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PROGETTO PER LA REALIZZAZIONE DI UN IMPIANTO PER LA  
PRODUZIONE DI ENERGIA MEDIANTE LO SFRUTTAMENTO DEL VENTO  
NEL TERRITORIO COMUNALE DI LESINA E POGGIO IMPERIALE (FG) LOC. S. SPIRITO  
POTENZA NOMINALE 66 MW

**PROGETTO DEFINITIVO - SIA**

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REV. DATA DESCRIZIONE

**R.3 Scheda tecnica aerogeneratore**

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# General Description

## EnVentus™



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## 1 Introduction

This *General Description* document contains data and general descriptions of the EnVentus™ wind turbine range. The EnVentus™ turbine range consists of various turbine variants, with different rotors and ratings.

For turbine variant specific information related to wind class definitions and performance details, please refer to the accompanying Performance Specification document.

## 2 General Description

A wind turbine within the EnVentus™ turbine range is a pitch regulated upwind turbine with active yaw and a three-blade rotor.

The wind turbine utilises the OptiTip® concept and a power system based on a permanent magnet generator and full-scale converter. With these features, the wind turbines are able to operate the rotor at variable speed and thereby maintain the power output at or near rated power even in high wind speed. At low wind speed, the OptiTip® concept and the power system work together to maximise the power output by operating at the optimal rotor speed and pitch angle.

### 3 Mechanical Design

#### 3.1 Rotor

The wind turbine is equipped with a rotor consisting of three blades and a hub. The blades are controlled by the microprocessor pitch control system OptiTip®. Based on the prevailing wind conditions, the blades are continuously positioned to optimise the pitch angle.

| Rotor                          | V162                   | V172                 |
|--------------------------------|------------------------|----------------------|
| Diameter                       | 162 m                  | 172 m                |
| Swept Area                     | 20612 m <sup>2</sup>   | 23235 m <sup>2</sup> |
| Speed, Dynamic Operation Range | 4.3 -12.1 rpm          |                      |
| Rotational Direction           | Clockwise (front view) |                      |
| Orientation                    | Upwind                 |                      |
| Tilt                           | 6°                     |                      |
| Hub Coning                     | 6°                     |                      |
| No. of Blades                  | 3                      |                      |
| Aerodynamic Brakes             | Full feathering        |                      |

Table 3-1: Rotor data

#### 3.2 Blades

The blades are made of carbon and fibreglass and consist of two airfoil shells with embedded structure.

| Blades                    | V162   | V172  |
|---------------------------|--|---|
| Blade Length              | 79.35 m  | 84.35 m   |
| Maximum Chord             | 4.3 m  | 4.3 m   |
| Chord at 90% blade radius | 1.68 m   | 1.25 m  |
| Type Description          | Structural airfoil shell   |   |
| Material                  | Fibreglass reinforced epoxy, carbon fibres and Solid Metal Tip (SMT) | Fibreglass reinforced polyester, carbon fibres and metallic diverter strips |
| Blade Connection          | Steel roots inserted   |   |
| Airfoils                  | High-lift profile  |   |

Table 3-2: Blade data

#### 3.3 Blade Bearing

The blade bearings allow the blades to operate at varying pitch angles.

|                    |                               |
|--------------------|-------------------------------|
| Blade Bearing      |                               |
| Blade bearing type | High-capacity slewing bearing |
| Lubrication        | Manual grease lubrication     |

Table 3-3: Blade bearing data

### 3.4 Pitch System

The turbine is equipped with a hydraulic, individual pitch system for each blade. Each pitch system is connected to the hydraulic rotating transfer unit in the nacelle by means of distributed hydraulic hoses and pipes. The hydraulic power unit is positioned in the nacelle.

Each pitch system consists of a hydraulic cylinder mounted to the hub and a piston rod mounted to the blade bearing. Valves facilitating operation of the pitch cylinder are installed on a pitch block bolted directly onto the cylinder.

| Pitch System |                      |
|--------------|----------------------|
| Type         | Hydraulic            |
| Number       | 1 cylinder per blade |
| Range        | -5° to 95°           |

Table 3-4: Pitch system data

| Hydraulic System |                                   |
|------------------|-----------------------------------|
| Main Pump        | Redundant internal-gear oil pumps |
| Pressure         | Max. 260 bar                      |
| Filtration       | 3 µm (absolute)<br>40 µm in line  |

Table 3-5: Hydraulic system data.

### 3.5 Hub

The hub supports the three blades and transfers the reaction forces and the torque to the Main Shaft. The hub structure also supports blade bearings and pitch cylinders.

| Hub      |                |
|----------|----------------|
| Type     | Ball shell hub |
| Material | Cast iron      |

Table 3-6: Hub data

### 3.6 Main Shaft

The main shaft transfers the reaction forces to the main bearing and the torque to the gearbox.

| Main Shaft       |              |
|------------------|--------------|
| Type Description | Hollow shaft |
| Material         | Cast iron    |

Table 3-7: Main shaft data



### 3.7 Main Bearing Housing

The main bearing housing carries the main bearings and is the connection point for the drive train system to the nacelle structure.

| Main Bearing Housing |           |
|----------------------|-----------|
| Material             | Cast iron |

Table 3-8: Main bearing housing data

### 3.8 Main Bearing

The main bearings constitute the main load transfer path for the rotor and drivetrain to the nacelle structure.

| Main Bearing |                  |
|--------------|------------------|
| Type         | Rolling bearings |
| Lubrication  | Oil circulation  |

Table 3-9: Main bearing data

### 3.9 Gearbox

The main gear converts the rotation of the rotor to generator rotation.

| Gearbox               |                          |
|-----------------------|--------------------------|
| Type                  | 2 Planetary stages       |
| Gear House Material   | Cast                     |
| Lubrication System    | Pressure oil lubrication |
| Total Gear Oil Volume | 900-1100 L               |
| Oil Cleanliness Codes | ISO 4406-/15/12          |

Table 3-10: Gearbox data

### 3.10 Generator Bearings

Generator bearings ensures a constant airgap between the generator rotor and stator. The bearings are arranged in an assembly that allows for up-tower service.

| Generator Bearing |                  |
|-------------------|------------------|
| Type              | Rolling bearings |
| Lubrication       | Oil circulation  |

Table 3-11: Generator bearing data

### 3.11 Yaw System

The yaw system is an active system based on a pre-tensioned plain bearing.

| Yaw System           |  |
|----------------------|--|
| Type                 | Plain bearing system                                 |
| Material             | Forged yaw ring heat-treated.<br>Plain bearings PETP |
| Yaw gear type        | Multiple stages planetary gear                       |
| Yawing Speed (50 Hz) | Approx. 0.4°/sec.                                    |
| Yawing Speed (60 Hz) | Approx. 0.5°/sec.                                    |

Table 3-12: Yaw system data

### 3.12 Crane

The nacelle is equipped with an internal service crane (single system hoist).

| Crane            |            |
|------------------|------------|
| Lifting Capacity | Max 800 kg |

Table 3-13: Crane data

### 3.13 Towers

Tubular Steel Towers and Concrete Hybrid Towers (CHT) are available as standard for several WTG configuration and hub height options.

Tubular steel towers consist of flange joined steel sections.

Concrete Hybrid Towers consists of a concrete bottom part with a transition piece towards a tubular steel top. The concrete part is made of precast high strength concrete rings, and the tubular steel top is made of flange joined steel sections.

Towers includes modular internals, which are certified to relevant type approvals.

Available hub heights are listed in the Performance Specification for each turbine variant. Designated hub heights include a distance from tower top flange to centre of the hub of approximately 2.5m. For steel towers the designated hub height also includes a distance from the foundation section to the ground level of approximately 0.2 m depending on the thickness of the bottom flange.

For steel towers, raised foundations of up to 3 m can be made available on a site-specific basis subject to soil and project conditions which raises the hub height also by up to 3m.

Further WTG configuration and hub height options are developed as non-standard products on site-specific basis.

| Towers |  |
|--------|--|
| Type   | Tubular steel towers<br>Concrete Hybrid Towers |

Table 3-14: Tower structure data

### 3.14 Modularized Nacelle

The modularized nacelle consists of three main elements. A cast iron front part, the base frame, and two modularized structures, the main nacelle house and the side-compartment. The base frame is the foundation for the power train and transmits loads from the rotor to the tower through the yaw system. The bottom surface is machined and connected to the yaw bearing and the yaw gears are bolted to the base frame. The base frame also includes a heavy-duty interface on each side. One interface is used to carry the HV transformer in the side-compartment. The additional interface can be used for several purposes, for example attaching a service crane for main component exchange operations.

The main nacelle house hosts the power train, hydraulic power unit, cooling systems and main control panels. The main nacelle house has an internal crane rail system that allows service and maintenance operations inside the main nacelle house.

The side-compartment structure hosts and integrates the main power production components as converter and HV transformer.

Both main nacelle house and side-compartment structures act as enclosures. The main nacelle house has a hatch positioned in the floor for lowering or hoisting equipment and evacuation of personnel.

The roof section is equipped with skylights, which can be opened both from inside out, and outside in. Access from the tower to the main nacelle house is through the base frame.

| Type Description   | Material   |
|--|--|
| <b>Main nacelle house and side compartment structure</b> | Sheet metal structure.<br>GRP components in roof dome and front cover. |
| <b>Base frame</b>  | Cast iron  |

Table 3-15: Nacelle structure and cover data

### 3.15 Thermal Conditioning System

The thermal conditioning system consists of:

- A Liquid Cooling System
- The Vestas Cooler Top®
- Air cooling of the internal main nacelle house and side-compartment
- Air cooling of the converter including a filter function

#### 3.15.1 Liquid Cooling

The liquid cooling system removes heat losses from gearbox, generator, hydraulic power unit, converter and the HV transformer.

The liquid cooling system pump unit includes a set of dynamic flow valves securing the right flow to the different systems. The pump unit also includes an electrical controlled valve for controlling the liquid temperature and a bypass filter for removal of particles in the cooling liquid.

### 3.15.2 Cooler Top®

The Vestas Cooler Top® located on top of the rear end of the nacelle main house. The Cooler Top® is a free flow cooler, thus ensuring that there are no electrical components in the thermal conditioning system located outside the nacelle. The Cooler Top® serves as base for the wind sensors, and the optional ice detection-, precipitation- and visibility sensors as well as aviation lights.

### 3.15.3 Main Nacelle House Conditioning

Hot air generated by mechanical and electrical equipment is dissipated from the main nacelle house by a fan system located in the nacelle main house structure. The conditioning system is taking ambient air into the main nacelle house and exhaust the hot air in the end of the main nacelle house.

### 3.15.4 Converter and Side-Compartment Air Cooling

The converter is both liquid and air cooled. The converter air cooling system comprises an air-to-air heat exchanger, which separates ambient air from converter internal air. The ambient air flow is provided by fan units delivering ambient air to the air-to-air heat exchanger through a filter. Fans on the internal side of the air-to-air exchanger provides the converter internal air circulation. The converter air cooling also provides air flow cooling to the side-compartment which is redirected by ducts to the critical spots.

## 4 Electrical Design

### 4.1 Generator

The generator is a three-phase permanent magnet generator connected to the grid through a full-scale converter. The generator housing allows the circulation of cooling air within the stator and rotor.

The heat generated by the losses is removed by an air-to-water heat exchanger.

| <i>Generator</i>                        |   |
|---|---|
| <b>Type</b>                             | Permanent Magnet Synchronous generator        |
| <b>Rated Power [P<sub>N</sub>]</b>      | Up to 7600 kW (depending on turbine variant)  |
| <b>Frequency range [f<sub>N</sub>]</b>  | 0-126 Hz                                      |
| <b>Voltage, Stator [U<sub>NS</sub>]</b> | 3 x 800 V (at rated speed)                    |
| <b>Number of Poles</b>                  | 36  |
| <b>Winding Type</b>                     | Form with Vacuum Pressurized Impregnation     |
| <b>Winding Connection</b>               | Star  |
| <b>Operational speed range</b>          | 0-420 rpm                                     |
| <b>Overspeed Limit (2 minutes)</b>      | 660 rpm                                       |
| <b>Temperature Sensors, Stator</b>      | PT100 sensors placed in the stator hot spots. |
| <b>Insulation Class</b>                 | H   |
| <b>Enclosure</b>                        | IP54  |

Table 4-1: Generator data

## 4.2 Converter

The converter is a full-scale converter system controlling both the generator and the power delivered to the grid. The converter consists of 4 machine-side converter units and 4 line-side converter units operating in parallel with a common controller.

The converter controls conversion of variable frequency AC power from the generator into fixed frequency AC power with desired active and reactive power levels (and other grid connection parameters) suitable for the grid.

The converter is located in the nacelle and has a grid side voltage rating of 720 V. The generator side voltage rating is nominally 800 V but depends on generator speed.

| Converter   |           |
|---|-----------|
| Nominal Apparent Power [ $S_N$ ] @ 1.0 p.u. voltage | 7750 kVA  |
| Nominal Grid Voltage                                | 3 x 720 V |
| Rated Generator Voltage                             | 3 x 800 V |
| Rated Grid Current @ 1.0 p.u. voltage               | 6488 A    |
| Enclosure   | IP54      |

Table 4-2: Converter data

## 4.3 HV Transformer

The transformer is a three-phase, three limb, two-winding, liquid immersed transformer. The transformer is equipped with an external water-cooling circuit. The insulation liquid used is environmentally friendly and low flammable.

The HV transformer is in the side-compartment, located in a separate transformer room with access through an interlock system.

The transformer is designed according to IEC standards and is available in the following version:

- Eco-design complying to Tier 2 of European Eco-design regulation No 548/2014 and No 2019/1783 set by the European Commission. Refer to Table 4-3.

### 4.3.1 General transformer data

| Transformer                        |   |
|------------------------------------|---|
| Type description                   | Eco-design liquid immersed transformer  |
| Basic layout                       | 3 phase, 2 winding transformer  |
| Applied standards                  | IEC 60076-1, IEC 60076-16, IEC 61936-1<br>Commission Regulation No 548/2014<br>Commission Regulation No 2019/1783 |
| Cooling method                     | KF/WF   |
| Rated power                        | 8400 kVA  |
| Expansion system                   | Sealed  |
| Insulation liquid, Type/Fire point | Natural ester, biodegradable/ K-class<br>(>300°C)   |
| No-load reactive power             | ~21 kVar <sup>1</sup>   |
| Full load reactive power           | ~882 kVar <sup>1</sup>  |

| <b>Transformer</b>  |   |
|---|---|
| <b>No-load current</b>  | ~ 0.25 % <sup>1</sup>   |
| <b>Positive sequence short-circuit impedance @ rated power, 95°C</b>  | 9.9 % <sup>2</sup>  |
| <b>Positive sequence short-circuit resistance @ rated power, 95°C</b> | ~0.9 % <sup>1</sup>   |
| <b>Zero sequence short-circuit impedance @ rated power, 95°C</b>      | ~9.4 % <sup>1</sup>   |
| <b>Zero sequence short-circuit resistance @ rated power, 95°C</b>     | ~0.9 % <sup>1</sup>   |
| <b>Rated voltage, turbine side</b>                                    |   |
| <b>U<sub>m</sub> 1.1kV</b>  | 0.720 kV  |
| <b>Rated voltage, grid side</b>                                       |   |
| <b>U<sub>m</sub> 24.0kV</b>   | 20.0-22.0 kV  |
| <b>U<sub>m</sub> 36.0kV</b>   | 22.1-33.0 kV  |
| <b>U<sub>m</sub> 40.5kV</b>   | 33.1-36.0 kV  |
| <b>Insulation level AC / LI / LIC</b>                                 |   |
| <b>U<sub>m</sub> 1.1kV</b>  | 3 / - / - kV  |
| <b>U<sub>m</sub> 24.0kV</b>   | 50 / 125 / 138 kV   |
| <b>U<sub>m</sub> 36.0kV</b>   | 70 / 170 / 187 kV   |
| <b>U<sub>m</sub> 40.5kV</b>   | 80 / 200 / 220 kV   |
| <b>Optional off-circuit tap changer</b>                               | 2±2 x 2.5 %   |
| <b>Frequency</b>  | 50 Hz / 60 Hz   |
| <b>Vector group</b>   | Dyn11   |
| <b>Inrush peak current</b>  | <4 x I <sub>n</sub> <sup>1</sup> (for Um=24.0kV)<br><8 x I <sub>n</sub> <sup>1</sup> (for Um=36.0-40.5kV)   |
| <b>Half crest time</b>  | ~ 0.5 s <sup>1</sup>  |
| <b>Sound power level</b>  | ≤ 80 dB(A)  |
| <b>Average winding temperature rise</b>                               | Class 120 (E) ≤65 K<br>Class 130 (B) ≤75 K  |
| <b>Max altitude</b>   | 3500 m  |
| <b>Insulation system</b>  | Hybrid insulation system<br>Winding insulation:<br>120 (E), Thermally Upgrader Paper<br>130 (B), High temperature insulation<br>Other materials can have different class. |
| <b>Insulation liquid, Amount</b>                                      | ≤ 3500 kg   |
| <b>Corrosion class</b>  | C3  |
| <b>Weight</b>   | ≤15000 kg   |
| <b>Overvoltage protection</b>   | Plug-in surge arresters on HV bushings  |
| <b>High voltage bushings</b>  | Outer cone, interface C1  |

Table 4-3: General transformer data.

### 4.3.2 Eco-design – IEC 50 Hz/60 Hz version

The transformer loss limits are given at rated power as combination of load loss and no-load loss which shall fulfil the Peak Efficiency Index (PEI) of the Eco-design requirement.

The maximum losses are described by the PEI limit section of Figure 4-1 and stretch over a range between Loss variant 1 and Loss variant 2.

The loss variant values are selected based on energy loss optimization with the turbine user profile, hence the energy loss of transformers between Loss variant 1 and Loss variant 2 are comparable.

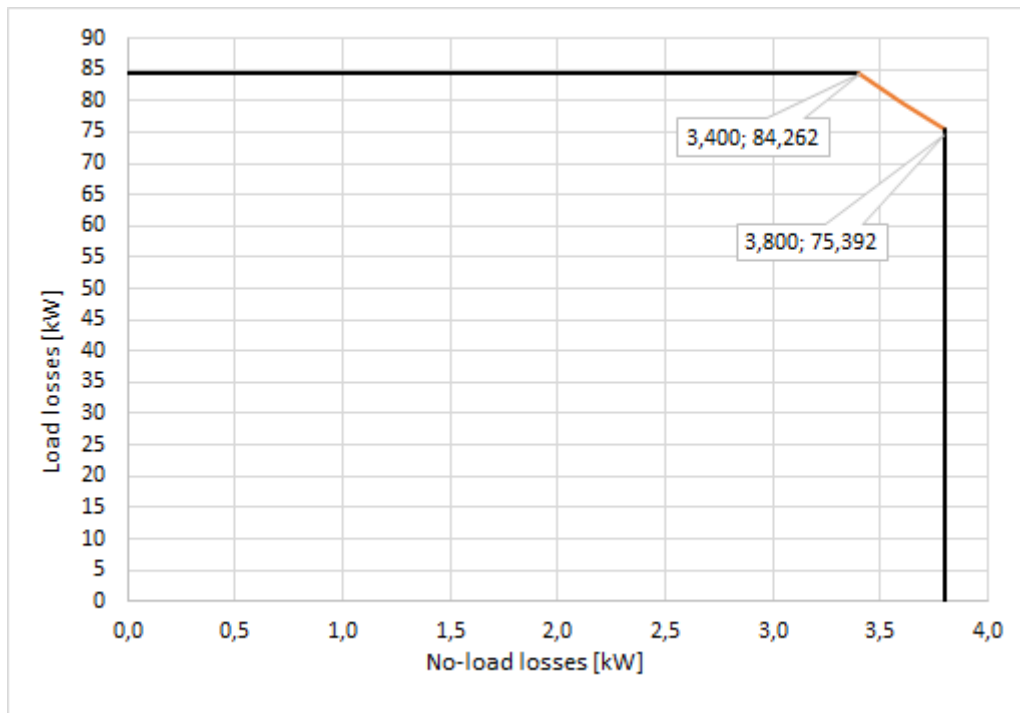


Figure 4-1: Transformer losses allowable area for 8400kVA

The actual load losses vary depending on the operational mode of the turbine, hence in Table 4-4, the load losses are provided at different operational modes for the two loss variants. For further recalculation of load losses at different operation modes, refer to Figure 4-2.

| Transformer losses (rated power 8400kVA) |                                    |                       |                       |                       |
|--|------------------------------------|-----------------------|-----------------------|-----------------------|
| <b>Applied standards</b>                 | Commission Regulation No 2019/1783 |                       |                       |                       |
| <b>Peak Efficiency Index (PEI)</b>       | ≥ 99.597                           |                       |                       |                       |
| <b>Loss variant 1</b>                    |                                    |                       |                       |                       |
| <b>No-load loss</b>                      | 3.40 kW                            |                       |                       |                       |
| <b>Load loss @ power, 95°C</b>           | <b>@8400kVA</b>                    | <b>@7200kVA</b>       | <b>@6800kVA</b>       | <b>@6000kVA</b>       |
|  | ≤84.262kW                          | ≤61.91kW <sup>3</sup> | ≤55.22kW <sup>3</sup> | ≤42.99kW <sup>3</sup> |
| <b>Loss variant 2</b>                    |                                    |                       |                       |                       |
| <b>No-load loss</b>                      | 3.80 kW                            |                       |                       |                       |
| <b>Load loss @ power, 95°C</b>           | <b>@8400kVA</b>                    | <b>@7200kVA</b>       | <b>@6800kVA</b>       | <b>@6000kVA</b>       |
|  | ≤75.32kW                           | ≤55.34kW <sup>3</sup> | ≤49.36kW <sup>3</sup> | ≤38.43kW <sup>3</sup> |

Table 4-4: Transformer losses for 8400kVA



Figure 4-2: Transformer load losses scaling

- NOTE**
- <sup>1</sup> Based on an average of calculated values across voltages and manufacturers.
  - <sup>2</sup> Subjected to standard IEC tolerances.
  - <sup>3</sup> Informative non-binding values based on operation mode.

#### 4.4 HV Cables

The high-voltage cable runs from the transformer in the side-compartment down the tower to the HV switchgear located at the bottom of the tower. The high-voltage cable will be constructed as:

- A three-core, rubber-insulated, halogen-free, high-voltage cable with a three-core split earth conductor.

| HV Cables                                     |  |
|---|--|
| <b>High-Voltage Cable Insulation Compound</b> | Improved ethylene-propylene (EP) based material-EPR or high modulus or hard grade ethylene-propylene rubber-HEPR |
| <b>Pre-terminated</b>                         | T-Connector Type-C in transformer end.<br>T-Connector Type-C in switchgear end.                                  |
| <b>Maximum Voltage (Um)</b>                   | 24 kV for 20-24.3 kV rated voltage<br>42 kV for 24.4-36.0 kV rated voltage                                       |
| <b>Conductor Cross Sections</b>               | Um: 42kV with 3x70 + 3x70/3 mm <sup>2</sup><br>Um: 24kV with 3x95 + 3x95/3 mm <sup>2</sup>                       |

Table 4-5: HV cables data

#### 4.5 HV Switchgear

A gas insulated switchgear is installed in the bottom of the tower as an integrated part of the turbine. Its controls are integrated with the turbine safety system, which monitors the condition of the switchgear and high voltage safety related devices in the turbine. This system is named 'Ready to Protect' and ensures all protection devices are operational, whenever high voltage components in the turbine are



energised. To ensure that the switchgear is always ready to trip, it is equipped with redundant trip circuits consisting of an active trip coil and an undervoltage trip coil.

In case of grid outage, the circuit breaker will disconnect the turbine from the grid after an adjustable time.

When grid returns, all relevant protection devices will automatically be powered up via UPS.

When all the protection devices are operational, the circuit breaker will re-close after an adjustable time. The re-close functionality can furthermore be used to implement a sequential energization of a wind park, to avoid simultaneous inrush currents from all turbines once grid returns after an outage.

In case the circuit breaker has tripped due to a fault detection, the circuit breaker will be blocked for re-connection until a manual reset is performed.

To avoid unauthorized access to the transformer room during live condition, the earthing switch of the circuit breaker, contains a trapped-key interlock system with its counterpart installed on the access door to the transformer room.

The switchgear is available in three variants with increasing features, see Table 4-6. Beside the increase in features, the switchgear can be configured depending on the number of grid cables planned to enter the individual turbine. The design of the switchgear solution is optimized such grid cables can be connected to the switchgear even before the tower is installed and still maintain its protection toward weather conditions and internal condensation due to a gas tight packing.

The switchgear is available in an IEC version and in an IEEE version. The IEEE version is however only available in the highest voltage class. The electrical parameters of the switchgear are seen in Table 4-7 for the IEC version and in Table 4-8 for the IEEE version.

| HV Switchgear   |       |            |          |
|---|-------|------------|----------|
| Variant   | Basic | Streamline | Standard |
| IEC standards   | ○     | ⊙          | ⊙        |
| IEEE standards  | ⊙     | ○          | ⊙        |
| Vacuum circuit breaker panel                            | ⊙     | ⊙          | ⊙        |
| Overcurrent, short-circuit and earth fault protection   | ⊙     | ⊙          | ⊙        |
| Disconnecter / earthing switch in circuit breaker panel | ⊙     | ⊙          | ⊙        |
| Voltage Presence Indicator System for circuit breaker   | ⊙     | ⊙          | ⊙        |
| Voltage Presence Indicator System for grid cables       | ⊙     | ⊙          | ⊙        |
| Double grid cable connection                            | ⊙     | ⊙          | ⊙        |
| Triple grid cable connection                            | ⊙     | ○          | ○        |
| Preconfigured relay settings                            | ⊙     | ⊙          | ⊙        |
| Turbine safety system integration                       | ⊙     | ⊙          | ⊙        |
| Redundant trip coil circuits                            | ⊙     | ⊙          | ⊙        |

| <b>HV Switchgear</b>   |              |                   |                 |
|--|--------------|-------------------|-----------------|
| <b>Variant</b>   | <b>Basic</b> | <b>Streamline</b> | <b>Standard</b> |
| Trip coil supervision  | ○            | ○                 | ○               |
| Pendant remote control from outside of tower                                 | ○            | ○                 | ○               |
| Sequential energization  | ○            | ○                 | ○               |
| Reclose blocking function  | ○            | ○                 | ○               |
| Heating elements   | ○            | ○                 | ○               |
| Trapped-key interlock system for circuit breaker panel                       | ○            | ○                 | ○               |
| Motor operation of circuit breaker   | ○            | ○                 | ○               |
| Cable panel for grid cables (configurable)                                   | ○            | ○                 | ○               |
| Switch disconnecter panels for grid cables – max three panels (configurable) | ○            | ○                 | ○               |
| Earthing switch for grid cables  | ○            | ○                 | ○               |
| Internal arc classification  | ○            | ○                 | ○               |
| Supervision on MCB's   | ○            | ○                 | ○               |
| Motor operation of switch disconnecter                                       | ○            | ○                 | ○               |
| SCADA operation and feedback of circuit breaker                              | ○            | ○                 | ○               |
| SCADA operation and feedback of switch disconnecter                          | ○            | ○                 | ○               |

Table 4-6: HV switchgear variants and features

#### 4.5.1 IEC 50/60Hz version

| <b>HV Switchgear</b>  |  |
|---|--|
| <b>Type description</b>   | Gas Insulated Switchgear   |
| <b>Applied standards</b>  | IEC 62271-103<br>IEC 62271-1, 62271-100,<br>62271-102, 62271-200 |
| <b>Insulation medium</b>  | SF <sub>6</sub>  |
| <b>Rated voltage</b>  |  |
| <b>U<sub>r</sub> 24.0kV</b>   | 20.0-22.0 kV   |
| <b>U<sub>r</sub> 36.0kV</b>   | 22.1-33.0 kV   |
| <b>U<sub>r</sub> 40.5kV</b>   | 33.1-36.0 kV   |
| <b>Rated insulation level AC // LI<br/>Common value / across isolation distance</b> |  |
| <b>U<sub>r</sub> 24.0kV</b>   | 50 / 60 // 125 / 145 kV  |
| <b>U<sub>r</sub> 36.0kV</b>   | 70 / 80 // 170 / 195 kV  |
| <b>U<sub>r</sub> 40.5kV</b>   | 85 / 90 // 185 / 215 kV  |
| <b>Rated frequency</b>  | 50 Hz / 60 Hz  |
| <b>Rated normal current</b>   | 630 A  |
| <b>Rated Short-time withstand current</b>   |  |
| <b>U<sub>r</sub> 24.0kV</b>   | 20 kA  |
| <b>U<sub>r</sub> 36.0kV</b>   | 25 kA  |

| HV Switchgear                                      |   |
|--|---|
| <b>U<sub>r</sub> 40.5kV</b>                        | 25 kA   |
| <b>Rated peak withstand current<br/>50 / 60 Hz</b> |   |
| <b>U<sub>r</sub> 24.0kV</b>                        | 50 / 52 kA  |
| <b>U<sub>r</sub> 36.0kV</b>                        | 62.5 / 65 kA  |
| <b>U<sub>r</sub> 40.5kV</b>                        | 62.5 / 65 kA  |
| <b>Rated duration of short-circuit</b>             | 1 s   |
| <b>Internal arc classification (option)</b>        |   |
| <b>U<sub>r</sub> 24.0kV</b>                        | IAC A FLR 20 kA, 1 s                                |
| <b>U<sub>r</sub> 36.0kV</b>                        | IAC A FLR 25 kA, 1 s                                |
| <b>U<sub>r</sub> 40.5kV</b>                        | IAC A FLR 25 kA, 1 s                                |
| <b>Connection interface</b>                        | Outside cone plug-in bushings,<br>IEC interface C1. |
| <b>Loss of service continuity category</b>         | LSC2  |
| <b>Ingress protection</b>                          |   |
| <b>Gas tank</b>                                    | IP 65   |
| <b>Enclosure</b>                                   | IP 2X   |
| <b>LV cabinet</b>                                  | IP 3X   |
| <b>Corrosion class</b>                             | C3  |

Table 4-7: HV switchgear data for IEC version

#### 4.5.2 IEEE 60Hz version

| HV Switchgear                               |  |
|---|--|
| <b>Type description</b>                     | Gas Insulated Switchgear   |
| <b>Applied standards</b>                    | IEEE 37.20.3, IEEE C37.20.4,<br>IEC 62271-200, ISO 12944.                      |
| <b>Insulation medium</b>                    | SF <sub>6</sub>  |
| <b>Rated voltage</b>                        |  |
| <b>U<sub>r</sub> 38.0kV</b>                 | 33.1-36.0 kV   |
| <b>Rated insulation level AC / LI</b>       | 70 / 150 kV  |
| <b>Rated frequency</b>                      | 60 Hz  |
| <b>Rated normal current</b>                 | 600 A  |
| <b>Rated Short-time withstand current</b>   | 25 kA  |
| <b>Rated peak withstand current</b>         | 65 kA  |
| <b>Rated duration of short-circuit</b>      | 1 s  |
| <b>Internal arc classification (option)</b> | IAC A FLR 25 kA, 1 s   |
| <b>Connection interface grid cables</b>     | Outside cone plug-in bushings,<br>IEEE 386 interface type dead<br>break, 600A. |
| <b>Ingress protection</b>                   |  |
| <b>Gas tank</b>                             | NEMA 4X / IP 65  |
| <b>Enclosure</b>                            | NEMA 2 / IP 2X   |
| <b>LV cabinet</b>                           | NEMA 2 / IP 3X   |
| <b>Corrosion class</b>                      | C3   |

Table 4-8: HV switchgear data for IEEE version

## 4.6 AUX System

The AUX system is supplied from a separate 720/400 V transformer located in the main nacelle house. The supply to this transformer primary side is provided from the converter cabinet. All auxiliary loads in the turbine such as motors, pumps, fans and heaters are supplied from this system.

The control system (DCN's) is also supplied from the Auxiliary Power System in all areas of the turbine.

The 400 V supply from the main nacelle house is transferred to tower controller cabinet, which is placed at the entrance platform of the turbine. This supply is then distributed for various 400 & 230 V loads such as service lift, working light system, additional / optional features & general-purpose loads, cabinet internal heating & ventilation. There is a 400/230 V control transformer placed inside the tower cabinet which provides supply to the Light Box/UPS (LBUPS) cabinet which is placed very near to the tower cabinet.

There is a 400 V service inlet provided in the tower control cabinet to connect an external power source that allows some of the systems to operate during installation & maintenance / service activities.

The working & emergency light system in Tower & Nacelle is supplied from the LBUPS cabinet which is placed in the entrance platform just beside the turbine entrance door. It is possible to add an optional battery cabinet to the LBUPS cabinet if extended back-up time is needed. The internal light in the hub is fed from built-in batteries in the light armature.

| Power Sockets                               |  |
|---|--|
| <b>Single Phase (Nacelle)</b>               | 230 V (16 A) (standard)<br>110 V (16 A) (option) |
| <b>Single Phase (Tower Platforms)</b>       | 230 V (10 A) (standard)<br>110 V (16 A) (option) |
| <b>Three Phase (Nacelle and Tower base)</b> | 3 x 400 V (20 A)                                 |

*Table 4-9: AUX system data*

## 4.7 Wind Sensors

The turbine is equipped with one ultrasonic wind sensor and one mechanical wind vane. The sensors have built-in heaters to minimise interference from ice and snow.

The turbine software will automatically detect and inform when a wind sensor is worn and needs to be replaced. The turbine will continue to operate using the other wind sensor without any production loss until the worn wind sensor is replaced.

## 4.8 Vestas Multi Processor (VMP) Controller

The turbine is controlled and monitored by the VMP8000 control system.

VMP8000 is a multiprocessor control system comprised of main controller, distributed control nodes, distributed IO nodes and ethernet switches and other network equipment. The main controller is placed in the tower bottom of the turbine. It runs the control algorithms of the turbine, as well as all IO communication.

The communications network is a time triggered Ethernet network (TTEthernet).

The VMP8000 control system serves the following main functions:

- Monitoring and supervision of overall operation.
- Synchronizing of the generator to the grid during connection sequence.
- Operating the wind turbine during various fault situations.
- Automatic yawing of the nacelle.
- OptiTip® - blade pitch control.
- Reactive power control and variable speed operation.
- Noise emission control.
- Monitoring of ambient conditions.
- Monitoring of the grid.
- Monitoring of the smoke detection system.

#### 4.9 Uninterruptible Power Supply (UPS)

During grid outage, an UPS system will ensure power supply for specific components.

The UPS system consists of 3 subsystems:

1. 230V AC UPS for all power backup to nacelle and hub control systems
2. 24V DC UPS for power backup to tower base control systems and ready to protect
3. 230V AC UPS for power backup to internal lights in tower, main nacelle house, side-compartment and hub

| Backup Time   | Standard     | Optional           |
|---|--------------|--------------------|
| <b>Control System*<br/>(230V AC and 24V DC UPS)</b> | Up to 30 min | Up to 19.5 hours** |
| <b>Emergency Lights<br/>(230V AC UPS)</b>           | 30 min       | 60 min ***         |
| <b>Ready to protect<br/>(24V DC UPS)</b>            | 7 days       | 37 days****        |

Table 4-10: UPS data

- NOTE** \*The control system includes: Turbine controller (VMP8000), HV switchgear functions, and remote-control system
- \*\*Requires upgrade of the 230V UPS for control system with extra batteries
- \*\*\*Requires upgrade of the 230V UPS for internal light with extra batteries
- \*\*\*\*Requires upgrade of the 24V DC UPS with extra batteries

- NOTE** For alternative backup times, contact Vestas.

## 5 Turbine Protection Systems

### 5.1 Braking Concept

The main brake on the turbine is aerodynamic. Stopping the turbine is done by full feathering the three blades (individually pitching of each blade). Each blade has a hydraulic accumulator to supply power for pitching the blade.

In addition, there is a hydraulic activated mechanical disc brake integrated into the generator. The mechanical brake is only used as a parking brake and when activating the emergency stop buttons.

### 5.2 Short Circuit Protections

| Breakers                          | Breaker for Aux. Power.  | Breaker 1 for Converter Modules | Breaker 2 for Converter Modules |
|-----------------------------------|--------------------------|---------------------------------|---------------------------------|
| <b>Breaking Capacity Icu, Ics</b> | Icu 91 kA<br>Ics 75% Icu | Icu 91 kA<br>Ics 50% Icu        | 91 kA<br>Ics 50% Icu            |
| <b>Making Capacity Icm</b>        | 223 kA                   | 223 kA                          | 223 kA                          |

Table 5-1: Short circuit protection data

### 5.3 Overspeed Protection

The safety system integrated in the VMP8000 control system monitors the rotor speed, using a combination of sensors in the hub. In case of an overspeed situation, the safety system activates the hydraulic safety pitch system, which will feather the blades and bring the turbine to standstill.

| Overspeed Protection |                   |
|----------------------|-------------------|
| <b>Sensor Type</b>   | MEMS              |
| <b>Trip Level</b>    | Variant dependent |

Table 5-2: Overspeed protection data

### 5.4 Arc Detection

The turbine is equipped with an Arc Detection system including multiple optical arc detection sensors placed in the HV transformer compartment and the converter cabinet. The Arc Detection system is connected to the turbine safety system via a dedicated arc detection relay ensuring immediate opening of the HV switchgear if an arc is detected.

### 5.5 Smoke Detection

The turbine is equipped with a Smoke Detection system including multiple smoke detection sensors placed in the main nacelle house, in the side-compartment, in the transformer compartment, in main electrical cabinets both in nacelle and in the tower base. The Smoke Detection system is connected to the turbine control system ensuring immediate opening of the HV switchgear if smoke is detected.

## 5.6 Lightning Protection of Blades, Nacelle, Hub and Tower

The Lightning Protection System (LPS) helps protect the wind turbine against the physical damage caused by lightning strikes. The LPS consists of five main parts:

- Air termination system e.g. lightning receptors, diverter strips, and SMTs
- Down conducting system (a system to conduct the lightning current down through the wind turbine to help avoid or minimise damage to the LPS itself or other parts of the wind turbine)
- Protection against overvoltage and overcurrent
- Shielding against magnetic and electrical fields
- Earthing system

| Lightning Protection Design Parameters |               |         | Protection Level I |
|--|---------------|---------|--------------------|
| Current Peak Value                     | $I_{max}$     | [kA]    | 200                |
| Impulse Charge                         | $Q_{impulse}$ | [C]     | 100                |
| Total Charge                           | $Q_{total}$   | [C]     | 300                |
| Specific Energy                        | W/R           | [MJ/Ω]  | 10                 |
| Average Steepness                      | di/dt         | [kA/μs] | 200                |

Table 5-3: Lightning protection design parameters (IEC)

## 5.7 EMC

The turbine and related equipment fulfil the EU Electromagnetic Compatibility (EMC) legislation:

- DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

The EMC performance is based on fulfilment of following standards:

### Emission

- IEC/CISPR 11 at wind turbine level
- IEC 61000-6-4 for telecommunications

### Immunity

- IEC 61000-6-2 for electronics installed
- IEC 61400-24 for lightning protection of electronics installed

Beside DIRECTIVE 2014/30/EU, electronics related to the functional safety evaluation shall fulfil

- IEC 62061 Safety on machinery (Directive 2006/42/EU Machinery)

## 5.8 RED (Radio Equipment Directive)

Related radio equipment installed in the turbine fulfil the EU legislation:

DIRECTIVE 2014/53/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014.

## 5.9 EMF (ElectroMagnetic Fields)

Electromagnetic fields in the wind turbine are identified to ensure safe stay for personnel during design, production, operation and service.

The following directive is basis for ensuring minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents.

DIRECTIVE 2013/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 June 2013.

## 5.10 Earthing

The Vestas Earthing System consists of individual earthing electrodes interconnected as one joint earthing system.

The Vestas Earthing System includes the TN-system and the Lightning Protection System for each wind turbine. It works as an earthing system for the medium voltage distribution system within the wind farm.

The Vestas Earthing System is adapted for the different types of turbine foundations. A separate set of documents describe the earthing system in detail, depending on the type of foundation.

In terms of lightning protection of the wind turbine, Vestas has no separate requirements for a certain minimum resistance to remote earth (measured in ohms) for this system. The earthing for the lightning protection system is based on the design and construction of the Vestas Earthing System.

A primary part of the Vestas Earthing System is the main earth bonding bar placed where all cables enter the wind turbine. All earthing electrodes are connected to this main earth bonding bar. Additionally, equipotential connections are made to all cables entering or leaving the wind turbine.

Requirements in the Vestas Earthing System specifications and work descriptions are minimum requirements from Vestas and IEC. Local and national requirements, as well as project requirements, may require additional measures.



## 5.11 Corrosion Protection

The turbine is as standard designed to withstand below corrosion environments according to ISO 12944-2:

| Corrosion Protection | External Areas | Internal Areas |
|----------------------|----------------|----------------|
| Nacelle              | C5             | C3             |
| Hub                  | C5             | C3             |
| Tower                | C5             | C3             |

Table 5-5: Corrosion protection data for nacelle, hub, and tower

As an option, the turbine can be protected to withstand alternative external corrosion environments – consult Vestas for further details.

## 6 Safety

The safety specifications in this section provide limited general information about the safety features of the turbine and are not a substitute for Buyer and its agents taking all appropriate safety precautions, including but not limited to (a) complying with all applicable safety, operation, maintenance, and service agreements, instructions, and requirements, (b) complying with all safety-related laws, regulations, and ordinances, and (c) conducting all appropriate safety training and education.

### 6.1 Access

Access to the turbine from the outside is through a door located at the entrance platform approximately 3 meters above ground level. The door is equipped with a lock. Access from the entrance platform to the tower top is by a ladder with fall arrest system or service lift. From the tower top there is two separate access routes to the nacelle main house, both via a ladder.

The nacelle consists of the main nacelle house which hosts the power train, and a side-compartment, which hosts converter and high voltage transformer. Access to the transformer room is controlled with an interlock.

Inside the nacelle main house, there are walkways along either side of the power train and in the rear end of the nacelle main house. The side-compartment has two access openings, one in the front and one in the back.

Access to the rotor is restricted with fixed or moveable guard with interlock.

### 6.2 Evacuation and Rescue

The basic principle for evacuation is inside and down via the normal access routes. From the centre of the nacelle main house there are two separate exit points to the tower, one on each side of the power train. The evacuation route to the tower is on fixed ladders with fall arrest system.

With two separate evacuation routes from the nacelle main house to the tower, it is the intention to avoid escape by means of descent device.

However, the turbine design still enables the possibility to descent directly from nacelle to ground via the service hatch in the bottom of the nacelle main house. Dedicated attachment points for a descent device are provided above the hatch.

It is a prerequisite that one or more descent devices are available in the turbine when there are people present in the turbine.

For rescue the normal access routes can be used, in addition to this it is possible to lower an injured person to the ground through the service hatch, one of the hatches in the spinner or from the roof.

The skylights in the roof can be opened from both the inside and outside.

Evacuation from the service lift is by ladder.

### 6.3 Rooms/Working Areas

The tower, nacelle main house and side-compartment are equipped with power sockets for electrical tools for service and maintenance of the turbine.

### 6.4 Floors, Platforms, Standing, and Working Places

All floors have anti-slip surfaces. There is one floor per tower section.

Rest platforms are provided at intervals of 12 metres along the tower ladder between platforms.

### 6.5 Service Lift

Towers for the EnVentus turbines are as standard delivered with a service lift. But for lower hub heights, towers without a service lift can be provide as an option. Please contact Vestas for additional details.

### 6.6 Work restraint and fall arrest

The tower ladder is equipped with a fall arrest system, either a rail or a wire.

The service areas in the turbines are equipped with yellow coloured anchor points. The anchor point may be used for work positioning, fall restraint, fall arrest and to attach a descent device to perform rescue or escape from the turbine.

The strength of the anchor point is verified by static and dynamic tests. The minimum required static test load is 22.5 kN.

### 6.7 Moving Parts, Guards, and Blocking Devices

All moving parts in the nacelle are shielded.

The turbine is equipped with a rotor lock to block the rotor and power train.

Blocking the pitch of the blade can be done both automatically and manually with a mechanical blade lock.

## 6.8 Lights

The turbine is equipped with lights in the tower, nacelle main house, side-compartment and hub.

There is emergency light in case of the loss of electrical power.

## 6.9 Emergency Stop

There are emergency stop buttons in the nacelle, hub and tower.

## 6.10 Power Disconnection

The turbine is equipped with breakers to allow for disconnection from all power sources during inspection or maintenance. The switches are marked with signs and are located in the nacelle and bottom of the tower.

## 6.11 Fire Protection/First Aid

When there are people present in the turbine, following fire and safety equipment must be available. In the nacelle: A first aid kit, a handheld fire extinguisher, and a fire blanket. In the tower a handheld fire extinguisher and a fire blanket at the entrance platform.

## 6.12 Warning Signs

Warning signs placed inside or on the turbine must be reviewed before operating or servicing the turbine.

## 6.13 Manuals and Warnings

The Vestas Corporate OH&S Manual and manuals for operation, maintenance and service of the turbine provide additional safety rules and information for operating, servicing or maintaining the turbine.

## 7 Environment

### 7.1 Chemicals

Chemicals used in the turbine are evaluated according to the Vestas Wind Systems A/S Environmental System certified according to ISO 14001:2015. The following chemicals are used in the turbine:

- Anti-freeze to help prevent the cooling system from freezing.
- Gear oil for lubricating the main bearing, gearbox and generator
- Hydraulic oil to pitch the blades, operate the brake and operate the rotor lock
- Grease for yaw system lubrication
- Transformer insulation liquid for HV transformer
- Various cleaning agents and chemicals for maintenance of the turbine.

## 8 Design Codes

### 8.1 Design Codes – Structural Design

The turbine design has been developed and verified in accordance with, but not limited to, the following main standards:

| Design Codes  |   |
|---|---|
| <b>Nacelle and Hub</b>  | IEC 61400-1 Edition 4<br>EN 50308   |
| <b>Tower (IEC)</b>  | IEC 61400-1 Edition 4<br>IEC 61400-6 Edition 1  |
| <b>Tower (DIBt)</b>   | Richtlinie für Windenergieanlagen,<br>DIBt, Ausgabe: Oktober 2012   |
| <b>Blades</b>   | IEC 61400-5:2020<br>IEC 1024-1<br>IEC 60721-2-4<br>IEC 61400 (Part 1, 12 and 23)<br>DEFU R25<br>DS/EN ISO 12944-2 |
| <b>Gearbox</b>  | IEC 61400-4   |
| <b>Generator</b>  | IEC 60034 (relevant parts)  |
| <b>Transformer</b>  | IEC 60076-11<br>IEC 60076-16<br>CENELEC HD637 S1  |
| <b>Lightning Protection</b>   | IEC 61400-24:2019   |
| <b>Safety of Machinery,<br/>Safety-related Parts of Control Systems</b> | EN ISO 13849-1:2015   |
| <b>Safety of Machinery – Electrical<br/>Equipment of Machines</b>       | EN 60204-1:2018   |

*Table 8-1: Design codes*

## 9 Colours

### 9.1 Nacelle Colour

| Colour of Vestas Nacelles      |                       |
|--------------------------------|-----------------------|
| <b>Standard Nacelle Colour</b> | RAL 7035 (light grey) |
| <b>Standard Logo</b>           | Vestas                |

Table 9-1: Colour, nacelle

### 9.2 Tower Colour

| Colour of Vestas Tower Section          |  |   |
|---|--|---|
|   | External:  | Internal:   |
| <b>Standard Steel Tower</b>             | RAL 7035 (light grey)  | RAL 9001 (cream white)  |
| <b>Standard Concrete Hybrid Tower</b>   | <b>Concrete part:</b><br>Unpainted concrete, corresponds approx. to RAL 7023 (concrete grey)<br><b>Steel part:</b> RAL 7035 (light grey) | <b>Concrete part:</b><br>Unpainted concrete, corresponds approx. to RAL 7023 (concrete grey)<br><b>Steel part:</b> RAL 9001 (cream white) |
| <b>Option for Concrete Hybrid Tower</b> | Concrete part can be painted with RAL 7035 (light grey)  |   |

Table 9-2: Colour, tower

### 9.3 Blade Colour

| Blade Colour                   |   |
|--------------------------------|---|
| <b>Standard Blade Colour</b>   | RAL 7035 (light grey). All lightning receptor surfaces on the blades are unpainted, excluding the Solid Metal Tips (SMT). |
| <b>Tip-End Colour Variants</b> | RAL 2009 (traffic orange), RAL 3020 (traffic red)   |
| <b>Gloss</b>                   | < 30% ISO 2813  |

Table 9-3: Colour, blades

## 10 Operational Envelope and Performance Guidelines

Actual climate and site conditions have many variables and should be considered in evaluating actual turbine performance. The design and operating parameters set forth in this section do not constitute warranties, guarantees, or representations as to turbine performance at actual sites.

### 10.1 Climate and Site Conditions

Values refer to hub height:

| Extreme Design Parameters                                   |               |
|---|---------------|
| Wind Climate  | All           |
| Ambient Temperature Interval (Standard Temperature Turbine) | -40° to +50°C |

Table 10-1: Extreme design parameters

### 10.2 Operational Envelope – Temperature and Altitude

Values below refer to hub height and are determined by the sensors and control system of the turbine.

| Operational Envelope – Temperature                       |               |
|--|---------------|
| Ambient Temperature Interval                             | -20° to +45°C |
| Ambient Temperature Interval (Low Temperature Operation) | -30° to +45°C |

Table 10-2: Operational envelope – temperature

#### NOTE

The wind turbine will stop producing power at ambient temperatures above 45°C.

For turbine variant specific information related to power performance within the operational envelope, please refer to turbine variant specific Performance Specifications.

For the low temperature operation of the wind turbine, consult Vestas for site specific evaluation.

The turbine is designed for use at altitudes up to 1000 m above sea level as standard and optional up to 2000 m above sea level.

### 10.3 Operational Envelope – Grid Connection

| Operational Envelope – Grid Connection                        |   |          |
|---|---|----------|
| Nominal Phase Voltage   | [U <sub>NP</sub> ]                        | 720 V    |
| Nominal Frequency   | [f <sub>N</sub> ]                         | 50/60 Hz |
| Maximum Frequency Gradient                                    | ±4 Hz/sec.                                |          |
| Maximum Negative Sequence Voltage                             | 3% (connection) 2.5% (operation)          |          |
| Minimum Required Short Circuit Ratio at Turbine HV Connection | 5.0 (contact Vestas for lower SCR levels) |          |
| Maximum Short Circuit Current Contribution                    | Contact Vestas for details                |          |

Table 10-3: Operational envelope – grid connection

The generator and the converter will be disconnected if\*:

| Protection Settings                                  |            |
|--|------------|
| Voltage Above 110%** of Nominal for 1800 Seconds     | 792 V      |
| Voltage Above 116% of Nominal for 60 Seconds         | 835 V      |
| Voltage Above 125% of Nominal for 2 Seconds          | 900 V      |
| Voltage Above 136% of Nominal for 0.150 Seconds      | 979 V      |
| Voltage Below 90%** of Nominal for 180 Seconds (FRT) | 648 V      |
| Voltage Below 85% of Nominal for 12 Seconds (FRT)    | 612 V      |
| Voltage Below 80% of Nominal for 4.8 Seconds (FRT)   | 576 V      |
| Frequency is Above 106% of Nominal for 120 Seconds   | 53/63.6 Hz |
| Frequency is Above 110% of Nominal for 0.2 Seconds   | 55/66 Hz   |
| Frequency is Below 94% of Nominal for 0.2 Seconds    | 47/56.4 Hz |

Table 10-4: Generator and converter disconnecting values

**NOTE**

\* Over the turbine lifetime, grid drop-outs are to occur at an average of no more than 50 times a year.

\*\* The turbine may be configured for continuous operation @ +/- 13 % voltage.

### 10.4 Operational Envelope – Reactive Power Capability

For turbine variant specific reactive power capability, please refer to the variant specific Performance Specification.

## 10.5 Performance – Fault Ride Through

The turbine is designed to stay connected during grid disturbances within the voltage tolerance curve as illustrated below:

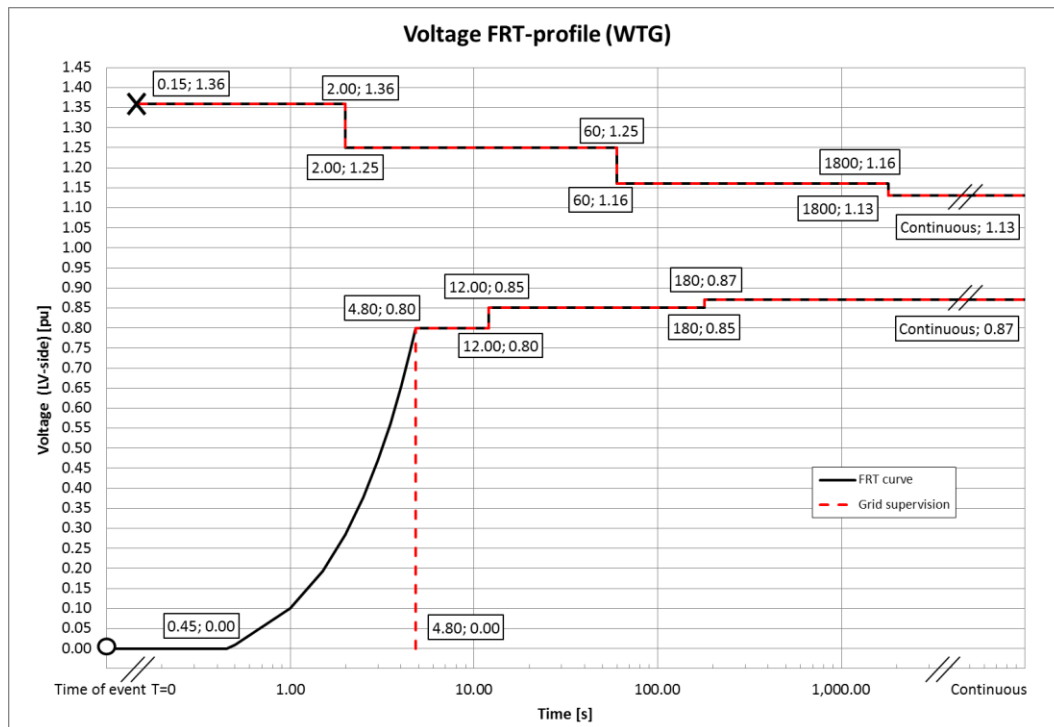


Figure 10-1: Voltage tolerance curve for symmetrical and asymmetrical faults, where U represents voltage as measured on the grid.

For grid disturbances outside the tolerance curve in Figure 10-1, the turbine will be disconnected from the grid.

| Power Recovery Time                      |                     |
|--|---------------------|
| Power Recovery to 90% of Pre-Fault Level | Maximum 0.1 seconds |

Table 10-5: Power recovery time

## 10.6 Performance – Reactive Current Contribution

The reactive current contribution depends on whether the fault applied to the turbine is symmetrical or asymmetrical.

### 10.6.1 Symmetrical Reactive Current Contribution

During symmetrical voltage dips, the wind farm will inject reactive current to support the grid voltage. The reactive current injected is a function of the measured grid voltage.



The default value gives a reactive current part of 1 p.u. of the rated active current at the high voltage side of the HV transformer. Figure 10-2, indicates the reactive current contribution as a function of the voltage. The reactive current contribution is independent from the actual wind conditions and pre-fault power level. As seen in Figure 10-2, the default current injection slope is 2% reactive current increase per 1% voltage decrease. The slope can be parameterized between 0 and 10 to adapt to site specific requirements.

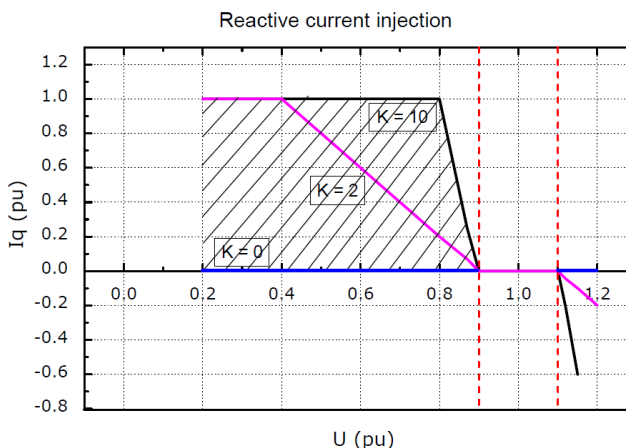


Figure 10-2: Reactive current injection

### 10.6.2 Asymmetrical Reactive Current Contribution

The injected current is based on the measured positive sequence voltage and the used K-factor. During asymmetrical voltage dips, the reactive current injection is limited to approximate 0.4 p.u. to limit the potential voltage increase on the healthy phases.

## 10.7 Performance – Multiple Voltage Dips

The turbine is designed to handle re-closure events and multiple voltage dips within a short period of time due to the fact that voltage dips are not evenly distributed during the year. For example, the turbine is designed to handle 10 voltage dips of duration of 200 ms, down to 20% voltage, within 30 minutes.

## 10.8 Performance – Active and Reactive Power Control

The turbine is designed for control of active and reactive power via the VestasOnline® SCADA system.

| Maximum Ramp Rates for External Control |  |
|---|--|
| <b>Active Power</b>                     | 0.1 p.u./sec for max. power level change of 0.3 p.u.<br>0.3 p.u./sec for max. power level change of 0.1 p.u. |
| <b>Reactive Power</b>                   | 20 p.u./sec  |

Table 10-6: Active/reactive power ramp rates

To support grid stability the turbine is capable to stay connected to the grid at active power references down to 10 % of nominal power for the turbine. For active power references below 10 % the turbine may disconnect from the grid.

### 10.9 Performance – Voltage Control

The turbine is designed for integration with VestasOnline® voltage control by utilising the turbine reactive power capability.

### 10.10 Performance – Frequency Control

The turbine can be configured to perform frequency control by decreasing the output power as a linear function of the grid frequency (over frequency). Dead band and slope for the frequency control function are configurable.

### 10.11 Distortion – Immunity

The turbine is able to connect with a pre-connection (background) voltage distortion level at the grid interface of 8% and operate with a post-connection voltage distortion level of 8%.

### 10.12 Main Contributors to Own Consumption

The consumption of electrical power by the wind turbine is defined as the power used by the wind turbine when it is not providing energy to the grid. This is defined in the control system as Production Generator 0 (zero).

The VMP8000 control system has a hibernate mode that reduces own consumption when possible. Similarly, cooling pumps may be turned off when the turbine idles.

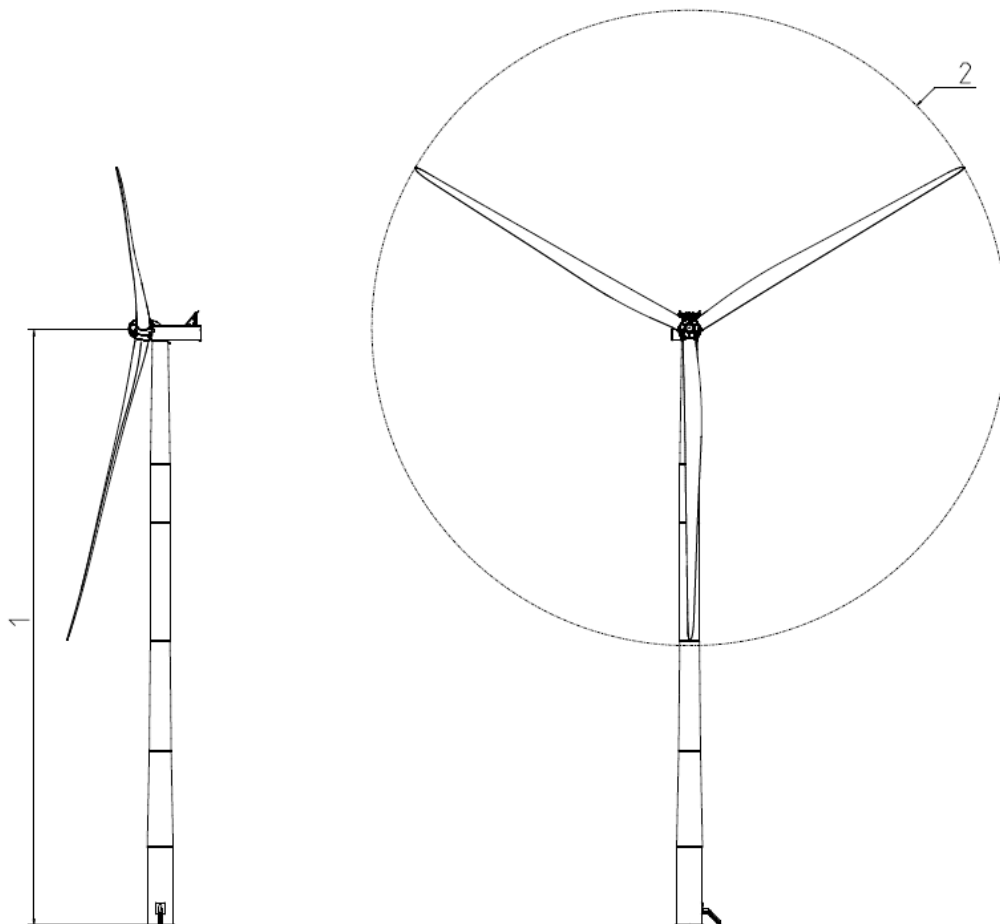
The components in Table 10-7 have the largest influence on the own consumption of the wind turbine. The values given are maximum component consumption, but the average consumption can be lower depending on the actual conditions, the climate, the wind turbine output, the cut-off hours, etc.

| Main contributors to Own Consumption   | V162                           | V172      |
|--|--------------------------------|-----------|
| Hydraulic Motor  | 3 x 18.5 kW                    | 3 x 22 kW |
| Yaw Motors   | 35/42 kW for 50/60 Hz          |           |
| Generator Cooling Fans   | 4 x 4 kW                       |           |
| Water Pumps  | 15 kW (max)                    |           |
| Oil Pump for Gearbox Lubrication   | 7.5 kW                         |           |
| Controller Including Heating Elements for the Hydraulics and all Controllers | Approximately 4 kW             |           |
| HV Transformer No-load Loss  | See section 4.3 HV Transformer |           |

Table 10-7: Main contributors to own consumption data.

**11 Drawings**

**11.1 Structural Design – Illustration of Outer Dimensions**



1: Hub heights: See Performance Specification      2: Rotor diameter: 162/172 m

*Figure 11-1: Illustration of outer dimensions – structure*

## 12 General Reservations, Notes and Disclaimers

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- The general descriptions in this document apply to the current version of the EnVentus™ turbines. Updated versions of the EnVentus™ turbines, which may be manufactured in the future, may differ from this general description. In the event that Vestas supplies an updated version of the EnVentus™ turbine, Vestas will provide an updated general description applicable to the updated version.
- Vestas recommends that the grid shall be as close to nominal as possible with limited variation in frequency and voltage.
- A certain time allowance for turbine warm-up must be expected following grid dropout and/or periods of very low ambient temperature.
- All listed start/stop parameters (e.g. wind speeds and temperatures) are equipped with hysteresis control. This can, in certain borderline situations, result in turbine stops even though the ambient conditions are within the listed operation parameters.
- The earthing system must comply with the minimum requirements from Vestas and be in accordance with local and national requirements and codes of standards.
- This document, General Description, is not an offer for sale, and does not contain any guarantee, warranty and/or verification of the power curve and noise (including, without limitation, the power curve and noise verification method). Any guarantee, warranty and/or verification of the power curve and noise (including, without limitation, the power curve and noise verification method) must be agreed to separately in writing.

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2022-07-08

# Performance Specification

## EnVentus™

### V172-7.2 MW 50/60 Hz



Classification: Restricted



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**See general reservations, notes and disclaimers (including, Section 5, p. 15) to this Performance Specification.**

## 1 General Description

The Vestas V172-7.2 MW is a wind turbine variant within the EnVentus™ turbine range. It is a pitch regulated upwind turbine with active yaw and a three-blade rotor. The V172-7.2 MW turbine has a rotor diameter of 172 m and a rated power of 7.2 MW.

## 2 Type Approvals and Available Hub Heights

The standard turbine is type certified according to the certification standards and available hub heights listed below:

| Certification       | Wind Class | Hub Height              |
|---------------------|------------|-------------------------|
| <b>IECRE OD-501</b> | IEC S      | 166 / 150 / 117 / 114 m |
| <b>DIBt 2012</b>    | DIBt S     | 175 / 164 m             |



### 3 Operational Envelope and Performance Guidelines

Actual climate and site conditions have many variables and should be considered in evaluating actual turbine performance. The design and operating parameters set forth in this section do not constitute warranties, guarantees, or representations as to turbine performance at actual sites.

#### 3.1 Climate and Site Conditions

The standard turbine is designed for the wind climate conditions listed below. Values refer to hub height.

|   | DIBt towers |           | IEC towers |          |          |          |
|---|-------------|-----------|------------|----------|----------|----------|
| Wind Class                                  | DIBt S      | DIBt S    | IEC S      | IEC S    | IEC S    | IEC S    |
| Hub Height                                  | CHT* 175m   | CHT* 164m | 166m       | 150m     | 117m     | 114m     |
| Power Rating                                | 7.2 MW      | 7.2 MW    | 7.2 MW     | 7.2 MW   | 7.2 MW   | 7.2 MW   |
| <b>Average design parameters</b>            |             |           |            |          |          |          |
| Wind Speed (10 min average), $V_{ave}$      | 7.2 m/s     | 7.2 m/s   | 7.4 m/s    | 8.0 m/s  | 7.4 m/s  | 7.2 m/s  |
| Weibull Scale Factor, $C$                   | 8.1 m/s     | 8.1 m/s   | 8.3 m/s    | 9.0 m/s  | 8.3 m/s  | 8.1 m/s  |
| Weibull Shape Factor, $k$                   | 2.00        | 2.00      | 2.48       | 2.50     | 2.50     | 2.10     |
| $I_{ref}$ acc. to IEC 61400-1               | S           | S         | 15%        | 13%      | 14%      | 11%      |
| Turbulence Intensity, $I_{90}$ (90% quant.) | S           | S         | 16.90%     | 14.60%   | 15.73%   | 12.69%   |
| Wind Shear, $\alpha$                        | 0.27        | 0.27      | 0.30       | 0.21     | 0.22     | 0.15     |
| Inflow Angle                                | 8°          | 8°        | 8°         | 8°       | 8°       | 8°       |
| <b>Extreme design parameters</b>            |             |           |            |          |          |          |
| Extr Wind Speed (10 min average), $V_{50}$  | 38.0 m/s    | 39.5 m/s  | 35.0 m/s   | 41.0 m/s | 39.5 m/s | 40.0 m/s |
| Survival Wind Speed (3 s gust), $V_{e50}$   | 53.2 m/s    | 55.3 m/s  | 49.0 m/s   | 57.4 m/s | 55.3 m/s | 56.0 m/s |
| Turbulence intensity, $I_{V(z)}$            | 11.10%      | 11.10%    | 11.00%     | 11.00%   | 11.00%   | 11.00%   |

\*CHT refers to Concrete Hybrid Tower

**NOTE**

The turbine is intended for low to medium wind speed sites and is classified as DIBt S and IEC S. Please contact Vestas Wind Systems A/S for further information if needed.

Climatic conditions for turbines with the optional Vestas Anti-icing System (VAS) may vary from above. Please contact Vestas Wind Systems A/S for further information.

### 3.1.1 Wind Power Plant Layout

Turbine spacing is to be evaluated site-specifically. Spacing below two rotor diameters (2D) may require sector-wise curtailment.

**NOTE** As evaluation of climate and site conditions is complex, consult Vestas for every project. If conditions exceed the above parameters, Vestas must be consulted.

## 3.2 Operational Envelope – Wind

Values refer to hub height and are determined by the sensors and control system of the turbine.

| Wind Climate                                 | DIBt S, IEC S |
|--|---------------|
|  | PO7200        |
| Cut-In, $V_{in}$                             | 3 m/s         |
| Cut-Out (10 min exponential avg.), $V_{out}$ | 25 m/s        |
| Re-Cut In (10 min exponential avg.)          | 23 m/s        |

### 3.3 Operational Envelope – Temperature and Altitude

Values below refer to hub height and are determined by the sensors and control system of the turbine.

| Operational Envelope – Temperature                       |               |
|--|---------------|
| Ambient Temperature Interval                             | -20° to +45°C |
| Ambient Temperature Interval (Low Temperature operation) | -30° to +45°C |

**NOTE**

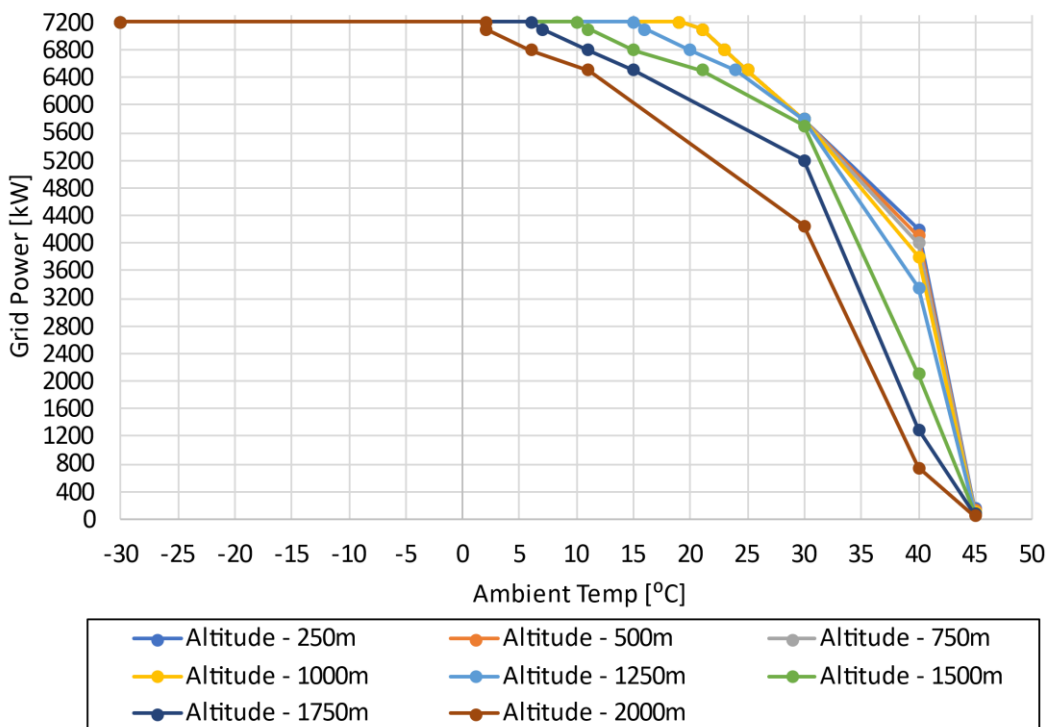
The wind turbine will stop producing power at ambient temperatures above 45°C. For the low temperature operation of the wind turbine please consult Vestas.

The turbine is designed for use at altitudes up to 1000 m above sea level as standard and optional up to 2000 m above sea level. Contact Vestas for more details.

### 3.3.1 Temperature dependent operation

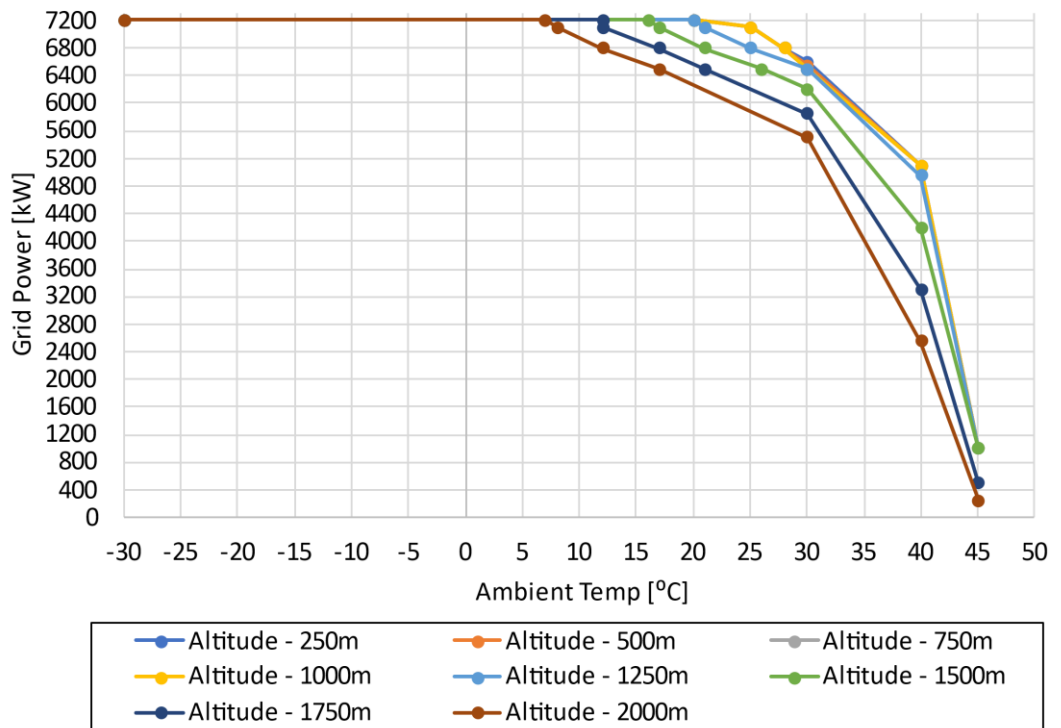
Values below refer to hub height and are determined by the sensors and control system of the turbine. At ambient temperatures above the thresholds shown for each operating mode, the turbine will maintain derated production.

The turbine will be available with two temperature performance steps a standard configuration (Performance Step 0, PS0) and an optional configuration (Performance Step 1, PS1).



| Temperature derate points for Standard Cooler top, V172-7.2MW |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Altitude [m]  | [°C] | [kW] | [°C] | [kW] | [°C] | [kW] | [°C] | [kW] | [°C] | [kW] | [°C] | [kW] | [°C] | [kW] |
| <250  | 19   | 7200 | 21   | 7100 | 23   | 6800 | 25   | 6500 | 30   | 5800 | 40   | 4200 | 45   | 150  |
| 250-500   | 19   | 7200 | 21   | 7100 | 23   | 6800 | 25   | 6500 | 30   | 5800 | 40   | 4100 | 45   | 125  |
| 500-750   | 19   | 7200 | 21   | 7100 | 23   | 6800 | 25   | 6500 | 30   | 5800 | 40   | 4000 | 45   | 115  |
| 750-1000  | 19   | 7200 | 21   | 7100 | 23   | 6800 | 25   | 6500 | 30   | 5800 | 40   | 3800 | 45   | 100  |
| 1000-1250   | 15   | 7200 | 16   | 7100 | 20   | 6800 | 24   | 6500 | 30   | 5800 | 40   | 3350 | 45   | 90   |
| 1250-1500   | 10   | 7200 | 11   | 7100 | 15   | 6800 | 21   | 6500 | 30   | 5700 | 40   | 2100 | 45   | 80   |
| 1500-1750   | 6    | 7200 | 7    | 7100 | 11   | 6800 | 15   | 6500 | 30   | 5200 | 40   | 1300 | 45   | 70   |
| 1750-2000   | 2    | 7200 | 2    | 7100 | 6    | 6800 | 11   | 6500 | 30   | 4250 | 40   | 750  | 45   | 50   |

Figure 3-1: Temperature dependant derated operation – Standard cooler top (PS0)



| Temperature derate points for Optional Cooler top, V172-7.2MW |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Altitude [m]  | [°C] | [kW] | [°C] | [kW] | [°C] | [kW] | [°C] | [kW] | [°C] | [kW] | [°C] | [kW] | [°C] | [kW] |
| <250  | 20   | 7200 | 25   | 7100 | 28   | 6800 | 30   | 6600 | -    | -    | 40   | 5100 | 45   | 1000 |
| 250-500   | 20   | 7200 | 25   | 7100 | 28   | 6800 | 30   | 6550 | -    | -    | 40   | 5100 | 45   | 1000 |
| 500-750   | 20   | 7200 | 25   | 7100 | 28   | 6800 | 30   | 6500 | -    | -    | 40   | 5100 | 45   | 1000 |
| 750-1000  | 20   | 7200 | 25   | 7100 | 28   | 6800 | 30   | 6500 | -    | -    | 40   | 5100 | 45   | 1000 |
| 1000-1250   | 20   | 7200 | 21   | 7100 | 25   | 6800 | 30   | 6500 | -    | -    | 40   | 4950 | 45   | 1000 |
| 1250-1500   | 16   | 7200 | 17   | 7100 | 21   | 6800 | 26   | 6500 | 30   | 6200 | 40   | 4200 | 45   | 1000 |
| 1500-1750   | 12   | 7200 | 12   | 7100 | 17   | 6800 | 21   | 6500 | 30   | 5850 | 40   | 3300 | 45   | 500  |
| 1750-2000   | 7    | 7200 | 8    | 7100 | 12   | 6800 | 17   | 6500 | 30   | 5500 | 40   | 2550 | 45   | 250  |

Figure 3-2: Temperature dependant derated operation – Optional cooler top (PS1)

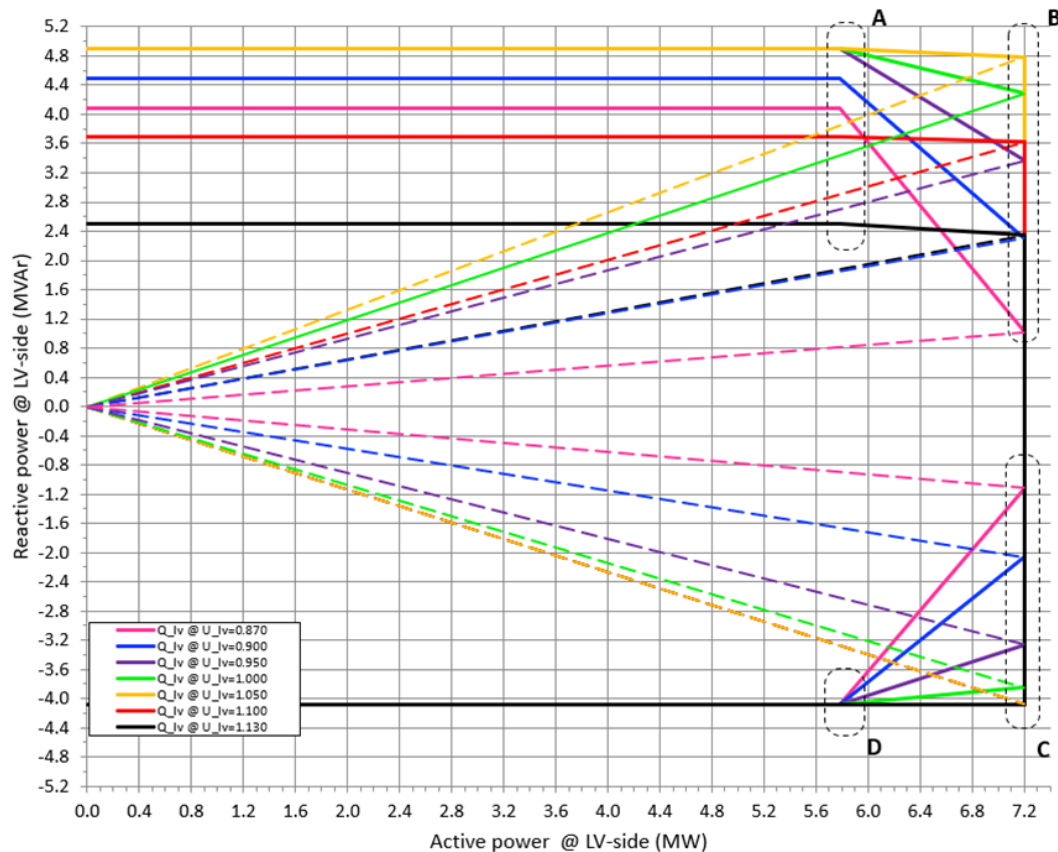
### 3.4 Operational Envelope – Conditions for Power Curve and $C_t$ Values (at Hub Height)

Please consult section 6 and subsequent, for power curves and  $C_t$  values.

| Conditions for Power Curve and $C_t$ Values (at Hub Height) |  |
|---|--|
| Wind Shear, $\alpha$  | 0.00-0.30 (10-minute average)                            |
| Turbulence Intensity, $I$                                   | 6-12% (10-minute average)                                |
| Blades  | Clean  |
| Rain  | No   |
| Ice/Snow on Blades  | No   |
| Leading Edge  | No damage  |
| Terrain   | IEC 61400-12-1   |
| Inflow Angle (Vertical)                                     | $0 \pm 2^\circ$  |
| Grid Voltage  | Nominal Voltage $\pm 2.5\%$                              |
| Grid Frequency  | Nominal Frequency $\pm 0.5$ Hz                           |
| Grid Active Power (LV-side)                                 | Per tabulated values in Section 6 and following sections |
| Grid Reactive Power (LV-side)                               | Power Factor 1.0   |

### 3.5 Operational Envelope – Reactive Power Capability

The turbine has a reactive power capability on the low voltage side of the HV transformer as illustrated in Figure 3-3:



| Point:   | Coordinates |       |       |       |       |        |       |        | Power factor   |               |
|--|-------------|-------|-------|-------|-------|--------|-------|--------|----------------|---------------|
|  | A           |       | B     |       | C     |        | D     |        | B (Capacitive) | C (Inductive) |
| Coordinate:  | x (P)       | y (Q) | x (P) | y (Q) | x (P) | y (Q)  | x (P) | y (Q)  |                |               |
| Reactive power [kVAr] @ LV side @ U <sub>lv</sub> = 0.870 p.u. voltage | 5.780       | 4.080 | 7.200 | 1.020 | 7.200 | -1.116 | 5.780 | -4.080 | 0.990          | 0.988         |
| Reactive power [kVAr] @ LV side @ U <sub>lv</sub> = 0.900 p.u. voltage | 5.780       | 4.488 | 7.200 | 2.299 | 7.200 | -2.064 | 5.780 | -4.080 | 0.953          | 0.961         |
| Reactive power [kVAr] @ LV side @ U <sub>lv</sub> = 0.950 p.u. voltage | 5.780       | 4.896 | 7.200 | 3.362 | 7.200 | -3.262 | 5.780 | -4.080 | 0.906          | 0.911         |
| Reactive power [kVAr] @ LV side @ U <sub>lv</sub> = 1.000 p.u. voltage | 5.780       | 4.896 | 7.200 | 4.283 | 7.200 | -3.846 | 5.780 | -4.080 | 0.859          | 0.882         |
| Reactive power [kVAr] @ LV side @ U <sub>lv</sub> = 1.050 p.u. voltage | 5.780       | 4.896 | 7.200 | 4.783 | 7.200 | -4.080 | 5.780 | -4.080 | 0.833          | 0.870         |
| Reactive power [kVAr] @ LV side @ U <sub>lv</sub> = 1.100 p.u. voltage | 5.780       | 3.697 | 7.200 | 3.621 | 7.200 | -4.080 | 5.780 | -4.080 | 0.893          | 0.870         |
| Reactive power [kVAr] @ LV side @ U <sub>lv</sub> = 1.130 p.u. voltage | 5.780       | 2.499 | 7.200 | 2.346 | 7.200 | -4.080 | 5.780 | -4.080 | 0.951          | 0.870         |

Figure 3-3: Reactive power capability.

The turbine is able to maintain the reactive power capability at low wind with no active power production.

### 3.5.1 Temperature dependent reactive power capability

The reactive power capability shown in Figure 3-3 is valid for ambient temperatures at which no active power derate is needed according to Figure 3-1 and Figure 3-2.

For ambient temperatures up to 40°C, where active power is derated below 6.8 MW because of ambient temperature, the shape of the PQ chart corresponding to 6.8 MW (Figure 3-4: A, B, C and D points) is maintained. The active power for the A, B, C and D points is however adjusted according to the overall WTG active power derate according to Figure 3-1 and Figure 3-2.

For ambient temperatures between 40°C and 45°C, reactive power is derated proportional to the active power derate.

Figure 3-4 shows an illustrative example of the reactive power derate.

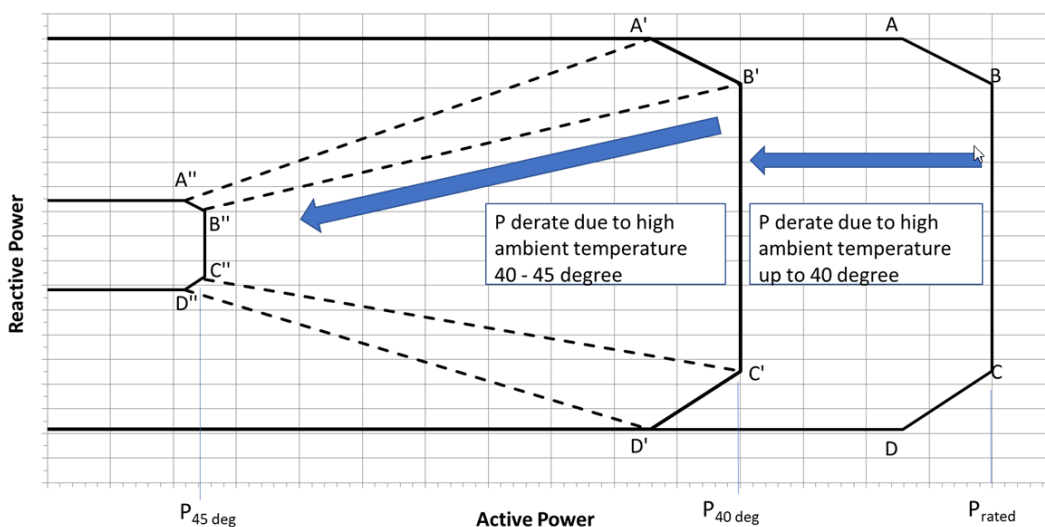


Figure 3-4 Reactive power capability temperature dependency. Illustrative example.



### 3.6 Operational Modes

The operational modes listed below are available for the turbine.

| Sound modes |                     |                         |                                     |
|-------------|---------------------|-------------------------|-------------------------------------|
| Mode No.    | Maximum Sound Level | Serrated trailing edges | Available hub heights               |
| PO7200      | 106.9 dBA           | Yes (standard)          | 175 / 166 / 164 / 150 / 117 / 114 m |
| PO7200-0S   | 110.1 dBA           | No (option)             | 175 / 166 / 164 / 150 / 117 / 114 m |

In addition, Sound Optimized (SO) modes as listed below are available as options for the turbine.

| Sound Optimized (SO) modes |                     |                         |                                     |
|----------------------------|---------------------|-------------------------|-------------------------------------|
| Mode No.                   | Maximum Sound Level | Serrated trailing edges | Available hub heights               |
| SO1                        | 105 dBA             | Yes (standard)          | 175 / 166 / 164 / 150 / 117 / 114 m |
| SO2                        | 104 dBA             | Yes (standard)          | 175 / 166 / 164 / 150 / 117 / 114 m |
| SO3                        | 103 dBA             | Yes (standard)          | 175 / 166 / 164 / 150 / 117 / 114 m |
| SO4                        | 102 dBA             | Yes (standard)          | 175 / 166 / 164 / 150 / 117 / 114 m |
| SO5                        | 101 dBA             | Yes (standard)          | 175 / 166 / 164 / 150 / 117 / 114 m |
| SO6                        | 100 dBA             | Yes (standard)          | 175 / 166 / 164 / 150 / 117 / 114 m |
| SO7                        | 99 dBA              | Yes (standard)          | 175 / 166 / 164 / 150 / 117 / 114 m |
| SO8                        | 98 dBA              | Yes (standard)          | 175 / 166 / 164 / 150 / 117 / 114 m |

**NOTE** Sound Optimized (SO) modes are only available with serrated trailing edges on the blades. For further details on sound performance and in case of specific requests, please contact Vestas Wind Systems A/S.

The operational modes listed below are available as options for the turbine. These modes are designed to reduce wake impact in a park layout. Sound performance remains identical to PO7200 and PO7200-0S.

| Ct modes    |                 |                                     |
|-------------|-----------------|-------------------------------------|
| Mode No.    | Ct Level @ 8m/s | Available hub heights               |
| PO7200-Ct74 | 0.74            | 175 / 166 / 164 / 150 / 117 / 114 m |

## 4 Drawings

Overview drawings describing the wind turbines, tower and foundation are shown in these documents.

V172 HH175 (DiBt) – 0114-1754  
V172 HH164 (DiBt) – 0114-1757  
V172 HH166 (IEC) – 0120-2603  
V172 HH150 (IEC) – 0120-2640  
V172 HH117 (IEC) – 0114-1759  
V172 HH114 (IEC) – 0128-6274

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**NOTE** For detailed drawings, please contact Vestas Wind Systems A/S.

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### 4.1 Turbine visual impression – side view



## 5 General Reservations, Notes and Disclaimers

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- The performance specifications described in this document apply to the current version of the V172-7.2 MW wind turbine. Updated versions of the V172-7.2 MW wind turbine, which may be manufactured in the future, may differ from these performance specifications. In the event that Vestas supplies an updated version of the V172-7.2 MW wind turbine, Vestas will provide an updated performance specification applicable to the updated version.
- All listed start/stop parameters (e.g. wind speeds) are equipped with hysteresis control. This can, in certain borderline situations, result in turbine stops even though the ambient conditions are within the listed operation parameters.
- This document, Performance Specification, is not an offer for sale, and does not contain any guarantee, warranty and/or verification of the power curve and sound (including, without limitation, the power curve and sound verification method). Any guarantee, warranty and/or verification of the power curve and sound (including, without limitation, the power curve and sound verification method) must be agreed to separately in writing.

**6 Power Curves, Ct Values and Sound Curves, Mode PO7200**

**6.1 Power Curves, Mode PO7200**

| Wind speed [m/s] | Air density [kg/m <sup>3</sup> ] |       |       |       |       |       |       |       |       |       |       |       |       |       |
|------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                  | 1.225                            | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0              | 32                               | 15    | 16    | 18    | 19    | 21    | 22    | 24    | 26    | 27    | 29    | 30    | 34    | 35    |
| 3.5              | 129                              | 78    | 83    | 87    | 91    | 95    | 100   | 105   | 109   | 114   | 119   | 124   | 134   | 140   |
| 4.0              | 288                              | 195   | 204   | 213   | 221   | 230   | 238   | 246   | 255   | 263   | 271   | 279   | 296   | 304   |
| 4.5              | 481                              | 346   | 359   | 371   | 383   | 395   | 407   | 420   | 432   | 444   | 457   | 469   | 493   | 506   |
| 5.0              | 715                              | 529   | 546   | 563   | 580   | 597   | 614   | 631   | 648   | 665   | 682   | 698   | 732   | 749   |
| 5.5              | 999                              | 748   | 770   | 793   | 816   | 839   | 862   | 885   | 907   | 930   | 953   | 976   | 1022  | 1045  |
| 6.0              | 1340                             | 1011  | 1041  | 1071  | 1101  | 1131  | 1160  | 1190  | 1220  | 1250  | 1280  | 1310  | 1370  | 1400  |
| 6.5              | 1739                             | 1322  | 1360  | 1398  | 1436  | 1475  | 1512  | 1550  | 1588  | 1626  | 1663  | 1701  | 1776  | 1814  |
| 7.0              | 2203                             | 1686  | 1733  | 1781  | 1828  | 1875  | 1922  | 1969  | 2016  | 2063  | 2109  | 2156  | 2249  | 2296  |
| 7.5              | 2729                             | 2100  | 2158  | 2215  | 2273  | 2330  | 2387  | 2444  | 2502  | 2559  | 2616  | 2672  | 2785  | 2842  |
| 8.0              | 3324                             | 2569  | 2639  | 2708  | 2777  | 2847  | 2915  | 2984  | 3052  | 3121  | 3189  | 3256  | 3391  | 3459  |
| 8.5              | 3986                             | 3098  | 3180  | 3262  | 3344  | 3426  | 3507  | 3587  | 3668  | 3748  | 3827  | 3907  | 4061  | 4137  |
| 9.0              | 4685                             | 3685  | 3780  | 3875  | 3969  | 4064  | 4155  | 4246  | 4337  | 4427  | 4513  | 4599  | 4737  | 4788  |
| 9.5              | 5314                             | 4287  | 4388  | 4488  | 4589  | 4689  | 4781  | 4874  | 4966  | 5058  | 5143  | 5229  | 5335  | 5357  |
| 10.0             | 5904                             | 4863  | 4964  | 5066  | 5168  | 5270  | 5363  | 5456  | 5550  | 5643  | 5730  | 5817  | 5909  | 5914  |
| 10.5             | 6441                             | 5389  | 5494  | 5598  | 5703  | 5808  | 5904  | 6000  | 6096  | 6192  | 6275  | 6358  | 6441  | 6440  |
| 11.0             | 6854                             | 5886  | 5993  | 6099  | 6205  | 6312  | 6399  | 6486  | 6574  | 6661  | 6725  | 6789  | 6850  | 6847  |
| 11.5             | 7078                             | 6361  | 6456  | 6551  | 6646  | 6741  | 6800  | 6860  | 6920  | 6980  | 7012  | 7045  | 7076  | 7074  |
| 12.0             | 7160                             | 6756  | 6820  | 6885  | 6949  | 7013  | 7040  | 7067  | 7094  | 7121  | 7134  | 7147  | 7159  | 7158  |
| 12.5             | 7195                             | 7008  | 7038  | 7068  | 7098  | 7129  | 7140  | 7152  | 7164  | 7176  | 7182  | 7188  | 7194  | 7194  |
| 13.0             | 7200                             | 7119  | 7133  | 7148  | 7162  | 7177  | 7182  | 7187  | 7193  | 7198  | 7199  | 7199  | 7200  | 7200  |
| 13.5             | 7200                             | 7166  | 7173  | 7179  | 7186  | 7192  | 7194  | 7196  | 7198  | 7199  | 7200  | 7200  | 7200  | 7200  |
| 14.0             | 7200                             | 7188  | 7191  | 7194  | 7196  | 7199  | 7199  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  |
| 14.5             | 7200                             | 7197  | 7198  | 7199  | 7199  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  |
| 15.0             | 7200                             | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  |
| 15.5             | 7200                             | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  |
| 16.0             | 7200                             | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  |
| 16.5             | 7200                             | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  |
| 17.0             | 7200                             | 7199  | 7199  | 7199  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  |
| 17.5             | 7194                             | 7179  | 7180  | 7182  | 7183  | 7185  | 7186  | 7187  | 7189  | 7190  | 7191  | 7192  | 7195  | 7196  |
| 18.0             | 7124                             | 7064  | 7069  | 7074  | 7078  | 7083  | 7089  | 7094  | 7100  | 7106  | 7112  | 7118  | 7130  | 7136  |
| 18.5             | 6959                             | 6887  | 6892  | 6897  | 6903  | 6908  | 6915  | 6922  | 6929  | 6935  | 6943  | 6951  | 6967  | 6976  |
| 19.0             | 6789                             | 6719  | 6724  | 6730  | 6735  | 6740  | 6747  | 6754  | 6760  | 6767  | 6774  | 6782  | 6797  | 6806  |
| 19.5             | 6630                             | 6561  | 6567  | 6572  | 6578  | 6584  | 6589  | 6595  | 6601  | 6607  | 6615  | 6622  | 6637  | 6645  |
| 20.0             | 6472                             | 6384  | 6392  | 6399  | 6407  | 6414  | 6422  | 6431  | 6439  | 6448  | 6456  | 6464  | 6481  | 6490  |
| 20.5             | 6262                             | 6129  | 6140  | 6151  | 6163  | 6174  | 6187  | 6200  | 6212  | 6225  | 6238  | 6250  | 6275  | 6287  |
| 21.0             | 5946                             | 5762  | 5777  | 5793  | 5809  | 5825  | 5842  | 5859  | 5876  | 5893  | 5911  | 5928  | 5964  | 5983  |
| 21.5             | 5538                             | 5328  | 5345  | 5362  | 5379  | 5396  | 5416  | 5435  | 5454  | 5474  | 5495  | 5516  | 5558  | 5579  |
| 22.0             | 5069                             | 4864  | 4880  | 4897  | 4913  | 4930  | 4950  | 4971  | 4991  | 5011  | 5031  | 5050  | 5090  | 5110  |
| 22.5             | 4597                             | 4402  | 4419  | 4436  | 4453  | 4471  | 4487  | 4504  | 4521  | 4538  | 4558  | 4577  | 4614  | 4631  |
| 23.0             | 4121                             | 3930  | 3947  | 3963  | 3979  | 3996  | 4013  | 4030  | 4047  | 4064  | 4083  | 4102  | 4136  | 4150  |
| 23.5             | 3636                             | 3468  | 3484  | 3500  | 3515  | 3531  | 3545  | 3559  | 3572  | 3586  | 3603  | 3619  | 3651  | 3666  |
| 24.0             | 3169                             | 3020  | 3034  | 3048  | 3062  | 3076  | 3089  | 3102  | 3115  | 3127  | 3141  | 3155  | 3184  | 3199  |
| 24.5             | 2718                             | 2589  | 2602  | 2615  | 2627  | 2640  | 2653  | 2665  | 2678  | 2690  | 2699  | 2709  | 2734  | 2750  |
| 25.0             | 2328                             | 2223  | 2232  | 2242  | 2252  | 2262  | 2271  | 2280  | 2289  | 2298  | 2308  | 2318  | 2335  | 2343  |

Original Instruction: T05 0127-1584 VER 01

T05 0127-1584 Ver 01 - Approved- Exported from DMS: 2022-08-25 by PIDEI

**6.2 Ct Values, Mode PO7200**

| Air density kg/m <sup>3</sup> |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wind speed [m/s]              | 1.225 | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0                           | 0.969 | 0.980 | 0.979 | 0.978 | 0.977 | 0.976 | 0.975 | 0.974 | 0.973 | 0.972 | 0.971 | 0.970 | 0.968 | 0.967 |
| 3.5                           | 0.885 | 0.893 | 0.892 | 0.892 | 0.891 | 0.890 | 0.889 | 0.889 | 0.888 | 0.887 | 0.886 | 0.886 | 0.884 | 0.883 |
| 4.0                           | 0.834 | 0.846 | 0.845 | 0.844 | 0.843 | 0.842 | 0.840 | 0.839 | 0.838 | 0.836 | 0.836 | 0.835 | 0.832 | 0.831 |
| 4.5                           | 0.818 | 0.827 | 0.826 | 0.824 | 0.823 | 0.821 | 0.821 | 0.820 | 0.819 | 0.819 | 0.818 | 0.818 | 0.817 | 0.816 |
| 5.0                           | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 |
| 5.5                           | 0.815 | 0.814 | 0.814 | 0.814 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 |
| 6.0                           | 0.814 | 0.816 | 0.816 | 0.816 | 0.816 | 0.816 | 0.815 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.813 | 0.813 |
| 6.5                           | 0.810 | 0.816 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.813 | 0.813 | 0.812 | 0.811 | 0.811 | 0.809 | 0.809 |
| 7.0                           | 0.805 | 0.814 | 0.813 | 0.812 | 0.812 | 0.811 | 0.810 | 0.809 | 0.808 | 0.808 | 0.807 | 0.806 | 0.804 | 0.803 |
| 7.5                           | 0.797 | 0.810 | 0.809 | 0.808 | 0.807 | 0.806 | 0.804 | 0.803 | 0.802 | 0.801 | 0.800 | 0.798 | 0.796 | 0.794 |
| 8.0                           | 0.788 | 0.804 | 0.803 | 0.802 | 0.800 | 0.799 | 0.797 | 0.796 | 0.794 | 0.793 | 0.791 | 0.790 | 0.787 | 0.785 |
| 8.5                           | 0.777 | 0.798 | 0.796 | 0.794 | 0.793 | 0.791 | 0.789 | 0.787 | 0.785 | 0.783 | 0.781 | 0.779 | 0.774 | 0.770 |
| 9.0                           | 0.750 | 0.789 | 0.786 | 0.784 | 0.781 | 0.779 | 0.775 | 0.771 | 0.768 | 0.764 | 0.759 | 0.755 | 0.734 | 0.719 |
| 9.5                           | 0.690 | 0.756 | 0.751 | 0.745 | 0.740 | 0.734 | 0.728 | 0.722 | 0.715 | 0.709 | 0.703 | 0.696 | 0.669 | 0.649 |
| 10.0                          | 0.628 | 0.703 | 0.696 | 0.689 | 0.682 | 0.675 | 0.668 | 0.661 | 0.654 | 0.647 | 0.641 | 0.634 | 0.609 | 0.590 |
| 10.5                          | 0.571 | 0.644 | 0.637 | 0.630 | 0.623 | 0.616 | 0.610 | 0.603 | 0.597 | 0.591 | 0.584 | 0.578 | 0.555 | 0.538 |
| 11.0                          | 0.513 | 0.590 | 0.584 | 0.577 | 0.571 | 0.564 | 0.557 | 0.550 | 0.544 | 0.537 | 0.529 | 0.521 | 0.499 | 0.486 |
| 11.5                          | 0.451 | 0.543 | 0.536 | 0.529 | 0.521 | 0.514 | 0.505 | 0.496 | 0.488 | 0.479 | 0.470 | 0.460 | 0.440 | 0.429 |
| 12.0                          | 0.392 | 0.496 | 0.487 | 0.478 | 0.468 | 0.459 | 0.449 | 0.439 | 0.429 | 0.419 | 0.410 | 0.401 | 0.382 | 0.373 |
| 12.5                          | 0.341 | 0.445 | 0.435 | 0.424 | 0.413 | 0.403 | 0.393 | 0.384 | 0.375 | 0.365 | 0.357 | 0.349 | 0.334 | 0.326 |
| 13.0                          | 0.299 | 0.393 | 0.383 | 0.373 | 0.363 | 0.353 | 0.345 | 0.337 | 0.328 | 0.320 | 0.313 | 0.306 | 0.292 | 0.286 |
| 13.5                          | 0.264 | 0.347 | 0.338 | 0.329 | 0.321 | 0.312 | 0.304 | 0.297 | 0.290 | 0.282 | 0.276 | 0.270 | 0.259 | 0.253 |
| 14.0                          | 0.235 | 0.308 | 0.300 | 0.292 | 0.284 | 0.276 | 0.270 | 0.263 | 0.257 | 0.251 | 0.245 | 0.240 | 0.230 | 0.225 |
| 14.5                          | 0.210 | 0.274 | 0.267 | 0.260 | 0.253 | 0.246 | 0.241 | 0.235 | 0.229 | 0.224 | 0.219 | 0.214 | 0.206 | 0.202 |
| 15.0                          | 0.188 | 0.245 | 0.239 | 0.233 | 0.226 | 0.220 | 0.215 | 0.211 | 0.206 | 0.201 | 0.197 | 0.193 | 0.185 | 0.181 |
| 15.5                          | 0.170 | 0.220 | 0.215 | 0.209 | 0.204 | 0.199 | 0.194 | 0.190 | 0.186 | 0.181 | 0.178 | 0.174 | 0.167 | 0.164 |
| 16.0                          | 0.155 | 0.199 | 0.194 | 0.190 | 0.185 | 0.180 | 0.176 | 0.172 | 0.168 | 0.164 | 0.161 | 0.158 | 0.152 | 0.149 |
| 16.5                          | 0.141 | 0.181 | 0.177 | 0.172 | 0.168 | 0.164 | 0.160 | 0.157 | 0.153 | 0.150 | 0.147 | 0.144 | 0.138 | 0.136 |
| 17.0                          | 0.129 | 0.165 | 0.161 | 0.157 | 0.153 | 0.149 | 0.146 | 0.143 | 0.140 | 0.137 | 0.134 | 0.132 | 0.127 | 0.124 |
| 17.5                          | 0.119 | 0.151 | 0.148 | 0.144 | 0.141 | 0.137 | 0.134 | 0.132 | 0.129 | 0.126 | 0.124 | 0.121 | 0.117 | 0.114 |
| 18.0                          | 0.108 | 0.137 | 0.134 | 0.131 | 0.128 | 0.124 | 0.122 | 0.120 | 0.117 | 0.115 | 0.112 | 0.110 | 0.106 | 0.105 |
| 18.5                          | 0.098 | 0.123 | 0.120 | 0.117 | 0.115 | 0.112 | 0.110 | 0.108 | 0.105 | 0.103 | 0.101 | 0.100 | 0.096 | 0.094 |
| 19.0                          | 0.088 | 0.110 | 0.108 | 0.105 | 0.103 | 0.100 | 0.099 | 0.097 | 0.095 | 0.093 | 0.091 | 0.089 | 0.086 | 0.085 |
| 19.5                          | 0.080 | 0.100 | 0.097 | 0.095 | 0.093 | 0.091 | 0.089 | 0.088 | 0.086 | 0.084 | 0.083 | 0.081 | 0.078 | 0.077 |
| 20.0                          | 0.073 | 0.090 | 0.088 | 0.086 | 0.084 | 0.083 | 0.081 | 0.079 | 0.078 | 0.076 | 0.075 | 0.074 | 0.071 | 0.070 |
| 20.5                          | 0.066 | 0.081 | 0.079 | 0.077 | 0.076 | 0.074 | 0.073 | 0.072 | 0.070 | 0.069 | 0.068 | 0.067 | 0.065 | 0.064 |
| 21.0                          | 0.058 | 0.071 | 0.070 | 0.068 | 0.067 | 0.066 | 0.065 | 0.063 | 0.062 | 0.061 | 0.060 | 0.059 | 0.058 | 0.057 |
| 21.5                          | 0.052 | 0.062 | 0.061 | 0.060 | 0.059 | 0.057 | 0.056 | 0.056 | 0.055 | 0.054 | 0.053 | 0.052 | 0.051 | 0.050 |
| 22.0                          | 0.045 | 0.053 | 0.052 | 0.052 | 0.051 | 0.050 | 0.049 | 0.048 | 0.047 | 0.047 | 0.046 | 0.045 | 0.044 | 0.044 |
| 22.5                          | 0.039 | 0.046 | 0.045 | 0.044 | 0.044 | 0.043 | 0.042 | 0.042 | 0.041 | 0.040 | 0.040 | 0.039 | 0.038 | 0.038 |
| 23.0                          | 0.033 | 0.039 | 0.039 | 0.038 | 0.037 | 0.037 | 0.036 | 0.036 | 0.035 | 0.035 | 0.034 | 0.034 | 0.033 | 0.033 |
| 23.5                          | 0.028 | 0.033 | 0.033 | 0.032 | 0.032 | 0.031 | 0.031 | 0.030 | 0.030 | 0.030 | 0.029 | 0.029 | 0.028 | 0.028 |
| 24.0                          | 0.024 | 0.028 | 0.028 | 0.027 | 0.027 | 0.026 | 0.026 | 0.026 | 0.025 | 0.025 | 0.025 | 0.025 | 0.024 | 0.024 |
| 24.5                          | 0.020 | 0.024 | 0.023 | 0.023 | 0.023 | 0.022 | 0.022 | 0.022 | 0.021 | 0.021 | 0.021 | 0.021 | 0.020 | 0.020 |
| 25.0                          | 0.017 | 0.020 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.017 | 0.017 |

Original Instruction: T05 0127-1584 VER 01

T05 0127-1584 Ver 01 - Approved- Exported from DMS: 2022-08-25 by PIDEI

### 6.3 Sound Curves, Mode PO7200

| Sound Power Level at Hub Height   |  |  |
|-----------------------------------|--|--|
| Conditions for Sound Power Level: | Measurement standard IEC 61400-11 ed. 3<br>Maximum turbulence at hub height: 30%<br>Inflow angle (vertical): 0 ±2°<br>Air density: 1.225 kg/m <sup>3</sup> |  |
| Wind speed at hub height [m/s]    | Sound Power Level at Hub Height [dBA]<br>Mode PO7200<br>(Blades with serrated trailing edge)   | Sound Power Level at Hub Height [dBA]<br>Mode PO7200-0S<br>(Blades without serrated trailing edge) |
| 3                                 | 94.6   | 97.8   |
| 4                                 | 94.6   | 97.8   |
| 5                                 | 95.2   | 98.4   |
| 6                                 | 98.6   | 101.8  |
| 7                                 | 102.2  | 105.4  |
| 8                                 | 105.6  | 108.8  |
| 9                                 | 106.9  | 110.1  |
| 10                                | 106.9  | 110.1  |
| 11                                | 106.9  | 110.1  |
| 12                                | 106.9  | 110.1  |
| 13                                | 106.9  | 110.1  |
| 14                                | 106.9  | 110.1  |
| 15                                | 106.9  | 110.1  |

Original Instruction: T05 0127-1584 VER 01

T05 0127-1584 Ver 01 - Approved- Exported from DMS: 2022-08-25 by PIDE L

**7 Power Curves, Ct Values and Sound Curves, Park Modes**

**7.1 Power Curves, Mode PO7200-Ct74**

| Air density [kg/m <sup>3</sup> ] |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wind speed [m/s]                 | 1.225 | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0                              | 33    | 16    | 17    | 18    | 20    | 21    | 23    | 25    | 26    | 28    | 30    | 31    | 35    | 36    |
| 3.5                              | 129   | 78    | 82    | 87    | 91    | 95    | 100   | 105   | 109   | 114   | 119   | 124   | 134   | 139   |
| 4.0                              | 285   | 194   | 203   | 211   | 220   | 228   | 236   | 244   | 253   | 261   | 269   | 277   | 294   | 302   |
| 4.5                              | 476   | 343   | 355   | 367   | 379   | 391   | 403   | 415   | 427   | 439   | 451   | 464   | 488   | 500   |
| 5.0                              | 707   | 523   | 540   | 556   | 573   | 590   | 607   | 624   | 640   | 657   | 674   | 690   | 724   | 741   |
| 5.5                              | 988   | 739   | 762   | 784   | 807   | 829   | 852   | 875   | 897   | 920   | 942   | 965   | 1010  | 1033  |
| 6.0                              | 1324  | 1000  | 1029  | 1059  | 1088  | 1118  | 1147  | 1177  | 1206  | 1236  | 1265  | 1295  | 1353  | 1383  |
| 6.5                              | 1717  | 1307  | 1345  | 1382  | 1420  | 1457  | 1494  | 1531  | 1569  | 1606  | 1643  | 1680  | 1754  | 1790  |
| 7.0                              | 2173  | 1666  | 1712  | 1759  | 1805  | 1851  | 1897  | 1943  | 1989  | 2035  | 2081  | 2127  | 2218  | 2263  |
| 7.5                              | 2688  | 2073  | 2129  | 2185  | 2242  | 2298  | 2354  | 2410  | 2466  | 2522  | 2577  | 2632  | 2743  | 2798  |
| 8.0                              | 3269  | 2533  | 2600  | 2668  | 2736  | 2803  | 2870  | 2937  | 3004  | 3071  | 3137  | 3203  | 3334  | 3399  |
| 8.5                              | 3914  | 3051  | 3130  | 3210  | 3290  | 3370  | 3449  | 3527  | 3605  | 3684  | 3761  | 3837  | 3989  | 4064  |
| 9.0                              | 4625  | 3632  | 3725  | 3818  | 3911  | 4004  | 4094  | 4184  | 4274  | 4364  | 4451  | 4538  | 4688  | 4751  |
| 9.5                              | 5290  | 4251  | 4352  | 4452  | 4553  | 4654  | 4747  | 4841  | 4934  | 5028  | 5115  | 5203  | 5318  | 5346  |
| 10.0                             | 5898  | 4849  | 4951  | 5054  | 5157  | 5259  | 5353  | 5447  | 5541  | 5635  | 5723  | 5811  | 5905  | 5912  |
| 10.5                             | 6439  | 5385  | 5489  | 5594  | 5699  | 5804  | 5901  | 5997  | 6093  | 6189  | 6272  | 6356  | 6439  | 6439  |
| 11.0                             | 6854  | 5886  | 5993  | 6099  | 6205  | 6312  | 6399  | 6486  | 6574  | 6661  | 6725  | 6789  | 6850  | 6847  |
| 11.5                             | 7078  | 6361  | 6456  | 6551  | 6646  | 6741  | 6800  | 6860  | 6920  | 6980  | 7012  | 7045  | 7076  | 7074  |
| 12.0                             | 7160  | 6756  | 6820  | 6885  | 6949  | 7013  | 7040  | 7067  | 7094  | 7121  | 7134  | 7147  | 7159  | 7158  |
| 12.5                             | 7195  | 7008  | 7038  | 7068  | 7098  | 7129  | 7140  | 7152  | 7164  | 7176  | 7182  | 7188  | 7194  | 7194  |
| 13.0                             | 7200  | 7119  | 7133  | 7148  | 7162  | 7177  | 7182  | 7187  | 7193  | 7198  | 7199  | 7199  | 7200  | 7200  |
| 13.5                             | 7200  | 7166  | 7173  | 7179  | 7186  | 7192  | 7194  | 7196  | 7198  | 7199  | 7200  | 7200  | 7200  | 7200  |
| 14.0                             | 7200  | 7188  | 7191  | 7194  | 7196  | 7199  | 7199  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  |
| 14.5                             | 7200  | 7197  | 7198  | 7199  | 7199  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  |
| 15.0                             | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  |
| 15.5                             | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  |
| 16.0                             | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  |
| 16.5                             | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  |
| 17.0                             | 7200  | 7199  | 7199  | 7199  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  | 7200  |
| 17.5                             | 7194  | 7179  | 7180  | 7182  | 7183  | 7185  | 7186  | 7187  | 7189  | 7190  | 7191  | 7192  | 7195  | 7196  |
| 18.0                             | 7124  | 7064  | 7069  | 7074  | 7078  | 7083  | 7089  | 7094  | 7100  | 7106  | 7112  | 7118  | 7130  | 7136  |
| 18.5                             | 6959  | 6887  | 6892  | 6897  | 6903  | 6908  | 6915  | 6922  | 6929  | 6935  | 6943  | 6951  | 6967  | 6976  |
| 19.0                             | 6789  | 6719  | 6724  | 6730  | 6735  | 6740  | 6747  | 6754  | 6760  | 6767  | 6774  | 6782  | 6797  | 6806  |
| 19.5                             | 6630  | 6561  | 6567  | 6572  | 6578  | 6584  | 6589  | 6595  | 6601  | 6607  | 6615  | 6622  | 6637  | 6645  |
| 20.0                             | 6472  | 6384  | 6392  | 6399  | 6407  | 6414  | 6422  | 6431  | 6439  | 6448  | 6456  | 6464  | 6481  | 6490  |
| 20.5                             | 6262  | 6129  | 6140  | 6151  | 6163  | 6174  | 6187  | 6200  | 6212  | 6225  | 6238  | 6250  | 6275  | 6287  |
| 21.0                             | 5946  | 5762  | 5777  | 5793  | 5809  | 5825  | 5842  | 5859  | 5876  | 5893  | 5911  | 5928  | 5964  | 5983  |
| 21.5                             | 5538  | 5328  | 5345  | 5362  | 5379  | 5396  | 5416  | 5435  | 5454  | 5474  | 5495  | 5516  | 5558  | 5579  |
| 22.0                             | 5069  | 4864  | 4880  | 4897  | 4913  | 4930  | 4950  | 4971  | 4991  | 5011  | 5031  | 5050  | 5090  | 5110  |
| 22.5                             | 4597  | 4402  | 4419  | 4436  | 4453  | 4471  | 4487  | 4504  | 4521  | 4538  | 4558  | 4577  | 4614  | 4631  |
| 23.0                             | 4121  | 3930  | 3947  | 3963  | 3979  | 3996  | 4013  | 4030  | 4047  | 4064  | 4083  | 4102  | 4136  | 4150  |
| 23.5                             | 3636  | 3468  | 3484  | 3500  | 3515  | 3531  | 3545  | 3559  | 3572  | 3586  | 3603  | 3619  | 3651  | 3666  |
| 24.0                             | 3169  | 3020  | 3034  | 3048  | 3062  | 3076  | 3089  | 3102  | 3115  | 3127  | 3141  | 3155  | 3184  | 3199  |
| 24.5                             | 2718  | 2589  | 2602  | 2615  | 2627  | 2640  | 2653  | 2665  | 2678  | 2690  | 2699  | 2709  | 2734  | 2750  |
| 25.0                             | 2328  | 2223  | 2232  | 2242  | 2252  | 2262  | 2271  | 2280  | 2289  | 2298  | 2308  | 2318  | 2335  | 2343  |

**7.2 Ct Values, Mode PO7200-Ct74**

| Air density kg/m <sup>3</sup> |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wind speed [m/s]              | 1.225 | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0                           | 0.942 | 0.953 | 0.952 | 0.951 | 0.951 | 0.950 | 0.949 | 0.948 | 0.947 | 0.946 | 0.945 | 0.944 | 0.941 | 0.940 |
| 3.5                           | 0.863 | 0.871 | 0.870 | 0.869 | 0.869 | 0.868 | 0.867 | 0.867 | 0.866 | 0.865 | 0.864 | 0.864 | 0.862 | 0.861 |
| 4.0                           | 0.807 | 0.819 | 0.818 | 0.817 | 0.816 | 0.815 | 0.813 | 0.812 | 0.811 | 0.810 | 0.809 | 0.808 | 0.807 | 0.806 |
| 4.5                           | 0.782 | 0.790 | 0.788 | 0.787 | 0.786 | 0.785 | 0.785 | 0.784 | 0.783 | 0.783 | 0.782 | 0.782 | 0.781 | 0.780 |
| 5.0                           | 0.770 | 0.770 | 0.770 | 0.770 | 0.770 | 0.770 | 0.770 | 0.770 | 0.770 | 0.770 | 0.770 | 0.770 | 0.770 | 0.770 |
| 5.5                           | 0.768 | 0.768 | 0.768 | 0.768 | 0.768 | 0.768 | 0.768 | 0.768 | 0.768 | 0.768 | 0.768 | 0.768 | 0.768 | 0.767 |
| 6.0                           | 0.766 | 0.769 | 0.769 | 0.769 | 0.769 | 0.769 | 0.768 | 0.768 | 0.768 | 0.767 | 0.767 | 0.767 | 0.766 | 0.765 |
| 6.5                           | 0.763 | 0.768 | 0.768 | 0.768 | 0.767 | 0.767 | 0.766 | 0.766 | 0.765 | 0.765 | 0.764 | 0.763 | 0.762 | 0.761 |
| 7.0                           | 0.757 | 0.766 | 0.765 | 0.765 | 0.764 | 0.763 | 0.763 | 0.762 | 0.761 | 0.760 | 0.759 | 0.758 | 0.756 | 0.755 |
| 7.5                           | 0.750 | 0.762 | 0.761 | 0.760 | 0.759 | 0.758 | 0.757 | 0.756 | 0.755 | 0.753 | 0.752 | 0.751 | 0.749 | 0.747 |
| 8.0                           | 0.741 | 0.756 | 0.755 | 0.754 | 0.753 | 0.751 | 0.750 | 0.749 | 0.747 | 0.746 | 0.744 | 0.743 | 0.740 | 0.738 |
| 8.5                           | 0.732 | 0.750 | 0.748 | 0.747 | 0.745 | 0.744 | 0.742 | 0.740 | 0.739 | 0.737 | 0.735 | 0.733 | 0.729 | 0.727 |
| 9.0                           | 0.720 | 0.745 | 0.743 | 0.741 | 0.739 | 0.737 | 0.735 | 0.732 | 0.730 | 0.728 | 0.725 | 0.722 | 0.710 | 0.701 |
| 9.5                           | 0.679 | 0.730 | 0.726 | 0.722 | 0.718 | 0.714 | 0.709 | 0.704 | 0.700 | 0.695 | 0.690 | 0.684 | 0.662 | 0.645 |
| 10.0                          | 0.626 | 0.695 | 0.688 | 0.682 | 0.676 | 0.669 | 0.663 | 0.657 | 0.650 | 0.644 | 0.638 | 0.632 | 0.607 | 0.589 |
| 10.5                          | 0.570 | 0.642 | 0.635 | 0.628 | 0.621 | 0.615 | 0.608 | 0.602 | 0.596 | 0.590 | 0.583 | 0.577 | 0.554 | 0.538 |
| 11.0                          | 0.513 | 0.590 | 0.584 | 0.577 | 0.571 | 0.564 | 0.557 | 0.550 | 0.544 | 0.537 | 0.529 | 0.521 | 0.499 | 0.486 |
| 11.5                          | 0.451 | 0.543 | 0.536 | 0.529 | 0.521 | 0.514 | 0.505 | 0.496 | 0.488 | 0.479 | 0.470 | 0.460 | 0.440 | 0.429 |
| 12.0                          | 0.392 | 0.496 | 0.487 | 0.478 | 0.468 | 0.459 | 0.449 | 0.439 | 0.429 | 0.419 | 0.410 | 0.401 | 0.382 | 0.373 |
| 12.5                          | 0.341 | 0.445 | 0.435 | 0.424 | 0.413 | 0.403 | 0.393 | 0.384 | 0.375 | 0.365 | 0.357 | 0.349 | 0.334 | 0.326 |
| 13.0                          | 0.299 | 0.393 | 0.383 | 0.373 | 0.363 | 0.353 | 0.345 | 0.337 | 0.328 | 0.320 | 0.313 | 0.306 | 0.292 | 0.286 |
| 13.5                          | 0.264 | 0.347 | 0.338 | 0.329 | 0.321 | 0.312 | 0.304 | 0.297 | 0.290 | 0.282 | 0.276 | 0.270 | 0.259 | 0.253 |
| 14.0                          | 0.235 | 0.308 | 0.300 | 0.292 | 0.284 | 0.276 | 0.270 | 0.263 | 0.257 | 0.251 | 0.245 | 0.240 | 0.230 | 0.225 |
| 14.5                          | 0.210 | 0.274 | 0.267 | 0.260 | 0.253 | 0.246 | 0.241 | 0.235 | 0.229 | 0.224 | 0.219 | 0.214 | 0.206 | 0.202 |
| 15.0                          | 0.188 | 0.245 | 0.239 | 0.233 | 0.226 | 0.220 | 0.215 | 0.211 | 0.206 | 0.201 | 0.197 | 0.193 | 0.185 | 0.181 |
| 15.5                          | 0.170 | 0.220 | 0.215 | 0.209 | 0.204 | 0.199 | 0.194 | 0.190 | 0.186 | 0.181 | 0.178 | 0.174 | 0.167 | 0.164 |
| 16.0                          | 0.155 | 0.199 | 0.194 | 0.190 | 0.185 | 0.180 | 0.176 | 0.172 | 0.168 | 0.164 | 0.161 | 0.158 | 0.152 | 0.149 |
| 16.5                          | 0.141 | 0.181 | 0.177 | 0.172 | 0.168 | 0.164 | 0.160 | 0.157 | 0.153 | 0.150 | 0.147 | 0.144 | 0.138 | 0.136 |
| 17.0                          | 0.129 | 0.165 | 0.161 | 0.157 | 0.153 | 0.149 | 0.146 | 0.143 | 0.140 | 0.137 | 0.134 | 0.132 | 0.127 | 0.124 |
| 17.5                          | 0.119 | 0.151 | 0.148 | 0.144 | 0.141 | 0.137 | 0.134 | 0.132 | 0.129 | 0.126 | 0.124 | 0.121 | 0.117 | 0.114 |
| 18.0                          | 0.108 | 0.137 | 0.134 | 0.131 | 0.128 | 0.124 | 0.122 | 0.120 | 0.117 | 0.115 | 0.112 | 0.110 | 0.106 | 0.105 |
| 18.5                          | 0.098 | 0.123 | 0.120 | 0.117 | 0.115 | 0.112 | 0.110 | 0.108 | 0.105 | 0.103 | 0.101 | 0.100 | 0.096 | 0.094 |
| 19.0                          | 0.088 | 0.110 | 0.108 | 0.105 | 0.103 | 0.100 | 0.099 | 0.097 | 0.095 | 0.093 | 0.091 | 0.089 | 0.086 | 0.085 |
| 19.5                          | 0.080 | 0.100 | 0.097 | 0.095 | 0.093 | 0.091 | 0.089 | 0.088 | 0.086 | 0.084 | 0.083 | 0.081 | 0.078 | 0.077 |
| 20.0                          | 0.073 | 0.090 | 0.088 | 0.086 | 0.084 | 0.083 | 0.081 | 0.079 | 0.078 | 0.076 | 0.075 | 0.074 | 0.071 | 0.070 |
| 20.5                          | 0.066 | 0.081 | 0.079 | 0.077 | 0.076 | 0.074 | 0.073 | 0.072 | 0.070 | 0.069 | 0.068 | 0.067 | 0.065 | 0.064 |
| 21.0                          | 0.058 | 0.071 | 0.070 | 0.068 | 0.067 | 0.066 | 0.065 | 0.063 | 0.062 | 0.061 | 0.060 | 0.059 | 0.058 | 0.057 |
| 21.5                          | 0.052 | 0.062 | 0.061 | 0.060 | 0.059 | 0.057 | 0.056 | 0.056 | 0.055 | 0.054 | 0.053 | 0.052 | 0.051 | 0.050 |
| 22.0                          | 0.045 | 0.053 | 0.052 | 0.052 | 0.051 | 0.050 | 0.049 | 0.048 | 0.047 | 0.047 | 0.046 | 0.045 | 0.044 | 0.044 |
| 22.5                          | 0.039 | 0.046 | 0.045 | 0.044 | 0.044 | 0.043 | 0.042 | 0.042 | 0.041 | 0.040 | 0.040 | 0.039 | 0.038 | 0.038 |
| 23.0                          | 0.033 | 0.039 | 0.039 | 0.038 | 0.037 | 0.037 | 0.036 | 0.036 | 0.035 | 0.035 | 0.034 | 0.034 | 0.033 | 0.033 |
| 23.5                          | 0.028 | 0.033 | 0.033 | 0.032 | 0.032 | 0.031 | 0.031 | 0.030 | 0.030 | 0.030 | 0.029 | 0.029 | 0.028 | 0.028 |
| 24.0                          | 0.024 | 0.028 | 0.028 | 0.027 | 0.027 | 0.026 | 0.026 | 0.026 | 0.025 | 0.025 | 0.025 | 0.025 | 0.024 | 0.024 |
| 24.5                          | 0.020 | 0.024 | 0.023 | 0.023 | 0.023 | 0.022 | 0.022 | 0.022 | 0.021 | 0.021 | 0.021 | 0.021 | 0.020 | 0.020 |
| 25.0                          | 0.017 | 0.020 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.017 | 0.017 |

Original Instruction: T05 0127-1584 VER 01

T05 0127-1584 Ver 01 - Approved- Exported from DMS: 2022-08-25 by PIDEI



## 8 Power Curves, Ct Values and Sound Curves, Sound Optimized Modes

### 8.1 Power Curves, Sound Optimized Mode SO1

| Air density [kg/m <sup>3</sup> ] |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wind speed [m/s]                 | 1.225 | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0                              | 32    | 15    | 16    | 18    | 19    | 21    | 22    | 24    | 26    | 27    | 29    | 30    | 34    | 35    |
| 3.5                              | 129   | 78    | 82    | 87    | 91    | 95    | 100   | 105   | 109   | 114   | 119   | 124   | 134   | 140   |
| 4.0                              | 288   | 196   | 204   | 213   | 221   | 230   | 238   | 246   | 255   | 263   | 271   | 279   | 296   | 304   |
| 4.5                              | 481   | 346   | 359   | 371   | 383   | 395   | 407   | 420   | 432   | 444   | 457   | 469   | 493   | 506   |
| 5.0                              | 715   | 529   | 546   | 563   | 580   | 597   | 614   | 631   | 648   | 665   | 681   | 698   | 732   | 749   |
| 5.5                              | 999   | 748   | 770   | 793   | 816   | 839   | 862   | 884   | 907   | 930   | 953   | 976   | 1022  | 1045  |
| 6.0                              | 1340  | 1011  | 1041  | 1071  | 1101  | 1131  | 1160  | 1190  | 1220  | 1250  | 1280  | 1310  | 1370  | 1400  |
| 6.5                              | 1739  | 1323  | 1360  | 1398  | 1436  | 1474  | 1512  | 1550  | 1588  | 1626  | 1663  | 1701  | 1776  | 1814  |
| 7.0                              | 2202  | 1686  | 1733  | 1780  | 1828  | 1875  | 1922  | 1969  | 2016  | 2063  | 2109  | 2156  | 2249  | 2295  |
| 7.5                              | 2729  | 2100  | 2157  | 2215  | 2272  | 2330  | 2387  | 2444  | 2502  | 2559  | 2616  | 2672  | 2785  | 2842  |
| 8.0                              | 3325  | 2569  | 2639  | 2708  | 2777  | 2847  | 2915  | 2984  | 3053  | 3121  | 3189  | 3257  | 3392  | 3459  |
| 8.5                              | 3976  | 3088  | 3170  | 3252  | 3333  | 3415  | 3496  | 3576  | 3657  | 3738  | 3817  | 3896  | 4054  | 4131  |
| 9.0                              | 4625  | 3612  | 3705  | 3799  | 3892  | 3986  | 4078  | 4170  | 4262  | 4354  | 4444  | 4534  | 4705  | 4785  |
| 9.5                              | 5232  | 4109  | 4213  | 4318  | 4423  | 4527  | 4630  | 4732  | 4835  | 4937  | 5035  | 5134  | 5299  | 5366  |
| 10.0                             | 5788  | 4604  | 4720  | 4835  | 4951  | 5066  | 5175  | 5284  | 5394  | 5503  | 5598  | 5693  | 5835  | 5882  |
| 10.5                             | 6232  | 5116  | 5239  | 5361  | 5484  | 5607  | 5707  | 5807  | 5907  | 6007  | 6082  | 6157  | 6260  | 6288  |
| 11.0                             | 6552  | 5642  | 5758  | 5874  | 5990  | 6107  | 6184  | 6261  | 6338  | 6416  | 6461  | 6506  | 6566  | 6580  |
| 11.5                             | 6719  | 6141  | 6231  | 6321  | 6412  | 6502  | 6542  | 6582  | 6622  | 6662  | 6681  | 6700  | 6724  | 6730  |
| 12.0                             | 6785  | 6509  | 6556  | 6602  | 6649  | 6696  | 6712  | 6728  | 6744  | 6760  | 6768  | 6777  | 6787  | 6789  |
| 12.5                             | 6800  | 6711  | 6727  | 6743  | 6759  | 6775  | 6780  | 6785  | 6790  | 6795  | 6797  | 6798  | 6800  | 6800  |
| 13.0                             | 6800  | 6769  | 6775  | 6781  | 6787  | 6793  | 6795  | 6797  | 6798  | 6800  | 6800  | 6800  | 6800  | 6800  |
| 13.5                             | 6800  | 6787  | 6790  | 6793  | 6796  | 6799  | 6799  | 6799  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  |
| 14.0                             | 6800  | 6796  | 6797  | 6798  | 6799  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  |
| 14.5                             | 6800  | 6799  | 6799  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  |
| 15.0                             | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  | 6800  |
| 15.5                             | 6797  | 6795  | 6795  | 6796  | 6796  | 6796  | 6796  | 6796  | 6796  | 6796  | 6796  | 6797  | 6797  | 6797  |
| 16.0                             | 6783  | 6779  | 6779  | 6780  | 6780  | 6780  | 6780  | 6781  | 6781  | 6782  | 6782  | 6783  | 6784  | 6784  |
| 16.5                             | 6759  | 6753  | 6753  | 6753  | 6754  | 6754  | 6755  | 6755  | 6756  | 6756  | 6757  | 6758  | 6759  | 6760  |
| 17.0                             | 6728  | 6721  | 6721  | 6722  | 6722  | 6723  | 6723  | 6724  | 6725  | 6725  | 6726  | 6727  | 6729  | 6730  |
| 17.5                             | 6698  | 6690  | 6690  | 6691  | 6692  | 6692  | 6693  | 6694  | 6695  | 6695  | 6696  | 6697  | 6699  | 6700  |
| 18.0                             | 6669  | 6659  | 6659  | 6660  | 6661  | 6662  | 6662  | 6663  | 6664  | 6665  | 6666  | 6668  | 6670  | 6670  |
| 18.5                             | 6642  | 6630  | 6630  | 6631  | 6632  | 6632  | 6633  | 6634  | 6635  | 6636  | 6638  | 6640  | 6641  | 6641  |
| 19.0                             | 6614  | 6595  | 6596  | 6598  | 6599  | 6600  | 6602  | 6603  | 6604  | 6606  | 6609  | 6611  | 6614  | 6614  |
| 19.5                             | 6560  | 6520  | 6523  | 6527  | 6530  | 6533  | 6537  | 6540  | 6543  | 6547  | 6551  | 6555  | 6562  | 6564  |
| 20.0                             | 6453  | 6378  | 6385  | 6391  | 6397  | 6404  | 6411  | 6418  | 6425  | 6432  | 6439  | 6446  | 6459  | 6465  |
| 20.5                             | 6260  | 6129  | 6140  | 6151  | 6162  | 6174  | 6186  | 6199  | 6211  | 6223  | 6236  | 6248  | 6272  | 6284  |
| 21.0                             | 5947  | 5763  | 5779  | 5794  | 5810  | 5826  | 5843  | 5860  | 5876  | 5893  | 5911  | 5929  | 5964  | 5982  |
| 21.5                             | 5536  | 5327  | 5345  | 5362  | 5380  | 5397  | 5416  | 5435  | 5455  | 5474  | 5495  | 5515  | 5557  | 5578  |
| 22.0                             | 5068  | 4862  | 4880  | 4898  | 4916  | 4935  | 4953  | 4971  | 4989  | 5007  | 5027  | 5048  | 5091  | 5114  |
| 22.5                             | 4596  | 4404  | 4420  | 4437  | 4453  | 4470  | 4488  | 4505  | 4523  | 4541  | 4559  | 4578  | 4614  | 4632  |
| 23.0                             | 4121  | 3932  | 3949  | 3965  | 3982  | 3999  | 4015  | 4032  | 4049  | 4066  | 4084  | 4103  | 4136  | 4151  |
| 23.5                             | 3634  | 3466  | 3483  | 3499  | 3515  | 3531  | 3546  | 3560  | 3575  | 3589  | 3604  | 3619  | 3650  | 3666  |
| 24.0                             | 3171  | 3019  | 3032  | 3046  | 3059  | 3072  | 3085  | 3097  | 3110  | 3123  | 3139  | 3155  | 3184  | 3197  |
| 24.5                             | 2721  | 2585  | 2599  | 2612  | 2626  | 2639  | 2651  | 2662  | 2673  | 2685  | 2697  | 2709  | 2736  | 2750  |
| 25.0                             | 2322  | 2222  | 2231  | 2241  | 2250  | 2260  | 2268  | 2277  | 2285  | 2293  | 2303  | 2312  | 2335  | 2349  |

## 8.2 Ct Values, Sound Optimized Mode SO1

| Wind speed [m/s] | Air density kg/m <sup>3</sup> |       |       |       |       |       |       |       |       |       |       |       |       |       |
|------------------|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                  | 1.225                         | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0              | 0.969                         | 0.980 | 0.979 | 0.978 | 0.977 | 0.976 | 0.975 | 0.974 | 0.973 | 0.972 | 0.971 | 0.970 | 0.968 | 0.967 |
| 3.5              | 0.885                         | 0.893 | 0.892 | 0.892 | 0.891 | 0.890 | 0.889 | 0.889 | 0.888 | 0.887 | 0.886 | 0.886 | 0.884 | 0.883 |
| 4.0              | 0.831                         | 0.845 | 0.844 | 0.843 | 0.841 | 0.840 | 0.839 | 0.838 | 0.837 | 0.835 | 0.834 | 0.833 | 0.830 | 0.828 |
| 4.5              | 0.817                         | 0.824 | 0.823 | 0.822 | 0.821 | 0.820 | 0.819 | 0.819 | 0.818 | 0.818 | 0.818 | 0.817 | 0.816 | 0.816 |
| 5.0              | 0.812                         | 0.811 | 0.811 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 |
| 5.5              | 0.814                         | 0.814 | 0.814 | 0.814 | 0.814 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 |
| 6.0              | 0.814                         | 0.816 | 0.816 | 0.816 | 0.816 | 0.816 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.813 |
| 6.5              | 0.810                         | 0.816 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.813 | 0.813 | 0.812 | 0.811 | 0.811 | 0.809 | 0.809 |
| 7.0              | 0.805                         | 0.814 | 0.813 | 0.812 | 0.812 | 0.811 | 0.810 | 0.809 | 0.808 | 0.807 | 0.807 | 0.806 | 0.804 | 0.803 |
| 7.5              | 0.797                         | 0.810 | 0.809 | 0.808 | 0.807 | 0.805 | 0.804 | 0.803 | 0.802 | 0.801 | 0.800 | 0.798 | 0.796 | 0.794 |
| 8.0              | 0.789                         | 0.804 | 0.803 | 0.802 | 0.800 | 0.799 | 0.798 | 0.796 | 0.795 | 0.793 | 0.792 | 0.790 | 0.787 | 0.785 |
| 8.5              | 0.771                         | 0.789 | 0.787 | 0.786 | 0.784 | 0.783 | 0.781 | 0.779 | 0.778 | 0.776 | 0.774 | 0.772 | 0.768 | 0.766 |
| 9.0              | 0.726                         | 0.743 | 0.741 | 0.740 | 0.738 | 0.737 | 0.735 | 0.734 | 0.732 | 0.731 | 0.729 | 0.727 | 0.721 | 0.716 |
| 9.5              | 0.668                         | 0.685 | 0.683 | 0.682 | 0.681 | 0.680 | 0.678 | 0.677 | 0.675 | 0.674 | 0.672 | 0.670 | 0.659 | 0.650 |
| 10.0             | 0.610                         | 0.633 | 0.632 | 0.631 | 0.629 | 0.628 | 0.626 | 0.624 | 0.623 | 0.621 | 0.617 | 0.613 | 0.598 | 0.587 |
| 10.5             | 0.547                         | 0.591 | 0.589 | 0.587 | 0.585 | 0.584 | 0.579 | 0.575 | 0.571 | 0.567 | 0.560 | 0.554 | 0.535 | 0.523 |
| 11.0             | 0.485                         | 0.555 | 0.552 | 0.548 | 0.544 | 0.540 | 0.533 | 0.526 | 0.519 | 0.512 | 0.503 | 0.494 | 0.474 | 0.462 |
| 11.5             | 0.423                         | 0.520 | 0.513 | 0.506 | 0.499 | 0.492 | 0.482 | 0.472 | 0.462 | 0.452 | 0.442 | 0.433 | 0.413 | 0.403 |
| 12.0             | 0.367                         | 0.475 | 0.465 | 0.454 | 0.444 | 0.434 | 0.424 | 0.414 | 0.404 | 0.393 | 0.385 | 0.376 | 0.359 | 0.351 |
| 12.5             | 0.319                         | 0.423 | 0.412 | 0.401 | 0.390 | 0.379 | 0.370 | 0.361 | 0.352 | 0.343 | 0.335 | 0.327 | 0.312 | 0.305 |
| 13.0             | 0.280                         | 0.371 | 0.361 | 0.351 | 0.341 | 0.332 | 0.324 | 0.316 | 0.308 | 0.300 | 0.293 | 0.286 | 0.274 | 0.268 |
| 13.5             | 0.247                         | 0.327 | 0.318 | 0.309 | 0.301 | 0.292 | 0.285 | 0.279 | 0.272 | 0.265 | 0.259 | 0.253 | 0.242 | 0.237 |
| 14.0             | 0.220                         | 0.289 | 0.282 | 0.274 | 0.267 | 0.259 | 0.253 | 0.247 | 0.241 | 0.235 | 0.230 | 0.225 | 0.216 | 0.211 |
| 14.5             | 0.197                         | 0.257 | 0.251 | 0.244 | 0.238 | 0.231 | 0.226 | 0.221 | 0.215 | 0.210 | 0.206 | 0.201 | 0.193 | 0.189 |
| 15.0             | 0.177                         | 0.230 | 0.224 | 0.219 | 0.213 | 0.207 | 0.202 | 0.198 | 0.193 | 0.189 | 0.185 | 0.181 | 0.174 | 0.170 |
| 15.5             | 0.160                         | 0.207 | 0.202 | 0.197 | 0.192 | 0.187 | 0.183 | 0.179 | 0.174 | 0.170 | 0.167 | 0.163 | 0.157 | 0.154 |
| 16.0             | 0.145                         | 0.187 | 0.182 | 0.178 | 0.173 | 0.169 | 0.165 | 0.162 | 0.158 | 0.154 | 0.151 | 0.148 | 0.142 | 0.140 |
| 16.5             | 0.132                         | 0.169 | 0.165 | 0.161 | 0.157 | 0.153 | 0.150 | 0.147 | 0.143 | 0.140 | 0.137 | 0.135 | 0.129 | 0.127 |
| 17.0             | 0.120                         | 0.154 | 0.150 | 0.146 | 0.143 | 0.139 | 0.136 | 0.133 | 0.130 | 0.127 | 0.125 | 0.123 | 0.118 | 0.116 |
| 17.5             | 0.110                         | 0.141 | 0.137 | 0.134 | 0.131 | 0.128 | 0.125 | 0.122 | 0.120 | 0.117 | 0.115 | 0.112 | 0.108 | 0.106 |
| 18.0             | 0.101                         | 0.129 | 0.126 | 0.123 | 0.120 | 0.117 | 0.114 | 0.112 | 0.110 | 0.107 | 0.105 | 0.103 | 0.099 | 0.097 |
| 18.5             | 0.093                         | 0.118 | 0.115 | 0.113 | 0.110 | 0.107 | 0.105 | 0.103 | 0.101 | 0.098 | 0.097 | 0.095 | 0.091 | 0.090 |
| 19.0             | 0.085                         | 0.108 | 0.106 | 0.103 | 0.101 | 0.098 | 0.096 | 0.094 | 0.092 | 0.090 | 0.089 | 0.087 | 0.084 | 0.082 |
| 19.5             | 0.079                         | 0.099 | 0.097 | 0.095 | 0.092 | 0.090 | 0.088 | 0.087 | 0.085 | 0.083 | 0.082 | 0.080 | 0.077 | 0.076 |
| 20.0             | 0.072                         | 0.090 | 0.088 | 0.086 | 0.084 | 0.082 | 0.081 | 0.079 | 0.078 | 0.076 | 0.075 | 0.074 | 0.071 | 0.070 |
| 20.5             | 0.066                         | 0.081 | 0.079 | 0.077 | 0.076 | 0.074 | 0.073 | 0.072 | 0.070 | 0.069 | 0.068 | 0.067 | 0.065 | 0.064 |
| 21.0             | 0.059                         | 0.071 | 0.070 | 0.068 | 0.067 | 0.066 | 0.065 | 0.063 | 0.062 | 0.061 | 0.060 | 0.059 | 0.058 | 0.057 |
| 21.5             | 0.051                         | 0.062 | 0.061 | 0.060 | 0.059 | 0.057 | 0.056 | 0.056 | 0.055 | 0.054 | 0.053 | 0.052 | 0.051 | 0.050 |
| 22.0             | 0.045                         | 0.053 | 0.052 | 0.052 | 0.051 | 0.050 | 0.049 | 0.048 | 0.047 | 0.047 | 0.046 | 0.045 | 0.044 | 0.044 |
| 22.5             | 0.039                         | 0.046 | 0.045 | 0.044 | 0.044 | 0.043 | 0.042 | 0.042 | 0.041 | 0.040 | 0.040 | 0.039 | 0.038 | 0.038 |
| 23.0             | 0.033                         | 0.039 | 0.039 | 0.038 | 0.037 | 0.037 | 0.036 | 0.036 | 0.035 | 0.035 | 0.034 | 0.034 | 0.033 | 0.033 |
| 23.5             | 0.028                         | 0.033 | 0.033 | 0.032 | 0.032 | 0.031 | 0.031 | 0.030 | 0.030 | 0.030 | 0.029 | 0.029 | 0.028 | 0.028 |
| 24.0             | 0.024                         | 0.028 | 0.028 | 0.027 | 0.027 | 0.026 | 0.026 | 0.026 | 0.025 | 0.025 | 0.025 | 0.024 | 0.024 | 0.024 |
| 24.5             | 0.020                         | 0.024 | 0.023 | 0.023 | 0.023 | 0.022 | 0.022 | 0.022 | 0.021 | 0.021 | 0.021 | 0.021 | 0.020 | 0.020 |
| 25.0             | 0.017                         | 0.020 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.017 | 0.017 |

### 8.3 Sound Curves, Sound Optimized Mode SO1

| Sound Power Level at Hub Height   |  |
|-----------------------------------|--|
| Conditions for Sound Power Level: | Measurement standard IEC 61400-11 ed. 3<br>Maximum turbulence at hub height: 30%<br>Inflow angle (vertical): 0 ±2°<br>Air density: 1.225 kg/m <sup>3</sup> |
| Wind speed at hub height [m/s]    | Sound Power Level at Hub Height [dBA]<br>Sound Optimized Mode SO1 (Blades with serrated trailing edge)   |
| 3                                 | 93.9   |
| 4                                 | 94.0   |
| 5                                 | 94.9   |
| 6                                 | 97.9   |
| 7                                 | 101.3  |
| 8                                 | 104.2  |
| 9                                 | 105.0  |
| 10                                | 105.0  |
| 11                                | 105.0  |
| 12                                | 105.0  |
| 13                                | 105.0  |
| 14                                | 105.0  |
| 15                                | 105.0  |

### 8.4 Power Curves, Sound Optimized Mode SO2

| Air density [kg/m <sup>3</sup> ] |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wind speed [m/s]                 | 1.225 | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0                              | 32    | 15    | 16    | 18    | 19    | 21    | 22    | 24    | 26    | 27    | 29    | 30    | 34    | 35    |
| 3.5                              | 129   | 78    | 82    | 87    | 91    | 95    | 100   | 105   | 109   | 114   | 119   | 124   | 134   | 140   |
| 4.0                              | 288   | 196   | 204   | 213   | 221   | 230   | 238   | 246   | 255   | 263   | 271   | 279   | 296   | 304   |
| 4.5                              | 481   | 346   | 358   | 371   | 383   | 395   | 407   | 420   | 432   | 444   | 456   | 469   | 493   | 506   |
| 5.0                              | 715   | 529   | 546   | 563   | 580   | 597   | 614   | 631   | 648   | 664   | 681   | 698   | 732   | 749   |
| 5.5                              | 999   | 748   | 770   | 793   | 816   | 839   | 861   | 884   | 907   | 930   | 953   | 976   | 1022  | 1045  |
| 6.0                              | 1340  | 1011  | 1041  | 1071  | 1101  | 1131  | 1160  | 1190  | 1220  | 1250  | 1280  | 1310  | 1369  | 1399  |
| 6.5                              | 1739  | 1323  | 1360  | 1398  | 1436  | 1474  | 1512  | 1550  | 1588  | 1626  | 1663  | 1701  | 1776  | 1813  |
| 7.0                              | 2202  | 1686  | 1733  | 1780  | 1827  | 1875  | 1922  | 1969  | 2016  | 2063  | 2109  | 2156  | 2249  | 2295  |
| 7.5                              | 2729  | 2100  | 2157  | 2215  | 2273  | 2331  | 2388  | 2445  | 2502  | 2559  | 2616  | 2672  | 2786  | 2842  |
| 8.0                              | 3320  | 2566  | 2635  | 2704  | 2773  | 2843  | 2911  | 2980  | 3048  | 3117  | 3185  | 3252  | 3387  | 3455  |
| 8.5                              | 3925  | 3050  | 3131  | 3211  | 3292  | 3373  | 3452  | 3531  | 3611  | 3690  | 3769  | 3847  | 4003  | 4080  |
| 9.0                              | 4505  | 3517  | 3608  | 3699  | 3790  | 3881  | 3971  | 4060  | 4150  | 4240  | 4328  | 4417  | 4592  | 4679  |
| 9.5                              | 5048  | 3958  | 4059  | 4161  | 4262  | 4363  | 4462  | 4561  | 4661  | 4760  | 4856  | 4952  | 5139  | 5230  |
| 10.0                             | 5552  | 4407  | 4518  | 4630  | 4741  | 4852  | 4958  | 5063  | 5169  | 5274  | 5367  | 5459  | 5628  | 5704  |
| 10.5                             | 5946  | 4865  | 4983  | 5101  | 5219  | 5338  | 5436  | 5534  | 5632  | 5730  | 5802  | 5874  | 5998  | 6051  |
| 11.0                             | 6223  | 5327  | 5440  | 5554  | 5668  | 5781  | 5859  | 5937  | 6014  | 6092  | 6136  | 6179  | 6249  | 6274  |
| 11.5                             | 6403  | 5777  | 5871  | 5964  | 6057  | 6151  | 6198  | 6246  | 6293  | 6340  | 6361  | 6382  | 6416  | 6429  |
| 12.0                             | 6538  | 6162  | 6223  | 6285  | 6347  | 6409  | 6433  | 6456  | 6480  | 6503  | 6515  | 6527  | 6545  | 6553  |
| 12.5                             | 6623  | 6430  | 6462  | 6494  | 6525  | 6557  | 6570  | 6582  | 6595  | 6607  | 6612  | 6618  | 6624  | 6626  |
| 13.0                             | 6653  | 6562  | 6579  | 6595  | 6611  | 6627  | 6633  | 6639  | 6644  | 6650  | 6651  | 6652  | 6653  | 6653  |
| 13.5                             | 6656  | 6615  | 6623  | 6631  | 6640  | 6648  | 6650  | 6652  | 6654  | 6656  | 6656  | 6656  | 6656  | 6657  |
| 14.0                             | 6646  | 6629  | 6633  | 6637  | 6641  | 6644  | 6645  | 6645  | 6645  | 6646  | 6646  | 6646  | 6646  | 6647  |
| 14.5                             | 6623  | 6617  | 6618  | 6619  | 6620  | 6621  | 6621  | 6621  | 6621  | 6622  | 6622  | 6623  | 6623  | 6624  |
| 15.0                             | 6588  | 6586  | 6586  | 6586  | 6586  | 6586  | 6586  | 6587  | 6587  | 6587  | 6588  | 6588  | 6588  | 6590  |
| 15.5                             | 6552  | 6548  | 6548  | 6549  | 6549  | 6549  | 6549  | 6550  | 6550  | 6551  | 6551  | 6552  | 6552  | 6553  |
| 16.0                             | 6517  | 6513  | 6513  | 6513  | 6513  | 6514  | 6514  | 6514  | 6515  | 6515  | 6516  | 6516  | 6518  | 6519  |
| 16.5                             | 6485  | 6480  | 6480  | 6481  | 6481  | 6481  | 6482  | 6482  | 6483  | 6483  | 6484  | 6484  | 6486  | 6487  |
| 17.0                             | 6455  | 6449  | 6449  | 6449  | 6450  | 6450  | 6451  | 6451  | 6452  | 6453  | 6453  | 6454  | 6456  | 6457  |
| 17.5                             | 6426  | 6419  | 6419  | 6420  | 6420  | 6421  | 6421  | 6422  | 6423  | 6423  | 6424  | 6425  | 6427  | 6427  |
| 18.0                             | 6399  | 6392  | 6392  | 6393  | 6393  | 6394  | 6395  | 6395  | 6396  | 6397  | 6397  | 6398  | 6400  | 6400  |
| 18.5                             | 6374  | 6367  | 6367  | 6368  | 6368  | 6369  | 6370  | 6370  | 6371  | 6372  | 6373  | 6374  | 6375  | 6376  |
| 19.0                             | 6347  | 6338  | 6339  | 6339  | 6340  | 6341  | 6342  | 6343  | 6343  | 6344  | 6345  | 6346  | 6348  | 6349  |
| 19.5                             | 6319  | 6309  | 6310  | 6311  | 6311  | 6312  | 6313  | 6314  | 6315  | 6316  | 6317  | 6318  | 6321  | 6322  |
| 20.0                             | 6286  | 6258  | 6261  | 6263  | 6266  | 6269  | 6271  | 6274  | 6276  | 6279  | 6281  | 6283  | 6288  | 6290  |
| 20.5                             | 6179  | 6089  | 6097  | 6105  | 6113  | 6121  | 6130  | 6138  | 6146  | 6155  | 6163  | 6171  | 6187  | 6195  |
| 21.0                             | 5918  | 5758  | 5771  | 5784  | 5798  | 5811  | 5826  | 5841  | 5857  | 5872  | 5887  | 5902  | 5932  | 5947  |
| 21.5                             | 5527  | 5328  | 5345  | 5361  | 5378  | 5394  | 5413  | 5432  | 5451  | 5470  | 5489  | 5508  | 5547  | 5566  |
| 22.0                             | 5070  | 4864  | 4881  | 4897  | 4914  | 4931  | 4949  | 4968  | 4987  | 5005  | 5027  | 5049  | 5091  | 5111  |
| 22.5                             | 4596  | 4402  | 4419  | 4436  | 4453  | 4470  | 4488  | 4505  | 4523  | 4540  | 4559  | 4578  | 4613  | 4630  |
| 23.0                             | 4123  | 3933  | 3949  | 3965  | 3982  | 3998  | 4014  | 4030  | 4047  | 4063  | 4083  | 4103  | 4140  | 4157  |
| 23.5                             | 3635  | 3467  | 3483  | 3499  | 3515  | 3531  | 3545  | 3560  | 3574  | 3589  | 3604  | 3619  | 3650  | 3666  |
| 24.0                             | 3171  | 3019  | 3032  | 3046  | 3059  | 3072  | 3085  | 3097  | 3110  | 3123  | 3139  | 3155  | 3184  | 3197  |
| 24.5                             | 2721  | 2585  | 2599  | 2612  | 2626  | 2639  | 2651  | 2662  | 2673  | 2685  | 2697  | 2709  | 2736  | 2750  |
| 25.0                             | 2322  | 2222  | 2231  | 2241  | 2250  | 2260  | 2268  | 2277  | 2285  | 2293  | 2303  | 2312  | 2335  | 2349  |

Original Instruction: T05 0127-1584 VER 01

T05 0127-1584 Ver 01 - Approved- Exported from DMS: 2022-08-25 by PIDEI

### 8.5 Ct Values, Sound Optimized Mode SO2

| Wind speed [m/s] | Air density kg/m <sup>3</sup> |       |       |       |       |       |       |       |       |       |       |       |       |       |
|------------------|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                  | 1.225                         | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0              | 0.969                         | 0.980 | 0.979 | 0.978 | 0.977 | 0.976 | 0.975 | 0.974 | 0.973 | 0.972 | 0.971 | 0.970 | 0.968 | 0.967 |
| 3.5              | 0.885                         | 0.893 | 0.892 | 0.892 | 0.891 | 0.890 | 0.889 | 0.889 | 0.888 | 0.887 | 0.886 | 0.886 | 0.884 | 0.883 |
| 4.0              | 0.832                         | 0.845 | 0.844 | 0.843 | 0.842 | 0.841 | 0.840 | 0.838 | 0.837 | 0.836 | 0.834 | 0.833 | 0.830 | 0.828 |
| 4.5              | 0.816                         | 0.825 | 0.823 | 0.822 | 0.821 | 0.820 | 0.819 | 0.819 | 0.818 | 0.818 | 0.817 | 0.817 | 0.816 | 0.816 |
| 5.0              | 0.812                         | 0.811 | 0.811 | 0.811 | 0.811 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 |
| 5.5              | 0.814                         | 0.814 | 0.814 | 0.814 | 0.814 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.814 |
| 6.0              | 0.814                         | 0.816 | 0.816 | 0.816 | 0.816 | 0.816 | 0.815 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.813 | 0.813 |
| 6.5              | 0.810                         | 0.816 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.813 | 0.813 | 0.812 | 0.811 | 0.811 | 0.809 | 0.809 |
| 7.0              | 0.805                         | 0.814 | 0.813 | 0.812 | 0.812 | 0.811 | 0.810 | 0.809 | 0.808 | 0.807 | 0.806 | 0.806 | 0.804 | 0.803 |
| 7.5              | 0.797                         | 0.810 | 0.809 | 0.808 | 0.807 | 0.806 | 0.804 | 0.803 | 0.802 | 0.801 | 0.800 | 0.798 | 0.796 | 0.795 |
| 8.0              | 0.785                         | 0.800 | 0.799 | 0.798 | 0.796 | 0.795 | 0.794 | 0.792 | 0.791 | 0.790 | 0.788 | 0.787 | 0.784 | 0.782 |
| 8.5              | 0.744                         | 0.759 | 0.758 | 0.757 | 0.755 | 0.754 | 0.752 | 0.751 | 0.750 | 0.748 | 0.747 | 0.745 | 0.742 | 0.741 |
| 9.0              | 0.685                         | 0.698 | 0.697 | 0.696 | 0.695 | 0.694 | 0.693 | 0.691 | 0.690 | 0.689 | 0.688 | 0.686 | 0.684 | 0.683 |
| 9.5              | 0.627                         | 0.639 | 0.638 | 0.637 | 0.636 | 0.635 | 0.634 | 0.633 | 0.632 | 0.631 | 0.629 | 0.628 | 0.625 | 0.622 |
| 10.0             | 0.572                         | 0.590 | 0.590 | 0.589 | 0.588 | 0.587 | 0.585 | 0.584 | 0.582 | 0.581 | 0.578 | 0.575 | 0.567 | 0.562 |
| 10.5             | 0.513                         | 0.549 | 0.548 | 0.547 | 0.545 | 0.544 | 0.540 | 0.537 | 0.533 | 0.530 | 0.524 | 0.518 | 0.505 | 0.498 |
| 11.0             | 0.453                         | 0.514 | 0.511 | 0.508 | 0.505 | 0.502 | 0.496 | 0.490 | 0.484 | 0.478 | 0.470 | 0.461 | 0.444 | 0.436 |
| 11.5             | 0.398                         | 0.479 | 0.474 | 0.468 | 0.463 | 0.457 | 0.449 | 0.441 | 0.432 | 0.424 | 0.415 | 0.407 | 0.390 | 0.381 |
| 12.0             | 0.351                         | 0.442 | 0.434 | 0.426 | 0.418 | 0.410 | 0.401 | 0.393 | 0.384 | 0.375 | 0.367 | 0.359 | 0.343 | 0.336 |
| 12.5             | 0.309                         | 0.401 | 0.392 | 0.383 | 0.373 | 0.364 | 0.356 | 0.348 | 0.339 | 0.331 | 0.324 | 0.317 | 0.303 | 0.296 |
| 13.0             | 0.273                         | 0.357 | 0.348 | 0.340 | 0.331 | 0.322 | 0.314 | 0.307 | 0.299 | 0.292 | 0.286 | 0.279 | 0.267 | 0.261 |
| 13.5             | 0.242                         | 0.317 | 0.309 | 0.301 | 0.293 | 0.285 | 0.278 | 0.272 | 0.265 | 0.258 | 0.253 | 0.247 | 0.237 | 0.232 |
| 14.0             | 0.215                         | 0.281 | 0.274 | 0.267 | 0.260 | 0.253 | 0.247 | 0.241 | 0.235 | 0.229 | 0.224 | 0.220 | 0.210 | 0.206 |
| 14.5             | 0.192                         | 0.250 | 0.244 | 0.237 | 0.231 | 0.225 | 0.220 | 0.214 | 0.209 | 0.204 | 0.200 | 0.196 | 0.188 | 0.184 |
| 15.0             | 0.171                         | 0.222 | 0.217 | 0.211 | 0.206 | 0.200 | 0.196 | 0.191 | 0.187 | 0.182 | 0.179 | 0.175 | 0.168 | 0.165 |
| 15.5             | 0.154                         | 0.199 | 0.194 | 0.189 | 0.185 | 0.180 | 0.176 | 0.172 | 0.168 | 0.164 | 0.161 | 0.157 | 0.151 | 0.148 |
| 16.0             | 0.139                         | 0.179 | 0.175 | 0.171 | 0.166 | 0.162 | 0.158 | 0.155 | 0.151 | 0.148 | 0.145 | 0.142 | 0.136 | 0.134 |
| 16.5             | 0.126                         | 0.162 | 0.158 | 0.154 | 0.151 | 0.147 | 0.144 | 0.140 | 0.137 | 0.134 | 0.131 | 0.129 | 0.124 | 0.122 |
| 17.0             | 0.115                         | 0.147 | 0.144 | 0.140 | 0.137 | 0.133 | 0.131 | 0.128 | 0.125 | 0.122 | 0.120 | 0.117 | 0.113 | 0.111 |
| 17.5             | 0.106                         | 0.135 | 0.132 | 0.129 | 0.125 | 0.122 | 0.120 | 0.117 | 0.115 | 0.112 | 0.110 | 0.108 | 0.104 | 0.102 |
| 18.0             | 0.097                         | 0.123 | 0.121 | 0.118 | 0.115 | 0.112 | 0.110 | 0.107 | 0.105 | 0.103 | 0.101 | 0.099 | 0.095 | 0.093 |
| 18.5             | 0.089                         | 0.113 | 0.111 | 0.108 | 0.106 | 0.103 | 0.101 | 0.099 | 0.097 | 0.094 | 0.093 | 0.091 | 0.088 | 0.086 |
| 19.0             | 0.082                         | 0.104 | 0.101 | 0.099 | 0.097 | 0.094 | 0.092 | 0.091 | 0.089 | 0.087 | 0.085 | 0.084 | 0.080 | 0.079 |
| 19.5             | 0.076                         | 0.096 | 0.094 | 0.091 | 0.089 | 0.087 | 0.085 | 0.084 | 0.082 | 0.080 | 0.079 | 0.077 | 0.074 | 0.073 |
| 20.0             | 0.070                         | 0.088 | 0.086 | 0.084 | 0.082 | 0.081 | 0.079 | 0.077 | 0.076 | 0.074 | 0.073 | 0.072 | 0.069 | 0.068 |
| 20.5             | 0.065                         | 0.080 | 0.078 | 0.077 | 0.075 | 0.073 | 0.072 | 0.071 | 0.069 | 0.068 | 0.067 | 0.066 | 0.063 | 0.062 |
| 21.0             | 0.058                         | 0.071 | 0.070 | 0.068 | 0.067 | 0.065 | 0.064 | 0.063 | 0.062 | 0.061 | 0.060 | 0.059 | 0.057 | 0.056 |
| 21.5             | 0.051                         | 0.062 | 0.061 | 0.060 | 0.058 | 0.057 | 0.056 | 0.055 | 0.055 | 0.054 | 0.053 | 0.052 | 0.051 | 0.050 |
| 22.0             | 0.045                         | 0.053 | 0.052 | 0.052 | 0.051 | 0.050 | 0.049 | 0.048 | 0.047 | 0.047 | 0.046 | 0.045 | 0.044 | 0.044 |
| 22.5             | 0.039                         | 0.046 | 0.045 | 0.044 | 0.044 | 0.043 | 0.042 | 0.042 | 0.041 | 0.040 | 0.040 | 0.039 | 0.038 | 0.038 |
| 23.0             | 0.033                         | 0.039 | 0.039 | 0.038 | 0.037 | 0.037 | 0.036 | 0.036 | 0.035 | 0.035 | 0.034 | 0.034 | 0.033 | 0.033 |
| 23.5             | 0.028                         | 0.033 | 0.033 | 0.032 | 0.032 | 0.031 | 0.031 | 0.030 | 0.030 | 0.030 | 0.029 | 0.029 | 0.028 | 0.028 |
| 24.0             | 0.024                         | 0.028 | 0.028 | 0.027 | 0.027 | 0.026 | 0.026 | 0.026 | 0.025 | 0.025 | 0.025 | 0.024 | 0.024 | 0.024 |
| 24.5             | 0.020                         | 0.024 | 0.023 | 0.023 | 0.023 | 0.022 | 0.022 | 0.022 | 0.021 | 0.021 | 0.021 | 0.021 | 0.020 | 0.020 |
| 25.0             | 0.017                         | 0.020 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.017 | 0.017 |

## 8.6 Sound Curves, Sound Optimized Mode SO2

| Sound Power Level at Hub Height   |  |
|-----------------------------------|--|
| Conditions for Sound Power Level: | Measurement standard IEC 61400-11 ed. 3<br>Maximum turbulence at hub height: 30%<br>Inflow angle (vertical): 0 ±2°<br>Air density: 1.225 kg/m <sup>3</sup> |
| Wind speed at hub height [m/s]    | Sound Power Level at Hub Height [dBA]<br>Sound Optimized Mode SO2 (Blades with serrated trailing edge)   |
| 3                                 | 93.9   |
| 4                                 | 94.0   |
| 5                                 | 94.9   |
| 6                                 | 97.9   |
| 7                                 | 101.3  |
| 8                                 | 103.7  |
| 9                                 | 104.0  |
| 10                                | 104.0  |
| 11                                | 104.0  |
| 12                                | 104.0  |
| 13                                | 104.0  |
| 14                                | 104.0  |
| 15                                | 104.0  |

### 8.7 Power Curves, Sound Optimized Mode SO3

| Air density [kg/m <sup>3</sup> ] |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wind speed [m/s]                 | 1.225 | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0                              | 32    | 15    | 16    | 18    | 19    | 21    | 23    | 24    | 26    | 27    | 29    | 30    | 34    | 35    |
| 3.5                              | 129   | 78    | 82    | 87    | 91    | 95    | 100   | 105   | 109   | 114   | 119   | 124   | 134   | 140   |
| 4.0                              | 288   | 196   | 204   | 213   | 221   | 230   | 238   | 246   | 255   | 263   | 271   | 279   | 296   | 304   |
| 4.5                              | 481   | 346   | 358   | 371   | 383   | 395   | 407   | 420   | 432   | 444   | 456   | 469   | 493   | 506   |
| 5.0                              | 715   | 529   | 546   | 563   | 580   | 597   | 614   | 631   | 648   | 664   | 681   | 698   | 732   | 749   |
| 5.5                              | 999   | 748   | 770   | 793   | 816   | 839   | 861   | 884   | 907   | 930   | 953   | 976   | 1022  | 1045  |
| 6.0                              | 1340  | 1011  | 1041  | 1071  | 1100  | 1130  | 1160  | 1190  | 1220  | 1250  | 1280  | 1310  | 1369  | 1399  |
| 6.5                              | 1739  | 1323  | 1360  | 1398  | 1436  | 1474  | 1512  | 1550  | 1588  | 1626  | 1663  | 1701  | 1776  | 1813  |
| 7.0                              | 2202  | 1686  | 1733  | 1780  | 1828  | 1875  | 1922  | 1969  | 2015  | 2062  | 2109  | 2156  | 2248  | 2295  |
| 7.5                              | 2728  | 2099  | 2156  | 2214  | 2272  | 2329  | 2386  | 2444  | 2501  | 2558  | 2615  | 2671  | 2784  | 2841  |
| 8.0                              | 3292  | 2545  | 2614  | 2682  | 2751  | 2819  | 2887  | 2955  | 3023  | 3091  | 3158  | 3225  | 3358  | 3425  |
| 8.5                              | 3838  | 2982  | 3061  | 3140  | 3219  | 3297  | 3375  | 3453  | 3531  | 3608  | 3685  | 3762  | 3914  | 3990  |
| 9.0                              | 4344  | 3388  | 3476  | 3564  | 3652  | 3740  | 3827  | 3914  | 4000  | 4087  | 4173  | 4258  | 4428  | 4513  |
| 9.5                              | 4825  | 3778  | 3875  | 3972  | 4069  | 4166  | 4261  | 4357  | 4452  | 4548  | 4640  | 4733  | 4914  | 5003  |
| 10.0                             | 5282  | 4177  | 4283  | 4389  | 4495  | 4601  | 4703  | 4805  | 4907  | 5009  | 5100  | 5191  | 5357  | 5433  |
| 10.5                             | 5652  | 4590  | 4704  | 4817  | 4931  | 5044  | 5142  | 5239  | 5337  | 5434  | 5507  | 5579  | 5707  | 5762  |
| 11.0                             | 5931  | 5018  | 5130  | 5242  | 5354  | 5466  | 5546  | 5627  | 5707  | 5788  | 5835  | 5883  | 5959  | 5986  |
| 11.5                             | 6115  | 5450  | 5546  | 5643  | 5740  | 5837  | 5889  | 5941  | 5993  | 6045  | 6068  | 6091  | 6129  | 6143  |
| 12.0                             | 6248  | 5833  | 5900  | 5968  | 6036  | 6104  | 6131  | 6158  | 6185  | 6211  | 6224  | 6236  | 6256  | 6263  |
| 12.5                             | 6334  | 6112  | 6149  | 6187  | 6224  | 6261  | 6274  | 6288  | 6302  | 6316  | 6322  | 6328  | 6336  | 6338  |
| 13.0                             | 6367  | 6259  | 6278  | 6298  | 6317  | 6336  | 6343  | 6350  | 6357  | 6363  | 6365  | 6366  | 6367  | 6368  |
| 13.5                             | 6375  | 6322  | 6332  | 6343  | 6353  | 6363  | 6366  | 6369  | 6371  | 6374  | 6374  | 6374  | 6375  | 6375  |
| 14.0                             | 6370  | 6345  | 6350  | 6356  | 6361  | 6367  | 6367  | 6368  | 6369  | 6369  | 6369  | 6369  | 6370  | 6370  |
| 14.5                             | 6353  | 6343  | 6345  | 6348  | 6350  | 6352  | 6352  | 6352  | 6352  | 6353  | 6353  | 6353  | 6353  | 6354  |
| 15.0                             | 6327  | 6324  | 6324  | 6325  | 6325  | 6325  | 6325  | 6325  | 6325  | 6326  | 6326  | 6326  | 6327  | 6327  |
| 15.5                             | 6297  | 6295  | 6295  | 6295  | 6295  | 6296  | 6296  | 6296  | 6296  | 6296  | 6297  | 6297  | 6298  | 6298  |
| 16.0                             | 6267  | 6264  | 6264  | 6264  | 6264  | 6264  | 6265  | 6265  | 6266  | 6266  | 6267  | 6267  | 6268  | 6269  |
| 16.5                             | 6237  | 6232  | 6232  | 6232  | 6233  | 6233  | 6233  | 6234  | 6234  | 6235  | 6235  | 6236  | 6237  | 6238  |
| 17.0                             | 6206  | 6201  | 6201  | 6201  | 6202  | 6202  | 6203  | 6203  | 6204  | 6204  | 6205  | 6205  | 6207  | 6208  |
| 17.5                             | 6177  | 6171  | 6172  | 6172  | 6173  | 6173  | 6174  | 6174  | 6175  | 6175  | 6176  | 6176  | 6178  | 6179  |
| 18.0                             | 6149  | 6143  | 6144  | 6144  | 6144  | 6145  | 6145  | 6146  | 6147  | 6147  | 6148  | 6149  | 6150  | 6151  |
| 18.5                             | 6124  | 6117  | 6118  | 6118  | 6119  | 6119  | 6120  | 6120  | 6121  | 6122  | 6122  | 6123  | 6124  | 6125  |
| 19.0                             | 6100  | 6092  | 6093  | 6093  | 6094  | 6095  | 6095  | 6096  | 6097  | 6097  | 6098  | 6099  | 6100  | 6101  |
| 19.5                             | 6074  | 6065  | 6066  | 6067  | 6067  | 6068  | 6069  | 6070  | 6071  | 6072  | 6072  | 6073  | 6075  | 6076  |
| 20.0                             | 6045  | 6033  | 6034  | 6035  | 6036  | 6037  | 6038  | 6039  | 6040  | 6041  | 6042  | 6044  | 6046  | 6047  |
| 20.5                             | 5991  | 5949  | 5953  | 5957  | 5961  | 5965  | 5968  | 5972  | 5976  | 5979  | 5983  | 5987  | 5994  | 5997  |
| 21.0                             | 5817  | 5708  | 5718  | 5727  | 5737  | 5747  | 5757  | 5768  | 5778  | 5789  | 5798  | 5808  | 5828  | 5839  |
| 21.5                             | 5497  | 5331  | 5345  | 5360  | 5374  | 5389  | 5405  | 5421  | 5438  | 5454  | 5469  | 5483  | 5515  | 5532  |
| 22.0                             | 5062  | 4876  | 4891  | 4905  | 4920  | 4935  | 4953  | 4971  | 4989  | 5006  | 5025  | 5043  | 5080  | 5099  |
| 22.5                             | 4596  | 4404  | 4421  | 4438  | 4454  | 4471  | 4488  | 4506  | 4523  | 4541  | 4559  | 4577  | 4615  | 4634  |
| 23.0                             | 4118  | 3934  | 3950  | 3966  | 3982  | 3998  | 4014  | 4031  | 4048  | 4065  | 4082  | 4100  | 4135  | 4153  |
| 23.5                             | 3635  | 3468  | 3483  | 3498  | 3512  | 3527  | 3542  | 3556  | 3571  | 3586  | 3602  | 3618  | 3653  | 3671  |
| 24.0                             | 3173  | 3019  | 3031  | 3044  | 3057  | 3069  | 3084  | 3099  | 3113  | 3128  | 3143  | 3158  | 3186  | 3200  |
| 24.5                             | 2721  | 2585  | 2599  | 2612  | 2626  | 2639  | 2651  | 2662  | 2673  | 2685  | 2697  | 2709  | 2736  | 2750  |
| 25.0                             | 2322  | 2222  | 2231  | 2241  | 2250  | 2260  | 2268  | 2277  | 2285  | 2293  | 2303  | 2312  | 2335  | 2349  |

Original Instruction: T05 0127-1584 VER 01

T05 0127-1584 Ver 01 - Approved- Exported from DMS: 2022-08-25 by PIDEI

### 8.8 Ct Values, Sound Optimized Mode SO3

| Wind speed [m/s] | Air density kg/m <sup>3</sup> |       |       |       |       |       |       |       |       |       |       |       |       |       |
|------------------|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                  | 1.225                         | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0              | 0.969                         | 0.980 | 0.979 | 0.978 | 0.977 | 0.976 | 0.975 | 0.974 | 0.973 | 0.972 | 0.971 | 0.970 | 0.968 | 0.967 |
| 3.5              | 0.885                         | 0.893 | 0.892 | 0.892 | 0.891 | 0.890 | 0.889 | 0.889 | 0.888 | 0.887 | 0.886 | 0.886 | 0.884 | 0.883 |
| 4.0              | 0.831                         | 0.846 | 0.844 | 0.843 | 0.842 | 0.841 | 0.840 | 0.839 | 0.837 | 0.836 | 0.834 | 0.833 | 0.830 | 0.828 |
| 4.5              | 0.816                         | 0.825 | 0.823 | 0.822 | 0.821 | 0.820 | 0.819 | 0.819 | 0.818 | 0.818 | 0.817 | 0.817 | 0.816 | 0.816 |
| 5.0              | 0.812                         | 0.811 | 0.811 | 0.811 | 0.811 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 |
| 5.5              | 0.814                         | 0.814 | 0.814 | 0.814 | 0.814 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.814 |
| 6.0              | 0.814                         | 0.816 | 0.816 | 0.816 | 0.816 | 0.816 | 0.815 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.813 | 0.813 |
| 6.5              | 0.810                         | 0.816 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.813 | 0.812 | 0.812 | 0.811 | 0.811 | 0.809 | 0.809 |
| 7.0              | 0.805                         | 0.814 | 0.813 | 0.812 | 0.812 | 0.811 | 0.810 | 0.809 | 0.808 | 0.807 | 0.807 | 0.806 | 0.804 | 0.803 |
| 7.5              | 0.796                         | 0.808 | 0.807 | 0.806 | 0.805 | 0.804 | 0.803 | 0.802 | 0.801 | 0.800 | 0.799 | 0.797 | 0.795 | 0.794 |
| 8.0              | 0.766                         | 0.780 | 0.779 | 0.778 | 0.776 | 0.775 | 0.774 | 0.772 | 0.771 | 0.770 | 0.768 | 0.767 | 0.764 | 0.763 |
| 8.5              | 0.706                         | 0.718 | 0.717 | 0.716 | 0.715 | 0.714 | 0.713 | 0.712 | 0.711 | 0.709 | 0.708 | 0.707 | 0.705 | 0.704 |
| 9.0              | 0.640                         | 0.651 | 0.650 | 0.649 | 0.648 | 0.647 | 0.646 | 0.645 | 0.644 | 0.643 | 0.642 | 0.641 | 0.639 | 0.638 |
| 9.5              | 0.584                         | 0.594 | 0.593 | 0.592 | 0.591 | 0.590 | 0.590 | 0.589 | 0.588 | 0.587 | 0.586 | 0.585 | 0.582 | 0.581 |
| 10.0             | 0.532                         | 0.547 | 0.546 | 0.545 | 0.545 | 0.544 | 0.543 | 0.542 | 0.541 | 0.540 | 0.537 | 0.535 | 0.528 | 0.525 |
| 10.5             | 0.479                         | 0.508 | 0.507 | 0.506 | 0.505 | 0.504 | 0.502 | 0.499 | 0.496 | 0.494 | 0.489 | 0.484 | 0.473 | 0.467 |
| 11.0             | 0.427                         | 0.476 | 0.474 | 0.471 | 0.469 | 0.467 | 0.462 | 0.457 | 0.453 | 0.448 | 0.441 | 0.434 | 0.419 | 0.411 |
| 11.5             | 0.376                         | 0.446 | 0.442 | 0.437 | 0.433 | 0.429 | 0.422 | 0.415 | 0.408 | 0.400 | 0.392 | 0.384 | 0.369 | 0.361 |
| 12.0             | 0.333                         | 0.414 | 0.408 | 0.401 | 0.394 | 0.388 | 0.379 | 0.371 | 0.363 | 0.355 | 0.348 | 0.340 | 0.326 | 0.319 |
| 12.5             | 0.294                         | 0.378 | 0.370 | 0.362 | 0.354 | 0.345 | 0.338 | 0.330 | 0.322 | 0.314 | 0.308 | 0.301 | 0.288 | 0.282 |
| 13.0             | 0.260                         | 0.339 | 0.331 | 0.322 | 0.314 | 0.306 | 0.299 | 0.292 | 0.285 | 0.278 | 0.272 | 0.266 | 0.254 | 0.249 |
| 13.5             | 0.230                         | 0.302 | 0.294 | 0.287 | 0.279 | 0.272 | 0.265 | 0.259 | 0.253 | 0.246 | 0.241 | 0.236 | 0.226 | 0.221 |
| 14.0             | 0.205                         | 0.268 | 0.261 | 0.255 | 0.248 | 0.241 | 0.236 | 0.230 | 0.225 | 0.219 | 0.214 | 0.210 | 0.201 | 0.197 |
| 14.5             | 0.183                         | 0.239 | 0.233 | 0.227 | 0.221 | 0.215 | 0.210 | 0.205 | 0.200 | 0.195 | 0.191 | 0.187 | 0.180 | 0.176 |
| 15.0             | 0.164                         | 0.213 | 0.208 | 0.203 | 0.197 | 0.192 | 0.188 | 0.183 | 0.179 | 0.175 | 0.171 | 0.168 | 0.161 | 0.158 |
| 15.5             | 0.148                         | 0.191 | 0.187 | 0.182 | 0.177 | 0.172 | 0.169 | 0.165 | 0.161 | 0.157 | 0.154 | 0.151 | 0.145 | 0.142 |
| 16.0             | 0.134                         | 0.172 | 0.168 | 0.164 | 0.160 | 0.156 | 0.152 | 0.149 | 0.145 | 0.142 | 0.139 | 0.136 | 0.131 | 0.129 |
| 16.5             | 0.121                         | 0.156 | 0.152 | 0.149 | 0.145 | 0.141 | 0.138 | 0.135 | 0.132 | 0.129 | 0.126 | 0.124 | 0.119 | 0.117 |
| 17.0             | 0.110                         | 0.142 | 0.138 | 0.135 | 0.132 | 0.128 | 0.126 | 0.123 | 0.120 | 0.117 | 0.115 | 0.113 | 0.108 | 0.106 |
| 17.5             | 0.101                         | 0.130 | 0.127 | 0.124 | 0.121 | 0.118 | 0.115 | 0.113 | 0.110 | 0.108 | 0.106 | 0.104 | 0.100 | 0.098 |
| 18.0             | 0.093                         | 0.119 | 0.116 | 0.113 | 0.110 | 0.108 | 0.105 | 0.103 | 0.101 | 0.099 | 0.097 | 0.095 | 0.091 | 0.090 |
| 18.5             | 0.086                         | 0.109 | 0.106 | 0.104 | 0.101 | 0.099 | 0.097 | 0.095 | 0.093 | 0.091 | 0.089 | 0.087 | 0.084 | 0.083 |
| 19.0             | 0.079                         | 0.100 | 0.098 | 0.095 | 0.093 | 0.091 | 0.089 | 0.087 | 0.085 | 0.083 | 0.082 | 0.080 | 0.077 | 0.076 |
| 19.5             | 0.073                         | 0.092 | 0.090 | 0.088 | 0.086 | 0.084 | 0.082 | 0.081 | 0.079 | 0.077 | 0.076 | 0.074 | 0.072 | 0.070 |
| 20.0             | 0.068                         | 0.085 | 0.083 | 0.081 | 0.080 | 0.078 | 0.076 | 0.075 | 0.073 | 0.071 | 0.070 | 0.069 | 0.066 | 0.065 |
| 20.5             | 0.063                         | 0.078 | 0.077 | 0.075 | 0.073 | 0.072 | 0.070 | 0.069 | 0.067 | 0.066 | 0.065 | 0.064 | 0.061 | 0.060 |
| 21.0             | 0.057                         | 0.070 | 0.069 | 0.067 | 0.066 | 0.065 | 0.063 | 0.062 | 0.061 | 0.060 | 0.059 | 0.058 | 0.056 | 0.055 |
| 21.5             | 0.051                         | 0.062 | 0.061 | 0.060 | 0.058 | 0.057 | 0.056 | 0.055 | 0.054 | 0.053 | 0.053 | 0.052 | 0.050 | 0.049 |
| 22.0             | 0.045                         | 0.054 | 0.053 | 0.052 | 0.051 | 0.050 | 0.049 | 0.048 | 0.047 | 0.046 | 0.046 | 0.045 | 0.044 | 0.043 |
| 22.5             | 0.039                         | 0.046 | 0.045 | 0.044 | 0.044 | 0.043 | 0.042 | 0.041 | 0.041 | 0.040 | 0.040 | 0.039 | 0.038 | 0.038 |
| 23.0             | 0.033                         | 0.039 | 0.039 | 0.038 | 0.037 | 0.037 | 0.036 | 0.036 | 0.035 | 0.035 | 0.034 | 0.034 | 0.033 | 0.033 |
| 23.5             | 0.028                         | 0.033 | 0.033 | 0.032 | 0.032 | 0.031 | 0.031 | 0.030 | 0.030 | 0.030 | 0.029 | 0.029 | 0.028 | 0.028 |
| 24.0             | 0.024                         | 0.028 | 0.028 | 0.027 | 0.027 | 0.026 | 0.026 | 0.026 | 0.025 | 0.025 | 0.025 | 0.025 | 0.024 | 0.024 |
| 24.5             | 0.020                         | 0.024 | 0.023 | 0.023 | 0.023 | 0.022 | 0.022 | 0.022 | 0.021 | 0.021 | 0.021 | 0.021 | 0.020 | 0.020 |
| 25.0             | 0.017                         | 0.020 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.017 | 0.017 |



### 8.9 Sound Curves, Sound Optimized Mode SO3

| Sound Power Level at Hub Height   |  |
|-----------------------------------|--|
| Conditions for Sound Power Level: | Measurement standard IEC 61400-11 ed. 3<br>Maximum turbulence at hub height: 30%<br>Inflow angle (vertical): 0 ±2°<br>Air density: 1.225 kg/m <sup>3</sup> |
| Wind speed at hub height [m/s]    | Sound Power Level at Hub Height [dBA]<br>Sound Optimized Mode SO3 (Blades with serrated trailing edge)   |
| 3                                 | 93.9   |
| 4                                 | 94.0   |
| 5                                 | 94.9   |
| 6                                 | 97.9   |
| 7                                 | 101.3  |
| 8                                 | 103.0  |
| 9                                 | 103.0  |
| 10                                | 103.0  |
| 11                                | 103.0  |
| 12                                | 103.0  |
| 13                                | 103.0  |
| 14                                | 103.0  |
| 15                                | 103.0  |

### 8.10 Power Curves, Sound Optimized Mode SO4

| Air density [kg/m <sup>3</sup> ] |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wind speed [m/s]                 | 1.225 | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0                              | 32    | 15    | 17    | 18    | 20    | 21    | 23    | 24    | 26    | 27    | 29    | 31    | 34    | 35    |
| 3.5                              | 129   | 78    | 83    | 87    | 91    | 95    | 100   | 105   | 110   | 114   | 119   | 124   | 134   | 140   |
| 4.0                              | 288   | 196   | 204   | 213   | 221   | 230   | 238   | 246   | 255   | 263   | 271   | 279   | 296   | 304   |
| 4.5                              | 481   | 346   | 358   | 371   | 383   | 395   | 407   | 420   | 432   | 444   | 456   | 469   | 493   | 506   |
| 5.0                              | 715   | 529   | 546   | 563   | 580   | 597   | 614   | 631   | 648   | 664   | 681   | 698   | 732   | 749   |
| 5.5                              | 999   | 748   | 770   | 793   | 816   | 839   | 861   | 884   | 907   | 930   | 953   | 976   | 1022  | 1045  |
| 6.0                              | 1340  | 1011  | 1041  | 1071  | 1100  | 1130  | 1160  | 1190  | 1220  | 1250  | 1280  | 1310  | 1369  | 1399  |
| 6.5                              | 1739  | 1323  | 1360  | 1398  | 1436  | 1474  | 1512  | 1550  | 1588  | 1626  | 1663  | 1701  | 1776  | 1813  |
| 7.0                              | 2202  | 1686  | 1733  | 1780  | 1827  | 1874  | 1921  | 1968  | 2015  | 2062  | 2109  | 2155  | 2249  | 2295  |
| 7.5                              | 2715  | 2089  | 2146  | 2203  | 2261  | 2318  | 2375  | 2432  | 2489  | 2546  | 2602  | 2658  | 2771  | 2827  |
| 8.0                              | 3228  | 2497  | 2564  | 2631  | 2698  | 2765  | 2831  | 2898  | 2964  | 3031  | 3097  | 3163  | 3294  | 3359  |
| 8.5                              | 3713  | 2884  | 2960  | 3036  | 3112  | 3189  | 3264  | 3339  | 3415  | 3490  | 3564  | 3639  | 3787  | 3860  |
| 9.0                              | 4171  | 3250  | 3335  | 3420  | 3504  | 3589  | 3673  | 3756  | 3840  | 3923  | 4006  | 4088  | 4252  | 4334  |
| 9.5                              | 4606  | 3601  | 3694  | 3787  | 3880  | 3973  | 4065  | 4156  | 4248  | 4339  | 4428  | 4517  | 4693  | 4779  |
| 10.0                             | 5019  | 3954  | 4055  | 4156  | 4257  | 4358  | 4456  | 4554  | 4652  | 4750  | 4839  | 4929  | 5094  | 5170  |
| 10.5                             | 5358  | 4318  | 4426  | 4535  | 4643  | 4752  | 4848  | 4945  | 5041  | 5138  | 5211  | 5285  | 5415  | 5472  |
| 11.0                             | 5621  | 4696  | 4806  | 4915  | 5024  | 5133  | 5217  | 5300  | 5383  | 5467  | 5518  | 5570  | 5652  | 5683  |
| 11.5                             | 5799  | 5092  | 5191  | 5291  | 5390  | 5490  | 5547  | 5604  | 5661  | 5719  | 5746  | 5772  | 5815  | 5830  |
| 12.0                             | 5935  | 5467  | 5542  | 5618  | 5693  | 5769  | 5800  | 5831  | 5862  | 5893  | 5907  | 5921  | 5943  | 5952  |
| 12.5                             | 6033  | 5764  | 5810  | 5855  | 5901  | 5946  | 5963  | 5979  | 5995  | 6012  | 6019  | 6026  | 6036  | 6040  |
| 13.0                             | 6084  | 5945  | 5969  | 5994  | 6019  | 6044  | 6052  | 6060  | 6069  | 6077  | 6079  | 6082  | 6084  | 6085  |
| 13.5                             | 6100  | 6029  | 6042  | 6055  | 6068  | 6082  | 6086  | 6089  | 6093  | 6097  | 6098  | 6099  | 6100  | 6100  |
| 14.0                             | 6094  | 6060  | 6067  | 6074  | 6082  | 6089  | 6090  | 6091  | 6093  | 6094  | 6094  | 6094  | 6094  | 6094  |
| 14.5                             | 6076  | 6059  | 6063  | 6067  | 6071  | 6075  | 6075  | 6075  | 6075  | 6076  | 6076  | 6076  | 6076  | 6076  |
| 15.0                             | 6052  | 6049  | 6050  | 6050  | 6051  | 6051  | 6051  | 6051  | 6052  | 6052  | 6052  | 6052  | 6053  | 6053  |
| 15.5                             | 6026  | 6024  | 6024  | 6024  | 6024  | 6024  | 6024  | 6025  | 6025  | 6025  | 6025  | 6026  | 6026  | 6027  |
| 16.0                             | 5998  | 5995  | 5995  | 5995  | 5995  | 5995  | 5996  | 5996  | 5996  | 5996  | 5997  | 5997  | 5998  | 5999  |
| 16.5                             | 5968  | 5964  | 5964  | 5964  | 5965  | 5965  | 5965  | 5966  | 5966  | 5967  | 5967  | 5967  | 5968  | 5969  |
| 17.0                             | 5938  | 5933  | 5933  | 5933  | 5934  | 5934  | 5934  | 5935  | 5935  | 5936  | 5936  | 5937  | 5938  | 5939  |
| 17.5                             | 5908  | 5904  | 5904  | 5904  | 5904  | 5905  | 5905  | 5906  | 5906  | 5907  | 5907  | 5908  | 5909  | 5910  |
| 18.0                             | 5881  | 5875  | 5876  | 5876  | 5876  | 5877  | 5877  | 5878  | 5878  | 5879  | 5879  | 5880  | 5881  | 5882  |
| 18.5                             | 5855  | 5849  | 5850  | 5850  | 5850  | 5851  | 5851  | 5852  | 5852  | 5853  | 5853  | 5854  | 5855  | 5856  |
| 19.0                             | 5830  | 5824  | 5824  | 5825  | 5825  | 5825  | 5826  | 5827  | 5827  | 5828  | 5829  | 5829  | 5831  | 5831  |
| 19.5                             | 5806  | 5799  | 5799  | 5800  | 5800  | 5801  | 5801  | 5802  | 5803  | 5803  | 5804  | 5805  | 5806  | 5807  |
| 20.0                             | 5779  | 5772  | 5772  | 5773  | 5773  | 5774  | 5775  | 5775  | 5776  | 5777  | 5778  | 5779  | 5780  | 5781  |
| 20.5                             | 5749  | 5731  | 5732  | 5734  | 5736  | 5737  | 5739  | 5741  | 5742  | 5744  | 5746  | 5747  | 5750  | 5751  |
| 21.0                             | 5659  | 5596  | 5602  | 5608  | 5613  | 5619  | 5625  | 5631  | 5637  | 5643  | 5648  | 5654  | 5664  | 5670  |
| 21.5                             | 5425  | 5313  | 5323  | 5333  | 5342  | 5352  | 5363  | 5374  | 5384  | 5395  | 5405  | 5415  | 5437  | 5448  |
| 22.0                             | 5042  | 4878  | 4891  | 4903  | 4916  | 4929  | 4945  | 4961  | 4977  | 4994  | 5010  | 5026  | 5057  | 5073  |
| 22.5                             | 4574  | 4396  | 4412  | 4428  | 4443  | 4459  | 4475  | 4491  | 4507  | 4523  | 4540  | 4557  | 4591  | 4607  |
| 23.0                             | 4097  | 3923  | 3938  | 3953  | 3968  | 3983  | 3999  | 4016  | 4032  | 4049  | 4065  | 4081  | 4113  | 4128  |
| 23.5                             | 3631  | 3468  | 3483  | 3498  | 3513  | 3528  | 3543  | 3557  | 3571  | 3586  | 3601  | 3616  | 3649  | 3667  |
| 24.0                             | 3171  | 3018  | 3032  | 3045  | 3059  | 3072  | 3086  | 3100  | 3113  | 3127  | 3142  | 3156  | 3185  | 3199  |
| 24.5                             | 2720  | 2586  | 2599  | 2613  | 2626  | 2640  | 2652  | 2664  | 2676  | 2688  | 2699  | 2709  | 2736  | 2752  |
| 25.0                             | 2322  | 2221  | 2231  | 2240  | 2250  | 2260  | 2269  | 2278  | 2287  | 2296  | 2305  | 2313  | 2334  | 2346  |

Original Instruction: T05 0127-1584 VER 01

T05 0127-1584 Ver 01 - Approved- Exported from DMS: 2022-08-25 by PIDEI

**8.11 Ct Values, Sound Optimized Mode SO4**

| Air density kg/m <sup>3</sup> |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wind speed [m/s]              | 1.225 | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0                           | 0.969 | 0.980 | 0.979 | 0.978 | 0.977 | 0.976 | 0.975 | 0.974 | 0.973 | 0.972 | 0.971 | 0.970 | 0.968 | 0.967 |
| 3.5                           | 0.885 | 0.893 | 0.892 | 0.892 | 0.891 | 0.890 | 0.889 | 0.889 | 0.888 | 0.887 | 0.886 | 0.886 | 0.884 | 0.883 |
| 4.0                           | 0.831 | 0.846 | 0.844 | 0.843 | 0.842 | 0.841 | 0.840 | 0.839 | 0.837 | 0.836 | 0.834 | 0.833 | 0.830 | 0.828 |
| 4.5                           | 0.816 | 0.825 | 0.824 | 0.822 | 0.821 | 0.820 | 0.819 | 0.819 | 0.818 | 0.818 | 0.817 | 0.817 | 0.816 | 0.816 |
| 5.0                           | 0.812 | 0.811 | 0.811 | 0.811 | 0.811 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 |
| 5.5                           | 0.814 | 0.814 | 0.814 | 0.814 | 0.814 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 |
| 6.0                           | 0.814 | 0.816 | 0.816 | 0.816 | 0.816 | 0.816 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.813 |
| 6.5                           | 0.810 | 0.816 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.813 | 0.813 | 0.812 | 0.811 | 0.811 | 0.809 | 0.809 |
| 7.0                           | 0.805 | 0.814 | 0.813 | 0.812 | 0.811 | 0.811 | 0.810 | 0.809 | 0.808 | 0.807 | 0.806 | 0.806 | 0.804 | 0.803 |
| 7.5                           | 0.785 | 0.797 | 0.796 | 0.795 | 0.794 | 0.793 | 0.792 | 0.791 | 0.789 | 0.788 | 0.787 | 0.786 | 0.784 | 0.782 |
| 8.0                           | 0.728 | 0.740 | 0.739 | 0.738 | 0.737 | 0.736 | 0.735 | 0.733 | 0.732 | 0.731 | 0.730 | 0.729 | 0.727 | 0.726 |
| 8.5                           | 0.661 | 0.670 | 0.669 | 0.669 | 0.668 | 0.667 | 0.666 | 0.665 | 0.664 | 0.663 | 0.662 | 0.661 | 0.660 | 0.659 |
| 9.0                           | 0.599 | 0.607 | 0.607 | 0.606 | 0.605 | 0.604 | 0.604 | 0.603 | 0.602 | 0.601 | 0.601 | 0.600 | 0.598 | 0.598 |
| 9.5                           | 0.546 | 0.554 | 0.553 | 0.553 | 0.552 | 0.551 | 0.551 | 0.550 | 0.549 | 0.549 | 0.548 | 0.547 | 0.545 | 0.544 |
| 10.0                          | 0.498 | 0.508 | 0.508 | 0.507 | 0.506 | 0.506 | 0.505 | 0.504 | 0.504 | 0.503 | 0.501 | 0.499 | 0.494 | 0.491 |
| 10.5                          | 0.448 | 0.470 | 0.470 | 0.469 | 0.468 | 0.468 | 0.466 | 0.464 | 0.462 | 0.460 | 0.456 | 0.452 | 0.443 | 0.438 |
| 11.0                          | 0.400 | 0.439 | 0.438 | 0.436 | 0.435 | 0.433 | 0.429 | 0.426 | 0.422 | 0.418 | 0.412 | 0.406 | 0.393 | 0.386 |
| 11.5                          | 0.354 | 0.412 | 0.409 | 0.406 | 0.403 | 0.399 | 0.393 | 0.388 | 0.382 | 0.376 | 0.368 | 0.361 | 0.347 | 0.340 |
| 12.0                          | 0.314 | 0.385 | 0.380 | 0.374 | 0.369 | 0.364 | 0.356 | 0.349 | 0.342 | 0.335 | 0.328 | 0.321 | 0.307 | 0.301 |
| 12.5                          | 0.279 | 0.355 | 0.348 | 0.340 | 0.333 | 0.326 | 0.319 | 0.312 | 0.305 | 0.298 | 0.291 | 0.285 | 0.273 | 0.267 |
| 13.0                          | 0.247 | 0.320 | 0.313 | 0.306 | 0.298 | 0.291 | 0.284 | 0.278 | 0.271 | 0.264 | 0.259 | 0.253 | 0.242 | 0.237 |
| 13.5                          | 0.220 | 0.287 | 0.280 | 0.273 | 0.266 | 0.259 | 0.253 | 0.247 | 0.241 | 0.235 | 0.230 | 0.225 | 0.215 | 0.211 |
| 14.0                          | 0.196 | 0.256 | 0.249 | 0.243 | 0.237 | 0.230 | 0.225 | 0.220 | 0.214 | 0.209 | 0.205 | 0.200 | 0.192 | 0.188 |
| 14.5                          | 0.175 | 0.228 | 0.222 | 0.217 | 0.211 | 0.205 | 0.201 | 0.196 | 0.191 | 0.187 | 0.183 | 0.179 | 0.171 | 0.168 |
| 15.0                          | 0.157 | 0.204 | 0.199 | 0.194 | 0.189 | 0.183 | 0.179 | 0.175 | 0.171 | 0.167 | 0.164 | 0.160 | 0.154 | 0.151 |
| 15.5                          | 0.141 | 0.183 | 0.179 | 0.174 | 0.169 | 0.165 | 0.161 | 0.158 | 0.154 | 0.150 | 0.147 | 0.144 | 0.138 | 0.136 |
| 16.0                          | 0.128 | 0.165 | 0.161 | 0.157 | 0.153 | 0.149 | 0.146 | 0.142 | 0.139 | 0.136 | 0.133 | 0.130 | 0.125 | 0.123 |
| 16.5                          | 0.116 | 0.149 | 0.146 | 0.142 | 0.139 | 0.135 | 0.132 | 0.129 | 0.126 | 0.123 | 0.121 | 0.118 | 0.114 | 0.112 |
| 17.0                          | 0.106 | 0.136 | 0.132 | 0.129 | 0.126 | 0.123 | 0.120 | 0.117 | 0.115 | 0.112 | 0.110 | 0.108 | 0.104 | 0.102 |
| 17.5                          | 0.097 | 0.124 | 0.121 | 0.118 | 0.115 | 0.112 | 0.110 | 0.108 | 0.105 | 0.103 | 0.101 | 0.099 | 0.095 | 0.093 |
| 18.0                          | 0.089 | 0.114 | 0.111 | 0.108 | 0.106 | 0.103 | 0.101 | 0.099 | 0.097 | 0.094 | 0.093 | 0.091 | 0.087 | 0.086 |
| 18.5                          | 0.082 | 0.104 | 0.102 | 0.100 | 0.097 | 0.095 | 0.093 | 0.091 | 0.089 | 0.087 | 0.085 | 0.084 | 0.080 | 0.079 |
| 19.0                          | 0.075 | 0.096 | 0.093 | 0.091 | 0.089 | 0.087 | 0.085 | 0.083 | 0.082 | 0.080 | 0.078 | 0.077 | 0.074 | 0.073 |
| 19.5                          | 0.070 | 0.088 | 0.086 | 0.084 | 0.082 | 0.080 | 0.079 | 0.077 | 0.075 | 0.074 | 0.072 | 0.071 | 0.068 | 0.067 |
| 20.0                          | 0.065 | 0.082 | 0.080 | 0.078 | 0.076 | 0.074 | 0.073 | 0.071 | 0.070 | 0.068 | 0.067 | 0.066 | 0.063 | 0.062 |
| 20.5                          | 0.060 | 0.076 | 0.074 | 0.072 | 0.071 | 0.069 | 0.068 | 0.066 | 0.065 | 0.063 | 0.062 | 0.061 | 0.059 | 0.058 |
| 21.0                          | 0.055 | 0.069 | 0.068 | 0.066 | 0.065 | 0.063 | 0.062 | 0.061 | 0.060 | 0.058 | 0.057 | 0.056 | 0.054 | 0.054 |
| 21.5                          | 0.050 | 0.062 | 0.060 | 0.059 | 0.058 | 0.057 | 0.056 | 0.055 | 0.054 | 0.053 | 0.052 | 0.051 | 0.049 | 0.049 |
| 22.0                          | 0.044 | 0.053 | 0.052 | 0.051 | 0.050 | 0.049 | 0.049 | 0.048 | 0.047 | 0.046 | 0.046 | 0.045 | 0.044 | 0.043 |
| 22.5                          | 0.038 | 0.046 | 0.045 | 0.044 | 0.043 | 0.043 | 0.042 | 0.041 | 0.041 | 0.040 | 0.039 | 0.039 | 0.038 | 0.037 |
| 23.0                          | 0.033 | 0.039 | 0.039 | 0.038 | 0.037 | 0.037 | 0.036 | 0.036 | 0.035 | 0.034 | 0.034 | 0.034 | 0.033 | 0.032 |
| 23.5                          | 0.028 | 0.033 | 0.033 | 0.032 | 0.032 | 0.031 | 0.031 | 0.030 | 0.030 | 0.029 | 0.029 | 0.029 | 0.028 | 0.028 |
| 24.0                          | 0.024 | 0.028 | 0.028 | 0.027 | 0.027 | 0.026 | 0.026 | 0.026 | 0.025 | 0.025 | 0.025 | 0.024 | 0.024 | 0.024 |
| 24.5                          | 0.020 | 0.024 | 0.023 | 0.023 | 0.023 | 0.022 | 0.022 | 0.022 | 0.021 | 0.021 | 0.021 | 0.021 | 0.020 | 0.020 |
| 25.0                          | 0.017 | 0.020 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.017 | 0.017 |

**8.12 Sound Curves, Sound Optimized Mode SO4**

| Sound Power Level at Hub Height   |  |
|-----------------------------------|--|
| Conditions for Sound Power Level: | Measurement standard IEC 61400-11 ed. 3<br>Maximum turbulence at hub height: 30%<br>Inflow angle (vertical): 0 ±2°<br>Air density: 1.225 kg/m <sup>3</sup> |
| Wind speed at hub height [m/s]    | Sound Power Level at Hub Height [dBA]<br>Sound Optimized Mode SO4 (Blades with serrated trailing edge)   |
| 3                                 | 93.9   |
| 4                                 | 94.0   |
| 5                                 | 94.9   |
| 6                                 | 97.9   |
| 7                                 | 101.2  |
| 8                                 | 102.0  |
| 9                                 | 102.0  |
| 10                                | 102.0  |
| 11                                | 102.0  |
| 12                                | 102.0  |
| 13                                | 102.0  |
| 14                                | 102.0  |
| 15                                | 102.0  |

**8.13 Power Curves, Sound Optimized Mode SO5**

| Air density [kg/m <sup>3</sup> ] |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wind speed [m/s]                 | 1.225 | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0                              | 32    | 15    | 17    | 18    | 20    | 21    | 23    | 24    | 26    | 27    | 29    | 31    | 34    | 35    |
| 3.5                              | 129   | 78    | 83    | 87    | 91    | 95    | 100   | 105   | 110   | 114   | 119   | 124   | 134   | 140   |
| 4.0                              | 288   | 196   | 204   | 213   | 221   | 230   | 238   | 246   | 255   | 263   | 271   | 279   | 296   | 304   |
| 4.5                              | 481   | 346   | 358   | 371   | 383   | 395   | 407   | 420   | 432   | 444   | 456   | 469   | 493   | 506   |
| 5.0                              | 715   | 529   | 546   | 563   | 580   | 597   | 614   | 631   | 648   | 664   | 681   | 698   | 732   | 749   |
| 5.5                              | 999   | 748   | 770   | 793   | 816   | 839   | 861   | 884   | 907   | 930   | 953   | 976   | 1022  | 1045  |
| 6.0                              | 1340  | 1011  | 1041  | 1071  | 1100  | 1130  | 1160  | 1190  | 1220  | 1250  | 1280  | 1310  | 1369  | 1399  |
| 6.5                              | 1739  | 1322  | 1360  | 1398  | 1436  | 1474  | 1512  | 1550  | 1588  | 1626  | 1663  | 1701  | 1776  | 1814  |
| 7.0                              | 2197  | 1682  | 1729  | 1776  | 1823  | 1870  | 1917  | 1964  | 2011  | 2058  | 2104  | 2151  | 2244  | 2290  |
| 7.5                              | 2674  | 2059  | 2116  | 2172  | 2228  | 2284  | 2340  | 2396  | 2452  | 2508  | 2563  | 2619  | 2729  | 2785  |
| 8.0                              | 3128  | 2420  | 2484  | 2549  | 2614  | 2679  | 2743  | 2808  | 2872  | 2937  | 3001  | 3064  | 3192  | 3255  |
| 8.5                              | 3553  | 2757  | 2830  | 2903  | 2976  | 3050  | 3122  | 3194  | 3267  | 3339  | 3410  | 3482  | 3624  | 3695  |
| 9.0                              | 3961  | 3081  | 3162  | 3243  | 3324  | 3405  | 3485  | 3565  | 3645  | 3724  | 3803  | 3882  | 4039  | 4117  |
| 9.5                              | 4347  | 3390  | 3479  | 3567  | 3655  | 3743  | 3830  | 3917  | 4004  | 4090  | 4176  | 4261  | 4429  | 4512  |
| 10.0                             | 4725  | 3708  | 3803  | 3898  | 3994  | 4089  | 4183  | 4276  | 4369  | 4463  | 4550  | 4637  | 4801  | 4877  |
| 10.5                             | 5058  | 4042  | 4144  | 4247  | 4350  | 4453  | 4548  | 4643  | 4738  | 4833  | 4908  | 4983  | 5117  | 5177  |
| 11.0                             | 5333  | 4397  | 4503  | 4608  | 4714  | 4820  | 4905  | 4990  | 5076  | 5161  | 5218  | 5276  | 5368  | 5404  |
| 11.5                             | 5521  | 4769  | 4870  | 4971  | 5072  | 5173  | 5237  | 5301  | 5365  | 5429  | 5460  | 5490  | 5540  | 5558  |
| 12.0                             | 5650  | 5114  | 5197  | 5281  | 5365  | 5449  | 5487  | 5525  | 5564  | 5602  | 5618  | 5634  | 5660  | 5669  |
| 12.5                             | 5742  | 5403  | 5460  | 5517  | 5575  | 5632  | 5653  | 5674  | 5695  | 5717  | 5725  | 5733  | 5746  | 5751  |
| 13.0                             | 5803  | 5612  | 5645  | 5679  | 5712  | 5746  | 5757  | 5768  | 5779  | 5790  | 5794  | 5798  | 5804  | 5805  |
| 13.5                             | 5828  | 5725  | 5744  | 5763  | 5781  | 5800  | 5806  | 5812  | 5817  | 5823  | 5825  | 5826  | 5828  | 5829  |
| 14.0                             | 5829  | 5778  | 5788  | 5798  | 5808  | 5818  | 5820  | 5823  | 5825  | 5828  | 5828  | 5828  | 5829  | 5829  |
| 14.5                             | 5812  | 5785  | 5791  | 5797  | 5803  | 5810  | 5810  | 5811  | 5812  | 5812  | 5812  | 5812  | 5812  | 5812  |
| 15.0                             | 5791  | 5786  | 5787  | 5788  | 5789  | 5791  | 5791  | 5791  | 5791  | 5791  | 5791  | 5791  | 5791  | 5792  |
| 15.5                             | 5769  | 5767  | 5767  | 5767  | 5767  | 5768  | 5768  | 5768  | 5768  | 5768  | 5768  | 5768  | 5769  | 5769  |
| 16.0                             | 5746  | 5743  | 5743  | 5743  | 5743  | 5744  | 5744  | 5744  | 5744  | 5745  | 5745  | 5745  | 5746  | 5746  |
| 16.5                             | 5719  | 5716  | 5716  | 5716  | 5716  | 5716  | 5717  | 5717  | 5717  | 5718  | 5718  | 5719  | 5720  | 5720  |
| 17.0                             | 5690  | 5687  | 5687  | 5687  | 5687  | 5687  | 5687  | 5688  | 5688  | 5688  | 5689  | 5689  | 5691  | 5691  |
| 17.5                             | 5661  | 5657  | 5657  | 5657  | 5658  | 5658  | 5658  | 5659  | 5659  | 5660  | 5660  | 5661  | 5662  | 5662  |
| 18.0                             | 5629  | 5623  | 5624  | 5624  | 5624  | 5625  | 5625  | 5626  | 5626  | 5627  | 5628  | 5628  | 5630  | 5631  |
| 18.5                             | 5596  | 5591  | 5591  | 5592  | 5592  | 5592  | 5593  | 5593  | 5594  | 5594  | 5595  | 5596  | 5597  | 5598  |
| 19.0                             | 5570  | 5565  | 5565  | 5566  | 5566  | 5566  | 5567  | 5567  | 5568  | 5569  | 5569  | 5570  | 5571  | 5571  |
| 19.5                             | 5547  | 5543  | 5543  | 5543  | 5544  | 5544  | 5544  | 5545  | 5545  | 5546  | 5546  | 5547  | 5548  | 5549  |
| 20.0                             | 5527  | 5522  | 5522  | 5523  | 5523  | 5524  | 5524  | 5525  | 5525  | 5526  | 5526  | 5527  | 5528  | 5529  |
| 20.5                             | 5505  | 5498  | 5498  | 5499  | 5500  | 5500  | 5501  | 5502  | 5502  | 5503  | 5504  | 5505  | 5506  | 5506  |
| 21.0                             | 5460  | 5433  | 5435  | 5438  | 5440  | 5443  | 5445  | 5448  | 5450  | 5453  | 5455  | 5458  | 5462  | 5465  |
| 21.5                             | 5304  | 5228  | 5235  | 5241  | 5248  | 5255  | 5261  | 5268  | 5274  | 5280  | 5288  | 5296  | 5310  | 5317  |
| 22.0                             | 4994  | 4865  | 4877  | 4889  | 4901  | 4914  | 4925  | 4937  | 4948  | 4960  | 4971  | 4982  | 5007  | 5020  |
| 22.5                             | 4545  | 4397  | 4410  | 4423  | 4436  | 4449  | 4462  | 4474  | 4487  | 4499  | 4514  | 4529  | 4557  | 4569  |
| 23.0                             | 4095  | 3941  | 3954  | 3968  | 3982  | 3996  | 4008  | 4020  | 4033  | 4045  | 4062  | 4078  | 4106  | 4117  |
| 23.5                             | 3633  | 3484  | 3497  | 3510  | 3523  | 3537  | 3551  | 3565  | 3579  | 3593  | 3606  | 3619  | 3646  | 3660  |
| 24.0                             | 3166  | 3024  | 3036  | 3049  | 3061  | 3074  | 3088  | 3102  | 3116  | 3130  | 3142  | 3154  | 3180  | 3195  |
| 24.5                             | 2724  | 2589  | 2602  | 2614  | 2627  | 2640  | 2650  | 2661  | 2672  | 2683  | 2696  | 2710  | 2735  | 2747  |
| 25.0                             | 2321  | 2224  | 2233  | 2242  | 2251  | 2260  | 2269  | 2277  | 2285  | 2294  | 2303  | 2312  | 2335  | 2350  |

Original Instruction: T05 0127-1584 VER 01

T05 0127-1584 Ver 01 - Approved- Exported from DMS: 2022-08-25 by PIDEI

**8.14 Ct Values, Sound Optimized Mode SO5**

| Air density kg/m <sup>3</sup> |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wind speed [m/s]              | 1.225 | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0                           | 0.969 | 0.980 | 0.979 | 0.978 | 0.977 | 0.976 | 0.975 | 0.974 | 0.973 | 0.972 | 0.971 | 0.970 | 0.968 | 0.967 |
| 3.5                           | 0.885 | 0.893 | 0.892 | 0.892 | 0.891 | 0.890 | 0.889 | 0.889 | 0.888 | 0.887 | 0.886 | 0.886 | 0.884 | 0.883 |
| 4.0                           | 0.831 | 0.846 | 0.844 | 0.843 | 0.842 | 0.841 | 0.840 | 0.839 | 0.837 | 0.836 | 0.834 | 0.833 | 0.830 | 0.828 |
| 4.5                           | 0.816 | 0.825 | 0.824 | 0.822 | 0.821 | 0.820 | 0.819 | 0.819 | 0.818 | 0.818 | 0.817 | 0.817 | 0.816 | 0.816 |
| 5.0                           | 0.812 | 0.811 | 0.811 | 0.811 | 0.811 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 |
| 5.5                           | 0.814 | 0.814 | 0.814 | 0.814 | 0.814 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.814 |
| 6.0                           | 0.814 | 0.816 | 0.816 | 0.816 | 0.816 | 0.816 | 0.815 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.813 | 0.813 |
| 6.5                           | 0.810 | 0.816 | 0.815 | 0.815 | 0.814 | 0.814 | 0.813 | 0.813 | 0.812 | 0.812 | 0.811 | 0.811 | 0.809 | 0.809 |
| 7.0                           | 0.800 | 0.809 | 0.808 | 0.807 | 0.807 | 0.806 | 0.805 | 0.804 | 0.804 | 0.803 | 0.802 | 0.801 | 0.799 | 0.798 |
| 7.5                           | 0.753 | 0.763 | 0.762 | 0.761 | 0.760 | 0.760 | 0.759 | 0.758 | 0.757 | 0.756 | 0.755 | 0.754 | 0.752 | 0.751 |
| 8.0                           | 0.681 | 0.690 | 0.690 | 0.689 | 0.688 | 0.687 | 0.686 | 0.686 | 0.685 | 0.684 | 0.683 | 0.682 | 0.680 | 0.680 |
| 8.5                           | 0.614 | 0.621 | 0.620 | 0.620 | 0.619 | 0.618 | 0.618 | 0.617 | 0.616 | 0.616 | 0.615 | 0.614 | 0.613 | 0.612 |
| 9.0                           | 0.556 | 0.562 | 0.562 | 0.561 | 0.561 | 0.560 | 0.560 | 0.559 | 0.558 | 0.558 | 0.557 | 0.557 | 0.555 | 0.555 |
| 9.5                           | 0.506 | 0.511 | 0.511 | 0.510 | 0.510 | 0.509 | 0.509 | 0.508 | 0.508 | 0.507 | 0.507 | 0.506 | 0.505 | 0.504 |
| 10.0                          | 0.462 | 0.469 | 0.468 | 0.468 | 0.468 | 0.467 | 0.467 | 0.466 | 0.466 | 0.465 | 0.464 | 0.463 | 0.459 | 0.457 |
| 10.5                          | 0.419 | 0.434 | 0.434 | 0.434 | 0.433 | 0.433 | 0.432 | 0.430 | 0.429 | 0.428 | 0.425 | 0.422 | 0.414 | 0.410 |
| 11.0                          | 0.377 | 0.407 | 0.406 | 0.405 | 0.404 | 0.403 | 0.400 | 0.397 | 0.395 | 0.392 | 0.387 | 0.382 | 0.371 | 0.365 |
| 11.5                          | 0.336 | 0.383 | 0.381 | 0.378 | 0.376 | 0.374 | 0.369 | 0.364 | 0.360 | 0.355 | 0.348 | 0.342 | 0.329 | 0.323 |
| 12.0                          | 0.297 | 0.358 | 0.354 | 0.350 | 0.346 | 0.342 | 0.336 | 0.329 | 0.323 | 0.317 | 0.310 | 0.304 | 0.291 | 0.285 |
| 12.5                          | 0.264 | 0.331 | 0.325 | 0.319 | 0.314 | 0.308 | 0.302 | 0.295 | 0.288 | 0.282 | 0.276 | 0.270 | 0.259 | 0.253 |
| 13.0                          | 0.235 | 0.302 | 0.295 | 0.289 | 0.282 | 0.276 | 0.270 | 0.263 | 0.257 | 0.251 | 0.246 | 0.240 | 0.230 | 0.225 |
| 13.5                          | 0.210 | 0.272 | 0.266 | 0.259 | 0.253 | 0.246 | 0.241 | 0.235 | 0.230 | 0.224 | 0.219 | 0.214 | 0.205 | 0.201 |
| 14.0                          | 0.187 | 0.244 | 0.238 | 0.232 | 0.226 | 0.220 | 0.215 | 0.210 | 0.205 | 0.200 | 0.195 | 0.191 | 0.183 | 0.179 |
| 14.5                          | 0.167 | 0.218 | 0.212 | 0.207 | 0.202 | 0.196 | 0.192 | 0.187 | 0.183 | 0.178 | 0.175 | 0.171 | 0.164 | 0.160 |
| 15.0                          | 0.150 | 0.195 | 0.190 | 0.185 | 0.180 | 0.176 | 0.172 | 0.168 | 0.164 | 0.160 | 0.156 | 0.153 | 0.147 | 0.144 |
| 15.5                          | 0.135 | 0.175 | 0.171 | 0.167 | 0.162 | 0.158 | 0.154 | 0.151 | 0.147 | 0.144 | 0.141 | 0.138 | 0.132 | 0.130 |
| 16.0                          | 0.122 | 0.158 | 0.154 | 0.151 | 0.147 | 0.143 | 0.140 | 0.136 | 0.133 | 0.130 | 0.128 | 0.125 | 0.120 | 0.118 |
| 16.5                          | 0.111 | 0.143 | 0.140 | 0.136 | 0.133 | 0.129 | 0.127 | 0.124 | 0.121 | 0.118 | 0.116 | 0.114 | 0.109 | 0.107 |
| 17.0                          | 0.101 | 0.130 | 0.127 | 0.124 | 0.121 | 0.118 | 0.115 | 0.113 | 0.110 | 0.108 | 0.106 | 0.103 | 0.099 | 0.098 |
| 17.5                          | 0.093 | 0.119 | 0.116 | 0.114 | 0.111 | 0.108 | 0.106 | 0.103 | 0.101 | 0.099 | 0.097 | 0.095 | 0.091 | 0.090 |
| 18.0                          | 0.085 | 0.109 | 0.107 | 0.104 | 0.101 | 0.099 | 0.097 | 0.095 | 0.093 | 0.091 | 0.089 | 0.087 | 0.084 | 0.082 |
| 18.5                          | 0.078 | 0.100 | 0.098 | 0.095 | 0.093 | 0.091 | 0.089 | 0.087 | 0.085 | 0.083 | 0.082 | 0.080 | 0.077 | 0.076 |
| 19.0                          | 0.072 | 0.092 | 0.090 | 0.087 | 0.085 | 0.083 | 0.082 | 0.080 | 0.078 | 0.076 | 0.075 | 0.073 | 0.071 | 0.069 |
| 19.5                          | 0.067 | 0.085 | 0.083 | 0.081 | 0.079 | 0.077 | 0.075 | 0.074 | 0.072 | 0.071 | 0.069 | 0.068 | 0.065 | 0.064 |
| 20.0                          | 0.062 | 0.078 | 0.077 | 0.075 | 0.073 | 0.071 | 0.070 | 0.068 | 0.067 | 0.066 | 0.064 | 0.063 | 0.061 | 0.060 |
| 20.5                          | 0.058 | 0.073 | 0.071 | 0.070 | 0.068 | 0.066 | 0.065 | 0.064 | 0.062 | 0.061 | 0.060 | 0.059 | 0.057 | 0.056 |
| 21.0                          | 0.053 | 0.067 | 0.066 | 0.064 | 0.063 | 0.061 | 0.060 | 0.059 | 0.058 | 0.057 | 0.056 | 0.054 | 0.053 | 0.052 |
| 21.5                          | 0.049 | 0.061 | 0.059 | 0.058 | 0.057 | 0.056 | 0.055 | 0.054 | 0.053 | 0.052 | 0.051 | 0.050 | 0.048 | 0.047 |
| 22.0                          | 0.044 | 0.053 | 0.052 | 0.051 | 0.050 | 0.049 | 0.048 | 0.047 | 0.047 | 0.046 | 0.045 | 0.044 | 0.043 | 0.042 |
| 22.5                          | 0.038 | 0.046 | 0.045 | 0.044 | 0.043 | 0.042 | 0.042 | 0.041 | 0.040 | 0.040 | 0.039 | 0.038 | 0.037 | 0.037 |
| 23.0                          | 0.033 | 0.039 | 0.039 | 0.038 | 0.037 | 0.036 | 0.036 | 0.035 | 0.035 | 0.034 | 0.034 | 0.033 | 0.032 | 0.032 |
| 23.5                          | 0.028 | 0.033 | 0.033 | 0.032 | 0.032 | 0.031 | 0.031 | 0.030 | 0.030 | 0.029 | 0.029 | 0.029 | 0.028 | 0.028 |
| 24.0                          | 0.024 | 0.028 | 0.028 | 0.027 | 0.027 | 0.026 | 0.026 | 0.026 | 0.025 | 0.025 | 0.025 | 0.024 | 0.024 | 0.024 |
| 24.5                          | 0.020 | 0.024 | 0.023 | 0.023 | 0.023 | 0.022 | 0.022 | 0.022 | 0.021 | 0.021 | 0.021 | 0.021 | 0.020 | 0.020 |
| 25.0                          | 0.017 | 0.020 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.017 | 0.017 |

**8.15 Sound Curves, Sound Optimized Mode SO5**

| Sound Power Level at Hub Height   |  |
|-----------------------------------|--|
| Conditions for Sound Power Level: | Measurement standard IEC 61400-11 ed. 3<br>Maximum turbulence at hub height: 30%<br>Inflow angle (vertical): 0 ±2°<br>Air density: 1.225 kg/m <sup>3</sup> |
| Wind speed at hub height [m/s]    | Sound Power Level at Hub Height [dBA]<br>Sound Optimized Mode SO5 (Blades with serrated trailing edge)   |
| 3                                 | 93.9   |
| 4                                 | 94.0   |
| 5                                 | 94.9   |
| 6                                 | 97.9   |
| 7                                 | 100.7  |
| 8                                 | 101.0  |
| 9                                 | 101.0  |
| 10                                | 101.0  |
| 11                                | 101.0  |
| 12                                | 101.0  |
| 13                                | 101.0  |
| 14                                | 101.0  |
| 15                                | 101.0  |

**8.16 Power Curves, Sound Optimized Mode SO6**

| Air density [kg/m <sup>3</sup> ] |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wind speed [m/s]                 | 1.225 | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0                              | 32    | 15    | 17    | 18    | 20    | 21    | 23    | 24    | 26    | 27    | 29    | 31    | 34    | 35    |
| 3.5                              | 129   | 78    | 83    | 87    | 91    | 95    | 100   | 105   | 110   | 114   | 119   | 124   | 134   | 140   |
| 4.0                              | 288   | 196   | 204   | 213   | 221   | 230   | 238   | 246   | 255   | 263   | 271   | 279   | 296   | 304   |
| 4.5                              | 481   | 346   | 358   | 371   | 383   | 395   | 407   | 420   | 432   | 444   | 456   | 469   | 493   | 506   |
| 5.0                              | 715   | 529   | 546   | 563   | 580   | 597   | 614   | 631   | 648   | 664   | 681   | 698   | 732   | 749   |
| 5.5                              | 999   | 748   | 770   | 793   | 816   | 839   | 861   | 884   | 907   | 930   | 953   | 976   | 1022  | 1045  |
| 6.0                              | 1340  | 1011  | 1041  | 1071  | 1100  | 1130  | 1160  | 1190  | 1220  | 1250  | 1280  | 1310  | 1369  | 1399  |
| 6.5                              | 1736  | 1321  | 1358  | 1396  | 1434  | 1472  | 1510  | 1548  | 1586  | 1623  | 1661  | 1698  | 1773  | 1811  |
| 7.0                              | 2175  | 1666  | 1713  | 1759  | 1806  | 1852  | 1899  | 1945  | 1991  | 2037  | 2083  | 2129  | 2221  | 2267  |
| 7.5                              | 2601  | 2004  | 2058  | 2113  | 2168  | 2222  | 2277  | 2331  | 2385  | 2439  | 2493  | 2547  | 2654  | 2708  |
| 8.0                              | 2997  | 2317  | 2380  | 2442  | 2504  | 2566  | 2628  | 2690  | 2751  | 2813  | 2874  | 2936  | 3058  | 3119  |
| 8.5                              | 3383  | 2623  | 2692  | 2762  | 2832  | 2901  | 2970  | 3040  | 3109  | 3178  | 3246  | 3315  | 3451  | 3519  |
| 9.0                              | 3748  | 2911  | 2988  | 3065  | 3142  | 3219  | 3295  | 3371  | 3447  | 3523  | 3598  | 3673  | 3822  | 3897  |
| 9.5                              | 4090  | 3183  | 3266  | 3350  | 3433  | 3517  | 3599  | 3681  | 3764  | 3846  | 3927  | 4008  | 4169  | 4248  |
| 10.0                             | 4425  | 3458  | 3548  | 3638  | 3728  | 3818  | 3906  | 3994  | 4083  | 4171  | 4256  | 4340  | 4502  | 4580  |
| 10.5                             | 4732  | 3744  | 3840  | 3936  | 4032  | 4128  | 4221  | 4313  | 4406  | 4498  | 4576  | 4654  | 4795  | 4857  |
| 11.0                             | 4993  | 4043  | 4145  | 4246  | 4348  | 4450  | 4536  | 4623  | 4710  | 4797  | 4863  | 4928  | 5037  | 5081  |
| 11.5                             | 5193  | 4369  | 4471  | 4572  | 4673  | 4775  | 4849  | 4922  | 4996  | 5070  | 5111  | 5152  | 5217  | 5240  |
| 12.0                             | 5341  | 4703  | 4795  | 4888  | 4980  | 5072  | 5123  | 5173  | 5223  | 5273  | 5296  | 5319  | 5354  | 5366  |
| 12.5                             | 5449  | 5013  | 5084  | 5156  | 5227  | 5299  | 5327  | 5356  | 5384  | 5413  | 5425  | 5437  | 5456  | 5462  |
| 13.0                             | 5521  | 5256  | 5302  | 5348  | 5393  | 5439  | 5455  | 5470  | 5486  | 5502  | 5508  | 5514  | 5523  | 5525  |
| 13.5                             | 5556  | 5400  | 5428  | 5457  | 5485  | 5514  | 5522  | 5530  | 5538  | 5546  | 5549  | 5552  | 5556  | 5557  |
| 14.0                             | 5567  | 5489  | 5503  | 5518  | 5532  | 5547  | 5551  | 5556  | 5560  | 5565  | 5566  | 5566  | 5567  | 5568  |
| 14.5                             | 5560  | 5520  | 5528  | 5536  | 5544  | 5552  | 5554  | 5556  | 5558  | 5559  | 5559  | 5559  | 5560  | 5560  |
| 15.0                             | 5540  | 5528  | 5530  | 5533  | 5536  | 5539  | 5539  | 5539  | 5539  | 5539  | 5539  | 5539  | 5540  | 5540  |
| 15.5                             | 5513  | 5509  | 5510  | 5510  | 5511  | 5512  | 5512  | 5512  | 5512  | 5512  | 5512  | 5513  | 5513  | 5513  |
| 16.0                             | 5486  | 5484  | 5484  | 5484  | 5485  | 5485  | 5485  | 5485  | 5485  | 5485  | 5485  | 5486  | 5486  | 5486  |
| 16.5                             | 5463  | 5461  | 5461  | 5461  | 5461  | 5462  | 5462  | 5462  | 5462  | 5462  | 5462  | 5463  | 5463  | 5463  |
| 17.0                             | 5441  | 5439  | 5439  | 5439  | 5439  | 5439  | 5440  | 5440  | 5440  | 5440  | 5441  | 5441  | 5442  | 5442  |
| 17.5                             | 5417  | 5414  | 5414  | 5415  | 5415  | 5415  | 5415  | 5415  | 5416  | 5416  | 5416  | 5417  | 5418  | 5418  |
| 18.0                             | 5388  | 5384  | 5385  | 5385  | 5385  | 5385  | 5386  | 5386  | 5386  | 5387  | 5387  | 5388  | 5389  | 5389  |
| 18.5                             | 5358  | 5354  | 5354  | 5354  | 5354  | 5355  | 5355  | 5355  | 5356  | 5356  | 5357  | 5357  | 5358  | 5359  |
| 19.0                             | 5329  | 5325  | 5325  | 5326  | 5326  | 5326  | 5327  | 5327  | 5327  | 5328  | 5328  | 5329  | 5330  | 5331  |
| 19.5                             | 5304  | 5300  | 5300  | 5300  | 5301  | 5301  | 5302  | 5302  | 5302  | 5303  | 5303  | 5304  | 5305  | 5305  |
| 20.0                             | 5283  | 5278  | 5279  | 5279  | 5279  | 5280  | 5280  | 5280  | 5281  | 5281  | 5282  | 5282  | 5283  | 5283  |
| 20.5                             | 5262  | 5257  | 5258  | 5258  | 5258  | 5259  | 5259  | 5260  | 5260  | 5261  | 5261  | 5262  | 5263  | 5263  |
| 21.0                             | 5238  | 5227  | 5228  | 5229  | 5230  | 5231  | 5232  | 5233  | 5233  | 5234  | 5235  | 5237  | 5239  | 5240  |
| 21.5                             | 5149  | 5099  | 5103  | 5107  | 5111  | 5115  | 5120  | 5125  | 5130  | 5135  | 5140  | 5145  | 5153  | 5156  |
| 22.0                             | 4918  | 4830  | 4838  | 4846  | 4854  | 4862  | 4869  | 4876  | 4882  | 4889  | 4899  | 4909  | 4924  | 4929  |
| 22.5                             | 4532  | 4411  | 4421  | 4430  | 4439  | 4448  | 4459  | 4470  | 4481  | 4492  | 4505  | 4519  | 4542  | 4553  |
| 23.0                             | 4071  | 3942  | 3953  | 3964  | 3975  | 3987  | 3998  | 4009  | 4021  | 4032  | 4045  | 4058  | 4085  | 4099  |
| 23.5                             | 3604  | 3470  | 3480  | 3490  | 3500  | 3511  | 3524  | 3537  | 3551  | 3564  | 3578  | 3591  | 3618  | 3631  |
| 24.0                             | 3127  | 3002  | 3013  | 3024  | 3035  | 3046  | 3059  | 3073  | 3087  | 3100  | 3109  | 3118  | 3142  | 3157  |
| 24.5                             | 2695  | 2573  | 2583  | 2593  | 2603  | 2614  | 2624  | 2634  | 2644  | 2654  | 2667  | 2681  | 2705  | 2714  |
| 25.0                             | 2316  | 2224  | 2231  | 2238  | 2245  | 2253  | 2261  | 2270  | 2279  | 2288  | 2297  | 2307  | 2325  | 2334  |

Original Instruction: T05 0127-1584 VER 01

T05 0127-1584 Ver 01 - Approved- Exported from DMS: 2022-08-25 by PIDEI



**8.17 Ct Values, Sound Optimized Mode SO6**

| Air density kg/m <sup>3</sup> |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wind speed [m/s]              | 1.225 | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0                           | 0.969 | 0.980 | 0.979 | 0.978 | 0.977 | 0.976 | 0.975 | 0.974 | 0.973 | 0.972 | 0.971 | 0.970 | 0.968 | 0.967 |
| 3.5                           | 0.885 | 0.893 | 0.892 | 0.892 | 0.891 | 0.890 | 0.889 | 0.889 | 0.888 | 0.887 | 0.886 | 0.886 | 0.884 | 0.883 |
| 4.0                           | 0.831 | 0.846 | 0.844 | 0.843 | 0.842 | 0.841 | 0.840 | 0.839 | 0.837 | 0.836 | 0.834 | 0.833 | 0.830 | 0.828 |
| 4.5                           | 0.816 | 0.825 | 0.824 | 0.822 | 0.821 | 0.820 | 0.819 | 0.819 | 0.818 | 0.818 | 0.817 | 0.817 | 0.816 | 0.816 |
| 5.0                           | 0.812 | 0.811 | 0.811 | 0.811 | 0.811 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 |
| 5.5                           | 0.814 | 0.814 | 0.814 | 0.814 | 0.814 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.814 |
| 6.0                           | 0.814 | 0.816 | 0.816 | 0.816 | 0.816 | 0.816 | 0.815 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.813 | 0.813 |
| 6.5                           | 0.807 | 0.813 | 0.812 | 0.812 | 0.812 | 0.811 | 0.811 | 0.810 | 0.810 | 0.809 | 0.809 | 0.808 | 0.807 | 0.806 |
| 7.0                           | 0.777 | 0.786 | 0.785 | 0.784 | 0.783 | 0.783 | 0.782 | 0.781 | 0.780 | 0.779 | 0.779 | 0.778 | 0.776 | 0.775 |
| 7.5                           | 0.706 | 0.715 | 0.714 | 0.713 | 0.712 | 0.711 | 0.711 | 0.710 | 0.709 | 0.708 | 0.708 | 0.707 | 0.705 | 0.704 |
| 8.0                           | 0.632 | 0.639 | 0.638 | 0.638 | 0.637 | 0.636 | 0.636 | 0.635 | 0.634 | 0.634 | 0.633 | 0.632 | 0.631 | 0.630 |
| 8.5                           | 0.571 | 0.577 | 0.576 | 0.576 | 0.575 | 0.575 | 0.574 | 0.573 | 0.573 | 0.572 | 0.572 | 0.571 | 0.570 | 0.569 |
| 9.0                           | 0.516 | 0.522 | 0.521 | 0.521 | 0.520 | 0.520 | 0.519 | 0.519 | 0.518 | 0.518 | 0.517 | 0.517 | 0.516 | 0.516 |
| 9.5                           | 0.469 | 0.473 | 0.473 | 0.472 | 0.472 | 0.471 | 0.471 | 0.471 | 0.470 | 0.470 | 0.469 | 0.469 | 0.468 | 0.468 |
| 10.0                          | 0.427 | 0.432 | 0.432 | 0.431 | 0.431 | 0.431 | 0.430 | 0.430 | 0.430 | 0.429 | 0.429 | 0.428 | 0.426 | 0.424 |
| 10.5                          | 0.389 | 0.398 | 0.398 | 0.398 | 0.398 | 0.397 | 0.397 | 0.396 | 0.395 | 0.395 | 0.393 | 0.391 | 0.385 | 0.382 |
| 11.0                          | 0.351 | 0.371 | 0.370 | 0.370 | 0.369 | 0.369 | 0.367 | 0.365 | 0.364 | 0.362 | 0.358 | 0.355 | 0.347 | 0.342 |
| 11.5                          | 0.315 | 0.348 | 0.346 | 0.345 | 0.344 | 0.343 | 0.340 | 0.337 | 0.333 | 0.330 | 0.325 | 0.320 | 0.309 | 0.303 |
| 12.0                          | 0.281 | 0.327 | 0.324 | 0.322 | 0.319 | 0.317 | 0.312 | 0.307 | 0.302 | 0.298 | 0.292 | 0.286 | 0.275 | 0.269 |
| 12.5                          | 0.250 | 0.305 | 0.301 | 0.297 | 0.293 | 0.289 | 0.284 | 0.278 | 0.272 | 0.267 | 0.261 | 0.256 | 0.245 | 0.240 |
| 13.0                          | 0.223 | 0.282 | 0.277 | 0.271 | 0.266 | 0.261 | 0.255 | 0.250 | 0.244 | 0.238 | 0.233 | 0.228 | 0.219 | 0.214 |
| 13.5                          | 0.199 | 0.257 | 0.251 | 0.245 | 0.240 | 0.234 | 0.229 | 0.224 | 0.218 | 0.213 | 0.209 | 0.204 | 0.195 | 0.191 |
| 14.0                          | 0.178 | 0.232 | 0.226 | 0.221 | 0.215 | 0.209 | 0.205 | 0.200 | 0.195 | 0.191 | 0.186 | 0.182 | 0.175 | 0.171 |
| 14.5                          | 0.160 | 0.208 | 0.203 | 0.198 | 0.193 | 0.188 | 0.183 | 0.179 | 0.175 | 0.171 | 0.167 | 0.163 | 0.157 | 0.153 |
| 15.0                          | 0.143 | 0.187 | 0.182 | 0.178 | 0.173 | 0.168 | 0.164 | 0.160 | 0.157 | 0.153 | 0.150 | 0.146 | 0.140 | 0.138 |
| 15.5                          | 0.129 | 0.168 | 0.164 | 0.160 | 0.155 | 0.151 | 0.148 | 0.144 | 0.141 | 0.138 | 0.135 | 0.132 | 0.127 | 0.124 |
| 16.0                          | 0.117 | 0.152 | 0.148 | 0.144 | 0.140 | 0.137 | 0.134 | 0.131 | 0.128 | 0.125 | 0.122 | 0.119 | 0.115 | 0.112 |
| 16.5                          | 0.106 | 0.138 | 0.134 | 0.131 | 0.127 | 0.124 | 0.121 | 0.119 | 0.116 | 0.113 | 0.111 | 0.109 | 0.104 | 0.102 |
| 17.0                          | 0.097 | 0.125 | 0.122 | 0.119 | 0.116 | 0.113 | 0.110 | 0.108 | 0.106 | 0.103 | 0.101 | 0.099 | 0.095 | 0.093 |
| 17.5                          | 0.089 | 0.115 | 0.112 | 0.109 | 0.106 | 0.104 | 0.101 | 0.099 | 0.097 | 0.095 | 0.093 | 0.091 | 0.087 | 0.086 |
| 18.0                          | 0.082 | 0.105 | 0.102 | 0.100 | 0.097 | 0.095 | 0.093 | 0.091 | 0.089 | 0.087 | 0.085 | 0.083 | 0.080 | 0.079 |
| 18.5                          | 0.075 | 0.096 | 0.094 | 0.092 | 0.089 | 0.087 | 0.085 | 0.083 | 0.082 | 0.080 | 0.078 | 0.077 | 0.074 | 0.072 |
| 19.0                          | 0.069 | 0.088 | 0.086 | 0.084 | 0.082 | 0.080 | 0.078 | 0.077 | 0.075 | 0.073 | 0.072 | 0.070 | 0.068 | 0.067 |
| 19.5                          | 0.064 | 0.081 | 0.079 | 0.078 | 0.076 | 0.074 | 0.072 | 0.071 | 0.069 | 0.068 | 0.066 | 0.065 | 0.063 | 0.062 |
| 20.0                          | 0.059 | 0.075 | 0.074 | 0.072 | 0.070 | 0.068 | 0.067 | 0.066 | 0.064 | 0.063 | 0.062 | 0.060 | 0.058 | 0.057 |
| 20.5                          | 0.055 | 0.070 | 0.068 | 0.067 | 0.065 | 0.064 | 0.062 | 0.061 | 0.060 | 0.058 | 0.057 | 0.056 | 0.054 | 0.053 |
| 21.0                          | 0.051 | 0.065 | 0.063 | 0.062 | 0.061 | 0.059 | 0.058 | 0.057 | 0.056 | 0.054 | 0.053 | 0.052 | 0.051 | 0.050 |
| 21.5                          | 0.048 | 0.059 | 0.058 | 0.057 | 0.056 | 0.054 | 0.053 | 0.052 | 0.051 | 0.050 | 0.049 | 0.048 | 0.047 | 0.046 |
| 22.0                          | 0.043 | 0.053 | 0.052 | 0.051 | 0.050 | 0.049 | 0.048 | 0.047 | 0.046 | 0.045 | 0.044 | 0.044 | 0.042 | 0.042 |
| 22.5                          | 0.038 | 0.046 | 0.045 | 0.044 | 0.043 | 0.042 | 0.041 | 0.041 | 0.040 | 0.039 | 0.039 | 0.038 | 0.037 | 0.037 |
| 23.0                          | 0.032 | 0.039 | 0.038 | 0.038 | 0.037 | 0.036 | 0.036 | 0.035 | 0.035 | 0.034 | 0.033 | 0.033 | 0.032 | 0.032 |
| 23.5                          | 0.028 | 0.033 | 0.032 | 0.032 | 0.031 | 0.031 | 0.030 | 0.030 | 0.029 | 0.029 | 0.029 | 0.028 | 0.027 | 0.027 |
| 24.0                          | 0.024 | 0.028 | 0.027 | 0.027 | 0.026 | 0.026 | 0.026 | 0.025 | 0.025 | 0.025 | 0.024 | 0.024 | 0.023 | 0.023 |
| 24.5                          | 0.020 | 0.023 | 0.023 | 0.023 | 0.022 | 0.022 | 0.022 | 0.021 | 0.021 | 0.021 | 0.021 | 0.020 | 0.020 | 0.020 |
| 25.0                          | 0.017 | 0.020 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 | 0.018 | 0.018 | 0.018 | 0.018 | 0.017 | 0.017 | 0.017 |

**8.18 Sound Curves, Sound Optimized Mode SO6**

| Sound Power Level at Hub Height   |  |
|-----------------------------------|--|
| Conditions for Sound Power Level: | Measurement standard IEC 61400-11 ed. 3<br>Maximum turbulence at hub height: 30%<br>Inflow angle (vertical): 0 ±2°<br>Air density: 1.225 kg/m <sup>3</sup> |
| Wind speed at hub height [m/s]    | Sound Power Level at Hub Height [dBA]<br>Sound Optimized Mode SO6 (Blades with serrated trailing edge)   |
| 3                                 | 93.9   |
| 4                                 | 94.0   |
| 5                                 | 94.9   |
| 6                                 | 97.8   |
| 7                                 | 100.0  |
| 8                                 | 100.0  |
| 9                                 | 100.0  |
| 10                                | 100.0  |
| 11                                | 100.0  |
| 12                                | 100.0  |
| 13                                | 100.0  |
| 14                                | 100.0  |
| 15                                | 100.0  |

Original Instruction: T05 0127-1584 VER 01

T05 0127-1584 Ver 01 - Approved- Exported from DMS: 2022-08-25 by PIDELE

**8.19 Power Curves, Sound Optimized Mode S07**

| Air density [kg/m <sup>3</sup> ] |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wind speed [m/s]                 | 1.225 | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0                              | 32    | 15    | 17    | 18    | 20    | 21    | 23    | 24    | 26    | 27    | 29    | 31    | 34    | 35    |
| 3.5                              | 129   | 78    | 83    | 87    | 91    | 95    | 100   | 105   | 110   | 114   | 119   | 124   | 134   | 140   |
| 4.0                              | 288   | 196   | 204   | 213   | 221   | 230   | 238   | 246   | 255   | 263   | 271   | 279   | 296   | 304   |
| 4.5                              | 481   | 346   | 358   | 371   | 383   | 395   | 407   | 420   | 432   | 444   | 456   | 469   | 493   | 506   |
| 5.0                              | 715   | 529   | 546   | 563   | 580   | 597   | 614   | 631   | 648   | 664   | 681   | 698   | 732   | 749   |
| 5.5                              | 999   | 748   | 770   | 793   | 816   | 839   | 861   | 884   | 907   | 930   | 953   | 976   | 1022  | 1045  |
| 6.0                              | 1339  | 1011  | 1040  | 1070  | 1100  | 1130  | 1160  | 1190  | 1220  | 1250  | 1280  | 1309  | 1369  | 1399  |
| 6.5                              | 1725  | 1312  | 1350  | 1388  | 1425  | 1463  | 1500  | 1538  | 1575  | 1613  | 1650  | 1688  | 1762  | 1799  |
| 7.0                              | 2130  | 1632  | 1677  | 1723  | 1768  | 1814  | 1859  | 1904  | 1949  | 1995  | 2040  | 2085  | 2174  | 2219  |
| 7.5                              | 2503  | 1928  | 1980  | 2033  | 2086  | 2139  | 2191  | 2243  | 2295  | 2347  | 2399  | 2451  | 2555  | 2606  |
| 8.0                              | 2857  | 2208  | 2267  | 2327  | 2386  | 2446  | 2505  | 2564  | 2622  | 2681  | 2740  | 2799  | 2915  | 2974  |
| 8.5                              | 3197  | 2475  | 2541  | 2607  | 2673  | 2740  | 2805  | 2871  | 2936  | 3002  | 3067  | 3132  | 3262  | 3326  |
| 9.0                              | 3517  | 2727  | 2800  | 2872  | 2945  | 3017  | 3089  | 3160  | 3232  | 3304  | 3375  | 3446  | 3587  | 3658  |
| 9.5                              | 3820  | 2967  | 3045  | 3124  | 3202  | 3280  | 3358  | 3435  | 3513  | 3590  | 3667  | 3743  | 3895  | 3971  |
| 10.0                             | 4124  | 3210  | 3295  | 3379  | 3463  | 3548  | 3630  | 3713  | 3796  | 3879  | 3961  | 4042  | 4200  | 4277  |
| 10.5                             | 4414  | 3461  | 3551  | 3641  | 3731  | 3821  | 3909  | 3997  | 4085  | 4174  | 4254  | 4334  | 4479  | 4544  |
| 11.0                             | 4667  | 3726  | 3822  | 3918  | 4013  | 4109  | 4196  | 4282  | 4369  | 4455  | 4526  | 4596  | 4719  | 4772  |
| 11.5                             | 4886  | 4020  | 4119  | 4217  | 4315  | 4413  | 4493  | 4572  | 4652  | 4732  | 4783  | 4835  | 4917  | 4948  |
| 12.0                             | 5047  | 4334  | 4428  | 4523  | 4617  | 4712  | 4773  | 4835  | 4897  | 4959  | 4988  | 5017  | 5064  | 5081  |
| 12.5                             | 5163  | 4634  | 4716  | 4797  | 4879  | 4961  | 4999  | 5037  | 5075  | 5113  | 5130  | 5146  | 5172  | 5181  |
| 13.0                             | 5236  | 4886  | 4945  | 5005  | 5064  | 5123  | 5145  | 5167  | 5189  | 5211  | 5219  | 5228  | 5241  | 5245  |
| 13.5                             | 5278  | 5053  | 5094  | 5135  | 5176  | 5217  | 5229  | 5240  | 5252  | 5263  | 5268  | 5273  | 5279  | 5281  |
| 14.0                             | 5302  | 5177  | 5200  | 5223  | 5246  | 5269  | 5275  | 5282  | 5289  | 5296  | 5298  | 5300  | 5302  | 5302  |
| 14.5                             | 5307  | 5243  | 5256  | 5268  | 5280  | 5292  | 5295  | 5299  | 5302  | 5306  | 5306  | 5307  | 5307  | 5307  |
| 15.0                             | 5298  | 5273  | 5278  | 5284  | 5290  | 5296  | 5296  | 5297  | 5297  | 5298  | 5298  | 5298  | 5298  | 5298  |
| 15.5                             | 5279  | 5271  | 5273  | 5274  | 5276  | 5278  | 5278  | 5278  | 5278  | 5278  | 5279  | 5279  | 5279  | 5279  |
| 16.0                             | 5254  | 5250  | 5251  | 5252  | 5252  | 5253  | 5253  | 5253  | 5253  | 5253  | 5253  | 5254  | 5254  | 5254  |
| 16.5                             | 5225  | 5223  | 5223  | 5223  | 5223  | 5223  | 5224  | 5224  | 5224  | 5224  | 5224  | 5225  | 5225  | 5225  |
| 17.0                             | 5194  | 5193  | 5193  | 5193  | 5193  | 5193  | 5193  | 5193  | 5193  | 5193  | 5194  | 5194  | 5195  | 5195  |
| 17.5                             | 5165  | 5162  | 5162  | 5162  | 5163  | 5163  | 5163  | 5164  | 5164  | 5164  | 5164  | 5165  | 5166  | 5166  |
| 18.0                             | 5137  | 5135  | 5135  | 5135  | 5135  | 5135  | 5135  | 5135  | 5135  | 5136  | 5136  | 5137  | 5137  | 5138  |
| 18.5                             | 5111  | 5108  | 5108  | 5108  | 5108  | 5108  | 5108  | 5109  | 5109  | 5110  | 5110  | 5110  | 5111  | 5112  |
| 19.0                             | 5085  | 5082  | 5082  | 5082  | 5082  | 5082  | 5082  | 5083  | 5083  | 5084  | 5084  | 5085  | 5085  | 5086  |
| 19.5                             | 5061  | 5057  | 5058  | 5058  | 5058  | 5058  | 5059  | 5059  | 5059  | 5060  | 5060  | 5061  | 5062  | 5062  |
| 20.0                             | 5039  | 5035  | 5036  | 5036  | 5036  | 5037  | 5037  | 5037  | 5038  | 5038  | 5038  | 5039  | 5039  | 5040  |
| 20.5                             | 5019  | 5016  | 5016  | 5016  | 5016  | 5016  | 5017  | 5017  | 5017  | 5018  | 5018  | 5018  | 5019  | 5020  |
| 21.0                             | 4999  | 4995  | 4995  | 4995  | 4995  | 4996  | 4996  | 4996  | 4997  | 4997  | 4998  | 4998  | 4999  | 5000  |
| 21.5                             | 4962  | 4943  | 4944  | 4946  | 4947  | 4949  | 4951  | 4952  | 4954  | 4956  | 4958  | 4960  | 4963  | 4965  |
| 22.0                             | 4805  | 4752  | 4756  | 4761  | 4765  | 4770  | 4775  | 4780  | 4785  | 4790  | 4795  | 4800  | 4810  | 4816  |
| 22.5                             | 4512  | 4413  | 4423  | 4432  | 4442  | 4452  | 4460  | 4468  | 4476  | 4484  | 4493  | 4503  | 4523  | 4534  |
| 23.0                             | 4063  | 3946  | 3957  | 3968  | 3978  | 3989  | 3998  | 4008  | 4017  | 4026  | 4039  | 4051  | 4075  | 4086  |
| 23.5                             | 3583  | 3464  | 3477  | 3489  | 3501  | 3514  | 3525  | 3536  | 3547  | 3559  | 3567  | 3575  | 3599  | 3615  |
| 24.0                             | 3126  | 3004  | 3015  | 3025  | 3035  | 3046  | 3056  | 3066  | 3077  | 3087  | 3100  | 3113  | 3138  | 3150  |
| 24.5                             | 2696  | 2599  | 2608  | 2617  | 2626  | 2636  | 2645  | 2654  | 2663  | 2673  | 2681  | 2688  | 2707  | 2717  |
| 25.0                             | 2347  | 2260  | 2266  | 2273  | 2280  | 2287  | 2295  | 2302  | 2310  | 2317  | 2327  | 2337  | 2355  | 2364  |

Original Instruction: T05 0127-1584 VER 01

T05 0127-1584 Ver 01 - Approved- Exported from DMS: 2022-08-25 by PIDEI

**8.20 Ct Values, Sound Optimized Mode S07**

| Air density kg/m <sup>3</sup> |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wind speed [m/s]              | 1.225 | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0                           | 0.969 | 0.980 | 0.979 | 0.978 | 0.977 | 0.976 | 0.975 | 0.974 | 0.973 | 0.972 | 0.971 | 0.970 | 0.968 | 0.967 |
| 3.5                           | 0.885 | 0.893 | 0.892 | 0.892 | 0.891 | 0.890 | 0.889 | 0.889 | 0.888 | 0.887 | 0.886 | 0.886 | 0.884 | 0.883 |
| 4.0                           | 0.831 | 0.846 | 0.844 | 0.843 | 0.842 | 0.841 | 0.840 | 0.839 | 0.837 | 0.836 | 0.834 | 0.833 | 0.830 | 0.828 |
| 4.5                           | 0.816 | 0.825 | 0.824 | 0.822 | 0.821 | 0.820 | 0.819 | 0.819 | 0.818 | 0.818 | 0.817 | 0.817 | 0.816 | 0.816 |
| 5.0                           | 0.812 | 0.811 | 0.811 | 0.811 | 0.811 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 |
| 5.5                           | 0.814 | 0.814 | 0.814 | 0.814 | 0.814 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.814 |
| 6.0                           | 0.813 | 0.816 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.814 | 0.813 | 0.813 | 0.812 |
| 6.5                           | 0.794 | 0.799 | 0.799 | 0.798 | 0.798 | 0.798 | 0.797 | 0.797 | 0.796 | 0.795 | 0.795 | 0.794 | 0.793 | 0.792 |
| 7.0                           | 0.735 | 0.742 | 0.742 | 0.741 | 0.740 | 0.740 | 0.739 | 0.738 | 0.738 | 0.737 | 0.736 | 0.735 | 0.734 | 0.733 |
| 7.5                           | 0.656 | 0.662 | 0.662 | 0.661 | 0.661 | 0.660 | 0.660 | 0.659 | 0.658 | 0.658 | 0.657 | 0.656 | 0.655 | 0.655 |
| 8.0                           | 0.587 | 0.593 | 0.592 | 0.592 | 0.591 | 0.591 | 0.590 | 0.590 | 0.589 | 0.589 | 0.588 | 0.588 | 0.587 | 0.586 |
| 8.5                           | 0.529 | 0.533 | 0.533 | 0.533 | 0.532 | 0.532 | 0.531 | 0.531 | 0.530 | 0.530 | 0.530 | 0.529 | 0.528 | 0.528 |
| 9.0                           | 0.477 | 0.481 | 0.481 | 0.480 | 0.480 | 0.480 | 0.479 | 0.479 | 0.478 | 0.478 | 0.478 | 0.477 | 0.477 | 0.476 |
| 9.5                           | 0.432 | 0.436 | 0.435 | 0.435 | 0.435 | 0.434 | 0.434 | 0.434 | 0.434 | 0.433 | 0.433 | 0.433 | 0.432 | 0.432 |
| 10.0                          | 0.395 | 0.398 | 0.397 | 0.397 | 0.397 | 0.397 | 0.396 | 0.396 | 0.396 | 0.396 | 0.395 | 0.395 | 0.394 | 0.393 |
| 10.5                          | 0.360 | 0.365 | 0.365 | 0.365 | 0.365 | 0.364 | 0.364 | 0.364 | 0.364 | 0.363 | 0.362 | 0.361 | 0.358 | 0.355 |
| 11.0                          | 0.327 | 0.339 | 0.339 | 0.338 | 0.338 | 0.338 | 0.337 | 0.336 | 0.335 | 0.334 | 0.332 | 0.329 | 0.324 | 0.320 |
| 11.5                          | 0.295 | 0.318 | 0.317 | 0.316 | 0.316 | 0.315 | 0.313 | 0.311 | 0.309 | 0.307 | 0.303 | 0.299 | 0.291 | 0.286 |
| 12.0                          | 0.265 | 0.300 | 0.298 | 0.297 | 0.295 | 0.294 | 0.290 | 0.286 | 0.283 | 0.279 | 0.275 | 0.270 | 0.260 | 0.255 |
| 12.5                          | 0.237 | 0.282 | 0.279 | 0.276 | 0.274 | 0.271 | 0.266 | 0.261 | 0.257 | 0.252 | 0.247 | 0.242 | 0.232 | 0.228 |
| 13.0                          | 0.212 | 0.263 | 0.258 | 0.254 | 0.250 | 0.246 | 0.241 | 0.236 | 0.231 | 0.226 | 0.221 | 0.217 | 0.207 | 0.203 |
| 13.5                          | 0.190 | 0.241 | 0.236 | 0.232 | 0.227 | 0.222 | 0.217 | 0.212 | 0.207 | 0.203 | 0.198 | 0.194 | 0.186 | 0.182 |
| 14.0                          | 0.170 | 0.220 | 0.215 | 0.210 | 0.205 | 0.199 | 0.195 | 0.191 | 0.186 | 0.182 | 0.178 | 0.174 | 0.167 | 0.163 |
| 14.5                          | 0.153 | 0.199 | 0.194 | 0.189 | 0.184 | 0.179 | 0.175 | 0.171 | 0.167 | 0.163 | 0.160 | 0.156 | 0.150 | 0.147 |
| 15.0                          | 0.137 | 0.179 | 0.175 | 0.170 | 0.166 | 0.161 | 0.158 | 0.154 | 0.150 | 0.146 | 0.143 | 0.140 | 0.135 | 0.132 |
| 15.5                          | 0.124 | 0.162 | 0.158 | 0.154 | 0.149 | 0.145 | 0.142 | 0.139 | 0.135 | 0.132 | 0.129 | 0.127 | 0.121 | 0.119 |
| 16.0                          | 0.112 | 0.146 | 0.142 | 0.139 | 0.135 | 0.131 | 0.128 | 0.125 | 0.122 | 0.120 | 0.117 | 0.115 | 0.110 | 0.108 |
| 16.5                          | 0.102 | 0.132 | 0.129 | 0.126 | 0.122 | 0.119 | 0.116 | 0.114 | 0.111 | 0.108 | 0.106 | 0.104 | 0.100 | 0.098 |
| 17.0                          | 0.093 | 0.120 | 0.117 | 0.114 | 0.111 | 0.108 | 0.106 | 0.103 | 0.101 | 0.099 | 0.097 | 0.095 | 0.091 | 0.089 |
| 17.5                          | 0.085 | 0.110 | 0.107 | 0.105 | 0.102 | 0.099 | 0.097 | 0.095 | 0.093 | 0.091 | 0.089 | 0.087 | 0.084 | 0.082 |
| 18.0                          | 0.078 | 0.101 | 0.098 | 0.096 | 0.093 | 0.091 | 0.089 | 0.087 | 0.085 | 0.083 | 0.081 | 0.080 | 0.077 | 0.075 |
| 18.5                          | 0.072 | 0.092 | 0.090 | 0.088 | 0.086 | 0.083 | 0.082 | 0.080 | 0.078 | 0.076 | 0.075 | 0.073 | 0.071 | 0.069 |
| 19.0                          | 0.066 | 0.084 | 0.082 | 0.081 | 0.079 | 0.077 | 0.075 | 0.073 | 0.072 | 0.070 | 0.069 | 0.067 | 0.065 | 0.064 |
| 19.5                          | 0.061 | 0.078 | 0.076 | 0.074 | 0.073 | 0.071 | 0.069 | 0.068 | 0.066 | 0.065 | 0.064 | 0.062 | 0.060 | 0.059 |
| 20.0                          | 0.057 | 0.072 | 0.071 | 0.069 | 0.067 | 0.066 | 0.064 | 0.063 | 0.062 | 0.060 | 0.059 | 0.058 | 0.056 | 0.055 |
| 20.5                          | 0.053 | 0.067 | 0.065 | 0.064 | 0.062 | 0.061 | 0.060 | 0.058 | 0.057 | 0.056 | 0.055 | 0.054 | 0.052 | 0.051 |
| 21.0                          | 0.049 | 0.062 | 0.061 | 0.059 | 0.058 | 0.057 | 0.056 | 0.054 | 0.053 | 0.052 | 0.051 | 0.050 | 0.048 | 0.048 |
| 21.5                          | 0.046 | 0.058 | 0.057 | 0.055 | 0.054 | 0.053 | 0.052 | 0.051 | 0.050 | 0.049 | 0.048 | 0.047 | 0.045 | 0.044 |
| 22.0                          | 0.042 | 0.052 | 0.051 | 0.050 | 0.049 | 0.048 | 0.047 | 0.046 | 0.045 | 0.044 | 0.043 | 0.043 | 0.041 | 0.041 |
| 22.5                          | 0.037 | 0.046 | 0.045 | 0.044 | 0.043 | 0.042 | 0.041 | 0.041 | 0.040 | 0.039 | 0.039 | 0.038 | 0.037 | 0.036 |
| 23.0                          | 0.032 | 0.039 | 0.038 | 0.038 | 0.037 | 0.036 | 0.036 | 0.035 | 0.034 | 0.034 | 0.033 | 0.033 | 0.032 | 0.031 |
| 23.5                          | 0.027 | 0.033 | 0.032 | 0.032 | 0.031 | 0.031 | 0.030 | 0.030 | 0.029 | 0.029 | 0.028 | 0.028 | 0.027 | 0.027 |
| 24.0                          | 0.023 | 0.028 | 0.027 | 0.027 | 0.026 | 0.026 | 0.025 | 0.025 | 0.025 | 0.024 | 0.024 | 0.024 | 0.023 | 0.023 |
| 24.5                          | 0.020 | 0.023 | 0.023 | 0.023 | 0.022 | 0.022 | 0.022 | 0.021 | 0.021 | 0.021 | 0.020 | 0.020 | 0.020 | 0.019 |
| 25.0                          | 0.017 | 0.020 | 0.020 | 0.019 | 0.019 | 0.019 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.017 | 0.017 | 0.017 |

Original Instruction: T05 0127-1584 VER 01

T05 0127-1584 Ver 01 - Approved- Exported from DMS: 2022-08-25 by PIDEI

**8.21 Sound Curves, Sound Optimized Mode SO7**

| Sound Power Level at Hub Height   |  |
|-----------------------------------|--|
| Conditions for Sound Power Level: | Measurement standard IEC 61400-11 ed. 3<br>Maximum turbulence at hub height: 30%<br>Inflow angle (vertical): 0 ±2°<br>Air density: 1.225 kg/m <sup>3</sup> |
| Wind speed at hub height [m/s]    | Sound Power Level at Hub Height [dBA]<br>Sound Optimized Mode SO7 (Blades with serrated trailing edge)   |
| 3                                 | 93.9   |
| 4                                 | 94.0   |
| 5                                 | 94.9   |
| 6                                 | 97.7   |
| 7                                 | 99.0   |
| 8                                 | 99.0   |
| 9                                 | 99.0   |
| 10                                | 99.0   |
| 11                                | 99.0   |
| 12                                | 99.0   |
| 13                                | 99.0   |
| 14                                | 99.0   |
| 15                                | 99.0   |

Original Instruction: T05 0127-1584 VER 01

T05 0127-1584 Ver 01 - Approved- Exported from DMS: 2022-08-25 by PIDELE

**8.22 Power Curves, Sound Optimized Mode SO8**

| Air density [kg/m <sup>3</sup> ] |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wind speed [m/s]                 | 1.225 | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0                              | 32    | 15    | 17    | 18    | 20    | 21    | 23    | 24    | 26    | 27    | 29    | 31    | 34    | 35    |
| 3.5                              | 129   | 78    | 83    | 87    | 91    | 95    | 100   | 105   | 110   | 114   | 119   | 124   | 134   | 140   |
| 4.0                              | 288   | 196   | 204   | 213   | 221   | 230   | 238   | 246   | 255   | 263   | 271   | 279   | 296   | 304   |
| 4.5                              | 481   | 346   | 358   | 371   | 383   | 395   | 407   | 420   | 432   | 444   | 456   | 469   | 493   | 506   |
| 5.0                              | 715   | 529   | 546   | 563   | 580   | 597   | 614   | 631   | 648   | 664   | 681   | 698   | 732   | 749   |
| 5.5                              | 999   | 748   | 770   | 793   | 816   | 839   | 861   | 884   | 907   | 930   | 953   | 976   | 1022  | 1045  |
| 6.0                              | 1336  | 1008  | 1038  | 1067  | 1097  | 1127  | 1157  | 1187  | 1216  | 1246  | 1276  | 1306  | 1365  | 1395  |
| 6.5                              | 1698  | 1292  | 1329  | 1366  | 1403  | 1441  | 1477  | 1514  | 1551  | 1588  | 1625  | 1662  | 1735  | 1771  |
| 7.0                              | 2052  | 1572  | 1616  | 1660  | 1704  | 1748  | 1791  | 1835  | 1879  | 1922  | 1966  | 2009  | 2095  | 2139  |
| 7.5                              | 2376  | 1829  | 1879  | 1929  | 1979  | 2029  | 2079  | 2129  | 2178  | 2228  | 2277  | 2327  | 2425  | 2475  |
| 8.0                              | 2687  | 2073  | 2129  | 2186  | 2242  | 2298  | 2354  | 2409  | 2465  | 2521  | 2576  | 2631  | 2742  | 2797  |
| 8.5                              | 2987  | 2310  | 2372  | 2434  | 2495  | 2557  | 2619  | 2680  | 2742  | 2803  | 2864  | 2926  | 3048  | 3108  |
| 9.0                              | 3276  | 2537  | 2604  | 2672  | 2740  | 2807  | 2874  | 2942  | 3009  | 3076  | 3142  | 3209  | 3342  | 3408  |
| 9.5                              | 3550  | 2752  | 2825  | 2898  | 2971  | 3045  | 3117  | 3190  | 3262  | 3335  | 3406  | 3478  | 3621  | 3692  |
| 10.0                             | 3820  | 2966  | 3044  | 3123  | 3201  | 3280  | 3357  | 3435  | 3512  | 3590  | 3666  | 3743  | 3894  | 3968  |
| 10.5                             | 4088  | 3186  | 3269  | 3353  | 3437  | 3521  | 3603  | 3686  | 3768  | 3851  | 3930  | 4009  | 4158  | 4228  |
| 11.0                             | 4323  | 3413  | 3502  | 3591  | 3680  | 3769  | 3853  | 3938  | 4022  | 4107  | 4179  | 4251  | 4383  | 4444  |
| 11.5                             | 4545  | 3661  | 3755  | 3848  | 3942  | 4036  | 4117  | 4197  | 4278  | 4359  | 4421  | 4483  | 4587  | 4629  |
| 12.0                             | 4725  | 3940  | 4034  | 4127  | 4220  | 4314  | 4385  | 4457  | 4529  | 4600  | 4642  | 4683  | 4748  | 4770  |
| 12.5                             | 4856  | 4230  | 4318  | 4406  | 4493  | 4581  | 4633  | 4684  | 4735  | 4787  | 4810  | 4833  | 4870  | 4885  |
| 13.0                             | 4951  | 4495  | 4568  | 4641  | 4714  | 4787  | 4818  | 4850  | 4881  | 4912  | 4925  | 4938  | 4958  | 4965  |
| 13.5                             | 5003  | 4695  | 4749  | 4802  | 4856  | 4909  | 4928  | 4946  | 4965  | 4983  | 4990  | 4996  | 5007  | 5011  |
| 14.0                             | 5036  | 4842  | 4878  | 4915  | 4951  | 4988  | 4997  | 5006  | 5015  | 5024  | 5028  | 5032  | 5037  | 5038  |
| 14.5                             | 5046  | 4936  | 4956  | 4977  | 4998  | 5019  | 5024  | 5030  | 5035  | 5041  | 5043  | 5044  | 5046  | 5046  |
| 15.0                             | 5042  | 4991  | 5002  | 5014  | 5025  | 5037  | 5038  | 5039  | 5040  | 5041  | 5041  | 5041  | 5042  | 5042  |
| 15.5                             | 5027  | 5000  | 5006  | 5013  | 5019  | 5025  | 5025  | 5026  | 5026  | 5026  | 5026  | 5026  | 5026  | 5027  |
| 16.0                             | 5004  | 4992  | 4995  | 4998  | 5000  | 5003  | 5003  | 5003  | 5003  | 5003  | 5003  | 5004  | 5004  | 5004  |
| 16.5                             | 4976  | 4967  | 4969  | 4971  | 4973  | 4976  | 4976  | 4976  | 4976  | 4976  | 4976  | 4976  | 4977  | 4977  |
| 17.0                             | 4948  | 4943  | 4944  | 4945  | 4946  | 4948  | 4948  | 4948  | 4948  | 4948  | 4948  | 4948  | 4948  | 4949  |
| 17.5                             | 4924  | 4916  | 4917  | 4919  | 4921  | 4923  | 4923  | 4923  | 4923  | 4923  | 4923  | 4924  | 4924  | 4924  |
| 18.0                             | 4899  | 4893  | 4894  | 4895  | 4897  | 4898  | 4898  | 4898  | 4898  | 4899  | 4899  | 4899  | 4900  | 4900  |
| 18.5                             | 4873  | 4866  | 4867  | 4868  | 4869  | 4870  | 4871  | 4871  | 4871  | 4871  | 4872  | 4872  | 4873  | 4873  |
| 19.0                             | 4844  | 4841  | 4841  | 4841  | 4841  | 4841  | 4842  | 4842  | 4842  | 4842  | 4843  | 4843  | 4844  | 4845  |
| 19.5                             | 4815  | 4812  | 4812  | 4812  | 4812  | 4813  | 4813  | 4813  | 4813  | 4814  | 4814  | 4815  | 4816  | 4816  |
| 20.0                             | 4791  | 4788  | 4788  | 4788  | 4789  | 4789  | 4789  | 4789  | 4790  | 4790  | 4790  | 4790  | 4791  | 4791  |
| 20.5                             | 4773  | 4771  | 4771  | 4771  | 4771  | 4771  | 4772  | 4772  | 4772  | 4772  | 4772  | 4772  | 4773  | 4773  |
| 21.0                             | 4759  | 4757  | 4757  | 4757  | 4757  | 4758  | 4758  | 4758  | 4758  | 4758  | 4759  | 4759  | 4759  | 4759  |
| 21.5                             | 4739  | 4735  | 4735  | 4736  | 4736  | 4737  | 4737  | 4737  | 4737  | 4738  | 4738  | 4739  | 4740  | 4741  |
| 22.0                             | 4664  | 4630  | 4633  | 4636  | 4638  | 4641  | 4644  | 4647  | 4651  | 4654  | 4657  | 4661  | 4666  | 4669  |
| 22.5                             | 4440  | 4382  | 4386  | 4391  | 4395  | 4400  | 4405  | 4411  | 4417  | 4423  | 4428  | 4434  | 4445  | 4450  |
| 23.0                             | 4055  | 3963  | 3971  | 3978  | 3986  | 3994  | 4001  | 4008  | 4016  | 4023  | 4034  | 4045  | 4062  | 4069  |
| 23.5                             | 3598  | 3501  | 3509  | 3517  | 3525  | 3533  | 3541  | 3549  | 3557  | 3565  | 3576  | 3587  | 3607  | 3616  |
| 24.0                             | 3155  | 3063  | 3070  | 3077  | 3084  | 3090  | 3099  | 3108  | 3117  | 3126  | 3136  | 3145  | 3164  | 3174  |
| 24.5                             | 2744  | 2662  | 2669  | 2676  | 2683  | 2690  | 2698  | 2706  | 2714  | 2722  | 2729  | 2737  | 2755  | 2765  |
| 25.0                             | 2395  | 2309  | 2316  | 2324  | 2331  | 2338  | 2346  | 2355  | 2363  | 2372  | 2380  | 2387  | 2403  | 2412  |

Original Instruction: T05 0127-1584 VER 01

T05 0127-1584 Ver 01 - Approved- Exported from DMS: 2022-08-25 by PIDEI

**8.23 Ct Values, Sound Optimized Mode SO8**

| Air density kg/m <sup>3</sup> |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wind speed [m/s]              | 1.225 | 0.950 | 0.975 | 1.000 | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.250 | 1.275 |
| 3.0                           | 0.969 | 0.980 | 0.979 | 0.978 | 0.977 | 0.976 | 0.975 | 0.974 | 0.973 | 0.972 | 0.971 | 0.970 | 0.968 | 0.967 |
| 3.5                           | 0.885 | 0.893 | 0.892 | 0.892 | 0.891 | 0.890 | 0.889 | 0.889 | 0.888 | 0.887 | 0.886 | 0.886 | 0.884 | 0.883 |
| 4.0                           | 0.831 | 0.846 | 0.844 | 0.843 | 0.842 | 0.841 | 0.840 | 0.839 | 0.837 | 0.836 | 0.834 | 0.833 | 0.830 | 0.828 |
| 4.5                           | 0.816 | 0.825 | 0.824 | 0.822 | 0.821 | 0.820 | 0.819 | 0.819 | 0.818 | 0.818 | 0.817 | 0.817 | 0.816 | 0.816 |
| 5.0                           | 0.812 | 0.811 | 0.811 | 0.811 | 0.811 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 | 0.812 |
| 5.5                           | 0.814 | 0.814 | 0.814 | 0.814 | 0.814 | 0.815 | 0.815 | 0.815 | 0.815 | 0.815 | 0.814 | 0.814 | 0.814 | 0.814 |
| 6.0                           | 0.808 | 0.811 | 0.811 | 0.811 | 0.811 | 0.810 | 0.810 | 0.810 | 0.810 | 0.809 | 0.809 | 0.809 | 0.808 | 0.808 |
| 6.5                           | 0.763 | 0.769 | 0.768 | 0.768 | 0.767 | 0.767 | 0.766 | 0.766 | 0.765 | 0.764 | 0.764 | 0.763 | 0.762 | 0.761 |
| 7.0                           | 0.681 | 0.688 | 0.687 | 0.686 | 0.686 | 0.685 | 0.685 | 0.684 | 0.684 | 0.683 | 0.682 | 0.682 | 0.681 | 0.680 |
| 7.5                           | 0.604 | 0.609 | 0.609 | 0.608 | 0.608 | 0.607 | 0.607 | 0.606 | 0.606 | 0.605 | 0.605 | 0.605 | 0.604 | 0.603 |
| 8.0                           | 0.540 | 0.544 | 0.544 | 0.544 | 0.543 | 0.543 | 0.543 | 0.542 | 0.542 | 0.541 | 0.541 | 0.541 | 0.540 | 0.539 |
| 8.5                           | 0.486 | 0.489 | 0.489 | 0.489 | 0.488 | 0.488 | 0.488 | 0.487 | 0.487 | 0.487 | 0.486 | 0.486 | 0.485 | 0.485 |
| 9.0                           | 0.439 | 0.442 | 0.442 | 0.441 | 0.441 | 0.441 | 0.441 | 0.440 | 0.440 | 0.440 | 0.439 | 0.439 | 0.439 | 0.438 |
| 9.5                           | 0.398 | 0.401 | 0.401 | 0.400 | 0.400 | 0.400 | 0.400 | 0.399 | 0.399 | 0.399 | 0.399 | 0.398 | 0.398 | 0.398 |
| 10.0                          | 0.363 | 0.365 | 0.365 | 0.365 | 0.364 | 0.364 | 0.364 | 0.364 | 0.364 | 0.363 | 0.363 | 0.363 | 0.362 | 0.362 |
| 10.5                          | 0.332 | 0.334 | 0.334 | 0.334 | 0.334 | 0.334 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.332 | 0.330 | 0.329 |
| 11.0                          | 0.302 | 0.309 | 0.309 | 0.309 | 0.308 | 0.308 | 0.308 | 0.307 | 0.307 | 0.306 | 0.305 | 0.304 | 0.300 | 0.297 |
| 11.5                          | 0.275 | 0.288 | 0.288 | 0.288 | 0.288 | 0.287 | 0.286 | 0.285 | 0.284 | 0.282 | 0.280 | 0.277 | 0.271 | 0.268 |
| 12.0                          | 0.248 | 0.272 | 0.271 | 0.270 | 0.270 | 0.269 | 0.267 | 0.264 | 0.262 | 0.260 | 0.256 | 0.252 | 0.244 | 0.240 |
| 12.5                          | 0.224 | 0.257 | 0.256 | 0.254 | 0.253 | 0.251 | 0.247 | 0.244 | 0.240 | 0.237 | 0.232 | 0.228 | 0.219 | 0.215 |
| 13.0                          | 0.201 | 0.243 | 0.240 | 0.237 | 0.234 | 0.231 | 0.227 | 0.222 | 0.218 | 0.214 | 0.209 | 0.205 | 0.197 | 0.193 |
| 13.5                          | 0.180 | 0.225 | 0.221 | 0.218 | 0.214 | 0.210 | 0.206 | 0.201 | 0.197 | 0.192 | 0.188 | 0.184 | 0.177 | 0.173 |
| 14.0                          | 0.162 | 0.207 | 0.203 | 0.199 | 0.194 | 0.190 | 0.186 | 0.181 | 0.177 | 0.173 | 0.169 | 0.166 | 0.159 | 0.155 |
| 14.5                          | 0.146 | 0.189 | 0.184 | 0.180 | 0.175 | 0.171 | 0.167 | 0.163 | 0.159 | 0.156 | 0.152 | 0.149 | 0.143 | 0.140 |
| 15.0                          | 0.131 | 0.171 | 0.167 | 0.163 | 0.158 | 0.154 | 0.151 | 0.147 | 0.143 | 0.140 | 0.137 | 0.134 | 0.128 | 0.126 |
| 15.5                          | 0.118 | 0.155 | 0.151 | 0.147 | 0.143 | 0.139 | 0.136 | 0.133 | 0.129 | 0.126 | 0.124 | 0.121 | 0.116 | 0.114 |
| 16.0                          | 0.107 | 0.140 | 0.136 | 0.133 | 0.129 | 0.126 | 0.123 | 0.120 | 0.117 | 0.114 | 0.112 | 0.110 | 0.105 | 0.103 |
| 16.5                          | 0.097 | 0.127 | 0.124 | 0.120 | 0.117 | 0.114 | 0.111 | 0.109 | 0.106 | 0.104 | 0.102 | 0.099 | 0.096 | 0.094 |
| 17.0                          | 0.089 | 0.115 | 0.112 | 0.109 | 0.106 | 0.104 | 0.101 | 0.099 | 0.097 | 0.094 | 0.093 | 0.091 | 0.087 | 0.085 |
| 17.5                          | 0.082 | 0.106 | 0.103 | 0.100 | 0.098 | 0.095 | 0.093 | 0.091 | 0.089 | 0.087 | 0.085 | 0.083 | 0.080 | 0.078 |
| 18.0                          | 0.075 | 0.097 | 0.094 | 0.092 | 0.089 | 0.087 | 0.085 | 0.083 | 0.081 | 0.080 | 0.078 | 0.076 | 0.073 | 0.072 |
| 18.5                          | 0.069 | 0.089 | 0.086 | 0.084 | 0.082 | 0.080 | 0.078 | 0.077 | 0.075 | 0.073 | 0.072 | 0.070 | 0.068 | 0.066 |
| 19.0                          | 0.063 | 0.081 | 0.079 | 0.077 | 0.075 | 0.073 | 0.072 | 0.070 | 0.069 | 0.067 | 0.066 | 0.065 | 0.062 | 0.061 |
| 19.5                          | 0.058 | 0.075 | 0.073 | 0.071 | 0.069 | 0.068 | 0.066 | 0.065 | 0.063 | 0.062 | 0.061 | 0.060 | 0.057 | 0.056 |
| 20.0                          | 0.054 | 0.069 | 0.067 | 0.066 | 0.064 | 0.063 | 0.061 | 0.060 | 0.059 | 0.057 | 0.056 | 0.055 | 0.053 | 0.052 |
| 20.5                          | 0.050 | 0.064 | 0.063 | 0.061 | 0.060 | 0.058 | 0.057 | 0.056 | 0.055 | 0.053 | 0.052 | 0.051 | 0.050 | 0.049 |
| 21.0                          | 0.047 | 0.060 | 0.058 | 0.057 | 0.056 | 0.054 | 0.053 | 0.052 | 0.051 | 0.050 | 0.049 | 0.048 | 0.046 | 0.045 |
| 21.5                          | 0.044 | 0.056 | 0.054 | 0.053 | 0.052 | 0.051 | 0.050 | 0.049 | 0.048 | 0.047 | 0.046 | 0.045 | 0.043 | 0.043 |
| 22.0                          | 0.041 | 0.051 | 0.050 | 0.049 | 0.048 | 0.047 | 0.046 | 0.045 | 0.044 | 0.043 | 0.042 | 0.042 | 0.040 | 0.039 |
| 22.5                          | 0.037 | 0.046 | 0.045 | 0.044 | 0.043 | 0.042 | 0.041 | 0.040 | 0.039 | 0.039 | 0.038 | 0.037 | 0.036 | 0.036 |
| 23.0                          | 0.032 | 0.039 | 0.039 | 0.038 | 0.037 | 0.036 | 0.036 | 0.035 | 0.034 | 0.034 | 0.033 | 0.033 | 0.032 | 0.031 |
| 23.5                          | 0.027 | 0.033 | 0.033 | 0.032 | 0.031 | 0.031 | 0.030 | 0.030 | 0.029 | 0.029 | 0.028 | 0.028 | 0.027 | 0.027 |
| 24.0                          | 0.023 | 0.028 | 0.027 | 0.027 | 0.026 | 0.026 | 0.026 | 0.025 | 0.025 | 0.024 | 0.024 | 0.024 | 0.023 | 0.023 |
| 24.5                          | 0.020 | 0.024 | 0.023 | 0.023 | 0.022 | 0.022 | 0.022 | 0.021 | 0.021 | 0.021 | 0.020 | 0.020 | 0.020 | 0.019 |
| 25.0                          | 0.017 | 0.020 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 | 0.018 | 0.018 | 0.018 | 0.018 | 0.017 | 0.017 | 0.017 |

Original Instruction: T05 0127-1584 VER 01

T05 0127-1584 Ver 01 - Approved- Exported from DMS: 2022-08-25 by PIDEI

**8.24 Sound Curves, Sound Optimized Mode SO8**

| Sound Power Level at Hub Height   |  |
|-----------------------------------|--|
| Conditions for Sound Power Level: | Measurement standard IEC 61400-11 ed. 3<br>Maximum turbulence at hub height: 30%<br>Inflow angle (vertical): 0 ±2°<br>Air density: 1.225 kg/m <sup>3</sup> |
| Wind speed at hub height [m/s]    | Sound Power Level at Hub Height [dBA]<br>Sound Optimized Mode SO8 (Blades with serrated trailing edge)   |
| 3                                 | 93.9   |
| 4                                 | 94.0   |
| 5                                 | 94.9   |
| 6                                 | 97.5   |
| 7                                 | 98.0   |
| 8                                 | 98.0   |
| 9                                 | 98.0   |
| 10                                | 98.0   |
| 11                                | 98.0   |
| 12                                | 98.0   |
| 13                                | 98.0   |
| 14                                | 98.0   |
| 15                                | 98.0   |

Original Instruction: T05 0127-1584 VER 01

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