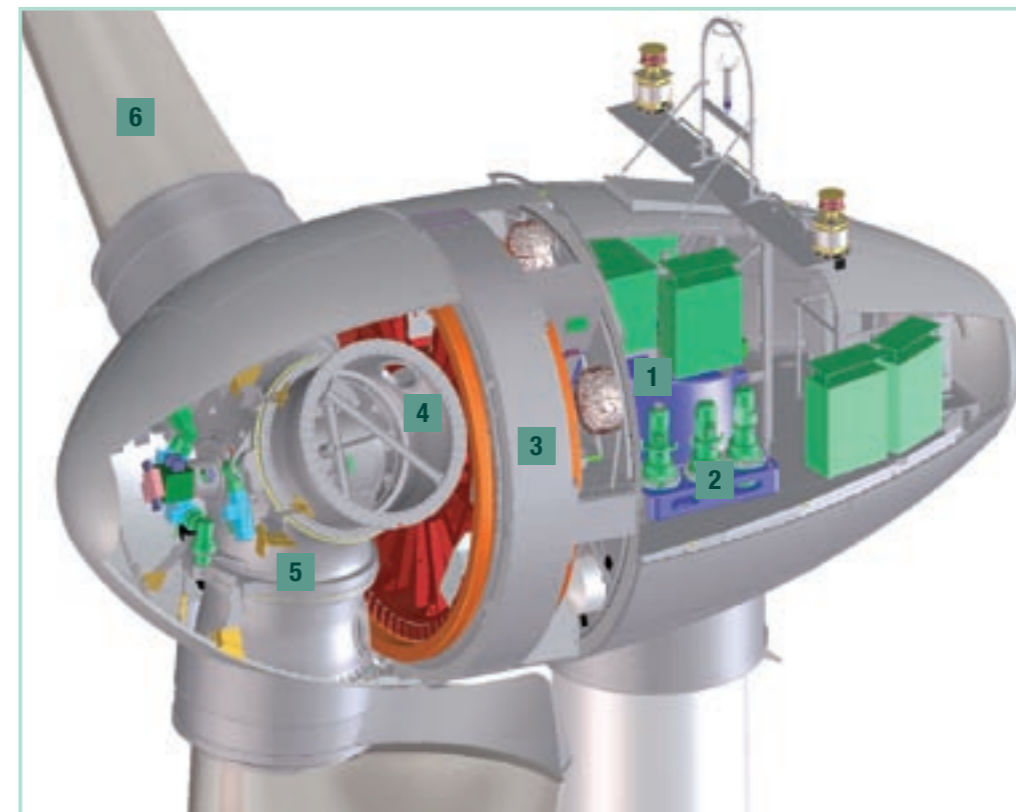
**Brake systems:** – 3 independent pitch control systems with emergency power supply  
 – Rotor brake  
 – Rotor lock

**Yaw system:** Active via yaw gear, load-dependent damping

**Cut-out wind speed:** 28–34 m/s (with ENERCON storm control\*)

**Remote monitoring:** ENERCON SCADA

\*For more information on the ENERCON storm control feature, please see the last page.



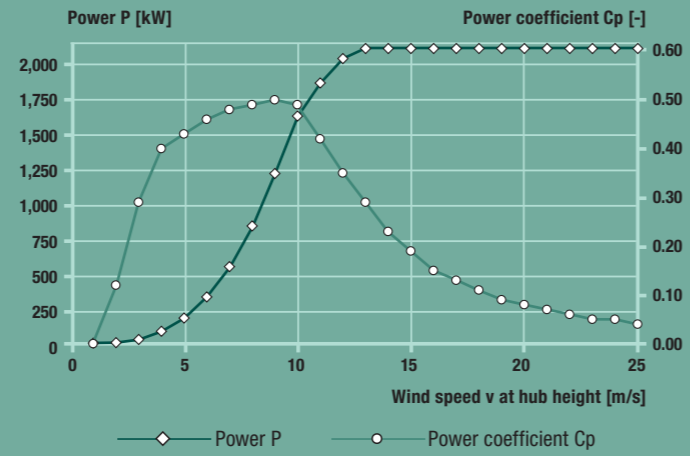
- 1 Main carrier
- 2 Yaw drive
- 3 Annular generator
- 4 Blade adapter
- 5 Rotor hub
- 6 Rotor blade

# E82

2,000 kW



## Calculated power curve



| Wind [m/s] | Power P [kW] | Power coefficient Cp [-] |
|------------|--------------|--------------------------|
| 1          | 0.0          | 0.00                     |
| 2          | 3.0          | 0.12                     |
| 3          | 25.0         | 0.29                     |
| 4          | 82.0         | 0.40                     |
| 5          | 174.0        | 0.43                     |
| 6          | 321.0        | 0.46                     |
| 7          | 532.0        | 0.48                     |
| 8          | 815.0        | 0.49                     |
| 9          | 1,180.0      | 0.50                     |
| 10         | 1,580.0      | 0.49                     |
| 11         | 1,810.0      | 0.42                     |
| 12         | 1,980.0      | 0.35                     |
| 13         | 2,050.0      | 0.29                     |
| 14         | 2,050.0      | 0.23                     |
| 15         | 2,050.0      | 0.19                     |
| 16         | 2,050.0      | 0.15                     |
| 17         | 2,050.0      | 0.13                     |
| 18         | 2,050.0      | 0.11                     |
| 19         | 2,050.0      | 0.09                     |
| 20         | 2,050.0      | 0.08                     |
| 21         | 2,050.0      | 0.07                     |
| 22         | 2,050.0      | 0.06                     |
| 23         | 2,050.0      | 0.05                     |
| 24         | 2,050.0      | 0.05                     |
| 25         | 2,050.0      | 0.04                     |

$\rho = 1.225 \text{ kg/m}^3$

For more information on the ENERCON power curve, please see the last page.

## Technical specifications E-82 E2

Rated power: 2,000 kW  
 Rotor diameter: 82 m  
 Hub height: 78 m / 85 m / 98 m / 108 m / 138 m  
 Wind zone (DIBT): WZ III  
 Wind class (IEC): IEC/NVN IIA

**WEC concept:** Gearless, variable speed  
 Single blade adjustment

**Rotor**  
 Type: Upwind rotor with active pitch control  
 Rotational direction: Clockwise  
 No. of blades: 3  
 Swept area: 5,281 m<sup>2</sup>  
 Blade material: GRP (epoxy resin);  
 Built-in lightning protection  
 Rotational speed: Variable, 6–18 rpm  
 Pitch control: ENERCON single blade pitch system;  
 one independent pitch system per rotor blade with allocated emergency supply

### Drive train with generator

Hub: Rigid  
 Main bearing: Double-row tapered/cylindrical roller bearings  
 Generator: ENERCON direct-drive annular generator

**Grid feed:** ENERCON inverter

**Brake systems:** – 3 independent pitch control systems with emergency power supply

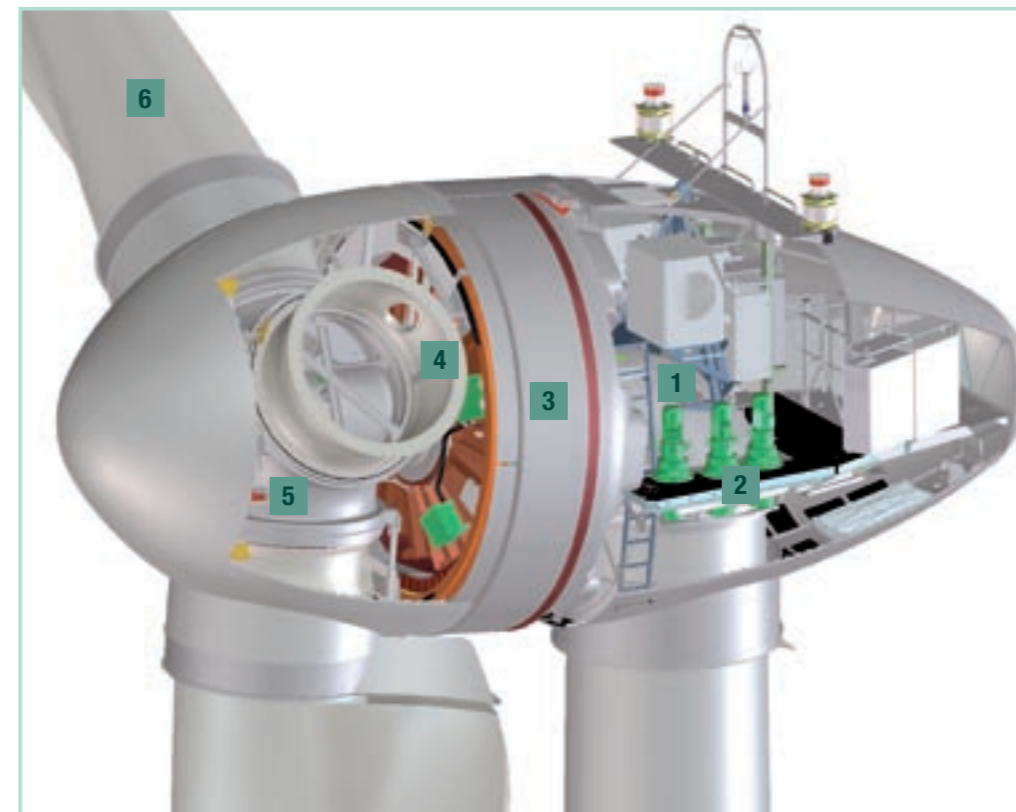
– Rotor brake  
 – Rotor lock

**Yaw system:** Active via yaw gear, load-dependent damping

**Cut-out wind speed:** 28–34 m/s (with ENERCON storm control\*)

**Remote monitoring:** ENERCON SCADA

\*For more information on the ENERCON storm control feature, please see the last page.



- 1 Main carrier
- 2 Yaw drive
- 3 Annular generator
- 4 Blade adapter
- 5 Rotor hub
- 6 Rotor blade

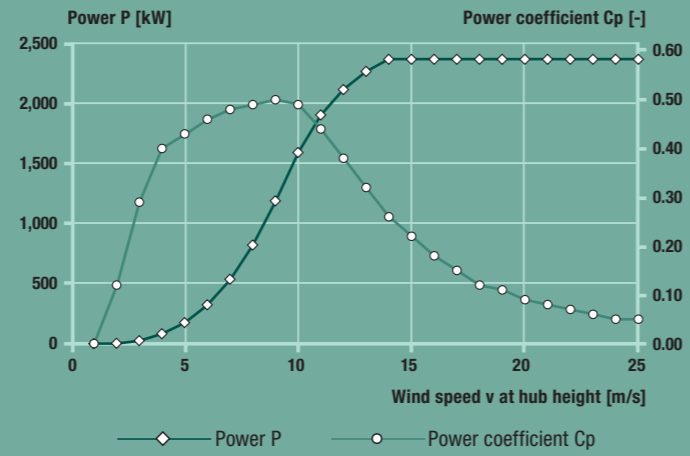


# E82

2,300 kW



## Calculated power curve



| Wind [m/s] | Power P [kW] | Power coefficient Cp [-] |
|------------|--------------|--------------------------|
| 1          | 0.0          | 0.00                     |
| 2          | 3.0          | 0.12                     |
| 3          | 25.0         | 0.29                     |
| 4          | 82.0         | 0.40                     |
| 5          | 174.0        | 0.43                     |
| 6          | 321.0        | 0.46                     |
| 7          | 532.0        | 0.48                     |
| 8          | 815.0        | 0.49                     |
| 9          | 1,180.0      | 0.50                     |
| 10         | 1,580.0      | 0.49                     |
| 11         | 1,890.0      | 0.44                     |
| 12         | 2,100.0      | 0.38                     |
| 13         | 2,250.0      | 0.32                     |
| 14         | 2,350.0      | 0.26                     |
| 15         | 2,350.0      | 0.22                     |
| 16         | 2,350.0      | 0.18                     |
| 17         | 2,350.0      | 0.15                     |
| 18         | 2,350.0      | 0.12                     |
| 19         | 2,350.0      | 0.11                     |
| 20         | 2,350.0      | 0.09                     |
| 21         | 2,350.0      | 0.08                     |
| 22         | 2,350.0      | 0.07                     |
| 23         | 2,350.0      | 0.06                     |
| 24         | 2,350.0      | 0.05                     |
| 25         | 2,350.0      | 0.05                     |

$\rho = 1.225 \text{ kg/m}^3$

For more information on the ENERCON power curve, please see the last page.

## Technical specifications E-82 E2

Rated power: 2,300 kW  
 Rotor diameter: 82 m  
 Hub height: 78 m / 85 m / 98 m / 108 m / 138 m  
 Wind zone (DIBt): WZ III  
 Wind class (IEC): IEC/NVN IIA

**WEC concept:** Gearless, variable speed  
 Single blade adjustment

**Rotor**  
 Type: Upwind rotor with active pitch control  
 Rotational direction: Clockwise  
 No. of blades: 3  
 Swept area: 5,281 m<sup>2</sup>  
 Blade material: GRP (epoxy resin);  
 Built-in lightning protection  
 Rotational speed: Variable, 6–18 rpm  
 Pitch control: ENERCON single blade pitch system;  
 one independent pitch system per rotor blade with allocated emergency supply

**Drive train with generator**  
 Hub: Rigid  
 Main bearing: Double-row tapered/cylindrical roller bearings  
 Generator: ENERCON direct-drive annular generator  
**Grid feed:** ENERCON inverter  
**Brake systems:** – 3 independent pitch control systems with emergency power supply  
 – Rotor brake  
 – Rotor lock  
**Yaw system:** Active via yaw gear, load-dependent damping  
**Cut-out wind speed:** 28–34 m/s (with ENERCON storm control\*)  
**Remote monitoring:** ENERCON SCADA

\*For more information on the ENERCON storm control feature, please see the last page.

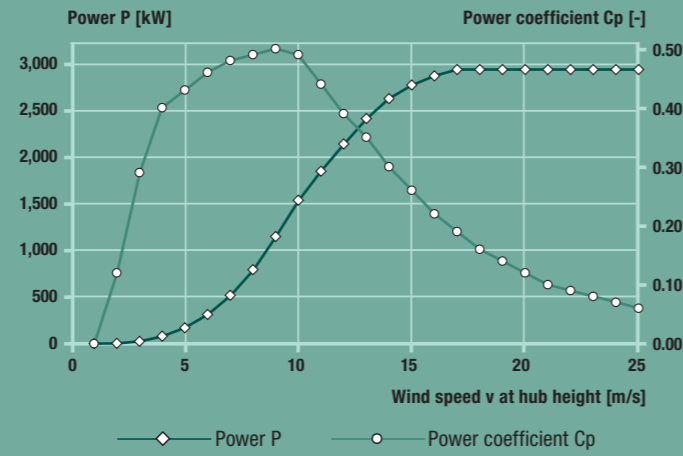


- 1 Main carrier
- 2 Yaw drive
- 3 Annular generator
- 4 Blade adapter
- 5 Rotor hub
- 6 Rotor blade

# E82

## 3,000 kW

### Calculated power curve



| Wind [m/s] | Power P [kW] | Power coefficient Cp [-] |
|------------|--------------|--------------------------|
| 1          | 0.0          | 0.00                     |
| 2          | 3.0          | 0.12                     |
| 3          | 25.0         | 0.29                     |
| 4          | 82.0         | 0.40                     |
| 5          | 174.0        | 0.43                     |
| 6          | 321.0        | 0.46                     |
| 7          | 532.0        | 0.48                     |
| 8          | 815.0        | 0.49                     |
| 9          | 1,180.0      | 0.50                     |
| 10         | 1,580.0      | 0.49                     |
| 11         | 1,900.0      | 0.44                     |
| 12         | 2,200.0      | 0.39                     |
| 13         | 2,480.0      | 0.35                     |
| 14         | 2,700.0      | 0.30                     |
| 15         | 2,850.0      | 0.26                     |
| 16         | 2,950.0      | 0.22                     |
| 17         | 3,020.0      | 0.19                     |
| 18         | 3,020.0      | 0.16                     |
| 19         | 3,020.0      | 0.14                     |
| 20         | 3,020.0      | 0.12                     |
| 21         | 3,020.0      | 0.10                     |
| 22         | 3,020.0      | 0.09                     |
| 23         | 3,020.0      | 0.08                     |
| 24         | 3,020.0      | 0.07                     |
| 25         | 3,020.0      | 0.06                     |

$\rho = 1.225 \text{ kg/m}^3$

For more information on the ENERCON power curve, please see the last page.

### Technical specifications E-82 E3

Rated power: 3,000 kW  
 Rotor diameter: 82 m  
 Hub height: 78 m / 85 m / 98 m / 108 m / 138 m  
 Wind class (IEC): IEC/NVN IA and IEC/NVN IIA

**WEC concept:** Gearless, variable speed  
 Single blade adjustment

**Rotor**  
 Type: Upwind rotor with active pitch control  
 Rotational direction: Clockwise  
 No. of blades: 3  
 Swept area: 5,281 m<sup>2</sup>  
 Blade material: GRP (epoxy resin);  
 Built-in lightning protection  
 Rotational speed: Variable, 6–18.5 rpm  
 Pitch control: ENERCON single blade pitch system;  
 one independent pitch system per rotor blade with allocated emergency supply

#### Drive train with generator

Hub: Rigid  
 Main bearing: Double-row tapered/cylindrical roller bearings  
 Generator: ENERCON direct-drive annular generator

**Grid feed:** ENERCON inverter

**Brake systems:** – 3 independent pitch control systems with emergency power supply  
 – Rotor brake  
 – Rotor lock

**Yaw system:** Active via yaw gear, load-dependent damping

**Cut-out wind speed:** 28–34 m/s (with ENERCON storm control\*)

**Remote monitoring:** ENERCON SCADA

\*For more information on the ENERCON storm control feature, please see the last page.



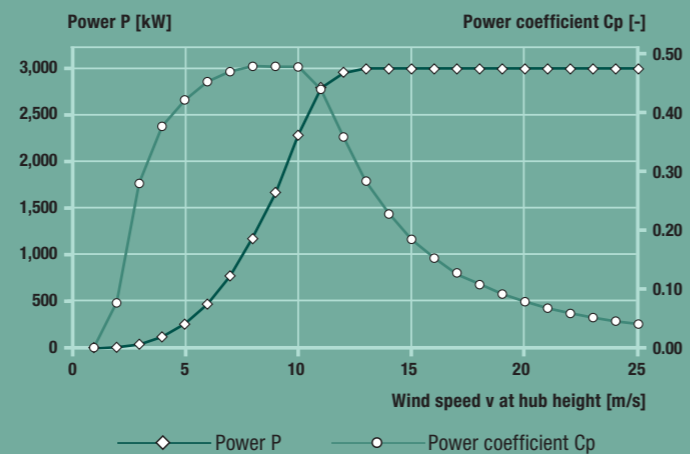
- 1 Main carrier
- 2 Yaw drive
- 3 Annular generator
- 4 Blade adapter
- 5 Rotor hub
- 6 Rotor blade

# E101

3,000 kW



## Calculated power curve



| Wind [m/s] | Power P [kW] | Power coefficient Cp [-] |
|------------|--------------|--------------------------|
| 1          | 0.0          | 0.000                    |
| 2          | 3.0          | 0.076                    |
| 3          | 37.0         | 0.279                    |
| 4          | 118.0        | 0.376                    |
| 5          | 258.0        | 0.421                    |
| 6          | 479.0        | 0.452                    |
| 7          | 790.0        | 0.469                    |
| 8          | 1,200.0      | 0.478                    |
| 9          | 1,710.0      | 0.478                    |
| 10         | 2,340.0      | 0.477                    |
| 11         | 2,867.0      | 0.439                    |
| 12         | 3,034.0      | 0.358                    |
| 13         | 3,050.0      | 0.283                    |
| 14         | 3,050.0      | 0.227                    |
| 15         | 3,050.0      | 0.184                    |
| 16         | 3,050.0      | 0.152                    |
| 17         | 3,050.0      | 0.127                    |
| 18         | 3,050.0      | 0.107                    |
| 19         | 3,050.0      | 0.091                    |
| 20         | 3,050.0      | 0.078                    |
| 21         | 3,050.0      | 0.067                    |
| 22         | 3,050.0      | 0.058                    |
| 23         | 3,050.0      | 0.051                    |
| 24         | 3,050.0      | 0.045                    |
| 25         | 3,050.0      | 0.040                    |

$\rho = 1.225 \text{ kg/m}^3$

For more information on the ENERCON power curve, please see the last page.

## Technical specifications E-101

Rated power: 3,000 kW  
 Rotor diameter: 101 m  
 Hub height: 99 m / 135 m  
 Wind zone (DIBT): WZ III  
 Wind class (IEC): IEC/NVN IIA

**WEC concept:** Gearless, variable speed  
 Single blade adjustment

### Rotor

Type: Upwind rotor with active pitch control  
 Rotational direction: Clockwise  
 No. of blades: 3  
 Swept area: 8,012 m<sup>2</sup>  
 Blade material: GRP (epoxy resin);  
 Built-in lightning protection  
 Rotational speed: Variable, 4–14.5 rpm  
 Pitch control: ENERCON single blade pitch system;  
 one independent pitch system per rotor blade with allocated emergency supply

### Drive train with generator

Hub: Rigid  
 Main bearing: Double-row tapered/cylindrical roller bearings  
 Generator: ENERCON direct-drive annular generator

**Grid feed:** ENERCON inverter

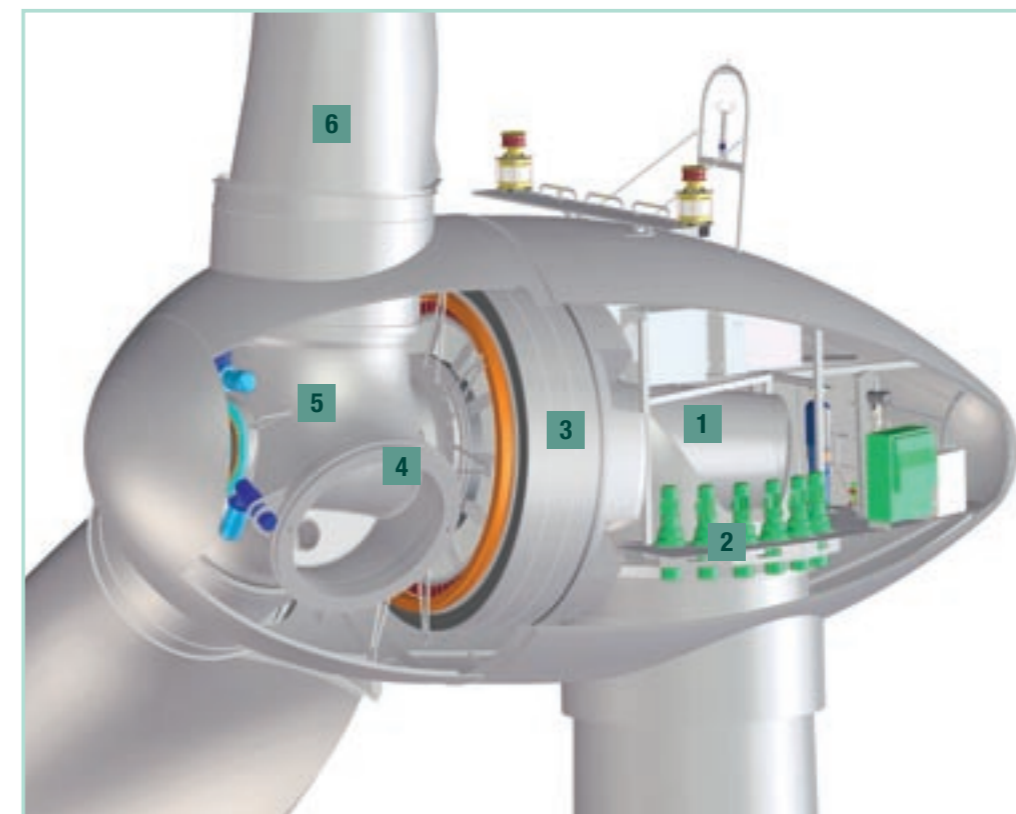
**Brake systems:** – 3 independent pitch control systems with emergency power supply  
 – Rotor brake  
 – Rotor lock, latching (15°)

**Yaw system:** Active via yaw gear, load-dependent damping

**Cut-out wind speed:** 28–34 m/s (with ENERCON storm control\*)

**Remote monitoring:** ENERCON SCADA

\*For more information on the ENERCON storm control feature, please see the last page.



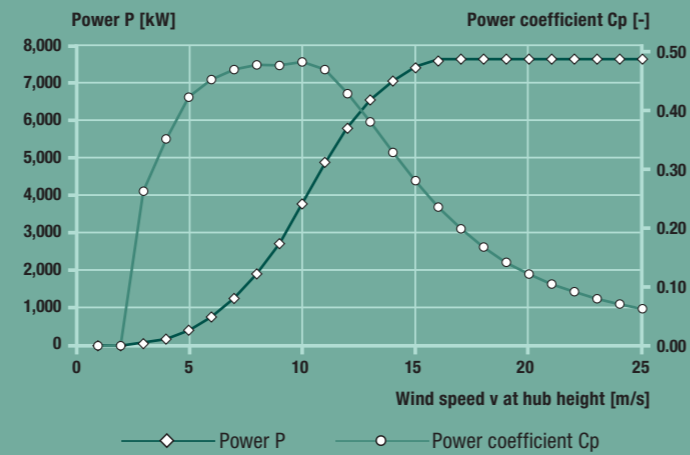
- 1 Main carrier
- 2 Yaw drive
- 3 Annular generator
- 4 Blade adapter
- 5 Rotor hub
- 6 Rotor blade

# E126

7,500 kW



## Calculated power curve



| Wind [m/s] | Power P [kW] | Power coefficient Cp [-] |
|------------|--------------|--------------------------|
| 1          | 0.0          | 0.000                    |
| 2          | 0.0          | 0.000                    |
| 3          | 55.0         | 0.263                    |
| 4          | 175.0        | 0.352                    |
| 5          | 410.0        | 0.423                    |
| 6          | 760.0        | 0.453                    |
| 7          | 1,250.0      | 0.470                    |
| 8          | 1,900.0      | 0.478                    |
| 9          | 2,700.0      | 0.477                    |
| 10         | 3,750.0      | 0.483                    |
| 11         | 4,850.0      | 0.470                    |
| 12         | 5,750.0      | 0.429                    |
| 13         | 6,500.0      | 0.381                    |
| 14         | 7,000.0      | 0.329                    |
| 15         | 7,350.0      | 0.281                    |
| 16         | 7,500.0      | 0.236                    |
| 17         | 7,580.0      | 0.199                    |
| 18         | 7,580.0      | 0.168                    |
| 19         | 7,580.0      | 0.142                    |
| 20         | 7,580.0      | 0.122                    |
| 21         | 7,580.0      | 0.105                    |
| 22         | 7,580.0      | 0.092                    |
| 23         | 7,580.0      | 0.080                    |
| 24         | 7,580.0      | 0.071                    |
| 25         | 7,580.0      | 0.063                    |

$\rho = 1.225 \text{ kg/m}^3$

For more information on the ENERCON power curve, please see the last page.

## Technical specifications E-126

Rated power: 7,500 kW  
 Rotor diameter: 127 m  
 Hub height: 135 m  
 Wind zone (DIBT): WZ III  
 Wind class (IEC): IEC/NVN IA

**WEC concept:** Gearless, variable speed  
 Single blade adjustment

**Rotor**  
 Type: Upwind rotor with active pitch control  
 Rotational direction: Clockwise  
 No. of blades: 3  
 Swept area: 12,668 m<sup>2</sup>  
 Blade material: GRP (epoxy resin)/GRP;  
 GRP (epoxy resin)/steel;  
 Built-in lightning protection  
 Rotational speed: Variable, 5–11.7 rpm  
 Pitch control: ENERCON single blade pitch system;  
 one independent pitch system per rotor  
 blade with allocated emergency supply

### Drive train with generator

Hub: Rigid  
 Main bearing: Single-row tapered roller bearing  
 Generator: ENERCON direct-drive annular generator

**Grid feed:** ENERCON inverter

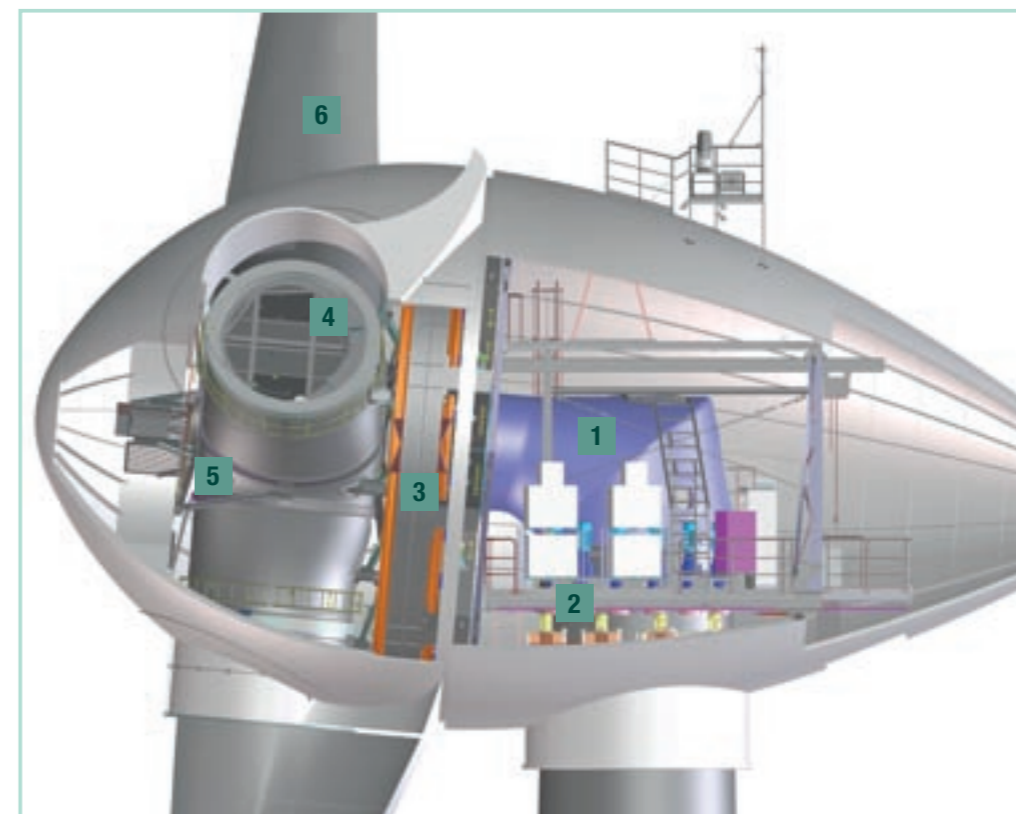
**Brake systems:** – 3 independent pitch control systems  
 with emergency power supply  
 – Rotor brake

**Yaw system:** Active via yaw gear,  
 load-dependent damping

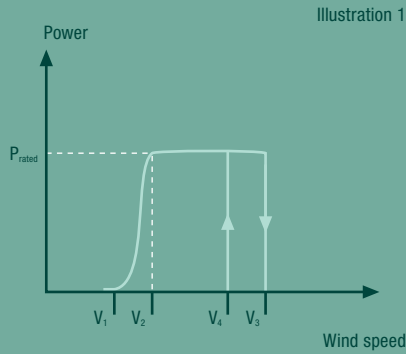
**Cut-out wind speed:** 28–34 m/s  
 (with ENERCON storm control\*)

**Remote monitoring:** ENERCON SCADA

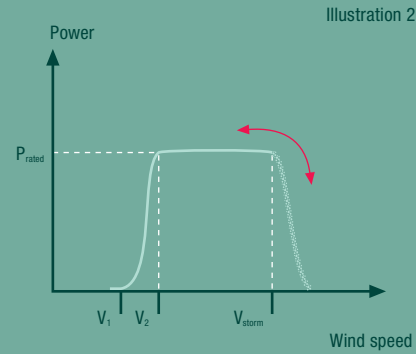
\*For more information on the ENERCON storm control feature, please see the last page.



- 1 Main carrier
- 2 Yaw drive
- 3 Annular generator
- 4 Blade adapter
- 5 Rotor hub
- 6 Rotor blade



Power curve without ENERCON storm control



Power curve with ENERCON storm control

### ENERCON power curves

According to current standards, power curve measurement parameters such as turbulence intensity are not taken into consideration. The results are deviating measurements on the same type of wind turbine at different locations. Again, when comparing yield using power curve measurements from different types of wind turbines, a clear picture cannot be obtained unless all measurement parameters are taken into consideration.

So in order to calculate power yield forecasts for its wind turbines, ENERCON does not use power curve measurements but calculated power curves.

These are based on the following:

- several different power curve measurements for the respective wind turbine type taken by accredited institutes with documented evidence of these measurements on the respective power curve certificates; or results from other turbine types if measurements have not yet begun or are still in progress
- average turbulence intensity of 12%
- standard air density of 1.225 kg/m<sup>3</sup>
- realistic assumptions concerning anemometer behaviour
- wind turbine operation with ENERCON's patented storm control feature which enables operation without shutdown at high wind speeds.

Thus the power curves for ENERCON wind turbines provide highly reliable and realistic calculations for expected energy yield according to the wind conditions at the respective site.

### Description of wind classes

IEC I  $V_{av}$  = 10 m/s  
 $V_{ext}$  = 70 m/s

IEC II  $V_{av}$  = 8.5 m/s  
 $V_{ext}$  = 59.5 m/s

IEC S  $V_{av}$  and  $V_{ext}$  are to be determined by the manufacturer

### ENERCON storm control

ENERCON wind turbines run with a special storm control feature. Storm control enables reduced wind turbine operation in the event of extremely high wind speeds, and prevents typical shutdowns which cause considerable yield losses.

### Power curve without ENERCON storm control

Illustration 1 shows that the wind turbine stops at a defined cut-out wind speed  $V_3$ . The reason is that a specified maximum wind speed has been exceeded. In wind turbines without storm control, this occurs, for example, at a wind speed of 25 m/s within a 20-second mean. The wind turbine only starts up again when the average wind speed drops below the cut-out wind speed or an even lower restart speed ( $V_4$  in the illustration; so-called strong wind hysteresis). In gusty wind conditions there may be a longer delay, which means that considerable yield losses are incurred.

### Power curve with ENERCON storm control

The power curve diagram showing operation with ENERCON storm control (illustration 2) demonstrates clearly that the wind turbine does not shut down automatically when a certain wind speed  $V_{storm}$  is exceeded, but merely reduces power output by slowing down the rotational speed. This is achieved by slightly pitching the rotor blades out of the wind. Once the wind speed drops, the blades turn back into the wind and the turbine immediately resumes operation at full power. This prevents yield-reducing shutdown and start-up procedures.