REGIONE BASILICATA

PROVINCIA DI POTENZA

COMUNE DI PIETRAGALLA   COMUNE DI POTENZA   COMUNE DI VAGLIO BASILICATA

Committente:

E**X**ENERGY s.r.l.s.
Via Principe Amedeo, n. 7 – 85010 Pignola (Pz)

Oggetto:

PROGETTO DEFINITIVO
"PARCO EOLICO POGGIO D'ORO"

Titolo:

Piano di manutenzione e gestione dell'impianto

Tavola:

B

-Progettista Architettonico/Elettromecc.:

Ing. Paolo Battistella

-Committente:

-Responsabile V.I.A.:

Arch. Antonio De Maio

VEGA sas
LANDSCAPE ECOLOGY
& URBAN PLANNING

-Consulenza Geologica:

Dott.Geologo Viviani

N°	REVISIONE	DATA	RED.	APPR.	
					Data:
0	Emissione	06/2019	MS	BP	Giugno 2019

Committente:
EXENERGY S.r.l.s.
Via Principe Amedeo, 7 – 85010 Pignola (PZ)

Parco Eolico Poggio d'Oro
GESTIONE E MANUTENZIONE
B

	Redatto	Note	Data
Emissione	P.Battistella		29 giugno 2019

A. PARTE GENERALE

A.1   Componenti dell'impianto

L'impianto eolico Poggio d'Oro presenta i seguenti componenti principali:

- 13 aerogeneratori di grande taglia

- 1 cavidotto interrato di impianto a 30 kV

- 2 cabine di raccolta delle linee di impianto

- 1 cavidotto interrato di collegamento tra cabine e sottostazione costituito da due o più terne da 30 kV

- 1 stallo produttore di trasformazione 30-150 kV

- 1 cavidotto da 150kV per il collegamento tra stallo produttore e sottostazione di Vaglio

La gestione e la manutenzione dell'impianto devono contemplare tutti i componenti elencati. Inoltre, per eseguire la corretta manutenzione sull'aerogeneratore, la piazzola deve essere sempre accessibile con i mezzi normalmente necessari (furgoni, cestello, gru,…) e quindi anche le vie di accesso devono essere correttamente manutenute mantenendo il fondo praticabile anche nella stagione avversa e organizzando lo sgombero neve nel caso di precipitazioni di tal tipo.

A.2   Schede Tecniche dei Componenti dell'impianto.

AEROGENERATORE

Le macchine proposte hanno le seguenti caratteristiche:

- grande taglia con diametro rotore fino a 117m;

- altezza mozzo fino a 91,5m, comunque altezza complessiva, altezza mozzo più pala, non superiore a 150m)

L'aerogeneratore di riferimento è Vestas modello V117 da 4,2MW di potenza nominale, con altezza mozzo pari a 91,5m. Tale turbina descrive e riassume le caratteristiche del gruppo di turbine idonee al sito.
In allegato 1 è riportata la scheda tecnica del Costruttore VESTAS con tutte le caratteristiche funzionali principali.

Lo schema costruttivo rimane quello classico, in cui la navicella è progettata con struttura portante saldata. Al suo interno sono alloggiati il sistema di trasmissione con moltiplicatore di giri, il generatore elettrico e i dispositivi ausiliari.

L'avvio della turbina avviene con un vento di 3m/s, a passo massimo.
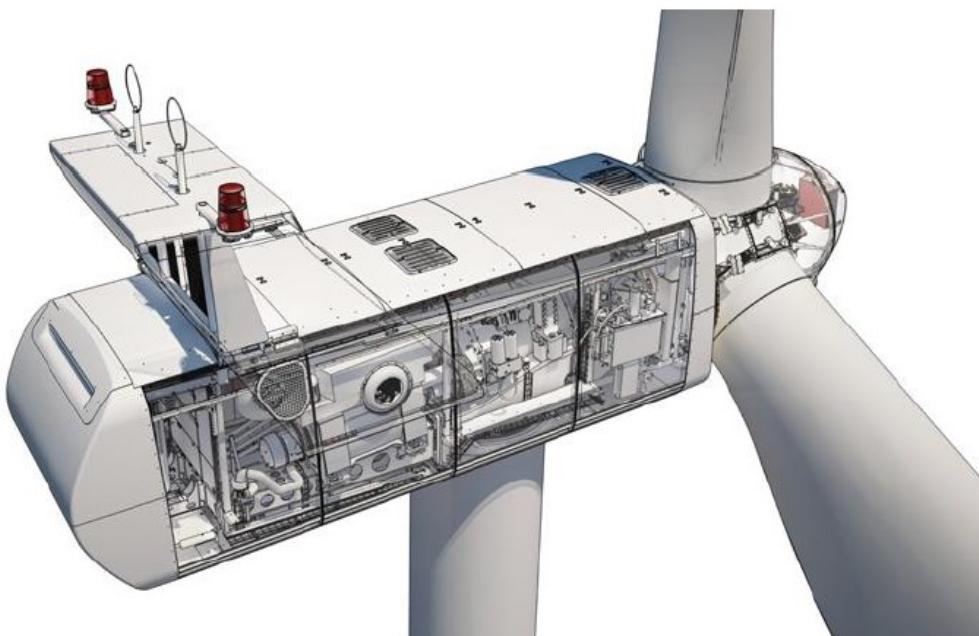
Figura 1 - Navicella Vestas V117

Al crescere del vento il rotore può aumentare la sua velocità fino a quella nominale, variando il passo delle pale e regolando il generatore.

A velocità del vento alte, oltre quella di raggiungimento della potenza nominale, il sistema di regolazione del passo e quello del generatore mantengono la potenza al valore

prefissato, indipendentemente da variazioni di velocità del vento, di carico, di temperatura o di densità dell'aria.

Quando necessario, l'aerogeneratore frena aerodinamicamente mettendo le pale completamente in bandiera.

Tutte le funzioni dell'aerogeneratore sono monitorate e controllate da diverse unità di controllo basate su microprocessori.

Le pale del rotore, aventi forte influenza sull'*output* della turbina e sull'emissione sonora, sono di materiale a base epossidica rinforzato da fibre di vetro e di carbonio, quindi caratterizzate da durevolezza, resistenza all'abrasione e alta resistenza ai fattori chimici e alle radiazioni solari. Hanno inoltre un rivestimento di protezione contro i fattori atmosferici.

Il profilo alare si estende fino alla navicella, ottimizzando così l'andamento delle linee di corrente per l'intera lunghezza della pala.

COMPONENTI PRINCIPALI DELLA TURBINA

Pale:
- ✓ Numero: 3
- ✓ Lunghezza: 58m
- ✓ Materiale: materiale composito a matrice epossidica rinforzata con fibra di vetro e carbonio

Rotore:
- ✓ Diametro 117 m
- ✓ Area spazzata 10.751 m^2

Sistema di controllo del passo (*pitch control*):
- ✓ Sistema idraulico
- ✓ massima affidabilità grazie al sistema di gestione della turbina
- ✓ Manutenzione meccanica e del software

Mozzo:
- ✓ design compatto ideale per la trasmissione dei carichi
- ✓ integrazione degli azionamenti delle pale

Generatore e convertitore di frequenza:
- ✓ generatore asincrono a doppia alimentazione.
- ✓ regime di rotazione variabile per un ottimo rendimento

✓ temperatura contenuta del generatore anche a temperature ambientali molto elevate; le aree a temperatura più elevata sono costantemente monitorate da numerosi sensori

Sistema di imbardata (*yaw control)*:

✓ azionamento mediante motoriduttori

✓ grazie allo scarso attrito del cuscinetto e la completa ventilazione dei freni, lo sforzo dei motoriduttori durante la rotazione è ridotto al minimo

CAVI ELETTRICI

I cavi elettrici unipolari a 30 kV di riferimento sono i Prysmian. La relativa scheda tecnica, "Medium Voltage Systems" – Prysmian Cavi e Sistemi Energia Srl, è allegata [2].

Tutti i collegamenti elettrici, tra gli aerogeneratori e alla sottostazione, sono realizzati per mezzo di **cavidotti interrati**: questa soluzione permette di minimizzare l'emissione elettromagnetica ed elimina del tutto il problema della visibilità delle linee aeree e il relativo impatto sull'avifauna.

SOTTOSTAZIONE MT/AT

Lo schema elettrico dell'impianto è descritto dall'unifilare di tav. A16b7.

La produzione elettrica del parco eolico, costituito da 13 aerogeneratori, viene raccolta con due differenti cabine.

La sottostazione dell'impianto è nel Comune di Vaglio di Basilicata.

I lavori prevedono la presenza di un trasformatore 30/150 kV, la strumentazione di misura e tutti i vari servizi ausiliari. Per la componentistica si veda la Relazione "A15 Disciplinare degli Elementi Tecnici".

La sottostazione verrà collegata con cavo AT a 150kV con la nuova stazione elettrica di Vaglio di Basilicata.

Per la stazione utente si rimanda alla tav.A.16.b.9.

A.3   Schemi di Funzionamento dell'impianto

I sistemi di controllo per la gestione dell'aerogeneratore sono il *pitch control* e lo *yaw control.*

Il primo, *pitch control,* di cui è dotata ciascuna pala in modo indipendente, esegue la rotazione delle pale intorno al loro asse principale e permette la riduzione della potenza al suo valore nominale, evitando così l'utilizzo di freni meccanici. Gli angoli aerodinamici e costruttivi sono costantemente monitorati, in modo da permettere veloci regolazioni in funzione del vento.

Il vento è misurato in continuo con anemometro di macchina.

Il carico elettrico è costantemente monitorato ed in caso di caduta di rete, ovvero mancanza di carico, si ha un arresto di emergenza del rotore tramite frenatura aerodinamica e stazionamento meccanico. Stessa procedura in caso di grave guasto e incendio.

Il secondo, *yaw control* detto anche *imbardata*, modifica l'orientamento della navicella, allineando la macchina rispetto alla direzione del vento e garantendo, indipendentemente dalla direzione del vento, la migliore esposizione del rotore ovvero perpendicolare alla direzione del vento in posizione sopravento rispetto alla torre.

La direzione del vento è costantemente monitorato da apposita banderuola di macchina.

Per gli schemi di funzionamento dell'impianto far riferimento alle seguenti tavole di progetto:

- A.16.b.3 Schemi funzionali dei singoli aerogeneratori
- A.16.b.7 Schemi elettrici impianto eolico
- A.16.b.4 Schemi di collegamento alla rete elettrica di distribuzione e trasmissione.

B. SISTEMA DI MANUTENZIONE DELL'IMPIANTO

L'aerogeneratore è dotato di un sistema di controllo remoto che permette di monitorarne costantemente lo stato, e in caso di anomalie, opportuni sensori trasmettono gli allarmi relativi consentendo tempestivi interventi anche per manutenzione non programmata.

Relativamente alla manutenzione dell'aerogeneratore la progettazione dello stesso ha raccolto le esigenze degli operatori sviluppando una macchina con le seguenti caratteristiche:

- ✓ accesso alla navicella dall'interno della torre con utilizzo di ascensore;
- ✓ montacarichi esterno
- ✓ notevole disponibilità di spazio nella navicella per interventi facili ed ergonomici
- ✓ accesso al mozzo agevole direttamente dalla navicella
- ✓ facilità nel raggiungere tutti i componenti
- ✓ sicurezza durante la manutenzione grazie alla protezione di tutte le parti rotanti
- ✓ in caso di necessità, la macchina consente lo smontaggio di molti componenti

Il programma di manutenzione generale programmata è suddiviso in tre categorie:

- ➢ Manutenzione visiva e con rilevamento di rumori anomali;
- ➢ Manutenzione meccanica con verifica livelli lubrificanti;
- ➢ Manutenzione elettrica.

C. MANUALE D'USO DI TUTTI I COMPONENTI DELL'IMPIANTO

Le turbine eoliche sono macchine nel pieno senso e quindi ricadono nel campo di applicazione della direttiva Macchine UE98/37 con successivi aggiornamenti e norme collegate.

La normativa di riferimento per la progettazione e la sicurezza è la CEI-EN 61400-1 ed.3 "Turbine eoliche – Parte 1: Prescrizioni per la progettazione" del febbraio 2006 (recepimento della IEC 61400-1 ed.3 del novembre 2005 "Wind Turbines – Part 1: Design requirements) e norme collegate.

Le turbine vengono progettate, costruite, collaudate, secondo le normative di cui sopra, e vengono sottoposte nel loro complesso all'esame di enti indipendenti di certificazione, che in caso di esito positivo, emettono differenti certificati. Il più completo, che riassume anche gli altri, è la certificazione di tipo (Type Certificate). Prima di questa vengono verificati il progetto, il sistema e l'organizzazione di costruzione, i materiali.

Per questo motivo il "Manuale d'Uso e Manutenzione" dell'aerogeneratore è un requisito essenziale che raccoglie in dettaglio tutte le operazioni di manutenzione ordinaria e straordinaria di tutti i componenti. La complessità della macchina ed il numero dei vari componenti incorporati rende il documento complessivo così articolato che solo alla consegna del WTG viene fornita la copia specifica per il tipo di macchina.

D. PROGRAMMA DI MANUTENZIONE

Il programma di manutenzione generale programmato prevede scadenze regolari con intervallo variabile a seconda della tipologia di controllo. Gli intervalli previsti sono:

- ➢ Manutenzione iniziale – ad 1 mese dall'entrata in funzione;
- ➢ Manutenzione semestrale;
- ➢ Manutenzione annuale (o secondo multipli di anno);

In tal modo si ottiene un ottimale livello di efficienza dell'impianto, garantendo costantemente adeguati livelli di sicurezza.

In particolare, le principali azioni riguardanti la torre sono:

- verifica della coppia di serraggio dei bulloni (cadenza annuale);
- controllo visivo dello stato delle lamiere (primo controllo dopo tre anni, successivi con cadenza annuale);
- misura dello spessore della vernice in diverse parti della torre (primo controllo dopo cinque anni e successivi dopo due anni).

Risulta evidente che grazie alla presenza di una squadra di manutenzione sulla macchina ogni semestre, vi sia la possibilità di segnalare eventuali anomalie riscontrate.

Per i collegamenti in AT e le sottostazioni AT/AT e AT/AAT si rimanda al progetto relativo alle Infrastrutture richieste da TERNA tramite STMG.

E. ALLEGATI

[1]   Performance Specification – V117-4.0/4.2 MW 50/60Hz - VESTAS

[2]   "Medium Voltage Systems" – Prysmian Cavi e Sistemi Energia Srl

Performance Specification
V117-4.0/4.2 MW 50/60 Hz
Strong Wind

Vestas Wind Systems A/S · Hedeager 42 · 8200 Aarhus N · Denmark · www.vestas.com

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

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Document no.: 0067-7063 V03
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Performance Specification V117-4.0/4.2 MW 50/60 Hz

Date: 2017-11-29
Restricted
Page 2 of 40

Table of contents

RESTRICTED

Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Table of contents

Date: 2017-11-29
Restricted
Page 3 of 40

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

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Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Table of contents

Date: 2017-11-29
Restricted
Page 4 of 40

Original Instruction: T05 0067-7063 VER 03

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Performance Specification V117-4.0/4.2 MW 50/60 Hz
General Description

Date: 2017-11-29
Restricted
Page 5 of 40

1 General Description

The Vestas V117-4.0/4.2 MW wind turbine is a pitch regulated upwind turbine with active yaw and a three-blade rotor. The Vestas V117-4.0/4.2 MW turbine has a rotor diameter of 117 m and a rated power of 4.0 MW.

Vestas offers an optional Power Optimized (PO) mode at 4.2 MW for the V117-4.0 MW variant.

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
Tower type		Standard
IEC61400-22	IEC IB	91.5 m
	IEC IIA	91.5 m

Table 2-1: Type approval data and available hub heights

The hub height can be increased by up to 3 m by use of raised foundation. Use of raised foundation is subject to site-specific evaluation and is not available for all soil conditions.

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.

Wind Climate	IEC IB	IEC IB S	IEC IIA
Power Rating	4.0MW	4.2MW	4.0/4.2MW
Extr Wind Speed (10 min average), V_{50}	50.0 m/s	50.0 m/s	42.5 m/s
Survival Wind Speed (3 s gust), V_{e50}	70.0 m/s	70.0 m/s	59.5 m/s
Turbulence Intensity, I_{V50}	11%	11%	11%

Table 3-1: Extreme design parameters – IEC

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Document no.: 0067-7063 V03	Performance Specification V117-4.0/4.2 MW 50/60 Hz	Date: 2017-11-29
Document owner: Platform Management	Operational Envelope and Performance Guidelines	Restricted
Type: T05 - General Description		Page 6 of 40

Wind Climate	IEC IB	IEC IB S	IEC IIA
Power Rating	**4.0MW**	**4.2MW**	**4.0/4.2MW**
Wind Speed (10 min average), V_{ave}	10.0 m/s	9.5 m/s	8.5 m/s
Weibull Scale Factor, C	11.3 m/s	10.7 m/s	9.6 m/s
Weibull Shape Factor, k	2.0	2.0	2.0
I_{ref} acc. to IEC 61400-1	0.14	0.14	0.16
Turbulence Intensity acc. to IEC 61400-1, Including Wind Farm Turbulence (@15 m/s) I_{90} (90% quantile)	15.7%	15.7%	18.0%
Wind Shear exponent, α	0.20	0.20	0.20
Inflow Angle (vertical)	8°	8°	8°

Table 3-2:   Average design parameters – IEC

3.1.1   Complex Terrain

Classification of complex terrain according to IEC 61400-1:2005 Chapter 11.2. For sites classified as complex, appropriate measures are to be included in site assessment. Positioning of each turbine must be verified via Vestas Site Check.

3.1.2   Altitude

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.

3.1.3   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	IEC IB	IEC IB S	IEC IIA
Power Rating	**4.0MW**	**4.2MW**	**4.0/4.2MW**
Cut-In, V_{in}	3 m/s	3 m/s	3 m/s
Cut-Out (10 min exponential avg.), V_{out}	25.0 m/s	25.0 m/s	25.0 m/s
Re-Cut In (10 min exponential avg.)	23.0 m/s	23.0 m/s	23.0 m/s

Table 3-3:   Operational envelope – wind – IEC

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Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Operational Envelope and Performance Guidelines

Date: 2017-11-29
Restricted
Page 7 of 40

3.3 Operational Envelope – Wind (HWO)

Optionally, the turbine can be offered with the High Wind Operation (HWO) control feature. The HWO control feature allows the turbine to operate up to the extended cut-out wind speeds listed in Table 3-4, p. 7, with a controlled derating of power and speed. The power curves associated with optional HWO control are found in Sections 7, 9, **Error! Reference source not found.**, **Error! Reference source not found.** and **Error! Reference source not found.**.. Values refer to hub height and are determined by the sensors and control system of the turbine.

Wind climate	IEC IB	IEC IB S	IEC IIA
Power Rating	**4.0MW**	**4.2MW**	**4.0/4.2MW**
Cut-In, V_{in}	3 m/s	3 m/s	3 m/s
Cut-Out (10 min exponential avg.), V_{out}	30.0 m/s	30.0 m/s	30.0 m/s
Re-Cut In (10 min exponential avg.)	28.0 m/s	28.0 m/s	28.0 m/s

Table 3-4:   Operational envelope – wind – IEC (High Wind Operation)

3.4 Operational Envelope – Conditions for Power Curve and Ct Values (at Hub Height)

Consult Section 6 and later sections for power curves and C_t values.

Conditions for Power Curve and C_t Values (at Hub Height)	
Wind Shear, α	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 ±2°
Grid Voltage	Nominal Voltage ±2.5%
Grid Frequency	Nominal Frequency ±0.5 Hz
Grid Active Power (at LV-side of turbine transformer)	As per tabulated values in Section 6 and later sections
Grid Reactive Power (at LV-side of turbine transformer)	Power Factor 1.0

Table 3-5:   Conditions for power curve and Ct values

RESTRICTED

Document no.: 0067-7063 V03   Date: 2017-11-29
Document owner: Platform Management   Performance Specification V117-4.0/4.2 MW 50/60 Hz   Restricted
Type: T05 - General Description   Operational Envelope and Performance Guidelines   Page 8 of 40

3.5   Sound Modes

The sound modes listed below are available for the turbine.

Sound modes			
Mode No.	**Maximum Sound Level**	**Serrated trailing edges**	**Available hub heights**
0/PO1	106.0 dBA	Yes (standard)	91.5 m
0-0S/ PO1-0S	108.5 dBA	No (option)	91.5 m

Table 3-6:   Available sound performance

NOTE   The turbine is as standard equipped with serrated trailing edges on the blades. Optionally, Mode 0-0S and PO1-0S can be offered without serrated trailing edges mounted on the blades.

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	105.0 dBA	Yes	91.5 m
SO2	103.0 dBA	Yes	91.5 m
SO3	101.0 dBA	Yes	91.5 m

Table 3-7:   Available Sound Optimized modes

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

3.6   Load Modes

The Load Optimized (LO) modes listed below are available for the turbine.

Load Optimized (LO) modes				
Mode No.	**Power**	**Maximum Sound Level**	**Serrated trailing edges**	**Available hub heights**
LO1	3.8 MW	106.0 dBA	Yes	91.5 m
LO2	3.6 MW	106.0 dBA	Yes	91.5 m

Table 3-8:   Available Load Optimized modes

NOTE   Load Optimized (LO) modes are only available with serrated trailing edges mounted on the blades.

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Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Drawings

Date: 2017-11-29
Restricted
Page 9 of 40

4 Drawings

4.1 Structural Design – Illustration of Outer Dimensions
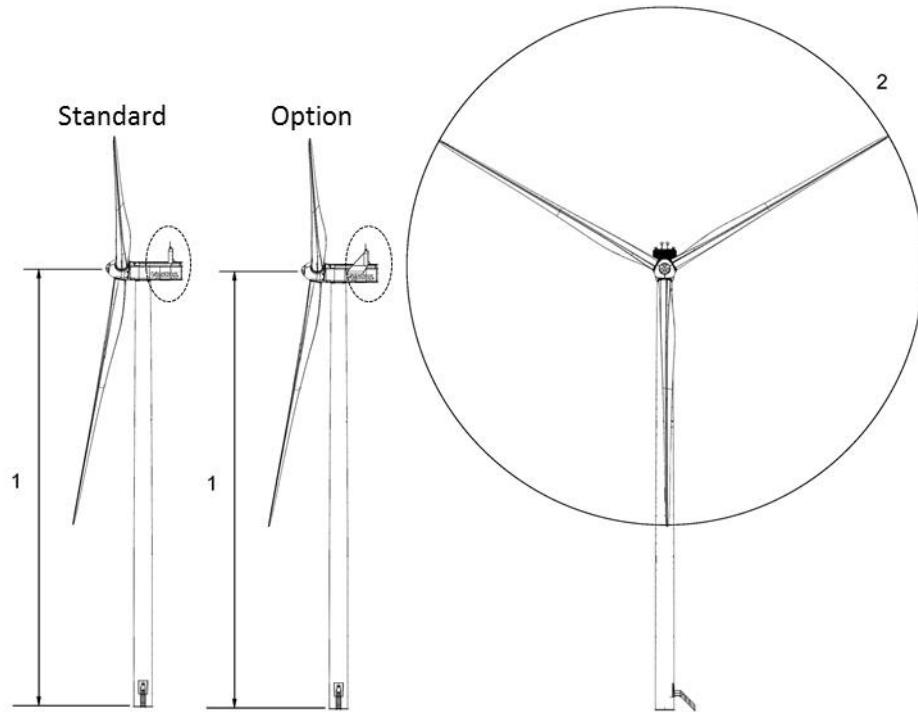
Figure 4-1: Illustration of outer dimensions – structure

1 Hub height:
91.5 m

2 Diameter:
117 m

NOTE The turbine to the right is shown with side panels on the cooler top (Option).

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Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
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Date: 2017-11-29
Restricted
Page 10 of 40

5	General Reservations, Notes and Disclaimers

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- The performance specifications described in this document apply to the current version of the V117-4.0/4.2 MW wind turbine. Updated versions of the V117-4.0/4.2 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 V117-4.0/4.2 MW wind, 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.

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Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Mode 0/0-0S

Date: 2017-11-29
Restricted
Page 11 of 40

6 Power Curves, Ct Values and Sound Curves, Mode 0/0-0S

6.1 Power Curves, Mode 0/0-0S

Air density [kg/m³]														
Wind speed [m/s]	1.225	0.95	0.975	1.0	1.025	1.05	1.075	1.1	1.125	1.15	1.175	1.2	1.25	1.275
3.0	12	4	5	5	6	7	7	8	9	9	10	11	13	14
3.5	65	38	41	43	46	48	50	53	55	58	60	63	68	70
4.0	140	96	100	104	108	112	116	120	124	128	132	136	144	148
4.5	230	166	172	178	184	190	195	201	207	213	218	224	236	242
5.0	336	248	256	264	272	280	288	296	304	312	320	328	344	351
5.5	460	344	355	365	376	386	397	407	418	429	439	450	471	481
6.0	610	460	474	487	501	515	528	542	556	569	583	597	624	638
6.5	788	597	615	632	649	667	684	701	719	736	753	770	805	822
7.0	996	758	780	802	823	845	866	888	910	931	953	974	1017	1038
7.5	1236	944	971	997	1024	1050	1077	1103	1130	1157	1183	1210	1262	1289
8.0	1507	1155	1187	1219	1251	1284	1316	1348	1380	1412	1443	1475	1539	1570
8.5	1814	1394	1432	1471	1509	1548	1586	1624	1662	1700	1738	1776	1851	1889
9.0	2155	1663	1708	1753	1799	1844	1888	1933	1978	2022	2067	2111	2199	2243
9.5	2521	1956	2008	2060	2112	2165	2216	2268	2319	2370	2420	2470	2570	2619
10.0	2892	2270	2328	2387	2445	2504	2560	2617	2673	2730	2784	2838	2945	2998
10.5	3245	2589	2652	2714	2777	2840	2899	2958	3018	3077	3133	3189	3298	3351
11.0	3555	2899	2964	3029	3094	3159	3218	3278	3337	3397	3449	3502	3601	3648
11.5	3800	3191	3257	3322	3387	3453	3507	3562	3617	3671	3714	3757	3833	3865
12.0	3940	3463	3523	3583	3643	3703	3745	3787	3829	3871	3894	3917	3952	3965
12.5	3987	3696	3743	3789	3836	3882	3903	3923	3944	3964	3972	3979	3990	3994
13.0	3998	3870	3894	3918	3942	3966	3972	3979	3986	3993	3994	3996	3999	3999
13.5	3999	3940	3950	3961	3971	3982	3985	3989	3992	3995	3996	3998	3999	3999
14.0	4000	3977	3981	3986	3990	3995	3996	3997	3998	3999	3999	4000	4000	4000
14.5	4000	3993	3994	3996	3997	3999	3999	3999	4000	4000	4000	4000	4000	4000
15.0	4000	3998	3999	3999	3999	4000	4000	4000	4000	4000	4000	4000	4000	4000
15.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
16.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
16.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
17.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
17.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
18.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
18.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
19.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
19.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
20.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
20.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
21.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
21.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
22.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
22.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
23.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
23.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
24.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
24.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
25.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000

Table 6-1: Power curve, Mode 0/0-0S

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

RESTRICTED

Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Mode 0/0-0S

Date: 2017-11-29
Restricted
Page 12 of 40

6.2 Ct Values, Mode 0/0-0S

Air density kg/m³													
Wind speed [m/s]	1.225	0.950	0.975	1.0	1.025	1.05	1.075	1.1	1.125	1.15	1.175	1.2	1.25	1.275
3.0	0.880	0.885	0.885	0.885	0.884	0.884	0.883	0.883	0.882	0.881	0.881	0.880	0.879	0.879
3.5	0.870	0.875	0.875	0.874	0.874	0.873	0.873	0.872	0.872	0.871	0.871	0.870	0.870	0.869
4.0	0.838	0.842	0.842	0.841	0.841	0.841	0.840	0.840	0.839	0.839	0.839	0.838	0.837	0.837
4.5	0.813	0.814	0.814	0.813	0.813	0.812	0.812	0.812	0.812	0.813	0.813	0.813	0.813	0.812
5.0	0.812	0.811	0.811	0.811	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812
5.5	0.812	0.814	0.814	0.814	0.814	0.814	0.814	0.813	0.813	0.813	0.813	0.812	0.812	0.811
6.0	0.807	0.811	0.811	0.811	0.810	0.810	0.810	0.809	0.809	0.809	0.808	0.808	0.807	0.807
6.5	0.804	0.808	0.807	0.807	0.806	0.806	0.806	0.805	0.805	0.805	0.804	0.804	0.803	0.803
7.0	0.801	0.806	0.805	0.805	0.805	0.804	0.804	0.803	0.803	0.802	0.802	0.801	0.800	0.799
7.5	0.794	0.801	0.800	0.800	0.799	0.798	0.798	0.797	0.797	0.796	0.795	0.795	0.793	0.793
8.0	0.787	0.796	0.795	0.794	0.794	0.793	0.792	0.791	0.790	0.790	0.789	0.788	0.786	0.786
8.5	0.786	0.796	0.795	0.794	0.793	0.792	0.791	0.791	0.790	0.789	0.788	0.787	0.785	0.784
9.0	0.783	0.795	0.794	0.793	0.792	0.791	0.790	0.789	0.788	0.786	0.785	0.784	0.782	0.780
9.5	0.770	0.792	0.790	0.789	0.787	0.786	0.784	0.782	0.780	0.778	0.775	0.773	0.767	0.764
10.0	0.739	0.780	0.777	0.774	0.770	0.767	0.763	0.760	0.756	0.752	0.748	0.743	0.734	0.729
10.5	0.687	0.747	0.742	0.737	0.732	0.727	0.721	0.715	0.710	0.704	0.698	0.692	0.681	0.675
11.0	0.626	0.697	0.691	0.685	0.679	0.672	0.666	0.659	0.653	0.646	0.639	0.633	0.618	0.611
11.5	0.564	0.644	0.637	0.631	0.624	0.618	0.610	0.603	0.595	0.588	0.580	0.572	0.555	0.546
12.0	0.496	0.595	0.587	0.579	0.572	0.564	0.555	0.546	0.537	0.528	0.517	0.507	0.486	0.475
12.5	0.430	0.546	0.536	0.527	0.517	0.508	0.497	0.485	0.474	0.463	0.452	0.441	0.419	0.409
13.0	0.372	0.495	0.483	0.471	0.459	0.447	0.436	0.425	0.413	0.402	0.392	0.382	0.363	0.355
13.5	0.327	0.439	0.427	0.415	0.404	0.392	0.382	0.372	0.362	0.352	0.344	0.335	0.320	0.312
14.0	0.289	0.387	0.377	0.366	0.355	0.345	0.336	0.327	0.319	0.310	0.303	0.296	0.282	0.276
14.5	0.257	0.343	0.333	0.324	0.314	0.305	0.297	0.290	0.283	0.275	0.269	0.263	0.251	0.246
15.0	0.228	0.303	0.295	0.286	0.278	0.270	0.264	0.257	0.251	0.244	0.239	0.234	0.224	0.219
15.5	0.206	0.271	0.264	0.256	0.249	0.242	0.237	0.231	0.225	0.220	0.215	0.210	0.202	0.197
16.0	0.186	0.243	0.237	0.231	0.225	0.218	0.213	0.208	0.203	0.198	0.194	0.190	0.182	0.179
16.5	0.169	0.220	0.215	0.209	0.203	0.198	0.193	0.189	0.185	0.180	0.176	0.173	0.166	0.162
17.0	0.154	0.200	0.195	0.190	0.185	0.180	0.176	0.172	0.168	0.164	0.161	0.157	0.151	0.148
17.5	0.141	0.182	0.178	0.173	0.169	0.164	0.161	0.157	0.154	0.150	0.147	0.144	0.138	0.136
18.0	0.130	0.167	0.163	0.159	0.155	0.151	0.148	0.144	0.141	0.138	0.135	0.132	0.127	0.125
18.5	0.119	0.153	0.150	0.146	0.142	0.139	0.136	0.133	0.130	0.127	0.124	0.122	0.117	0.115
19.0	0.110	0.141	0.137	0.134	0.131	0.127	0.125	0.122	0.119	0.116	0.114	0.112	0.108	0.106
19.5	0.102	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
20.0	0.094	0.120	0.118	0.115	0.112	0.109	0.107	0.105	0.102	0.100	0.098	0.096	0.093	0.091
20.5	0.088	0.112	0.109	0.107	0.104	0.101	0.099	0.097	0.095	0.093	0.091	0.090	0.086	0.085
21.0	0.082	0.104	0.102	0.099	0.097	0.095	0.093	0.091	0.089	0.087	0.085	0.084	0.080	0.079
21.5	0.077	0.098	0.096	0.093	0.091	0.089	0.087	0.085	0.084	0.082	0.080	0.079	0.076	0.074
22.0	0.072	0.091	0.089	0.087	0.085	0.083	0.082	0.080	0.078	0.077	0.075	0.074	0.071	0.070
22.5	0.068	0.086	0.084	0.082	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.067	0.065
23.0	0.063	0.080	0.078	0.076	0.075	0.073	0.071	0.070	0.068	0.067	0.066	0.065	0.062	0.061
23.5	0.060	0.075	0.073	0.072	0.070	0.068	0.067	0.066	0.064	0.063	0.062	0.061	0.059	0.058
24.0	0.056	0.071	0.069	0.068	0.066	0.064	0.063	0.062	0.061	0.059	0.058	0.057	0.055	0.054
24.5	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
25.0	0.050	0.063	0.061	0.060	0.059	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.049	0.049

Table 6-2: C_t values, Mode 0/0-0S

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Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Mode 0/0-0S

Date: 2017-11-29
Restricted
Page 13 of 40

6.3 Sound Curves, Mode 0/0-0S

Sound Power Level at Hub Height		
Conditions for Sound Power Level:	**Measurement standard IEC 61400-11 ed. 3** **Maximum turbulence at hub height: 30%** **Inflow angle (vertical): 0 ±2°** **Air density: 1.225 kg/m^3**	
Wind speed at hub height [m/s]	**Sound Power Level at Hub Height [dBA]** **Mode 0 (Blades with serrated trailing edge)**	**Sound Power Level at Hub Height [dBA]** **Mode 0-0S (Blades without serrated trailing edge)**
3	92.2	94.5
4	92.8	95.4
5	94.0	97.1
6	97.0	100.2
7	100.0	103.1
8	102.8	105.6
9	105.1	107.7
10	106.0	108.5
11	106.0	108.5
12	106.0	108.5
13	106.0	108.5
14	106.0	108.5
15	106.0	108.5
16	106.0	108.5
17	106.0	108.5
18	106.0	108.5
19	106.0	108.5
20	106.0	108.5

Table 6-3: Sound curves, Mode 0/0-0S

RESTRICTED

Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Mode 0/0-0S
(HWO)

Date: 2017-11-29
Restricted
Page 14 of 40

7 Power Curves, Ct Values and Sound Curves, Mode 0/0-0S (HWO)

7.1 Power Curves, Mode 0/0-0S (HWO)

Air density [kg/m³]														
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	12	4	5	5	6	7	7	8	9	9	10	11	13	14
3.5	65	38	41	43	46	48	50	53	55	58	60	63	68	70
4.0	140	96	100	104	108	112	116	120	124	128	132	136	144	148
4.5	230	166	172	178	184	190	195	201	207	213	218	224	236	242
5.0	336	248	256	264	272	280	288	296	304	312	320	328	344	351
5.5	460	344	355	365	376	386	397	407	418	429	439	450	471	481
6.0	610	460	474	487	501	515	528	542	556	569	583	597	624	638
6.5	788	597	615	632	649	667	684	701	719	736	753	770	805	822
7.0	996	758	780	802	823	845	866	888	910	931	953	974	1017	1038
7.5	1236	944	971	997	1024	1050	1077	1103	1130	1157	1183	1210	1262	1289
8.0	1507	1155	1187	1219	1251	1284	1316	1348	1380	1412	1443	1475	1539	1570
8.5	1814	1394	1432	1471	1509	1548	1586	1624	1662	1700	1738	1776	1851	1889
9.0	2155	1663	1708	1753	1799	1844	1888	1933	1978	2022	2067	2111	2199	2243
9.5	2521	1956	2008	2060	2112	2165	2216	2268	2319	2370	2420	2470	2570	2619
10.0	2892	2270	2328	2387	2445	2504	2560	2617	2673	2730	2784	2838	2945	2998
10.5	3245	2589	2652	2714	2777	2840	2899	2958	3018	3077	3133	3189	3298	3351
11.0	3555	2899	2964	3029	3094	3159	3218	3278	3337	3397	3449	3502	3601	3648
11.5	3800	3191	3257	3322	3387	3453	3507	3562	3617	3671	3714	3757	3833	3865
12.0	3940	3463	3523	3583	3643	3703	3745	3787	3829	3871	3894	3917	3952	3965
12.5	3987	3696	3743	3789	3836	3882	3903	3923	3944	3964	3972	3979	3990	3994
13.0	3998	3870	3894	3918	3942	3966	3972	3979	3986	3993	3994	3996	3999	3999
13.5	3999	3940	3950	3961	3971	3982	3985	3989	3992	3995	3996	3998	3999	3999
14.0	4000	3977	3981	3986	3990	3995	3996	3997	3998	3999	3999	4000	4000	4000
14.5	4000	3993	3994	3996	3997	3999	3999	3999	4000	4000	4000	4000	4000	4000
15.0	4000	3998	3999	3999	3999	4000	4000	4000	4000	4000	4000	4000	4000	4000
15.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
16.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
16.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
17.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
17.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
18.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
18.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
19.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
19.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
20.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
20.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
21.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
21.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
22.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
22.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
23.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
23.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
24.0	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999
24.5	3989	3989	3989	3989	3989	3989	3989	3989	3989	3989	3989	3989	3989	3989
25.0	3961	3961	3961	3961	3961	3961	3961	3961	3961	3961	3961	3961	3961	3961
25.5	3904	3904	3904	3904	3904	3904	3904	3904	3904	3904	3904	3904	3904	3904
26.0	3823	3823	3823	3823	3823	3823	3823	3823	3823	3823	3823	3823	3823	3823
26.5	3715	3715	3715	3715	3715	3715	3715	3715	3715	3715	3715	3715	3715	3715
27.0	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590
27.5	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422
28.0	3220	3219	3219	3219	3219	3219	3220	3220	3220	3220	3220	3220	3220	3220
28.5	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987
29.0	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733
29.5	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484
30.0	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305

Table 7-1: Power curve, Mode 0/0-0S (HWO)

Vestas Wind Systems A/S · Hedeager 42 · 8200 Arhus N · Denmark · www.vestas.com

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

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Document no.: 0067-7063 V03
Document owner: Platform Management
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Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Mode 0/0-0S
(HWO)

Date: 2017-11-29
Restricted
Page 15 of 40

7.2 Ct Values, Mode 0/0-0S (HWO)

Wind speed [m/s]	Air density kg/m³													
	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	0.880	0.885	0.885	0.885	0.884	0.884	0.883	0.883	0.882	0.881	0.881	0.880	0.879	0.879
3.5	0.870	0.875	0.875	0.874	0.874	0.873	0.873	0.872	0.872	0.871	0.871	0.870	0.870	0.869
4.0	0.838	0.842	0.842	0.841	0.841	0.841	0.840	0.840	0.839	0.839	0.839	0.838	0.837	0.837
4.5	0.813	0.814	0.814	0.813	0.813	0.812	0.812	0.812	0.812	0.813	0.813	0.813	0.813	0.812
5.0	0.812	0.811	0.811	0.811	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812
5.5	0.812	0.814	0.814	0.814	0.814	0.814	0.814	0.813	0.813	0.813	0.813	0.812	0.812	0.811
6.0	0.807	0.811	0.811	0.811	0.810	0.810	0.810	0.809	0.809	0.809	0.808	0.808	0.807	0.807
6.5	0.804	0.808	0.807	0.807	0.806	0.806	0.806	0.805	0.805	0.805	0.804	0.804	0.803	0.803
7.0	0.801	0.806	0.805	0.805	0.805	0.804	0.804	0.803	0.803	0.802	0.802	0.801	0.800	0.799
7.5	0.794	0.801	0.800	0.800	0.799	0.798	0.798	0.797	0.797	0.796	0.795	0.795	0.793	0.793
8.0	0.787	0.796	0.795	0.794	0.794	0.793	0.792	0.791	0.790	0.790	0.789	0.788	0.786	0.786
8.5	0.786	0.796	0.795	0.794	0.793	0.792	0.791	0.791	0.790	0.789	0.788	0.787	0.785	0.784
9.0	0.783	0.795	0.794	0.793	0.792	0.791	0.790	0.789	0.788	0.786	0.785	0.784	0.782	0.780
9.5	0.770	0.792	0.790	0.789	0.787	0.786	0.784	0.782	0.780	0.778	0.775	0.773	0.767	0.764
10.0	0.739	0.780	0.777	0.774	0.770	0.767	0.763	0.760	0.756	0.752	0.748	0.743	0.734	0.729
10.5	0.687	0.747	0.742	0.737	0.732	0.727	0.721	0.715	0.710	0.704	0.698	0.692	0.681	0.675
11.0	0.626	0.697	0.691	0.685	0.679	0.672	0.666	0.659	0.653	0.646	0.639	0.633	0.618	0.611
11.5	0.564	0.644	0.637	0.631	0.624	0.618	0.610	0.603	0.595	0.588	0.580	0.572	0.555	0.546
12.0	0.496	0.595	0.587	0.579	0.572	0.564	0.555	0.546	0.537	0.528	0.517	0.507	0.486	0.475
12.5	0.430	0.546	0.536	0.527	0.517	0.508	0.497	0.485	0.474	0.463	0.452	0.441	0.419	0.409
13.0	0.372	0.495	0.483	0.471	0.459	0.447	0.436	0.425	0.413	0.402	0.392	0.382	0.363	0.355
13.5	0.327	0.439	0.427	0.415	0.404	0.392	0.382	0.372	0.362	0.352	0.344	0.335	0.320	0.312
14.0	0.289	0.387	0.377	0.366	0.355	0.345	0.336	0.327	0.319	0.310	0.303	0.296	0.282	0.276
14.5	0.257	0.343	0.333	0.324	0.314	0.305	0.297	0.290	0.283	0.275	0.269	0.263	0.251	0.246
15.0	0.228	0.303	0.295	0.286	0.278	0.270	0.264	0.257	0.251	0.244	0.239	0.234	0.224	0.219
15.5	0.206	0.271	0.264	0.256	0.249	0.242	0.237	0.231	0.225	0.220	0.215	0.210	0.202	0.197
16.0	0.186	0.243	0.237	0.231	0.225	0.218	0.213	0.208	0.203	0.198	0.194	0.190	0.182	0.179
16.5	0.169	0.220	0.215	0.209	0.203	0.198	0.193	0.189	0.185	0.180	0.176	0.173	0.166	0.162
17.0	0.154	0.200	0.195	0.190	0.185	0.180	0.176	0.172	0.168	0.164	0.161	0.157	0.151	0.148
17.5	0.141	0.182	0.178	0.173	0.169	0.164	0.161	0.157	0.154	0.150	0.147	0.144	0.138	0.136
18.0	0.130	0.167	0.163	0.159	0.155	0.151	0.148	0.144	0.141	0.138	0.135	0.132	0.127	0.125
18.5	0.119	0.153	0.150	0.146	0.142	0.139	0.136	0.133	0.130	0.127	0.124	0.122	0.117	0.115
19.0	0.110	0.141	0.137	0.134	0.131	0.127	0.125	0.122	0.119	0.116	0.114	0.112	0.108	0.106
19.5	0.102	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
20.0	0.094	0.120	0.118	0.115	0.112	0.109	0.107	0.105	0.102	0.100	0.098	0.096	0.093	0.091
20.5	0.088	0.112	0.109	0.107	0.104	0.101	0.099	0.097	0.095	0.093	0.091	0.090	0.086	0.085
21.0	0.082	0.104	0.102	0.099	0.097	0.095	0.093	0.091	0.089	0.087	0.085	0.084	0.080	0.079
21.5	0.077	0.098	0.096	0.093	0.091	0.089	0.087	0.085	0.084	0.082	0.080	0.079	0.076	0.074
22.0	0.072	0.091	0.089	0.087	0.085	0.083	0.082	0.080	0.078	0.077	0.075	0.074	0.071	0.070
22.5	0.068	0.086	0.084	0.082	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.067	0.065
23.0	0.063	0.080	0.078	0.076	0.075	0.073	0.071	0.070	0.068	0.067	0.066	0.065	0.062	0.061
23.5	0.060	0.075	0.073	0.072	0.070	0.068	0.067	0.066	0.064	0.063	0.062	0.061	0.059	0.058
24.0	0.056	0.071	0.069	0.068	0.066	0.064	0.063	0.062	0.061	0.059	0.058	0.057	0.055	0.054
24.5	0.053	0.066	0.065	0.064	0.062	0.061	0.059	0.058	0.057	0.056	0.055	0.054	0.052	0.051
25.0	0.050	0.062	0.061	0.060	0.058	0.057	0.056	0.055	0.054	0.052	0.052	0.051	0.049	0.048
25.5	0.047	0.058	0.057	0.056	0.055	0.053	0.052	0.051	0.050	0.049	0.048	0.048	0.046	0.045
26.0	0.043	0.054	0.053	0.052	0.051	0.049	0.049	0.048	0.047	0.046	0.045	0.044	0.043	0.042
26.5	0.040	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.043	0.042	0.041	0.041	0.039	0.039
27.0	0.037	0.046	0.045	0.044	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.037	0.036	0.036
27.5	0.033	0.042	0.041	0.040	0.039	0.038	0.037	0.037	0.036	0.035	0.035	0.034	0.033	0.032
28.0	0.030	0.037	0.037	0.036	0.035	0.034	0.034	0.033	0.032	0.032	0.031	0.031	0.030	0.029
28.5	0.027	0.033	0.033	0.032	0.031	0.031	0.030	0.029	0.029	0.028	0.028	0.027	0.026	0.026
29.0	0.024	0.029	0.029	0.028	0.027	0.027	0.026	0.026	0.025	0.025	0.025	0.024	0.023	0.023
29.5	0.021	0.026	0.025	0.025	0.024	0.024	0.023	0.023	0.022	0.022	0.022	0.021	0.021	0.020
30.0	0.019	0.023	0.022	0.022	0.022	0.021	0.021	0.020	0.020	0.020	0.019	0.019	0.019	0.018

Table 7-2: C_t values, Mode 0/0-0S (HWO)

Vestas

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

RESTRICTED

Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Mode 0/0-0S
(HWO)

Date: 2017-11-29
Restricted
Page 16 of 40

7.3   Sound Curves, Mode 0/0-0S (HWO)

Sound Power Level at Hub Height		
Conditions for Sound Power Level:	Measurement standard IEC 61400-11 ed. 3 Maximum turbulence at hub height: 30% Inflow angle (vertical): 0 ±2° Air density: 1.225 kg/m^3	
Wind speed at hub height [m/s]	**Sound Power Level at Hub Height [dBA] Mode 0 (HWO) (Blades with serrated trailing edge)**	**Sound Power Level at Hub Height [dBA] Mode 0-0S (HWO) (Blades without serrated trailing edge)**
3	92.2	94.5
4	92.8	95.4
5	94.0	97.1
6	97.0	100.2
7	100.0	103.1
8	102.8	105.6
9	105.1	107.7
10	106.0	108.5
11	106.0	108.5
12	106.0	108.5
13	106.0	108.5
14	106.0	108.5
15	106.0	108.5
16	106.0	108.5
17	106.0	108.5
18	106.0	108.5
19	106.0	108.5
20	106.0	108.5

Table 7-3: Sound curves, Mode 0/0-0S (HWO)

RESTRICTED

Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Power
Optimized Mode PO1/PO1-0S

Date: 2017-11-29
Restricted
Page 17 of 40

8 Power Curves, Ct Values and Sound Curves, Power Optimized Mode PO1/PO1-0S

8.1 Power Curves, Power Optimized Mode PO1/PO1-0S

Wind speed [m/s]	Air density [kg/m^3]													
	1.225	0.95	0.975	1.0	1.025	1.05	1.075	1.1	1.125	1.15	1.175	1.2	1.25	1.275
3.0	12	4	5	5	6	7	7	8	9	9	10	11	13	14
3.5	65	38	41	43	46	48	50	53	55	58	60	63	68	70
4.0	140	96	100	104	108	112	116	120	124	128	132	136	144	148
4.5	230	166	172	178	184	190	195	201	207	213	218	224	236	242
5.0	336	248	256	264	272	280	288	296	304	312	320	328	344	351
5.5	460	344	355	365	376	386	397	407	418	429	439	450	471	481
6.0	610	460	474	487	501	515	528	542	556	569	583	597	624	638
6.5	788	597	615	632	649	667	684	701	719	736	753	770	805	822
7.0	996	758	780	802	823	845	866	888	910	931	953	974	1017	1038
7.5	1236	944	971	997	1024	1050	1077	1103	1130	1157	1183	1210	1262	1289
8.0	1507	1155	1187	1219	1251	1284	1316	1348	1380	1412	1443	1475	1539	1570
8.5	1814	1394	1432	1471	1509	1548	1586	1624	1662	1700	1738	1776	1851	1889
9.0	2155	1663	1708	1753	1799	1844	1888	1933	1978	2022	2067	2111	2199	2243
9.5	2521	1956	2008	2060	2112	2165	2216	2268	2319	2370	2420	2470	2570	2619
10.0	2892	2270	2328	2387	2445	2504	2560	2617	2673	2730	2784	2838	2945	2998
10.5	3245	2589	2652	2714	2777	2840	2899	2959	3018	3077	3133	3189	3298	3352
11.0	3556	2899	2964	3029	3094	3159	3219	3278	3337	3397	3450	3503	3604	3652
11.5	3815	3191	3257	3322	3387	3453	3509	3564	3620	3676	3723	3769	3855	3895
12.0	4008	3463	3524	3586	3647	3709	3757	3805	3853	3902	3937	3973	4035	4062
12.5	4124	3702	3756	3809	3862	3916	3952	3988	4024	4060	4081	4102	4137	4151
13.0	4178	3900	3941	3981	4022	4063	4084	4105	4126	4147	4157	4167	4183	4188
13.5	4187	4033	4057	4081	4105	4129	4140	4151	4162	4172	4177	4182	4189	4192
14.0	4196	4116	4130	4143	4157	4171	4176	4181	4186	4191	4192	4194	4197	4199
14.5	4200	4162	4169	4176	4182	4189	4191	4193	4195	4198	4198	4199	4200	4200
15.0	4200	4186	4188	4192	4194	4198	4198	4199	4199	4200	4200	4200	4200	4200
15.5	4200	4194	4196	4197	4198	4199	4200	4200	4200	4200	4200	4200	4200	4200
16.0	4200	4198	4198	4199	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
16.5	4200	4199	4199	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
17.0	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
17.5	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
18.0	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
18.5	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
19.0	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
19.5	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
20.0	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
20.5	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
21.0	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
21.5	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
22.0	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
22.5	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
23.0	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
23.5	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
24.0	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
24.5	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
25.0	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200

Table 8-1: Power curve, Power Optimized Mode PO1/PO1-0S

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

RESTRICTED

Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Power
Optimized Mode PO1/PO1-0S

Date: 2017-11-29
Restricted
Page 18 of 40

8.2 Ct Values, Power Optimized Mode PO1/PO1-0S

Air density kg/m³													
Wind speed [m/s]	**1.225**	**0.950**	**0.975**	**1.0**	**1.025**	**1.05**	**1.075**	**1.1**	**1.125**	**1.15**	**1.175**	**1.2**	**1.25**	**1.275**
3.0	**0.880**	0.885	0.885	0.885	0.884	0.884	0.883	0.883	0.882	0.881	0.881	0.880	0.879	0.879
3.5	**0.870**	0.875	0.875	0.874	0.874	0.873	0.873	0.872	0.872	0.871	0.871	0.870	0.870	0.869
4.0	**0.838**	0.842	0.842	0.841	0.841	0.841	0.840	0.840	0.839	0.839	0.839	0.838	0.837	0.837
4.5	**0.813**	0.814	0.814	0.813	0.813	0.812	0.812	0.812	0.812	0.813	0.813	0.813	0.813	0.812
5.0	**0.812**	0.811	0.811	0.811	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812
5.5	**0.812**	0.814	0.814	0.814	0.814	0.814	0.814	0.813	0.813	0.813	0.813	0.812	0.812	0.811
6.0	**0.807**	0.811	0.811	0.811	0.810	0.810	0.810	0.809	0.809	0.809	0.808	0.808	0.807	0.807
6.5	**0.804**	0.808	0.807	0.807	0.806	0.806	0.806	0.805	0.805	0.805	0.804	0.804	0.803	0.803
7.0	**0.801**	0.806	0.805	0.805	0.805	0.804	0.804	0.803	0.803	0.802	0.802	0.801	0.800	0.799
7.5	**0.794**	0.801	0.800	0.800	0.799	0.798	0.798	0.797	0.797	0.796	0.795	0.795	0.793	0.793
8.0	**0.787**	0.796	0.795	0.794	0.794	0.793	0.792	0.791	0.790	0.790	0.789	0.788	0.786	0.786
8.5	**0.786**	0.796	0.795	0.794	0.793	0.792	0.791	0.791	0.790	0.789	0.788	0.787	0.785	0.784
9.0	**0.783**	0.795	0.794	0.793	0.792	0.791	0.790	0.789	0.788	0.786	0.785	0.784	0.782	0.780
9.5	**0.770**	0.792	0.790	0.789	0.787	0.786	0.784	0.782	0.780	0.778	0.775	0.773	0.767	0.764
10.0	**0.739**	0.780	0.777	0.774	0.770	0.767	0.763	0.760	0.756	0.752	0.748	0.743	0.734	0.729
10.5	**0.687**	0.747	0.742	0.737	0.732	0.727	0.721	0.715	0.710	0.704	0.698	0.692	0.681	0.675
11.0	**0.626**	0.697	0.691	0.685	0.679	0.672	0.666	0.659	0.653	0.646	0.640	0.633	0.619	0.612
11.5	**0.566**	0.644	0.637	0.631	0.624	0.618	0.610	0.603	0.596	0.589	0.581	0.574	0.558	0.551
12.0	**0.507**	0.595	0.587	0.580	0.573	0.565	0.557	0.549	0.541	0.533	0.524	0.516	0.498	0.489
12.5	**0.448**	0.547	0.538	0.530	0.522	0.513	0.504	0.495	0.486	0.476	0.467	0.457	0.439	0.429
13.0	**0.393**	0.499	0.490	0.480	0.471	0.461	0.451	0.441	0.431	0.421	0.412	0.402	0.384	0.375
13.5	**0.345**	0.452	0.441	0.431	0.420	0.409	0.400	0.390	0.380	0.371	0.362	0.354	0.338	0.330
14.0	**0.305**	0.404	0.394	0.383	0.373	0.363	0.354	0.345	0.336	0.327	0.320	0.312	0.298	0.291
14.5	**0.271**	0.360	0.351	0.341	0.332	0.322	0.314	0.306	0.298	0.290	0.284	0.277	0.265	0.259
15.0	**0.241**	0.320	0.311	0.303	0.294	0.285	0.279	0.272	0.265	0.258	0.252	0.247	0.236	0.231
15.5	**0.217**	0.286	0.279	0.271	0.263	0.256	0.250	0.244	0.238	0.232	0.227	0.222	0.212	0.208
16.0	**0.196**	0.257	0.250	0.244	0.237	0.230	0.225	0.220	0.214	0.209	0.205	0.200	0.192	0.188
16.5	**0.178**	0.232	0.226	0.220	0.214	0.208	0.204	0.199	0.194	0.189	0.186	0.182	0.174	0.171
17.0	**0.162**	0.211	0.205	0.200	0.195	0.189	0.185	0.181	0.177	0.173	0.169	0.165	0.159	0.156
17.5	**0.148**	0.192	0.187	0.183	0.178	0.173	0.169	0.165	0.162	0.158	0.154	0.151	0.145	0.142
18.0	**0.136**	0.176	0.171	0.167	0.163	0.159	0.155	0.152	0.148	0.145	0.142	0.139	0.133	0.131
18.5	**0.125**	0.161	0.157	0.154	0.150	0.146	0.143	0.139	0.136	0.133	0.131	0.128	0.123	0.121
19.0	**0.115**	0.148	0.144	0.141	0.137	0.134	0.131	0.128	0.125	0.122	0.120	0.117	0.113	0.111
19.5	**0.106**	0.136	0.133	0.130	0.127	0.124	0.121	0.118	0.116	0.113	0.111	0.109	0.104	0.103
20.0	**0.099**	0.126	0.123	0.120	0.117	0.115	0.112	0.110	0.107	0.105	0.103	0.101	0.097	0.095
20.5	**0.092**	0.117	0.115	0.112	0.109	0.106	0.104	0.102	0.100	0.098	0.096	0.094	0.090	0.089
21.0	**0.086**	0.109	0.107	0.104	0.102	0.099	0.097	0.095	0.093	0.091	0.089	0.087	0.084	0.083
21.5	**0.081**	0.103	0.100	0.098	0.096	0.093	0.091	0.089	0.088	0.086	0.084	0.082	0.079	0.078
22.0	**0.076**	0.096	0.094	0.092	0.089	0.087	0.085	0.084	0.082	0.080	0.079	0.077	0.074	0.073
22.5	**0.071**	0.090	0.088	0.086	0.084	0.082	0.080	0.078	0.077	0.075	0.074	0.072	0.070	0.068
23.0	**0.066**	0.084	0.082	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.068	0.065	0.064
23.5	**0.062**	0.079	0.077	0.075	0.073	0.072	0.070	0.069	0.067	0.066	0.065	0.064	0.061	0.060
24.0	**0.059**	0.074	0.072	0.071	0.069	0.067	0.066	0.065	0.063	0.062	0.061	0.060	0.058	0.057
24.5	**0.055**	0.070	0.068	0.067	0.065	0.064	0.062	0.061	0.060	0.059	0.058	0.057	0.055	0.054
25.0	**0.052**	0.066	0.064	0.063	0.062	0.060	0.059	0.058	0.057	0.055	0.054	0.053	0.052	0.051

Table 8-2: C_t values, Power Optimized Mode PO1/PO1-0S

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Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Power
Optimized Mode PO1/PO1-0S

Date: 2017-11-29
Restricted
Page 19 of 40

8.3   Sound Curves, Power Optimized Mode PO1/PO1-0S

Sound Power Level at Hub Height		
Conditions for Sound Power Level:	**Measurement standard IEC 61400-11 ed. 3** **Maximum turbulence at hub height: 30%** **Inflow angle (vertical): 0 ±2°** **Air density: 1.225 kg/m³**	
Wind speed at hub height [m/s]	**Sound Power Level at Hub Height [dBA]** **Power Optimized Mode PO1** **(Blades with serrated trailing edge)**	**Sound Power Level at Hub Height [dBA]** **Power Optimized Mode PO1-0S** **(Blades without serrated trailing edge)**
3	92.2	94.5
4	92.8	95.4
5	94.0	97.1
6	97.0	100.2
7	100.0	103.1
8	102.8	105.6
9	105.1	107.7
10	106.0	108.5
11	106.0	108.5
12	106.0	108.5
13	106.0	108.5
14	106.0	108.5
15	106.0	108.5
16	106.0	108.5
17	106.0	108.5
18	106.0	108.5
19	106.0	108.5
20	106.0	108.5

Table 8-3: Sound curves, Power Optimized Mode PO1/PO1-0S

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

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Document no.: 0067-7063 V03
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Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Power
Optimized Mode PO1/PO1-0S (HWO)

Date: 2017-11-29
Restricted
Page 20 of 40

9 Power Curves, Ct Values and Sound Curves, Power Optimized Mode PO1/PO1-0S (HWO)

9.1 Power Curves, Power Optimized Mode PO1/PO1-0S (HWO)

Wind speed [m/s]	Air density [kg/m³]													
	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	12	4	5	5	6	7	7	8	9	9	10	11	13	14
3.5	65	38	41	43	46	48	50	53	55	58	60	63	68	70
4.0	140	96	100	104	108	112	116	120	124	128	132	136	144	148
4.5	230	166	172	178	184	190	195	201	207	213	218	224	236	242
5.0	336	248	256	264	272	280	288	296	304	312	320	328	344	351
5.5	460	344	355	365	376	386	397	407	418	429	439	450	471	481
6.0	610	460	474	487	501	515	528	542	556	569	583	597	624	638
6.5	788	597	615	632	649	667	684	701	719	736	753	770	805	822
7.0	996	758	780	802	823	845	866	888	910	931	953	974	1017	1038
7.5	1236	944	971	997	1024	1050	1077	1103	1130	1157	1183	1210	1262	1289
8.0	1507	1155	1187	1219	1251	1284	1316	1348	1380	1412	1443	1475	1539	1570
8.5	1814	1394	1432	1471	1509	1548	1586	1624	1662	1700	1738	1776	1851	1889
9.0	2155	1663	1708	1753	1799	1844	1888	1933	1978	2022	2067	2111	2199	2243
9.5	2521	1956	2008	2060	2112	2165	2216	2268	2319	2370	2420	2470	2570	2619
10.0	2892	2270	2328	2387	2445	2504	2560	2617	2673	2730	2784	2838	2945	2998
10.5	3245	2589	2652	2714	2777	2840	2899	2959	3018	3077	3133	3189	3298	3352
11.0	3556	2899	2964	3029	3094	3159	3219	3278	3337	3397	3450	3503	3604	3652
11.5	3815	3191	3257	3322	3387	3453	3509	3564	3620	3676	3723	3769	3855	3895
12.0	4008	3463	3524	3586	3647	3709	3757	3805	3853	3902	3937	3973	4035	4062
12.5	4124	3702	3756	3809	3862	3916	3952	3988	4024	4060	4081	4102	4137	4151
13.0	4178	3900	3941	3981	4022	4063	4084	4105	4126	4147	4157	4167	4183	4188
13.5	4187	4033	4057	4081	4105	4129	4140	4151	4162	4172	4177	4182	4189	4192
14.0	4196	4116	4130	4143	4157	4171	4176	4181	4186	4191	4192	4194	4197	4199
14.5	4200	4162	4169	4176	4182	4189	4191	4193	4195	4198	4198	4199	4200	4200
15.0	4200	4186	4188	4192	4194	4198	4198	4199	4199	4200	4200	4200	4200	4200
15.5	4200	4194	4196	4197	4198	4199	4200	4200	4200	4200	4200	4200	4200	4200
16.0	4200	4198	4198	4199	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
16.5	4200	4199	4199	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
17.0	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
17.5	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
18.0	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
18.5	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
19.0	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
19.5	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
20.0	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
20.5	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
21.0	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
21.5	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
22.0	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
22.5	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
23.0	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
23.5	4198	4198	4198	4198	4198	4198	4198	4198	4198	4198	4198	4198	4198	4198
24.0	4173	4173	4173	4173	4173	4173	4173	4173	4173	4173	4173	4173	4173	4173
24.5	4118	4118	4118	4118	4118	4118	4118	4118	4118	4118	4118	4118	4118	4118
25.0	4036	4036	4036	4036	4036	4036	4036	4036	4036	4036	4036	4035	4036	4036
25.5	3937	3937	3937	3937	3937	3937	3937	3937	3937	3937	3937	3937	3937	3937
26.0	3830	3830	3830	3830	3830	3830	3830	3830	3830	3830	3830	3830	3830	3830
26.5	3716	3716	3716	3716	3716	3716	3716	3716	3716	3716	3716	3716	3716	3716
27.0	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590
27.5	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422
28.0	3219	3220	3219	3219	3219	3219	3219	3219	3219	3219	3219	3219	3219	3219
28.5	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987
29.0	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733
29.5	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484
30.0	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305

Table 9-1: Power curve, Power Optimized Mode PO1/PO1-0S (HWO)

Vestas Wind Systems A/S · Hedeager 42 · 8200 Arhus N · Denmark · www.vestas.com

Vestas®

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Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Power
Optimized Mode PO1/PO1-0S (HWO)

Date: 2017-11-29
Restricted
Page 21 of 40

9.2 Ct Values, Power Optimized Mode PO1/PO1-0S (HWO)

Wind speed [m/s]	Air density kg/m³													
	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	0.880	0.885	0.885	0.885	0.884	0.884	0.883	0.883	0.882	0.881	0.881	0.880	0.879	0.879
3.5	0.870	0.875	0.875	0.874	0.874	0.873	0.873	0.872	0.872	0.871	0.871	0.870	0.870	0.869
4.0	0.838	0.842	0.842	0.841	0.841	0.841	0.840	0.840	0.839	0.839	0.839	0.838	0.837	0.837
4.5	0.813	0.814	0.814	0.813	0.813	0.812	0.812	0.812	0.812	0.813	0.813	0.813	0.813	0.812
5.0	0.812	0.811	0.811	0.811	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812
5.5	0.812	0.814	0.814	0.814	0.814	0.814	0.814	0.813	0.813	0.813	0.813	0.812	0.812	0.811
6.0	0.807	0.811	0.811	0.811	0.810	0.810	0.810	0.809	0.809	0.809	0.808	0.808	0.807	0.807
6.5	0.804	0.808	0.807	0.807	0.806	0.806	0.806	0.805	0.805	0.805	0.804	0.804	0.803	0.803
7.0	0.801	0.806	0.805	0.805	0.805	0.804	0.804	0.803	0.803	0.802	0.802	0.801	0.800	0.799
7.5	0.794	0.801	0.800	0.800	0.799	0.798	0.798	0.797	0.797	0.796	0.795	0.795	0.793	0.793
8.0	0.787	0.796	0.795	0.794	0.794	0.793	0.792	0.791	0.790	0.790	0.789	0.788	0.786	0.786
8.5	0.786	0.796	0.795	0.794	0.793	0.792	0.791	0.791	0.790	0.789	0.788	0.787	0.785	0.784
9.0	0.783	0.795	0.794	0.793	0.792	0.791	0.790	0.789	0.788	0.786	0.785	0.784	0.782	0.780
9.5	0.770	0.792	0.790	0.789	0.787	0.786	0.784	0.782	0.780	0.778	0.775	0.773	0.767	0.764
10.0	0.739	0.780	0.777	0.774	0.770	0.767	0.763	0.760	0.756	0.752	0.748	0.743	0.734	0.729
10.5	0.687	0.747	0.742	0.737	0.732	0.727	0.721	0.715	0.710	0.704	0.698	0.692	0.681	0.675
11.0	0.626	0.697	0.691	0.685	0.679	0.672	0.666	0.659	0.653	0.646	0.640	0.633	0.619	0.612
11.5	0.566	0.644	0.637	0.631	0.624	0.618	0.610	0.603	0.596	0.589	0.581	0.574	0.558	0.551
12.0	0.507	0.595	0.587	0.580	0.573	0.565	0.557	0.549	0.541	0.533	0.524	0.516	0.498	0.489
12.5	0.448	0.547	0.538	0.530	0.522	0.513	0.504	0.495	0.486	0.476	0.467	0.457	0.439	0.429
13.0	0.393	0.499	0.490	0.480	0.471	0.461	0.451	0.441	0.431	0.421	0.412	0.402	0.384	0.375
13.5	0.345	0.452	0.441	0.431	0.420	0.409	0.400	0.390	0.380	0.371	0.362	0.354	0.338	0.330
14.0	0.305	0.404	0.394	0.383	0.373	0.363	0.354	0.345	0.336	0.327	0.320	0.312	0.298	0.291
14.5	0.271	0.360	0.351	0.341	0.332	0.322	0.314	0.306	0.298	0.290	0.284	0.277	0.265	0.259
15.0	0.241	0.320	0.311	0.303	0.294	0.285	0.279	0.272	0.265	0.258	0.252	0.247	0.236	0.231
15.5	0.217	0.286	0.279	0.271	0.263	0.256	0.250	0.244	0.238	0.232	0.227	0.222	0.212	0.208
16.0	0.196	0.257	0.250	0.244	0.237	0.230	0.225	0.220	0.214	0.209	0.205	0.200	0.192	0.188
16.5	0.178	0.232	0.226	0.220	0.214	0.208	0.204	0.199	0.194	0.189	0.186	0.182	0.174	0.171
17.0	0.162	0.211	0.205	0.200	0.195	0.189	0.185	0.181	0.177	0.173	0.169	0.165	0.159	0.156
17.5	0.148	0.192	0.187	0.183	0.178	0.173	0.169	0.165	0.162	0.158	0.154	0.151	0.145	0.142
18.0	0.136	0.176	0.171	0.167	0.163	0.159	0.155	0.152	0.148	0.145	0.142	0.139	0.133	0.131
18.5	0.125	0.161	0.157	0.154	0.150	0.146	0.143	0.139	0.136	0.133	0.131	0.128	0.123	0.121
19.0	0.115	0.148	0.144	0.141	0.137	0.134	0.131	0.128	0.125	0.122	0.120	0.117	0.113	0.111
19.5	0.106	0.136	0.133	0.130	0.127	0.124	0.121	0.118	0.116	0.113	0.111	0.109	0.104	0.103
20.0	0.099	0.126	0.123	0.120	0.117	0.115	0.112	0.110	0.107	0.105	0.103	0.101	0.097	0.095
20.5	0.092	0.117	0.115	0.112	0.109	0.106	0.104	0.102	0.100	0.098	0.096	0.094	0.090	0.089
21.0	0.086	0.109	0.107	0.104	0.102	0.099	0.097	0.095	0.093	0.091	0.089	0.087	0.084	0.083
21.5	0.081	0.103	0.100	0.098	0.096	0.093	0.091	0.089	0.088	0.086	0.084	0.082	0.079	0.078
22.0	0.076	0.096	0.094	0.092	0.089	0.087	0.085	0.084	0.082	0.080	0.079	0.077	0.074	0.073
22.5	0.071	0.090	0.088	0.086	0.084	0.082	0.080	0.078	0.077	0.075	0.074	0.072	0.070	0.068
23.0	0.066	0.084	0.082	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.068	0.065	0.064
23.5	0.062	0.079	0.077	0.075	0.073	0.072	0.070	0.069	0.067	0.066	0.065	0.064	0.061	0.060
24.0	0.058	0.074	0.072	0.070	0.069	0.067	0.066	0.064	0.063	0.062	0.061	0.060	0.057	0.056
24.5	0.055	0.068	0.067	0.065	0.064	0.062	0.061	0.060	0.059	0.058	0.057	0.056	0.054	0.053
25.0	0.051	0.063	0.062	0.061	0.059	0.058	0.057	0.056	0.055	0.053	0.052	0.052	0.050	0.049
25.5	0.047	0.059	0.058	0.056	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.046	0.045
26.0	0.043	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.043	0.042
26.5	0.040	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.043	0.042	0.041	0.041	0.039	0.039
27.0	0.037	0.046	0.045	0.044	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.037	0.036	0.036
27.5	0.033	0.042	0.041	0.040	0.039	0.038	0.037	0.037	0.036	0.035	0.035	0.034	0.033	0.032
28.0	0.030	0.037	0.037	0.036	0.035	0.034	0.034	0.033	0.032	0.032	0.031	0.031	0.030	0.029
28.5	0.027	0.033	0.033	0.032	0.031	0.031	0.030	0.029	0.029	0.028	0.028	0.027	0.026	0.026
29.0	0.024	0.029	0.029	0.028	0.027	0.027	0.026	0.026	0.025	0.025	0.025	0.024	0.023	0.023
29.5	0.021	0.026	0.025	0.025	0.024	0.024	0.023	0.023	0.022	0.022	0.022	0.021	0.021	0.020
30.0	0.019	0.023	0.022	0.022	0.022	0.021	0.021	0.020	0.020	0.020	0.019	0.019	0.019	0.018

Table 9-2: C_t values, Power Optimized Mode PO1/PO1-0S (HWO)

Original Instruction: T05 0067-7063 VER 03

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Power Curves, Ct Values and Sound Curves, Power
Optimized Mode PO1/PO1-0S (HWO) | Date: 2017-11-29
Restricted
Page 22 of 40 |

9.3 Sound Curves, Power Optimized Mode PO1/PO1-0S (HWO)

Sound Power Level at Hub Height		
Conditions for Sound Power Level:	**Measurement standard IEC 61400-11 ed. 3** **Maximum turbulence at hub height: 30%** **Inflow angle (vertical): 0 ±2°** **Air density: 1.225 kg/m³**	
Wind speed at hub height [m/s]	**Sound Power Level at Hub Height [dBA]** **Power Optimized Mode PO1 (HWO) (Blades with serrated trailing edge)**	**Sound Power Level at Hub Height [dBA]** **Power Optimized Mode PO1-0S (HWO) (Blades without serrated trailing edge)**
3	92.2	94.5
4	92.8	95.4
5	94.0	97.1
6	97.0	100.2
7	100.0	103.1
8	102.8	105.6
9	105.1	107.7
10	106.0	108.5
11	106.0	108.5
12	106.0	108.5
13	106.0	108.5
14	106.0	108.5
15	106.0	108.5
16	106.0	108.5
17	106.0	108.5
18	106.0	108.5
19	106.0	108.5
20	106.0	108.5

Table 9-3: Sound curves, Power Optimized Mode PO1/PO1-0S (HWO)

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

RESTRICTED

Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Sound
Optimized Mode SO1

Date: 2017-11-29
Restricted
Page 23 of 40

10 Power Curves, Ct Values and Sound Curves, Sound Optimized Mode SO1

10.1 Power Curves, Sound Optimized Mode SO1

Air density [kg/m³]														
Wind speed [m/s]	1.225	0.95	0.975	1.0	1.025	1.05	1.075	1.1	1.125	1.15	1.175	1.2	1.25	1.275
3.0	12	4	5	5	6	7	7	8	9	9	10	11	13	14
3.5	65	38	41	43	46	48	50	53	55	58	60	63	68	70
4.0	140	96	100	104	108	112	116	120	124	128	132	136	144	148
4.5	230	166	172	178	184	190	195	201	207	213	218	224	236	242
5.0	336	248	256	264	272	280	288	296	304	312	320	328	344	351
5.5	460	344	355	365	376	386	397	407	418	429	439	450	471	481
6.0	610	460	474	487	501	515	528	542	556	569	583	597	624	638
6.5	788	597	615	632	649	667	684	701	719	736	753	770	805	822
7.0	996	758	780	802	823	845	866	888	910	931	953	974	1017	1038
7.5	1236	944	971	997	1024	1050	1077	1103	1130	1157	1183	1210	1262	1289
8.0	1510	1156	1188	1220	1253	1285	1317	1349	1381	1414	1446	1478	1542	1574
8.5	1815	1394	1433	1471	1510	1548	1586	1625	1663	1701	1739	1777	1853	1890
9.0	2150	1658	1703	1748	1793	1838	1883	1927	1972	2016	2061	2105	2194	2237
9.5	2501	1939	1991	2043	2095	2147	2198	2249	2300	2351	2401	2451	2550	2600
10.0	2855	2236	2294	2352	2410	2468	2525	2581	2637	2693	2747	2801	2906	2957
10.5	3184	2538	2601	2664	2727	2790	2849	2908	2966	3025	3078	3131	3231	3278
11.0	3454	2843	2908	2972	3037	3101	3156	3211	3266	3321	3365	3410	3491	3528
11.5	3680	3142	3204	3266	3327	3389	3436	3484	3532	3579	3613	3646	3705	3729
12.0	3848	3419	3473	3528	3582	3636	3673	3709	3745	3781	3804	3826	3862	3876
12.5	3949	3655	3697	3740	3782	3824	3847	3870	3893	3916	3927	3938	3955	3960
13.0	3990	3842	3868	3893	3919	3944	3954	3963	3972	3982	3984	3987	3992	3993
13.5	3996	3928	3939	3950	3962	3973	3977	3982	3986	3990	3992	3994	3996	3998
14.0	4000	3977	3981	3986	3990	3995	3996	3997	3998	3999	3999	4000	4000	4000
14.5	4000	3993	3994	3996	3997	3999	3999	3999	4000	4000	4000	4000	4000	4000
15.0	4000	3998	3999	3999	3999	4000	4000	4000	4000	4000	4000	4000	4000	4000
15.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
16.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
16.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
17.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
17.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
18.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
18.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
19.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
19.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
20.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
20.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
21.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
21.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
22.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
22.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
23.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
23.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
24.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
24.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
25.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000

Table 10-1: Power curve, Sound Optimized Mode SO1

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Document no.: 0067-7063 V03	Performance Specification V117-4.0/4.2 MW 50/60 Hz	Date: 2017-11-29
Document owner: Platform Management	Power Curves, Ct Values and Sound Curves, Sound	Restricted
Type: T05 - General Description	Optimized Mode SO1	Page 24 of 40

10.2   Ct Values, Sound Optimized Mode SO1

Wind speed [m/s]	Air density kg/m³
	1.225	0.950	0.975	1.0	1.025	1.05	1.075	1.1	1.125	1.15	1.175	1.2	1.25	1.275
3.0	**0.880**	0.885	0.885	0.885	0.884	0.884	0.883	0.883	0.882	0.881	0.881	0.880	0.879	0.879
3.5	**0.870**	0.875	0.875	0.874	0.874	0.873	0.873	0.872	0.872	0.871	0.871	0.870	0.870	0.869
4.0	**0.838**	0.842	0.842	0.841	0.841	0.841	0.840	0.840	0.839	0.839	0.839	0.838	0.837	0.837
4.5	**0.813**	0.814	0.814	0.813	0.813	0.812	0.812	0.812	0.812	0.813	0.813	0.813	0.813	0.812
5.0	**0.812**	0.811	0.811	0.811	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812
5.5	**0.812**	0.814	0.814	0.814	0.814	0.814	0.814	0.813	0.813	0.813	0.813	0.812	0.812	0.811
6.0	**0.807**	0.811	0.811	0.811	0.810	0.810	0.810	0.809	0.809	0.809	0.808	0.808	0.807	0.807
6.5	**0.804**	0.808	0.807	0.807	0.806	0.806	0.806	0.805	0.805	0.805	0.804	0.804	0.803	0.803
7.0	**0.801**	0.806	0.805	0.805	0.805	0.804	0.804	0.803	0.803	0.802	0.802	0.801	0.800	0.799
7.5	**0.794**	0.801	0.800	0.800	0.799	0.798	0.798	0.797	0.797	0.796	0.795	0.795	0.793	0.793
8.0	**0.794**	0.803	0.802	0.801	0.800	0.800	0.799	0.798	0.798	0.797	0.796	0.795	0.794	0.793
8.5	**0.791**	0.800	0.800	0.799	0.798	0.797	0.796	0.796	0.795	0.794	0.793	0.792	0.790	0.789
9.0	**0.789**	0.799	0.798	0.797	0.796	0.796	0.795	0.794	0.793	0.792	0.791	0.790	0.787	0.786
9.5	**0.769**	0.787	0.786	0.785	0.784	0.783	0.781	0.780	0.778	0.776	0.774	0.772	0.767	0.764
10.0	**0.728**	0.761	0.759	0.757	0.755	0.752	0.749	0.746	0.743	0.740	0.736	0.732	0.724	0.719
10.5	**0.670**	0.722	0.718	0.714	0.711	0.707	0.702	0.698	0.693	0.688	0.682	0.676	0.663	0.657
11.0	**0.604**	0.677	0.672	0.666	0.661	0.656	0.649	0.642	0.635	0.629	0.620	0.612	0.595	0.586
11.5	**0.541**	0.632	0.625	0.618	0.611	0.604	0.596	0.587	0.579	0.570	0.561	0.551	0.531	0.521
12.0	**0.481**	0.586	0.577	0.569	0.561	0.552	0.542	0.532	0.522	0.512	0.502	0.492	0.471	0.461
12.5	**0.424**	0.538	0.528	0.518	0.508	0.498	0.487	0.477	0.466	0.455	0.445	0.434	0.414	0.405
13.0	**0.371**	0.490	0.479	0.467	0.456	0.444	0.433	0.422	0.411	0.400	0.390	0.381	0.362	0.354
13.5	**0.327**	0.437	0.425	0.414	0.402	0.391	0.381	0.371	0.361	0.351	0.343	0.335	0.319	0.312
14.0	**0.289**	0.387	0.377	0.366	0.355	0.344	0.336	0.327	0.319	0.310	0.303	0.296	0.282	0.276
14.5	**0.257**	0.343	0.333	0.324	0.314	0.305	0.297	0.290	0.283	0.275	0.269	0.263	0.251	0.246
15.0	**0.228**	0.303	0.295	0.286	0.278	0.270	0.264	0.257	0.251	0.244	0.239	0.234	0.224	0.219
15.5	**0.206**	0.271	0.264	0.256	0.249	0.242	0.237	0.231	0.225	0.220	0.215	0.210	0.202	0.197
16.0	**0.186**	0.243	0.237	0.231	0.225	0.218	0.213	0.208	0.203	0.198	0.194	0.190	0.182	0.179
16.5	**0.169**	0.220	0.215	0.209	0.203	0.198	0.193	0.189	0.185	0.180	0.176	0.173	0.166	0.162
17.0	**0.154**	0.200	0.195	0.190	0.185	0.180	0.176	0.172	0.168	0.164	0.161	0.157	0.151	0.148
17.5	**0.141**	0.182	0.178	0.173	0.169	0.164	0.161	0.157	0.154	0.150	0.147	0.144	0.138	0.136
18.0	**0.130**	0.167	0.163	0.159	0.155	0.151	0.148	0.144	0.141	0.138	0.135	0.132	0.127	0.125
18.5	**0.119**	0.153	0.150	0.146	0.142	0.139	0.136	0.133	0.130	0.127	0.124	0.122	0.117	0.115
19.0	**0.110**	0.141	0.137	0.134	0.131	0.127	0.125	0.122	0.119	0.116	0.114	0.112	0.108	0.106
19.5	**0.102**	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
20.0	**0.094**	0.120	0.118	0.115	0.112	0.109	0.107	0.105	0.102	0.100	0.098	0.096	0.093	0.091
20.5	**0.088**	0.112	0.109	0.107	0.104	0.101	0.099	0.097	0.095	0.093	0.091	0.090	0.086	0.085
21.0	**0.082**	0.104	0.102	0.099	0.097	0.095	0.093	0.091	0.089	0.087	0.085	0.084	0.080	0.079
21.5	**0.077**	0.098	0.096	0.093	0.091	0.089	0.087	0.085	0.084	0.082	0.080	0.079	0.076	0.074
22.0	**0.072**	0.091	0.089	0.087	0.085	0.083	0.082	0.080	0.078	0.077	0.075	0.074	0.071	0.070
22.5	**0.068**	0.086	0.084	0.082	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.067	0.065
23.0	**0.063**	0.080	0.078	0.076	0.075	0.073	0.071	0.070	0.068	0.067	0.066	0.065	0.062	0.061
23.5	**0.060**	0.075	0.073	0.072	0.070	0.068	0.067	0.066	0.064	0.063	0.062	0.061	0.059	0.058
24.0	**0.056**	0.071	0.069	0.068	0.066	0.064	0.063	0.062	0.061	0.059	0.058	0.057	0.055	0.054
24.5	**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
25.0	**0.050**	0.063	0.061	0.060	0.059	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.049	0.049

Table 10-2: C_t values, Sound Optimized Mode SO1

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

RESTRICTED

Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Sound
Optimized Mode SO1

Date: 2017-11-29
Restricted
Page 25 of 40

10.3 Sound Curves, Sound Optimized Mode SO1

Sound Power Level at Hub Height	
Conditions for Sound Power Level:	**Measurement standard IEC 61400-11 ed. 3** **Maximum turbulence at hub height: 30%** **Inflow angle (vertical): 0 ±2°** **Air density: 1.225 kg/m³**
Wind speed at hub height [m/s]	**Sound Power Level at Hub Height [dBA]** **Sound Optimized Mode SO1 (Blades with serrated trailing edge)**
3	92.2
4	92.8
5	94.0
6	97.0
7	100.0
8	102.7
9	104.2
10	105.0
11	105.0
12	105.0
13	105.0
14	105.0
15	105.0
16	105.0
17	105.0
18	105.0
19	105.0
20	105.0

Table 10-3: Sound curves, Sound Optimized Mode SO1

RESTRICTED

Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, SO1 (HWO)

Date: 2017-11-29
Restricted
Page 26 of 40

11 Power Curves, Ct Values and Sound Curves, SO1 (HWO)

11.1 Power Curves, SO1 (HWO)

Air density [kg/m³]													
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	12	4	5	5	6	7	7	8	9	9	10	11	13	14
3.5	65	38	41	43	46	48	50	53	55	58	60	63	68	70
4.0	140	96	100	104	108	112	116	120	124	128	132	136	144	148
4.5	230	166	172	178	184	190	195	201	207	213	218	224	236	242
5.0	336	248	256	264	272	280	288	296	304	312	320	328	344	351
5.5	460	344	355	365	376	386	397	407	418	429	439	450	471	481
6.0	610	460	474	487	501	515	528	542	556	569	583	597	624	638
6.5	788	597	615	632	649	667	684	701	719	736	753	770	805	822
7.0	996	758	780	802	823	845	866	888	910	931	953	974	1017	1038
7.5	1236	944	971	997	1024	1050	1077	1103	1130	1157	1183	1210	1262	1289
8.0	1510	1156	1188	1220	1253	1285	1317	1349	1381	1414	1446	1478	1542	1574
8.5	1815	1394	1433	1471	1510	1548	1586	1625	1663	1701	1739	1777	1853	1890
9.0	2150	1658	1703	1748	1793	1838	1883	1927	1972	2016	2061	2105	2194	2237
9.5	2501	1939	1991	2043	2095	2147	2198	2249	2300	2351	2401	2451	2550	2600
10.0	2855	2236	2294	2352	2410	2468	2525	2581	2637	2693	2747	2801	2906	2957
10.5	3184	2538	2601	2664	2727	2790	2849	2908	2966	3025	3078	3131	3231	3278
11.0	3454	2843	2908	2972	3037	3101	3156	3211	3266	3321	3365	3410	3491	3528
11.5	3680	3142	3204	3266	3327	3389	3436	3484	3532	3579	3613	3646	3705	3729
12.0	3848	3419	3473	3528	3582	3636	3673	3709	3745	3781	3804	3826	3862	3876
12.5	3949	3655	3697	3740	3782	3824	3847	3870	3893	3916	3927	3938	3955	3960
13.0	3990	3842	3868	3893	3919	3944	3954	3963	3972	3982	3984	3987	3992	3993
13.5	3996	3928	3939	3950	3962	3973	3977	3982	3986	3990	3992	3994	3996	3998
14.0	4000	3977	3981	3986	3990	3995	3996	3997	3998	3999	3999	4000	4000	4000
14.5	4000	3993	3994	3996	3997	3999	3999	3999	4000	4000	4000	4000	4000	4000
15.0	4000	3998	3999	3999	3999	4000	4000	4000	4000	4000	4000	4000	4000	4000
15.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
16.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
16.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
17.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
17.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
18.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
18.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
19.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
19.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
20.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
20.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
21.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
21.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
22.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
22.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
23.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
23.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
24.0	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999
24.5	3989	3989	3989	3989	3989	3989	3989	3989	3989	3989	3989	3989	3989	3989
25.0	3961	3961	3961	3961	3961	3961	3961	3961	3961	3961	3961	3961	3961	3961
25.5	3904	3904	3904	3904	3904	3904	3904	3904	3904	3904	3904	3904	3904	3904
26.0	3823	3823	3823	3823	3823	3823	3823	3823	3823	3823	3823	3823	3823	3823
26.5	3715	3715	3715	3715	3715	3715	3715	3715	3715	3715	3715	3715	3715	3715
27.0	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590
27.5	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422
28.0	3220	3219	3219	3219	3219	3219	3220	3220	3220	3220	3220	3220	3220	3220
28.5	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987
29.0	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733
29.5	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484
30.0	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305

Table 11-1: Power curve, SO1 (HWO)

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Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, SO1 (HWO)

Date: 2017-11-29
Restricted
Page 27 of 40

11.2   Ct Values, SO1 (HWO)

Air density kg/m³														
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	**0.880**	0.885	0.885	0.885	0.884	0.884	0.883	0.883	0.882	0.881	0.881	0.880	0.879	0.879
3.5	**0.870**	0.875	0.875	0.874	0.874	0.873	0.873	0.872	0.872	0.871	0.871	0.870	0.870	0.869
4.0	**0.838**	0.842	0.842	0.841	0.841	0.841	0.840	0.840	0.839	0.839	0.839	0.838	0.837	0.837
4.5	**0.813**	0.814	0.814	0.813	0.813	0.812	0.812	0.812	0.812	0.813	0.813	0.813	0.813	0.812
5.0	**0.812**	0.811	0.811	0.811	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812
5.5	**0.812**	0.814	0.814	0.814	0.814	0.814	0.814	0.813	0.813	0.813	0.813	0.812	0.812	0.811
6.0	**0.807**	0.811	0.811	0.811	0.810	0.810	0.810	0.809	0.809	0.809	0.808	0.808	0.807	0.807
6.5	**0.804**	0.808	0.807	0.807	0.806	0.806	0.806	0.805	0.805	0.805	0.804	0.804	0.803	0.803
7.0	**0.801**	0.806	0.805	0.805	0.805	0.804	0.804	0.803	0.803	0.802	0.802	0.801	0.800	0.799
7.5	**0.794**	0.801	0.800	0.800	0.799	0.798	0.798	0.797	0.797	0.796	0.795	0.795	0.793	0.793
8.0	**0.794**	0.803	0.802	0.801	0.800	0.800	0.799	0.798	0.798	0.797	0.796	0.795	0.794	0.793
8.5	**0.791**	0.800	0.800	0.799	0.798	0.797	0.796	0.796	0.795	0.794	0.793	0.792	0.790	0.789
9.0	**0.789**	0.799	0.798	0.797	0.796	0.796	0.795	0.794	0.793	0.792	0.791	0.790	0.787	0.786
9.5	**0.769**	0.787	0.786	0.785	0.784	0.783	0.781	0.780	0.778	0.776	0.774	0.772	0.767	0.764
10.0	**0.728**	0.761	0.759	0.757	0.755	0.752	0.749	0.746	0.743	0.740	0.736	0.732	0.724	0.719
10.5	**0.670**	0.722	0.718	0.714	0.711	0.707	0.702	0.698	0.693	0.688	0.682	0.676	0.663	0.657
11.0	**0.604**	0.677	0.672	0.666	0.661	0.656	0.649	0.642	0.635	0.629	0.620	0.612	0.595	0.586
11.5	**0.541**	0.632	0.625	0.618	0.611	0.604	0.596	0.587	0.579	0.570	0.561	0.551	0.531	0.521
12.0	**0.481**	0.586	0.577	0.569	0.561	0.552	0.542	0.532	0.522	0.512	0.502	0.492	0.471	0.461
12.5	**0.424**	0.538	0.528	0.518	0.508	0.498	0.487	0.477	0.466	0.455	0.445	0.434	0.414	0.405
13.0	**0.371**	0.490	0.479	0.467	0.456	0.444	0.433	0.422	0.411	0.400	0.390	0.381	0.362	0.354
13.5	**0.327**	0.437	0.425	0.414	0.402	0.391	0.381	0.371	0.361	0.351	0.343	0.335	0.319	0.312
14.0	**0.289**	0.387	0.377	0.366	0.355	0.344	0.336	0.327	0.319	0.310	0.303	0.296	0.282	0.276
14.5	**0.257**	0.343	0.333	0.324	0.314	0.305	0.297	0.290	0.283	0.275	0.269	0.263	0.251	0.246
15.0	**0.228**	0.303	0.295	0.286	0.278	0.270	0.264	0.257	0.251	0.244	0.239	0.234	0.224	0.219
15.5	**0.206**	0.271	0.264	0.256	0.249	0.242	0.237	0.231	0.225	0.220	0.215	0.210	0.202	0.197
16.0	**0.186**	0.243	0.237	0.231	0.225	0.218	0.213	0.208	0.203	0.198	0.194	0.190	0.182	0.179
16.5	**0.169**	0.220	0.215	0.209	0.203	0.198	0.193	0.189	0.185	0.180	0.176	0.173	0.166	0.162
17.0	**0.154**	0.200	0.195	0.190	0.185	0.180	0.176	0.172	0.168	0.164	0.161	0.157	0.151	0.148
17.5	**0.141**	0.182	0.178	0.173	0.169	0.164	0.161	0.157	0.154	0.150	0.147	0.144	0.138	0.136
18.0	**0.130**	0.167	0.163	0.159	0.155	0.151	0.148	0.144	0.141	0.138	0.135	0.132	0.127	0.125
18.5	**0.119**	0.153	0.150	0.146	0.142	0.139	0.136	0.133	0.130	0.127	0.124	0.122	0.117	0.115
19.0	**0.110**	0.141	0.137	0.134	0.131	0.127	0.125	0.122	0.119	0.116	0.114	0.112	0.108	0.106
19.5	**0.102**	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
20.0	**0.094**	0.120	0.118	0.115	0.112	0.109	0.107	0.105	0.102	0.100	0.098	0.096	0.093	0.091
20.5	**0.088**	0.112	0.109	0.107	0.104	0.101	0.099	0.097	0.095	0.093	0.091	0.090	0.086	0.085
21.0	**0.082**	0.104	0.102	0.099	0.097	0.095	0.093	0.091	0.089	0.087	0.085	0.084	0.080	0.079
21.5	**0.077**	0.098	0.096	0.093	0.091	0.089	0.087	0.085	0.084	0.082	0.080	0.079	0.076	0.074
22.0	**0.072**	0.091	0.089	0.087	0.085	0.083	0.082	0.080	0.078	0.077	0.075	0.074	0.071	0.070
22.5	**0.068**	0.086	0.084	0.082	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.067	0.065
23.0	**0.063**	0.080	0.078	0.076	0.075	0.073	0.071	0.070	0.068	0.067	0.066	0.065	0.062	0.061
23.5	**0.060**	0.075	0.073	0.072	0.070	0.068	0.067	0.066	0.064	0.063	0.062	0.061	0.059	0.058
24.0	**0.056**	0.071	0.069	0.068	0.066	0.064	0.063	0.062	0.061	0.059	0.058	0.057	0.055	0.054
24.5	**0.053**	0.066	0.065	0.064	0.062	0.061	0.059	0.058	0.057	0.056	0.055	0.054	0.052	0.051
25.0	**0.050**	0.062	0.061	0.060	0.058	0.057	0.056	0.055	0.054	0.052	0.052	0.051	0.049	0.048
25.5	**0.047**	0.058	0.057	0.056	0.055	0.053	0.052	0.051	0.050	0.049	0.048	0.048	0.046	0.045
26.0	**0.043**	0.054	0.053	0.052	0.051	0.049	0.049	0.048	0.047	0.046	0.045	0.044	0.043	0.042
26.5	**0.040**	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.043	0.042	0.041	0.041	0.039	0.039
27.0	**0.037**	0.046	0.045	0.044	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.037	0.036	0.036
27.5	**0.033**	0.042	0.041	0.040	0.039	0.038	0.037	0.037	0.036	0.035	0.035	0.034	0.033	0.032
28.0	**0.030**	0.037	0.037	0.036	0.035	0.034	0.034	0.033	0.032	0.032	0.031	0.031	0.030	0.029
28.5	**0.027**	0.033	0.033	0.032	0.031	0.031	0.030	0.029	0.029	0.028	0.028	0.027	0.026	0.026
29.0	**0.024**	0.029	0.029	0.028	0.027	0.027	0.026	0.026	0.025	0.025	0.025	0.024	0.023	0.023
29.5	**0.021**	0.026	0.025	0.025	0.024	0.024	0.023	0.023	0.022	0.022	0.022	0.021	0.021	0.020
30.0	**0.019**	0.023	0.023	0.022	0.022	0.021	0.021	0.020	0.020	0.020	0.019	0.019	0.019	0.018

Table 11-2: C_t values, SO1 (HWO)

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

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Document no.: 0067-7063 V03		Date: 2017-11-29
Document owner: Platform Management	Performance Specification V117-4.0/4.2 MW 50/60 Hz	Restricted
Type: T05 - General Description	Power Curves, Ct Values and Sound Curves, SO1 (HWO)	Page 28 of 40

11.3   Sound Curves, SO1 (HWO)

Sound Power Level at Hub Height	
Conditions for Sound Power Level:	**Measurement standard IEC 61400-11 ed. 3** **Maximum turbulence at hub height: 30%** **Inflow angle (vertical): 0 ±2°** **Air density: 1.225 kg/m³**
Wind speed at hub height [m/s]	**Sound Power Level at Hub Height [dBA]** **SO1 (HWO) (Blades with serrated trailing edge)**
3	92.2
4	92.8
5	94.0
6	97.0
7	100.0
8	102.7
9	104.2
10	105.0
11	105.0
12	105.0
13	105.0
14	105.0
15	105.0
16	105.0
17	105.0
18	105.0
19	105.0
20	105.0

Table 11-3: Sound curves, SO1 (HWO)

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

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Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Sound
Optimized Mode SO2

Date: 2017-11-29
Restricted
Page 29 of 40

12 Power Curves, Ct Values and Sound Curves, Sound Optimized Mode SO2

12.1 Power Curves, Sound Optimized Mode SO2

Air density [kg/m^3]														
Wind speed [m/s]	1.225	0.95	0.975	1.0	1.025	1.05	1.075	1.1	1.125	1.15	1.175	1.2	1.25	1.275
3.0	12	4	5	5	6	7	7	8	9	9	10	11	13	14
3.5	65	38	41	43	46	48	50	53	55	58	60	63	68	70
4.0	140	96	100	104	108	112	116	120	124	128	132	136	144	148
4.5	230	166	172	178	184	190	195	201	207	213	218	224	236	242
5.0	336	248	256	264	272	280	288	296	304	312	320	328	344	351
5.5	460	344	355	365	376	386	397	407	418	429	439	450	471	481
6.0	610	460	474	487	501	515	528	542	556	569	583	597	624	638
6.5	788	597	615	632	649	667	684	701	719	736	753	771	805	822
7.0	997	759	781	803	824	846	868	889	911	933	954	976	1019	1041
7.5	1235	943	970	997	1023	1050	1076	1103	1129	1156	1182	1209	1261	1288
8.0	1501	1151	1183	1215	1247	1279	1310	1342	1374	1406	1438	1469	1533	1564
8.5	1781	1371	1409	1446	1484	1521	1558	1595	1633	1670	1707	1744	1818	1854
9.0	2051	1588	1630	1673	1715	1758	1800	1842	1884	1926	1968	2010	2092	2134
9.5	2310	1796	1844	1891	1938	1986	2032	2079	2126	2172	2218	2264	2356	2402
10.0	2557	1994	2046	2098	2150	2202	2253	2304	2355	2406	2456	2507	2606	2654
10.5	2792	2189	2246	2302	2358	2415	2470	2525	2580	2636	2688	2740	2842	2892
11.0	3012	2406	2465	2525	2585	2644	2699	2754	2809	2864	2913	2963	3055	3097
11.5	3226	2650	2711	2771	2832	2892	2944	2996	3048	3100	3142	3184	3260	3295
12.0	3423	2940	2996	3052	3108	3164	3206	3247	3289	3330	3361	3392	3446	3468
12.5	3586	3258	3302	3346	3390	3434	3460	3486	3513	3539	3555	3570	3596	3606
13.0	3693	3518	3545	3572	3600	3627	3639	3652	3664	3676	3682	3688	3696	3699
13.5	3763	3674	3689	3703	3717	3732	3737	3743	3748	3754	3757	3760	3764	3766
14.0	3820	3781	3788	3795	3802	3809	3811	3814	3816	3818	3819	3820	3821	3821
14.5	3856	3841	3844	3847	3850	3854	3854	3854	3855	3855	3855	3855	3856	3856
15.0	3884	3878	3880	3881	3882	3883	3883	3884	3884	3884	3884	3884	3884	3884
15.5	3908	3906	3906	3907	3907	3908	3908	3908	3908	3908	3908	3908	3908	3908
16.0	3932	3931	3931	3932	3932	3932	3932	3932	3932	3932	3932	3932	3932	3932
16.5	3955	3955	3955	3955	3955	3955	3955	3955	3955	3955	3955	3955	3955	3955
17.0	3974	3974	3974	3974	3974	3974	3974	3974	3974	3974	3974	3974	3974	3974
17.5	3991	3991	3991	3991	3991	3991	3991	3991	3991	3991	3991	3991	3991	3991
18.0	3997	3997	3997	3997	3997	3997	3997	3997	3997	3997	3997	3997	3997	3997
18.5	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999
19.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
19.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
20.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
20.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
21.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
21.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
22.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
22.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
23.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
23.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
24.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
24.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
25.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000

Table 12-1: Power curve, Sound Optimized Mode SO2

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

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Document no.: 0067-7063 V03 Document owner: Platform Management Type: T05 - General Description	Performance Specification V117-4.0/4.2 MW 50/60 Hz Power Curves, Ct Values and Sound Curves, Sound Optimized Mode SO2	Date: 2017-11-29 Restricted Page 30 of 40

12.2 Ct Values, Sound Optimized Mode SO2

Air density kg/m³														
Wind speed [m/s]	1.225	0.950	0.975	1.0	1.025	1.05	1.075	1.1	1.125	1.15	1.175	1.2	1.25	1.275
3.0	0.880	0.885	0.885	0.885	0.884	0.884	0.883	0.883	0.882	0.881	0.881	0.880	0.879	0.879
3.5	0.870	0.875	0.875	0.874	0.874	0.873	0.873	0.872	0.872	0.871	0.871	0.870	0.870	0.869
4.0	0.838	0.842	0.842	0.841	0.841	0.841	0.840	0.840	0.839	0.839	0.839	0.838	0.837	0.837
4.5	0.813	0.814	0.814	0.813	0.813	0.812	0.812	0.812	0.812	0.813	0.813	0.813	0.813	0.812
5.0	0.812	0.811	0.811	0.811	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812
5.5	0.812	0.814	0.814	0.814	0.814	0.814	0.814	0.813	0.813	0.813	0.813	0.812	0.812	0.811
6.0	0.807	0.811	0.811	0.811	0.810	0.810	0.810	0.809	0.809	0.809	0.808	0.808	0.807	0.807
6.5	0.806	0.810	0.810	0.810	0.809	0.809	0.809	0.808	0.808	0.808	0.807	0.807	0.806	0.806
7.0	0.804	0.810	0.809	0.809	0.808	0.808	0.807	0.807	0.806	0.806	0.805	0.805	0.804	0.803
7.5	0.801	0.808	0.807	0.807	0.806	0.806	0.805	0.804	0.804	0.803	0.803	0.802	0.801	0.800
8.0	0.792	0.799	0.798	0.798	0.797	0.797	0.796	0.795	0.795	0.794	0.793	0.793	0.791	0.791
8.5	0.751	0.759	0.758	0.757	0.757	0.756	0.755	0.755	0.754	0.753	0.753	0.752	0.751	0.750
9.0	0.688	0.695	0.695	0.694	0.693	0.693	0.692	0.692	0.691	0.690	0.690	0.689	0.688	0.687
9.5	0.627	0.634	0.633	0.633	0.632	0.631	0.631	0.630	0.630	0.629	0.628	0.628	0.626	0.626
10.0	0.574	0.580	0.580	0.579	0.579	0.578	0.577	0.577	0.576	0.576	0.575	0.575	0.573	0.572
10.5	0.526	0.534	0.534	0.533	0.533	0.532	0.532	0.531	0.530	0.530	0.529	0.528	0.525	0.523
11.0	0.482	0.500	0.499	0.498	0.497	0.496	0.494	0.493	0.491	0.489	0.487	0.484	0.479	0.475
11.5	0.444	0.476	0.474	0.472	0.470	0.468	0.465	0.462	0.459	0.456	0.452	0.448	0.439	0.434
12.0	0.409	0.465	0.461	0.457	0.453	0.448	0.443	0.438	0.432	0.427	0.421	0.415	0.402	0.396
12.5	0.374	0.458	0.451	0.444	0.437	0.430	0.422	0.414	0.406	0.398	0.390	0.382	0.366	0.359
13.0	0.337	0.438	0.428	0.418	0.409	0.399	0.390	0.381	0.371	0.362	0.354	0.345	0.330	0.322
13.5	0.303	0.402	0.392	0.381	0.371	0.361	0.352	0.343	0.334	0.326	0.318	0.311	0.297	0.290
14.0	0.273	0.364	0.354	0.345	0.335	0.325	0.317	0.309	0.301	0.293	0.286	0.280	0.267	0.261
14.5	0.246	0.327	0.318	0.310	0.301	0.292	0.285	0.278	0.270	0.263	0.257	0.252	0.240	0.235
15.0	0.221	0.292	0.284	0.277	0.269	0.261	0.255	0.249	0.242	0.236	0.231	0.226	0.216	0.212
15.5	0.200	0.263	0.256	0.250	0.243	0.236	0.230	0.225	0.219	0.214	0.209	0.205	0.196	0.192
16.0	0.182	0.239	0.232	0.226	0.220	0.214	0.209	0.204	0.199	0.195	0.191	0.186	0.179	0.175
16.5	0.167	0.217	0.212	0.206	0.201	0.195	0.191	0.186	0.182	0.178	0.174	0.170	0.163	0.160
17.0	0.153	0.198	0.194	0.189	0.184	0.179	0.175	0.171	0.167	0.163	0.160	0.156	0.150	0.147
17.5	0.141	0.182	0.177	0.173	0.168	0.164	0.160	0.157	0.153	0.150	0.147	0.144	0.138	0.135
18.0	0.129	0.167	0.163	0.159	0.155	0.151	0.147	0.144	0.141	0.138	0.135	0.132	0.127	0.125
18.5	0.119	0.153	0.150	0.146	0.142	0.139	0.136	0.133	0.130	0.127	0.124	0.122	0.117	0.115
19.0	0.110	0.141	0.137	0.134	0.131	0.127	0.125	0.122	0.119	0.116	0.114	0.112	0.108	0.106
19.5	0.102	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
20.0	0.094	0.120	0.118	0.115	0.112	0.109	0.107	0.105	0.102	0.100	0.098	0.096	0.093	0.091
20.5	0.088	0.112	0.109	0.107	0.104	0.101	0.099	0.097	0.095	0.093	0.091	0.090	0.086	0.085
21.0	0.082	0.104	0.102	0.099	0.097	0.095	0.093	0.091	0.089	0.087	0.085	0.084	0.080	0.079
21.5	0.077	0.098	0.096	0.093	0.091	0.089	0.087	0.085	0.084	0.082	0.080	0.079	0.076	0.074
22.0	0.072	0.091	0.089	0.087	0.085	0.083	0.082	0.080	0.078	0.077	0.075	0.074	0.071	0.070
22.5	0.068	0.086	0.084	0.082	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.067	0.065
23.0	0.063	0.080	0.078	0.076	0.075	0.073	0.071	0.070	0.068	0.067	0.066	0.065	0.062	0.061
23.5	0.060	0.075	0.073	0.072	0.070	0.068	0.067	0.066	0.064	0.063	0.062	0.061	0.059	0.058
24.0	0.056	0.071	0.069	0.068	0.066	0.064	0.063	0.062	0.061	0.059	0.058	0.057	0.055	0.054
24.5	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
25.0	0.050	0.063	0.061	0.060	0.059	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.049	0.049

Table 12-2: C_t values, Sound Optimized Mode SO2

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

RESTRICTED

Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Sound
Optimized Mode SO2

Date: 2017-11-29
Restricted
Page 31 of 40

12.3 Sound Curves, Sound Optimized Mode SO2

Sound Power Level at Hub Height	
Conditions for Sound Power Level:	**Measurement standard IEC 61400-11 ed. 3 Maximum turbulence at hub height: 30% Inflow angle (vertical): 0 ±2° Air density: 1.225 kg/m^3**
Wind speed at hub height [m/s]	**Sound Power Level at Hub Height [dBA] Sound Optimized Mode SO2 (Blades with serrated trailing edge)**
3	92.2
4	92.8
5	94.0
6	97.0
7	99.9
8	101.6
9	102.3
10	102.3
11	102.4
12	102.7
13	103.0
14	103.0
15	103.0
16	103.0
17	103.0
18	103.0
19	103.0
20	103.0

Table 12-3: Sound curves, Sound Optimized Mode SO2

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

RESTRICTED

Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, SO2 (HWO)

Date: 2017-11-29
Restricted
Page 32 of 40

13 Power Curves, Ct Values and Sound Curves, SO2 (HWO)

13.1 Power Curves, SO2 (HWO)

Wind speed [m/s]	Air density [kg/m³]													
	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	12	4	5	5	6	7	7	8	9	9	10	11	13	14
3.5	65	38	41	43	46	48	50	53	55	58	60	63	68	70
4.0	140	96	100	104	108	112	116	120	124	128	132	136	144	148
4.5	230	166	172	178	184	190	195	201	207	213	218	224	236	242
5.0	336	248	256	264	272	280	288	296	304	312	320	328	344	351
5.5	460	344	355	365	376	386	397	407	418	429	439	450	471	481
6.0	610	460	474	487	501	515	528	542	556	569	583	597	624	638
6.5	788	597	615	632	649	667	684	701	719	736	753	771	805	822
7.0	997	759	781	803	824	846	868	889	911	933	954	976	1019	1041
7.5	1235	943	970	997	1023	1050	1076	1103	1129	1156	1182	1209	1261	1288
8.0	1501	1151	1183	1215	1247	1279	1310	1342	1374	1406	1438	1469	1533	1564
8.5	1781	1371	1409	1446	1484	1521	1558	1595	1633	1670	1707	1744	1818	1854
9.0	2051	1588	1630	1673	1715	1758	1800	1842	1884	1926	1968	2010	2092	2134
9.5	2310	1796	1844	1891	1938	1986	2032	2079	2126	2172	2218	2264	2356	2402
10.0	2557	1994	2046	2098	2150	2202	2253	2304	2355	2406	2456	2507	2606	2654
10.5	2792	2189	2246	2302	2358	2415	2470	2525	2580	2636	2688	2740	2842	2892
11.0	3012	2406	2465	2525	2585	2644	2699	2754	2809	2864	2913	2963	3055	3097
11.5	3226	2650	2711	2771	2832	2892	2944	2996	3048	3100	3142	3184	3260	3295
12.0	3423	2940	2996	3052	3108	3164	3206	3247	3289	3330	3361	3392	3446	3468
12.5	3586	3258	3302	3346	3390	3434	3460	3486	3513	3539	3555	3570	3596	3606
13.0	3693	3518	3545	3572	3600	3627	3639	3652	3664	3676	3682	3688	3696	3699
13.5	3763	3674	3689	3703	3717	3732	3737	3743	3748	3754	3757	3760	3764	3766
14.0	3820	3781	3788	3795	3802	3809	3811	3814	3816	3818	3819	3820	3821	3821
14.5	3856	3841	3844	3847	3850	3854	3854	3854	3855	3855	3855	3855	3856	3856
15.0	3884	3878	3880	3881	3882	3883	3883	3884	3884	3884	3884	3884	3884	3884
15.5	3908	3906	3906	3907	3907	3908	3908	3908	3908	3908	3908	3908	3908	3908
16.0	3932	3931	3931	3932	3932	3932	3932	3932	3932	3932	3932	3932	3932	3932
16.5	3955	3955	3955	3955	3955	3955	3955	3955	3955	3955	3955	3955	3955	3955
17.0	3974	3974	3974	3974	3974	3974	3974	3974	3974	3974	3974	3974	3974	3974
17.5	3991	3991	3991	3991	3991	3991	3991	3991	3991	3991	3991	3991	3991	3991
18.0	3997	3997	3997	3997	3997	3997	3997	3997	3997	3997	3997	3997	3997	3997
18.5	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999
19.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
19.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
20.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
20.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
21.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
21.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
22.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
22.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
23.0	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
23.5	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
24.0	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999
24.5	3989	3989	3989	3989	3989	3989	3989	3989	3989	3989	3989	3989	3989	3989
25.0	3961	3961	3961	3961	3961	3961	3961	3961	3961	3961	3961	3961	3961	3961
25.5	3904	3904	3904	3904	3904	3904	3904	3904	3904	3904	3904	3904	3904	3904
26.0	3823	3823	3823	3823	3823	3823	3823	3823	3823	3823	3823	3823	3823	3823
26.5	3715	3715	3715	3715	3715	3715	3715	3715	3715	3715	3715	3715	3715	3715
27.0	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590	3590
27.5	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422	3422
28.0	3220	3219	3219	3219	3219	3219	3220	3220	3220	3220	3220	3220	3220	3220
28.5	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987	2987
29.0	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733	2733
29.5	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484
30.0	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305	2305

Table 13-1: Power curve, SO2 (HWO)

RESTRICTED

Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, SO2 (HWO)

Date: 2017-11-29
Restricted
Page 33 of 40

13.2 Ct Values, SO2 (HWO)

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	0.880	0.885	0.885	0.885	0.884	0.884	0.883	0.883	0.882	0.881	0.881	0.880	0.879	0.879
3.5	0.870	0.875	0.875	0.874	0.874	0.873	0.873	0.872	0.872	0.871	0.871	0.870	0.870	0.869
4.0	0.838	0.842	0.842	0.841	0.841	0.841	0.840	0.840	0.839	0.839	0.839	0.838	0.837	0.837
4.5	0.813	0.814	0.814	0.813	0.813	0.812	0.812	0.812	0.812	0.813	0.813	0.813	0.813	0.812
5.0	0.812	0.811	0.811	0.811	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812
5.5	0.812	0.814	0.814	0.814	0.814	0.814	0.814	0.813	0.813	0.813	0.813	0.812	0.812	0.811
6.0	0.807	0.811	0.811	0.811	0.810	0.810	0.810	0.809	0.809	0.809	0.808	0.808	0.807	0.807
6.5	0.806	0.810	0.810	0.810	0.809	0.809	0.809	0.808	0.808	0.808	0.807	0.807	0.806	0.806
7.0	0.804	0.810	0.809	0.809	0.808	0.808	0.807	0.807	0.806	0.806	0.805	0.805	0.804	0.803
7.5	0.801	0.808	0.807	0.807	0.806	0.806	0.805	0.804	0.804	0.803	0.803	0.802	0.801	0.800
8.0	0.792	0.799	0.798	0.798	0.797	0.797	0.796	0.795	0.795	0.794	0.793	0.793	0.791	0.791
8.5	0.751	0.759	0.758	0.757	0.757	0.756	0.755	0.755	0.754	0.753	0.753	0.752	0.751	0.750
9.0	0.688	0.695	0.695	0.694	0.693	0.693	0.692	0.692	0.691	0.690	0.690	0.689	0.688	0.687
9.5	0.627	0.634	0.633	0.633	0.632	0.631	0.631	0.630	0.630	0.629	0.628	0.628	0.626	0.626
10.0	0.574	0.580	0.580	0.579	0.579	0.578	0.577	0.577	0.576	0.576	0.575	0.575	0.573	0.572
10.5	0.526	0.534	0.534	0.533	0.533	0.532	0.532	0.531	0.530	0.530	0.529	0.528	0.525	0.523
11.0	0.482	0.500	0.499	0.498	0.497	0.496	0.494	0.493	0.491	0.489	0.487	0.484	0.479	0.475
11.5	0.444	0.476	0.474	0.472	0.470	0.468	0.465	0.462	0.459	0.456	0.452	0.448	0.439	0.434
12.0	0.409	0.465	0.461	0.457	0.453	0.448	0.443	0.438	0.432	0.427	0.421	0.415	0.402	0.396
12.5	0.374	0.458	0.451	0.444	0.437	0.430	0.422	0.414	0.406	0.398	0.390	0.382	0.366	0.359
13.0	0.337	0.438	0.428	0.418	0.409	0.399	0.390	0.381	0.371	0.362	0.354	0.345	0.330	0.322
13.5	0.303	0.402	0.392	0.381	0.371	0.361	0.352	0.343	0.334	0.326	0.318	0.311	0.297	0.290
14.0	0.273	0.364	0.354	0.345	0.335	0.325	0.317	0.309	0.301	0.293	0.286	0.280	0.267	0.261
14.5	0.246	0.327	0.318	0.310	0.301	0.292	0.285	0.278	0.270	0.263	0.257	0.252	0.240	0.235
15.0	0.221	0.292	0.284	0.277	0.269	0.261	0.255	0.249	0.242	0.236	0.231	0.226	0.216	0.212
15.5	0.200	0.263	0.256	0.250	0.243	0.236	0.230	0.225	0.219	0.214	0.209	0.205	0.196	0.192
16.0	0.182	0.239	0.232	0.226	0.220	0.214	0.209	0.204	0.199	0.195	0.191	0.186	0.179	0.175
16.5	0.167	0.217	0.212	0.206	0.201	0.195	0.191	0.186	0.182	0.178	0.174	0.170	0.163	0.160
17.0	0.153	0.198	0.194	0.189	0.184	0.179	0.175	0.171	0.167	0.163	0.160	0.156	0.150	0.147
17.5	0.141	0.182	0.177	0.173	0.168	0.164	0.160	0.157	0.153	0.150	0.147	0.144	0.138	0.135
18.0	0.129	0.167	0.163	0.159	0.155	0.151	0.147	0.144	0.141	0.138	0.135	0.132	0.127	0.125
18.5	0.119	0.153	0.150	0.146	0.142	0.139	0.136	0.133	0.130	0.127	0.124	0.122	0.117	0.115
19.0	0.110	0.141	0.137	0.134	0.131	0.127	0.125	0.122	0.119	0.116	0.114	0.112	0.108	0.106
19.5	0.102	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
20.0	0.094	0.120	0.118	0.115	0.112	0.109	0.107	0.105	0.102	0.100	0.098	0.096	0.093	0.091
20.5	0.088	0.112	0.109	0.107	0.104	0.101	0.099	0.097	0.095	0.093	0.091	0.090	0.086	0.085
21.0	0.082	0.104	0.102	0.099	0.097	0.095	0.093	0.091	0.089	0.087	0.085	0.084	0.080	0.079
21.5	0.077	0.098	0.096	0.093	0.091	0.089	0.087	0.085	0.084	0.082	0.080	0.079	0.076	0.074
22.0	0.072	0.091	0.089	0.087	0.085	0.083	0.082	0.080	0.078	0.077	0.075	0.074	0.071	0.070
22.5	0.068	0.086	0.084	0.082	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.067	0.065
23.0	0.063	0.080	0.078	0.076	0.075	0.073	0.071	0.070	0.068	0.067	0.066	0.065	0.062	0.061
23.5	0.060	0.075	0.073	0.072	0.070	0.068	0.067	0.066	0.064	0.063	0.062	0.061	0.059	0.058
24.0	0.056	0.071	0.069	0.068	0.066	0.064	0.063	0.062	0.061	0.059	0.058	0.057	0.055	0.054
24.5	0.053	0.066	0.065	0.064	0.062	0.061	0.059	0.058	0.057	0.056	0.055	0.054	0.052	0.051
25.0	0.050	0.062	0.061	0.060	0.058	0.057	0.056	0.055	0.054	0.052	0.052	0.051	0.049	0.048
25.5	0.047	0.058	0.057	0.056	0.055	0.053	0.052	0.051	0.050	0.049	0.048	0.048	0.046	0.045
26.0	0.043	0.054	0.053	0.052	0.051	0.049	0.049	0.048	0.047	0.046	0.045	0.044	0.043	0.042
26.5	0.040	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.043	0.042	0.041	0.041	0.039	0.039
27.0	0.037	0.046	0.045	0.044	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.037	0.036	0.036
27.5	0.033	0.042	0.041	0.040	0.039	0.038	0.037	0.037	0.036	0.035	0.035	0.034	0.033	0.032
28.0	0.030	0.037	0.037	0.036	0.035	0.034	0.034	0.033	0.032	0.032	0.031	0.031	0.030	0.029
28.5	0.027	0.033	0.033	0.032	0.031	0.031	0.030	0.029	0.029	0.028	0.028	0.027	0.026	0.026
29.0	0.024	0.029	0.029	0.028	0.027	0.027	0.026	0.026	0.025	0.025	0.025	0.024	0.023	0.023
29.5	0.021	0.026	0.025	0.025	0.024	0.024	0.023	0.023	0.022	0.022	0.022	0.021	0.021	0.020
30.0	0.019	0.023	0.023	0.022	0.022	0.021	0.021	0.020	0.020	0.020	0.019	0.019	0.019	0.018

Table 13-2: C$_t$ values, SO2 (HWO)

RESTRICTED

Document no.: 0067-7063 V03		Date: 2017-11-29
Document owner: Platform Management	Performance Specification V117-4.0/4.2 MW 50/60 Hz	Restricted
Type: T05 - General Description	Power Curves, Ct Values and Sound Curves, SO2 (HWO)	Page 34 of 40

13.3   Sound Curves, SO2 (HWO)

Sound Power Level at Hub Height	
Conditions for Sound Power Level:	**Measurement standard IEC 61400-11 ed. 3** **Maximum turbulence at hub height: 30%** **Inflow angle (vertical): 0 ±2°** **Air density: 1.225 kg/m³**
Wind speed at hub height [m/s]	**Sound Power Level at Hub Height [dBA]** **SO2 (HWO) (Blades with serrated trailing edge)**
3	92.2
4	92.8
5	94.0
6	97.0
7	99.9
8	101.6
9	102.3
10	102.3
11	102.4
12	102.7
13	103.0
14	103.0
15	103.0
16	103.0
17	103.0
18	103.0
19	103.0
20	103.0

Table 13-3: Sound curves, SO2 (HWO)

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

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Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Sound
Optimized Mode SO3

Date: 2017-11-29
Restricted
Page 35 of 40

14 Power Curves, Ct Values and Sound Curves, Sound Optimized Mode SO3

14.1 Power Curves, Sound Optimized Mode SO3

Air density [kg/m³]														
Wind speed [m/s]	1.225	0.95	0.975	1.0	1.025	1.05	1.075	1.1	1.125	1.15	1.175	1.2	1.25	1.275
3.0	12	4	5	5	6	7	7	8	9	9	10	11	13	14
3.5	65	38	41	43	46	48	50	53	55	58	60	63	68	70
4.0	140	96	100	104	108	112	116	120	124	128	132	136	144	148
4.5	230	166	172	178	184	190	195	201	207	213	218	224	236	242
5.0	336	248	256	264	272	280	288	296	304	312	320	328	344	351
5.5	460	344	355	365	376	386	397	407	418	429	439	450	471	481
6.0	610	460	474	487	501	515	528	542	556	569	583	597	624	638
6.5	788	597	615	632	649	667	684	701	719	736	753	771	805	823
7.0	997	759	781	802	824	846	867	889	911	932	954	975	1019	1040
7.5	1231	941	967	994	1020	1046	1073	1099	1126	1152	1178	1204	1257	1283
8.0	1476	1133	1164	1196	1227	1258	1289	1320	1352	1383	1414	1445	1507	1538
8.5	1708	1317	1353	1389	1424	1460	1496	1531	1567	1602	1638	1673	1743	1778
9.0	1921	1487	1527	1566	1606	1646	1686	1725	1765	1804	1843	1882	1959	1998
9.5	2124	1650	1693	1737	1781	1824	1867	1910	1953	1996	2039	2081	2166	2208
10.0	2318	1806	1853	1900	1947	1995	2041	2088	2134	2180	2226	2272	2362	2407
10.5	2504	1960	2011	2061	2112	2163	2213	2262	2312	2362	2409	2457	2548	2592
11.0	2670	2128	2181	2235	2288	2342	2391	2440	2489	2539	2582	2626	2708	2746
11.5	2829	2316	2370	2424	2478	2532	2579	2625	2672	2718	2755	2792	2859	2889
12.0	2978	2556	2604	2652	2701	2749	2786	2823	2860	2897	2924	2951	2998	3018
12.5	3111	2835	2872	2909	2946	2983	3005	3027	3050	3072	3085	3098	3120	3128
13.0	3206	3074	3095	3116	3137	3158	3166	3175	3184	3193	3198	3202	3208	3210
13.5	3280	3220	3230	3239	3249	3258	3262	3266	3270	3274	3276	3278	3281	3283
14.0	3364	3342	3346	3350	3355	3359	3360	3361	3362	3363	3363	3364	3364	3365
14.5	3437	3430	3432	3433	3435	3436	3437	3437	3437	3437	3437	3437	3437	3437
15.0	3497	3495	3496	3496	3497	3497	3497	3497	3497	3497	3497	3497	3497	3498
15.5	3550	3548	3548	3548	3548	3549	3549	3549	3549	3549	3549	3550	3550	3550
16.0	3592	3590	3590	3590	3590	3591	3591	3591	3591	3591	3591	3592	3592	3592
16.5	3630	3627	3628	3628	3628	3628	3628	3629	3629	3629	3629	3629	3630	3630
17.0	3666	3663	3664	3664	3664	3665	3665	3665	3665	3666	3666	3666	3667	3667
17.5	3700	3696	3696	3697	3697	3698	3698	3698	3698	3699	3699	3699	3700	3700
18.0	3736	3733	3733	3733	3734	3734	3734	3735	3735	3736	3736	3736	3736	3737
18.5	3769	3766	3766	3766	3766	3767	3767	3767	3768	3768	3768	3768	3769	3769
19.0	3794	3791	3792	3792	3792	3792	3793	3793	3793	3794	3794	3794	3795	3795
19.5	3817	3814	3814	3814	3815	3815	3815	3816	3816	3816	3816	3817	3817	3818
20.0	3838	3835	3835	3836	3836	3837	3837	3837	3837	3838	3838	3838	3839	3839
20.5	3858	3855	3856	3856	3856	3857	3857	3857	3858	3858	3858	3858	3859	3859
21.0	3878	3874	3875	3875	3875	3875	3876	3876	3876	3877	3877	3877	3878	3878
21.5	3894	3890	3890	3891	3891	3892	3892	3892	3892	3893	3893	3893	3894	3894
22.0	3909	3906	3906	3906	3907	3907	3907	3907	3908	3908	3908	3908	3909	3909
22.5	3923	3920	3921	3921	3921	3922	3922	3922	3923	3923	3923	3923	3923	3924
23.0	3937	3934	3934	3934	3935	3935	3935	3936	3936	3936	3936	3937	3937	3937
23.5	3949	3946	3946	3947	3947	3947	3948	3948	3948	3948	3949	3949	3949	3950
24.0	3960	3957	3957	3957	3958	3958	3958	3958	3959	3959	3959	3959	3960	3960
24.5	3968	3965	3966	3966	3966	3966	3967	3967	3967	3967	3968	3968	3968	3968
25.0	3976	3974	3974	3974	3974	3975	3975	3975	3975	3976	3976	3976	3976	3976

Table 14-1: Power curve, Sound Optimized Mode SO3

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

RESTRICTED

Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Sound
Optimized Mode SO3

Date: 2017-11-29
Restricted
Page 36 of 40

14.2   Ct Values, Sound Optimized Mode SO3

Air density kg/m³													
Wind speed [m/s]	**1.225**	**0.950**	**0.975**	**1.0**	**1.025**	**1.05**	**1.075**	**1.1**	**1.125**	**1.15**	**1.175**	**1.2**	**1.25**	**1.275**
3.0	**0.880**	0.885	0.885	0.885	0.884	0.884	0.883	0.883	0.882	0.881	0.881	0.880	0.879	0.879
3.5	**0.870**	0.875	0.875	0.874	0.874	0.873	0.873	0.872	0.872	0.871	0.871	0.870	0.870	0.869
4.0	**0.838**	0.842	0.842	0.841	0.841	0.841	0.840	0.840	0.839	0.839	0.839	0.838	0.837	0.837
4.5	**0.813**	0.814	0.814	0.813	0.813	0.812	0.812	0.812	0.812	0.813	0.813	0.813	0.813	0.812
5.0	**0.812**	0.811	0.811	0.811	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812
5.5	**0.812**	0.814	0.814	0.814	0.814	0.814	0.814	0.813	0.813	0.813	0.813	0.812	0.812	0.811
6.0	**0.807**	0.811	0.811	0.811	0.810	0.810	0.810	0.809	0.809	0.809	0.808	0.808	0.807	0.807
6.5	**0.807**	0.811	0.811	0.810	0.810	0.810	0.809	0.809	0.808	0.808	0.808	0.807	0.806	0.806
7.0	**0.805**	0.810	0.810	0.809	0.809	0.808	0.808	0.807	0.807	0.806	0.806	0.805	0.804	0.804
7.5	**0.793**	0.799	0.798	0.798	0.797	0.797	0.796	0.796	0.795	0.794	0.794	0.793	0.792	0.791
8.0	**0.746**	0.752	0.751	0.751	0.750	0.750	0.749	0.749	0.748	0.748	0.747	0.746	0.745	0.745
8.5	**0.674**	0.680	0.679	0.679	0.678	0.678	0.677	0.677	0.676	0.676	0.675	0.675	0.674	0.673
9.0	**0.604**	0.609	0.609	0.608	0.608	0.607	0.607	0.606	0.606	0.605	0.605	0.604	0.603	0.603
9.5	**0.545**	0.550	0.549	0.549	0.548	0.548	0.547	0.547	0.546	0.546	0.546	0.545	0.544	0.544
10.0	**0.495**	0.500	0.499	0.499	0.498	0.498	0.497	0.497	0.497	0.496	0.496	0.495	0.494	0.493
10.5	**0.452**	0.457	0.457	0.457	0.456	0.456	0.455	0.455	0.455	0.454	0.453	0.453	0.450	0.449
11.0	**0.411**	0.424	0.424	0.423	0.422	0.422	0.420	0.419	0.418	0.417	0.415	0.413	0.408	0.405
11.5	**0.375**	0.399	0.398	0.397	0.396	0.394	0.392	0.390	0.387	0.385	0.382	0.379	0.371	0.367
12.0	**0.344**	0.388	0.385	0.381	0.378	0.375	0.371	0.366	0.362	0.358	0.353	0.348	0.338	0.333
12.5	**0.315**	0.383	0.377	0.371	0.365	0.359	0.353	0.346	0.340	0.334	0.327	0.321	0.309	0.302
13.0	**0.285**	0.369	0.361	0.353	0.344	0.336	0.328	0.321	0.313	0.305	0.299	0.292	0.279	0.273
13.5	**0.259**	0.342	0.333	0.324	0.315	0.307	0.299	0.292	0.285	0.277	0.271	0.265	0.253	0.248
14.0	**0.236**	0.314	0.306	0.297	0.289	0.281	0.274	0.267	0.260	0.253	0.248	0.242	0.231	0.226
14.5	**0.216**	0.287	0.279	0.271	0.264	0.256	0.250	0.244	0.237	0.231	0.226	0.221	0.212	0.207
15.0	**0.197**	0.260	0.253	0.246	0.239	0.232	0.227	0.221	0.216	0.210	0.206	0.201	0.193	0.189
15.5	**0.180**	0.237	0.231	0.224	0.218	0.212	0.207	0.202	0.197	0.192	0.188	0.184	0.177	0.173
16.0	**0.165**	0.216	0.211	0.205	0.200	0.194	0.190	0.185	0.181	0.176	0.173	0.169	0.162	0.159
16.5	**0.152**	0.198	0.193	0.188	0.183	0.178	0.174	0.170	0.166	0.162	0.159	0.155	0.149	0.146
17.0	**0.140**	0.182	0.177	0.173	0.168	0.164	0.160	0.157	0.153	0.149	0.146	0.143	0.138	0.135
17.5	**0.130**	0.168	0.163	0.159	0.155	0.151	0.148	0.145	0.141	0.138	0.135	0.132	0.127	0.125
18.0	**0.120**	0.155	0.151	0.148	0.144	0.140	0.137	0.134	0.131	0.128	0.125	0.123	0.118	0.116
18.5	**0.112**	0.144	0.140	0.137	0.134	0.130	0.127	0.125	0.122	0.119	0.117	0.114	0.110	0.108
19.0	**0.104**	0.133	0.130	0.127	0.123	0.120	0.118	0.115	0.113	0.110	0.108	0.106	0.102	0.100
19.5	**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
20.0	**0.090**	0.115	0.112	0.110	0.107	0.104	0.102	0.100	0.098	0.096	0.094	0.092	0.089	0.087
20.5	**0.084**	0.107	0.105	0.103	0.100	0.098	0.096	0.094	0.092	0.090	0.088	0.086	0.083	0.081
21.0	**0.079**	0.101	0.098	0.096	0.094	0.091	0.090	0.088	0.086	0.084	0.082	0.081	0.078	0.076
21.5	**0.075**	0.095	0.093	0.091	0.089	0.086	0.085	0.083	0.081	0.079	0.078	0.076	0.074	0.072
22.0	**0.071**	0.089	0.087	0.085	0.083	0.081	0.080	0.078	0.076	0.075	0.073	0.072	0.069	0.068
22.5	**0.066**	0.084	0.082	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.068	0.065	0.064
23.0	**0.062**	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
23.5	**0.059**	0.074	0.072	0.071	0.069	0.068	0.066	0.065	0.064	0.062	0.061	0.060	0.058	0.057
24.0	**0.056**	0.070	0.068	0.067	0.065	0.064	0.063	0.061	0.060	0.059	0.058	0.057	0.055	0.054
24.5	**0.053**	0.066	0.065	0.063	0.062	0.060	0.059	0.058	0.057	0.056	0.055	0.054	0.052	0.051
25.0	**0.050**	0.062	0.061	0.060	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.049	0.048

Table 14-2: C_t values, Sound Optimized Mode SO3

Vestas

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

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Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, Sound
Optimized Mode SO3

Date: 2017-11-29
Restricted
Page 37 of 40

14.3 Sound Curves, Sound Optimized Mode SO3

Sound Power Level at Hub Height	
Conditions for Sound Power Level:	**Measurement standard IEC 61400-11 ed. 3** **Maximum turbulence at hub height: 30%** **Inflow angle (vertical): 0 ±2°** **Air density: 1.225 kg/m^3**
Wind speed at hub height [m/s]	**Sound Power Level at Hub Height [dBA]** **Sound Optimized Mode SO3 (Blades with serrated trailing edge)**
3	92.2
4	92.8
5	94.0
6	97.0
7	99.8
8	100.8
9	101.0
10	101.0
11	101.0
12	101.0
13	101.0
14	101.0
15	101.0
16	101.0
17	101.0
18	101.0
19	101.0
20	101.0

Table 14-3: Sound curves, Sound Optimized Mode SO3

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

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Document no.: 0067-7063 V03
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Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, SO3 (HWO)

Date: 2017-11-29
Restricted
Page 38 of 40

15 Power Curves, Ct Values and Sound Curves, SO3 (HWO)

15.1 Power Curves, SO3 (HWO)

Wind speed [m/s]	Air density [kg/m³]													
	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	12	4	5	5	6	7	7	8	9	9	10	11	13	14
3.5	65	38	41	43	46	48	50	53	55	58	60	63	68	70
4.0	140	96	100	104	108	112	116	120	124	128	132	136	144	148
4.5	230	166	172	178	184	190	195	201	207	213	218	224	236	242
5.0	336	248	256	264	272	280	288	296	304	312	320	328	344	351
5.5	460	344	355	365	376	386	397	407	418	429	439	450	471	481
6.0	610	460	474	487	501	515	528	542	556	569	583	597	624	638
6.5	788	597	615	632	649	667	684	701	719	736	753	771	805	823
7.0	997	759	781	802	824	846	867	889	911	932	954	975	1019	1040
7.5	1231	941	967	994	1020	1046	1073	1099	1126	1152	1178	1204	1257	1283
8.0	1476	1133	1164	1196	1227	1258	1289	1320	1352	1383	1414	1445	1507	1538
8.5	1708	1317	1353	1389	1424	1460	1496	1531	1567	1602	1638	1673	1743	1778
9.0	1921	1487	1527	1566	1606	1646	1686	1725	1765	1804	1843	1882	1959	1998
9.5	2124	1650	1693	1737	1781	1824	1867	1910	1953	1996	2039	2081	2166	2208
10.0	2318	1806	1853	1900	1947	1995	2041	2088	2134	2180	2226	2272	2362	2407
10.5	2504	1960	2011	2061	2112	2163	2213	2262	2312	2362	2409	2457	2548	2592
11.0	2670	2128	2181	2235	2288	2342	2391	2440	2489	2539	2582	2626	2708	2746
11.5	2829	2316	2370	2424	2478	2532	2579	2625	2672	2718	2755	2792	2859	2889
12.0	2978	2556	2604	2652	2701	2749	2786	2823	2860	2897	2924	2951	2998	3018
12.5	3111	2835	2872	2909	2946	2983	3005	3027	3050	3072	3085	3098	3120	3128
13.0	3206	3074	3095	3116	3137	3158	3166	3175	3184	3193	3198	3202	3208	3210
13.5	3280	3220	3230	3239	3249	3258	3262	3266	3270	3274	3276	3278	3281	3283
14.0	3364	3342	3346	3350	3355	3359	3360	3361	3362	3363	3363	3364	3364	3365
14.5	3437	3430	3432	3433	3435	3436	3437	3437	3437	3437	3437	3437	3437	3437
15.0	3497	3495	3496	3496	3497	3497	3497	3497	3497	3497	3497	3497	3497	3498
15.5	3550	3548	3548	3548	3548	3549	3549	3549	3549	3549	3549	3550	3550	3550
16.0	3592	3590	3590	3590	3590	3591	3591	3591	3591	3591	3591	3592	3592	3592
16.5	3630	3627	3628	3628	3628	3628	3628	3629	3629	3629	3629	3629	3630	3630
17.0	3666	3663	3664	3664	3664	3665	3665	3665	3665	3666	3666	3666	3667	3667
17.5	3700	3696	3696	3697	3697	3698	3698	3698	3698	3699	3699	3699	3700	3700
18.0	3736	3733	3733	3733	3734	3734	3734	3735	3735	3736	3736	3736	3736	3737
18.5	3769	3766	3766	3766	3766	3767	3767	3767	3768	3768	3768	3768	3769	3769
19.0	3794	3791	3792	3792	3792	3792	3793	3793	3793	3794	3794	3794	3795	3795
19.5	3817	3814	3814	3814	3815	3815	3815	3816	3816	3816	3816	3817	3817	3818
20.0	3838	3835	3835	3836	3836	3837	3837	3837	3837	3838	3838	3838	3839	3839
20.5	3858	3855	3856	3856	3856	3857	3857	3857	3858	3858	3858	3858	3859	3859
21.0	3878	3874	3875	3875	3875	3875	3876	3876	3876	3877	3877	3877	3878	3878
21.5	3894	3890	3890	3891	3891	3892	3892	3892	3892	3893	3893	3893	3894	3894
22.0	3909	3906	3906	3906	3907	3907	3907	3907	3908	3908	3908	3908	3909	3909
22.5	3923	3920	3921	3921	3921	3922	3922	3922	3922	3923	3923	3923	3923	3924
23.0	3937	3934	3934	3934	3935	3935	3935	3936	3936	3936	3936	3937	3937	3937
23.5	3949	3946	3946	3947	3947	3947	3948	3948	3948	3948	3949	3949	3949	3950
24.0	3958	3955	3956	3956	3956	3957	3957	3957	3957	3958	3958	3958	3958	3958
24.5	3954	3951	3952	3952	3952	3952	3953	3953	3953	3954	3954	3954	3954	3955
25.0	3931	3928	3928	3928	3929	3929	3929	3930	3930	3930	3930	3931	3931	3931
25.5	3876	3873	3874	3874	3874	3875	3875	3875	3876	3876	3876	3876	3877	3877
26.0	3800	3797	3797	3798	3798	3798	3799	3799	3799	3799	3800	3800	3800	3800
26.5	3697	3694	3694	3695	3695	3695	3696	3696	3696	3696	3697	3697	3697	3697
27.0	3572	3570	3570	3570	3571	3571	3571	3571	3572	3572	3572	3572	3573	3573
27.5	3412	3409	3410	3410	3410	3410	3410	3411	3411	3411	3411	3411	3412	3412
28.0	3214	3213	3213	3213	3213	3214	3214	3214	3214	3214	3214	3214	3214	3214
28.5	2985	2984	2984	2984	2985	2985	2985	2985	2985	2985	2985	2985	2985	2985
29.0	2732	2732	2732	2732	2732	2732	2732	2732	2732	2732	2732	2732	2732	2732
29.5	2482	2481	2481	2481	2481	2481	2481	2482	2482	2482	2482	2482	2482	2482
30.0	2303	2303	2303	2303	2303	2303	2303	2303	2303	2303	2303	2303	2303	2303

Table 15-1: Power curve, SO3 (HWO)

RESTRICTED

Document no.: 0067-7063 V03		Date: 2017-11-29
Document owner: Platform Management	Performance Specification V117-4.0/4.2 MW 50/60 Hz	Restricted
Type: T05 - General Description	Power Curves, Ct Values and Sound Curves, SO3 (HWO)	Page 39 of 40

15.2   Ct Values, SO3 (HWO)

Air density kg/m³													
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	0.880	0.885	0.885	0.885	0.884	0.884	0.883	0.883	0.882	0.881	0.881	0.880	0.879	0.879
3.5	0.870	0.875	0.875	0.874	0.874	0.873	0.873	0.872	0.872	0.871	0.871	0.870	0.870	0.869
4.0	0.838	0.842	0.842	0.841	0.841	0.841	0.840	0.840	0.839	0.839	0.839	0.838	0.837	0.837
4.5	0.813	0.814	0.814	0.813	0.813	0.812	0.812	0.812	0.812	0.813	0.813	0.813	0.813	0.812
5.0	0.812	0.811	0.811	0.811	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812	0.812
5.5	0.812	0.814	0.814	0.814	0.814	0.814	0.814	0.813	0.813	0.813	0.813	0.812	0.812	0.811
6.0	0.807	0.811	0.811	0.811	0.810	0.810	0.810	0.809	0.809	0.809	0.808	0.808	0.807	0.807
6.5	0.807	0.811	0.811	0.810	0.810	0.810	0.809	0.809	0.808	0.808	0.808	0.807	0.806	0.806
7.0	0.805	0.810	0.810	0.809	0.809	0.808	0.808	0.807	0.807	0.806	0.806	0.805	0.804	0.804
7.5	0.793	0.799	0.798	0.798	0.797	0.797	0.796	0.796	0.795	0.794	0.794	0.793	0.792	0.791
8.0	0.746	0.752	0.751	0.751	0.750	0.750	0.749	0.749	0.748	0.748	0.747	0.746	0.745	0.745
8.5	0.674	0.680	0.679	0.679	0.678	0.678	0.677	0.677	0.676	0.676	0.675	0.675	0.674	0.673
9.0	0.604	0.609	0.609	0.608	0.608	0.607	0.607	0.606	0.606	0.605	0.605	0.604	0.603	0.603
9.5	0.545	0.550	0.549	0.549	0.548	0.548	0.547	0.547	0.546	0.546	0.546	0.545	0.544	0.544
10.0	0.495	0.500	0.499	0.499	0.498	0.498	0.497	0.497	0.497	0.496	0.496	0.495	0.494	0.493
10.5	0.452	0.457	0.457	0.457	0.456	0.456	0.455	0.455	0.455	0.454	0.453	0.453	0.450	0.449
11.0	0.411	0.424	0.424	0.423	0.422	0.422	0.420	0.419	0.418	0.417	0.415	0.413	0.408	0.405
11.5	0.375	0.399	0.398	0.397	0.396	0.394	0.392	0.390	0.387	0.385	0.382	0.379	0.371	0.367
12.0	0.344	0.388	0.385	0.381	0.378	0.375	0.371	0.366	0.362	0.358	0.353	0.348	0.338	0.333
12.5	0.315	0.383	0.377	0.371	0.365	0.359	0.353	0.346	0.340	0.334	0.327	0.321	0.309	0.302
13.0	0.285	0.369	0.361	0.353	0.344	0.336	0.328	0.321	0.313	0.305	0.299	0.292	0.279	0.273
13.5	0.259	0.342	0.333	0.324	0.315	0.307	0.299	0.292	0.285	0.277	0.271	0.265	0.253	0.248
14.0	0.236	0.314	0.306	0.297	0.289	0.281	0.274	0.267	0.260	0.253	0.248	0.242	0.231	0.226
14.5	0.216	0.287	0.279	0.271	0.264	0.256	0.250	0.244	0.237	0.231	0.226	0.221	0.212	0.207
15.0	0.197	0.260	0.253	0.246	0.239	0.232	0.227	0.221	0.216	0.210	0.206	0.201	0.193	0.189
15.5	0.180	0.237	0.231	0.224	0.218	0.212	0.207	0.202	0.197	0.192	0.188	0.184	0.177	0.173
16.0	0.165	0.216	0.211	0.205	0.200	0.194	0.190	0.185	0.181	0.176	0.173	0.169	0.162	0.159
16.5	0.152	0.198	0.193	0.188	0.183	0.178	0.174	0.170	0.166	0.162	0.159	0.155	0.149	0.146
17.0	0.140	0.182	0.177	0.173	0.168	0.164	0.160	0.157	0.153	0.149	0.146	0.143	0.138	0.135
17.5	0.130	0.168	0.163	0.159	0.155	0.151	0.148	0.145	0.141	0.138	0.135	0.132	0.127	0.125
18.0	0.120	0.155	0.151	0.148	0.144	0.140	0.137	0.134	0.131	0.128	0.125	0.123	0.118	0.116
18.5	0.112	0.144	0.140	0.137	0.134	0.130	0.127	0.125	0.122	0.119	0.117	0.114	0.110	0.108
19.0	0.104	0.133	0.130	0.127	0.123	0.120	0.118	0.115	0.113	0.110	0.108	0.106	0.102	0.100
19.5	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
20.0	0.090	0.115	0.112	0.110	0.107	0.104	0.102	0.100	0.098	0.096	0.094	0.092	0.089	0.087
20.5	0.084	0.107	0.105	0.103	0.100	0.098	0.096	0.094	0.092	0.090	0.088	0.086	0.083	0.081
21.0	0.079	0.101	0.098	0.096	0.094	0.091	0.090	0.088	0.086	0.084	0.082	0.081	0.078	0.076
21.5	0.075	0.095	0.093	0.091	0.089	0.086	0.085	0.083	0.081	0.079	0.078	0.076	0.074	0.072
22.0	0.071	0.089	0.087	0.085	0.083	0.081	0.080	0.078	0.076	0.075	0.073	0.072	0.069	0.068
22.5	0.066	0.084	0.082	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.068	0.065	0.064
23.0	0.062	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
23.5	0.059	0.074	0.072	0.071	0.069	0.068	0.066	0.065	0.064	0.062	0.061	0.060	0.058	0.057
24.0	0.056	0.070	0.068	0.067	0.065	0.064	0.062	0.061	0.060	0.059	0.058	0.057	0.055	0.054
24.5	0.052	0.066	0.064	0.063	0.061	0.060	0.059	0.058	0.057	0.055	0.054	0.053	0.052	0.051
25.0	0.049	0.062	0.060	0.059	0.058	0.056	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.048
25.5	0.046	0.058	0.057	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045
26.0	0.043	0.054	0.053	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.045	0.044	0.042	0.042
26.5	0.040	0.050	0.049	0.048	0.046	0.045	0.045	0.044	0.043	0.042	0.041	0.041	0.039	0.039
27.0	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	0.035
27.5	0.033	0.041	0.041	0.040	0.039	0.038	0.037	0.037	0.036	0.035	0.035	0.034	0.033	0.032
28.0	0.030	0.037	0.037	0.036	0.035	0.034	0.034	0.033	0.032	0.032	0.031	0.031	0.030	0.029
28.5	0.027	0.033	0.033	0.032	0.031	0.030	0.030	0.029	0.029	0.028	0.028	0.027	0.026	0.026
29.0	0.024	0.029	0.029	0.028	0.027	0.027	0.026	0.026	0.025	0.025	0.025	0.024	0.023	0.023
29.5	0.021	0.026	0.025	0.025	0.024	0.024	0.023	0.023	0.022	0.022	0.022	0.021	0.021	0.020
30.0	0.019	0.023	0.022	0.022	0.022	0.021	0.021	0.020	0.020	0.020	0.019	0.019	0.019	0.018

Table 15-2: C$_t$ values, SO3 (HWO)

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

RESTRICTED

Document no.: 0067-7063 V03
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.0/4.2 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves, SO3 (HWO)

Date: 2017-11-29
Restricted
Page 40 of 40

15.3 Sound Curves, SO3 (HWO)

Sound Power Level at Hub Height	
Conditions for Sound Power Level:	**Measurement standard IEC 61400-11 ed. 3** **Maximum turbulence at hub height: 30%** **Inflow angle (vertical): 0 ±2°** **Air density: 1.225 kg/m^3**
Wind speed at hub height [m/s]	**Sound Power Level at Hub Height [dBA]** **SO3 (HWO) (Blades with serrated trailing edge)**
3	92.2
4	92.8
5	94.0
6	97.0
7	99.8
8	100.8
9	101.0
10	101.0
11	101.0
12	101.0
13	101.0
14	101.0
15	101.0
16	101.0
17	101.0
18	101.0
19	101.0
20	101.0

Table 15-3: Sound curves, SO3 (HWO)

Original Instruction: T05 0067-7063 VER 03

T05 0067-7063 Ver 03 - Approved - Exported from DMS: 2018-02-19 by FRPIC

PRYSMIAN
CABLES & SYSTEMS

Medium Voltage Systems

PRYSMIAN
CABLES & SYSTEMS

System Solution and Innovation
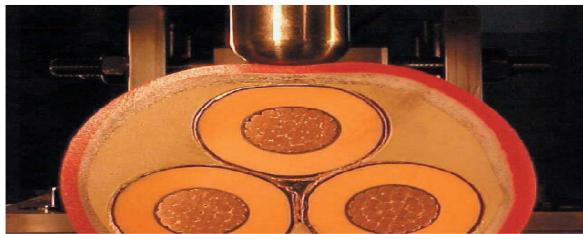
Prysmian is one of the worldwide leading players in the energy cable systems market, thanks to its innovative technological approach and to its capability in maintaining cost leadership, together with a strong commitment to Research and Development.

Extensive research has been conducted by Prysmian to provide solutions, which fully meet customers' requirements, with a strong focus on the development of competitive and reliable underground systems.
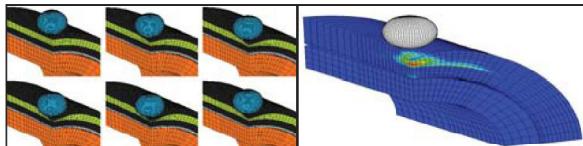
Prysmian dominates the technology scenario in all phases of power circuits development – engineering, design, production, installation and maintenance – with a turnkey approach, which covers the asset's entire lifetime and provides customers with the benefits of a lower total cost of ownership of the system.

Major Utilities are currently installing Pirelli power distribution solutions and exploiting their benefits.
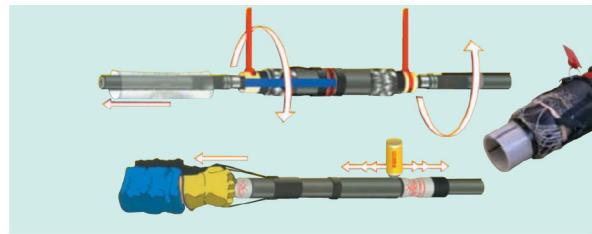
> AIR BAG™ Cable System

Prysmian has patented an innovative polymeric mechanical protection for cables, which, extended to accessories and installation aspects, has resulted into a new full system approach. This fully polymeric protection employed in the **Air Bag**™ cables absorbs impacts and reduces the risk of permanent deformations and damage to the sensitive underlying cable layers. Generally, **Air Bag**™ cable designs have reduced weights and dimensions, compared to traditional cables. This provides for significant economic advantages in terms of total system cost, allowing easier handling, longer delivery lengths and, therefore, a reduced need for joints. Another key advantage of the **Air Bag**™ Cable System is related to installation: **Air Bag**™ perfectly combines the new technologies applied to cables and accessories to exploit its innovative installation solutions at their best. **Air Bag**™ Cable Systems can be installed in simplified compact trenches with no need for sand, backfill selection and/or special external protections like tiles and pipes, thanks to its superior mechanical properties. Also mechanised installation technologies benefit of the exceptional robustness of **Air Bag**™, which allows quicker and more efficient operations.

> Elaspeed™ V1.2

Following the success of the original **Elaspeed**™ range, Prysmian has developed the second generation of these products, to further improve and speed up installation operations.

The new **Elaspeed**™ 1.2 joints adopt the well proven cold-shrink technique, combined with the acknowledged leadership of Prysmian EPDM rubber technology, and enhanced with innovative features:

- The new self-ejecting tube reduces risks of errors during the installation.
- The standardised mastic pads ensure correct positioning and optimal water tightness.
- The inner part of the joint body is pre-greased with silicone lubricant and allows a cleaner installation and better electrical performances.
- The new textile straps allow easier handling.

Most importantly, **Elaspeed**™ 1.2 joints allow checking and monitoring any single jointing operation, and ensure superior quality and reliability of the installation.
Elaspeed™ 1.2 joints are suitable for most applications and cable constructions, including transition jointing. They are available in **Air Bag**™ configuration to ensure full system mechanical protection and compatibility. All joints are 100% factory tested and comply with the strictest national and international standards.

> Microtunnelling

Environmental and social issues are nowadays putting strong pressure on the growing need for upgrading and renewing power distribution and transmission grids. In this scenario Prysmian dedicates its efforts to the development of new cable designs, which allow for optimised installation techniques. A typical example of this is **Air Bag**™ Microtunneling. The **Air Bag**™ Microtunnelling technique consists of two phases. Horizontal drilling is carried out by means of a drilling head with a remote control sensor placed inside of it. Constant radar monitoring allows to precisely track even highly complex routes. The **Air Bag**™ cable is laid with no additional protection pipes or ducts, which would instead be required by a standard cable, and installation time is reduced by up to 30 percent. This type of installation does not require to open trenches in the carriageway, thus minimising disruption inconveniences, and, thereby, cuts down all costs related to restoration of road surfaces and removal of excavation debris. Installation works are carried out with the same equipment commonly used for pipelines laying and require limited resources for handling. The **Air Bag**™ Microtunnelling technology proves to be very fast, easy and effective. Thanks to its minimum environmental impact, the system proposed by Prysmian is the perfect solution for the installation of power distribution lines in densely populated urban areas or in protected rural environments, such as parks and reserves. For installation operations carried out with innovative techniques and systems, such as Microtunnelling, Prysmian may offer to its customers full turn-key project consulting and supervision.

> New Services
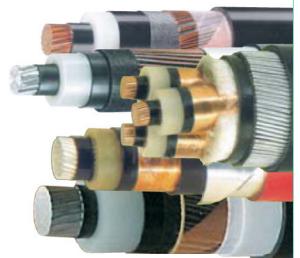
In addition to the innovative products resulted from our strong industrial background and technical expertise, we also offer to our customers fully integrated supply chain services.

The range includes:

• Cut-to-length
• Delivery to site
• Drum management
• Vendor Managed Inventory
• Order tracking
• E-business

All service packages are tailored to the real customer needs in order to optimise efficiencies and to continuously improve our relationship.

PRYSMIAN

About us

Prysmian Cables & Systems is a world-class multinational company. Founded in 1872 as "Ditta Pirelli & C.", it has achieved a leading position for more than a century of operations in its two key international markets – "Energy Cables & Systems" and "Telecom Cables & Systems".

Prysmian Cables and Systems is one of the worldwide leading manufacturer of power and telecommunications cables, with 52 manufacturing facilities in 21 countries in five continents and a market share in excess of 10%.

Prysmian Energy Cables and Systems is a global solutions provider, offering a wide range of integrated solutions, such as cable systems, system design and engineering, project management, installation and post-sale services.

Prysmian Energy Cables and Systems concentrates on continuous product innovation and on achieving a competitive edge by focusing on research and development. This is done through Prysmian's own R&D centres and by co-operating with universities, scientific institutions and above all, our customers. Prysmian's world-wide organisation makes and delivers advanced technological solutions to customers anywhere in the world.

Global
Solutions Provider
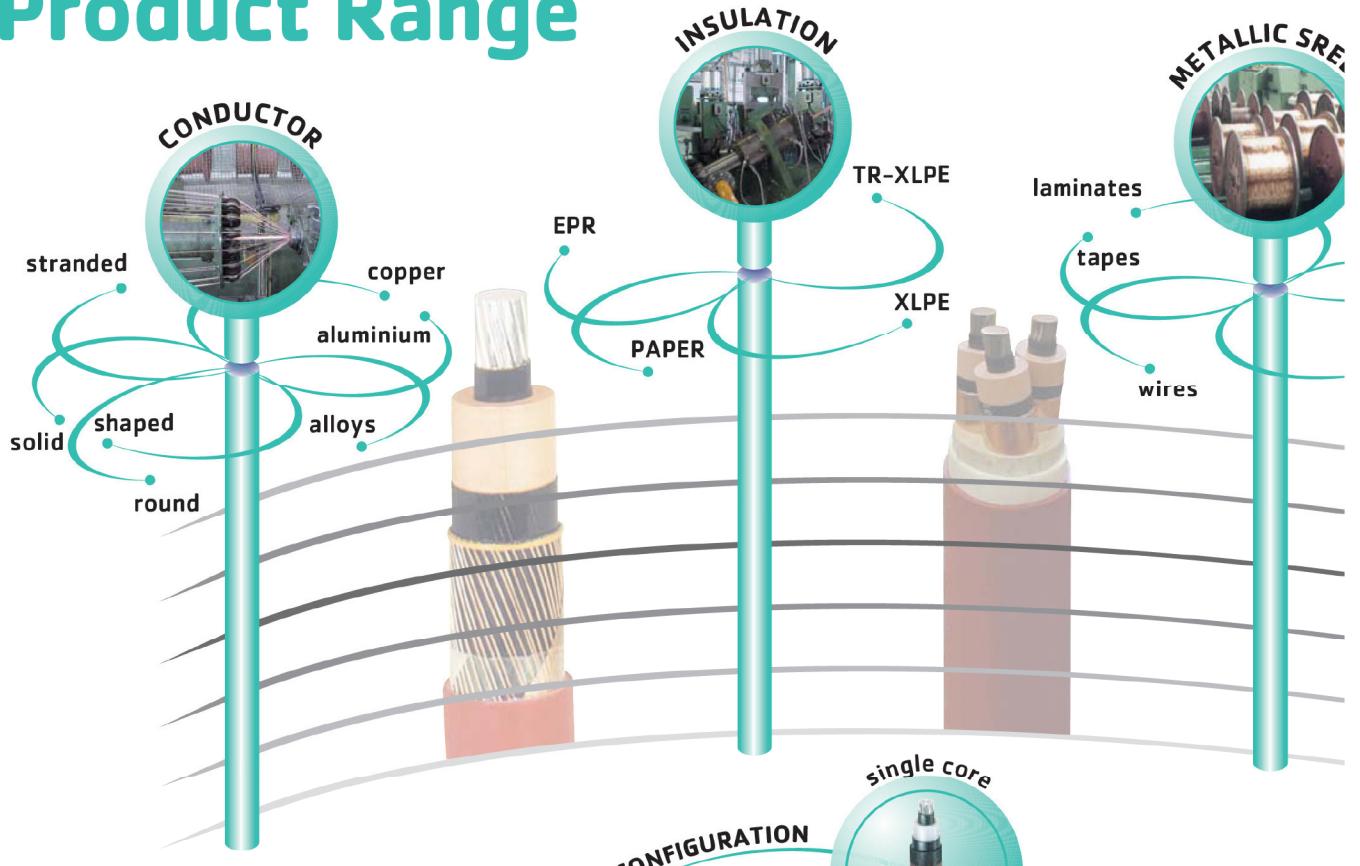
The energy market has been changing dramatically in recent years, as a result of deregulation and privatisation. To face the challenge of competition, energy transmission and distribution operators are driven towards an optimum use of their existing resources and new investments.

To support its customers, Prysmian has evolved over the years from the traditional role of cable manufacturer to that of a **Global Solution Provider**. Prysmian focuses on a total system approach, to give its customers the lowest cost of ownership of their new and installed cable networks.

This "Total System" approach is, at all voltages, the ultimate solution to provide power utilities with real advantages in terms of asset optimisation. Besides an increasing activity on product innovation to lower investment costs, Prysmian is developing additional pre and post sales services for its customers – e.g. network services, enhanced logistics, engineering studies – to optimise asset management and give the best possible exploitation of transmission and distribution networks.

PRYSMIAN
CABLES & SYSTEMS

Product Range

CONDUCTOR

- stranded
- copper
- aluminium
- shaped
- alloys
- solid
- round

INSULATION

- EPR
- TR–XLPE
- PAPER
- XLPE

METALLIC SRE...

- laminates
- tapes
- wires

CONFIGURATION

- single core
- three-core
- triplex
- three-core +
- messenger (aerial)
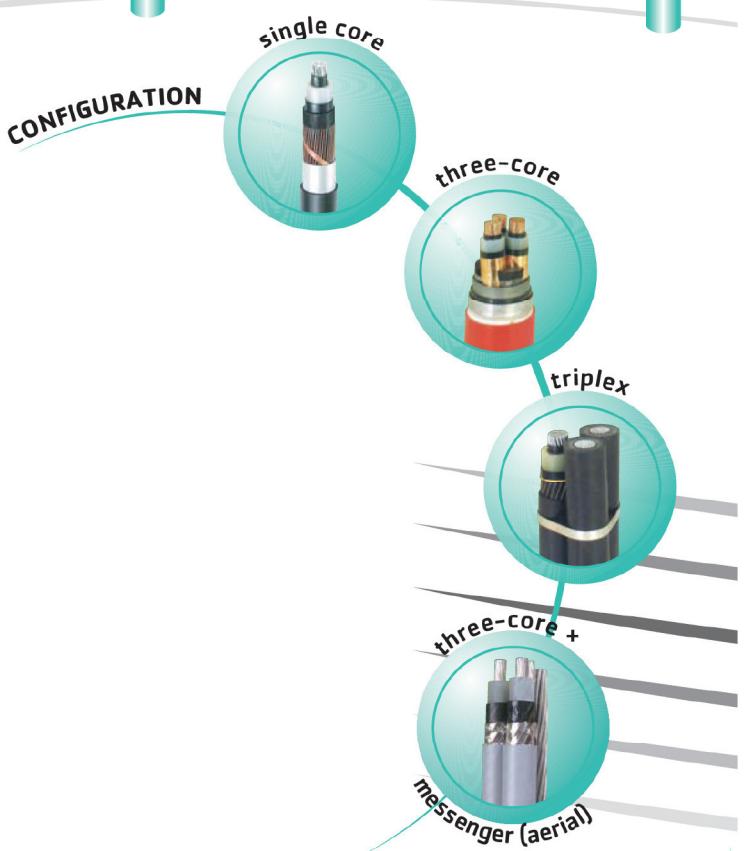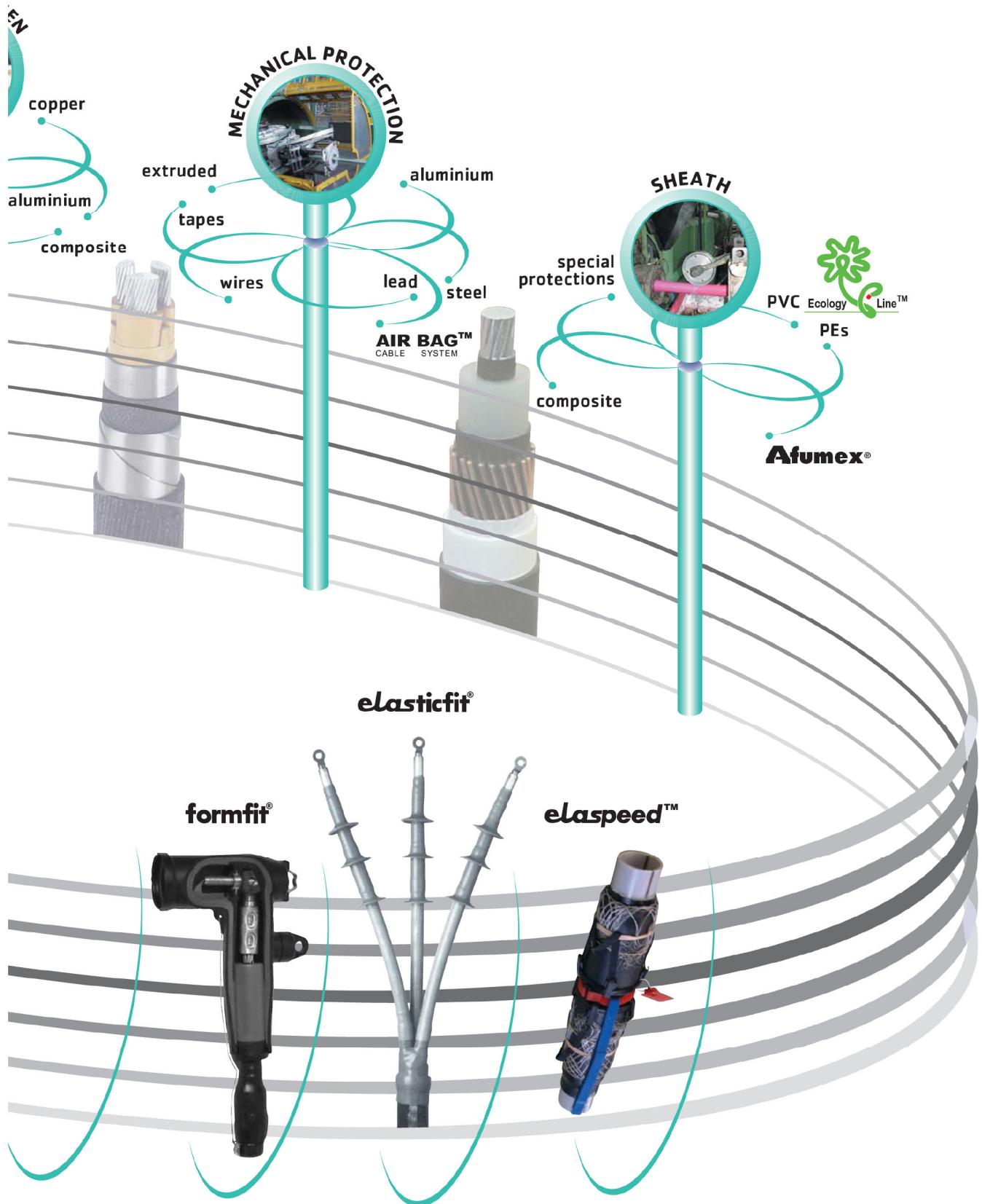
Prysmian is one of the worldwide leading players in the manufacture of an extensive range of cables, conductors, components and accessories for underground and overhead distribution systems. The adopted design and process technologies ensure continued service reliability and long term performance.

Cables can be supplied in single core, three-core or bundled formation, with solid/stranded, round/shaped, aluminium, copper or alloy conductors and different types of insulation materials (polymers, elastomers and paper). All cables incorporate a metallic screen, which may consist of wires, tapes or laminates of different materials (copper, aluminium, composite). Depending upon cable construction, the insulated cores are either individually or collectively screened. Where necessary water blocking elements can be included to limit moisture migration. Mechanical protection, where appropriate, is provided through alternative traditional metallic or innovative polymeric solutions. Outer sheaths and finishes are available in PVC, PE of different density, **Afumex®** materials – for a reduced emission of smoke and corrosive gases in the case of fire – and with special protections against termites and other boring insects.

Accessories play a vital role in a power system. Prysmian has gained expertise in the design, manufacture and testing of products across all voltages during many years of partnership with customers. Prysmian offers a comprehensive range of accessories for glanding, jointing, connecting and terminating. The range includes joints (also transition and trifurcating joints), terminations (for both indoor and outdoor use), connectors, glands, cleats and fixings, link boxes, tooling, fused equipment units and resins.

Prysmian also provides engineering services capable of fulfilling any power system specification or requirement and of delivering customised solutions.

copper

aluminium

composite

MECHANICAL PROTECTION

extruded

aluminium

tapes

wires

lead

steel

AIR BAG™
CABLE   SYSTEM

SHEATH

special
protections

PVC Ecology · Line™

PEs

composite

Afumex®

eLasticfit®

formfit®

eLaspeed™

PRYSMIAN
CABLES & SYSTEMS

Total
Quality Commitment

Prysmian is characterised by a competent and experienced approach to global solutions with state-of-the-art resources applied to research, engineering and manufacturing. Within the Prysmian Group, there are manufacturing facilities dedicated to the production of LV cables, accessories and components in all five continents, and a single business unit, which gathers all critical functions in a co-ordinated management structure with common operative policies. The main advantages of this organisation are: great manufacturing flexibility, strong engineering expertise, advanced services and **total quality commitment**.

The Prysmian brand has always been a guarantee for the supply of products and services based on worldwide excellence in quality standards. Prysmian has a built-in multi-step quality assurance program, which covers the entire production process from cable design and raw materials purchasing, to final inspection and testing documentation.
Prysmian business locations and manufacturing sites are certified according to **ISO 9001 Quality Management System standards** for their specific activities and products and **ISO 14001 Environmental Quality standards**.

Standards
and Recommendations

Prysmiam products are designed to comply with all major national and international standards (e.g. **IEC, CENELEC, BS, CEI, DIN VDE, ICEA, IRAM, NBR, NF, SABS, SFS, TSE, UNE, UTE, NBN, AEIC, ANSI, AS/NZS** etc.) and with customer's specific requirements.

Besides, thanks to an undisputed expertise developed over decades in servicing all major utilities anywhere in the world, Prysmian relies on a long-standing tradition of participation and on a strong presence within international scientific bodies— **IEC, CENELEC** and **AEIC** among others – to develop relevant standards, technical recommendations and guidelines.

References
Major Customers

Americas

Canada	Hydro Quebec, ENMAX, Toronto Hydro
USA	Nevada Power, Florida Power & Light, Georgia Power, Exelon, National Grid, ConEdison, Entergy, Detroit Edison, Keyspan, ...
Argentina	Edenor, Edesur,Epe de Santa Fé
Brazil	Coelba, Cosern, Coelce, Eletropaulo, Light, Eletronorte, ...
Chile	Chilectra, CGE
Colombia	Codensa, EEPM, ISA
Mexico	CFE, LyFC
Peru	Edelnor, Tecsur
Uruguay	UTE
Venezuela	Electricidad de Caracas

Africa and M. East

Algeria	Sonelgaz
Libya	GEC
Morocco	ONE
Nigeria	NEPA
Tunisia	STEG
South Africa	Eskom
Lebanon	EDL
Kuwait	MEW
U.A.E.	ADWEA, DEWA, SEWA, FEWA

Europe

Austria	Wienström, EVN
Belgium	Electrabel
Czech Republic	SME, JME, PRE, STE, ZCE
France	EDF
Germany	RWE, HEW, e.on, EnBW
Hungary	ELMU, ÉMÁSZ, DÉMÁSZ, DÉDÁSZ, TITÁSZ, ÉDÁSZ, MVM
Italy	Enel, ACEA, AEM Milano, ACEGAS Trieste, AEC Bolzano
Netherlands	NUON, TZH, ESSENT, ENECO, DELTA, REMU
Romania	Electrica SA, Transelectrica
Scandinavia	Wattenfall
Slovakia	ZSE, SSE, VSE
Spain	Iberdrola, Endesa, Union Fenosa
Turkey	TEIAS, TEDAS EDM
UK	Western Power Distribution, GPU, East Midlands Electricity, Scottish and Southern, National Grid, Scottish Power, NEDL, United Utilities, SEEB, 24 Seven, Northern Ireland Electricity, ...

Asia

Brunei	DES
China	Tianjin Power Bureau, Beijing PSB, Lahsa PSB, Qindao PSB, Daqing PSB, Shanghai PSB, Nanjing PSB...
Hong Kong	CLP Power, Hong kong Electric (HEC)
Malaysia	TNB, SESB, SESCO
Singapore	PowerGrid, Singapore Power
Thailand	MEA, PEA
Vietnam	HCMC PC, Hanoi PC

Australia

	Western Power, Integral Energy, Country Energy, Energy Australia,...

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