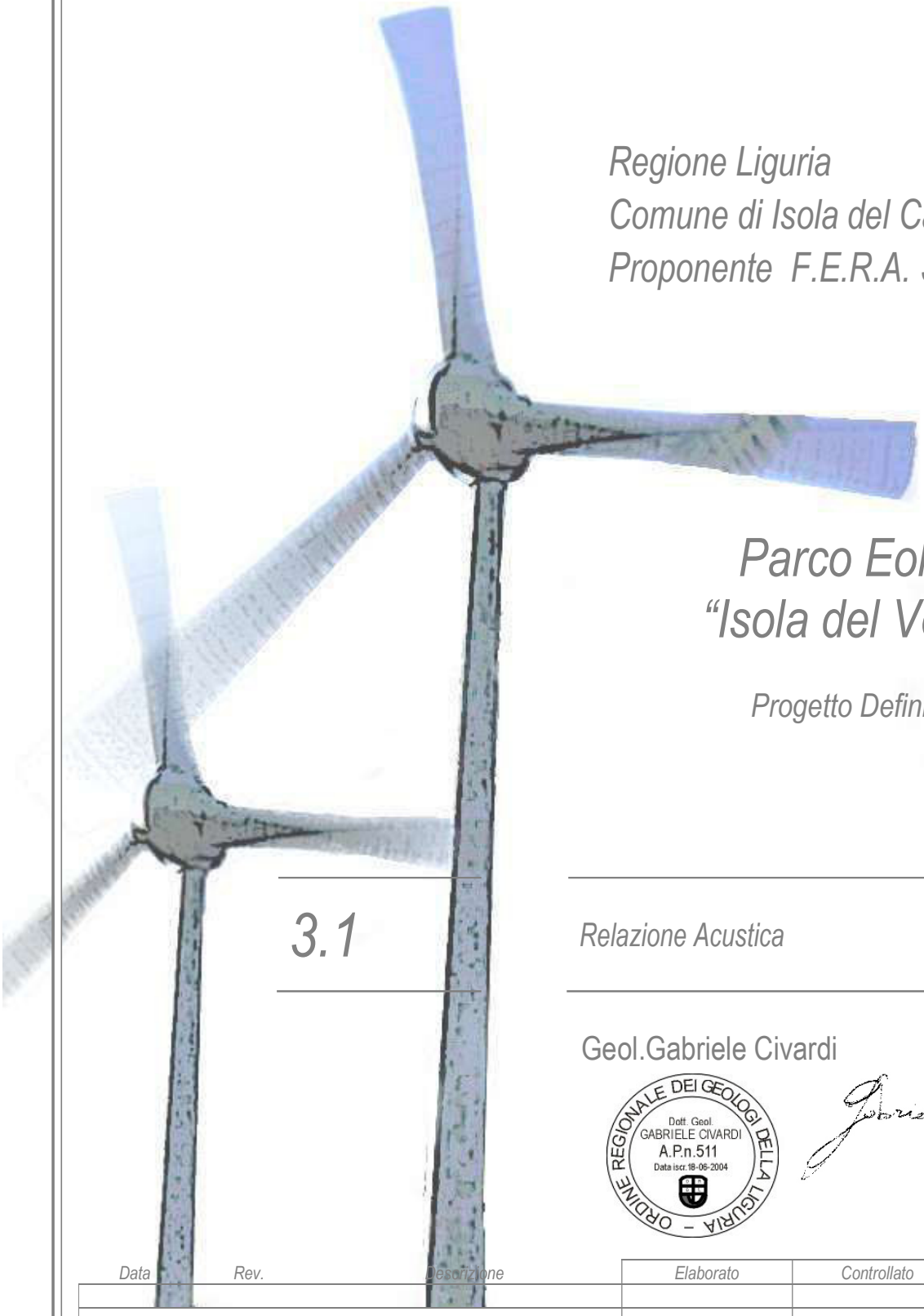
Firmato digitalmente da
Gabriele Civardi
CN = Gabriele Civardi
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Regione Liguria
Comune di Isola del Cantone (GE)
Proponente F.E.R.A. S.r.l.

Parco Eolico "Isola del Vento"

Progetto Definitivo

3.1

Relazione Acustica

Geol.Gabriele Civardi

ORDINE REGIONALE DEI GEOLOGI DELLA LIGURIA
Dott. Geol. GABRIELE CIVARDI
A.P.n.511
Data iscr. 18-06-2004

Data	*Rev.*	*Descrizione*	*Elaborato*	*Controllato*	*Approvato*
01.03.2024	Rev A	Prima emissione	G. Civardi	G. Civardi	G.Caroli

Comm. 88 ***Elaborato:*** ID2-3.1A_Relazione Acustica

E' vietata la riproduzione del presente documento, anche parziale, con qualsiasi mezzo, senza l'autorizzazione di F.E.R.A. srl.

DOTT. GEOL. GABRIELE CIVARDI
Geologia – Idrogeologia – Geofisica
Acustica ambientale
Sicurezza del lavoro

IMPIANTO EOLICO
"ISOLA DEL VENTO"
COMUNE DI ISOLA DEL CANTONE

Provincia di Genova

Oggetto:
Realizzazione impianto eolico all'interno del territorio comunale del Comune di Isola del Cantone denominato "ISOLA DEL VENTO"

Contenuto:
Valutazione previsionale di impatto acustico.

Committente:
F. E. R. A. Fabbrica Energie Rinnovabili Alternative S.r.l.

Data:
Febbraio 2024

N° lavoro
1280/A

STUDIO TECNICO DI GEOLOGIA
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INDICE

1 Premessa *3*

1.2 Recettori sensibili considerati e zonizzazione acustica **3**

2 Normativa di riferimento *4*

3 Caratterizzazione acustica del sito *5*

4 Caratteristica dell'attività insediativa. *6*

4.1 Attrezzature **6**

4.2 Potenziali ricettori **7**

5 Rilievi fonometrici *7*

5.1 Clima acustico stato 0 **7**

5.2 Postazioni di misura **8**

6 Verifica limiti assoluti *10*

7 Verifica limiti differenziali *11*

8 Conclusioni *13*

9 Grafici misure fonometriche *13*

Allegati:

- **Scheda aerogeneratore**
- **Corografia con individuazione aerogeneratori e ricettori sensibili considerati.**
- **Carta Isorumore**

1 PREMESSA

Con riferimento al progetto del parco eolico "*ISOLA DEL VENTO*" costituito da sei aerogeneratori per la produzione di energia elettrica da fonte rinnovabile, all'interno del territorio comunale di Isola del Cantone (GE), lo scrivente Dott. Geol. Gabriele Civardi, iscritto all'Ordine Regionale dei Geologi della Liguria al n° AP 511, tecnico competente in acustica ambientale (D.G.R.L. n° 1461 del 26/06/2005), è stato incaricato dalla Società F.E.R.A. S.r.l. di eseguire una valutazione previsionale di impatto acustico relativa alle emissioni sonore prodotte dai sei aerogeneratori.

Lo studio sarà svolto sulla traccia di quanto suggerito dalla normativa vigente in materia.

Lo scrivente tecnico si è recato sul posto per eseguire i necessari rilievi fonometrici sia in periodo diurno che in quello notturno.

La presente relazione rappresenta un rapporto su quanto rilevato e uno studio previsionale come richiesto dalla legislazione.

1.2 Recettori sensibili considerati e zonizzazione acustica

Dall'osservazione del Piano di Zonizzazione Acustica in vigore presso il Comune di Isola del Cantone, si è potuto verificare che la classe di destinazione d'uso del territorio, relativamente alla zona nella quale si inserisce il parco è una **zona III "area di tipo misto"**, in questo caso il valore massimo di immissione in Leq(A) è pari a 60 dBA nel periodo diurno e a 50 dBA nel periodo notturno.

Da una analisi svolta attraverso foto satellitari, sopralluoghi ed indagini catastali si sono identificati i seguenti recettori:

- R1 Loc. Cassine: si tratta di un edificio residenziale abitato;
- R2 Loc. Pinceto: si tratta di un edificio residenziale abitato;
- R3 Loc. Case Serre: sii tratta di un edificio residenziale abitato;
- R4: si tratta di un edificio residenziale abitato;
- R5: si tratta di un edificio residenziale abitato;
- R6 Loc. Giretta: si tratta di un edificio residenziale abitato.

Per maggiori dettagli si veda anche l'elaborato *ID2-3.2A_Distanza dai centri abitati e dalle abitazioni sparse.*

Dall'osservazione del Piano di Zonizzazione Acustica si è potuto verificare che la classe di destinazione d'uso del territorio è:

- ✓ recettore R1 **zona II "area di tipo residenziale";**
- ✓ recettore R2, R3, R6 **zona III "area di tipo misto";**
- ✓ recettore R4, R5 **zona IV "area di intensa attività umana.**

Si riporta in allegato uno stralcio cartografico con l'individuazione dei recettori sensibili considerati e dell'impianto.
Per maggiori dettagli si veda anche l'elaborato *ID2-3.3A_Layout su PCCA.*

2 NORMATIVA DI RIFERIMENTO

La redazione della presente valutazione tiene conto di quanto disposto dalla normativa di legge in materia di rumore ambientale ed in particolare di:

- ✓ Circolare n° 1769 datata 30.04.1966 del Ministero LL.PP. a titolo "Criteri di valutazione e collaudo dei requisiti acustici nelle costruzioni edilizie"
- ✓ D.P.C.M. 1.3.91 "Limiti massimi di esposizione al rumore negli ambienti abitativi e nell'ambiente esterno" G.U. n° 57 del 8/3/91 S.G.
- ✓ L.26.10.95 n° 447 "Legge quadro sull'inquinamento acustico", G.U. n° 254 del 30.10.95 S.G.
- ✓ D.M. 16.3.98 " Tecniche di rilevamento del rumore e metodologie di misura" G.U. n° 76 del 1.4.98
- ✓ D.P.C.M. 5.10.97 "Determinazione dei requisiti acustici passivi degli edifici" G.U. n° 297 del 22.10.97 S.G.
- ✓ D.P.C.M. 14/11/97 "Determinazione dei limiti di emissione di attenzione e di qualità" G.U. n° 280 del 1/12/97.
- ✓ **D.M. MiTE 1/6/2022 "Determinazione dei criteri per la misurazione del rumore emesso dagli impianti eolici e per il contenimento del relativo inquinamento acustico"**

Nelle sottoelencate tabella 1, 2 e 3 sono riportati rispettivamente i valori limite di emissione, di immissione e di qualità, così come definiti dal D.P.C.M. 14/11/97.

LIMITI MASSIMI Leq(A)		
	Tempi di riferimento	
Classe di destinazione d'uso del territorio	Diurno	Notturno
I - Aree particolarmente protette	45	35
II - Aree prevalentemente residenziali	50	40
III - Aree di tipo misto	55	45
IV - Aree di intensa attività umana	60	50
V - Aree prevalentemente industriali	65	55
VI - Aree esclusivamente industriali	65	65

Tabella 1 – valori limite di emissione ai sensi del D.P.C.M. 14/11/97 (art.2)

LIMITI MASSIMI Leq(A)		
	Tempi di riferimento	
Classe di destinazione d'uso del territorio	Diurno	Notturno
I - Aree particolarmente protette	50	40
II - Aree prevalentemente residenziali	55	45
III - Aree di tipo misto	60	50
IV - Aree di intensa attività umana	65	55
V - Aree prevalentemente industriali	70	60
VI - Aree esclusivamente industriali	70	70

Tabella 2 – valori limite di immissione ai sensi del D.P.C.M. 14/11/97 (art.3)

LIMITI MASSIMI Leq(A)		
	Tempi di riferimento	
Classe di destinazione d'uso del territorio	Diurno	Notturno
I - Aree particolarmente protette	47	37
II - Aree prevalentemente residenziali	52	42
III - Aree di tipo misto	57	47
IV - Aree di intensa attività umana	62	52
V - Aree prevalentemente industriali	67	57
VI - Aree esclusivamente industriali	70	70

Tabella 3 – valori limite di qualità ai sensi del D.P.C.M. 14/11/97 (art.7)

3 CARATTERIZZAZIONE ACUSTICA DEL SITO

L'area oggetto di intervento è situata lungo una linea di crinale che da Costa De Riatta si estende sino a Costa del Taglio, passando attraverso Bricco Grosso (748 m.s.l.m.) e Bricco Piccolo (695 m.s.l.m.).

Le principali fonti di rumore in ambiente rilevate dallo scrivente sono costituite:

✓ dal traffico veicolare che scorre sulla viabilità locale;

✓ dal rumore delle attività comportamentali del comparto.

In merito alla valutazione del clima acustico allo stato 0 e delle rilevazioni in sito si demanda al successivo capitolo.

4 CARATTERISTICA DELL'ATTIVITÀ INSEDIATIVA

Il progetto prevede la realizzazione di un *Parco Eolico* composto da sei aerogeneratori, aventi potenza nominale 4.500 kW ciascuno ed altezza al mozzo di 112 metri, collegati alla rete elettrica attraverso una sottostazione di trasformazione. Il collegamento del *Parco Eolico* alla sottostazione avverrà attraverso un cavidotto interrato di media tensione.

4.1 Attrezzature

Il *Parco eolico* è costituito da alcuni elementi che producono rumore, di cui di seguito viene fornito il dettaglio:

N°	Tipo di attrezzatura	Quantità	Unita' di misura	Livello di pressione sonora
1	Rotore in movimento	6	Leq dBA	103.9

Tabella 4 - Misure livello sonoro attrezzature più importanti in Leq [dB(A)]

I livelli di pressione sonora dei vari macchinari sono stati forniti dalla Vestas Italia, una delle più importanti Società che produce turbine eoliche e che abbiamo preso come riferimento in questa fase della progettazione. Come si può constatare dalla precedente tabella l'attrezzatura più rumorosa è rappresentata dal rotore in movimento dell'aerogeneratore. Facciamo presente come il modello di turbina sarà scelto dal proponente in una fase esecutiva della progettazione, ma comunque dovrà avere un livello di pressione sonora uguale o inferiore a quella considerata per questa valutazione acustica preliminare.

In particolare la rumorosità prodotta dal rotore dell'impianto è riferita ad una velocità del vento pari a circa 10 m/s. Tale rumorosità è la massima prevista ed inoltre dipende

dalla velocità del vento. Inoltre si deve considerare che maggiore è la velocità del vento, maggiore sarà il valore di rumore di fondo del comparto.
La cabina elettrica non conterrà strumentazioni rumorose e quindi non sarà oggetto di valutazione previsionale di impatto acustico.

4.2 Potenziali ricettori

Gli aerogeneratori non saranno sempre in funzione, ma si attiveranno solo in presenza del vento. In tali periodi potranno comunque funzionare nell'arco di tutta la giornata e quindi sia in periodo diurno che in quello notturno.
Gli edifici residenziali più vicini al Parco Eolico a progetto sono costituiti da sei edifici di civile abitazione (ricettore R1, R2, R3, R4, R5 ed R6) siti intorno all'area dell'impianto.
I ricettori sensibili più vicini sono pertanto definiti dagli abitanti delle case, sia per quanto concerne i limiti differenziali che per quelli assoluti.

5 RILIEVI FONOMETRICI

5.1 Clima acustico stato 0

Le determinazioni sono state effettuate in conformità alla normativa di cui al D.M. 16.3.98 tramite l'uso di:
fonometro integratore di classe 1, Larson & Davis, mod. 831, serial number 0004120, conforme alle ISO 10012, ANSI S1.4 1983 e ANSI S1.11 1986, IEC 651/1979, IEC 804/1985 type 1 e IEC 1260/1995 class 1, AINSI S1.11-1986 type 1D; centro di taratura LAT 146 certificato n° 15050 del 21.09.2022.
calibratore modello CAL200, serial number 12806; centro di taratura LAT 146 certificato n° 15052 del 27.09.2022.
Le misurazioni, in accordo con gli allegati del D.P.C.M. 1/3/91, sono state effettuate determinando il Livello sonoro equivalente (L_{EQ}) secondo la curva di ponderazione A, il L_{min}, L_{max}, L_p, grandezze considerate significative ai fini della caratterizzazione del clima acustico dell'unità immobiliare.
Le determinazioni sono state effettuate definendole nell'ambito di:
a) un tempo di riferimento T_r cioè collocando il fenomeno acustico nel periodo diurno

ovvero in quello notturno;

b) un tempo di osservazione T_o nel quale viene effettuata la misura;

c) un tempo di misura T_m pari al tempo d'integrazione.

Il tempo d'integrazione secondo quanto indicato negli allegati del citato D.P.C.M., varia normalmente da un minimo di 10" ad un massimo di 60", salvo casi particolari.

Le misurazioni sono state effettuate nel corso delle normali condizioni ambientali di traffico e attività umana sia in periodo diurno che in quello notturno.

Le condizioni meteorologiche erano caratterizzate da tempo sereno e comunque tali da non disturbare la misura.

Le misure sono state effettuate con la seguente procedura:

posizionamento del fonometro	a mt 1.50 di altezza dal suolo;
distanza del fonometro da superfici interferenti	> 1 mt;
tempo di osservazione diurno	dalle ore 9.00 alle ore 19.00 ;
tempo di osservazione notturno	dalle ore 22.00 alle ore 6.00 ;

Le misurazioni hanno fornito i valori trascritti in tabella 7. Qui di seguito è riportata una tabella contenente i periodi di misura come definiti dalla normativa vigente.

Tempi tempo di riferimento	Periodo diurno dalle ore 06.00 alle 22.00	Periodo notturno dalle ore 22.00 alle 06.00
tempo di osservazione	30'	30'
tempo di misura (ogni misura)	15'	15'

Tabella 6 - Periodi di misura

5.2 Postazioni di misura

Nel caso specifico sono stati rilevati i Leq di pressione sonora in curva A come segue:

- nei pressi delle unità immobiliari che si ritiene siano maggiormente esposte alle emissioni sonore derivanti dal *Parco Eolico* sia in periodo diurno che in quello notturno.

I grafici relativi alle misure più importanti si riportano in allegato.

Si riporta qui di seguito una tabella con la sintesi delle misure maggiormente significative. Le misure sono state arrotondate allo 0,5 dB(A) come previsto dal DM 16/3/1998.

Punto di misura	Descrizione misura	Leq dB(A)
1	Clima acustico presso R1 - Cassine (giorno)	48.0
2	Clima acustico presso R1 - Cassine (notte)	43.0
3	Clima acustico presso R2 - Pinceto (giorno)	42.0
4	Clima acustico presso R2 - Pinceto (notte)	39.0
5	Clima acustico presso R3 - Case Serre (giorno)	31.0
6	Clima acustico presso R3 - Case Serre (notte)	31.0
7	Clima acustico presso R4 (giorno)	56.0
8	Clima acustico presso R4 (notte)	44.0
9	Clima acustico presso R5 (giorno)	60.0
10	Clima acustico presso R5 (notte)	48.0
11	Clima acustico presso R6 - Giretta (giorno)	52.0
12	Clima acustico presso R6 - Giretta (notte)	48.0

Tabella 7 - Misure in ambiente esterno e interno in Leq [dB(A)]

Come previsto dal **D.M. MiTE 1/6/2022** per ogni recettore è stata svolta una caratterizzazione climatica. Le aree sono molto vicine tra loro e risentono delle medesime condizioni climatiche.

Le misure sono state svolte in assenza di precipitazioni.

Tramite un anemometro portatile sono state verificate e misurate le condizioni di ventosità nei pressi dei recettori: tutte le misure sono state effettuate in presenza di vento la cui velocità era compresa tra i 3 ed i 4 m/s e che quindi non era superiore ai limiti previsti dalla normativa per l'esecuzione delle misure in ambiente esterno.

6 VERIFICA LIMITI ASSOLUTI

Si è proceduto alla redazione di elaborati previsionali (curve isolivello) ottenute mediante software previsionale certificato, considerando nel modello previsionale la topografia, le condizioni atmosferiche e considerando per l'aerogeneratore una potenza acustica di **103.9 dB(A),** fornita dalla Vestas Italia, per una velocità del vento pari a 10 m/sec .

In particolare si è fatto uso del software IMMI della Wolfel Meβsysteme Softwere, specificatamente creato per la realizzazione di mappe di previsione del rumore.
Nel modello si è inserito un punto ricettore presso la facciata dei tre ricettori: la quota del recettore è stata inserita considerando l'ultimo piano dell'edificio.
Si riporta in allegato la mappa isolivello.

Limiti di emissione

Il valori di emissione ottenuti per i sei ricettori sono i seguenti:

Tipo ricettore	Emissione (dB)	Limite diurno/notturno (dB)	Superamento limiti
Edificio di civile abitazione sito in Loc. Cassine (**R1**)	37.9	50/40	Nessuno
Edificio di civile abitazione sito in Loc. Pinceto (**R2**)	36.08	55/45	Nessuno
Edificio di civile abitazione sito in Loc. Case Serre (**R3**)	38.38	55/45	Nessuno
Edificio di civile abitazione (**R4**)	35.57	60/50	Nessuno
Edificio di civile abitazione (**R5**)	35.8	60/50	Nessuno
Edificio di civile abitazione sito in Loc. Giretta (**R6**)	35.78	55/45	Nessuno

Non si evidenziano superi del limite assoluto di emissione.

Limiti di immissione

Sommando logaritmicamente il valore calcolato con il clima acustico misurato presso i sei ricettori in periodo diurno ed in periodo notturno si ricavano i seguenti risultati:

Tipo ricettore	Immissione diurna (dB)	Immissione notturna (dB)	Limite diurno/notturno (dB)	Superamento limiti
Edificio di civile abitazione sito in Loc. Cassine (**R1**)	48.4	44.2	55/45	Nessuno
Edificio di civile abitazione sito in Loc. Pinceto (**R2**)	43.0	40.8	60/50	Nessuno
Edificio di civile abitazione sito in Loc. Case Serre (**R3**)	39.1	39.1	60/50	Nessuno
Edificio di civile abitazione (**R4**)	56.0	44.6	u65/55	Nessuno
Edificio di civile abitazione (**R5**)	60.0	48.3	65/55	Nessuno
Edificio di civile abitazione sito in Loc. Giretta (**R6**)	52.1	48.3	60/50	Nessuno

Tali valori garantiscono il rispetto dei limiti imposti dalla normativa sia in periodo diurno che in quello notturno.

7 VERIFICA LIMITI DIFFERENZIALI

Il recente D.M. MiTE 1/6/2022 “Determinazione dei criteri per la misurazione del rumore emesso dagli impianti eolici e per il contenimento del relativo inquinamento acustico”, che precisa quanto segue: Art. 5, comma 1, lettera b): *≪Agli impianti eolici si applica il disposto di cui all’art. 4 del decreto del Presidente del Consiglio dei Ministri 14/11/1997, recante valori limite differenziali di immissione. In deroga alla richiamata disposizione, nel caso del rumore eolico le valutazioni vengono eseguite unicamente in facciata agli edifici e, pertanto, non trovano applicazione al verificarsi della sola condizione contenuta nella lett. a) del comma 2 dello stesso≫*.

Nella lett. a), comma 2 si indica che: *≪Le disposizioni di cui al comma precedente non si applicano nei seguenti casi, in quanto ogni effetto del rumore è da ritenersi trascurabile: se il rumore misurato a finestre aperte sia inferiore a 50 dB(A) durante il*

periodo diurno e 40 dB(A) durante il periodo notturno».

Dall'osservazione dei valori di immissione calcolati in facciata al capitolo precedente si può applicare il criterio differenziale per i soli recettori R1, R2, R4, R5 e R6.

I risultati per la verifica dei limiti differenziali diurni sono i seguenti.

Recettori	Rumore ambientale diurno	Rumore residuo diurno	Differenziale diurno	Superamento limite diurno (5 dB)
R1	48.8	48.0	0.8	0
R2	43.0	42.0	1	0
R4	56.0	56.0	0	0
R5	60.0	60.0	0	0
R6	52.1	52.0	0.1	0

I risultati per la verifica dei limiti differenziali notturni sono i seguenti.

Recettori	Rumore ambientale notturno	Rumore residuo notturno	Differenziale notturno	Superamento limite notturno (3 dB)
R1	44.2	43.0	1.2	0
R2	40.8	39.0	1.8	0
R4	44.6	44.0	0.6	0
R5	48.3	48.0	0.3	0
R6	48.3	48.0	0.3	0

Come dimostrano i valori riportati nelle precedenti tabelle il limite di immissione differenziale risulta rispettato.

8 CONCLUSIONI

La presente relazione si pone l'obiettivo di garantire che il *Parco Eolico* a progetto non produca nell'area circostante, apprezzabile inquinamento acustico ambientale e che non comprometta il clima acustico degli edifici più vicini.

Da quanto emerso nel corso delle indagini effettuate si è accertato che l'insediamento non produce, per quanto concerne il traffico veicolare, alcun mutamento rispetto alla situazione attuale.

In merito invece ai limiti massimi di emissione in ambiente previsti dalla zonizzazione acustica comunale si è constatato che per i ricettori non vengono superati.

Per quanto concerne i limiti differenziali nei confronti dei ricettori più prossimi, si è verificato che l'incremento differenziale non supera i livelli previsti dalla normativa, sia durante il periodo diurno che durante quello notturno.

Si conferma quindi che il *Parco Eolico* a progetto non produce emissioni rumorose che possono modificare negativamente il clima acustico degli edifici di civile abitazione ad esso più vicini.

Relativamente alle sole aree più prossime all'impianto si valuta che vi sarà un aumento della rumorosità che implicherà una modifica alla zonizzazione acustica del Comune di Isola del Cantone (GE) all'interno del quale verrà realizzato il parco. Si ribadisce che tale modifica, come previsto dalla norma vigente, dovrà essere valutata e redatta dal Comune interessato, anche se la Società proponente ha predisposto una proposta di variante della zonizzazione acustica (si veda a questo riguardo l'elaborato *ID2-3.4A_Proposta di variazione PCCA*).

Genova, Dicembre 2023

9 Grafici misure fonometriche

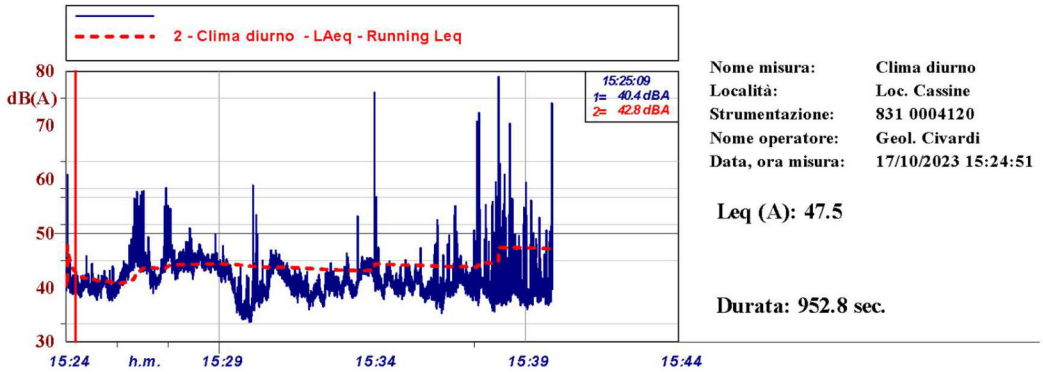


Grafico 1: T.H. del clima acustico diurno presso R1.

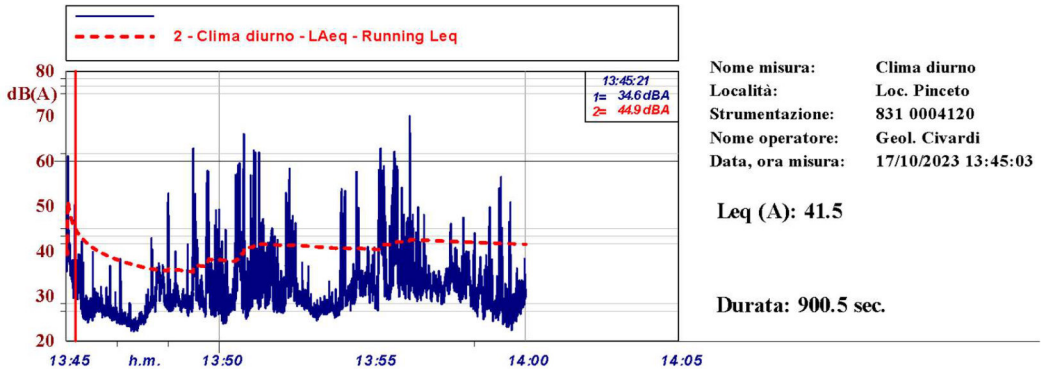


Grafico 2: T.H. clima acustico diurno presso R2.

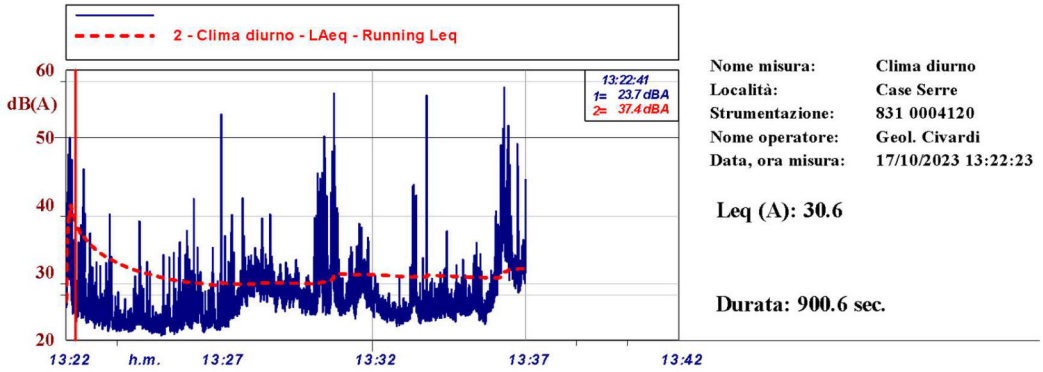


Grafico 3: T.H. clima acustico diurno presso R3.

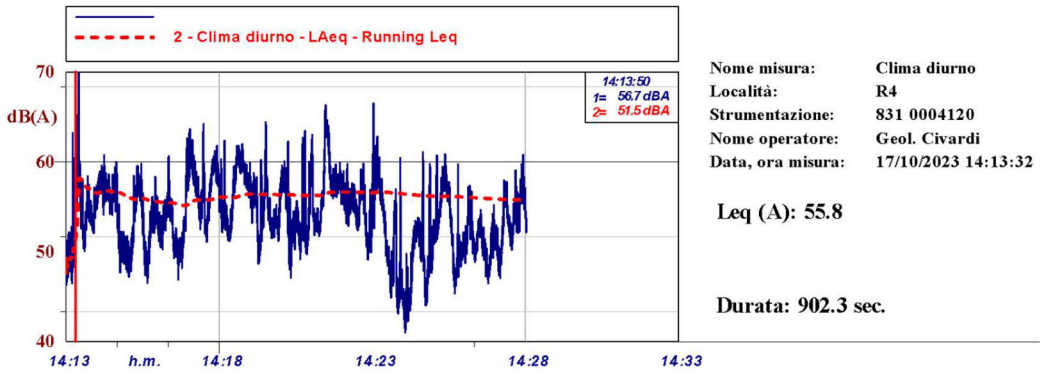


Grafico 4: T.H. clima acustico diurno presso R4.

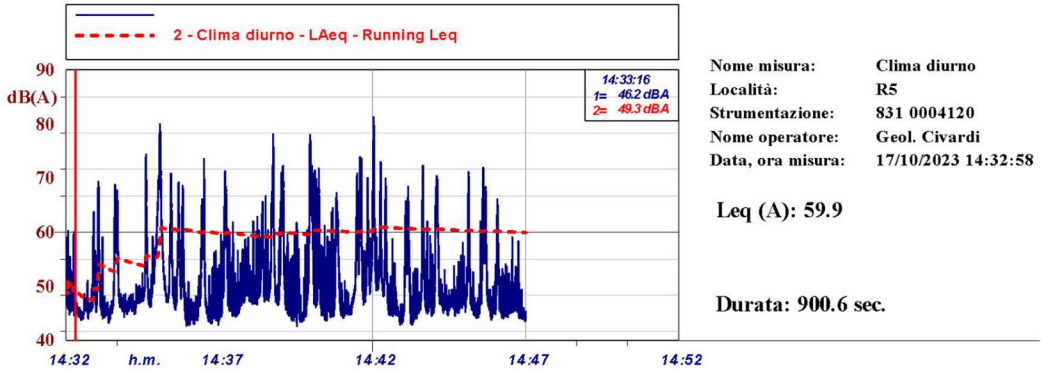


Grafico 5: T.H. clima acustico diurno presso R5

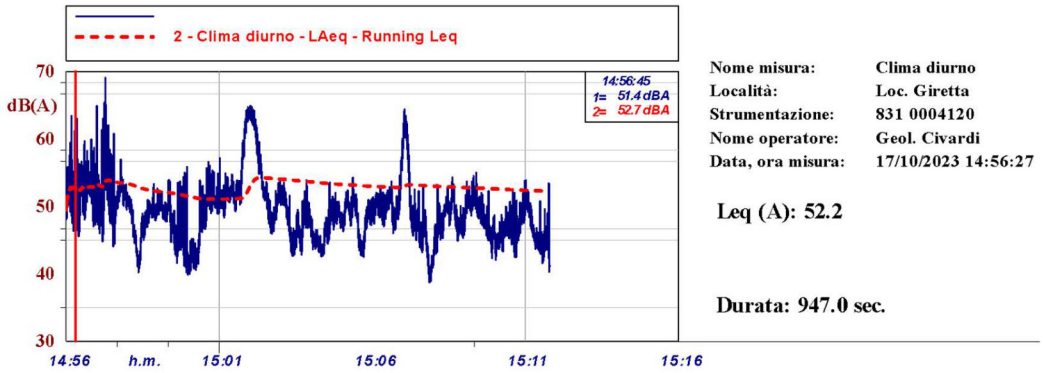


Grafico 6: T.H. clima acustico diurno presso R6

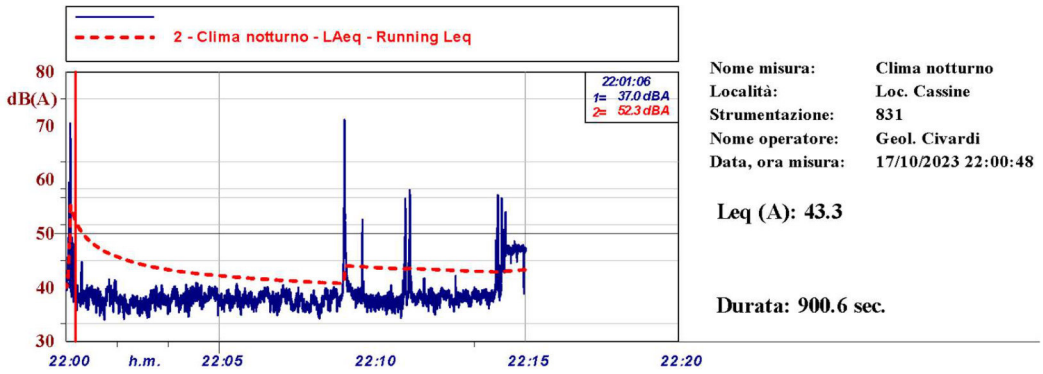


Grafico 7: T.H. del clima acustico notturno presso R1.

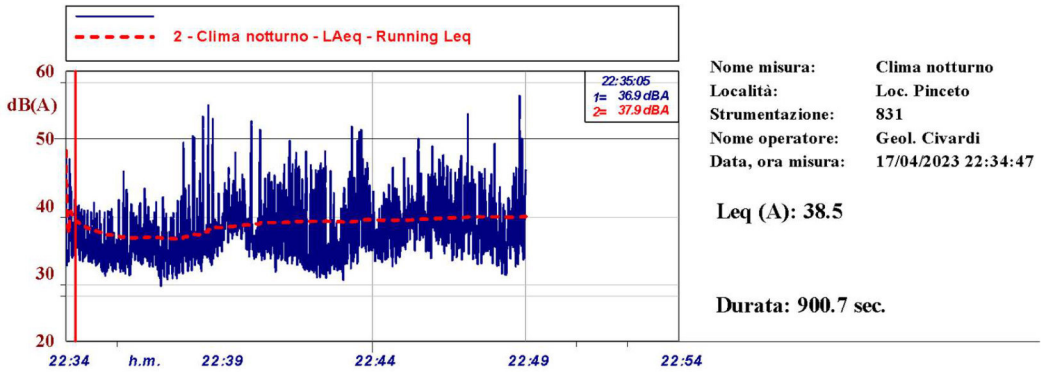


Grafico 8: T.H. del clima acustico notturno presso R2.

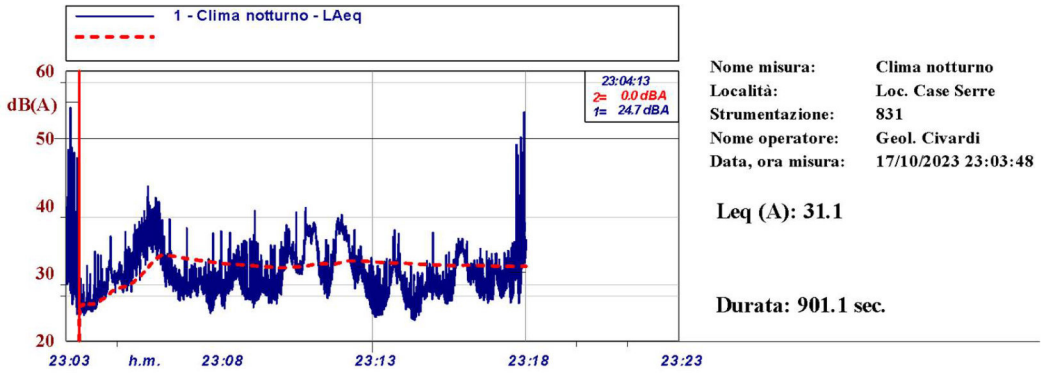


Grafico 9: T.H. del clima acustico notturno presso R3.

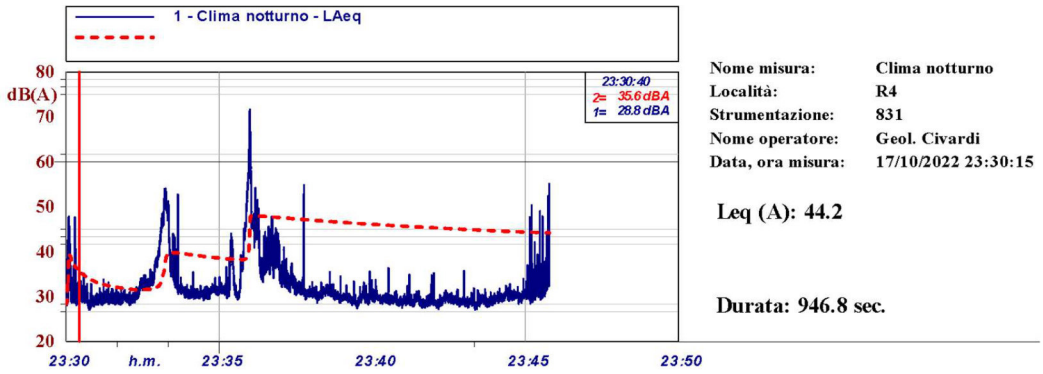


Grafico 10: T.H. del clima acustico notturno presso R4.

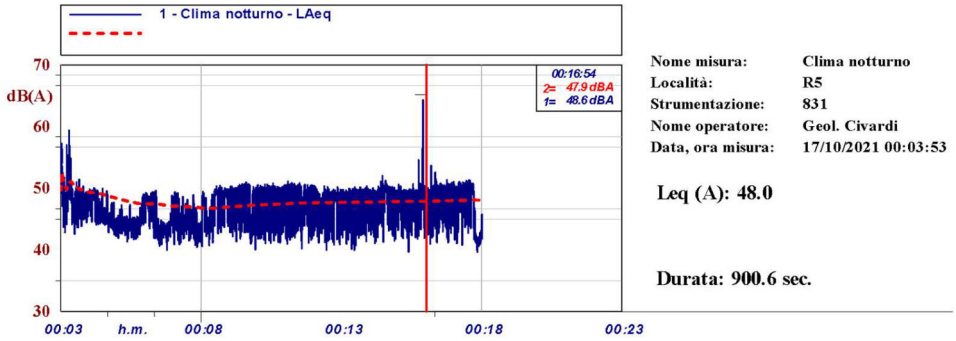


Grafico 11: T.H. del clima acustico notturno presso R5.

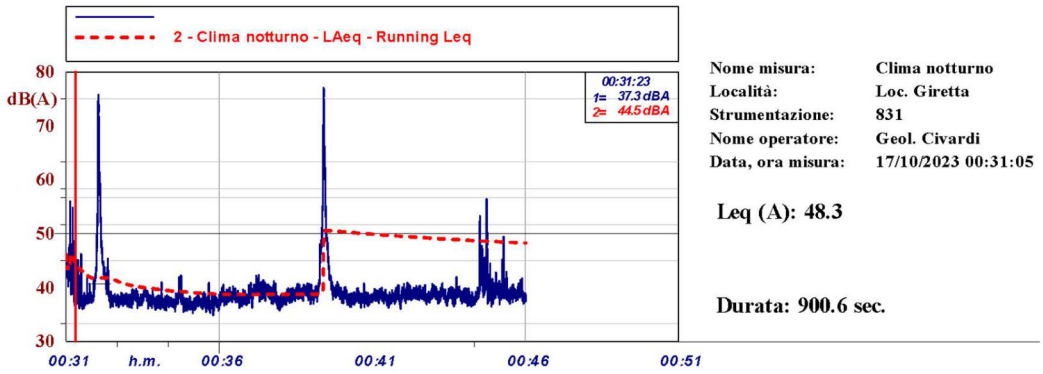
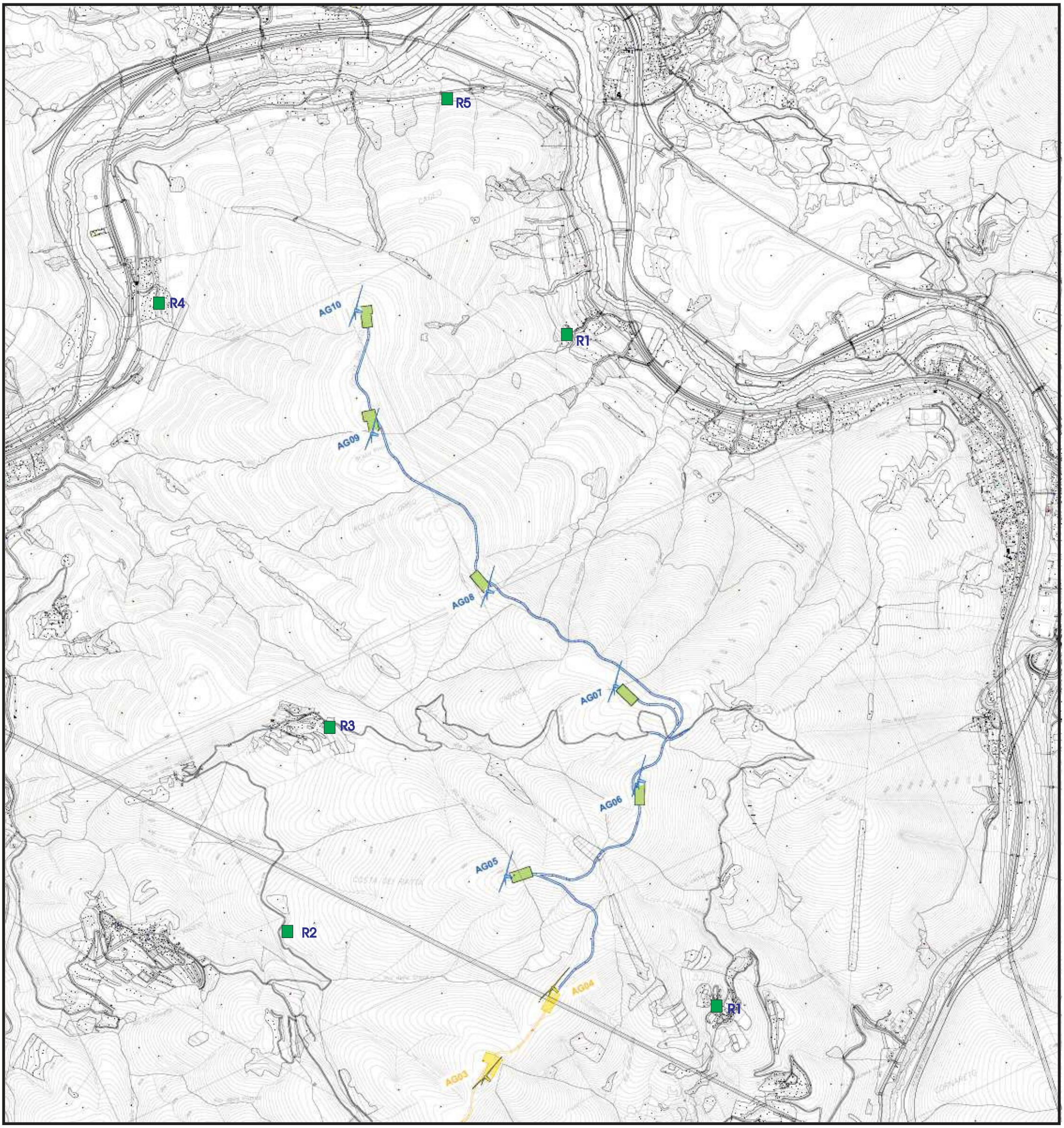
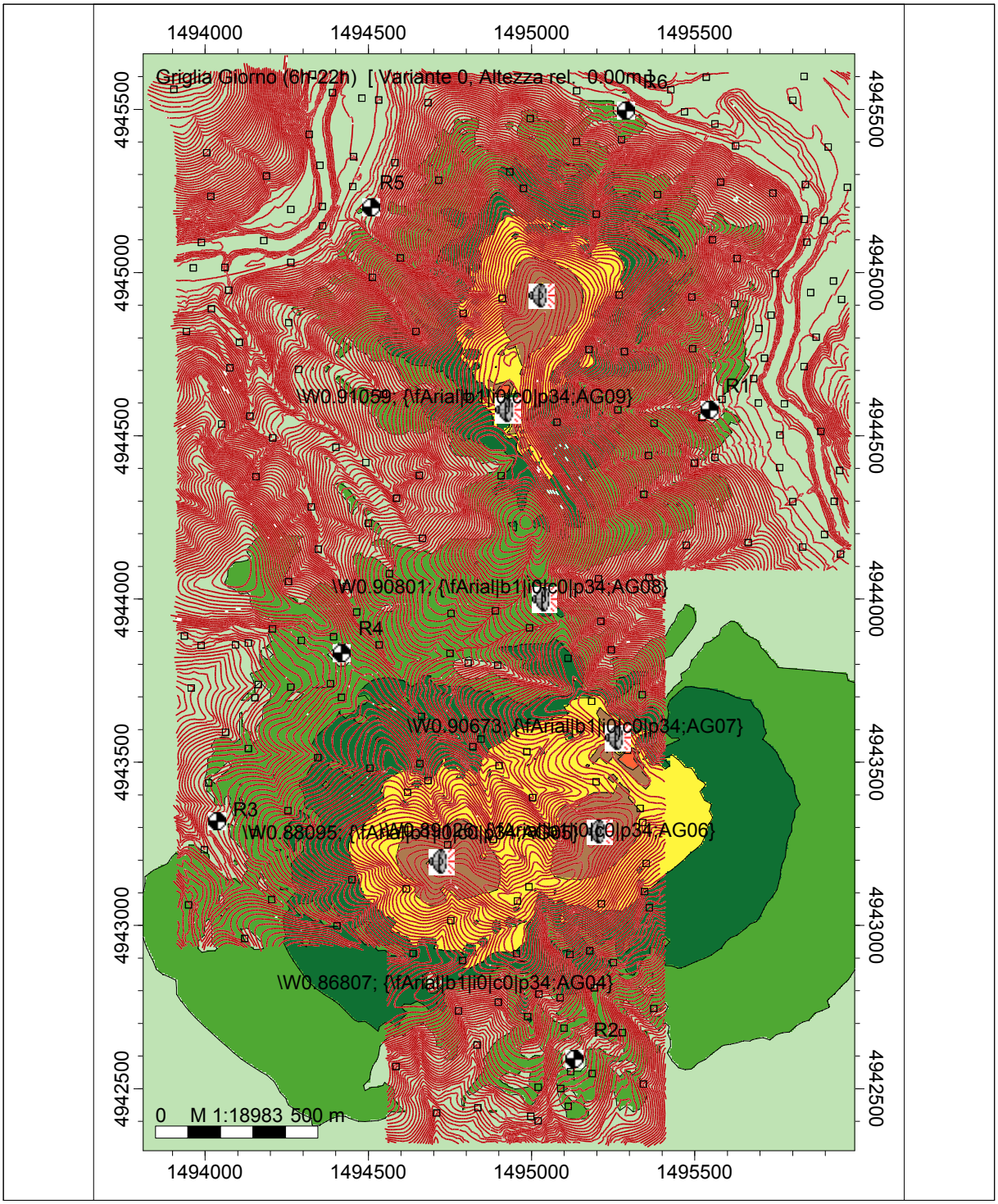


Grafico 12: T.H. del clima acustico notturno presso R6.



Ricettore sensibile



Legenda

- Simbolo
- Linea altimetrica
- Punto ricevitore
- Punto sorg./ISO 9613

Giorno (6h-22h)
Livello
dB(A)

- >..-35
- >35-40
- >40-45
- >45-50
- >50-55
- >55-60
- >60-65
- >65-70
- >70-75
- >75-80
- >80-..

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Centro di Taratura
LAT N° 146
Calibration Centre
Laboratorio Accreditato di Taratura

LAT N° 146

CERTIFICATO DI TARATURA LAT 146 15050
Certificate of Calibration

- data di emissione *date of issue*	**2022/09/27**
- cliente *customer*	**SPECTRA S.r.l.** **Via J. F. Kennedy, 19 - 20871 Vimercate (MB)**
- destinatario *receiver*	**Civardi Gabriele** **Corso Perrone, 15 - 16152 Genova (GE)**
- richiesta *application*	**T496/22**
- in data *date*	**2022/09/21**
Si riferisce a *referring to*	
- oggetto *item*	**Fonometro**
- costruttore *manufacturer*	**LARSON DAVIS**
- modello *model*	**831**
- matricola *serial number*	**0004120**
- data di ricevimento oggetto *date of receipt of item*	**2022/09/21**
- data delle misure *date of measurements*	**2022/09/27**
- registro di laboratorio *laboratory reference*	**22-1121-RLA**

Il presente certificato di taratura è emesso in base all'accreditamento LAT N° 146 rilasciato in accordo ai decreti attuativi della legge n. 273/1991 che ha istituito il Sistema Nazionale di Taratura (SNT).
ACCREDIA attesta le capacità di misura e di taratura, le competenze metrologiche del Centro e la riferibilità delle tarature eseguite ai campioni nazionali e internazionali delle unità di misura del Sistema Internazionale delle Unità (SI).
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The measurement results reported in this Certificate were obtained following the procedures given in the following page, where the reference standards are indicated as well, from which starts the traceability chain of the laboratory, and the related calibration certificates in their course of validity. They relate only to the calibrated item and they are valid for the time and conditions of calibration, unless otherwise specified.

Le incertezze di misura dichiarate in questo documento sono state determinate conformemente al documento EA-4/02 e sono espresse come incertezza estesa ottenuta moltiplicando l'incertezza tipo per il fattore di copertura *k* corrispondente ad livello di fiducia di circa il 95%. Normalmente tale fattore *k* vale 2.
The measurement uncertainties stated in this document have been determined according to EA-4/02. They were estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor k corresponding to a confidence level of about 95%. Normally, this factor k is 2.

Il Responsabile del Centro
Head of the Centre

Firmato digitalmente da
TIZIANO MUCHETTI
T = Ingegnere
Data e ora della firma:
27/09/2022 12:34:59

Restricted
Document no.: 0067-7065 V09
2019-08-27

Performance Specification

V136-4.0/4.2 MW 50/60 Hz



Original Instruction: T05 0067-7065 VER 09

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Original Instruction: T05 0067-7065 VER 09

Table of contents

1 GENERAL DESCRIPTION 5

2 TYPE APPROVALS AND AVAILABLE HUB HEIGHTS 5

3 OPERATIONAL ENVELOPE AND PERFORMANCE GUIDELINES 5

3.1 CLIMATE AND SITE CONDITIONS 5
3.1.1 Complex Terrain 7
3.1.2 Altitude 7
3.1.3 Wind Power Plant Layout 7
3.2 OPERATIONAL ENVELOPE – WIND 7
3.3 OPERATIONAL ENVELOPE – WIND (HWO) 7
3.4 OPERATIONAL ENVELOPE – CONDITIONS FOR POWER CURVE AND CT VALUES (AT HUB HEIGHT) 8
3.5 SOUND MODES 9
3.6 LOAD MODES 10

4 DRAWINGS 11

4.1 STRUCTURAL DESIGN – ILLUSTRATION OF OUTER DIMENSIONS 11

5 GENERAL RESERVATIONS, NOTES AND DISCLAIMERS 12

6 POWER CURVES, CT VALUES AND SOUND CURVES, MODE 0/0-0S 13

6.1 POWER CURVES, MODE 0/0-0S 13
6.2 CT VALUES, MODE 0/0-0S 14
6.3 SOUND CURVES, MODE 0/0-0S 15

7 POWER CURVES, CT VALUES AND SOUND CURVES, MODE 0/0-0S (HWO) 16

7.1 POWER CURVES, MODE 0/0-0S (HWO) 16
7.2 CT VALUES, MODE 0/0-0S (HWO) 18
7.3 SOUND CURVES, MODE 0/0-0S (HWO) 19

8 POWER CURVES, CT VALUES AND SOUND CURVES, POWER OPTIMIZED MODE PO1/PO1-0S 20

8.1 POWER CURVES, POWER OPTIMIZED MODE PO1/PO1-0S 20
8.2 CT VALUES, POWER OPTIMIZED MODE PO1/PO1-0S 21
8.3 SOUND CURVES, POWER OPTIMIZED MODE PO1/PO1-0S 22

9 POWER CURVES, CT VALUES AND SOUND CURVES, POWER OPTIMIZED MODE PO1/PO1-0S (HWO) 23

9.1 POWER CURVES, POWER OPTIMIZED MODE PO1/PO1-0S (HWO) 23
9.2 CT VALUES, POWER OPTIMIZED MODE PO1/PO1-0S (HWO) 25
9.3 SOUND CURVES, POWER OPTIMIZED MODE PO1/PO1-0S (HWO) 26

10 POWER CURVES, CT VALUES AND SOUND CURVES, SOUND OPTIMIZED MODE SO1 27

10.1 POWER CURVES, SOUND OPTIMIZED MODE SO1 27
10.2 CT VALUES, SOUND OPTIMIZED MODE SO1 28
10.3 SOUND CURVES, SOUND OPTIMIZED MODE SO1 29

11 POWER CURVES, CT VALUES AND SOUND CURVES, SOUND OPTIMIZED MODE SO1 (HWO) 30

11.1 POWER CURVES, SOUND OPTIMIZED MODE SO1 (HWO) 30
11.2 CT VALUES, SOUND OPTIMIZED MODE SO1 (HWO) 32
11.3 SOUND CURVES, SOUND OPTIMIZED MODE SO1 (HWO) 33

12 POWER CURVES, CT VALUES AND SOUND CURVES, SOUND OPTIMIZED MODE SO2 34

12.1 POWER CURVES, SOUND OPTIMIZED MODE SO2 34
12.2 CT VALUES, SOUND OPTIMIZED MODE SO2 35
12.3 SOUND CURVES, SOUND OPTIMIZED MODE SO2 36

13 POWER CURVES, CT VALUES AND SOUND CURVES, SOUND OPTIMIZED MODE SO2 (HWO) 37

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

13.1 Power Curves, Sound Optimized Mode SO2 (HWO) 37
13.2 Ct Values, Sound Optimized Mode SO2 (HWO) 39
13.3 Sound Curves, Sound Optimized Mode SO2 (HWO) 40

14 POWER CURVES, CT VALUES AND SOUND CURVES, SOUND OPTIMIZED MODE SO11 41

14.1 Power Curves, Sound Optimized Mode SO11 41
14.2 Ct Values, Sound Optimized Mode SO11 43
14.3 Sound Curves, Sound Optimized Mode SO11 44

15 POWER CURVES, CT VALUES AND SOUND CURVES, SOUND OPTIMIZED MODE SO11 (HWO) 45

15.1 Power Curves, Sound Optimized Mode SO11 (HWO) 45
15.2 Ct Values, Sound Optimized Mode SO11 (HWO) 47
15.3 Sound Curves, Sound Optimized Mode SO11 (HWO) 48

16 POWER CURVES, CT VALUES AND SOUND CURVES, SOUND OPTIMIZED MODE SO12 49

16.1 Power Curves, Sound Optimized Mode SO12 49
16.2 Ct Values, Sound Optimized Mode SO12 51
16.3 Sound Curves, Sound Optimized Mode SO12 52

17 POWER CURVES, CT VALUES AND SOUND CURVES, SOUND OPTIMIZED MODE SO12 (HWO) 53

17.1 Power Curves, Sound Optimized Mode SO12 (HWO) 53
17.2 Ct Values, Sound Optimized Mode SO12 (HWO) 55
17.3 Sound Curves, Sound Optimized Mode SO12 (HWO) 56

18 POWER CURVES, CT VALUES AND SOUND CURVES, SOUND OPTIMIZED MODE SO13 57

18.1 Power Curves, Sound Optimized Mode SO13 57
18.2 Ct Values, Sound Optimized Mode SO13 59
18.3 Sound Curves, Sound Optimized Mode SO13 60

19 POWER CURVES, CT VALUES AND SOUND CURVES, SOUND OPTIMIZED MODE SO13 (HWO) 61

19.1 Power Curves, Sound Optimized Mode SO13 (HWO) 61
19.2 Ct Values, Sound Optimized Mode SO13 (HWO) 63
19.3 Sound Curves, Sound Optimized Mode SO13 (HWO) 64

20 POWER CURVES, CT VALUES AND SOUND CURVES, LOAD OPTIMIZED MODE LO1 65

20.1 Power Curves, Load Optimized Mode LO1 65
20.2 Ct Values, Load Optimized Mode LO1 66
20.3 Sound Curves, Load Optimized Mode LO1 67

21 POWER CURVES, CT VALUES AND SOUND CURVES, LOAD OPTIMIZED MODE LO1 (HWO) 68

21.1 Power Curves, Load Optimized Mode LO1 (HWO) 68
21.2 Ct Values, Load Optimized Mode LO1 (HWO) 70
21.3 Sound Curves, Load Optimized Mode LO1 (HWO) 71

22 POWER CURVES, CT VALUES AND SOUND CURVES, LOAD OPTIMIZED MODE LO2 72

22.1 Power Curves, Load Optimized Mode LO2 72
22.2 Ct Values, Load Optimized Mode LO2 73
22.3 Sound Curves, Load Optimized Mode LO2 74

23 POWER CURVES, CT VALUES AND SOUND CURVES, LOAD OPTIMIZED MODE LO2 (HWO) 75

23.1 Power Curves, Load Optimized Mode LO2 (HWO) 75
23.2 Ct Values, Load Optimized Mode LO2 (HWO) 77
23.3 Sound Curves, Load Optimized Mode LO2 (HWO) 78

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

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Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

1 General Description

The Vestas V136-4.0/4.2 MW wind turbine is a pitch regulated upwind turbine with active yaw and a three-blade rotor. The Vestas V136-4.0/4.2 MW turbine has a rotor diameter of 136 m and a rated power of 4.0 MW.

Vestas offers an optional Power Optimized (PO) mode at 4.2 MW for the V136-4.0 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**	**Large diameter (non-split)** [1]	**Large diameter (split)**
IEC61400-22	IEC IIB	105 m[2] / 112 m / 117 m[2]		
	IEC IIIB		162 m	
DIBt 2012	WZ4(S), GK2	112 m		
	WZ2(S), GK2			149 m / 166 m

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

[1]: These towers require special transport conditions as the bottom diameter is above 5 m and are not available as standard to the US/Canadian market, but can be evaluated on a case-by-case basis.

[2]: Special transport optimized tower for US/Canada.

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 does 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.

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

Wind Climate	IEC IIB	IEC IIB S	IEC IIIB
Hub Height	**105/112/117 m**	**105/112/117 m**	**162 m**
Power Rating	**4.0MW**	**4.2MW**	**4.0/4.2MW**
Extr Wind Speed (10 min average), V_{50}	42.5 m/s	42.5 m/s	37.5 m/s
Survival Wind Speed (3 s gust), V_{e50}	59.5 m/s	59.5 m/s	52.5 m/s
Turbulence Intensity, I_{V50}	11%	11%	11%

Table 3-1: Extreme design parameters – IEC

Wind Climate	IEC IIB	IEC IIB S	IEC IIIB
Hub Height	**105/112/117 m**	**105/112/117 m**	**162 m**
Power Rating	**4.0MW**	**4.2MW**	**4.0/4.2MW**
Wind Speed (10 min average), V_{ave}	8.5 m/s	8.0 m/s	7.5 m/s
Weibull Scale Factor, C	9.6 m/s	8.9 m/s	8.5 m/s
Weibull Shape Factor, k	2.0	2.0	2.0
I_{ref} acc. to IEC 61400-1	0.14	0.14	0.14
Turbulence Intensity acc. to IEC 61400-1, Including Wind Farm Turbulence (@15 m/s) I_{90} (90% quantile)	15.7%	15.7%	15.7%
Wind Shear, α	0.20	0.20	0.20
Inflow Angle (vertical)	8°	8°	8°

Table 3-2: Average design parameters – IEC

Wind Climate / Terrain Category	WZ4(S), GK2	WZ2(S), GK2	WZ2(S), GK2
Hub Height	**112 m**	**149 m**	**166 m**
Power Rating	**4.0/4.2MW**	**4.0/4.2MW**	**4.0/4.2MW**
Extr Wind Speed (10 min average), V_{50}	42.5 m/s	38.5 m/s	39.2 m/s
Survival Wind Speed (3 s gust), V_{e50}	59.5 m/s	53.9 m/s	54.9 m/s
Turbulence intensity, $I_{v(z)}$	12.9%	12.3%	12.1%

Table 3-3: Extreme design parameters – DIBt

Wind Climate / Terrain Category	WZ4(S), GK2	WZ2(S), GK2	WZ2(S), GK2
Hub Height	**112 m**	**149 m**	**166 m**
Power Rating	**4.0/4.2MW**	**4.0/4.2MW**	**4.0/4.2MW**
Wind Speed (10 min average), V_{ave}	7.95 m/s	7.63 m/s	7.05 m/s
I_{ref} acc. to IEC 61400-1	0.14	0.14	0.14
Turbulence Intensity acc. to IEC 61400-1, Including Wind Farm Turbulence (@15 m/s) I_{90} (90% quantile)	15.7%	15.7%	15.7%

Table 3-4: Average design parameters – DIBt

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

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 IIB / IEC IIB S	IEC IIIB
Hub height	**105 / 112 / 117 m**	**162**
Cut-In, V_{in}	3 m/s	3 m/s
Cut-Out (10 min exponential avg.), V_{out}	27.0 m/s	27.0 m/s
Re-Cut In (10 min exponential avg.)	25.0 m/s	25.0 m/s

Table 3-5: Operational envelope – wind – IEC

Wind climate	WZ4(S)	WZ2(S)
Hub height	**112 m**	**149 / 166 m**
Cut-In, V_{in}	3 m/s	3 m/s
Cut-Out (10 min exponential avg.), V_{out}	27.0 m/s	27.0 m/s
Re-Cut In (10 min exponential avg.)	25.0 m/s	25.0 m/s

Table 3-6: Operational envelope – wind – DIBt

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 3-7, p. 8 and Table 3-8, p. 8, with a controlled derating of power and speed. The power curves associated with optional HWO control are found in Sections 7, 9, 11, 13, 15, 17 and 19. Values refer to hub height and are determined by the sensors and control system of the turbine.

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

Wind climate	IEC IIB / IEC IIB S	IEC IIIB
Hub height	**105 / 112 / 117 m**	**162**
Cut-In, V_{in}	3 m/s	3 m/s
Cut-Out (10 min exponential avg.), V_{out}	32.0 m/s	32.0 m/s
Re-Cut In (10 min exponential avg.)	30.0 m/s	30.0 m/s

Table 3-7: Operational envelope – wind – IEC (High Wind Operation)

Wind climate	WZ4(S)	WZ2(S)
Hub height	**112 m**	**149 / 166 m**
Cut-In, V_{in}	3 m/s	3 m/s
Cut-Out (10 min exponential avg.), V_{out}	32.0 m/s	32.0 m/s
Re-Cut In (10 min exponential avg.)	30.0 m/s	30.0 m/s

Table 3-8: Operational envelope – wind – DIBt (High Wind Operation)

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

Consult Section 6 and following 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 from Section 6 and onwards
Grid Reactive Power (at LV-side of turbine transformer)	Power Factor 1.0

Table 3-9: Conditions for power curve and Ct values

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

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	103.9 dBA	Yes (standard)	105 / 112 / 117 / 149 / 162 / 166 m
0-0S	106.9 dBA	No (option)	105 / 112 / 117 / 149 / 162 / 166 m
PO1	103.9 dBA	Yes (standard)	105 / 112 / 117 / 149 / 162 / 166 m
PO1-0S	106.9 dBA	No (option)	105 / 112 / 117 / 149 / 162 / 166 m

Table 3-10: Available sound performance

NOTE The turbine is as standard equipped with serrated trailing edges on the blades. Optionally, Mode 0-0S 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	102.0 dBA	Yes	105 / 112 / 117 / 149 / 162 / 166 m
SO2	99.5 dBA	Yes	105 / 112 / 117 / 149 / 166 m
SO11	99.2 dBA	Yes	112 m(1)
SO12	99.9 dBA	Yes	112 m(1)
SO13	97.0 dBA	Yes	112 m(1)

Table 3-11: Available Sound Optimized modes

(1): SO11, SO12, SO13 is not applicable for DIBt towers

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

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T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

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	103.9 dBA	Yes	105 / 112 / 117 / 149 / 162 / 166 m
LO2	3.6 MW	103.9 dBA	Yes	105 / 112 / 117 m

Table 3-12: Available Load Optimized modes

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

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

4 Drawings

4.1 Structural Design – Illustration of Outer Dimensions

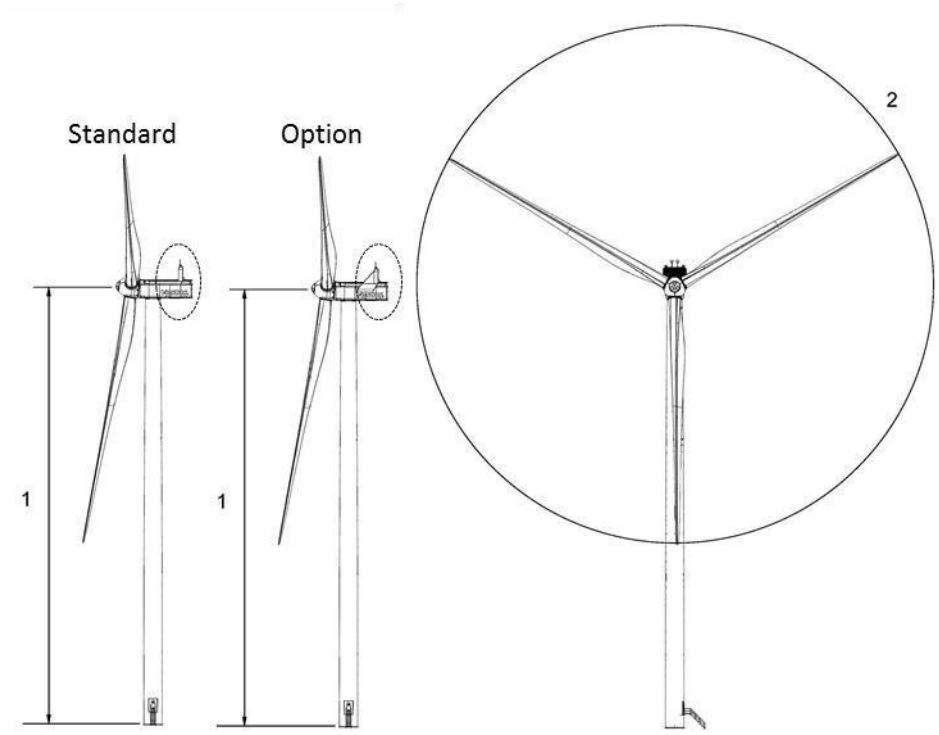


Figure 4-1: Illustration of outer dimensions – structure

1 Hub height:
105/112/117/149/162/166 m

2 Diameter:
136 m

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

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T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

5 General Reservations, Notes and Disclaimers

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- The performance specifications described in this document apply to the current version of the V136-4.0/4.2 MW wind turbine. Updated versions of the V136-4.0/4.2 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 V136-4.0/4.2 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.

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

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

NOTE The power curves and Ct values presented in Section 6 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

6.1 Power Curves, Mode 0/0-0S

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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**224**	162	168	173	179	185	190	196	201	207	213	218	229	235
4.5	**337**	250	258	265	273	281	289	297	305	313	321	329	344	352
5.0	**478**	358	369	380	391	402	413	423	434	445	456	467	488	499
5.5	**648**	490	505	519	533	548	562	576	591	605	619	633	662	676
6.0	**853**	649	668	687	705	724	742	761	779	798	816	835	872	890
6.5	**1096**	838	861	885	908	932	955	979	1002	1026	1049	1072	1119	1142
7.0	**1380**	1059	1088	1118	1147	1176	1206	1235	1264	1293	1322	1351	1410	1439
7.5	**1704**	1312	1347	1383	1419	1455	1491	1526	1562	1598	1633	1668	1739	1774
8.0	**2070**	1600	1643	1686	1730	1773	1816	1858	1901	1944	1986	2028	2112	2153
8.5	**2472**	1924	1975	2026	2077	2128	2178	2228	2278	2327	2376	2424	2520	2567
9.0	**2874**	2273	2330	2388	2446	2504	2558	2612	2667	2721	2772	2823	2923	2972
9.5	**3238**	2621	2681	2742	2803	2864	2919	2975	3030	3085	3136	3187	3286	3334
10.0	**3566**	2950	3011	3073	3135	3196	3251	3307	3362	3418	3467	3517	3610	3655
10.5	**3821**	3252	3314	3376	3438	3500	3552	3604	3656	3708	3746	3784	3849	3876
11.0	**3954**	3526	3582	3638	3694	3750	3787	3824	3861	3898	3916	3935	3964	3975
11.5	**3992**	3757	3797	3837	3877	3917	3932	3948	3963	3978	3983	3988	3994	3996
12.0	**3999**	3912	3929	3946	3964	3981	3985	3989	3993	3997	3998	3998	3999	4000
12.5	**4000**	3974	3979	3985	3991	3996	3997	3998	3999	4000	4000	4000	4000	4000
13.0	**4000**	3993	3994	3996	3998	3999	4000	4000	4000	4000	4000	4000	4000	4000
13.5	**4000**	3995	3996	3997	3998	3999	4000	4000	4000	4000	4000	4000	4000	4000
14.0	**4000**	3998	3999	3999	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
14.5	**4000**	3999	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
15.0	**4000**	4000	4000	4000	4000	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
25.5	**4000**	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
26.0	**4000**	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
26.5	**4000**	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
27.0	**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 0067-7065 VER 09

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6.2 Ct Values, Mode 0/0-0S

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	**0.878**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.852**	0.859	0.857	0.856	0.855	0.853	0.853	0.853	0.853	0.853	0.853	0.852	0.852	0.853
4.5	**0.855**	0.854	0.854	0.855	0.855	0.855	0.855	0.856	0.856	0.856	0.856	0.856	0.855	0.855
5.0	**0.851**	0.855	0.855	0.855	0.855	0.854	0.854	0.853	0.853	0.853	0.852	0.852	0.851	0.850
5.5	**0.846**	0.852	0.852	0.851	0.851	0.850	0.850	0.849	0.849	0.848	0.848	0.847	0.846	0.846
6.0	**0.841**	0.847	0.847	0.846	0.846	0.845	0.845	0.844	0.844	0.843	0.842	0.842	0.840	0.840
6.5	**0.835**	0.843	0.842	0.842	0.841	0.840	0.840	0.839	0.838	0.837	0.837	0.836	0.834	0.833
7.0	**0.828**	0.838	0.837	0.836	0.835	0.834	0.833	0.832	0.832	0.831	0.830	0.829	0.827	0.826
7.5	**0.821**	0.832	0.831	0.830	0.829	0.828	0.827	0.826	0.825	0.824	0.823	0.822	0.820	0.818
8.0	**0.822**	0.837	0.836	0.835	0.834	0.833	0.831	0.830	0.829	0.827	0.826	0.824	0.821	0.819
8.5	**0.802**	0.838	0.836	0.833	0.831	0.828	0.825	0.821	0.818	0.814	0.810	0.806	0.798	0.793
9.0	**0.745**	0.810	0.805	0.800	0.795	0.790	0.784	0.777	0.771	0.765	0.759	0.752	0.739	0.732
9.5	**0.673**	0.753	0.746	0.738	0.731	0.724	0.717	0.709	0.702	0.694	0.687	0.680	0.666	0.659
10.0	**0.606**	0.687	0.679	0.671	0.663	0.656	0.648	0.641	0.634	0.627	0.620	0.613	0.599	0.591
10.5	**0.541**	0.625	0.618	0.610	0.603	0.595	0.588	0.581	0.573	0.566	0.557	0.549	0.532	0.523
11.0	**0.471**	0.570	0.561	0.553	0.545	0.537	0.528	0.519	0.510	0.501	0.491	0.481	0.461	0.451
11.5	**0.404**	0.517	0.507	0.498	0.488	0.478	0.467	0.456	0.446	0.435	0.425	0.414	0.395	0.386
12.0	**0.348**	0.463	0.451	0.439	0.428	0.416	0.406	0.395	0.385	0.374	0.365	0.357	0.340	0.332
12.5	**0.302**	0.406	0.395	0.383	0.372	0.361	0.352	0.343	0.333	0.324	0.317	0.309	0.296	0.289
13.0	**0.265**	0.354	0.344	0.334	0.324	0.315	0.307	0.299	0.292	0.284	0.278	0.271	0.260	0.254
13.5	**0.236**	0.312	0.304	0.295	0.287	0.279	0.272	0.265	0.259	0.252	0.247	0.241	0.231	0.226
14.0	**0.210**	0.276	0.269	0.261	0.254	0.247	0.241	0.236	0.230	0.224	0.220	0.215	0.206	0.202
14.5	**0.188**	0.246	0.239	0.233	0.227	0.221	0.216	0.211	0.206	0.201	0.197	0.192	0.185	0.181
15.0	**0.169**	0.219	0.214	0.208	0.203	0.197	0.193	0.189	0.184	0.180	0.176	0.173	0.166	0.162
15.5	**0.153**	0.198	0.193	0.188	0.183	0.178	0.174	0.170	0.167	0.163	0.159	0.156	0.150	0.147
16.0	**0.139**	0.179	0.175	0.170	0.166	0.162	0.158	0.155	0.151	0.148	0.145	0.142	0.136	0.134
16.5	**0.127**	0.163	0.159	0.155	0.151	0.147	0.144	0.141	0.138	0.135	0.132	0.129	0.125	0.122
17.0	**0.116**	0.149	0.145	0.142	0.138	0.135	0.132	0.129	0.126	0.123	0.121	0.119	0.114	0.112
17.5	**0.107**	0.136	0.133	0.130	0.127	0.123	0.121	0.118	0.116	0.113	0.111	0.109	0.105	0.103
18.0	**0.098**	0.125	0.122	0.119	0.116	0.114	0.111	0.109	0.107	0.104	0.102	0.100	0.097	0.095
18.5	**0.091**	0.115	0.113	0.110	0.107	0.105	0.103	0.101	0.098	0.096	0.095	0.093	0.089	0.088
19.0	**0.084**	0.106	0.104	0.101	0.099	0.097	0.095	0.093	0.091	0.089	0.087	0.086	0.082	0.081
19.5	**0.078**	0.098	0.096	0.094	0.092	0.090	0.088	0.086	0.084	0.083	0.081	0.080	0.077	0.075
20.0	**0.073**	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
20.5	**0.068**	0.085	0.083	0.081	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.067	0.066
21.0	**0.064**	0.080	0.078	0.076	0.074	0.073	0.071	0.070	0.069	0.067	0.066	0.065	0.063	0.061
21.5	**0.060**	0.075	0.073	0.072	0.070	0.069	0.067	0.066	0.065	0.063	0.062	0.061	0.059	0.058
22.0	**0.057**	0.070	0.069	0.067	0.066	0.064	0.063	0.062	0.061	0.060	0.059	0.058	0.056	0.055
22.5	**0.053**	0.066	0.065	0.063	0.062	0.061	0.060	0.058	0.057	0.056	0.055	0.054	0.052	0.052
23.0	**0.050**	0.062	0.061	0.059	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.049	0.048
23.5	**0.047**	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046
24.0	**0.045**	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.046	0.044	0.043
24.5	**0.042**	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.045	0.044	0.043	0.042	0.041
25.0	**0.040**	0.049	0.048	0.047	0.046	0.045	0.045	0.044	0.043	0.042	0.042	0.041	0.040	0.039
25.5	**0.039**	0.047	0.046	0.045	0.044	0.043	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.037
26.0	**0.037**	0.045	0.044	0.043	0.042	0.041	0.041	0.040	0.039	0.038	0.038	0.037	0.036	0.036
26.5	**0.035**	0.043	0.042	0.041	0.040	0.039	0.039	0.038	0.037	0.037	0.036	0.036	0.034	0.034
27.0	**0.033**	0.041	0.040	0.039	0.038	0.038	0.037	0.036	0.036	0.035	0.034	0.034	0.033	0.033

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

Original Instruction: T05 0067-7065 VER 09

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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	90.9	93.2
4	91.1	93.6
5	92.9	96.5
6	96.0	100.0
7	99.6	103.2
8	102.9	106.0
9	103.9	106.9
10	103.9	106.9
11	103.9	106.9
12	103.9	106.9
13	103.9	106.9
14	103.9	106.9
15	103.9	106.9
16	103.9	106.9
17	103.9	106.9
18	103.9	106.9
19	103.9	106.9
20	103.9	106.9

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

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

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

NOTE The power curves and Ct values presented in Section 7 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**224**	162	168	173	179	185	190	196	201	207	213	218	229	235
4.5	**337**	250	258	265	273	281	289	297	305	313	321	329	344	352
5.0	**478**	358	369	380	391	402	413	423	434	445	456	467	488	499
5.5	**648**	490	505	519	533	548	562	576	591	605	619	633	662	676
6.0	**853**	649	668	687	705	724	742	761	779	798	816	835	872	890
6.5	**1096**	838	861	885	908	932	955	979	1002	1026	1049	1072	1119	1142
7.0	**1380**	1059	1088	1118	1147	1176	1206	1235	1264	1293	1322	1351	1410	1439
7.5	**1704**	1312	1347	1383	1419	1455	1491	1526	1562	1598	1633	1668	1739	1774
8.0	**2070**	1600	1643	1686	1730	1773	1816	1858	1901	1944	1986	2028	2112	2153
8.5	**2472**	1924	1975	2026	2077	2128	2178	2228	2278	2327	2376	2424	2520	2567
9.0	**2874**	2273	2330	2388	2446	2504	2558	2612	2667	2721	2772	2823	2923	2972
9.5	**3238**	2621	2681	2742	2803	2864	2919	2975	3030	3085	3136	3187	3286	3334
10.0	**3566**	2950	3011	3073	3135	3196	3251	3307	3362	3418	3467	3517	3610	3655
10.5	**3821**	3252	3314	3376	3438	3500	3552	3604	3656	3708	3746	3784	3849	3876
11.0	**3954**	3526	3582	3638	3694	3750	3787	3824	3861	3898	3916	3935	3964	3975
11.5	**3992**	3757	3797	3837	3877	3917	3932	3948	3963	3978	3983	3988	3994	3996
12.0	**3999**	3912	3929	3946	3964	3981	3985	3989	3993	3997	3998	3998	3999	4000
12.5	**4000**	3974	3979	3985	3991	3996	3997	3998	3999	4000	4000	4000	4000	4000
13.0	**4000**	3993	3994	3996	3998	3999	4000	4000	4000	4000	4000	4000	4000	4000
13.5	**4000**	3995	3996	3997	3998	3999	4000	4000	4000	4000	4000	4000	4000	4000
14.0	**4000**	3998	3999	3999	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
14.5	**4000**	3999	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
15.0	**4000**	4000	4000	4000	4000	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	**3998**	3998	3998	3998	3998	3998	3998	3998	3998	3998	3998	3998	3998	3998
25.5	**3976**	3975	3975	3975	3975	3975	3975	3975	3975	3975	3975	3975	3976	3976
26.0	**3928**	3928	3928	3928	3928	3928	3928	3928	3928	3928	3928	3928	3928	3928
26.5	**3857**	3857	3857	3857	3857	3857	3857	3857	3857	3857	3857	3857	3857	3857
27.0	**3764**	3763	3763	3763	3763	3764	3764	3764	3764	3764	3764	3764	3764	3764
27.5	**3630**	3630	3630	3630	3630	3630	3630	3630	3630	3630	3630	3630	3630	3630

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Air density [kg/m^3]														
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**
28.0	**3468**	3468	3468	3468	3468	3468	3468	3468	3468	3468	3468	3468	3468	3468
28.5	**3275**	3275	3275	3275	3275	3275	3275	3275	3275	3275	3275	3275	3275	3274
29.0	**3049**	3049	3049	3049	3049	3049	3049	3049	3049	3049	3049	3049	3049	3049
29.5	**2805**	2806	2806	2806	2806	2806	2806	2806	2806	2806	2805	2805	2805	2805
30.0	**2565**	2565	2565	2565	2565	2565	2565	2565	2565	2565	2565	2565	2565	2565
30.5	**2324**	2324	2324	2324	2324	2324	2324	2324	2324	2324	2324	2324	2324	2324
31.0	**2090**	2090	2090	2090	2090	2090	2090	2090	2090	2090	2090	2090	2090	2090
31.5	**1884**	1884	1884	1884	1884	1884	1884	1884	1884	1884	1884	1884	1884	1884
32.0	**1732**	1732	1732	1732	1732	1732	1732	1732	1732	1732	1732	1732	1732	1732

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

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

7.2 Ct Values, 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	**0.878**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.852**	0.859	0.857	0.856	0.855	0.853	0.853	0.853	0.853	0.853	0.853	0.852	0.852	0.853
4.5	**0.855**	0.854	0.854	0.855	0.855	0.855	0.855	0.856	0.856	0.856	0.856	0.856	0.855	0.855
5.0	**0.851**	0.855	0.855	0.855	0.855	0.854	0.854	0.853	0.853	0.853	0.852	0.852	0.851	0.850
5.5	**0.846**	0.852	0.852	0.851	0.851	0.850	0.850	0.849	0.849	0.848	0.848	0.847	0.846	0.846
6.0	**0.841**	0.847	0.847	0.846	0.846	0.845	0.845	0.844	0.844	0.843	0.842	0.842	0.840	0.840
6.5	**0.835**	0.843	0.842	0.842	0.841	0.840	0.840	0.839	0.838	0.837	0.837	0.836	0.834	0.833
7.0	**0.828**	0.838	0.837	0.836	0.835	0.834	0.833	0.832	0.832	0.831	0.830	0.829	0.827	0.826
7.5	**0.821**	0.832	0.831	0.830	0.829	0.828	0.827	0.826	0.825	0.824	0.823	0.822	0.820	0.818
8.0	**0.822**	0.837	0.836	0.835	0.834	0.833	0.831	0.830	0.829	0.827	0.826	0.824	0.821	0.819
8.5	**0.802**	0.838	0.836	0.833	0.831	0.828	0.825	0.821	0.818	0.814	0.810	0.806	0.798	0.793
9.0	**0.745**	0.810	0.805	0.800	0.795	0.790	0.784	0.777	0.771	0.765	0.759	0.752	0.739	0.732
9.5	**0.673**	0.753	0.746	0.738	0.731	0.724	0.717	0.709	0.702	0.694	0.687	0.680	0.666	0.659
10.0	**0.606**	0.687	0.679	0.671	0.663	0.656	0.648	0.641	0.634	0.627	0.620	0.613	0.599	0.591
10.5	**0.541**	0.625	0.618	0.610	0.603	0.595	0.588	0.581	0.573	0.566	0.557	0.549	0.532	0.523
11.0	**0.471**	0.570	0.561	0.553	0.545	0.537	0.528	0.519	0.510	0.501	0.491	0.481	0.461	0.451
11.5	**0.404**	0.517	0.507	0.498	0.488	0.478	0.467	0.456	0.446	0.435	0.425	0.414	0.395	0.386
12.0	**0.348**	0.463	0.451	0.439	0.428	0.416	0.406	0.395	0.385	0.374	0.365	0.357	0.340	0.332
12.5	**0.302**	0.406	0.395	0.383	0.372	0.361	0.352	0.343	0.333	0.324	0.317	0.309	0.296	0.289
13.0	**0.265**	0.354	0.344	0.334	0.324	0.315	0.307	0.299	0.292	0.284	0.278	0.271	0.260	0.254
13.5	**0.236**	0.312	0.304	0.295	0.287	0.279	0.272	0.265	0.259	0.252	0.247	0.241	0.231	0.226
14.0	**0.210**	0.276	0.269	0.261	0.254	0.247	0.241	0.236	0.230	0.224	0.220	0.215	0.206	0.202
14.5	**0.188**	0.246	0.239	0.233	0.227	0.221	0.216	0.211	0.206	0.201	0.197	0.192	0.185	0.181
15.0	**0.169**	0.219	0.214	0.208	0.203	0.197	0.193	0.189	0.184	0.180	0.176	0.173	0.166	0.162
15.5	**0.153**	0.198	0.193	0.188	0.183	0.178	0.174	0.170	0.167	0.163	0.159	0.156	0.150	0.147
16.0	**0.139**	0.179	0.175	0.170	0.166	0.162	0.158	0.155	0.151	0.148	0.145	0.142	0.136	0.134
16.5	**0.127**	0.163	0.159	0.155	0.151	0.147	0.144	0.141	0.138	0.135	0.132	0.129	0.125	0.122
17.0	**0.116**	0.149	0.145	0.142	0.138	0.135	0.132	0.129	0.126	0.123	0.121	0.119	0.114	0.112
17.5	**0.107**	0.136	0.133	0.130	0.127	0.123	0.121	0.118	0.116	0.113	0.111	0.109	0.105	0.103
18.0	**0.098**	0.125	0.122	0.119	0.116	0.114	0.111	0.109	0.107	0.104	0.102	0.100	0.097	0.095
18.5	**0.091**	0.115	0.113	0.110	0.107	0.105	0.103	0.101	0.098	0.096	0.095	0.093	0.089	0.088
19.0	**0.084**	0.106	0.104	0.101	0.099	0.097	0.095	0.093	0.091	0.089	0.087	0.086	0.082	0.081
19.5	**0.078**	0.098	0.096	0.094	0.092	0.090	0.088	0.086	0.084	0.083	0.081	0.080	0.077	0.075
20.0	**0.073**	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
20.5	**0.068**	0.085	0.083	0.081	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.067	0.066
21.0	**0.064**	0.080	0.078	0.076	0.074	0.073	0.071	0.070	0.069	0.067	0.066	0.065	0.063	0.061
21.5	**0.060**	0.075	0.073	0.072	0.070	0.069	0.067	0.066	0.065	0.063	0.062	0.061	0.059	0.058
22.0	**0.057**	0.070	0.069	0.067	0.066	0.064	0.063	0.062	0.061	0.060	0.059	0.058	0.056	0.055
22.5	**0.053**	0.066	0.065	0.063	0.062	0.061	0.060	0.058	0.057	0.056	0.055	0.054	0.052	0.052
23.0	**0.050**	0.062	0.061	0.059	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.049	0.048
23.5	**0.047**	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046
24.0	**0.045**	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.046	0.044	0.043
24.5	**0.042**	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.045	0.044	0.043	0.042	0.041
25.0	**0.040**	0.049	0.048	0.047	0.046	0.045	0.045	0.044	0.043	0.042	0.042	0.041	0.040	0.039
25.5	**0.038**	0.047	0.046	0.045	0.044	0.043	0.042	0.042	0.041	0.040	0.040	0.039	0.038	0.037
26.0	**0.036**	0.044	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.038	0.037	0.037	0.035	0.035
26.5	**0.034**	0.041	0.040	0.039	0.039	0.038	0.037	0.036	0.036	0.035	0.035	0.034	0.033	0.033
27.0	**0.031**	0.038	0.037	0.037	0.036	0.035	0.034	0.034	0.033	0.033	0.032	0.032	0.031	0.030
27.5	**0.029**	0.035	0.034	0.034	0.033	0.032	0.032	0.031	0.031	0.030	0.030	0.029	0.028	0.028
28.0	**0.026**	0.032	0.031	0.031	0.030	0.030	0.029	0.029	0.028	0.028	0.027	0.027	0.026	0.026
28.5	**0.024**	0.029	0.028	0.028	0.027	0.027	0.026	0.026	0.025	0.025	0.025	0.024	0.024	0.023
29.0	**0.021**	0.026	0.025	0.025	0.024	0.024	0.024	0.023	0.023	0.022	0.022	0.022	0.021	0.021
29.5	**0.019**	0.023	0.023	0.022	0.022	0.021	0.021	0.021	0.020	0.020	0.020	0.019	0.019	0.019
30.0	**0.017**	0.020	0.020	0.020	0.019	0.019	0.019	0.018	0.018	0.018	0.017	0.017	0.017	0.016
30.5	**0.015**	0.018	0.017	0.017	0.017	0.016	0.016	0.016	0.016	0.015	0.015	0.015	0.015	0.014
31.0	**0.013**	0.016	0.015	0.015	0.015	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.013	0.013
31.5	**0.011**	0.014	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.011
32.0	**0.010**	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.011	0.010	0.010	0.010

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

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

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	90.9	93.2
4	91.1	93.6
5	92.9	96.5
6	96.0	100.0
7	99.6	103.2
8	102.8	105.9
9	103.9	106.9
10	103.9	106.9
11	103.9	106.9
12	103.9	106.9
13	103.9	106.9
14	103.9	106.9
15	103.9	106.9
16	103.9	106.9
17	103.9	106.9
18	103.9	106.9
19	103.9	106.9
20	103.9	106.9

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

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

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

NOTE The power curves and Ct values presented in Section 8 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

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

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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**224**	162	168	174	179	185	190	196	201	207	213	218	229	235
4.5	**337**	250	258	265	273	281	289	297	305	313	321	329	345	352
5.0	**478**	358	369	380	391	402	413	423	434	445	456	467	488	499
5.5	**648**	490	505	519	533	548	562	576	591	605	619	634	662	676
6.0	**853**	649	668	687	705	724	742	761	779	798	816	835	872	890
6.5	**1096**	838	861	885	908	932	955	979	1002	1026	1049	1072	1119	1143
7.0	**1380**	1059	1088	1118	1147	1176	1206	1235	1264	1293	1322	1351	1410	1439
7.5	**1704**	1311	1347	1383	1419	1455	1491	1526	1562	1598	1633	1668	1739	1774
8.0	**2070**	1600	1643	1686	1730	1773	1816	1858	1901	1944	1986	2028	2112	2154
8.5	**2472**	1924	1975	2026	2077	2128	2178	2228	2278	2328	2376	2424	2520	2566
9.0	**2874**	2273	2330	2388	2446	2504	2558	2612	2667	2721	2772	2823	2923	2971
9.5	**3238**	2621	2681	2742	2803	2864	2919	2975	3030	3085	3136	3187	3286	3334
10.0	**3567**	2950	3012	3073	3135	3196	3252	3307	3362	3418	3468	3517	3612	3658
10.5	**3847**	3252	3314	3376	3438	3500	3554	3607	3661	3714	3758	3803	3884	3920
11.0	**4035**	3526	3584	3643	3701	3759	3803	3848	3892	3937	3970	4002	4059	4084
11.5	**4146**	3767	3817	3866	3916	3966	3998	4030	4062	4094	4112	4129	4157	4167
12.0	**4188**	3957	3993	4030	4066	4103	4119	4136	4152	4168	4175	4182	4191	4194
12.5	**4198**	4084	4104	4125	4146	4167	4173	4180	4187	4194	4195	4197	4199	4199
13.0	**4200**	4148	4159	4169	4180	4190	4192	4194	4196	4199	4199	4199	4200	4200
13.5	**4200**	4167	4174	4180	4187	4194	4195	4196	4198	4199	4199	4200	4200	4200
14.0	**4200**	4184	4187	4191	4194	4198	4198	4199	4199	4200	4200	4200	4200	4200
14.5	**4200**	4193	4194	4196	4198	4199	4199	4200	4200	4200	4200	4200	4200	4200
15.0	**4200**	4194	4196	4196	4198	4198	4199	4199	4200	4200	4200	4200	4200	4200
15.5	**4200**	4196	4197	4198	4198	4199	4199	4200	4200	4200	4200	4200	4200	4200
16.0	**4200**	4198	4198	4199	4199	4200	4200	4200	4200	4200	4200	4200	4200	4200
16.5	**4200**	4198	4199	4199	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
17.0	**4200**	4199	4199	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
25.5	**4200**	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
26.0	**4200**	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
26.5	**4200**	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
27.0	**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

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

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

Air density kg/m³														
Wind speed [m/s]	**1.225**	**0.950**	**0.975**	**1.000**	**1.025**	**1.050**	**1.075**	**1.100**	**1.125**	**1.150**	**1.175**	**1.200**	**1.250**	**1.275**
3.0	**0.879**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.852**	0.858	0.857	0.856	0.855	0.853	0.853	0.853	0.853	0.853	0.853	0.852	0.852	0.853
4.5	**0.855**	0.854	0.854	0.855	0.855	0.855	0.855	0.856	0.856	0.856	0.856	0.855	0.855	0.855
5.0	**0.851**	0.855	0.855	0.855	0.855	0.854	0.854	0.853	0.853	0.853	0.852	0.852	0.851	0.850
5.5	**0.847**	0.852	0.852	0.851	0.851	0.850	0.850	0.849	0.849	0.848	0.848	0.847	0.846	0.846
6.0	**0.841**	0.847	0.847	0.846	0.846	0.845	0.845	0.844	0.843	0.843	0.842	0.842	0.840	0.840
6.5	**0.835**	0.843	0.842	0.842	0.841	0.840	0.840	0.839	0.838	0.837	0.837	0.836	0.834	0.833
7.0	**0.828**	0.838	0.837	0.836	0.835	0.834	0.833	0.832	0.831	0.831	0.830	0.829	0.827	0.826
7.5	**0.821**	0.832	0.831	0.830	0.829	0.828	0.827	0.826	0.825	0.824	0.823	0.822	0.820	0.818
8.0	**0.822**	0.838	0.836	0.835	0.834	0.833	0.831	0.830	0.829	0.827	0.826	0.824	0.821	0.819
8.5	**0.802**	0.838	0.835	0.833	0.831	0.828	0.825	0.821	0.818	0.814	0.810	0.806	0.798	0.793
9.0	**0.745**	0.810	0.805	0.800	0.795	0.790	0.783	0.777	0.771	0.765	0.758	0.752	0.739	0.732
9.5	**0.673**	0.753	0.746	0.739	0.731	0.724	0.717	0.709	0.702	0.694	0.687	0.680	0.666	0.659
10.0	**0.606**	0.687	0.679	0.671	0.664	0.656	0.649	0.641	0.634	0.627	0.620	0.613	0.599	0.592
10.5	**0.545**	0.625	0.618	0.610	0.603	0.596	0.588	0.581	0.574	0.567	0.560	0.552	0.537	0.530
11.0	**0.483**	0.570	0.562	0.554	0.546	0.539	0.531	0.523	0.515	0.507	0.499	0.491	0.474	0.466
11.5	**0.423**	0.519	0.510	0.502	0.494	0.485	0.476	0.468	0.459	0.450	0.441	0.432	0.414	0.406
12.0	**0.367**	0.469	0.460	0.451	0.441	0.432	0.422	0.413	0.403	0.394	0.385	0.376	0.359	0.351
12.5	**0.319**	0.420	0.410	0.400	0.390	0.380	0.370	0.361	0.352	0.343	0.335	0.327	0.312	0.305
13.0	**0.280**	0.371	0.362	0.352	0.342	0.333	0.324	0.316	0.308	0.300	0.293	0.287	0.274	0.268
13.5	**0.249**	0.328	0.320	0.311	0.303	0.294	0.287	0.280	0.273	0.266	0.260	0.254	0.243	0.238
14.0	**0.221**	0.291	0.283	0.276	0.268	0.261	0.255	0.248	0.242	0.236	0.231	0.226	0.217	0.212
14.5	**0.198**	0.259	0.253	0.246	0.239	0.232	0.227	0.222	0.217	0.211	0.207	0.202	0.194	0.190
15.0	**0.177**	0.231	0.225	0.219	0.214	0.208	0.203	0.198	0.194	0.189	0.185	0.181	0.174	0.171
15.5	**0.161**	0.208	0.203	0.198	0.193	0.187	0.183	0.179	0.175	0.171	0.167	0.164	0.157	0.154
16.0	**0.146**	0.188	0.184	0.179	0.174	0.170	0.166	0.162	0.159	0.155	0.152	0.149	0.143	0.140
16.5	**0.133**	0.171	0.167	0.163	0.159	0.155	0.151	0.148	0.145	0.141	0.139	0.136	0.131	0.128
17.0	**0.122**	0.156	0.152	0.149	0.145	0.141	0.138	0.135	0.132	0.129	0.127	0.124	0.120	0.117
17.5	**0.112**	0.143	0.140	0.136	0.133	0.129	0.127	0.124	0.121	0.119	0.116	0.114	0.110	0.108
18.0	**0.103**	0.131	0.128	0.125	0.122	0.119	0.117	0.114	0.112	0.109	0.107	0.105	0.101	0.099
18.5	**0.095**	0.121	0.118	0.115	0.113	0.110	0.108	0.105	0.103	0.101	0.099	0.097	0.094	0.092
19.0	**0.088**	0.111	0.109	0.106	0.104	0.101	0.099	0.097	0.095	0.093	0.091	0.090	0.086	0.085
19.5	**0.082**	0.103	0.101	0.098	0.096	0.094	0.092	0.090	0.088	0.086	0.085	0.083	0.080	0.079
20.0	**0.076**	0.096	0.094	0.092	0.089	0.087	0.086	0.084	0.082	0.080	0.079	0.077	0.075	0.073
20.5	**0.071**	0.089	0.087	0.085	0.083	0.081	0.080	0.078	0.077	0.075	0.074	0.072	0.070	0.069
21.0	**0.066**	0.083	0.081	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.068	0.065	0.064
21.5	**0.063**	0.079	0.077	0.075	0.074	0.072	0.070	0.069	0.068	0.066	0.065	0.064	0.062	0.061
22.0	**0.059**	0.074	0.072	0.071	0.069	0.067	0.066	0.065	0.064	0.062	0.061	0.060	0.058	0.057
22.5	**0.056**	0.069	0.068	0.066	0.065	0.063	0.062	0.061	0.060	0.059	0.058	0.057	0.055	0.054
23.0	**0.052**	0.065	0.063	0.062	0.061	0.059	0.058	0.057	0.056	0.055	0.054	0.053	0.051	0.050
23.5	**0.049**	0.061	0.060	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.050	0.048	0.048
24.0	**0.047**	0.058	0.056	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045
24.5	**0.044**	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.046	0.045	0.043	0.043
25.0	**0.042**	0.052	0.051	0.049	0.048	0.047	0.047	0.046	0.045	0.044	0.043	0.043	0.041	0.041
25.5	**0.040**	0.049	0.048	0.047	0.046	0.045	0.044	0.044	0.043	0.042	0.041	0.041	0.039	0.039
26.0	**0.038**	0.047	0.046	0.045	0.044	0.043	0.042	0.042	0.041	0.040	0.039	0.039	0.038	0.037
26.5	**0.036**	0.044	0.044	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.038	0.037	0.036	0.035
27.0	**0.035**	0.042	0.041	0.041	0.040	0.039	0.038	0.038	0.037	0.036	0.036	0.035	0.034	0.034

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

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

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/m^3**	
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	90.9	93.2
4	91.1	93.6
5	92.9	96.5
6	96.0	100.0
7	99.6	103.2
8	102.9	106.0
9	103.9	106.9
10	103.9	106.9
11	103.9	106.9
12	103.9	106.9
13	103.9	106.9
14	103.9	106.9
15	103.9	106.9
16	103.9	106.9
17	103.9	106.9
18	103.9	106.9
19	103.9	106.9
20	103.9	106.9

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

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

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

NOTE The power curves and Ct values presented in Section 9 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

9.1 Power Curves, Power Optimized Mode PO1/PO1-0S (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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**224**	162	168	174	179	185	190	196	201	207	213	218	229	235
4.5	**337**	250	258	265	273	281	289	297	305	313	321	329	345	352
5.0	**478**	358	369	380	391	402	413	423	434	445	456	467	488	499
5.5	**648**	490	505	519	533	548	562	576	591	605	619	634	662	676
6.0	**853**	649	668	687	705	724	742	761	779	798	816	835	872	890
6.5	**1096**	838	861	885	908	932	955	979	1002	1026	1049	1072	1119	1143
7.0	**1380**	1059	1088	1118	1147	1176	1206	1235	1264	1293	1322	1351	1410	1439
7.5	**1704**	1311	1347	1383	1419	1455	1491	1526	1562	1598	1633	1668	1739	1774
8.0	**2070**	1600	1643	1686	1730	1773	1816	1858	1901	1944	1986	2028	2112	2154
8.5	**2472**	1924	1975	2026	2077	2128	2178	2228	2278	2328	2376	2424	2520	2566
9.0	**2874**	2273	2330	2388	2446	2504	2558	2612	2667	2721	2772	2823	2923	2971
9.5	**3238**	2621	2681	2742	2803	2864	2919	2975	3030	3085	3136	3187	3286	3334
10.0	**3567**	2950	3012	3073	3135	3196	3252	3307	3362	3418	3468	3517	3612	3658
10.5	**3847**	3252	3314	3376	3438	3500	3554	3607	3661	3714	3758	3803	3884	3920
11.0	**4035**	3526	3584	3643	3701	3759	3803	3848	3892	3937	3970	4002	4059	4084
11.5	**4146**	3767	3817	3866	3916	3966	3998	4030	4062	4094	4112	4129	4157	4167
12.0	**4188**	3957	3993	4030	4066	4103	4119	4136	4152	4168	4175	4182	4191	4194
12.5	**4198**	4084	4104	4125	4146	4167	4173	4180	4187	4194	4195	4197	4199	4199
13.0	**4200**	4148	4159	4169	4180	4190	4192	4194	4196	4199	4199	4199	4200	4200
13.5	**4200**	4167	4174	4180	4187	4194	4195	4196	4198	4199	4199	4200	4200	4200
14.0	**4200**	4184	4187	4191	4194	4198	4198	4199	4199	4200	4200	4200	4200	4200
14.5	**4200**	4193	4194	4196	4198	4199	4199	4200	4200	4200	4200	4200	4200	4200
15.0	**4200**	4194	4196	4196	4198	4198	4199	4199	4200	4200	4200	4200	4200	4200
15.5	**4200**	4196	4197	4198	4198	4199	4199	4200	4200	4200	4200	4200	4200	4200
16.0	**4200**	4198	4198	4199	4199	4200	4200	4200	4200	4200	4200	4200	4200	4200
16.5	**4200**	4198	4199	4199	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
17.0	**4200**	4199	4199	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	**4199**	4199	4199	4199	4199	4199	4199	4199	4199	4199	4199	4199	4199	4199
24.5	**4189**	4189	4189	4189	4189	4189	4189	4189	4189	4189	4189	4189	4189	4189
25.0	**4146**	4146	4146	4146	4146	4146	4146	4146	4146	4146	4146	4146	4146	4146
25.5	**4079**	4079	4079	4079	4079	4079	4079	4079	4079	4079	4079	4079	4079	4079
26.0	**3984**	3984	3984	3984	3984	3984	3984	3984	3984	3984	3984	3984	3984	3984
26.5	**3873**	3873	3873	3873	3873	3873	3873	3873	3873	3873	3873	3873	3873	3873

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

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**
27.0	**3763**	3763	3763	3763	3763	3763	3763	3763	3763	3763	3763	3763	3763	3763
27.5	**3629**	3629	3629	3629	3629	3629	3629	3629	3629	3629	3629	3629	3629	3629
28.0	**3467**	3467	3467	3467	3467	3467	3467	3467	3467	3467	3467	3467	3467	3467
28.5	**3274**	3274	3274	3274	3274	3274	3274	3274	3274	3274	3274	3274	3274	3274
29.0	**3048**	3048	3048	3048	3048	3048	3048	3048	3048	3048	3048	3048	3048	3048
29.5	**2805**	2805	2805	2805	2805	2805	2805	2805	2805	2805	2805	2805	2805	2805
30.0	**2564**	2564	2564	2564	2564	2564	2564	2564	2564	2564	2564	2564	2564	2564
30.5	**2324**	2324	2324	2324	2324	2324	2324	2324	2324	2324	2324	2324	2324	2324
31.0	**2089**	2089	2089	2089	2089	2089	2089	2089	2089	2089	2089	2089	2089	2089
31.5	**1883**	1883	1883	1883	1883	1883	1883	1883	1883	1883	1883	1883	1883	1883
32.0	**1731**	1732	1732	1732	1732	1732	1731	1731	1731	1731	1731	1731	1731	1731

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

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

9.2 Ct Values, Power Optimized Mode PO1/PO1-0S (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	**0.879**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.852**	0.858	0.857	0.856	0.855	0.853	0.853	0.853	0.853	0.853	0.853	0.852	0.852	0.853
4.5	**0.855**	0.854	0.854	0.855	0.855	0.855	0.855	0.856	0.856	0.856	0.856	0.855	0.855	0.855
5.0	**0.851**	0.855	0.855	0.855	0.855	0.854	0.854	0.853	0.853	0.853	0.852	0.852	0.851	0.850
5.5	**0.847**	0.852	0.852	0.851	0.851	0.850	0.850	0.849	0.849	0.848	0.848	0.847	0.846	0.846
6.0	**0.841**	0.847	0.847	0.846	0.846	0.845	0.845	0.844	0.843	0.843	0.842	0.842	0.840	0.840
6.5	**0.835**	0.843	0.842	0.842	0.841	0.840	0.840	0.839	0.838	0.837	0.837	0.836	0.834	0.833
7.0	**0.828**	0.838	0.837	0.836	0.835	0.834	0.833	0.832	0.831	0.831	0.830	0.829	0.827	0.826
7.5	**0.821**	0.832	0.831	0.830	0.829	0.828	0.827	0.826	0.825	0.824	0.823	0.822	0.820	0.818
8.0	**0.822**	0.838	0.836	0.835	0.834	0.833	0.831	0.830	0.829	0.827	0.826	0.824	0.821	0.819
8.5	**0.802**	0.838	0.835	0.833	0.831	0.828	0.825	0.821	0.818	0.814	0.810	0.806	0.798	0.793
9.0	**0.745**	0.810	0.805	0.800	0.795	0.790	0.783	0.777	0.771	0.765	0.758	0.752	0.739	0.732
9.5	**0.673**	0.753	0.746	0.739	0.731	0.724	0.717	0.709	0.702	0.694	0.687	0.680	0.666	0.659
10.0	**0.606**	0.687	0.679	0.671	0.664	0.656	0.649	0.641	0.634	0.627	0.620	0.613	0.599	0.592
10.5	**0.545**	0.625	0.618	0.610	0.603	0.596	0.588	0.581	0.574	0.567	0.560	0.552	0.537	0.530
11.0	**0.483**	0.570	0.562	0.554	0.546	0.539	0.531	0.523	0.515	0.507	0.499	0.491	0.474	0.466
11.5	**0.423**	0.519	0.510	0.502	0.494	0.485	0.476	0.468	0.459	0.450	0.441	0.432	0.414	0.406
12.0	**0.367**	0.469	0.460	0.451	0.441	0.432	0.422	0.413	0.403	0.394	0.385	0.376	0.359	0.351
12.5	**0.319**	0.420	0.410	0.400	0.390	0.380	0.370	0.361	0.352	0.343	0.335	0.327	0.312	0.305
13.0	**0.280**	0.371	0.362	0.352	0.342	0.333	0.324	0.316	0.308	0.300	0.293	0.287	0.274	0.268
13.5	**0.249**	0.328	0.320	0.311	0.303	0.294	0.287	0.280	0.273	0.266	0.260	0.254	0.243	0.238
14.0	**0.221**	0.291	0.283	0.276	0.268	0.261	0.255	0.248	0.242	0.236	0.231	0.226	0.217	0.212
14.5	**0.198**	0.259	0.253	0.246	0.239	0.232	0.227	0.222	0.217	0.211	0.207	0.202	0.194	0.190
15.0	**0.177**	0.231	0.225	0.219	0.214	0.208	0.203	0.198	0.194	0.189	0.185	0.181	0.174	0.171
15.5	**0.161**	0.208	0.203	0.198	0.193	0.187	0.183	0.179	0.175	0.171	0.167	0.164	0.157	0.154
16.0	**0.146**	0.188	0.184	0.179	0.174	0.170	0.166	0.162	0.159	0.155	0.152	0.149	0.143	0.140
16.5	**0.133**	0.171	0.167	0.163	0.159	0.155	0.151	0.148	0.145	0.141	0.139	0.136	0.131	0.128
17.0	**0.122**	0.156	0.152	0.149	0.145	0.141	0.138	0.135	0.132	0.129	0.127	0.124	0.120	0.117
17.5	**0.112**	0.143	0.140	0.136	0.133	0.129	0.127	0.124	0.121	0.119	0.116	0.114	0.110	0.108
18.0	**0.103**	0.131	0.128	0.125	0.122	0.119	0.117	0.114	0.112	0.109	0.107	0.105	0.101	0.099
18.5	**0.095**	0.121	0.118	0.115	0.113	0.110	0.108	0.105	0.103	0.101	0.099	0.097	0.094	0.092
19.0	**0.088**	0.111	0.109	0.106	0.104	0.101	0.099	0.097	0.095	0.093	0.091	0.090	0.086	0.085
19.5	**0.082**	0.103	0.101	0.098	0.096	0.094	0.092	0.090	0.088	0.086	0.085	0.083	0.080	0.079
20.0	**0.076**	0.096	0.094	0.092	0.089	0.087	0.086	0.084	0.082	0.080	0.079	0.077	0.075	0.073
20.5	**0.071**	0.089	0.087	0.085	0.083	0.081	0.080	0.078	0.077	0.075	0.074	0.072	0.070	0.069
21.0	**0.066**	0.083	0.081	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.068	0.065	0.064
21.5	**0.063**	0.079	0.077	0.075	0.074	0.072	0.070	0.069	0.068	0.066	0.065	0.064	0.062	0.061
22.0	**0.059**	0.074	0.072	0.071	0.069	0.067	0.066	0.065	0.064	0.062	0.061	0.060	0.058	0.057
22.5	**0.056**	0.069	0.068	0.066	0.065	0.063	0.062	0.061	0.060	0.059	0.058	0.057	0.055	0.054
23.0	**0.052**	0.065	0.063	0.062	0.061	0.059	0.058	0.057	0.056	0.055	0.054	0.053	0.051	0.050
23.5	**0.049**	0.061	0.060	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.050	0.048	0.048
24.0	**0.047**	0.058	0.056	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045
24.5	**0.044**	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.046	0.045	0.043	0.043
25.0	**0.041**	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.044	0.043	0.042	0.041	0.040
25.5	**0.039**	0.048	0.047	0.046	0.045	0.044	0.043	0.043	0.042	0.041	0.040	0.040	0.038	0.038
26.0	**0.036**	0.044	0.044	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.038	0.037	0.036	0.035
26.5	**0.034**	0.041	0.040	0.040	0.039	0.038	0.037	0.037	0.036	0.035	0.035	0.034	0.033	0.033
27.0	**0.031**	0.038	0.037	0.037	0.036	0.035	0.034	0.034	0.033	0.033	0.032	0.032	0.031	0.030
27.5	**0.029**	0.035	0.034	0.034	0.033	0.032	0.032	0.031	0.031	0.030	0.030	0.029	0.028	0.028
28.0	**0.026**	0.032	0.031	0.031	0.030	0.030	0.029	0.029	0.028	0.028	0.027	0.027	0.026	0.026
28.5	**0.024**	0.029	0.028	0.028	0.027	0.027	0.026	0.026	0.025	0.025	0.025	0.024	0.024	0.023
29.0	**0.021**	0.026	0.025	0.025	0.024	0.024	0.024	0.023	0.023	0.022	0.022	0.022	0.021	0.021
29.5	**0.019**	0.023	0.023	0.022	0.022	0.021	0.021	0.021	0.020	0.020	0.020	0.019	0.019	0.019
30.0	**0.017**	0.020	0.020	0.020	0.019	0.019	0.019	0.018	0.018	0.018	0.017	0.017	0.017	0.016
30.5	**0.015**	0.018	0.017	0.017	0.017	0.016	0.016	0.016	0.016	0.015	0.015	0.015	0.015	0.014
31.0	**0.013**	0.016	0.015	0.015	0.015	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.013	0.013
31.5	**0.011**	0.014	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.011
32.0	**0.010**	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.011	0.010	0.010	0.010

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

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

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/m^3**	
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	90.9	93.2
4	91.1	93.6
5	92.9	96.5
6	96.0	100.0
7	99.6	103.2
8	102.8	105.9
9	103.9	106.9
10	103.9	106.9
11	103.9	106.9
12	103.9	106.9
13	103.9	106.9
14	103.9	106.9
15	103.9	106.9
16	103.9	106.9
17	103.9	106.9
18	103.9	106.9
19	103.9	106.9
20	103.9	106.9

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

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

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

NOTE The power curves and Ct values presented in Section 10 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

10.1 Power Curves, Sound Optimized Mode SO1

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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**224**	162	168	173	179	185	190	196	201	207	213	218	229	235
4.5	**336**	250	257	265	273	281	289	297	305	313	321	329	344	352
5.0	**477**	358	369	380	391	402	412	423	434	445	456	466	488	499
5.5	**648**	490	504	519	533	547	562	576	590	605	619	633	662	676
6.0	**853**	649	668	686	705	724	742	761	779	798	816	835	872	890
6.5	**1096**	837	861	884	908	932	955	978	1002	1025	1049	1072	1119	1142
7.0	**1381**	1059	1088	1118	1147	1176	1206	1235	1265	1294	1323	1352	1411	1440
7.5	**1707**	1312	1348	1384	1421	1457	1493	1529	1565	1600	1636	1672	1742	1778
8.0	**2070**	1598	1641	1684	1728	1771	1814	1857	1900	1943	1985	2027	2112	2154
8.5	**2455**	1904	1955	2006	2056	2107	2157	2207	2257	2307	2356	2406	2503	2551
9.0	**2827**	2206	2264	2321	2379	2436	2493	2550	2606	2663	2718	2773	2880	2932
9.5	**3149**	2485	2549	2612	2676	2740	2801	2862	2923	2984	3039	3094	3198	3248
10.0	**3410**	2759	2827	2895	2963	3030	3090	3150	3210	3270	3317	3363	3447	3484
10.5	**3604**	3051	3118	3185	3252	3319	3367	3416	3464	3513	3543	3574	3625	3646
11.0	**3727**	3313	3371	3428	3486	3544	3577	3610	3644	3677	3694	3711	3737	3746
11.5	**3792**	3524	3567	3611	3655	3698	3716	3734	3752	3769	3777	3784	3795	3799
12.0	**3823**	3676	3703	3729	3756	3782	3791	3799	3807	3816	3818	3820	3824	3825
12.5	**3842**	3772	3785	3799	3812	3826	3829	3832	3836	3840	3840	3841	3843	3844
13.0	**3861**	3827	3834	3840	3847	3853	3855	3856	3858	3860	3860	3861	3862	3862
13.5	**3883**	3859	3864	3869	3874	3879	3880	3881	3882	3883	3883	3883	3883	3883
14.0	**3902**	3891	3893	3896	3898	3900	3901	3902	3902	3903	3902	3902	3902	3902
14.5	**3919**	3914	3915	3916	3918	3919	3919	3919	3919	3920	3920	3919	3919	3919
15.0	**3934**	3930	3931	3932	3933	3934	3934	3934	3934	3934	3934	3934	3934	3934
15.5	**3946**	3945	3945	3946	3946	3946	3947	3947	3947	3947	3947	3946	3946	3946
16.0	**3958**	3958	3958	3959	3959	3959	3959	3959	3959	3959	3959	3958	3958	3958
16.5	**3970**	3971	3972	3972	3972	3972	3972	3972	3971	3971	3971	3971	3970	3970
17.0	**3983**	3984	3984	3984	3984	3984	3984	3984	3983	3983	3983	3983	3982	3982
17.5	**3992**	3994	3994	3994	3993	3993	3993	3993	3993	3993	3993	3992	3992	3992
18.0	**3998**	3998	3998	3998	3998	3998	3998	3998	3998	3998	3998	3998	3998	3997
18.5	**4000**	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	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
25.5	**4000**	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
26.0	**4000**	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
26.5	**4000**	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
27.0	**4000**	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000

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

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

10.2 Ct Values, Sound Optimized Mode SO1

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	**0.878**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.852**	0.859	0.857	0.856	0.855	0.853	0.853	0.853	0.853	0.853	0.853	0.852	0.852	0.853
4.5	**0.857**	0.856	0.856	0.856	0.856	0.856	0.856	0.857	0.857	0.857	0.857	0.857	0.856	0.856
5.0	**0.851**	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.852	0.852	0.852	0.851	0.850	0.850
5.5	**0.846**	0.852	0.851	0.851	0.850	0.850	0.849	0.849	0.848	0.848	0.847	0.847	0.846	0.845
6.0	**0.841**	0.847	0.847	0.846	0.845	0.845	0.844	0.844	0.843	0.843	0.842	0.842	0.840	0.840
6.5	**0.837**	0.845	0.844	0.844	0.843	0.842	0.842	0.841	0.840	0.840	0.839	0.838	0.836	0.835
7.0	**0.840**	0.850	0.849	0.848	0.847	0.846	0.845	0.844	0.843	0.843	0.842	0.841	0.839	0.838
7.5	**0.843**	0.854	0.853	0.852	0.852	0.851	0.850	0.849	0.848	0.847	0.846	0.844	0.842	0.841
8.0	**0.833**	0.845	0.844	0.843	0.842	0.841	0.840	0.839	0.838	0.837	0.835	0.834	0.831	0.830
8.5	**0.790**	0.805	0.804	0.803	0.802	0.801	0.799	0.798	0.797	0.796	0.794	0.792	0.787	0.785
9.0	**0.721**	0.737	0.736	0.735	0.734	0.734	0.732	0.731	0.729	0.728	0.726	0.723	0.717	0.714
9.5	**0.643**	0.662	0.662	0.661	0.660	0.660	0.658	0.657	0.655	0.654	0.650	0.647	0.638	0.634
10.0	**0.570**	0.607	0.605	0.604	0.603	0.602	0.598	0.595	0.592	0.588	0.582	0.576	0.563	0.556
10.5	**0.503**	0.573	0.569	0.565	0.561	0.557	0.550	0.543	0.536	0.529	0.521	0.512	0.493	0.484
11.0	**0.439**	0.536	0.529	0.522	0.514	0.507	0.498	0.488	0.479	0.470	0.460	0.449	0.430	0.420
11.5	**0.380**	0.489	0.480	0.470	0.460	0.451	0.440	0.430	0.419	0.409	0.399	0.390	0.372	0.363
12.0	**0.330**	0.436	0.426	0.415	0.404	0.394	0.384	0.374	0.364	0.355	0.346	0.338	0.322	0.315
12.5	**0.289**	0.384	0.374	0.364	0.354	0.343	0.335	0.326	0.318	0.310	0.303	0.296	0.282	0.276
13.0	**0.255**	0.338	0.329	0.320	0.311	0.302	0.294	0.287	0.280	0.273	0.267	0.261	0.250	0.244
13.5	**0.228**	0.300	0.292	0.285	0.277	0.269	0.263	0.257	0.250	0.244	0.239	0.233	0.224	0.219
14.0	**0.204**	0.268	0.261	0.254	0.247	0.240	0.235	0.229	0.224	0.218	0.214	0.209	0.200	0.196
14.5	**0.184**	0.240	0.234	0.228	0.222	0.216	0.211	0.206	0.201	0.196	0.192	0.188	0.181	0.177
15.0	**0.166**	0.215	0.210	0.204	0.199	0.194	0.189	0.185	0.181	0.177	0.173	0.169	0.163	0.159
15.5	**0.151**	0.195	0.190	0.185	0.180	0.176	0.172	0.168	0.164	0.160	0.157	0.154	0.148	0.145
16.0	**0.137**	0.177	0.173	0.168	0.164	0.160	0.156	0.153	0.150	0.146	0.143	0.140	0.135	0.132
16.5	**0.126**	0.161	0.158	0.154	0.150	0.146	0.143	0.140	0.137	0.134	0.131	0.128	0.123	0.121
17.0	**0.116**	0.148	0.144	0.141	0.138	0.134	0.131	0.128	0.126	0.123	0.120	0.118	0.114	0.111
17.5	**0.106**	0.136	0.133	0.129	0.126	0.123	0.121	0.118	0.115	0.113	0.111	0.109	0.105	0.103
18.0	**0.098**	0.125	0.122	0.119	0.116	0.113	0.111	0.109	0.107	0.104	0.102	0.100	0.097	0.095
18.5	**0.091**	0.115	0.113	0.110	0.107	0.105	0.103	0.101	0.098	0.096	0.095	0.093	0.089	0.088
19.0	**0.084**	0.106	0.104	0.101	0.099	0.097	0.095	0.093	0.091	0.089	0.087	0.086	0.082	0.081
19.5	**0.078**	0.098	0.096	0.094	0.092	0.090	0.088	0.086	0.084	0.083	0.081	0.080	0.077	0.075
20.0	**0.073**	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
20.5	**0.068**	0.085	0.083	0.082	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.067	0.066
21.0	**0.064**	0.080	0.078	0.076	0.074	0.073	0.071	0.070	0.069	0.067	0.066	0.065	0.063	0.061
21.5	**0.060**	0.075	0.073	0.072	0.070	0.069	0.067	0.066	0.065	0.063	0.062	0.061	0.059	0.058
22.0	**0.057**	0.070	0.069	0.067	0.066	0.064	0.063	0.062	0.061	0.060	0.059	0.058	0.056	0.055
22.5	**0.053**	0.066	0.065	0.063	0.062	0.061	0.059	0.058	0.057	0.056	0.055	0.054	0.052	0.052
23.0	**0.050**	0.062	0.061	0.059	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.049	0.048
23.5	**0.047**	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.046	0.046
24.0	**0.045**	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.043
24.5	**0.042**	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.045	0.044	0.043	0.042	0.041
25.0	**0.040**	0.049	0.048	0.047	0.046	0.045	0.045	0.044	0.043	0.042	0.042	0.041	0.040	0.039
25.5	**0.038**	0.047	0.046	0.045	0.044	0.043	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.037
26.0	**0.037**	0.045	0.044	0.043	0.042	0.041	0.041	0.040	0.039	0.038	0.038	0.037	0.036	0.036
26.5	**0.035**	0.043	0.042	0.041	0.040	0.039	0.039	0.038	0.037	0.037	0.036	0.035	0.034	0.034
27.0	**0.033**	0.041	0.040	0.039	0.038	0.037	0.037	0.036	0.036	0.035	0.034	0.034	0.033	0.032

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

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

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/m^3**
Wind speed at hub height [m/s]	**Sound Power Level at Hub Height [dBA]** **Sound Optimized Mode SO1** **(Blades with serrated trailing edge)**
3	90.9
4	91.1
5	92.9
6	96.0
7	99.5
8	101.6
9	101.9
10	101.8
11	102.0
12	102.0
13	102.0
14	102.0
15	102.0
16	102.0
17	102.0
18	102.0
19	102.0
20	102.0

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

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

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

NOTE The power curves and Ct values presented in Section 11 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

11.1 Power Curves, Sound Optimized Mode 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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**224**	162	168	173	179	185	190	196	201	207	213	218	229	235
4.5	**336**	250	257	265	273	281	289	297	305	313	321	329	344	352
5.0	**477**	358	369	380	391	402	412	423	434	445	456	466	488	499
5.5	**648**	490	504	519	533	547	562	576	590	605	619	633	662	676
6.0	**853**	649	668	686	705	724	742	761	779	798	816	835	872	890
6.5	**1096**	837	861	884	908	932	955	978	1002	1025	1049	1072	1119	1142
7.0	**1381**	1059	1088	1118	1147	1176	1206	1235	1265	1294	1323	1352	1411	1440
7.5	**1707**	1312	1348	1384	1421	1457	1493	1529	1565	1600	1636	1672	1742	1778
8.0	**2070**	1598	1641	1684	1728	1771	1814	1857	1900	1943	1985	2027	2112	2154
8.5	**2455**	1904	1955	2006	2056	2107	2157	2207	2257	2307	2356	2406	2503	2551
9.0	**2827**	2206	2264	2321	2379	2436	2493	2550	2606	2663	2718	2773	2880	2932
9.5	**3149**	2485	2549	2612	2676	2740	2801	2862	2923	2984	3039	3094	3198	3248
10.0	**3410**	2759	2827	2895	2963	3030	3090	3150	3210	3270	3317	3363	3447	3484
10.5	**3604**	3051	3118	3185	3252	3319	3367	3416	3464	3513	3543	3574	3625	3646
11.0	**3727**	3313	3371	3428	3486	3544	3577	3610	3644	3677	3694	3711	3737	3746
11.5	**3791**	3524	3567	3611	3655	3698	3716	3734	3752	3769	3777	3784	3795	3799
12.0	**3823**	3676	3703	3729	3756	3782	3791	3799	3807	3816	3818	3820	3824	3825
12.5	**3842**	3772	3785	3799	3812	3826	3829	3832	3836	3840	3840	3841	3843	3844
13.0	**3861**	3827	3834	3840	3847	3853	3855	3856	3858	3860	3860	3861	3862	3862
13.5	**3883**	3859	3864	3869	3874	3879	3880	3881	3882	3883	3883	3883	3883	3883
14.0	**3902**	3891	3893	3896	3898	3900	3901	3902	3902	3903	3902	3902	3902	3902
14.5	**3919**	3914	3915	3916	3918	3919	3919	3919	3919	3920	3920	3919	3919	3919
15.0	**3934**	3930	3931	3932	3933	3934	3934	3934	3934	3934	3934	3934	3934	3934
15.5	**3946**	3945	3945	3946	3946	3946	3947	3947	3947	3947	3947	3946	3946	3946
16.0	**3958**	3958	3958	3959	3959	3959	3959	3959	3959	3959	3959	3958	3958	3958
16.5	**3970**	3971	3972	3972	3972	3972	3972	3972	3971	3971	3971	3971	3970	3970
17.0	**3983**	3984	3984	3984	3984	3984	3984	3984	3983	3983	3983	3983	3982	3982
17.5	**3992**	3994	3994	3994	3993	3993	3993	3993	3993	3993	3993	3992	3992	3992
18.0	**3998**	3998	3998	3998	3998	3998	3998	3998	3998	3998	3998	3998	3998	3997
18.5	**4000**	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	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
25.5	**3999**	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999	3999
26.0	**3987**	3987	3987	3987	3987	3987	3987	3987	3987	3987	3987	3987	3987	3987
26.5	**3946**	3946	3946	3946	3946	3946	3946	3946	3946	3946	3946	3946	3946	3946
27.0	**3882**	3882	3882	3882	3882	3882	3882	3882	3882	3882	3882	3882	3882	3882
27.5	**3731**	3731	3731	3731	3731	3731	3731	3731	3731	3731	3731	3731	3731	3731

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Air density [kg/m^3]														
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**
28.0	**3516**	3516	3516	3516	3516	3516	3516	3516	3516	3516	3516	3516	3516	3516
28.5	**3279**	3279	3279	3279	3279	3279	3279	3279	3279	3279	3279	3279	3279	3279
29.0	**3037**	3037	3037	3037	3037	3037	3037	3037	3037	3037	3037	3037	3037	3037
29.5	**2791**	2791	2791	2791	2791	2791	2791	2791	2791	2791	2791	2791	2791	2791
30.0	**2549**	2549	2549	2549	2549	2549	2549	2549	2549	2549	2549	2549	2549	2549
30.5	**2309**	2309	2309	2309	2309	2309	2309	2309	2309	2309	2309	2309	2309	2309
31.0	**2074**	2074	2074	2074	2074	2074	2074	2074	2074	2074	2074	2074	2074	2074
31.5	**1870**	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
32.0	**1722**	1722	1722	1722	1722	1722	1722	1722	1722	1722	1722	1722	1722	1723

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

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

11.2 Ct Values, Sound Optimized Mode 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	**0.878**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.852**	0.859	0.857	0.856	0.855	0.853	0.853	0.853	0.853	0.853	0.853	0.852	0.852	0.853
4.5	**0.857**	0.856	0.856	0.856	0.856	0.856	0.856	0.857	0.857	0.857	0.857	0.857	0.856	0.856
5.0	**0.851**	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.852	0.852	0.852	0.851	0.850	0.850
5.5	**0.846**	0.852	0.851	0.851	0.850	0.850	0.849	0.849	0.848	0.848	0.847	0.847	0.846	0.845
6.0	**0.841**	0.847	0.847	0.846	0.845	0.845	0.844	0.844	0.843	0.843	0.842	0.842	0.840	0.840
6.5	**0.837**	0.845	0.844	0.844	0.843	0.842	0.842	0.841	0.840	0.840	0.839	0.838	0.836	0.835
7.0	**0.840**	0.850	0.849	0.848	0.847	0.846	0.845	0.844	0.843	0.843	0.842	0.841	0.839	0.838
7.5	**0.843**	0.854	0.853	0.852	0.852	0.851	0.850	0.849	0.848	0.847	0.846	0.844	0.842	0.841
8.0	**0.833**	0.845	0.844	0.843	0.842	0.841	0.840	0.839	0.838	0.837	0.835	0.834	0.831	0.830
8.5	**0.790**	0.805	0.804	0.803	0.802	0.801	0.799	0.798	0.797	0.796	0.794	0.792	0.787	0.785
9.0	**0.721**	0.737	0.736	0.735	0.734	0.734	0.732	0.731	0.729	0.728	0.726	0.723	0.717	0.714
9.5	**0.643**	0.662	0.662	0.661	0.660	0.660	0.658	0.657	0.655	0.654	0.650	0.647	0.638	0.634
10.0	**0.570**	0.607	0.605	0.604	0.603	0.602	0.598	0.595	0.592	0.588	0.582	0.576	0.563	0.556
10.5	**0.503**	0.573	0.569	0.565	0.561	0.557	0.550	0.543	0.536	0.529	0.521	0.512	0.493	0.484
11.0	**0.439**	0.536	0.529	0.522	0.514	0.507	0.498	0.488	0.479	0.470	0.460	0.449	0.430	0.420
11.5	**0.380**	0.489	0.480	0.470	0.460	0.451	0.440	0.430	0.419	0.409	0.399	0.390	0.372	0.363
12.0	**0.330**	0.436	0.426	0.415	0.404	0.394	0.384	0.374	0.364	0.355	0.346	0.338	0.322	0.315
12.5	**0.289**	0.384	0.374	0.364	0.354	0.343	0.335	0.326	0.318	0.310	0.303	0.296	0.282	0.276
13.0	**0.255**	0.338	0.329	0.320	0.311	0.302	0.294	0.287	0.280	0.273	0.267	0.261	0.250	0.244
13.5	**0.228**	0.300	0.292	0.285	0.277	0.269	0.263	0.257	0.250	0.244	0.239	0.233	0.224	0.219
14.0	**0.204**	0.268	0.261	0.254	0.247	0.240	0.235	0.229	0.224	0.218	0.214	0.209	0.200	0.196
14.5	**0.184**	0.240	0.234	0.228	0.222	0.216	0.211	0.206	0.201	0.196	0.192	0.188	0.181	0.177
15.0	**0.166**	0.215	0.210	0.204	0.199	0.194	0.189	0.185	0.181	0.177	0.173	0.169	0.163	0.159
15.5	**0.151**	0.195	0.190	0.185	0.180	0.176	0.172	0.168	0.164	0.160	0.157	0.154	0.148	0.145
16.0	**0.137**	0.177	0.173	0.168	0.164	0.160	0.156	0.153	0.150	0.146	0.143	0.140	0.135	0.132
16.5	**0.126**	0.161	0.158	0.154	0.150	0.146	0.143	0.140	0.137	0.134	0.131	0.128	0.123	0.121
17.0	**0.116**	0.148	0.144	0.141	0.138	0.134	0.131	0.128	0.126	0.123	0.120	0.118	0.114	0.111
17.5	**0.106**	0.136	0.133	0.129	0.126	0.123	0.121	0.118	0.115	0.113	0.111	0.109	0.105	0.103
18.0	**0.098**	0.125	0.122	0.119	0.116	0.113	0.111	0.109	0.107	0.104	0.102	0.100	0.097	0.095
18.5	**0.091**	0.115	0.113	0.110	0.107	0.105	0.103	0.101	0.098	0.096	0.095	0.093	0.089	0.088
19.0	**0.084**	0.106	0.104	0.101	0.099	0.097	0.095	0.093	0.091	0.089	0.087	0.086	0.082	0.081
19.5	**0.078**	0.098	0.096	0.094	0.092	0.090	0.088	0.086	0.084	0.083	0.081	0.080	0.077	0.075
20.0	**0.073**	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
20.5	**0.068**	0.085	0.083	0.082	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.067	0.066
21.0	**0.064**	0.080	0.078	0.076	0.074	0.073	0.071	0.070	0.069	0.067	0.066	0.065	0.063	0.061
21.5	**0.060**	0.075	0.073	0.072	0.070	0.069	0.067	0.066	0.065	0.063	0.062	0.061	0.059	0.058
22.0	**0.057**	0.070	0.069	0.067	0.066	0.064	0.063	0.062	0.061	0.060	0.059	0.058	0.056	0.055
22.5	**0.053**	0.066	0.065	0.063	0.062	0.061	0.059	0.058	0.057	0.056	0.055	0.054	0.052	0.052
23.0	**0.050**	0.062	0.061	0.059	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.049	0.048
23.5	**0.047**	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.046	0.046
24.0	**0.045**	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.043
24.5	**0.042**	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.045	0.044	0.043	0.042	0.041
25.0	**0.040**	0.049	0.048	0.047	0.046	0.045	0.045	0.044	0.043	0.042	0.042	0.041	0.040	0.039
25.5	**0.038**	0.047	0.046	0.045	0.044	0.043	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.037
26.0	**0.037**	0.045	0.044	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.038	0.037	0.036	0.035
26.5	**0.035**	0.042	0.041	0.040	0.040	0.039	0.038	0.037	0.037	0.036	0.036	0.035	0.034	0.034
27.0	**0.032**	0.039	0.039	0.038	0.037	0.036	0.036	0.035	0.035	0.034	0.033	0.033	0.032	0.032
27.5	**0.030**	0.036	0.036	0.035	0.034	0.033	0.033	0.032	0.032	0.031	0.031	0.030	0.029	0.029
28.0	**0.027**	0.033	0.032	0.031	0.031	0.030	0.030	0.029	0.029	0.028	0.028	0.027	0.027	0.026
28.5	**0.024**	0.029	0.029	0.028	0.028	0.027	0.027	0.026	0.026	0.025	0.025	0.025	0.024	0.024
29.0	**0.022**	0.026	0.026	0.025	0.025	0.024	0.024	0.023	0.023	0.023	0.022	0.022	0.021	0.021
29.5	**0.019**	0.023	0.023	0.022	0.022	0.021	0.021	0.021	0.020	0.020	0.020	0.019	0.019	0.019
30.0	**0.017**	0.020	0.020	0.020	0.019	0.019	0.018	0.018	0.018	0.018	0.017	0.017	0.017	0.016
30.5	**0.015**	0.018	0.017	0.017	0.017	0.016	0.016	0.016	0.016	0.015	0.015	0.015	0.015	0.014
31.0	**0.013**	0.015	0.015	0.015	0.015	0.014	0.014	0.014	0.014	0.013	0.013	0.013	0.013	0.013
31.5	**0.011**	0.013	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.011	0.011	0.011
32.0	**0.010**	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.011	0.010	0.010	0.010	0.010

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

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

11.3 Sound Curves, Sound Optimized Mode 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/m^3**
Wind speed at hub height [m/s]	**Sound Power Level at Hub Height [dBA]** **Sound Optimized Mode SO1 (HWO)** **(Blades with serrated trailing edge)**
3	90.9
4	91.1
5	92.9
6	96.0
7	99.5
8	101.6
9	101.9
10	101.8
11	102.0
12	102.0
13	102.0
14	102.0
15	102.0
16	102.0
17	102.0
18	102.0
19	102.0
20	102.0

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

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

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

NOTE The power curves and Ct values presented in Section 12 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

12.1 Power Curves, Sound Optimized Mode SO2

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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**224**	162	168	173	179	185	190	196	201	207	213	218	229	235
4.5	**336**	250	257	265	273	281	289	297	305	313	321	329	344	352
5.0	**477**	358	369	380	391	402	412	423	434	445	456	466	488	499
5.5	**648**	490	504	519	533	547	562	576	590	605	619	633	662	676
6.0	**853**	649	668	686	705	724	742	761	779	798	816	835	872	890
6.5	**1096**	837	861	885	908	932	955	979	1002	1026	1049	1072	1120	1143
7.0	**1381**	1058	1088	1117	1147	1176	1206	1235	1264	1294	1323	1352	1410	1438
7.5	**1675**	1304	1340	1376	1412	1448	1483	1518	1552	1587	1616	1646	1700	1724
8.0	**1870**	1560	1599	1637	1675	1714	1740	1767	1794	1820	1837	1853	1880	1890
8.5	**1967**	1790	1818	1845	1873	1901	1914	1926	1939	1952	1957	1962	1970	1974
9.0	**2030**	1955	1968	1981	1994	2007	2011	2015	2020	2024	2026	2028	2031	2031
9.5	**2075**	2049	2054	2059	2064	2069	2070	2071	2072	2073	2074	2074	2075	2076
10.0	**2114**	2108	2108	2109	2110	2111	2111	2112	2113	2113	2114	2114	2114	2114
10.5	**2148**	2159	2157	2155	2153	2151	2151	2150	2149	2149	2148	2148	2147	2147
11.0	**2195**	2230	2226	2221	2216	2212	2209	2206	2203	2200	2199	2197	2194	2192
11.5	**2238**	2284	2279	2274	2268	2263	2259	2255	2251	2247	2244	2241	2236	2233
12.0	**2295**	2344	2338	2333	2328	2322	2318	2314	2310	2306	2302	2299	2292	2288
12.5	**2361**	2414	2409	2403	2397	2391	2386	2382	2377	2372	2368	2365	2357	2354
13.0	**2420**	2475	2469	2462	2456	2450	2446	2441	2436	2432	2428	2424	2417	2414
13.5	**2473**	2523	2517	2511	2505	2498	2494	2490	2486	2482	2479	2476	2470	2467
14.0	**2516**	2565	2559	2553	2547	2542	2537	2533	2529	2525	2522	2519	2513	2510
14.5	**2566**	2618	2612	2606	2600	2594	2590	2586	2581	2577	2573	2570	2563	2560
15.0	**2673**	2716	2711	2707	2702	2698	2694	2691	2687	2684	2680	2677	2670	2666
15.5	**2760**	2795	2791	2788	2785	2781	2778	2775	2772	2769	2766	2763	2757	2754
16.0	**2852**	2880	2877	2874	2872	2869	2867	2864	2862	2860	2857	2854	2849	2847
16.5	**2927**	2943	2942	2940	2939	2937	2936	2934	2933	2932	2930	2929	2925	2923
17.0	**2976**	2979	2979	2979	2979	2979	2979	2978	2978	2978	2977	2976	2975	2974
17.5	**2997**	2996	2996	2997	2997	2998	2998	2998	2998	2998	2997	2997	2997	2996
18.0	**3006**	3006	3006	3006	3006	3006	3006	3006	3006	3006	3006	3006	3006	3006
18.5	**3020**	3020	3020	3020	3021	3021	3021	3020	3020	3020	3020	3020	3019	3019
19.0	**3046**	3058	3057	3056	3055	3054	3053	3052	3050	3049	3048	3047	3045	3044
19.5	**3091**	3104	3103	3102	3101	3100	3099	3098	3096	3095	3094	3093	3090	3089
20.0	**3154**	3162	3162	3161	3161	3161	3160	3159	3158	3157	3156	3155	3153	3152
20.5	**3222**	3217	3218	3219	3220	3220	3221	3221	3222	3222	3222	3222	3222	3222
21.0	**3276**	3260	3262	3264	3266	3267	3269	3270	3272	3273	3274	3275	3277	3277
21.5	**3314**	3299	3301	3302	3304	3306	3307	3309	3310	3312	3312	3313	3315	3316
22.0	**3341**	3324	3327	3329	3331	3333	3334	3336	3337	3339	3339	3340	3341	3342
22.5	**3368**	3352	3354	3356	3358	3360	3361	3363	3364	3365	3366	3367	3368	3369
23.0	**3393**	3373	3375	3377	3380	3382	3384	3386	3387	3389	3390	3392	3394	3395
23.5	**3407**	3389	3391	3393	3395	3398	3399	3401	3402	3404	3405	3406	3408	3410
24.0	**3415**	3397	3399	3401	3403	3406	3407	3409	3410	3412	3413	3414	3416	3417
24.5	**3419**	3401	3403	3405	3407	3409	3410	3412	3413	3415	3416	3417	3420	3421
25.0	**3418**	3401	3403	3405	3407	3410	3411	3412	3413	3415	3416	3417	3420	3421
25.5	**3405**	3381	3383	3386	3389	3392	3394	3396	3398	3400	3402	3404	3407	3408
26.0	**3402**	3380	3383	3385	3387	3389	3391	3393	3395	3397	3399	3401	3404	3405
26.5	**3400**	3380	3382	3384	3386	3388	3390	3391	3393	3395	3397	3399	3401	3403
27.0	**3384**	3367	3368	3370	3372	3374	3375	3377	3378	3380	3381	3382	3385	3386

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

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

12.2 Ct Values, Sound Optimized Mode SO2

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	**0.878**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.852**	0.859	0.857	0.856	0.855	0.853	0.853	0.853	0.853	0.853	0.853	0.852	0.852	0.853
4.5	**0.857**	0.856	0.856	0.856	0.856	0.856	0.856	0.857	0.857	0.857	0.857	0.857	0.856	0.856
5.0	**0.851**	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.852	0.851	0.850	0.850
5.5	**0.846**	0.852	0.851	0.851	0.850	0.850	0.849	0.849	0.848	0.848	0.847	0.847	0.846	0.845
6.0	**0.847**	0.853	0.853	0.852	0.852	0.851	0.851	0.850	0.850	0.849	0.848	0.848	0.846	0.846
6.5	**0.844**	0.852	0.852	0.851	0.850	0.850	0.849	0.848	0.848	0.847	0.846	0.845	0.843	0.842
7.0	**0.844**	0.855	0.855	0.854	0.853	0.852	0.851	0.850	0.849	0.849	0.847	0.845	0.840	0.837
7.5	**0.790**	0.843	0.842	0.841	0.840	0.839	0.834	0.830	0.826	0.821	0.811	0.801	0.779	0.768
8.0	**0.655**	0.800	0.791	0.781	0.772	0.763	0.749	0.735	0.721	0.706	0.689	0.672	0.638	0.621
8.5	**0.526**	0.709	0.693	0.677	0.661	0.645	0.627	0.608	0.590	0.572	0.557	0.541	0.513	0.499
9.0	**0.433**	0.601	0.583	0.564	0.545	0.527	0.512	0.498	0.483	0.469	0.457	0.445	0.423	0.412
9.5	**0.365**	0.498	0.483	0.468	0.453	0.438	0.427	0.415	0.404	0.392	0.383	0.374	0.357	0.349
10.0	**0.313**	0.419	0.407	0.395	0.383	0.371	0.362	0.353	0.344	0.335	0.327	0.320	0.306	0.299
10.5	**0.271**	0.361	0.350	0.340	0.330	0.320	0.313	0.305	0.297	0.290	0.283	0.277	0.265	0.260
11.0	**0.238**	0.318	0.309	0.300	0.291	0.282	0.276	0.269	0.262	0.255	0.250	0.244	0.234	0.229
11.5	**0.211**	0.281	0.274	0.266	0.258	0.250	0.244	0.238	0.232	0.226	0.221	0.216	0.207	0.203
12.0	**0.190**	0.252	0.245	0.238	0.231	0.224	0.219	0.214	0.208	0.203	0.199	0.194	0.186	0.182
12.5	**0.172**	0.228	0.222	0.216	0.209	0.203	0.199	0.194	0.189	0.184	0.180	0.176	0.169	0.165
13.0	**0.157**	0.206	0.201	0.196	0.190	0.185	0.180	0.176	0.172	0.167	0.164	0.160	0.154	0.150
13.5	**0.144**	0.188	0.183	0.178	0.173	0.169	0.165	0.161	0.157	0.153	0.150	0.147	0.141	0.138
14.0	**0.131**	0.171	0.167	0.162	0.158	0.153	0.150	0.147	0.143	0.140	0.137	0.134	0.128	0.126
14.5	**0.120**	0.157	0.153	0.149	0.145	0.141	0.138	0.135	0.131	0.128	0.126	0.123	0.118	0.116
15.0	**0.113**	0.146	0.143	0.139	0.135	0.132	0.129	0.126	0.123	0.120	0.118	0.115	0.111	0.108
15.5	**0.106**	0.136	0.133	0.130	0.126	0.123	0.120	0.118	0.115	0.112	0.110	0.108	0.104	0.102
16.0	**0.099**	0.128	0.125	0.122	0.119	0.116	0.113	0.111	0.108	0.106	0.104	0.102	0.098	0.096
16.5	**0.093**	0.119	0.116	0.114	0.111	0.108	0.106	0.104	0.101	0.099	0.097	0.095	0.092	0.090
17.0	**0.087**	0.110	0.108	0.105	0.103	0.100	0.098	0.096	0.094	0.092	0.090	0.089	0.085	0.084
17.5	**0.081**	0.102	0.100	0.097	0.095	0.093	0.091	0.089	0.087	0.085	0.084	0.082	0.079	0.078
18.0	**0.075**	0.094	0.092	0.090	0.088	0.086	0.084	0.082	0.081	0.079	0.078	0.076	0.073	0.072
18.5	**0.069**	0.087	0.086	0.084	0.082	0.080	0.078	0.077	0.075	0.073	0.072	0.071	0.068	0.067
19.0	**0.065**	0.082	0.080	0.078	0.076	0.074	0.073	0.071	0.070	0.068	0.067	0.066	0.064	0.063
19.5	**0.061**	0.077	0.075	0.074	0.072	0.070	0.069	0.067	0.066	0.065	0.063	0.062	0.060	0.059
20.0	**0.058**	0.073	0.071	0.070	0.068	0.067	0.065	0.064	0.063	0.061	0.060	0.059	0.057	0.056
20.5	**0.055**	0.069	0.068	0.066	0.065	0.063	0.062	0.061	0.060	0.058	0.057	0.056	0.055	0.054
21.0	**0.053**	0.065	0.064	0.063	0.061	0.060	0.059	0.058	0.057	0.056	0.055	0.054	0.052	0.051
21.5	**0.050**	0.063	0.061	0.060	0.059	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.050	0.049
22.0	**0.048**	0.059	0.058	0.057	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.049	0.047	0.046
22.5	**0.045**	0.056	0.055	0.054	0.053	0.051	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.044
23.0	**0.043**	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.044	0.042	0.042
23.5	**0.041**	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.044	0.043	0.042	0.041	0.040	0.039
24.0	**0.039**	0.047	0.046	0.045	0.045	0.044	0.043	0.042	0.041	0.041	0.040	0.039	0.038	0.038
24.5	**0.037**	0.045	0.044	0.043	0.042	0.041	0.041	0.040	0.039	0.039	0.038	0.037	0.036	0.036
25.0	**0.035**	0.042	0.042	0.041	0.040	0.039	0.039	0.038	0.037	0.037	0.036	0.035	0.034	0.034
25.5	**0.033**	0.040	0.040	0.039	0.038	0.037	0.037	0.036	0.035	0.035	0.034	0.034	0.033	0.032
26.0	**0.032**	0.038	0.038	0.037	0.036	0.035	0.035	0.034	0.034	0.033	0.033	0.032	0.031	0.031
26.5	**0.030**	0.036	0.036	0.035	0.034	0.034	0.033	0.033	0.032	0.032	0.031	0.031	0.030	0.029
27.0	**0.029**	0.035	0.034	0.033	0.033	0.032	0.032	0.031	0.031	0.030	0.030	0.029	0.028	0.028

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

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

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	90.9
4	91.1
5	92.9
6	96.0
7	99.0
8	99.4
9	99.4
10	99.5
11	99.5
12	99.5
13	99.5
14	99.5
15	99.5
16	99.5
17	99.5
18	99.5
19	99.5
20	99.5

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

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

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

NOTE The power curves and Ct values presented in Section 13 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

13.1 Power Curves, Sound Optimized Mode SO2 (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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**224**	162	168	173	179	185	190	196	201	207	213	218	229	235
4.5	**336**	250	257	265	273	281	289	297	305	313	321	329	344	352
5.0	**477**	358	369	380	391	402	412	423	434	445	456	466	488	499
5.5	**648**	490	504	519	533	547	562	576	590	605	619	633	662	676
6.0	**853**	649	668	686	705	724	742	761	779	798	816	835	872	890
6.5	**1096**	837	861	885	908	932	955	979	1002	1026	1049	1072	1120	1143
7.0	**1381**	1058	1088	1117	1147	1176	1206	1235	1264	1294	1323	1352	1410	1438
7.5	**1675**	1304	1340	1376	1412	1448	1483	1518	1552	1587	1616	1646	1700	1724
8.0	**1870**	1560	1599	1637	1675	1714	1740	1767	1794	1820	1837	1853	1880	1890
8.5	**1967**	1790	1818	1845	1873	1901	1914	1926	1939	1952	1957	1962	1970	1974
9.0	**2030**	1955	1968	1981	1994	2007	2011	2015	2020	2024	2026	2028	2031	2031
9.5	**2075**	2049	2054	2059	2064	2069	2070	2071	2072	2073	2074	2074	2075	2076
10.0	**2114**	2108	2108	2109	2110	2111	2111	2112	2113	2113	2114	2114	2114	2114
10.5	**2148**	2159	2157	2155	2153	2151	2151	2150	2149	2149	2148	2148	2147	2147
11.0	**2195**	2230	2226	2221	2216	2212	2209	2206	2203	2200	2199	2197	2194	2192
11.5	**2238**	2284	2279	2274	2268	2263	2259	2255	2251	2247	2244	2241	2236	2233
12.0	**2295**	2344	2338	2333	2328	2322	2318	2314	2310	2306	2302	2299	2292	2288
12.5	**2361**	2414	2409	2403	2397	2391	2386	2382	2377	2372	2368	2365	2357	2354
13.0	**2420**	2475	2469	2462	2456	2450	2446	2441	2436	2432	2428	2424	2417	2414
13.5	**2473**	2523	2517	2511	2505	2498	2494	2490	2486	2482	2479	2476	2470	2467
14.0	**2516**	2565	2559	2553	2547	2542	2537	2533	2529	2525	2522	2519	2513	2510
14.5	**2566**	2618	2612	2606	2600	2594	2590	2586	2581	2577	2573	2570	2563	2560
15.0	**2673**	2716	2711	2707	2702	2698	2694	2691	2687	2684	2680	2677	2670	2666
15.5	**2760**	2795	2791	2788	2785	2781	2778	2775	2772	2769	2766	2763	2757	2754
16.0	**2852**	2880	2877	2874	2872	2869	2867	2864	2862	2860	2857	2854	2849	2847
16.5	**2927**	2943	2942	2940	2939	2937	2936	2934	2933	2932	2930	2929	2925	2923
17.0	**2976**	2979	2979	2979	2979	2979	2979	2978	2978	2978	2977	2976	2975	2974
17.5	**2997**	2996	2996	2997	2997	2998	2998	2998	2998	2998	2997	2997	2997	2996
18.0	**3006**	3006	3006	3006	3006	3006	3006	3006	3006	3006	3006	3006	3006	3006
18.5	**3020**	3020	3020	3020	3021	3021	3021	3020	3020	3020	3020	3020	3019	3019
19.0	**3046**	3058	3057	3056	3055	3054	3053	3052	3050	3049	3048	3047	3045	3044
19.5	**3091**	3104	3103	3102	3101	3100	3099	3098	3096	3095	3094	3093	3090	3089
20.0	**3154**	3162	3162	3161	3161	3161	3160	3159	3158	3157	3156	3155	3153	3152
20.5	**3222**	3217	3218	3219	3220	3220	3221	3221	3222	3222	3222	3222	3222	3222
21.0	**3276**	3260	3262	3264	3266	3267	3269	3270	3272	3273	3274	3275	3277	3277
21.5	**3314**	3299	3301	3302	3304	3306	3307	3309	3310	3312	3312	3313	3315	3316
22.0	**3341**	3324	3327	3329	3331	3333	3334	3336	3337	3339	3339	3340	3341	3342
22.5	**3368**	3352	3354	3356	3358	3360	3361	3363	3364	3365	3366	3367	3368	3369
23.0	**3393**	3373	3375	3377	3380	3382	3384	3386	3387	3389	3390	3392	3394	3395
23.5	**3407**	3389	3391	3393	3395	3398	3399	3401	3402	3404	3405	3406	3408	3410
24.0	**3415**	3397	3399	3401	3403	3406	3407	3409	3410	3412	3413	3414	3416	3417
24.5	**3419**	3401	3403	3405	3407	3409	3410	3412	3413	3415	3416	3417	3420	3421
25.0	**3418**	3401	3403	3405	3407	3410	3411	3412	3413	3415	3416	3417	3420	3421
25.5	**3405**	3381	3383	3386	3389	3392	3394	3396	3398	3400	3402	3404	3407	3408
26.0	**3402**	3380	3382	3384	3386	3389	3391	3393	3395	3397	3398	3400	3403	3405
26.5	**3388**	3369	3371	3373	3375	3377	3379	3380	3382	3384	3385	3387	3389	3391
27.0	**3337**	3322	3323	3325	3327	3328	3330	3331	3333	3334	3335	3336	3338	3339
27.5	**3142**	3137	3137	3138	3138	3139	3140	3140	3141	3141	3141	3142	3143	3143

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

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**
28.0	**2825**	2822	2822	2823	2823	2823	2824	2824	2824	2824	2824	2824	2825	2825
28.5	**2364**	2366	2366	2366	2365	2365	2365	2365	2365	2364	2364	2364	2364	2364
29.0	**1893**	1895	1895	1895	1894	1894	1894	1894	1893	1893	1893	1893	1893	1892
29.5	**1570**	1571	1571	1571	1571	1571	1571	1571	1570	1570	1570	1570	1570	1570
30.0	**1364**	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1363	1363
30.5	**1225**	1226	1225	1225	1225	1225	1225	1225	1225	1225	1225	1225	1225	1225
31.0	**1150**	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
31.5	**1098**	1098	1098	1098	1098	1098	1098	1098	1098	1098	1098	1098	1098	1098
32.0	**1074**	1074	1074	1074	1074	1074	1074	1074	1074	1074	1074	1074	1074	1075

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

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

13.2 Ct Values, Sound Optimized Mode SO2 (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	**0.878**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.852**	0.859	0.857	0.856	0.855	0.853	0.853	0.853	0.853	0.853	0.853	0.852	0.852	0.853
4.5	**0.857**	0.856	0.856	0.856	0.856	0.856	0.856	0.857	0.857	0.857	0.857	0.857	0.856	0.856
5.0	**0.851**	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.852	0.851	0.850	0.850
5.5	**0.846**	0.852	0.851	0.851	0.850	0.850	0.849	0.849	0.848	0.848	0.847	0.847	0.846	0.845
6.0	**0.847**	0.853	0.853	0.852	0.852	0.851	0.851	0.850	0.850	0.849	0.848	0.848	0.846	0.846
6.5	**0.844**	0.852	0.852	0.851	0.850	0.850	0.849	0.848	0.848	0.847	0.846	0.845	0.843	0.842
7.0	**0.844**	0.855	0.855	0.854	0.853	0.852	0.851	0.850	0.849	0.849	0.847	0.845	0.840	0.837
7.5	**0.790**	0.843	0.842	0.841	0.840	0.839	0.834	0.830	0.826	0.821	0.811	0.801	0.779	0.768
8.0	**0.655**	0.800	0.791	0.781	0.772	0.763	0.749	0.735	0.721	0.706	0.689	0.672	0.638	0.621
8.5	**0.526**	0.709	0.693	0.677	0.661	0.645	0.627	0.608	0.590	0.572	0.557	0.541	0.513	0.499
9.0	**0.433**	0.601	0.583	0.564	0.545	0.527	0.512	0.498	0.483	0.469	0.457	0.445	0.423	0.412
9.5	**0.365**	0.498	0.483	0.468	0.453	0.438	0.427	0.415	0.404	0.392	0.383	0.374	0.357	0.349
10.0	**0.313**	0.419	0.407	0.395	0.383	0.371	0.362	0.353	0.344	0.335	0.327	0.320	0.306	0.299
10.5	**0.271**	0.361	0.350	0.340	0.330	0.320	0.313	0.305	0.297	0.290	0.283	0.277	0.265	0.260
11.0	**0.238**	0.318	0.309	0.300	0.291	0.282	0.276	0.269	0.262	0.255	0.250	0.244	0.234	0.229
11.5	**0.211**	0.281	0.274	0.266	0.258	0.250	0.244	0.238	0.232	0.226	0.221	0.216	0.207	0.203
12.0	**0.190**	0.252	0.245	0.238	0.231	0.224	0.219	0.214	0.208	0.203	0.199	0.194	0.186	0.182
12.5	**0.172**	0.228	0.222	0.216	0.209	0.203	0.199	0.194	0.189	0.184	0.180	0.176	0.169	0.165
13.0	**0.157**	0.206	0.201	0.196	0.190	0.185	0.180	0.176	0.172	0.167	0.164	0.160	0.154	0.150
13.5	**0.144**	0.188	0.183	0.178	0.173	0.169	0.165	0.161	0.157	0.153	0.150	0.147	0.141	0.138
14.0	**0.131**	0.171	0.167	0.162	0.158	0.153	0.150	0.147	0.143	0.140	0.137	0.134	0.128	0.126
14.5	**0.120**	0.157	0.153	0.149	0.145	0.141	0.138	0.135	0.131	0.128	0.126	0.123	0.118	0.116
15.0	**0.113**	0.146	0.143	0.139	0.135	0.132	0.129	0.126	0.123	0.120	0.118	0.115	0.111	0.108
15.5	**0.106**	0.136	0.133	0.130	0.126	0.123	0.120	0.118	0.115	0.112	0.110	0.108	0.104	0.102
16.0	**0.099**	0.128	0.125	0.122	0.119	0.116	0.113	0.111	0.108	0.106	0.104	0.102	0.098	0.096
16.5	**0.093**	0.119	0.116	0.114	0.111	0.108	0.106	0.104	0.101	0.099	0.097	0.095	0.092	0.090
17.0	**0.087**	0.110	0.108	0.105	0.103	0.100	0.098	0.096	0.094	0.092	0.090	0.089	0.085	0.084
17.5	**0.081**	0.102	0.100	0.097	0.095	0.093	0.091	0.089	0.087	0.085	0.084	0.082	0.079	0.078
18.0	**0.075**	0.094	0.092	0.090	0.088	0.086	0.084	0.082	0.081	0.079	0.078	0.076	0.073	0.072
18.5	**0.069**	0.087	0.086	0.084	0.082	0.080	0.078	0.077	0.075	0.073	0.072	0.071	0.068	0.067
19.0	**0.065**	0.082	0.080	0.078	0.076	0.074	0.073	0.071	0.070	0.068	0.067	0.066	0.064	0.063
19.5	**0.061**	0.077	0.075	0.074	0.072	0.070	0.069	0.067	0.066	0.065	0.063	0.062	0.060	0.059
20.0	**0.058**	0.073	0.071	0.070	0.068	0.067	0.065	0.064	0.063	0.061	0.060	0.059	0.057	0.056
20.5	**0.055**	0.069	0.068	0.066	0.065	0.063	0.062	0.061	0.060	0.058	0.057	0.056	0.055	0.054
21.0	**0.053**	0.065	0.064	0.063	0.061	0.060	0.059	0.058	0.057	0.056	0.055	0.054	0.052	0.051
21.5	**0.050**	0.063	0.061	0.060	0.059	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.050	0.049
22.0	**0.048**	0.059	0.058	0.057	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.049	0.047	0.046
22.5	**0.045**	0.056	0.055	0.054	0.053	0.051	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.044
23.0	**0.043**	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.044	0.042	0.042
23.5	**0.041**	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.044	0.043	0.042	0.041	0.040	0.039
24.0	**0.039**	0.047	0.046	0.045	0.045	0.044	0.043	0.042	0.041	0.041	0.040	0.039	0.038	0.038
24.5	**0.037**	0.045	0.044	0.043	0.042	0.041	0.041	0.040	0.039	0.039	0.038	0.037	0.036	0.036
25.0	**0.035**	0.042	0.042	0.041	0.040	0.039	0.039	0.038	0.037	0.037	0.036	0.035	0.034	0.034
25.5	**0.033**	0.040	0.040	0.039	0.038	0.037	0.037	0.036	0.035	0.035	0.034	0.034	0.033	0.032
26.0	**0.032**	0.038	0.038	0.037	0.036	0.035	0.035	0.034	0.034	0.033	0.033	0.032	0.031	0.031
26.5	**0.030**	0.036	0.036	0.035	0.034	0.034	0.033	0.033	0.032	0.032	0.031	0.031	0.030	0.029
27.0	**0.028**	0.034	0.034	0.033	0.032	0.032	0.031	0.031	0.030	0.030	0.029	0.029	0.028	0.028
27.5	**0.026**	0.031	0.031	0.030	0.029	0.029	0.028	0.028	0.028	0.027	0.027	0.026	0.026	0.025
28.0	**0.023**	0.027	0.027	0.026	0.026	0.025	0.025	0.025	0.024	0.024	0.023	0.023	0.023	0.022
28.5	**0.019**	0.023	0.022	0.022	0.022	0.021	0.021	0.021	0.020	0.020	0.020	0.019	0.019	0.019
29.0	**0.016**	0.018	0.018	0.018	0.017	0.017	0.017	0.017	0.016	0.016	0.016	0.016	0.015	0.015
29.5	**0.013**	0.015	0.015	0.015	0.015	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.013	0.013
30.0	**0.011**	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.011	0.011
30.5	**0.010**	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.010	0.010	0.010	0.010	0.010	0.010
31.0	**0.009**	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.009
31.5	**0.008**	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.008
32.0	**0.008**	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008

Table 13-2: C_t values, Sound Optimized Mode SO2 (HWO)

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

13.3 Sound Curves, Sound Optimized Mode 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/m^3**
Wind speed at hub height [m/s]	**Sound Power Level at Hub Height [dBA]** **Sound Optimized Mode SO2 (HWO)** **(Blades with serrated trailing edge)**
3	90.9
4	91.1
5	92.9
6	96.0
7	99.0
8	99.4
9	99.4
10	99.5
11	99.5
12	99.5
13	99.5
14	99.5
15	99.5
16	99.5
17	99.5
18	99.5
19	99.5
20	99.5

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

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

14 Power Curves, Ct Values and Sound Curves, Sound Optimized Mode SO11

NOTE

The power curves and Ct values presented in Section 14 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

14.1 Power Curves, Sound Optimized Mode SO11

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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**224**	162	168	173	179	185	190	196	201	207	213	218	229	235
4.5	**336**	250	257	265	273	281	289	297	305	313	321	329	344	352
5.0	**477**	358	369	380	391	401	412	423	434	445	456	466	488	499
5.5	**642**	486	501	515	529	543	557	572	586	600	614	628	656	670
6.0	**820**	627	644	662	680	697	715	732	750	768	785	803	838	855
6.5	**1001**	768	790	811	832	853	875	896	917	938	959	980	1022	1043
7.0	**1185**	912	937	962	987	1012	1036	1061	1086	1111	1136	1160	1209	1234
7.5	**1362**	1052	1080	1109	1137	1166	1194	1222	1250	1278	1306	1334	1390	1417
8.0	**1535**	1193	1225	1257	1289	1321	1352	1384	1416	1447	1476	1506	1561	1588
8.5	**1715**	1412	1444	1476	1508	1540	1568	1595	1623	1651	1672	1694	1734	1752
9.0	**1907**	1722	1745	1768	1790	1812	1828	1844	1859	1874	1885	1896	1915	1923
9.5	**2058**	1980	1991	2002	2013	2024	2030	2036	2042	2048	2051	2055	2061	2063
10.0	**2157**	2131	2135	2139	2143	2147	2149	2150	2152	2154	2155	2156	2157	2158
10.5	**2218**	2206	2208	2210	2212	2214	2214	2215	2216	2217	2217	2218	2218	2218
11.0	**2267**	2260	2261	2262	2264	2265	2265	2266	2266	2266	2266	2267	2267	2266
11.5	**2309**	2307	2307	2308	2308	2309	2309	2310	2310	2310	2310	2310	2309	2309
12.0	**2344**	2343	2344	2344	2344	2344	2344	2344	2344	2344	2344	2344	2343	2343
12.5	**2372**	2373	2373	2373	2373	2373	2373	2373	2373	2372	2372	2372	2371	2371
13.0	**2398**	2400	2400	2400	2400	2400	2400	2399	2399	2399	2399	2398	2398	2398
13.5	**2420**	2421	2421	2421	2421	2421	2421	2421	2420	2420	2420	2420	2420	2419
14.0	**2435**	2436	2436	2436	2436	2436	2436	2436	2436	2436	2435	2435	2435	2435
14.5	**2449**	2451	2451	2451	2451	2451	2450	2450	2450	2450	2450	2449	2449	2449
15.0	**2464**	2466	2466	2466	2466	2466	2465	2465	2465	2465	2465	2464	2464	2464
15.5	**2480**	2482	2482	2482	2482	2482	2482	2481	2481	2481	2481	2480	2480	2480
16.0	**2498**	2500	2500	2500	2500	2500	2499	2499	2499	2498	2498	2498	2497	2497
16.5	**2517**	2521	2521	2520	2520	2520	2519	2519	2519	2518	2518	2518	2517	2516
17.0	**2540**	2544	2544	2544	2544	2543	2543	2542	2542	2541	2541	2540	2539	2538
17.5	**2566**	2572	2571	2571	2570	2570	2569	2569	2568	2568	2567	2566	2565	2564
18.0	**2598**	2606	2605	2605	2604	2604	2603	2602	2602	2601	2600	2599	2597	2596
18.5	**2636**	2646	2645	2644	2644	2643	2642	2641	2640	2639	2638	2637	2635	2634
19.0	**2676**	2685	2684	2684	2683	2682	2681	2680	2679	2678	2678	2676	2674	2674
19.5	**2715**	2724	2724	2723	2722	2722	2721	2720	2719	2718	2717	2716	2714	2713
20.0	**2748**	2756	2755	2755	2754	2754	2753	2752	2752	2751	2750	2749	2748	2747
20.5	**2773**	2778	2778	2777	2777	2776	2776	2776	2775	2775	2774	2774	2773	2772
21.0	**2789**	2793	2793	2793	2792	2792	2791	2791	2791	2790	2790	2790	2789	2788
21.5	**2804**	2812	2811	2810	2810	2809	2808	2808	2807	2806	2805	2805	2803	2803
22.0	**2833**	2847	2846	2844	2843	2842	2841	2840	2839	2837	2836	2835	2832	2831
22.5	**2878**	2893	2891	2890	2889	2888	2886	2885	2884	2882	2881	2879	2876	2875
23.0	**2914**	2923	2922	2922	2921	2920	2919	2918	2918	2917	2916	2915	2913	2912
23.5	**2942**	2951	2950	2949	2948	2948	2947	2946	2945	2945	2944	2943	2941	2940
24.0	**2965**	2970	2970	2969	2969	2969	2968	2968	2967	2967	2966	2965	2964	2964

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

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**
24.5	**2978**	2981	2980	2980	2980	2980	2979	2979	2979	2979	2979	2978	2978	2977
25.0	**2984**	2984	2984	2984	2984	2984	2984	2984	2984	2984	2984	2984	2983	2983
25.5	**2986**	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986	2985	2985
26.0	**2986**	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986
26.5	**2986**	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986
27.0	**2986**	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986

Table 14-1: Power curve, Sound Optimized Mode SO11

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

14.2 Ct Values, Sound Optimized Mode SO11

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	**0.878**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.852**	0.859	0.857	0.856	0.855	0.853	0.853	0.853	0.853	0.853	0.853	0.852	0.852	0.853
4.5	**0.857**	0.856	0.856	0.856	0.856	0.856	0.856	0.857	0.857	0.857	0.857	0.857	0.856	0.856
5.0	**0.841**	0.845	0.845	0.845	0.845	0.844	0.844	0.843	0.843	0.843	0.842	0.842	0.841	0.840
5.5	**0.785**	0.791	0.790	0.790	0.789	0.789	0.788	0.788	0.787	0.787	0.786	0.786	0.785	0.784
6.0	**0.708**	0.713	0.713	0.712	0.712	0.711	0.711	0.710	0.710	0.709	0.709	0.708	0.707	0.707
6.5	**0.637**	0.642	0.642	0.641	0.641	0.640	0.640	0.639	0.639	0.639	0.638	0.638	0.637	0.636
7.0	**0.575**	0.579	0.578	0.578	0.578	0.577	0.577	0.577	0.576	0.576	0.576	0.575	0.574	0.574
7.5	**0.518**	0.522	0.522	0.522	0.521	0.521	0.521	0.520	0.520	0.520	0.519	0.519	0.518	0.517
8.0	**0.468**	0.474	0.474	0.473	0.473	0.473	0.472	0.472	0.471	0.471	0.470	0.469	0.466	0.464
8.5	**0.427**	0.461	0.459	0.457	0.454	0.452	0.449	0.446	0.443	0.439	0.435	0.431	0.422	0.418
9.0	**0.394**	0.477	0.469	0.462	0.454	0.446	0.439	0.431	0.424	0.416	0.409	0.402	0.387	0.381
9.5	**0.358**	0.468	0.456	0.445	0.433	0.422	0.412	0.402	0.393	0.383	0.375	0.367	0.351	0.344
10.0	**0.318**	0.424	0.412	0.400	0.389	0.377	0.368	0.359	0.350	0.341	0.333	0.325	0.311	0.304
10.5	**0.279**	0.369	0.359	0.349	0.340	0.330	0.322	0.314	0.306	0.298	0.292	0.286	0.273	0.268
11.0	**0.246**	0.323	0.314	0.306	0.298	0.289	0.283	0.276	0.269	0.263	0.257	0.251	0.241	0.236
11.5	**0.218**	0.284	0.277	0.270	0.263	0.255	0.250	0.244	0.238	0.232	0.227	0.223	0.213	0.209
12.0	**0.194**	0.252	0.245	0.239	0.233	0.227	0.221	0.216	0.211	0.206	0.202	0.198	0.190	0.186
12.5	**0.173**	0.224	0.218	0.213	0.207	0.202	0.197	0.193	0.188	0.184	0.180	0.177	0.170	0.166
13.0	**0.155**	0.200	0.195	0.190	0.186	0.181	0.177	0.173	0.169	0.165	0.162	0.159	0.152	0.149
13.5	**0.141**	0.181	0.176	0.172	0.168	0.163	0.160	0.156	0.153	0.149	0.146	0.144	0.138	0.135
14.0	**0.127**	0.163	0.159	0.155	0.151	0.147	0.144	0.141	0.138	0.135	0.132	0.130	0.125	0.122
14.5	**0.115**	0.147	0.144	0.140	0.137	0.133	0.131	0.128	0.125	0.122	0.120	0.118	0.113	0.111
15.0	**0.105**	0.133	0.130	0.127	0.124	0.121	0.118	0.116	0.113	0.111	0.109	0.107	0.103	0.101
15.5	**0.096**	0.121	0.119	0.116	0.113	0.110	0.108	0.106	0.104	0.101	0.099	0.098	0.094	0.092
16.0	**0.088**	0.111	0.109	0.106	0.104	0.101	0.099	0.097	0.095	0.093	0.091	0.090	0.086	0.085
16.5	**0.081**	0.103	0.100	0.098	0.096	0.093	0.092	0.090	0.088	0.086	0.084	0.083	0.080	0.078
17.0	**0.075**	0.095	0.093	0.091	0.089	0.087	0.085	0.083	0.081	0.080	0.078	0.077	0.074	0.073
17.5	**0.070**	0.088	0.086	0.084	0.082	0.080	0.079	0.077	0.076	0.074	0.073	0.071	0.069	0.068
18.0	**0.066**	0.082	0.081	0.079	0.077	0.075	0.074	0.072	0.071	0.069	0.068	0.067	0.064	0.063
18.5	**0.062**	0.077	0.076	0.074	0.072	0.071	0.069	0.068	0.066	0.065	0.064	0.063	0.061	0.060
19.0	**0.058**	0.072	0.071	0.069	0.068	0.066	0.065	0.064	0.062	0.061	0.060	0.059	0.057	0.056
19.5	**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
20.0	**0.052**	0.064	0.063	0.061	0.060	0.059	0.058	0.057	0.055	0.054	0.053	0.053	0.051	0.050
20.5	**0.049**	0.060	0.059	0.058	0.057	0.055	0.054	0.053	0.052	0.051	0.050	0.050	0.048	0.047
21.0	**0.046**	0.057	0.056	0.055	0.053	0.052	0.051	0.050	0.049	0.048	0.048	0.047	0.045	0.045
21.5	**0.044**	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.045	0.043	0.042
22.0	**0.042**	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.045	0.044	0.043	0.042	0.041	0.040
22.5	**0.040**	0.049	0.048	0.047	0.046	0.045	0.044	0.043	0.043	0.042	0.041	0.040	0.039	0.039
23.0	**0.038**	0.046	0.046	0.045	0.044	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.037	0.037
23.5	**0.036**	0.044	0.043	0.042	0.042	0.041	0.040	0.039	0.039	0.038	0.037	0.037	0.036	0.035
24.0	**0.034**	0.042	0.041	0.040	0.040	0.039	0.038	0.038	0.037	0.036	0.036	0.035	0.034	0.033
24.5	**0.033**	0.040	0.039	0.038	0.038	0.037	0.036	0.036	0.035	0.034	0.034	0.033	0.032	0.032
25.0	**0.031**	0.038	0.037	0.037	0.036	0.035	0.035	0.034	0.033	0.033	0.032	0.032	0.031	0.030
25.5	**0.030**	0.036	0.036	0.035	0.034	0.034	0.033	0.033	0.032	0.031	0.031	0.030	0.030	0.029
26.0	**0.029**	0.035	0.034	0.033	0.033	0.032	0.031	0.031	0.030	0.030	0.030	0.029	0.028	0.028
26.5	**0.027**	0.033	0.032	0.032	0.031	0.031	0.030	0.030	0.029	0.029	0.028	0.028	0.027	0.027
27.0	**0.026**	0.031	0.031	0.030	0.030	0.029	0.029	0.028	0.028	0.027	0.027	0.027	0.026	0.025

Table 14-2: C_t values, Sound Optimized Mode SO11

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

14.3 Sound Curves, Sound Optimized Mode SO11

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 SO11 (Blades with serrated trailing edge)**
3	90.9
4	91.1
5	92.9
6	94.5
7	95.6
8	96.9
9	98.0
10	98.8
11	99.1
12	99.2
13	99.2
14	99.2
15	99.2
16	99.2
17	99.2
18	99.2
19	99.2
20	99.2

Table 14-3: Sound curves, Sound Optimized Mode SO11

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

15 Power Curves, Ct Values and Sound Curves, Sound Optimized Mode SO11 (HWO)

NOTE The power curves and Ct values presented in Section 15 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

15.1 Power Curves, Sound Optimized Mode SO11 (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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**224**	162	168	173	179	185	190	196	201	207	213	218	229	235
4.5	**336**	250	257	265	273	281	289	297	305	313	321	329	344	352
5.0	**477**	358	369	380	391	401	412	423	434	445	456	466	488	499
5.5	**642**	486	501	515	529	543	557	572	586	600	614	628	656	670
6.0	**820**	627	644	662	680	697	715	732	750	768	785	803	838	855
6.5	**1001**	768	790	811	832	853	875	896	917	938	959	980	1022	1043
7.0	**1185**	912	937	962	987	1012	1036	1061	1086	1111	1136	1160	1209	1234
7.5	**1362**	1052	1080	1109	1137	1166	1194	1222	1250	1278	1306	1334	1390	1417
8.0	**1535**	1193	1225	1257	1289	1321	1352	1384	1416	1447	1476	1506	1561	1588
8.5	**1715**	1412	1444	1476	1508	1540	1568	1595	1623	1651	1672	1694	1734	1752
9.0	**1907**	1722	1745	1768	1790	1812	1828	1844	1859	1874	1885	1896	1915	1923
9.5	**2058**	1980	1991	2002	2013	2024	2030	2036	2042	2048	2051	2055	2061	2063
10.0	**2157**	2131	2135	2139	2143	2147	2149	2150	2152	2154	2155	2156	2157	2158
10.5	**2218**	2206	2208	2210	2212	2214	2214	2215	2216	2217	2217	2218	2218	2218
11.0	**2267**	2260	2261	2262	2264	2265	2265	2266	2266	2266	2266	2267	2267	2266
11.5	**2309**	2307	2307	2308	2308	2309	2309	2310	2310	2310	2310	2310	2309	2309
12.0	**2344**	2343	2344	2344	2344	2344	2344	2344	2344	2344	2344	2344	2343	2343
12.5	**2372**	2373	2373	2373	2373	2373	2373	2373	2373	2372	2372	2372	2371	2371
13.0	**2398**	2400	2400	2400	2400	2400	2400	2399	2399	2399	2399	2398	2398	2398
13.5	**2420**	2421	2421	2421	2421	2421	2421	2421	2420	2420	2420	2420	2420	2419
14.0	**2435**	2436	2436	2436	2436	2436	2436	2436	2436	2436	2435	2435	2435	2435
14.5	**2449**	2451	2451	2451	2451	2451	2450	2450	2450	2450	2450	2449	2449	2449
15.0	**2464**	2466	2466	2466	2466	2466	2465	2465	2465	2465	2465	2464	2464	2464
15.5	**2480**	2482	2482	2482	2482	2482	2482	2481	2481	2481	2481	2480	2480	2480
16.0	**2498**	2500	2500	2500	2500	2500	2499	2499	2499	2498	2498	2498	2497	2497
16.5	**2517**	2521	2521	2520	2520	2520	2519	2519	2519	2518	2518	2518	2517	2516
17.0	**2540**	2544	2544	2544	2544	2543	2543	2542	2542	2541	2541	2540	2539	2538
17.5	**2566**	2572	2571	2571	2570	2570	2569	2569	2568	2568	2567	2566	2565	2564
18.0	**2598**	2606	2605	2605	2604	2604	2603	2602	2602	2601	2600	2599	2597	2596
18.5	**2636**	2646	2645	2644	2644	2643	2642	2641	2640	2639	2638	2637	2635	2634
19.0	**2676**	2685	2684	2684	2683	2682	2681	2680	2679	2678	2678	2676	2674	2674
19.5	**2715**	2724	2724	2723	2722	2722	2721	2720	2719	2718	2717	2716	2714	2713
20.0	**2749**	2756	2755	2755	2754	2754	2753	2752	2752	2751	2750	2749	2748	2747
20.5	**2773**	2778	2778	2777	2777	2776	2776	2776	2775	2775	2774	2774	2773	2772
21.0	**2789**	2793	2793	2793	2792	2792	2791	2791	2791	2790	2790	2790	2789	2788
21.5	**2804**	2812	2811	2810	2810	2809	2808	2808	2807	2806	2805	2805	2803	2803
22.0	**2833**	2847	2846	2844	2843	2842	2841	2840	2839	2837	2836	2835	2832	2831
22.5	**2878**	2893	2891	2890	2889	2888	2886	2885	2884	2882	2881	2879	2876	2875
23.0	**2914**	2923	2922	2922	2921	2920	2919	2918	2918	2917	2916	2915	2913	2912
23.5	**2942**	2951	2950	2949	2948	2948	2947	2946	2945	2945	2944	2943	2941	2940
24.0	**2965**	2970	2970	2969	2969	2969	2968	2968	2967	2967	2966	2965	2964	2964
24.5	**2978**	2981	2980	2980	2980	2980	2979	2979	2979	2979	2979	2978	2978	2977
25.0	**2984**	2984	2984	2984	2984	2984	2984	2984	2984	2984	2984	2984	2983	2983
25.5	**2986**	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986	2985	2985
26.0	**2986**	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986	2986
26.5	**2979**	2979	2979	2979	2979	2979	2979	2979	2979	2979	2979	2979	2979	2979
27.0	**2955**	2955	2955	2955	2955	2955	2955	2955	2955	2955	2955	2955	2955	2955
27.5	**2834**	2834	2834	2834	2834	2834	2834	2834	2834	2834	2834	2834	2834	2834

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

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**
28.0	**2635**	2635	2635	2635	2635	2635	2635	2635	2635	2635	2635	2635	2635	2635
28.5	**2333**	2333	2333	2333	2333	2333	2333	2333	2333	2333	2333	2333	2333	2333
29.0	**2052**	2052	2052	2052	2052	2052	2052	2052	2052	2052	2052	2052	2052	2052
29.5	**1846**	1846	1845	1845	1845	1845	1845	1845	1845	1846	1846	1846	1845	1845
30.0	**1703**	1703	1703	1703	1703	1703	1703	1703	1703	1703	1703	1703	1703	1703
30.5	**1599**	1599	1599	1599	1599	1599	1599	1599	1599	1599	1599	1599	1599	1599
31.0	**1524**	1524	1524	1524	1524	1524	1524	1524	1524	1524	1524	1524	1524	1524
31.5	**1471**	1471	1471	1471	1471	1471	1471	1471	1471	1471	1471	1471	1471	1471
32.0	**1443**	1443	1443	1443	1443	1443	1443	1443	1443	1443	1443	1443	1443	1443

Table 15-1: Power curve, Sound Optimized Mode SO11 (HWO)

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

15.2 Ct Values, Sound Optimized Mode SO11 (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	**0.878**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.852**	0.859	0.857	0.856	0.855	0.853	0.853	0.853	0.853	0.853	0.853	0.852	0.852	0.853
4.5	**0.857**	0.856	0.856	0.856	0.856	0.856	0.856	0.857	0.857	0.857	0.857	0.857	0.856	0.856
5.0	**0.841**	0.845	0.845	0.845	0.845	0.844	0.844	0.843	0.843	0.843	0.842	0.842	0.841	0.840
5.5	**0.785**	0.791	0.790	0.790	0.789	0.789	0.788	0.788	0.787	0.787	0.786	0.786	0.785	0.784
6.0	**0.708**	0.713	0.713	0.712	0.712	0.711	0.711	0.710	0.710	0.709	0.709	0.708	0.707	0.707
6.5	**0.637**	0.642	0.642	0.641	0.641	0.640	0.640	0.639	0.639	0.639	0.638	0.638	0.637	0.636
7.0	**0.575**	0.579	0.578	0.578	0.578	0.577	0.577	0.577	0.576	0.576	0.576	0.575	0.574	0.574
7.5	**0.518**	0.522	0.522	0.522	0.521	0.521	0.521	0.520	0.520	0.520	0.519	0.519	0.518	0.517
8.0	**0.468**	0.474	0.474	0.473	0.473	0.473	0.472	0.472	0.471	0.471	0.470	0.469	0.466	0.464
8.5	**0.427**	0.461	0.459	0.457	0.454	0.452	0.449	0.446	0.443	0.439	0.435	0.431	0.422	0.418
9.0	**0.394**	0.477	0.469	0.462	0.454	0.446	0.439	0.431	0.424	0.416	0.409	0.402	0.387	0.381
9.5	**0.358**	0.468	0.456	0.445	0.433	0.422	0.412	0.402	0.393	0.383	0.375	0.367	0.351	0.344
10.0	**0.318**	0.424	0.412	0.400	0.389	0.377	0.368	0.359	0.350	0.341	0.333	0.325	0.311	0.304
10.5	**0.279**	0.369	0.359	0.349	0.340	0.330	0.322	0.314	0.306	0.298	0.292	0.286	0.273	0.268
11.0	**0.246**	0.323	0.314	0.306	0.298	0.289	0.283	0.276	0.269	0.263	0.257	0.251	0.241	0.236
11.5	**0.218**	0.284	0.277	0.270	0.263	0.255	0.250	0.244	0.238	0.232	0.227	0.223	0.213	0.209
12.0	**0.194**	0.252	0.245	0.239	0.233	0.227	0.221	0.216	0.211	0.206	0.202	0.198	0.190	0.186
12.5	**0.173**	0.224	0.218	0.213	0.207	0.202	0.197	0.193	0.188	0.184	0.180	0.177	0.170	0.166
13.0	**0.155**	0.200	0.195	0.190	0.186	0.181	0.177	0.173	0.169	0.165	0.162	0.159	0.152	0.149
13.5	**0.141**	0.181	0.176	0.172	0.168	0.163	0.160	0.156	0.153	0.149	0.146	0.144	0.138	0.135
14.0	**0.127**	0.163	0.159	0.155	0.151	0.147	0.144	0.141	0.138	0.135	0.132	0.130	0.125	0.122
14.5	**0.115**	0.147	0.144	0.140	0.137	0.133	0.131	0.128	0.125	0.122	0.120	0.118	0.113	0.111
15.0	**0.105**	0.133	0.130	0.127	0.124	0.121	0.118	0.116	0.113	0.111	0.109	0.107	0.103	0.101
15.5	**0.096**	0.121	0.119	0.116	0.113	0.110	0.108	0.106	0.104	0.101	0.099	0.098	0.094	0.092
16.0	**0.088**	0.111	0.109	0.106	0.104	0.101	0.099	0.097	0.095	0.093	0.091	0.090	0.086	0.085
16.5	**0.081**	0.103	0.100	0.098	0.096	0.093	0.092	0.090	0.088	0.086	0.084	0.083	0.080	0.078
17.0	**0.075**	0.095	0.093	0.091	0.089	0.087	0.085	0.083	0.081	0.080	0.078	0.077	0.074	0.073
17.5	**0.070**	0.088	0.086	0.084	0.082	0.080	0.079	0.077	0.076	0.074	0.073	0.071	0.069	0.068
18.0	**0.066**	0.082	0.081	0.079	0.077	0.075	0.074	0.072	0.071	0.069	0.068	0.067	0.064	0.063
18.5	**0.062**	0.077	0.076	0.074	0.072	0.071	0.069	0.068	0.066	0.065	0.064	0.063	0.061	0.060
19.0	**0.058**	0.072	0.071	0.069	0.068	0.066	0.065	0.064	0.062	0.061	0.060	0.059	0.057	0.056
19.5	**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
20.0	**0.052**	0.064	0.063	0.061	0.060	0.059	0.058	0.057	0.055	0.054	0.053	0.053	0.051	0.050
20.5	**0.049**	0.060	0.059	0.058	0.057	0.055	0.054	0.053	0.052	0.051	0.050	0.050	0.048	0.047
21.0	**0.046**	0.057	0.056	0.055	0.053	0.052	0.051	0.050	0.049	0.048	0.048	0.047	0.045	0.045
21.5	**0.044**	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.045	0.043	0.042
22.0	**0.042**	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.045	0.044	0.043	0.042	0.041	0.040
22.5	**0.040**	0.049	0.048	0.047	0.046	0.045	0.044	0.043	0.043	0.042	0.041	0.040	0.039	0.039
23.0	**0.038**	0.046	0.046	0.045	0.044	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.037	0.037
23.5	**0.036**	0.044	0.043	0.042	0.042	0.041	0.040	0.039	0.039	0.038	0.037	0.037	0.036	0.035
24.0	**0.034**	0.042	0.041	0.040	0.040	0.039	0.038	0.038	0.037	0.036	0.036	0.035	0.034	0.033
24.5	**0.033**	0.040	0.039	0.038	0.038	0.037	0.036	0.036	0.035	0.034	0.034	0.033	0.032	0.032
25.0	**0.031**	0.038	0.037	0.037	0.036	0.035	0.035	0.034	0.033	0.033	0.032	0.032	0.031	0.030
25.5	**0.030**	0.036	0.036	0.035	0.034	0.034	0.033	0.033	0.032	0.031	0.031	0.030	0.030	0.029
26.0	**0.029**	0.035	0.034	0.033	0.033	0.032	0.031	0.031	0.030	0.030	0.030	0.029	0.028	0.028
26.5	**0.027**	0.033	0.032	0.032	0.031	0.030	0.030	0.029	0.029	0.029	0.028	0.028	0.027	0.027
27.0	**0.026**	0.031	0.031	0.030	0.029	0.029	0.028	0.028	0.028	0.027	0.027	0.026	0.026	0.025
27.5	**0.024**	0.029	0.028	0.028	0.027	0.027	0.026	0.026	0.026	0.025	0.025	0.024	0.024	0.023
28.0	**0.022**	0.026	0.025	0.025	0.025	0.024	0.024	0.023	0.023	0.023	0.022	0.022	0.022	0.021
28.5	**0.019**	0.022	0.022	0.022	0.021	0.021	0.021	0.020	0.020	0.020	0.020	0.019	0.019	0.019
29.0	**0.016**	0.019	0.019	0.019	0.018	0.018	0.018	0.018	0.017	0.017	0.017	0.017	0.016	0.016
29.5	**0.014**	0.017	0.017	0.016	0.016	0.016	0.016	0.015	0.015	0.015	0.015	0.015	0.014	0.014
30.0	**0.013**	0.015	0.015	0.015	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.013	0.013	0.013
30.5	**0.012**	0.014	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.011
31.0	**0.011**	0.012	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.011	0.010	0.010
31.5	**0.010**	0.011	0.011	0.011	0.011	0.011	0.011	0.010	0.010	0.010	0.010	0.010	0.010	0.009
32.0	**0.009**	0.011	0.011	0.010	0.010	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009

Table 15-2: C_t values, Sound Optimized Mode SO11 (HWO)

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

15.3 Sound Curves, Sound Optimized Mode SO11 (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]** **Sound Optimized Mode SO11 (HWO)** **(Blades with serrated trailing edge)**
3	90.9
4	91.1
5	92.9
6	94.5
7	95.6
8	96.9
9	98.0
10	98.8
11	99.1
12	99.2
13	99.2
14	99.2
15	99.2
16	99.2
17	99.2
18	99.2
19	99.2
20	99.2

Table 15-3: Sound curves, Sound Optimized Mode SO11 (HWO)

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

16 Power Curves, Ct Values and Sound Curves, Sound Optimized Mode SO12

NOTE

The power curves and Ct values presented in Section 16 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

16.1 Power Curves, Sound Optimized Mode SO12

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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**224**	162	168	173	179	185	190	196	201	207	213	218	229	235
4.5	**336**	250	257	265	273	281	289	297	305	313	321	329	344	352
5.0	**477**	358	369	380	391	402	412	423	434	445	456	467	488	499
5.5	**646**	489	504	518	532	547	561	575	589	604	618	632	660	674
6.0	**840**	641	659	677	696	714	732	750	768	786	804	822	858	876
6.5	**1048**	804	827	849	871	893	916	938	960	982	1004	1026	1070	1092
7.0	**1253**	965	992	1018	1044	1071	1097	1123	1149	1176	1202	1228	1279	1305
7.5	**1422**	1098	1127	1157	1187	1217	1246	1276	1305	1334	1364	1393	1451	1480
8.0	**1581**	1224	1257	1290	1322	1355	1387	1420	1452	1485	1517	1549	1613	1645
8.5	**1823**	1452	1488	1524	1560	1596	1629	1663	1696	1730	1761	1792	1852	1882
9.0	**2118**	1842	1872	1903	1933	1964	1988	2012	2036	2060	2079	2098	2135	2151
9.5	**2310**	2166	2187	2207	2228	2248	2259	2269	2279	2290	2296	2303	2315	2320
10.0	**2385**	2343	2350	2358	2366	2374	2376	2378	2380	2382	2383	2384	2385	2386
10.5	**2425**	2409	2412	2414	2417	2420	2420	2421	2422	2423	2424	2424	2425	2425
11.0	**2460**	2452	2453	2454	2456	2458	2458	2459	2459	2460	2460	2460	2460	2460
11.5	**2487**	2484	2485	2485	2486	2486	2487	2487	2487	2487	2487	2487	2487	2487
12.0	**2511**	2511	2511	2511	2511	2511	2511	2511	2511	2511	2511	2511	2511	2511
12.5	**2536**	2538	2538	2538	2538	2538	2538	2537	2537	2537	2537	2537	2536	2536
13.0	**2572**	2575	2575	2575	2575	2574	2574	2574	2574	2573	2573	2572	2571	2571
13.5	**2626**	2630	2630	2630	2630	2629	2629	2628	2628	2628	2627	2626	2625	2624
14.0	**2684**	2690	2689	2689	2689	2688	2688	2687	2686	2686	2685	2684	2683	2682
14.5	**2744**	2751	2751	2750	2750	2750	2749	2748	2747	2747	2746	2745	2743	2742
15.0	**2808**	2816	2815	2814	2814	2814	2813	2812	2811	2810	2810	2808	2806	2806
15.5	**2868**	2876	2876	2875	2875	2874	2874	2873	2872	2871	2870	2869	2867	2866
16.0	**2928**	2936	2936	2935	2935	2934	2933	2932	2931	2930	2930	2928	2926	2925
16.5	**2983**	2992	2991	2990	2990	2989	2988	2988	2987	2986	2985	2984	2982	2981
17.0	**3035**	3044	3044	3043	3042	3042	3041	3040	3039	3038	3037	3036	3034	3033
17.5	**3085**	3095	3094	3094	3093	3092	3091	3090	3089	3088	3087	3086	3084	3083
18.0	**3136**	3146	3145	3145	3144	3143	3142	3141	3140	3139	3138	3137	3134	3133
18.5	**3188**	3200	3199	3198	3197	3196	3195	3194	3193	3192	3190	3189	3186	3185
19.0	**3242**	3255	3254	3253	3252	3251	3250	3249	3247	3246	3245	3244	3241	3239
19.5	**3296**	3308	3307	3306	3305	3304	3303	3302	3301	3300	3298	3297	3294	3293
20.0	**3345**	3357	3356	3355	3354	3353	3352	3351	3350	3349	3347	3346	3343	3342
20.5	**3390**	3401	3400	3399	3399	3398	3397	3396	3394	3393	3392	3391	3388	3387
21.0	**3433**	3444	3443	3443	3442	3441	3440	3439	3437	3436	3435	3434	3432	3430
21.5	**3474**	3485	3484	3484	3483	3482	3481	3480	3479	3478	3476	3475	3472	3471
22.0	**3514**	3525	3524	3523	3522	3522	3520	3519	3518	3517	3516	3515	3513	3511
22.5	**3550**	3559	3559	3558	3557	3556	3555	3554	3553	3553	3552	3551	3548	3547
23.0	**3577**	3585	3584	3584	3583	3583	3582	3581	3580	3580	3579	3578	3576	3576
23.5	**3600**	3605	3605	3604	3604	3603	3603	3602	3601	3601	3600	3600	3599	3598
24.0	**3615**	3619	3618	3618	3618	3617	3617	3617	3616	3616	3616	3615	3615	3614

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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**
24.5	**3625**	3627	3627	3627	3627	3626	3626	3626	3626	3626	3625	3625	3625	3624
25.0	**3631**	3632	3632	3632	3632	3632	3631	3631	3631	3631	3631	3631	3631	3631
25.5	**3634**	3635	3635	3635	3635	3635	3635	3635	3635	3635	3634	3634	3634	3634
26.0	**3635**	3635	3635	3635	3635	3635	3635	3635	3635	3635	3635	3635	3635	3635
26.5	**3636**	3636	3636	3636	3636	3636	3636	3636	3636	3636	3636	3636	3636	3636
27.0	**3636**	3636	3636	3636	3636	3636	3636	3636	3636	3636	3636	3636	3636	3636

Table 16-1: Power curve, Sound Optimized Mode SO12

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

16.2 Ct Values, Sound Optimized Mode SO12

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	**0.878**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.852**	0.859	0.857	0.856	0.855	0.853	0.853	0.853	0.853	0.853	0.853	0.852	0.852	0.853
4.5	**0.857**	0.856	0.856	0.856	0.856	0.856	0.856	0.857	0.857	0.857	0.857	0.857	0.856	0.856
5.0	**0.845**	0.850	0.849	0.849	0.849	0.848	0.848	0.848	0.847	0.847	0.846	0.846	0.845	0.844
5.5	**0.808**	0.814	0.813	0.813	0.812	0.812	0.811	0.811	0.810	0.810	0.809	0.809	0.808	0.807
6.0	**0.752**	0.758	0.758	0.757	0.757	0.756	0.756	0.755	0.755	0.754	0.754	0.753	0.752	0.751
6.5	**0.697**	0.703	0.702	0.702	0.701	0.701	0.700	0.700	0.699	0.698	0.698	0.697	0.696	0.696
7.0	**0.633**	0.638	0.638	0.637	0.637	0.636	0.636	0.635	0.635	0.634	0.634	0.633	0.632	0.632
7.5	**0.557**	0.562	0.561	0.561	0.560	0.560	0.559	0.559	0.559	0.558	0.558	0.557	0.556	0.556
8.0	**0.491**	0.496	0.496	0.495	0.495	0.494	0.494	0.494	0.493	0.493	0.492	0.492	0.491	0.490
8.5	**0.462**	0.483	0.481	0.480	0.478	0.476	0.475	0.473	0.471	0.469	0.467	0.464	0.460	0.457
9.0	**0.449**	0.528	0.520	0.512	0.505	0.497	0.490	0.483	0.476	0.469	0.462	0.455	0.442	0.436
9.5	**0.412**	0.533	0.521	0.509	0.497	0.485	0.474	0.463	0.452	0.441	0.431	0.422	0.404	0.395
10.0	**0.358**	0.483	0.469	0.456	0.442	0.428	0.417	0.407	0.396	0.385	0.376	0.367	0.350	0.342
10.5	**0.308**	0.413	0.401	0.390	0.378	0.366	0.357	0.348	0.340	0.331	0.323	0.316	0.302	0.295
11.0	**0.269**	0.356	0.346	0.337	0.327	0.318	0.310	0.303	0.295	0.288	0.281	0.275	0.263	0.258
11.5	**0.236**	0.309	0.301	0.293	0.285	0.277	0.271	0.265	0.258	0.252	0.246	0.241	0.231	0.226
12.0	**0.208**	0.271	0.265	0.258	0.251	0.244	0.238	0.233	0.227	0.222	0.217	0.213	0.204	0.200
12.5	**0.185**	0.240	0.234	0.228	0.223	0.217	0.212	0.207	0.202	0.197	0.193	0.189	0.182	0.178
13.0	**0.167**	0.215	0.210	0.205	0.200	0.194	0.190	0.186	0.182	0.177	0.174	0.170	0.163	0.160
13.5	**0.152**	0.197	0.192	0.187	0.182	0.178	0.174	0.170	0.166	0.162	0.159	0.156	0.149	0.147
14.0	**0.140**	0.180	0.175	0.171	0.167	0.162	0.159	0.155	0.152	0.148	0.145	0.142	0.137	0.134
14.5	**0.128**	0.165	0.161	0.157	0.153	0.149	0.146	0.143	0.140	0.137	0.134	0.131	0.126	0.124
15.0	**0.118**	0.152	0.148	0.144	0.141	0.137	0.134	0.132	0.129	0.126	0.123	0.121	0.116	0.114
15.5	**0.110**	0.140	0.137	0.134	0.130	0.127	0.125	0.122	0.119	0.117	0.114	0.112	0.108	0.106
16.0	**0.102**	0.130	0.127	0.124	0.121	0.118	0.116	0.113	0.111	0.108	0.106	0.104	0.100	0.098
16.5	**0.095**	0.121	0.118	0.116	0.113	0.110	0.108	0.105	0.103	0.101	0.099	0.097	0.093	0.092
17.0	**0.089**	0.113	0.110	0.108	0.105	0.103	0.100	0.098	0.096	0.094	0.092	0.091	0.087	0.086
17.5	**0.083**	0.105	0.103	0.100	0.098	0.096	0.094	0.092	0.090	0.088	0.086	0.085	0.081	0.080
18.0	**0.078**	0.099	0.096	0.094	0.092	0.090	0.088	0.086	0.084	0.082	0.081	0.079	0.076	0.075
18.5	**0.073**	0.093	0.090	0.088	0.086	0.084	0.083	0.081	0.079	0.077	0.076	0.075	0.072	0.071
19.0	**0.069**	0.087	0.085	0.083	0.081	0.079	0.077	0.076	0.074	0.073	0.071	0.070	0.067	0.066
19.5	**0.065**	0.082	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.067	0.066	0.064	0.063
20.0	**0.061**	0.077	0.075	0.074	0.072	0.070	0.069	0.068	0.066	0.065	0.064	0.063	0.060	0.059
20.5	**0.058**	0.073	0.071	0.070	0.068	0.067	0.065	0.064	0.063	0.061	0.060	0.059	0.057	0.056
21.0	**0.055**	0.069	0.067	0.066	0.064	0.063	0.062	0.061	0.059	0.058	0.057	0.056	0.054	0.053
21.5	**0.053**	0.066	0.064	0.063	0.062	0.060	0.059	0.058	0.057	0.056	0.055	0.054	0.052	0.051
22.0	**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
22.5	**0.048**	0.059	0.058	0.057	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046
23.0	**0.045**	0.056	0.055	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.047	0.046	0.044	0.044
23.5	**0.043**	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.044	0.042	0.041
24.0	**0.041**	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.044	0.043	0.042	0.041	0.040	0.039
24.5	**0.039**	0.048	0.047	0.046	0.045	0.044	0.043	0.042	0.041	0.041	0.040	0.039	0.038	0.037
25.0	**0.037**	0.045	0.044	0.043	0.042	0.042	0.041	0.040	0.039	0.039	0.038	0.037	0.036	0.036
25.5	**0.035**	0.043	0.042	0.041	0.041	0.040	0.039	0.038	0.038	0.037	0.036	0.036	0.035	0.034
26.0	**0.034**	0.041	0.040	0.039	0.039	0.038	0.037	0.036	0.036	0.035	0.035	0.034	0.033	0.033
26.5	**0.032**	0.039	0.038	0.037	0.037	0.036	0.035	0.035	0.034	0.034	0.033	0.032	0.032	0.031
27.0	**0.031**	0.037	0.036	0.036	0.035	0.034	0.034	0.033	0.033	0.032	0.032	0.031	0.030	0.030

Table 16-2: C_t values, Sound Optimized Mode SO12

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

16.3 Sound Curves, Sound Optimized Mode SO12

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 SO12 (Blades with serrated trailing edge)**
3	90.9
4	91.1
5	92.9
6	95.0
7	97.1
8	98.8
9	99.7
10	99.9
11	99.9
12	99.9
13	99.9
14	99.9
15	99.9
16	99.9
17	99.9
18	99.9
19	99.9
20	99.9

Table 16-3: Sound curves, Sound Optimized Mode SO12

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

17 Power Curves, Ct Values and Sound Curves, Sound Optimized Mode SO12 (HWO)

NOTE The power curves and Ct values presented in Section 17 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

17.1 Power Curves, Sound Optimized Mode SO12 (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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**224**	162	168	173	179	185	190	196	201	207	213	218	229	235
4.5	**336**	250	257	265	273	281	289	297	305	313	321	329	344	352
5.0	**477**	358	369	380	391	402	412	423	434	445	456	467	488	499
5.5	**646**	489	504	518	532	547	561	575	589	604	618	632	660	674
6.0	**840**	641	659	677	696	714	732	750	768	786	804	822	858	876
6.5	**1048**	804	827	849	871	893	916	938	960	982	1004	1026	1070	1092
7.0	**1253**	965	992	1018	1044	1071	1097	1123	1149	1176	1202	1228	1279	1305
7.5	**1422**	1098	1127	1157	1187	1217	1246	1276	1305	1334	1364	1393	1451	1480
8.0	**1581**	1224	1257	1290	1322	1355	1387	1420	1452	1485	1517	1549	1613	1645
8.5	**1823**	1452	1488	1524	1560	1596	1629	1663	1696	1730	1761	1792	1852	1882
9.0	**2118**	1842	1872	1903	1933	1964	1988	2012	2036	2060	2079	2098	2135	2151
9.5	**2310**	2166	2187	2207	2228	2248	2259	2269	2279	2290	2296	2303	2315	2320
10.0	**2385**	2343	2350	2358	2366	2374	2376	2378	2380	2382	2383	2384	2385	2386
10.5	**2425**	2409	2412	2414	2417	2420	2420	2421	2422	2423	2424	2424	2425	2425
11.0	**2460**	2452	2453	2454	2456	2458	2458	2459	2459	2460	2460	2460	2460	2460
11.5	**2487**	2484	2485	2485	2486	2486	2487	2487	2487	2487	2487	2487	2487	2487
12.0	**2511**	2511	2511	2511	2511	2511	2511	2511	2511	2511	2511	2511	2511	2511
12.5	**2536**	2538	2538	2538	2538	2538	2538	2537	2537	2537	2537	2537	2536	2536
13.0	**2572**	2575	2575	2575	2575	2574	2574	2574	2574	2573	2573	2572	2571	2571
13.5	**2626**	2630	2630	2630	2630	2629	2629	2628	2628	2628	2627	2626	2625	2624
14.0	**2684**	2690	2689	2689	2689	2688	2688	2687	2686	2686	2685	2684	2683	2682
14.5	**2744**	2751	2751	2750	2750	2750	2749	2748	2747	2747	2746	2745	2743	2742
15.0	**2808**	2816	2815	2814	2814	2814	2813	2812	2811	2810	2810	2808	2806	2806
15.5	**2868**	2876	2876	2875	2875	2874	2874	2873	2872	2871	2870	2869	2867	2866
16.0	**2928**	2936	2936	2935	2935	2934	2933	2932	2931	2930	2930	2928	2926	2925
16.5	**2983**	2992	2991	2990	2990	2989	2988	2988	2987	2986	2985	2984	2982	2981
17.0	**3035**	3044	3044	3043	3042	3042	3041	3040	3039	3038	3037	3036	3034	3033
17.5	**3085**	3095	3094	3094	3093	3092	3091	3090	3089	3088	3087	3086	3084	3083
18.0	**3136**	3146	3145	3145	3144	3143	3142	3141	3140	3139	3138	3137	3134	3133
18.5	**3188**	3200	3199	3198	3197	3196	3195	3194	3193	3192	3190	3189	3186	3185
19.0	**3242**	3255	3254	3253	3252	3251	3250	3249	3247	3246	3245	3244	3241	3239
19.5	**3296**	3308	3307	3306	3305	3304	3303	3302	3301	3300	3298	3297	3294	3293
20.0	**3345**	3356	3356	3355	3354	3353	3352	3351	3350	3349	3347	3346	3343	3342
20.5	**3390**	3401	3400	3399	3399	3398	3397	3396	3394	3393	3392	3391	3388	3387
21.0	**3433**	3444	3443	3443	3442	3441	3440	3439	3437	3436	3435	3434	3432	3430
21.5	**3474**	3485	3484	3484	3483	3482	3481	3480	3479	3478	3476	3475	3472	3471
22.0	**3514**	3525	3524	3523	3522	3522	3520	3519	3518	3517	3516	3515	3513	3511
22.5	**3550**	3559	3559	3558	3557	3556	3555	3554	3553	3553	3552	3551	3548	3547
23.0	**3577**	3585	3584	3584	3583	3583	3582	3581	3580	3580	3579	3578	3576	3576
23.5	**3600**	3605	3605	3604	3604	3603	3603	3602	3601	3601	3600	3600	3599	3598
24.0	**3615**	3619	3618	3618	3618	3617	3617	3617	3616	3616	3616	3615	3615	3614
24.5	**3625**	3627	3627	3627	3627	3626	3626	3626	3626	3626	3625	3625	3625	3624
25.0	**3631**	3632	3632	3632	3632	3632	3631	3631	3631	3631	3631	3631	3631	3631
25.5	**3634**	3635	3635	3635	3635	3635	3635	3635	3635	3635	3634	3634	3634	3634
26.0	**3634**	3635	3635	3635	3635	3635	3635	3635	3634	3634	3634	3634	3634	3634
26.5	**3604**	3604	3604	3604	3604	3604	3604	3604	3604	3604	3604	3604	3604	3604
27.0	**3527**	3527	3527	3527	3527	3527	3527	3527	3527	3527	3527	3527	3527	3527
27.5	**3271**	3271	3271	3271	3271	3271	3271	3271	3271	3271	3271	3271	3271	3271

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

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**
28.0	**2895**	2895	2895	2895	2895	2895	2895	2895	2895	2895	2895	2895	2895	2895
28.5	**2404**	2404	2404	2404	2404	2404	2404	2404	2404	2404	2404	2404	2404	2404
29.0	**2064**	2064	2064	2064	2064	2064	2064	2064	2064	2064	2064	2064	2064	2064
29.5	**1849**	1849	1849	1849	1849	1849	1849	1849	1849	1849	1849	1849	1849	1849
30.0	**1703**	1703	1703	1703	1703	1703	1703	1703	1703	1703	1703	1703	1703	1703
30.5	**1599**	1599	1599	1599	1599	1599	1599	1599	1599	1599	1599	1599	1599	1599
31.0	**1524**	1524	1524	1524	1524	1524	1524	1524	1524	1524	1524	1524	1524	1524
31.5	**1471**	1471	1471	1471	1471	1471	1471	1471	1471	1471	1471	1471	1471	1471
32.0	**1443**	1443	1443	1443	1443	1443	1443	1443	1443	1443	1443	1443	1443	1443

Table 17-1: Power curve, Sound Optimized Mode SO12 (HWO)

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

17.2 Ct Values, Sound Optimized Mode SO12 (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	**0.878**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.852**	0.859	0.857	0.856	0.855	0.853	0.853	0.853	0.853	0.853	0.853	0.852	0.852	0.853
4.5	**0.857**	0.856	0.856	0.856	0.856	0.856	0.856	0.857	0.857	0.857	0.857	0.857	0.856	0.856
5.0	**0.845**	0.850	0.849	0.849	0.849	0.848	0.848	0.848	0.847	0.847	0.846	0.846	0.845	0.844
5.5	**0.808**	0.814	0.813	0.813	0.812	0.812	0.811	0.811	0.810	0.810	0.809	0.809	0.808	0.807
6.0	**0.752**	0.758	0.758	0.757	0.757	0.756	0.756	0.755	0.755	0.754	0.754	0.753	0.752	0.751
6.5	**0.697**	0.703	0.702	0.702	0.701	0.701	0.700	0.700	0.699	0.698	0.698	0.697	0.696	0.696
7.0	**0.633**	0.638	0.638	0.637	0.637	0.636	0.636	0.635	0.635	0.634	0.634	0.633	0.632	0.632
7.5	**0.557**	0.562	0.561	0.561	0.560	0.560	0.559	0.559	0.559	0.558	0.558	0.557	0.556	0.556
8.0	**0.491**	0.496	0.496	0.495	0.495	0.494	0.494	0.494	0.493	0.493	0.492	0.492	0.491	0.490
8.5	**0.462**	0.483	0.481	0.480	0.478	0.476	0.475	0.473	0.471	0.469	0.467	0.464	0.460	0.457
9.0	**0.449**	0.528	0.520	0.512	0.505	0.497	0.490	0.483	0.476	0.469	0.462	0.455	0.442	0.436
9.5	**0.412**	0.533	0.521	0.509	0.497	0.485	0.474	0.463	0.452	0.441	0.431	0.422	0.404	0.395
10.0	**0.358**	0.483	0.469	0.456	0.442	0.428	0.417	0.407	0.396	0.385	0.376	0.367	0.350	0.342
10.5	**0.308**	0.413	0.401	0.390	0.378	0.366	0.357	0.348	0.340	0.331	0.323	0.316	0.302	0.295
11.0	**0.269**	0.356	0.346	0.337	0.327	0.318	0.310	0.303	0.295	0.288	0.281	0.275	0.263	0.258
11.5	**0.236**	0.309	0.301	0.293	0.285	0.277	0.271	0.265	0.258	0.252	0.246	0.241	0.231	0.226
12.0	**0.208**	0.271	0.265	0.258	0.251	0.244	0.238	0.233	0.227	0.222	0.217	0.213	0.204	0.200
12.5	**0.185**	0.240	0.234	0.228	0.223	0.217	0.212	0.207	0.202	0.197	0.193	0.189	0.182	0.178
13.0	**0.167**	0.215	0.210	0.205	0.200	0.194	0.190	0.186	0.182	0.177	0.174	0.170	0.163	0.160
13.5	**0.152**	0.197	0.192	0.187	0.182	0.178	0.174	0.170	0.166	0.162	0.159	0.156	0.149	0.147
14.0	**0.140**	0.180	0.175	0.171	0.167	0.162	0.159	0.155	0.152	0.148	0.145	0.142	0.137	0.134
14.5	**0.128**	0.165	0.161	0.157	0.153	0.149	0.146	0.143	0.140	0.137	0.134	0.131	0.126	0.124
15.0	**0.118**	0.152	0.148	0.144	0.141	0.137	0.134	0.132	0.129	0.126	0.123	0.121	0.116	0.114
15.5	**0.110**	0.140	0.137	0.134	0.130	0.127	0.125	0.122	0.119	0.117	0.114	0.112	0.108	0.106
16.0	**0.102**	0.130	0.127	0.124	0.121	0.118	0.116	0.113	0.111	0.108	0.106	0.104	0.100	0.098
16.5	**0.095**	0.121	0.118	0.116	0.113	0.110	0.108	0.105	0.103	0.101	0.099	0.097	0.093	0.092
17.0	**0.089**	0.113	0.110	0.108	0.105	0.103	0.100	0.098	0.096	0.094	0.092	0.091	0.087	0.086
17.5	**0.083**	0.105	0.103	0.100	0.098	0.096	0.094	0.092	0.090	0.088	0.086	0.085	0.081	0.080
18.0	**0.078**	0.099	0.096	0.094	0.092	0.090	0.088	0.086	0.084	0.082	0.081	0.079	0.076	0.075
18.5	**0.073**	0.093	0.090	0.088	0.086	0.084	0.083	0.081	0.079	0.077	0.076	0.075	0.072	0.071
19.0	**0.069**	0.087	0.085	0.083	0.081	0.079	0.077	0.076	0.074	0.073	0.071	0.070	0.067	0.066
19.5	**0.065**	0.082	0.080	0.078	0.076	0.075	0.073	0.072	0.070	0.069	0.067	0.066	0.064	0.063
20.0	**0.061**	0.077	0.075	0.074	0.072	0.070	0.069	0.068	0.066	0.065	0.064	0.063	0.060	0.059
20.5	**0.058**	0.073	0.071	0.070	0.068	0.067	0.065	0.064	0.063	0.061	0.060	0.059	0.057	0.056
21.0	**0.055**	0.069	0.067	0.066	0.064	0.063	0.062	0.061	0.059	0.058	0.057	0.056	0.054	0.053
21.5	**0.053**	0.066	0.064	0.063	0.062	0.060	0.059	0.058	0.057	0.056	0.055	0.054	0.052	0.051
22.0	**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
22.5	**0.048**	0.059	0.058	0.057	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046
23.0	**0.045**	0.056	0.055	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.047	0.046	0.044	0.044
23.5	**0.043**	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.044	0.042	0.041
24.0	**0.041**	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.044	0.043	0.042	0.041	0.040	0.039
24.5	**0.039**	0.048	0.047	0.046	0.045	0.044	0.043	0.042	0.041	0.041	0.040	0.039	0.038	0.037
25.0	**0.037**	0.045	0.044	0.043	0.042	0.042	0.041	0.040	0.039	0.039	0.038	0.037	0.036	0.036
25.5	**0.035**	0.043	0.042	0.041	0.041	0.040	0.039	0.038	0.038	0.037	0.036	0.036	0.035	0.034
26.0	**0.034**	0.041	0.040	0.039	0.039	0.038	0.037	0.036	0.036	0.035	0.035	0.034	0.033	0.033
26.5	**0.032**	0.039	0.038	0.037	0.036	0.036	0.035	0.034	0.034	0.033	0.033	0.032	0.031	0.031
27.0	**0.030**	0.036	0.035	0.035	0.034	0.033	0.033	0.032	0.032	0.031	0.031	0.030	0.029	0.029
27.5	**0.027**	0.032	0.032	0.031	0.031	0.030	0.030	0.029	0.029	0.028	0.028	0.027	0.027	0.026
28.0	**0.023**	0.028	0.027	0.027	0.027	0.026	0.026	0.025	0.025	0.024	0.024	0.024	0.023	0.023
28.5	**0.019**	0.023	0.023	0.022	0.022	0.021	0.021	0.021	0.021	0.020	0.020	0.020	0.019	0.019
29.0	**0.017**	0.019	0.019	0.019	0.018	0.018	0.018	0.018	0.017	0.017	0.017	0.017	0.016	0.016
29.5	**0.014**	0.017	0.017	0.016	0.016	0.016	0.016	0.015	0.015	0.015	0.015	0.015	0.014	0.014
30.0	**0.013**	0.015	0.015	0.015	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.013	0.013	0.013
30.5	**0.012**	0.014	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.011
31.0	**0.011**	0.012	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.011	0.010	0.010
31.5	**0.010**	0.011	0.011	0.011	0.011	0.011	0.011	0.010	0.010	0.010	0.010	0.010	0.010	0.009
32.0	**0.009**	0.011	0.011	0.010	0.010	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009

Table 17-2: C_t values, Sound Optimized Mode SO12 (HWO)

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

17.3 Sound Curves, Sound Optimized Mode SO12 (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]** **Sound Optimized Mode SO12 (HWO)** **(Blades with serrated trailing edge)**
3	90.9
4	91.1
5	92.9
6	95.0
7	97.1
8	98.8
9	99.7
10	99.9
11	99.9
12	99.9
13	99.9
14	99.9
15	99.9
16	99.9
17	99.9
18	99.9
19	99.9
20	99.9

Table 17-3: Sound curves, Sound Optimized Mode SO12 (HWO)

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

18 Power Curves, Ct Values and Sound Curves, Sound Optimized Mode SO13

NOTE The power curves and Ct values presented in Section 18 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

18.1 Power Curves, Sound Optimized Mode SO13

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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**218**	158	164	169	175	180	186	191	197	202	208	213	224	229
4.5	**321**	239	246	254	261	269	276	283	291	298	306	313	328	336
5.0	**429**	323	333	343	352	362	372	381	391	401	410	420	439	449
5.5	**531**	402	414	426	437	449	461	473	484	496	508	520	543	555
6.0	**643**	490	504	518	532	546	560	574	588	602	615	629	657	671
6.5	**773**	592	608	625	642	658	674	691	707	724	740	757	789	806
7.0	**906**	696	715	734	753	772	792	811	830	849	868	887	925	944
7.5	**1038**	799	821	843	864	886	908	930	951	973	994	1016	1059	1080
8.0	**1200**	929	954	979	1003	1028	1053	1078	1103	1128	1152	1176	1222	1245
8.5	**1361**	1063	1091	1120	1148	1177	1205	1232	1260	1288	1312	1337	1382	1403
9.0	**1463**	1157	1188	1219	1250	1281	1309	1338	1366	1395	1418	1440	1482	1501
9.5	**1538**	1270	1301	1331	1361	1392	1415	1439	1463	1487	1504	1521	1551	1564
10.0	**1643**	1449	1474	1498	1523	1548	1564	1580	1596	1612	1622	1632	1650	1657
10.5	**1746**	1647	1661	1675	1689	1703	1710	1718	1725	1733	1737	1741	1749	1752
11.0	**1812**	1785	1789	1794	1799	1803	1805	1807	1808	1810	1811	1811	1812	1812
11.5	**1842**	1841	1841	1842	1842	1842	1842	1842	1842	1842	1842	1842	1842	1842
12.0	**1864**	1865	1865	1865	1865	1865	1865	1864	1864	1864	1864	1864	1864	1864
12.5	**1883**	1884	1884	1884	1884	1884	1884	1884	1883	1883	1883	1883	1883	1883
13.0	**1902**	1903	1903	1903	1903	1903	1902	1902	1902	1902	1902	1902	1902	1901
13.5	**1919**	1920	1920	1920	1920	1920	1920	1920	1919	1919	1919	1919	1919	1918
14.0	**1935**	1936	1936	1936	1936	1936	1936	1936	1936	1936	1935	1935	1935	1935
14.5	**1951**	1953	1953	1952	1952	1952	1952	1952	1952	1952	1952	1951	1951	1951
15.0	**1968**	1969	1969	1969	1969	1969	1969	1968	1968	1968	1968	1968	1967	1967
15.5	**1983**	1985	1985	1985	1984	1984	1984	1984	1984	1984	1984	1983	1983	1983
16.0	**1997**	1999	1999	1999	1999	1998	1998	1998	1998	1998	1998	1998	1997	1997
16.5	**2010**	2012	2012	2012	2011	2011	2011	2011	2011	2011	2011	2010	2010	2010
17.0	**2022**	2023	2023	2023	2023	2023	2023	2023	2022	2022	2022	2022	2022	2021
17.5	**2032**	2034	2034	2034	2034	2034	2034	2033	2033	2033	2033	2033	2032	2032
18.0	**2042**	2044	2044	2044	2044	2044	2043	2043	2043	2043	2043	2042	2042	2042
18.5	**2052**	2053	2053	2053	2053	2052	2052	2052	2052	2052	2052	2052	2051	2051
19.0	**2060**	2061	2061	2061	2061	2061	2061	2061	2060	2060	2060	2060	2060	2060
19.5	**2067**	2068	2068	2068	2068	2068	2068	2068	2068	2068	2068	2067	2067	2067
20.0	**2073**	2074	2074	2074	2074	2074	2074	2074	2073	2073	2073	2073	2073	2073
20.5	**2078**	2079	2079	2079	2079	2079	2079	2078	2078	2078	2078	2078	2078	2078
21.0	**2084**	2085	2085	2085	2085	2085	2084	2084	2084	2084	2084	2084	2083	2083
21.5	**2090**	2093	2093	2092	2092	2092	2092	2092	2091	2091	2091	2091	2090	2090
22.0	**2100**	2103	2102	2102	2102	2102	2102	2101	2101	2101	2101	2100	2100	2099
22.5	**2111**	2114	2113	2113	2113	2113	2112	2112	2112	2112	2111	2111	2110	2110
23.0	**2123**	2126	2125	2125	2125	2125	2124	2124	2124	2124	2123	2123	2122	2122
23.5	**2133**	2135	2135	2135	2135	2135	2134	2134	2134	2134	2133	2133	2133	2132
24.0	**2141**	2143	2142	2142	2142	2142	2142	2142	2141	2141	2141	2141	2140	2140

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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**
24.5	**2147**	2148	2148	2148	2148	2148	2148	2148	2147	2147	2147	2147	2147	2146
25.0	**2151**	2152	2152	2152	2152	2152	2151	2151	2151	2151	2151	2151	2151	2151
25.5	**2154**	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2153	2153
26.0	**2154**	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154
26.5	**2155**	2155	2155	2155	2155	2155	2155	2155	2155	2155	2155	2155	2155	2155
27.0	**2155**	2155	2155	2155	2155	2155	2155	2155	2155	2155	2155	2155	2155	2155

Table 18-1: Power curve, Sound Optimized Mode SO13

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

18.2 Ct Values, Sound Optimized Mode SO13

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	**0.878**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.785**	0.789	0.789	0.789	0.788	0.788	0.788	0.787	0.787	0.786	0.786	0.785	0.785	0.784
4.5	**0.693**	0.698	0.698	0.697	0.696	0.696	0.695	0.695	0.694	0.694	0.693	0.693	0.692	0.692
5.0	**0.622**	0.625	0.624	0.624	0.624	0.623	0.623	0.623	0.623	0.622	0.622	0.622	0.622	0.621
5.5	**0.546**	0.548	0.548	0.548	0.548	0.547	0.547	0.547	0.547	0.547	0.547	0.547	0.546	0.546
6.0	**0.487**	0.489	0.489	0.489	0.489	0.489	0.489	0.488	0.488	0.488	0.488	0.487	0.487	0.486
6.5	**0.446**	0.449	0.449	0.448	0.448	0.448	0.448	0.447	0.447	0.447	0.447	0.446	0.446	0.445
7.0	**0.407**	0.410	0.409	0.409	0.409	0.409	0.408	0.408	0.408	0.408	0.407	0.407	0.407	0.407
7.5	**0.371**	0.374	0.373	0.373	0.373	0.373	0.373	0.372	0.372	0.372	0.372	0.371	0.371	0.371
8.0	**0.349**	0.352	0.352	0.352	0.351	0.351	0.351	0.351	0.350	0.350	0.350	0.349	0.348	0.347
8.5	**0.327**	0.332	0.332	0.332	0.332	0.332	0.331	0.331	0.330	0.330	0.329	0.328	0.325	0.323
9.0	**0.293**	0.301	0.301	0.301	0.301	0.301	0.300	0.299	0.299	0.298	0.296	0.295	0.291	0.289
9.5	**0.259**	0.278	0.277	0.276	0.275	0.274	0.272	0.271	0.269	0.267	0.264	0.262	0.256	0.253
10.0	**0.236**	0.269	0.267	0.264	0.262	0.260	0.256	0.253	0.250	0.246	0.243	0.239	0.232	0.228
10.5	**0.216**	0.264	0.259	0.255	0.250	0.246	0.242	0.237	0.233	0.228	0.224	0.220	0.212	0.208
11.0	**0.194**	0.248	0.243	0.237	0.232	0.226	0.221	0.217	0.212	0.207	0.203	0.198	0.190	0.187
11.5	**0.172**	0.223	0.218	0.212	0.207	0.201	0.197	0.192	0.188	0.184	0.180	0.176	0.169	0.166
12.0	**0.153**	0.198	0.193	0.188	0.183	0.179	0.175	0.171	0.167	0.163	0.160	0.157	0.150	0.148
12.5	**0.137**	0.176	0.172	0.168	0.164	0.159	0.156	0.153	0.149	0.146	0.143	0.140	0.135	0.132
13.0	**0.123**	0.158	0.154	0.150	0.147	0.143	0.140	0.137	0.134	0.131	0.128	0.126	0.121	0.119
13.5	**0.112**	0.143	0.139	0.136	0.133	0.129	0.127	0.124	0.121	0.119	0.116	0.114	0.110	0.108
14.0	**0.101**	0.129	0.126	0.123	0.120	0.117	0.115	0.112	0.110	0.107	0.105	0.103	0.100	0.098
14.5	**0.092**	0.117	0.115	0.112	0.109	0.107	0.104	0.102	0.100	0.098	0.096	0.094	0.091	0.089
15.0	**0.084**	0.107	0.104	0.102	0.099	0.097	0.095	0.093	0.091	0.089	0.087	0.086	0.083	0.081
15.5	**0.077**	0.098	0.095	0.093	0.091	0.089	0.087	0.085	0.084	0.082	0.080	0.079	0.076	0.075
16.0	**0.071**	0.090	0.088	0.086	0.084	0.082	0.080	0.078	0.077	0.075	0.074	0.073	0.070	0.069
16.5	**0.066**	0.083	0.081	0.079	0.077	0.075	0.074	0.072	0.071	0.069	0.068	0.067	0.065	0.064
17.0	**0.061**	0.076	0.075	0.073	0.071	0.070	0.068	0.067	0.066	0.064	0.063	0.062	0.060	0.059
17.5	**0.056**	0.071	0.069	0.068	0.066	0.065	0.063	0.062	0.061	0.060	0.059	0.058	0.056	0.055
18.0	**0.053**	0.066	0.064	0.063	0.061	0.060	0.059	0.058	0.057	0.055	0.054	0.054	0.052	0.051
18.5	**0.049**	0.061	0.060	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.050	0.048	0.048
19.0	**0.046**	0.057	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.047	0.045	0.044
19.5	**0.043**	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.044	0.042	0.042
20.0	**0.040**	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.043	0.042	0.042	0.041	0.040	0.039
20.5	**0.038**	0.046	0.046	0.045	0.044	0.043	0.042	0.041	0.041	0.040	0.039	0.039	0.037	0.037
21.0	**0.036**	0.044	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.037	0.037	0.036	0.035	0.035
21.5	**0.034**	0.042	0.041	0.040	0.039	0.038	0.038	0.037	0.036	0.036	0.035	0.035	0.034	0.033
22.0	**0.032**	0.039	0.039	0.038	0.037	0.036	0.036	0.035	0.034	0.034	0.033	0.033	0.032	0.031
22.5	**0.031**	0.037	0.037	0.036	0.035	0.034	0.034	0.033	0.033	0.032	0.032	0.031	0.030	0.030
23.0	**0.029**	0.035	0.035	0.034	0.033	0.033	0.032	0.031	0.031	0.030	0.030	0.030	0.029	0.028
23.5	**0.028**	0.033	0.033	0.032	0.032	0.031	0.030	0.030	0.029	0.029	0.029	0.028	0.027	0.027
24.0	**0.026**	0.032	0.031	0.031	0.030	0.030	0.029	0.029	0.028	0.028	0.027	0.027	0.026	0.026
24.5	**0.025**	0.030	0.030	0.029	0.029	0.028	0.028	0.027	0.027	0.026	0.026	0.026	0.025	0.025
25.0	**0.024**	0.029	0.028	0.028	0.027	0.027	0.026	0.026	0.026	0.025	0.025	0.024	0.024	0.023
25.5	**0.023**	0.028	0.027	0.027	0.026	0.026	0.025	0.025	0.025	0.024	0.024	0.023	0.023	0.023
26.0	**0.022**	0.026	0.026	0.025	0.025	0.024	0.024	0.024	0.023	0.023	0.023	0.022	0.022	0.022
26.5	**0.021**	0.025	0.025	0.024	0.024	0.023	0.023	0.023	0.022	0.022	0.022	0.021	0.021	0.021
27.0	**0.020**	0.024	0.024	0.023	0.023	0.022	0.022	0.022	0.021	0.021	0.021	0.021	0.020	0.020

Table 18-2: C_t values, Sound Optimized Mode SO13

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

18.3 Sound Curves, Sound Optimized Mode SO13

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 SO13 (Blades with serrated trailing edge)**
3	90.9
4	91.0
5	91.4
6	92.4
7	93.1
8	94.3
9	95.8
10	96.5
11	96.9
12	97.0
13	97.0
14	97.0
15	97.0
16	97.0
17	97.0
18	97.0
19	97.0
20	97.0

Table 18-3: Sound curves, Sound Optimized Mode SO13

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

19 Power Curves, Ct Values and Sound Curves, Sound Optimized Mode SO13 (HWO)

NOTE The power curves and Ct values presented in Section 19 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

19.1 Power Curves, Sound Optimized Mode SO13 (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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**218**	158	164	169	175	180	186	191	197	202	208	213	224	229
4.5	**321**	239	246	254	261	269	276	283	291	298	306	313	328	336
5.0	**429**	323	333	343	352	362	372	381	391	401	410	420	439	449
5.5	**531**	402	414	426	437	449	461	473	484	496	508	520	543	555
6.0	**643**	490	504	518	532	546	560	574	588	602	615	629	657	671
6.5	**773**	592	608	625	642	658	674	691	707	724	740	757	789	806
7.0	**906**	696	715	734	753	772	792	811	830	849	868	887	925	944
7.5	**1038**	799	821	843	864	886	908	930	951	973	994	1016	1059	1080
8.0	**1200**	929	954	979	1003	1028	1053	1078	1103	1128	1152	1176	1222	1245
8.5	**1361**	1063	1091	1120	1148	1177	1205	1232	1260	1288	1312	1337	1382	1403
9.0	**1463**	1157	1188	1219	1250	1281	1309	1338	1366	1395	1418	1440	1482	1501
9.5	**1538**	1270	1301	1331	1361	1392	1415	1439	1463	1487	1504	1521	1551	1564
10.0	**1643**	1449	1474	1498	1523	1548	1564	1580	1596	1612	1622	1632	1650	1657
10.5	**1746**	1647	1661	1675	1689	1703	1710	1718	1725	1733	1737	1741	1749	1752
11.0	**1812**	1785	1789	1794	1799	1803	1805	1807	1808	1810	1811	1811	1812	1812
11.5	**1842**	1841	1841	1842	1842	1842	1842	1842	1842	1842	1842	1842	1842	1842
12.0	**1864**	1865	1865	1865	1865	1865	1865	1864	1864	1864	1864	1864	1864	1864
12.5	**1883**	1884	1884	1884	1884	1884	1884	1884	1883	1883	1883	1883	1883	1883
13.0	**1902**	1903	1903	1903	1903	1903	1902	1902	1902	1902	1902	1902	1902	1901
13.5	**1919**	1920	1920	1920	1920	1920	1920	1920	1919	1919	1919	1919	1919	1918
14.0	**1935**	1936	1936	1936	1936	1936	1936	1936	1936	1936	1935	1935	1935	1935
14.5	**1951**	1953	1953	1952	1952	1952	1952	1952	1952	1952	1952	1951	1951	1951
15.0	**1968**	1969	1969	1969	1969	1969	1969	1968	1968	1968	1968	1968	1967	1967
15.5	**1983**	1985	1985	1985	1984	1984	1984	1984	1984	1984	1984	1983	1983	1983
16.0	**1997**	1999	1999	1999	1999	1998	1998	1998	1998	1998	1998	1997	1997	1997
16.5	**2010**	2012	2012	2012	2011	2011	2011	2011	2011	2011	2011	2010	2010	2010
17.0	**2022**	2023	2023	2023	2023	2023	2023	2023	2022	2022	2022	2022	2022	2021
17.5	**2032**	2034	2034	2034	2034	2034	2034	2033	2033	2033	2033	2033	2032	2032
18.0	**2042**	2044	2044	2044	2044	2044	2043	2043	2043	2043	2043	2042	2042	2042
18.5	**2052**	2053	2053	2053	2053	2052	2052	2052	2052	2052	2052	2052	2051	2051
19.0	**2060**	2061	2061	2061	2061	2061	2061	2061	2060	2060	2060	2060	2060	2060
19.5	**2067**	2068	2068	2068	2068	2068	2068	2068	2068	2068	2068	2067	2067	2067
20.0	**2073**	2074	2074	2074	2074	2074	2074	2074	2073	2073	2073	2073	2073	2073
20.5	**2078**	2079	2079	2079	2079	2079	2079	2078	2078	2078	2078	2078	2078	2078
21.0	**2084**	2085	2085	2085	2085	2085	2084	2084	2084	2084	2084	2084	2083	2083
21.5	**2090**	2093	2093	2092	2092	2092	2092	2092	2091	2091	2091	2091	2090	2090
22.0	**2100**	2103	2102	2102	2102	2102	2102	2101	2101	2101	2101	2100	2100	2099
22.5	**2111**	2114	2113	2113	2113	2113	2112	2112	2112	2112	2111	2111	2110	2110
23.0	**2123**	2126	2125	2125	2125	2125	2124	2124	2124	2124	2123	2123	2122	2122
23.5	**2133**	2135	2135	2135	2135	2135	2134	2134	2134	2134	2133	2133	2133	2132
24.0	**2141**	2143	2142	2142	2142	2142	2142	2142	2141	2141	2141	2141	2140	2140
24.5	**2147**	2148	2148	2148	2148	2148	2148	2148	2147	2147	2147	2147	2147	2146
25.0	**2151**	2152	2152	2152	2152	2152	2151	2151	2151	2151	2151	2151	2151	2151
25.5	**2154**	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2153	2153
26.0	**2154**	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154
26.5	**2155**	2155	2155	2155	2155	2155	2155	2155	2155	2155	2155	2155	2155	2155
27.0	**2155**	2155	2155	2155	2155	2155	2155	2155	2155	2155	2155	2155	2155	2155
27.5	**2153**	2153	2153	2153	2153	2153	2153	2153	2153	2153	2153	2153	2153	2153

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

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**
28.0	**2127**	2127	2127	2127	2127	2127	2127	2127	2127	2127	2127	2127	2127	2127
28.5	**2050**	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050
29.0	**1929**	1929	1929	1929	1929	1929	1929	1929	1929	1929	1929	1929	1929	1929
29.5	**1750**	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
30.0	**1600**	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
30.5	**1488**	1488	1488	1488	1488	1488	1488	1488	1488	1488	1488	1488	1488	1488
31.0	**1413**	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413	1413
31.5	**1364**	1363	1363	1363	1363	1363	1363	1363	1363	1364	1364	1364	1364	1364
32.0	**1338**	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338

Table 19-1: Power curve, Sound Optimized Mode SO13 (HWO)

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

19.2 Ct Values, Sound Optimized Mode SO13 (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	**0.878**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.785**	0.789	0.789	0.789	0.788	0.788	0.788	0.787	0.787	0.786	0.786	0.785	0.785	0.784
4.5	**0.693**	0.698	0.698	0.697	0.696	0.696	0.695	0.695	0.694	0.694	0.693	0.693	0.692	0.692
5.0	**0.622**	0.625	0.624	0.624	0.624	0.623	0.623	0.623	0.623	0.622	0.622	0.622	0.622	0.621
5.5	**0.546**	0.548	0.548	0.548	0.548	0.547	0.547	0.547	0.547	0.547	0.547	0.547	0.546	0.546
6.0	**0.487**	0.489	0.489	0.489	0.489	0.489	0.489	0.488	0.488	0.488	0.488	0.487	0.487	0.486
6.5	**0.446**	0.449	0.449	0.448	0.448	0.448	0.448	0.447	0.447	0.447	0.447	0.446	0.446	0.445
7.0	**0.407**	0.410	0.409	0.409	0.409	0.409	0.408	0.408	0.408	0.408	0.407	0.407	0.407	0.407
7.5	**0.371**	0.374	0.373	0.373	0.373	0.373	0.373	0.372	0.372	0.372	0.372	0.371	0.371	0.371
8.0	**0.349**	0.352	0.352	0.352	0.351	0.351	0.351	0.351	0.350	0.350	0.350	0.349	0.348	0.347
8.5	**0.327**	0.332	0.332	0.332	0.332	0.332	0.331	0.331	0.330	0.330	0.329	0.328	0.325	0.323
9.0	**0.293**	0.301	0.301	0.301	0.301	0.301	0.300	0.299	0.299	0.298	0.296	0.295	0.291	0.289
9.5	**0.259**	0.278	0.277	0.276	0.275	0.274	0.272	0.271	0.269	0.267	0.264	0.262	0.256	0.253
10.0	**0.236**	0.269	0.267	0.264	0.262	0.260	0.256	0.253	0.250	0.246	0.243	0.239	0.232	0.228
10.5	**0.216**	0.264	0.259	0.255	0.250	0.246	0.242	0.237	0.233	0.228	0.224	0.220	0.212	0.208
11.0	**0.194**	0.248	0.243	0.237	0.232	0.226	0.221	0.217	0.212	0.207	0.203	0.198	0.190	0.187
11.5	**0.172**	0.223	0.218	0.212	0.207	0.201	0.197	0.192	0.188	0.184	0.180	0.176	0.169	0.166
12.0	**0.153**	0.198	0.193	0.188	0.183	0.179	0.175	0.171	0.167	0.163	0.160	0.157	0.150	0.148
12.5	**0.137**	0.176	0.172	0.168	0.164	0.159	0.156	0.153	0.149	0.146	0.143	0.140	0.135	0.132
13.0	**0.123**	0.158	0.154	0.150	0.147	0.143	0.140	0.137	0.134	0.131	0.128	0.126	0.121	0.119
13.5	**0.112**	0.143	0.139	0.136	0.133	0.129	0.127	0.124	0.121	0.119	0.116	0.114	0.110	0.108
14.0	**0.101**	0.129	0.126	0.123	0.120	0.117	0.115	0.112	0.110	0.107	0.105	0.103	0.100	0.098
14.5	**0.092**	0.117	0.115	0.112	0.109	0.107	0.104	0.102	0.100	0.098	0.096	0.094	0.091	0.089
15.0	**0.084**	0.107	0.104	0.102	0.099	0.097	0.095	0.093	0.091	0.089	0.087	0.086	0.083	0.081
15.5	**0.077**	0.098	0.095	0.093	0.091	0.089	0.087	0.085	0.084	0.082	0.080	0.079	0.076	0.075
16.0	**0.071**	0.090	0.088	0.086	0.084	0.082	0.080	0.078	0.077	0.075	0.074	0.073	0.070	0.069
16.5	**0.066**	0.083	0.081	0.079	0.077	0.075	0.074	0.072	0.071	0.069	0.068	0.067	0.065	0.064
17.0	**0.061**	0.076	0.075	0.073	0.071	0.070	0.068	0.067	0.066	0.064	0.063	0.062	0.060	0.059
17.5	**0.056**	0.071	0.069	0.068	0.066	0.065	0.063	0.062	0.061	0.060	0.059	0.058	0.056	0.055
18.0	**0.053**	0.066	0.064	0.063	0.061	0.060	0.059	0.058	0.057	0.055	0.054	0.054	0.052	0.051
18.5	**0.049**	0.061	0.060	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.050	0.048	0.048
19.0	**0.046**	0.057	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.047	0.045	0.044
19.5	**0.043**	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.044	0.042	0.042
20.0	**0.040**	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.043	0.042	0.042	0.041	0.040	0.039
20.5	**0.038**	0.046	0.046	0.045	0.044	0.043	0.042	0.041	0.041	0.040	0.039	0.039	0.037	0.037
21.0	**0.036**	0.044	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.037	0.037	0.036	0.035	0.035
21.5	**0.034**	0.042	0.041	0.040	0.039	0.038	0.038	0.037	0.036	0.036	0.035	0.035	0.034	0.033
22.0	**0.032**	0.039	0.039	0.038	0.037	0.036	0.036	0.035	0.034	0.034	0.033	0.033	0.032	0.031
22.5	**0.031**	0.037	0.037	0.036	0.035	0.034	0.034	0.033	0.033	0.032	0.032	0.031	0.030	0.030
23.0	**0.029**	0.035	0.035	0.034	0.033	0.033	0.032	0.031	0.031	0.030	0.030	0.030	0.029	0.028
23.5	**0.028**	0.033	0.033	0.032	0.032	0.031	0.030	0.030	0.029	0.029	0.029	0.028	0.027	0.027
24.0	**0.026**	0.032	0.031	0.031	0.030	0.030	0.029	0.029	0.028	0.028	0.027	0.027	0.026	0.026
24.5	**0.025**	0.030	0.030	0.029	0.029	0.028	0.028	0.027	0.027	0.026	0.026	0.026	0.025	0.025
25.0	**0.024**	0.029	0.028	0.028	0.027	0.027	0.026	0.026	0.026	0.025	0.025	0.024	0.024	0.023
25.5	**0.023**	0.028	0.027	0.027	0.026	0.026	0.025	0.025	0.025	0.024	0.024	0.023	0.023	0.023
26.0	**0.022**	0.026	0.026	0.025	0.025	0.024	0.024	0.024	0.023	0.023	0.023	0.022	0.022	0.022
26.5	**0.021**	0.025	0.025	0.024	0.024	0.023	0.023	0.023	0.022	0.022	0.022	0.021	0.021	0.021
27.0	**0.020**	0.024	0.024	0.023	0.023	0.022	0.022	0.022	0.021	0.021	0.021	0.021	0.020	0.020
27.5	**0.019**	0.023	0.023	0.022	0.022	0.021	0.021	0.021	0.021	0.020	0.020	0.020	0.019	0.019
28.0	**0.018**	0.022	0.021	0.021	0.021	0.020	0.020	0.020	0.019	0.019	0.019	0.019	0.018	0.018
28.5	**0.017**	0.020	0.020	0.020	0.019	0.019	0.019	0.018	0.018	0.018	0.018	0.017	0.017	0.017
29.0	**0.016**	0.018	0.018	0.018	0.018	0.017	0.017	0.017	0.017	0.016	0.016	0.016	0.016	0.015
29.5	**0.014**	0.016	0.016	0.016	0.016	0.015	0.015	0.015	0.015	0.014	0.014	0.014	0.014	0.014
30.0	**0.012**	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.013	0.013	0.013	0.013	0.012	0.012
30.5	**0.011**	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.011
31.0	**0.010**	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.011	0.010	0.010	0.010	0.010	0.010
31.5	**0.009**	0.011	0.011	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.009	0.009	0.009
32.0	**0.009**	0.010	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009

Table 19-2: C_t values, Sound Optimized Mode SO13 (HWO)

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

19.3 Sound Curves, Sound Optimized Mode SO13 (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]** **Sound Optimized Mode SO13 (HWO)** **(Blades with serrated trailing edge)**
3	90.9
4	91.0
5	91.4
6	92.4
7	93.1
8	94.3
9	95.8
10	96.5
11	96.9
12	97.0
13	97.0
14	97.0
15	97.0
16	97.0
17	97.0
18	97.0
19	97.0
20	97.0

Table 19-3: Sound curves, Sound Optimized Mode SO13 (HWO)

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

20 Power Curves, Ct Values and Sound Curves, Load Optimized Mode LO1

NOTE The power curves and Ct values presented in Section 20 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

20.1 Power Curves, Load Optimized Mode LO1

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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**224**	162	168	173	179	185	190	196	201	207	213	218	229	235
4.5	**337**	250	258	265	273	281	289	297	305	313	321	329	345	352
5.0	**478**	358	369	380	391	402	413	423	434	445	456	467	488	499
5.5	**648**	490	505	519	533	548	562	576	591	605	619	633	662	676
6.0	**853**	649	668	687	705	724	742	761	779	798	816	835	872	890
6.5	**1096**	838	861	885	908	932	955	979	1002	1026	1049	1072	1119	1142
7.0	**1380**	1059	1088	1118	1147	1176	1206	1235	1264	1293	1322	1351	1410	1439
7.5	**1704**	1312	1347	1383	1419	1455	1491	1526	1562	1598	1633	1668	1739	1774
8.0	**2070**	1600	1643	1686	1730	1773	1816	1858	1901	1944	1986	2028	2112	2153
8.5	**2472**	1924	1975	2026	2077	2128	2178	2228	2278	2327	2376	2424	2520	2567
9.0	**2874**	2273	2330	2388	2446	2504	2558	2612	2667	2721	2772	2823	2923	2972
9.5	**3230**	2621	2681	2742	2803	2864	2919	2974	3029	3084	3132	3181	3274	3318
10.0	**3512**	2950	3010	3070	3131	3191	3242	3292	3342	3393	3432	3472	3543	3574
10.5	**3686**	3244	3298	3353	3408	3462	3500	3537	3575	3612	3637	3662	3703	3720
11.0	**3769**	3474	3515	3556	3597	3639	3662	3686	3710	3733	3745	3757	3775	3782
11.5	**3795**	3643	3669	3694	3720	3745	3755	3765	3775	3785	3788	3792	3796	3798
12.0	**3800**	3739	3751	3762	3774	3786	3789	3792	3795	3798	3798	3799	3800	3800
12.5	**3800**	3779	3784	3788	3793	3798	3798	3799	3799	3800	3800	3800	3800	3800
13.0	**3800**	3793	3795	3796	3798	3800	3800	3800	3800	3800	3800	3800	3800	3800
13.5	**3800**	3796	3797	3798	3799	3800	3800	3800	3800	3800	3800	3800	3800	3800
14.0	**3800**	3798	3799	3799	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
14.5	**3800**	3799	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
15.0	**3800**	3799	3799	3799	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
15.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
16.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
16.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
17.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
17.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
18.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
18.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
19.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
19.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
20.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
20.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
21.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
21.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
22.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
22.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
23.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
23.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
24.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
24.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
25.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
25.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
26.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
26.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
27.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800

Table 20-1: Power curve, Load Optimized Mode LO1

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

20.2 Ct Values, Load Optimized Mode LO1

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	**0.878**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.852**	0.859	0.857	0.856	0.855	0.853	0.853	0.853	0.853	0.853	0.853	0.852	0.852	0.853
4.5	**0.855**	0.854	0.854	0.855	0.855	0.855	0.855	0.856	0.856	0.856	0.856	0.856	0.855	0.855
5.0	**0.851**	0.855	0.855	0.855	0.855	0.854	0.854	0.853	0.853	0.853	0.852	0.852	0.851	0.850
5.5	**0.847**	0.852	0.852	0.851	0.851	0.850	0.850	0.849	0.849	0.848	0.848	0.847	0.846	0.846
6.0	**0.841**	0.847	0.847	0.846	0.846	0.845	0.845	0.844	0.844	0.843	0.842	0.842	0.840	0.840
6.5	**0.835**	0.843	0.842	0.842	0.841	0.840	0.840	0.839	0.838	0.837	0.837	0.836	0.834	0.833
7.0	**0.828**	0.838	0.837	0.836	0.835	0.834	0.833	0.832	0.832	0.831	0.830	0.829	0.827	0.826
7.5	**0.821**	0.832	0.831	0.830	0.829	0.828	0.827	0.826	0.825	0.824	0.823	0.822	0.820	0.818
8.0	**0.822**	0.837	0.836	0.835	0.834	0.833	0.831	0.830	0.829	0.827	0.826	0.824	0.821	0.819
8.5	**0.802**	0.838	0.836	0.833	0.831	0.828	0.825	0.821	0.818	0.814	0.810	0.806	0.798	0.793
9.0	**0.745**	0.810	0.805	0.800	0.795	0.790	0.784	0.777	0.771	0.765	0.759	0.752	0.739	0.732
9.5	**0.670**	0.753	0.746	0.738	0.731	0.724	0.717	0.709	0.701	0.694	0.686	0.678	0.663	0.655
10.0	**0.594**	0.687	0.679	0.671	0.663	0.654	0.646	0.638	0.629	0.621	0.612	0.603	0.585	0.575
10.5	**0.517**	0.623	0.614	0.605	0.596	0.587	0.577	0.567	0.558	0.548	0.537	0.527	0.506	0.496
11.0	**0.444**	0.559	0.549	0.538	0.528	0.518	0.507	0.496	0.486	0.475	0.465	0.454	0.434	0.424
11.5	**0.380**	0.497	0.486	0.475	0.463	0.452	0.441	0.430	0.419	0.409	0.399	0.390	0.371	0.363
12.0	**0.327**	0.437	0.425	0.414	0.402	0.391	0.381	0.371	0.362	0.352	0.344	0.336	0.320	0.313
12.5	**0.285**	0.381	0.370	0.360	0.349	0.339	0.331	0.322	0.314	0.306	0.299	0.292	0.279	0.273
13.0	**0.251**	0.332	0.323	0.314	0.305	0.296	0.289	0.282	0.275	0.268	0.262	0.257	0.246	0.241
13.5	**0.223**	0.294	0.286	0.278	0.271	0.263	0.257	0.251	0.245	0.239	0.234	0.229	0.219	0.215
14.0	**0.199**	0.260	0.254	0.247	0.240	0.234	0.228	0.223	0.218	0.212	0.208	0.204	0.195	0.191
14.5	**0.179**	0.232	0.226	0.220	0.215	0.209	0.204	0.200	0.195	0.190	0.186	0.183	0.175	0.172
15.0	**0.160**	0.207	0.202	0.197	0.192	0.187	0.183	0.179	0.175	0.171	0.167	0.164	0.157	0.154
15.5	**0.145**	0.187	0.183	0.178	0.174	0.169	0.165	0.162	0.158	0.155	0.151	0.148	0.143	0.140
16.0	**0.132**	0.170	0.166	0.162	0.158	0.153	0.150	0.147	0.144	0.140	0.138	0.135	0.130	0.127
16.5	**0.121**	0.154	0.151	0.147	0.144	0.140	0.137	0.134	0.131	0.128	0.126	0.123	0.119	0.116
17.0	**0.111**	0.141	0.138	0.135	0.131	0.128	0.125	0.123	0.120	0.117	0.115	0.113	0.109	0.107
17.5	**0.102**	0.129	0.126	0.123	0.120	0.117	0.115	0.113	0.110	0.108	0.106	0.104	0.100	0.098
18.0	**0.094**	0.119	0.116	0.114	0.111	0.108	0.106	0.104	0.102	0.099	0.097	0.096	0.092	0.090
18.5	**0.087**	0.110	0.107	0.105	0.102	0.100	0.098	0.096	0.094	0.092	0.090	0.088	0.085	0.084
19.0	**0.080**	0.101	0.099	0.096	0.094	0.092	0.090	0.088	0.087	0.085	0.083	0.082	0.079	0.077
19.5	**0.074**	0.094	0.092	0.090	0.087	0.085	0.084	0.082	0.080	0.079	0.077	0.076	0.073	0.072
20.0	**0.069**	0.087	0.085	0.083	0.081	0.080	0.078	0.076	0.075	0.073	0.072	0.071	0.068	0.067
20.5	**0.065**	0.081	0.079	0.078	0.076	0.074	0.073	0.071	0.070	0.069	0.067	0.066	0.064	0.063
21.0	**0.061**	0.076	0.074	0.073	0.071	0.069	0.068	0.067	0.065	0.064	0.063	0.062	0.060	0.059
21.5	**0.058**	0.072	0.070	0.069	0.067	0.066	0.064	0.063	0.062	0.061	0.060	0.059	0.057	0.056
22.0	**0.054**	0.067	0.066	0.064	0.063	0.062	0.060	0.059	0.058	0.057	0.056	0.055	0.053	0.052
22.5	**0.051**	0.063	0.062	0.061	0.059	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.050	0.049
23.0	**0.048**	0.059	0.058	0.057	0.056	0.054	0.053	0.052	0.051	0.050	0.050	0.049	0.047	0.046
23.5	**0.045**	0.056	0.055	0.054	0.052	0.051	0.050	0.049	0.049	0.048	0.047	0.046	0.045	0.044
24.0	**0.043**	0.053	0.052	0.051	0.050	0.048	0.048	0.047	0.046	0.045	0.044	0.044	0.042	0.042
24.5	**0.041**	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.044	0.043	0.042	0.041	0.040	0.040
25.0	**0.039**	0.047	0.046	0.045	0.044	0.044	0.043	0.042	0.041	0.041	0.040	0.039	0.038	0.038
25.5	**0.037**	0.045	0.044	0.043	0.042	0.042	0.041	0.040	0.039	0.039	0.038	0.038	0.036	0.036
26.0	**0.035**	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.038	0.037	0.036	0.036	0.035	0.034
26.5	**0.034**	0.041	0.040	0.039	0.038	0.038	0.037	0.036	0.036	0.035	0.035	0.034	0.033	0.033
27.0	**0.032**	0.039	0.038	0.037	0.037	0.036	0.035	0.035	0.034	0.034	0.033	0.033	0.032	0.031

Table 20-2: C_t values, Load Optimized Mode LO1

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

20.3 Sound Curves, Load Optimized Mode LO1

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]** **Load Optimized Mode LO1** **(Blades with serrated trailing edge)**
3	90.9
4	91.1
5	92.9
6	96.0
7	99.6
8	102.8
9	103.9
10	103.9
11	103.9
12	103.9
13	103.9
14	103.9
15	103.9
16	103.9
17	103.9
18	103.9
19	103.9
20	103.9

Table 20-3: Sound curves, Load Optimized Mode LO1

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

21 Power Curves, Ct Values and Sound Curves, Load Optimized Mode LO1 (HWO)

NOTE The power curves and Ct values presented in Section 21 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

21.1 Power Curves, Load Optimized Mode LO1 (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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**224**	162	168	173	179	185	190	196	201	207	213	218	229	235
4.5	**337**	250	258	265	273	281	289	297	305	313	321	329	345	352
5.0	**478**	358	369	380	391	402	413	423	434	445	456	467	488	499
5.5	**648**	490	505	519	533	548	562	576	591	605	619	633	662	676
6.0	**853**	649	668	687	705	724	742	761	779	798	816	835	872	890
6.5	**1096**	838	861	885	908	932	955	979	1002	1026	1049	1072	1119	1142
7.0	**1380**	1059	1088	1118	1147	1176	1206	1235	1264	1293	1322	1351	1410	1439
7.5	**1704**	1312	1347	1383	1419	1455	1491	1526	1562	1598	1633	1668	1739	1774
8.0	**2070**	1600	1643	1686	1730	1773	1816	1858	1901	1944	1986	2028	2112	2153
8.5	**2472**	1924	1975	2026	2077	2128	2178	2228	2278	2327	2376	2424	2520	2567
9.0	**2874**	2273	2330	2388	2446	2504	2558	2612	2667	2721	2772	2823	2923	2972
9.5	**3230**	2621	2681	2742	2803	2864	2919	2974	3029	3084	3132	3181	3274	3318
10.0	**3512**	2950	3010	3070	3131	3191	3242	3292	3342	3393	3432	3472	3543	3574
10.5	**3686**	3244	3298	3353	3408	3462	3500	3537	3575	3612	3637	3662	3703	3720
11.0	**3769**	3474	3515	3556	3597	3639	3662	3686	3710	3733	3745	3757	3775	3782
11.5	**3795**	3643	3669	3694	3720	3745	3755	3765	3775	3785	3788	3792	3796	3798
12.0	**3800**	3739	3751	3762	3774	3786	3789	3792	3795	3798	3798	3799	3800	3800
12.5	**3800**	3779	3784	3788	3793	3798	3798	3799	3799	3800	3800	3800	3800	3800
13.0	**3800**	3793	3795	3796	3798	3800	3800	3800	3800	3800	3800	3800	3800	3800
13.5	**3800**	3796	3797	3798	3799	3800	3800	3800	3800	3800	3800	3800	3800	3800
14.0	**3800**	3798	3799	3799	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
14.5	**3800**	3799	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
15.0	**3800**	3799	3799	3799	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
15.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
16.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
16.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
17.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
17.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
18.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
18.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
19.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
19.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
20.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
20.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
21.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
21.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
22.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
22.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
23.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
23.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
24.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
24.5	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
25.0	**3800**	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
25.5	**3798**	3798	3798	3798	3798	3798	3798	3798	3798	3798	3798	3798	3798	3798
26.0	**3790**	3790	3790	3790	3790	3790	3790	3790	3790	3790	3790	3790	3790	3790
26.5	**3759**	3759	3759	3759	3759	3759	3759	3759	3759	3759	3759	3759	3759	3759
27.0	**3722**	3722	3722	3722	3722	3722	3722	3722	3722	3722	3722	3722	3722	3722

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Air density [kg/m^3]														
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**
27.5	**3621**	3621	3621	3621	3621	3621	3621	3621	3621	3621	3621	3621	3621	3621
28.0	**3467**	3467	3467	3467	3467	3467	3467	3467	3467	3467	3467	3467	3467	3467
28.5	**3275**	3275	3275	3275	3275	3275	3275	3275	3275	3275	3275	3275	3275	3274
29.0	**3049**	3049	3049	3049	3049	3049	3049	3049	3049	3049	3049	3049	3049	3049
29.5	**2805**	2806	2806	2806	2806	2806	2806	2806	2806	2806	2805	2805	2805	2805
30.0	**2565**	2565	2565	2565	2565	2565	2565	2565	2565	2565	2565	2565	2565	2565
30.5	**2324**	2324	2324	2324	2324	2324	2324	2324	2324	2324	2324	2324	2324	2324
31.0	**2090**	2090	2090	2090	2090	2090	2090	2090	2090	2090	2090	2090	2090	2090
31.5	**1884**	1884	1884	1884	1884	1884	1884	1884	1884	1884	1884	1884	1884	1884
32.0	**1732**	1732	1732	1732	1732	1732	1732	1732	1732	1732	1732	1732	1732	1732

Table 21-1: Power curve, Load Optimized Mode LO1 (HWO)

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

21.2 Ct Values, Load Optimized Mode LO1 (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	**0.878**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.852**	0.859	0.857	0.856	0.855	0.853	0.853	0.853	0.853	0.853	0.853	0.852	0.852	0.853
4.5	**0.855**	0.854	0.854	0.855	0.855	0.855	0.855	0.856	0.856	0.856	0.856	0.856	0.855	0.855
5.0	**0.851**	0.855	0.855	0.855	0.855	0.854	0.854	0.853	0.853	0.853	0.852	0.852	0.851	0.850
5.5	**0.847**	0.852	0.852	0.851	0.851	0.850	0.850	0.849	0.849	0.848	0.848	0.847	0.846	0.846
6.0	**0.841**	0.847	0.847	0.846	0.846	0.845	0.845	0.844	0.844	0.843	0.842	0.842	0.840	0.840
6.5	**0.835**	0.843	0.842	0.842	0.841	0.840	0.840	0.839	0.838	0.837	0.837	0.836	0.834	0.833
7.0	**0.828**	0.838	0.837	0.836	0.835	0.834	0.833	0.832	0.832	0.831	0.830	0.829	0.827	0.826
7.5	**0.821**	0.832	0.831	0.830	0.829	0.828	0.827	0.826	0.825	0.824	0.823	0.822	0.820	0.818
8.0	**0.822**	0.837	0.836	0.835	0.834	0.833	0.831	0.830	0.829	0.827	0.826	0.824	0.821	0.819
8.5	**0.802**	0.838	0.836	0.833	0.831	0.828	0.825	0.821	0.818	0.814	0.810	0.806	0.798	0.793
9.0	**0.745**	0.810	0.805	0.800	0.795	0.790	0.784	0.777	0.771	0.765	0.759	0.752	0.739	0.732
9.5	**0.670**	0.753	0.746	0.738	0.731	0.724	0.717	0.709	0.701	0.694	0.686	0.678	0.663	0.655
10.0	**0.594**	0.687	0.679	0.671	0.663	0.654	0.646	0.638	0.629	0.621	0.612	0.603	0.585	0.575
10.5	**0.517**	0.623	0.614	0.605	0.596	0.587	0.577	0.567	0.558	0.548	0.537	0.527	0.506	0.496
11.0	**0.444**	0.559	0.549	0.538	0.528	0.518	0.507	0.496	0.486	0.475	0.465	0.454	0.434	0.424
11.5	**0.380**	0.497	0.486	0.475	0.463	0.452	0.441	0.430	0.419	0.409	0.399	0.390	0.371	0.363
12.0	**0.327**	0.437	0.425	0.414	0.402	0.391	0.381	0.371	0.362	0.352	0.344	0.336	0.320	0.313
12.5	**0.285**	0.381	0.370	0.360	0.349	0.339	0.331	0.322	0.314	0.306	0.299	0.292	0.279	0.273
13.0	**0.251**	0.332	0.323	0.314	0.305	0.296	0.289	0.282	0.275	0.268	0.262	0.257	0.246	0.241
13.5	**0.223**	0.294	0.286	0.278	0.271	0.263	0.257	0.251	0.245	0.239	0.234	0.229	0.219	0.215
14.0	**0.199**	0.260	0.254	0.247	0.240	0.234	0.228	0.223	0.218	0.212	0.208	0.204	0.195	0.191
14.5	**0.179**	0.232	0.226	0.220	0.215	0.209	0.204	0.200	0.195	0.190	0.186	0.183	0.175	0.172
15.0	**0.160**	0.207	0.202	0.197	0.192	0.187	0.183	0.179	0.175	0.171	0.167	0.164	0.157	0.154
15.5	**0.145**	0.187	0.183	0.178	0.174	0.169	0.165	0.162	0.158	0.155	0.151	0.148	0.143	0.140
16.0	**0.132**	0.170	0.166	0.162	0.158	0.153	0.150	0.147	0.144	0.140	0.138	0.135	0.130	0.127
16.5	**0.121**	0.154	0.151	0.147	0.144	0.140	0.137	0.134	0.131	0.128	0.126	0.123	0.119	0.116
17.0	**0.111**	0.141	0.138	0.135	0.131	0.128	0.125	0.123	0.120	0.117	0.115	0.113	0.109	0.107
17.5	**0.102**	0.129	0.126	0.123	0.120	0.117	0.115	0.113	0.110	0.108	0.106	0.104	0.100	0.098
18.0	**0.094**	0.119	0.116	0.114	0.111	0.108	0.106	0.104	0.102	0.099	0.097	0.096	0.092	0.090
18.5	**0.087**	0.110	0.107	0.105	0.102	0.100	0.098	0.096	0.094	0.092	0.090	0.088	0.085	0.084
19.0	**0.080**	0.101	0.099	0.096	0.094	0.092	0.090	0.088	0.087	0.085	0.083	0.082	0.079	0.077
19.5	**0.074**	0.094	0.092	0.090	0.087	0.085	0.084	0.082	0.080	0.079	0.077	0.076	0.073	0.072
20.0	**0.069**	0.087	0.085	0.083	0.081	0.080	0.078	0.076	0.075	0.073	0.072	0.071	0.068	0.067
20.5	**0.065**	0.081	0.079	0.078	0.076	0.074	0.073	0.071	0.070	0.069	0.067	0.066	0.064	0.063
21.0	**0.061**	0.076	0.074	0.073	0.071	0.069	0.068	0.067	0.065	0.064	0.063	0.062	0.060	0.059
21.5	**0.058**	0.072	0.070	0.069	0.067	0.066	0.064	0.063	0.062	0.061	0.060	0.059	0.057	0.056
22.0	**0.054**	0.067	0.066	0.064	0.063	0.062	0.060	0.059	0.058	0.057	0.056	0.055	0.053	0.052
22.5	**0.051**	0.063	0.062	0.061	0.059	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.050	0.049
23.0	**0.048**	0.059	0.058	0.057	0.056	0.054	0.053	0.052	0.051	0.050	0.050	0.049	0.047	0.046
23.5	**0.045**	0.056	0.055	0.054	0.052	0.051	0.050	0.049	0.049	0.048	0.047	0.046	0.045	0.044
24.0	**0.043**	0.053	0.052	0.051	0.050	0.048	0.048	0.047	0.046	0.045	0.044	0.044	0.042	0.042
24.5	**0.041**	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.044	0.043	0.042	0.041	0.040	0.040
25.0	**0.039**	0.047	0.046	0.045	0.044	0.044	0.043	0.042	0.041	0.041	0.040	0.039	0.038	0.038
25.5	**0.037**	0.045	0.044	0.043	0.042	0.042	0.041	0.040	0.039	0.039	0.038	0.037	0.036	0.036
26.0	**0.035**	0.043	0.042	0.041	0.040	0.039	0.039	0.038	0.037	0.037	0.036	0.035	0.034	0.034
26.5	**0.033**	0.040	0.039	0.039	0.038	0.037	0.036	0.036	0.035	0.034	0.034	0.033	0.032	0.032
27.0	**0.031**	0.038	0.037	0.036	0.035	0.035	0.034	0.034	0.033	0.032	0.032	0.031	0.030	0.030
27.5	**0.029**	0.035	0.034	0.034	0.033	0.032	0.032	0.031	0.031	0.030	0.030	0.029	0.028	0.028
28.0	**0.026**	0.032	0.031	0.031	0.030	0.030	0.029	0.029	0.028	0.028	0.027	0.027	0.026	0.026
28.5	**0.024**	0.029	0.028	0.028	0.027	0.027	0.026	0.026	0.025	0.025	0.025	0.024	0.024	0.023
29.0	**0.021**	0.026	0.025	0.025	0.024	0.024	0.024	0.023	0.023	0.022	0.022	0.022	0.021	0.021
29.5	**0.019**	0.023	0.023	0.022	0.022	0.021	0.021	0.021	0.020	0.020	0.020	0.019	0.019	0.019
30.0	**0.017**	0.020	0.020	0.020	0.019	0.019	0.019	0.018	0.018	0.018	0.017	0.017	0.017	0.016
30.5	**0.015**	0.018	0.017	0.017	0.017	0.016	0.016	0.016	0.016	0.015	0.015	0.015	0.015	0.014
31.0	**0.013**	0.016	0.015	0.015	0.015	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.013	0.013
31.5	**0.011**	0.014	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.011
32.0	**0.010**	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.011	0.010	0.010	0.010

Table 21-2: C_t values, Load Optimized Mode LO1 (HWO)

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

21.3 Sound Curves, Load Optimized Mode LO1 (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]** **Load Optimized Mode LO1 (HWO)** **(Blades with serrated trailing edge)**
3	90.9
4	91.1
5	92.9
6	96.0
7	99.6
8	102.9
9	103.9
10	103.9
11	103.9
12	103.9
13	103.9
14	103.9
15	103.9
16	103.9
17	103.9
18	103.9
19	103.9
20	103.9

Table 21-3: Sound curves, Load Optimized Mode LO1 (HWO)

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

Original Instruction: T05 0067-7065 VER 09

22 Power Curves, Ct Values and Sound Curves, Load Optimized Mode LO2

NOTE The power curves and Ct values presented in Section 22 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

22.1 Power Curves, Load Optimized Mode LO2

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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**224**	162	168	173	179	185	190	196	201	207	213	218	229	235
4.5	**337**	250	258	265	273	281	289	297	305	313	321	329	344	352
5.0	**478**	358	369	380	391	402	413	423	434	445	456	467	488	499
5.5	**648**	490	505	519	533	548	562	576	591	605	619	633	662	676
6.0	**853**	649	668	687	705	724	742	761	779	798	816	835	872	890
6.5	**1096**	838	861	885	908	932	955	979	1002	1026	1049	1073	1119	1142
7.0	**1380**	1059	1088	1118	1147	1176	1206	1235	1264	1293	1322	1351	1410	1439
7.5	**1706**	1312	1348	1384	1420	1456	1492	1528	1564	1600	1635	1670	1741	1776
8.0	**2072**	1601	1644	1687	1731	1774	1817	1859	1902	1945	1987	2029	2114	2156
8.5	**2466**	1912	1963	2014	2066	2117	2167	2218	2268	2319	2368	2417	2515	2563
9.0	**2861**	2227	2287	2347	2407	2468	2525	2583	2640	2698	2752	2806	2912	2962
9.5	**3197**	2528	2598	2667	2736	2806	2866	2926	2987	3047	3097	3147	3239	3280
10.0	**3429**	2819	2891	2962	3034	3106	3161	3215	3270	3324	3359	3394	3454	3478
10.5	**3542**	3073	3141	3208	3275	3342	3379	3415	3451	3488	3506	3524	3553	3563
11.0	**3587**	3263	3317	3370	3423	3477	3498	3519	3540	3561	3570	3578	3591	3594
11.5	**3597**	3428	3458	3489	3520	3551	3560	3570	3579	3589	3592	3595	3598	3599
12.0	**3599**	3520	3536	3552	3567	3583	3586	3590	3594	3598	3598	3599	3599	3600
12.5	**3600**	3566	3573	3580	3587	3594	3595	3596	3598	3599	3599	3600	3600	3600
13.0	**3600**	3585	3588	3592	3595	3598	3599	3599	3600	3600	3600	3600	3600	3600
13.5	**3600**	3589	3592	3594	3596	3598	3599	3599	3600	3600	3600	3600	3600	3600
14.0	**3600**	3595	3596	3597	3598	3599	3600	3600	3600	3600	3600	3600	3600	3600
14.5	**3600**	3598	3598	3599	3599	3600	3600	3600	3600	3600	3600	3600	3600	3600
15.0	**3600**	3597	3598	3598	3599	3600	3600	3600	3600	3600	3600	3600	3600	3600
15.5	**3600**	3598	3599	3599	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
16.0	**3600**	3599	3599	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
16.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
17.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
17.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
18.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
18.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
19.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
19.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
20.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
20.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
21.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
21.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
22.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
22.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
23.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
23.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
24.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
24.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
25.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
25.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
26.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
26.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
27.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600

Table 22-1: Power curve, Load Optimized Mode LO2

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

22.2 Ct Values, Load Optimized Mode LO2

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	**0.878**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.852**	0.859	0.857	0.856	0.855	0.853	0.853	0.853	0.853	0.853	0.853	0.852	0.852	0.853
4.5	**0.855**	0.854	0.854	0.855	0.855	0.855	0.855	0.856	0.856	0.856	0.856	0.856	0.855	0.855
5.0	**0.851**	0.855	0.855	0.855	0.855	0.854	0.854	0.853	0.853	0.853	0.852	0.852	0.851	0.850
5.5	**0.847**	0.852	0.852	0.851	0.851	0.850	0.850	0.849	0.849	0.848	0.848	0.847	0.846	0.846
6.0	**0.841**	0.847	0.847	0.846	0.846	0.845	0.845	0.844	0.844	0.843	0.842	0.842	0.840	0.840
6.5	**0.835**	0.843	0.842	0.842	0.841	0.840	0.840	0.839	0.838	0.837	0.837	0.836	0.834	0.833
7.0	**0.828**	0.838	0.837	0.836	0.835	0.834	0.833	0.832	0.832	0.831	0.830	0.829	0.827	0.826
7.5	**0.831**	0.842	0.841	0.840	0.839	0.838	0.837	0.836	0.835	0.834	0.833	0.832	0.830	0.828
8.0	**0.831**	0.845	0.844	0.842	0.841	0.840	0.839	0.838	0.837	0.835	0.834	0.833	0.830	0.828
8.5	**0.805**	0.828	0.827	0.826	0.825	0.823	0.821	0.819	0.817	0.815	0.812	0.809	0.802	0.798
9.0	**0.746**	0.788	0.785	0.783	0.780	0.778	0.774	0.770	0.766	0.762	0.757	0.752	0.740	0.735
9.5	**0.668**	0.730	0.727	0.723	0.719	0.715	0.709	0.703	0.697	0.691	0.683	0.676	0.659	0.650
10.0	**0.581**	0.670	0.665	0.659	0.653	0.648	0.639	0.630	0.622	0.613	0.603	0.592	0.570	0.559
10.5	**0.494**	0.608	0.600	0.592	0.583	0.575	0.564	0.552	0.541	0.529	0.518	0.506	0.483	0.471
11.0	**0.419**	0.540	0.530	0.520	0.509	0.499	0.487	0.475	0.464	0.452	0.441	0.430	0.409	0.399
11.5	**0.357**	0.476	0.464	0.452	0.440	0.428	0.417	0.407	0.396	0.385	0.375	0.366	0.348	0.340
12.0	**0.308**	0.413	0.402	0.391	0.379	0.368	0.359	0.349	0.340	0.331	0.323	0.315	0.301	0.294
12.5	**0.268**	0.358	0.348	0.338	0.329	0.319	0.311	0.303	0.295	0.288	0.281	0.275	0.263	0.257
13.0	**0.236**	0.313	0.304	0.296	0.288	0.279	0.273	0.266	0.259	0.253	0.247	0.242	0.231	0.227
13.5	**0.211**	0.277	0.270	0.262	0.255	0.248	0.242	0.236	0.231	0.225	0.220	0.215	0.206	0.202
14.0	**0.188**	0.246	0.239	0.233	0.227	0.220	0.215	0.210	0.205	0.200	0.196	0.192	0.184	0.180
14.5	**0.169**	0.219	0.214	0.208	0.203	0.197	0.193	0.189	0.184	0.180	0.176	0.172	0.165	0.162
15.0	**0.151**	0.196	0.191	0.186	0.182	0.177	0.173	0.169	0.165	0.161	0.158	0.155	0.149	0.146
15.5	**0.137**	0.177	0.173	0.168	0.164	0.160	0.156	0.153	0.149	0.146	0.143	0.140	0.135	0.132
16.0	**0.125**	0.161	0.157	0.153	0.149	0.145	0.142	0.139	0.136	0.133	0.130	0.127	0.123	0.120
16.5	**0.114**	0.146	0.143	0.139	0.136	0.132	0.130	0.127	0.124	0.121	0.119	0.116	0.112	0.110
17.0	**0.105**	0.134	0.131	0.127	0.124	0.121	0.119	0.116	0.114	0.111	0.109	0.107	0.103	0.101
17.5	**0.096**	0.122	0.120	0.117	0.114	0.111	0.109	0.106	0.104	0.102	0.100	0.098	0.094	0.093
18.0	**0.089**	0.113	0.110	0.107	0.105	0.102	0.100	0.098	0.096	0.094	0.092	0.090	0.087	0.085
18.5	**0.082**	0.104	0.102	0.099	0.097	0.095	0.093	0.091	0.089	0.087	0.085	0.084	0.081	0.079
19.0	**0.076**	0.096	0.094	0.091	0.089	0.087	0.085	0.084	0.082	0.080	0.079	0.077	0.074	0.073
19.5	**0.070**	0.089	0.087	0.085	0.083	0.081	0.079	0.078	0.076	0.074	0.073	0.072	0.069	0.068
20.0	**0.066**	0.083	0.081	0.079	0.077	0.075	0.074	0.072	0.071	0.069	0.068	0.067	0.065	0.063
20.5	**0.061**	0.077	0.075	0.074	0.072	0.070	0.069	0.068	0.066	0.065	0.064	0.063	0.060	0.059
21.0	**0.057**	0.072	0.070	0.069	0.067	0.066	0.064	0.063	0.062	0.061	0.060	0.059	0.057	0.056
21.5	**0.054**	0.068	0.066	0.065	0.064	0.062	0.061	0.060	0.059	0.057	0.056	0.055	0.054	0.053
22.0	**0.051**	0.064	0.062	0.061	0.060	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.050	0.050
22.5	**0.048**	0.060	0.059	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.047	0.047
23.0	**0.045**	0.056	0.055	0.054	0.053	0.051	0.050	0.050	0.049	0.048	0.047	0.046	0.045	0.044
23.5	**0.043**	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.044	0.042	0.042
24.0	**0.041**	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.043	0.043	0.042	0.041	0.040	0.039
24.5	**0.038**	0.047	0.046	0.045	0.044	0.043	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.037
25.0	**0.037**	0.045	0.044	0.043	0.042	0.041	0.041	0.040	0.039	0.038	0.038	0.037	0.036	0.035
25.5	**0.035**	0.043	0.042	0.041	0.040	0.039	0.039	0.038	0.037	0.037	0.036	0.036	0.034	0.034
26.0	**0.033**	0.041	0.040	0.039	0.038	0.037	0.037	0.036	0.036	0.035	0.034	0.034	0.033	0.032
26.5	**0.032**	0.039	0.038	0.037	0.036	0.036	0.035	0.034	0.034	0.033	0.033	0.032	0.031	0.031
27.0	**0.030**	0.037	0.036	0.035	0.035	0.034	0.033	0.033	0.032	0.032	0.031	0.031	0.030	0.030

Table 22-2: C_t values, Load Optimized Mode LO2

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

22.3 Sound Curves, Load Optimized Mode LO2

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]** **Load Optimized Mode LO2** **(Blades with serrated trailing edge)**
3	90.9
4	91.1
5	92.9
6	96.0
7	99.6
8	102.2
9	102.5
10	102.5
11	102.5
12	102.5
13	102.5
14	102.5
15	102.5
16	102.5
17	102.5
18	102.5
19	102.5
20	102.5

Table 22-3: Sound curves, Load Optimized Mode LO2

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

23 Power Curves, Ct Values and Sound Curves, Load Optimized Mode LO2 (HWO)

NOTE The power curves and Ct values presented in Section 23 are not valid for hub heights ≤ 104 m. For hub heights ≤ 104 m, Vestas must be consulted for project specific evaluation.

23.1 Power Curves, Load Optimized Mode LO2 (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	**57**	32	35	37	39	41	43	46	48	50	52	55	59	61
3.5	**132**	91	95	99	102	106	110	114	117	121	125	128	136	140
4.0	**224**	162	168	173	179	185	190	196	201	207	213	218	229	235
4.5	**337**	250	258	265	273	281	289	297	305	313	321	329	344	352
5.0	**478**	358	369	380	391	402	413	423	434	445	456	467	488	499
5.5	**648**	490	505	519	533	548	562	576	591	605	619	633	662	676
6.0	**853**	649	668	687	705	724	742	761	779	798	816	835	872	890
6.5	**1096**	838	861	885	908	932	955	979	1002	1026	1049	1073	1119	1142
7.0	**1380**	1059	1088	1118	1147	1176	1206	1235	1264	1293	1322	1351	1410	1439
7.5	**1706**	1312	1348	1384	1420	1456	1492	1528	1564	1600	1635	1670	1741	1776
8.0	**2072**	1601	1644	1687	1731	1774	1817	1860	1902	1945	1987	2029	2114	2156
8.5	**2466**	1912	1963	2014	2066	2117	2167	2218	2268	2319	2368	2417	2515	2563
9.0	**2861**	2227	2287	2347	2407	2468	2525	2583	2640	2698	2752	2806	2912	2962
9.5	**3197**	2528	2598	2667	2736	2806	2866	2926	2987	3047	3097	3147	3239	3280
10.0	**3429**	2819	2891	2962	3034	3106	3161	3215	3270	3324	3359	3394	3454	3478
10.5	**3542**	3073	3141	3208	3275	3342	3379	3415	3451	3488	3506	3524	3553	3563
11.0	**3587**	3263	3317	3370	3423	3477	3498	3519	3540	3561	3570	3578	3591	3594
11.5	**3597**	3428	3458	3489	3520	3551	3560	3570	3579	3589	3592	3595	3598	3599
12.0	**3599**	3520	3536	3552	3567	3583	3586	3590	3594	3598	3598	3599	3599	3600
12.5	**3600**	3566	3573	3580	3587	3594	3595	3596	3598	3599	3599	3600	3600	3600
13.0	**3600**	3585	3588	3592	3595	3598	3599	3599	3600	3600	3600	3600	3600	3600
13.5	**3600**	3589	3592	3594	3596	3598	3599	3599	3600	3600	3600	3600	3600	3600
14.0	**3600**	3595	3596	3597	3598	3599	3600	3600	3600	3600	3600	3600	3600	3600
14.5	**3600**	3598	3598	3599	3599	3600	3600	3600	3600	3600	3600	3600	3600	3600
15.0	**3600**	3597	3598	3598	3599	3600	3600	3600	3600	3600	3600	3600	3600	3600
15.5	**3600**	3598	3599	3599	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
16.0	**3600**	3599	3599	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
16.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
17.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
17.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
18.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
18.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
19.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
19.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
20.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
20.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
21.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
21.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
22.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
22.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
23.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
23.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
24.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
24.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
25.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
25.5	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
26.0	**3600**	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
26.5	**3595**	3595	3595	3595	3595	3595	3595	3595	3595	3595	3595	3595	3595	3595
27.0	**3589**	3589	3589	3589	3589	3589	3589	3589	3589	3589	3589	3589	3589	3589
27.5	**3543**	3543	3543	3543	3543	3543	3543	3543	3543	3543	3543	3543	3543	3543

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

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**
28.0	**3440**	3439	3439	3439	3439	3440	3440	3440	3440	3440	3440	3440	3440	3440
28.5	**3270**	3270	3270	3270	3270	3270	3270	3270	3270	3270	3270	3270	3270	3270
29.0	**3049**	3049	3049	3049	3049	3049	3049	3049	3049	3049	3049	3049	3049	3049
29.5	**2806**	2806	2806	2806	2806	2806	2806	2806	2805	2805	2805	2806	2806	2806
30.0	**2565**	2565	2565	2565	2565	2565	2565	2565	2565	2565	2565	2565	2565	2565
30.5	**2324**	2324	2324	2324	2324	2324	2324	2324	2324	2324	2324	2324	2324	2324
31.0	**2090**	2090	2090	2090	2090	2090	2090	2090	2090	2090	2090	2090	2090	2090
31.5	**1884**	1884	1884	1884	1884	1884	1884	1884	1884	1884	1884	1884	1884	1884
32.0	**1732**	1732	1732	1732	1732	1732	1732	1732	1732	1732	1732	1732	1732	1732

Table 23-1: Power curve, Load Optimized Mode LO2 (HWO)

Original Instruction: T05 0067-7065 VER 09

T05 0067-7065 Ver 09 - Approved- Exported from DMS: 2019-09-18 by FRPIC

23.2 Ct Values, Load Optimized Mode LO2 (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	**0.878**	0.883	0.882	0.882	0.882	0.881	0.881	0.880	0.880	0.880	0.879	0.879	0.878	0.878
3.5	**0.852**	0.855	0.855	0.855	0.855	0.854	0.854	0.854	0.853	0.853	0.853	0.852	0.851	0.851
4.0	**0.852**	0.859	0.857	0.856	0.855	0.853	0.853	0.853	0.853	0.853	0.853	0.852	0.852	0.853
4.5	**0.855**	0.854	0.854	0.855	0.855	0.855	0.855	0.856	0.856	0.856	0.856	0.856	0.855	0.855
5.0	**0.851**	0.855	0.855	0.855	0.855	0.854	0.854	0.853	0.853	0.853	0.852	0.852	0.851	0.850
5.5	**0.847**	0.852	0.852	0.851	0.851	0.850	0.850	0.849	0.849	0.848	0.848	0.847	0.846	0.846
6.0	**0.841**	0.847	0.847	0.846	0.846	0.845	0.845	0.844	0.844	0.843	0.842	0.842	0.840	0.840
6.5	**0.835**	0.843	0.842	0.842	0.841	0.840	0.840	0.839	0.838	0.837	0.837	0.836	0.834	0.833
7.0	**0.828**	0.838	0.837	0.836	0.835	0.834	0.833	0.832	0.832	0.831	0.830	0.829	0.827	0.826
7.5	**0.831**	0.842	0.841	0.840	0.839	0.838	0.837	0.836	0.835	0.834	0.833	0.832	0.830	0.828
8.0	**0.831**	0.845	0.844	0.842	0.841	0.840	0.839	0.838	0.837	0.835	0.834	0.833	0.830	0.828
8.5	**0.805**	0.828	0.827	0.826	0.825	0.823	0.821	0.819	0.817	0.815	0.812	0.809	0.802	0.798
9.0	**0.746**	0.788	0.785	0.783	0.780	0.778	0.774	0.770	0.766	0.762	0.757	0.752	0.740	0.735
9.5	**0.668**	0.730	0.727	0.723	0.719	0.715	0.709	0.703	0.697	0.691	0.683	0.676	0.659	0.650
10.0	**0.581**	0.670	0.665	0.659	0.653	0.648	0.639	0.630	0.622	0.613	0.603	0.592	0.570	0.559
10.5	**0.494**	0.608	0.600	0.592	0.583	0.575	0.564	0.552	0.541	0.529	0.518	0.506	0.483	0.471
11.0	**0.419**	0.540	0.530	0.520	0.509	0.499	0.487	0.475	0.464	0.452	0.441	0.430	0.409	0.399
11.5	**0.357**	0.476	0.464	0.452	0.440	0.428	0.417	0.407	0.396	0.385	0.375	0.366	0.348	0.340
12.0	**0.308**	0.413	0.402	0.391	0.379	0.368	0.359	0.349	0.340	0.331	0.323	0.315	0.301	0.294
12.5	**0.268**	0.358	0.348	0.338	0.329	0.319	0.311	0.303	0.295	0.288	0.281	0.275	0.263	0.257
13.0	**0.236**	0.313	0.304	0.296	0.288	0.279	0.273	0.266	0.259	0.253	0.247	0.242	0.231	0.227
13.5	**0.211**	0.277	0.270	0.262	0.255	0.248	0.242	0.236	0.231	0.225	0.220	0.215	0.206	0.202
14.0	**0.188**	0.246	0.239	0.233	0.227	0.220	0.215	0.210	0.205	0.200	0.196	0.192	0.184	0.180
14.5	**0.169**	0.219	0.214	0.208	0.203	0.197	0.193	0.189	0.184	0.180	0.176	0.172	0.165	0.162
15.0	**0.151**	0.196	0.191	0.186	0.182	0.177	0.173	0.169	0.165	0.161	0.158	0.155	0.149	0.146
15.5	**0.137**	0.177	0.173	0.168	0.164	0.160	0.156	0.153	0.149	0.146	0.143	0.140	0.135	0.132
16.0	**0.125**	0.161	0.157	0.153	0.149	0.145	0.142	0.139	0.136	0.133	0.130	0.127	0.123	0.120
16.5	**0.114**	0.146	0.143	0.139	0.136	0.132	0.130	0.127	0.124	0.121	0.119	0.116	0.112	0.110
17.0	**0.105**	0.134	0.131	0.127	0.124	0.121	0.119	0.116	0.114	0.111	0.109	0.107	0.103	0.101
17.5	**0.096**	0.122	0.120	0.117	0.114	0.111	0.109	0.106	0.104	0.102	0.100	0.098	0.094	0.093
18.0	**0.089**	0.113	0.110	0.107	0.105	0.102	0.100	0.098	0.096	0.094	0.092	0.090	0.087	0.085
18.5	**0.082**	0.104	0.102	0.099	0.097	0.095	0.093	0.091	0.089	0.087	0.085	0.084	0.081	0.079
19.0	**0.076**	0.096	0.094	0.091	0.089	0.087	0.085	0.084	0.082	0.080	0.079	0.077	0.074	0.073
19.5	**0.070**	0.089	0.087	0.085	0.083	0.081	0.079	0.078	0.076	0.074	0.073	0.072	0.069	0.068
20.0	**0.066**	0.083	0.081	0.079	0.077	0.075	0.074	0.072	0.071	0.069	0.068	0.067	0.065	0.063
20.5	**0.061**	0.077	0.075	0.074	0.072	0.070	0.069	0.068	0.066	0.065	0.064	0.063	0.060	0.059
21.0	**0.057**	0.072	0.070	0.069	0.067	0.066	0.064	0.063	0.062	0.061	0.060	0.059	0.057	0.056
21.5	**0.054**	0.068	0.066	0.065	0.064	0.062	0.061	0.060	0.059	0.057	0.056	0.055	0.054	0.053
22.0	**0.051**	0.064	0.062	0.061	0.060	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.050	0.050
22.5	**0.048**	0.060	0.059	0.057	0.056	0.055	0.054	0.053	0.052	0.051	0.050	0.049	0.047	0.047
23.0	**0.045**	0.056	0.055	0.054	0.053	0.051	0.050	0.050	0.049	0.048	0.047	0.046	0.045	0.044
23.5	**0.043**	0.053	0.052	0.051	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.044	0.042	0.042
24.0	**0.041**	0.050	0.049	0.048	0.047	0.046	0.045	0.044	0.043	0.043	0.042	0.041	0.040	0.039
24.5	**0.038**	0.047	0.046	0.045	0.044	0.043	0.043	0.042	0.041	0.040	0.040	0.039	0.038	0.037
25.0	**0.037**	0.045	0.044	0.043	0.042	0.041	0.041	0.040	0.039	0.038	0.038	0.037	0.036	0.035
25.5	**0.035**	0.043	0.042	0.041	0.040	0.039	0.039	0.038	0.037	0.037	0.036	0.036	0.034	0.034
26.0	**0.033**	0.041	0.040	0.039	0.038	0.037	0.037	0.036	0.035	0.035	0.034	0.034	0.033	0.032
26.5	**0.032**	0.038	0.038	0.037	0.036	0.035	0.035	0.034	0.034	0.033	0.033	0.032	0.031	0.031
27.0	**0.030**	0.037	0.036	0.035	0.034	0.034	0.033	0.033	0.032	0.031	0.031	0.030	0.030	0.029
27.5	**0.028**	0.034	0.034	0.033	0.032	0.032	0.031	0.031	0.030	0.030	0.029	0.029	0.028	0.027
28.0	**0.026**	0.032	0.031	0.031	0.030	0.029	0.029	0.028	0.028	0.027	0.027	0.027	0.026	0.025
28.5	**0.024**	0.029	0.028	0.028	0.027	0.027	0.026	0.026	0.025	0.025	0.025	0.024	0.024	0.023
29.0	**0.021**	0.026	0.025	0.025	0.024	0.024	0.024	0.023	0.023	0.022	0.022	0.022	0.021	0.021
29.5	**0.019**	0.023	0.023	0.022	0.022	0.021	0.021	0.021	0.020	0.020	0.020	0.019	0.019	0.019
30.0	**0.017**	0.020	0.020	0.020	0.019	0.019	0.019	0.018	0.018	0.018	0.017	0.017	0.017	0.016
30.5	**0.015**	0.018	0.017	0.017	0.017	0.016	0.016	0.016	0.016	0.015	0.015	0.015	0.015	0.014
31.0	**0.013**	0.016	0.015	0.015	0.015	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.013	0.013
31.5	**0.011**	0.014	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.011
32.0	**0.010**	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.011	0.010	0.010	0.010

Table 23-2: C_t values, Load Optimized Mode LO2 (HWO)

Original Instruction: T05 0067-7065 VER 09

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23.3 Sound Curves, Load Optimized Mode LO2 (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]** **Load Optimized Mode LO2 (HWO)** **(Blades with serrated trailing edge)**
3	90.9
4	91.1
5	92.9
6	96.0
7	99.6
8	102.2
9	102.5
10	102.5
11	102.5
12	102.5
13	102.5
14	102.5
15	102.5
16	102.5
17	102.5
18	102.5
19	102.5
20	102.5

Table 23-3: Sound curves, Load Optimized Mode LO2 (HWO)

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DMS 0067-4732 V03

V136-4.0/4.2 MW
Third octave noise emission



Original Instruction: T05 0067-4732 VER 03

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Original Instruction: T05 0067-4732 VER 03

Abstract

This document serves as a paper behind the General Specification.

The document describes the measured/estimated third octave spectra for noise levels according to the General Specification.

The document is a living document and will be updated regularly.

When new measurements exist, the document might be updated.

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Original Instruction: T05 0067-4732 VER 03

Contents

1. Introduction 4
2. Method 4
   2.1 Procedure 4
   2.2 Physical environment 4
3. Results 5
   3.1 Results V136 4.0 MW, Mode 0 5
   3.2 Results V136 4.2 MW, PO1 7
   3.3 Results V136 4.0 MW, SO1 9
   3.4 Results V136 4.0 MW, SO2 10
   3.5 Results V136 4.0 MW, SO11 11
   3.6 Results V136 4.0 MW, SO12 12
   3.7 Results V136 4.0 MW, SO13 13
   3.8 Results V136 4.0 MW, LO1 14
   3.9 Results V136 4.0 MW, LO2 15
4. Limitations 16
5. Recalculation to 10 m wind speeds 16

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Original Instruction: T05 0067-4732 VER 03

1. Introduction

The purpose of this document is to present the expected third octave noise spectra for the V136-4.0/4.2 MW turbine.

Results for the turbine with Serrated Trailing Edges are based upon internal measurement results obtained on the V136 prototype turbine located at the Østerild test site in Denmark.

Since no prototype for the turbine without Serrated Trailing Edges yet exist all presented octaves for this are based on internal measurement results obtained on a V126-3.3 MW without located at the Østerild test site in Denmark.

2. Method

2.1 Procedure

During measurements, a very large number of correlated values for noise emission spectra and turbine operating parameters are identified.

From these a relation between noise emission within each 1/3 octave band, wind speed and operational conditions are extracted. By combination of these extracted values and the actual turbine operation and rotor size, an estimate of the actual 1/3 octave performance is obtained.

The frequency content is limited to the frequency range 6.3 Hz to 10 kHz to secure that measurement system limitations are not influencing the findings. The stated spectral values are thus representative for the expected noise emission from the turbine at each wind speed.

The method is verified as giving results corresponding to direct measured values.

The reported wind speed range cover hub height wind speeds from 3 to 20 m/s. Extrapolations outside this wind speed range is not possible due to limitations in the measured input data.

The stated values do not in any way enable issuing guarantees.

2.2 Physical environment

The results are valid for the downwind reference position as defined according to IEC 61400-11 Ed.3.

Applicable environmental conditions are thus corresponding to the standardized requirements as described directly and indirectly in IEC 61400-11.

These can be interpreted as air density 1.225 kg/m^3, yaw errors below +/- 15 deg. and vertical inflow angles below +/- 10 deg. Blade condition is clean and undamaged.

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3. Results

3.1 Results V136 4.0 MW, Mode 0

Frequency	Hub height wind speeds [m/s]																	
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s	16 m/s	17 m/s	18 m/s	19 m/s	20 m/s
6.3 Hz	15.6	15.3	16.1	19.9	23.8	28.6	30.1	30.4	30.8	31.1	32.0	32.7	33.3	33.9	34.4	34.9	35.3	35.7
8 Hz	22.4	22.3	23.2	26.9	30.7	35.3	36.8	37.1	37.4	37.7	38.5	39.1	39.6	40.2	40.6	41.1	41.4	41.8
10 Hz	28.5	28.4	29.4	33.0	36.9	41.3	42.7	43.0	43.3	43.6	44.2	44.8	45.2	45.8	46.1	46.5	46.8	47.1
12.5 Hz	34.2	34.1	35.3	38.8	42.7	47.0	48.3	48.5	48.8	49.1	49.7	50.2	50.6	51.0	51.3	51.7	52.0	52.2
16 Hz	40.2	40.1	41.4	44.9	48.7	52.9	54.2	54.4	54.6	54.8	55.3	55.8	56.1	56.5	56.7	57.0	57.3	57.5
20 Hz	45.2	45.2	46.5	50.0	53.8	57.8	59.1	59.3	59.5	59.7	60.1	60.5	60.8	61.1	61.3	61.6	61.8	62.0
25 Hz	50.0	50.0	51.4	54.8	58.5	62.5	63.7	63.9	64.0	64.2	64.6	64.9	65.1	65.4	65.6	65.8	66.0	66.2
31.5 Hz	54.5	54.5	56.0	59.4	63.1	67.0	68.1	68.3	68.4	68.5	68.9	69.1	69.3	69.6	69.7	69.9	70.1	70.2
40 Hz	58.8	58.9	60.4	63.8	67.5	71.2	72.4	72.5	72.6	72.7	72.9	73.2	73.3	73.5	73.6	73.8	73.9	74.0
50 Hz	62.5	62.6	64.2	67.5	71.2	74.9	76.0	76.1	76.2	76.2	76.4	76.6	76.7	76.9	77.0	77.1	77.2	77.3
63 Hz	66.0	66.1	67.8	71.0	74.7	78.3	79.4	79.4	79.5	79.6	79.7	79.9	80.0	80.1	80.2	80.3	80.3	80.4
80 Hz	69.2	69.4	71.1	74.3	77.9	81.5	82.5	82.6	82.6	82.7	82.8	82.9	82.9	83.0	83.1	83.2	83.2	83.3
100 Hz	71.9	72.0	73.8	77.0	80.6	84.1	85.1	85.2	85.2	85.2	85.3	85.4	85.4	85.5	85.5	85.6	85.6	85.6
125 Hz	74.2	74.4	76.2	79.3	83.0	86.4	87.4	87.4	87.5	87.5	87.5	87.6	87.6	87.6	87.7	87.7	87.7	87.7
160 Hz	76.4	76.6	78.4	81.6	85.2	88.6	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.7	89.7	89.7	89.7	89.7
200 Hz	78.1	78.3	80.1	83.2	86.9	90.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2
250 Hz	79.4	79.6	81.5	84.6	88.2	91.5	92.5	92.5	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.3	92.3
315 Hz	80.4	80.6	82.5	85.6	89.2	92.5	93.4	93.4	93.4	93.4	93.4	93.4	93.3	93.3	93.3	93.3	93.3	93.2
400 Hz	81.1	81.3	83.2	86.3	89.9	93.1	94.1	94.1	94.1	94.1	94.0	94.0	94.0	93.9	93.9	93.9	93.9	93.9
500 Hz	81.4	81.6	83.5	86.6	90.2	93.4	94.4	94.4	94.4	94.3	94.3	94.3	94.3	94.2	94.2	94.2	94.2	94.1
630 Hz	81.4	81.6	83.4	86.5	90.1	93.3	94.3	94.3	94.3	94.3	94.3	94.2	94.2	94.2	94.2	94.2	94.1	94.1
800 Hz	81.0	81.2	83.0	86.1	89.7	92.9	93.9	93.9	93.9	93.9	93.9	93.9	93.8	93.8	93.8	93.8	93.8	93.8
1 kHz	80.2	80.5	82.2	85.3	88.9	92.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2
1.25 kHz	79.2	79.4	81.1	84.2	87.8	91.1	92.1	92.1	92.2	92.2	92.2	92.2	92.2	92.2	92.2	92.2	92.2	92.2
1.6 kHz	77.7	77.8	79.5	82.6	86.2	89.6	90.6	90.6	90.6	90.7	90.7	90.7	90.8	90.8	90.8	90.8	90.9	90.9
2 kHz	75.9	76.1	77.7	80.9	84.4	87.8	88.9	88.9	88.9	89.0	89.0	89.1	89.2	89.2	89.2	89.3	89.3	89.4
2.5 kHz	73.8	74.0	75.6	78.7	82.3	85.8	86.8	86.9	86.9	87.0	87.1	87.2	87.2	87.3	87.4	87.4	87.5	87.5
3.15 kHz	71.3	71.5	73.0	76.2	79.8	83.3	84.4	84.4	84.5	84.6	84.7	84.8	84.9	85.0	85.1	85.2	85.3	85.3
4 kHz	68.4	68.5	70.0	73.2	76.8	80.4	81.5	81.5	81.6	81.7	81.9	82.1	82.2	82.3	82.5	82.6	82.7	82.7
5 kHz	65.3	65.4	66.8	70.0	73.6	77.3	78.4	78.5	78.6	78.7	79.0	79.2	79.3	79.5	79.7	79.8	79.9	80.0
6.3 kHz	61.7	61.8	63.1	66.4	70.0	73.7	74.9	75.0	75.2	75.3	75.6	75.8	76.0	76.3	76.4	76.6	76.8	76.9
8 kHz	57.7	57.7	59.0	62.3	65.9	69.7	70.9	71.1	71.2	71.4	71.8	72.1	72.3	72.6	72.8	73.0	73.2	73.3
10 kHz	53.6	53.6	54.7	58.0	61.7	65.6	66.9	67.0	67.2	67.4	67.8	68.2	68.5	68.8	69.1	69.3	69.5	69.7
A-wgt	90.9	91.1	92.9	96.0	99.6	102.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9

Table 1: V136-4.0MW Mode 0, expected 1/3 octave band performance, (Blades with serrated trailing edge)

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Frequency	Hub height wind speeds [m/s]																	
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s	16 m/s	17 m/s	18 m/s	19 m/s	20 m/s
6.3 Hz	21.4	21.1	22.0	26.6	30.2	35.3	36.9	37.4	38.0	38.5	39.6	40.5	41.0	41.5	41.8	42.1	42.2	42.3
8 Hz	27.6	27.4	28.8	33.1	36.6	41.2	42.7	43.0	43.5	43.9	44.7	45.3	45.6	45.9	46.1	46.1	46.2	46.1
10 Hz	33.1	33.1	34.7	38.8	42.2	46.4	47.7	48.0	48.4	48.6	49.2	49.6	49.7	49.9	49.9	49.8	49.7	49.5
12.5 Hz	38.4	38.4	40.3	44.3	47.6	51.4	52.6	52.8	53.0	53.2	53.5	53.7	53.7	53.6	53.5	53.3	53.1	52.8
16 Hz	43.9	44.0	46.1	49.9	53.2	56.6	57.6	57.7	57.8	57.9	58.0	58.0	57.9	57.6	57.4	57.1	56.7	56.4
20 Hz	48.5	48.7	51.1	54.7	57.9	61.0	61.9	62.0	62.0	62.0	61.9	61.7	61.5	61.1	60.7	60.3	59.9	59.4
25 Hz	52.8	53.2	55.7	59.2	62.3	65.1	66.0	65.9	65.9	65.8	65.5	65.2	64.9	64.4	63.9	63.4	62.9	62.3
31.5 Hz	57.0	57.4	60.2	63.5	66.6	69.1	69.9	69.8	69.7	69.5	69.1	68.7	68.2	67.6	67.1	66.4	65.8	65.3
40 Hz	61.0	61.5	64.4	67.7	70.7	73.0	73.7	73.5	73.3	73.2	72.6	72.0	71.5	70.8	70.2	69.4	68.8	68.1
50 Hz	64.5	65.0	68.1	71.2	74.2	76.3	77.0	76.8	76.5	76.3	75.6	74.9	74.4	73.5	72.9	72.1	71.4	70.7
63 Hz	67.8	68.3	71.5	74.6	77.6	79.5	80.1	79.9	79.6	79.3	78.5	77.8	77.1	76.2	75.5	74.7	73.9	73.2
80 Hz	70.8	71.4	74.7	77.7	80.7	82.5	83.0	82.8	82.5	82.2	81.3	80.5	79.8	78.9	78.1	77.2	76.4	75.7
100 Hz	73.4	74.0	77.3	80.4	83.3	85.0	85.5	85.3	84.9	84.6	83.7	82.9	82.1	81.1	80.4	79.5	78.6	77.8
125 Hz	75.6	76.3	79.6	82.7	85.6	87.3	87.8	87.5	87.1	86.8	85.9	85.0	84.3	83.3	82.5	81.5	80.7	79.9
160 Hz	77.8	78.5	81.8	84.9	87.8	89.5	90.0	89.7	89.3	89.0	88.1	87.2	86.4	85.4	84.6	83.7	82.9	82.0
200 Hz	79.5	80.1	83.5	86.5	89.5	91.2	91.7	91.5	91.1	90.7	89.8	88.9	88.2	87.2	86.4	85.5	84.6	83.8
250 Hz	80.8	81.5	84.8	87.9	90.9	92.7	93.2	92.9	92.6	92.3	91.4	90.5	89.8	88.8	88.0	87.1	86.3	85.5
315 Hz	82.0	82.6	85.9	89.0	92.0	93.9	94.5	94.2	93.9	93.6	92.8	92.0	91.3	90.3	89.6	88.7	87.9	87.1
400 Hz	82.8	83.4	86.6	89.8	92.8	94.9	95.5	95.3	95.0	94.7	94.0	93.2	92.6	91.7	91.0	90.2	89.4	88.7
500 Hz	83.3	83.8	86.9	90.2	93.3	95.5	96.2	96.0	95.8	95.5	94.9	94.2	93.6	92.8	92.2	91.4	90.7	90.0
630 Hz	83.5	83.9	86.9	90.4	93.5	95.9	96.6	96.5	96.3	96.1	95.6	95.0	94.5	93.8	93.2	92.5	91.8	91.2
800 Hz	83.3	83.7	86.6	90.2	93.4	96.0	96.8	96.8	96.6	96.5	96.1	95.7	95.2	94.6	94.1	93.5	92.9	92.3
1 kHz	82.9	83.2	86.0	89.6	92.9	95.9	96.8	96.7	96.7	96.6	96.4	96.1	95.7	95.2	94.8	94.3	93.8	93.2
1.25 kHz	82.2	82.4	85.0	88.8	92.2	95.4	96.4	96.5	96.5	96.5	96.4	96.3	96.1	95.7	95.4	94.9	94.5	94.0
1.6 kHz	81.1	81.2	83.5	87.6	91.0	94.7	95.8	95.9	96.1	96.1	96.3	96.3	96.2	96.0	95.8	95.5	95.1	94.8
2 kHz	79.8	79.8	81.9	86.1	89.7	93.7	94.9	95.1	95.4	95.6	95.9	96.1	96.2	96.1	96.0	95.8	95.6	95.3
2.5 kHz	78.2	78.1	79.9	84.4	88.0	92.5	93.8	94.1	94.5	94.8	95.3	95.7	95.9	96.1	96.1	96.0	95.9	95.8
3.15 kHz	76.2	76.0	77.6	82.2	86.0	90.9	92.4	92.8	93.3	93.7	94.5	95.1	95.5	95.8	96.0	96.1	96.1	96.1
4 kHz	73.8	73.5	74.8	79.7	83.6	89.0	90.7	91.2	91.8	92.3	93.5	94.3	94.9	95.4	95.7	96.0	96.2	96.3
5 kHz	71.3	70.9	71.8	77.0	81.0	87.0	88.8	89.4	90.2	90.8	92.3	93.3	94.1	94.9	95.4	95.8	96.1	96.3
6.3 kHz	68.4	67.8	68.4	73.9	78.1	84.6	86.6	87.3	88.3	89.0	90.8	92.2	93.1	94.1	94.8	95.4	95.9	96.2
8 kHz	65.1	64.3	64.5	70.3	74.7	81.8	84.1	84.9	86.0	86.9	89.0	90.7	91.9	93.2	94.0	94.9	95.5	96.0
10 kHz	61.7	60.8	60.6	66.7	71.2	79.0	81.4	82.4	83.7	84.7	87.2	89.2	90.6	92.2	93.2	94.2	95.0	95.7
A-wgt	93.2	93.6	96.5	100.0	103.2	106.0	106.9	106.9	106.9	106.9	106.9	106.9	106.9	106.9	106.9	106.9	106.9	106.9

Table 2: V136-4.0MW Mode 0-0S, expected 1/3 octave band performance (Blades without serrated trailing edge)

Original Instruction: T05 0067-4732 VER 03

T05 0067-4732 Ver 03 - Approved- Exported from DMS: 2020-06-17 by FRPIC

VESTAS PROPRIETARY NOTICE

Original Instruction: T05 0067-4732 VER 03

3.2 Results V136 4.2 MW, PO1

Frequency	Hub height wind speeds [m/s]																	
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s	16 m/s	17 m/s	18 m/s	19 m/s	20 m/s
6.3 Hz	15.6	15.3	16.1	19.9	23.8	28.5	30.1	30.4	30.7	31.1	31.8	32.6	33.2	33.8	34.3	34.8	35.3	35.6
8 Hz	22.4	22.3	23.2	26.9	30.7	35.2	36.8	37.1	37.4	37.7	38.4	39.0	39.6	40.1	40.5	40.9	41.4	41.7
10 Hz	28.5	28.4	29.4	33.0	36.9	41.2	42.7	43.0	43.3	43.5	44.1	44.7	45.2	45.6	46.0	46.4	46.8	47.1
12.5 Hz	34.2	34.1	35.3	38.8	42.7	46.9	48.3	48.5	48.8	49.1	49.6	50.1	50.5	50.9	51.3	51.6	51.9	52.2
16 Hz	40.2	40.1	41.4	44.9	48.7	52.8	54.2	54.4	54.6	54.8	55.2	55.7	56.0	56.4	56.7	57.0	57.3	57.5
20 Hz	45.2	45.2	46.5	50.0	53.8	57.7	59.1	59.3	59.5	59.6	60.0	60.4	60.7	61.0	61.3	61.5	61.8	62.0
25 Hz	50.0	50.0	51.4	54.8	58.5	62.4	63.7	63.9	64.0	64.2	64.5	64.8	65.1	65.3	65.6	65.8	66.0	66.1
31.5 Hz	54.5	54.5	56.0	59.4	63.1	66.9	68.1	68.3	68.4	68.5	68.8	69.1	69.3	69.5	69.7	69.9	70.0	70.2
40 Hz	58.8	58.9	60.4	63.8	67.5	71.1	72.4	72.5	72.6	72.7	72.9	73.1	73.3	73.5	73.6	73.8	73.9	74.0
50 Hz	62.5	62.6	64.2	67.5	71.2	74.8	76.0	76.1	76.1	76.2	76.4	76.6	76.7	76.9	77.0	77.1	77.2	77.3
63 Hz	66.0	66.1	67.8	71.0	74.7	78.2	79.4	79.4	79.5	79.6	79.7	79.8	80.0	80.1	80.1	80.2	80.3	80.4
80 Hz	69.2	69.4	71.1	74.3	77.9	81.4	82.5	82.6	82.6	82.7	82.8	82.9	82.9	83.0	83.1	83.1	83.2	83.3
100 Hz	71.9	72.0	73.8	77.0	80.6	84.0	85.1	85.2	85.2	85.2	85.3	85.4	85.4	85.5	85.5	85.6	85.6	85.6
125 Hz	74.2	74.4	76.2	79.3	83.0	86.3	87.4	87.4	87.5	87.5	87.5	87.6	87.6	87.6	87.6	87.7	87.7	87.7
160 Hz	76.4	76.6	78.4	81.6	85.2	88.5	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.7	89.7	89.7	89.7
200 Hz	78.1	78.3	80.1	83.2	86.9	90.1	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2
250 Hz	79.4	79.6	81.5	84.6	88.2	91.4	92.5	92.5	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.3	92.3
315 Hz	80.4	80.6	82.5	85.6	89.2	92.4	93.4	93.4	93.4	93.4	93.4	93.4	93.3	93.3	93.3	93.3	93.3	93.3
400 Hz	81.1	81.3	83.2	86.3	89.9	93.0	94.1	94.1	94.1	94.1	94.0	94.0	94.0	94.0	93.9	93.9	93.9	93.9
500 Hz	81.4	81.6	83.5	86.6	90.2	93.3	94.4	94.4	94.4	94.3	94.3	94.3	94.3	94.2	94.2	94.2	94.2	94.1
630 Hz	81.4	81.6	83.4	86.5	90.1	93.2	94.3	94.3	94.3	94.3	94.3	94.2	94.2	94.2	94.2	94.2	94.1	94.1
800 Hz	81.0	81.2	83.0	86.1	89.7	92.8	93.9	93.9	93.9	93.9	93.9	93.9	93.8	93.8	93.8	93.8	93.8	93.8
1 kHz	80.2	80.5	82.2	85.3	88.9	92.1	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2
1.25 kHz	79.2	79.4	81.1	84.2	87.8	91.0	92.1	92.1	92.2	92.2	92.2	92.2	92.2	92.2	92.2	92.2	92.2	92.2
1.6 kHz	77.7	77.8	79.5	82.6	86.2	89.5	90.6	90.6	90.6	90.7	90.7	90.7	90.8	90.8	90.8	90.8	90.9	90.9
2 kHz	75.9	76.1	77.7	80.9	84.4	87.7	88.9	88.9	88.9	89.0	89.0	89.1	89.1	89.2	89.2	89.3	89.3	89.3
2.5 kHz	73.8	74.0	75.6	78.7	82.3	85.7	86.8	86.9	86.9	87.0	87.1	87.2	87.2	87.3	87.4	87.4	87.5	87.5
3.15 kHz	71.3	71.5	73.0	76.2	79.8	83.2	84.4	84.4	84.5	84.5	84.7	84.8	84.9	85.0	85.1	85.2	85.3	85.3
4 kHz	68.4	68.5	70.0	73.2	76.8	80.3	81.5	81.5	81.6	81.7	81.9	82.0	82.2	82.3	82.4	82.5	82.6	82.7
5 kHz	65.3	65.4	66.8	70.0	73.6	77.2	78.4	78.5	78.6	78.7	78.9	79.1	79.3	79.5	79.6	79.8	79.9	80.0
6.3 kHz	61.7	61.8	63.1	66.4	70.0	73.6	74.9	75.0	75.1	75.3	75.5	75.8	76.0	76.2	76.4	76.6	76.7	76.9
8 kHz	57.7	57.7	59.0	62.3	65.9	69.6	70.9	71.1	71.2	71.4	71.7	72.0	72.3	72.5	72.7	72.9	73.1	73.3
10 kHz	53.6	53.6	54.7	58.0	61.7	65.5	66.9	67.0	67.2	67.4	67.8	68.2	68.5	68.7	69.0	69.2	69.5	69.7
A-wgt	90.9	91.1	92.9	96.0	99.6	102.8	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9

Table 3: V136-4.2MW PO1, expected 1/3 octave band performance, (Blades with serrated trailing edge)

T05 0067-4732 Ver 03 - Approved- Exported from DMS: 2020-06-17 by FRPIC

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Frequency	Hub height wind speeds [m/s]																	
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s	16 m/s	17 m/s	18 m/s	19 m/s	20 m/s
6.3 Hz	21.4	21.1	22.0	26.6	30.2	35.2	36.9	37.4	38.0	38.5	39.4	40.3	40.9	41.4	41.8	42.0	42.2	42.3
8 Hz	27.6	27.4	28.8	33.1	36.6	41.1	42.7	43.0	43.5	43.8	44.5	45.2	45.6	45.9	46.0	46.1	46.2	46.1
10 Hz	33.1	33.1	34.7	38.8	42.2	46.3	47.7	48.0	48.3	48.6	49.1	49.5	49.7	49.8	49.9	49.8	49.7	49.6
12.5 Hz	38.4	38.4	40.3	44.3	47.6	51.3	52.6	52.8	53.0	53.1	53.4	53.6	53.7	53.7	53.6	53.4	53.1	52.9
16 Hz	43.9	44.0	46.1	49.9	53.2	56.5	57.6	57.7	57.8	57.9	58.0	58.0	57.9	57.7	57.5	57.2	56.8	56.4
20 Hz	48.5	48.7	51.1	54.7	57.9	60.9	61.9	62.0	62.0	62.0	61.9	61.7	61.5	61.2	60.8	60.4	59.9	59.5
25 Hz	52.8	53.2	55.7	59.2	62.3	65.0	66.0	65.9	65.9	65.8	65.6	65.3	64.9	64.5	64.1	63.5	62.9	62.4
31.5 Hz	57.0	57.4	60.2	63.5	66.6	69.0	69.9	69.8	69.7	69.6	69.2	68.7	68.3	67.8	67.2	66.6	65.9	65.3
40 Hz	61.0	61.5	64.4	67.7	70.7	72.9	73.7	73.5	73.4	73.2	72.7	72.1	71.5	70.9	70.3	69.6	68.9	68.2
50 Hz	64.5	65.0	68.1	71.2	74.2	76.2	77.0	76.8	76.6	76.3	75.8	75.1	74.4	73.7	73.1	72.3	71.5	70.8
63 Hz	67.8	68.3	71.5	74.6	77.6	79.4	80.1	79.9	79.6	79.3	78.7	77.9	77.2	76.5	75.7	74.9	74.0	73.3
80 Hz	70.8	71.4	74.7	77.7	80.7	82.4	83.0	82.8	82.5	82.2	81.5	80.7	79.9	79.1	78.3	77.5	76.6	75.8
100 Hz	73.4	74.0	77.3	80.4	83.3	84.9	85.5	85.3	85.0	84.6	83.9	83.0	82.2	81.4	80.6	79.7	78.8	77.9
125 Hz	75.6	76.3	79.6	82.7	85.6	87.2	87.8	87.5	87.2	86.9	86.1	85.2	84.3	83.5	82.7	81.8	80.8	80.0
160 Hz	77.8	78.5	81.8	84.9	87.8	89.4	90.0	89.7	89.4	89.0	88.3	87.3	86.5	85.7	84.8	83.9	83.0	82.1
200 Hz	79.5	80.1	83.5	86.5	89.5	91.1	91.7	91.5	91.1	90.8	90.0	89.1	88.3	87.5	86.6	85.7	84.8	83.9
250 Hz	80.8	81.5	84.8	87.9	90.9	92.6	93.2	92.9	92.6	92.3	91.5	90.7	89.9	89.1	88.2	87.4	86.4	85.6
315 Hz	82.0	82.6	85.9	89.0	92.0	93.8	94.5	94.2	93.9	93.6	92.9	92.1	91.3	90.6	89.8	88.9	88.0	87.2
400 Hz	82.8	83.4	86.6	89.8	92.8	94.8	95.5	95.3	95.0	94.7	94.1	93.3	92.6	91.9	91.2	90.4	89.5	88.8
500 Hz	83.3	83.8	86.9	90.2	93.3	95.4	96.2	96.0	95.8	95.6	95.0	94.3	93.7	93.0	92.3	91.6	90.8	90.1
630 Hz	83.5	83.9	86.9	90.4	93.5	95.8	96.6	96.5	96.3	96.2	95.7	95.1	94.6	94.0	93.4	92.7	91.9	91.3
800 Hz	83.3	83.7	86.6	90.2	93.4	95.9	96.8	96.8	96.7	96.5	96.2	95.7	95.3	94.8	94.2	93.7	93.0	92.4
1 kHz	82.9	83.2	86.0	89.6	92.9	95.8	96.8	96.7	96.7	96.6	96.4	96.1	95.8	95.4	94.9	94.4	93.8	93.3
1.25 kHz	82.2	82.4	85.0	88.8	92.2	95.3	96.4	96.5	96.5	96.5	96.5	96.3	96.1	95.8	95.4	95.0	94.5	94.1
1.6 kHz	81.1	81.2	83.5	87.6	91.0	94.6	95.8	95.9	96.0	96.1	96.3	96.3	96.2	96.1	95.8	95.6	95.2	94.8
2 kHz	79.8	79.8	81.9	86.1	89.7	93.6	94.9	95.1	95.4	95.5	95.9	96.1	96.1	96.1	96.0	95.9	95.6	95.4
2.5 kHz	78.2	78.1	79.9	84.4	88.0	92.4	93.8	94.1	94.4	94.7	95.2	95.7	95.9	96.0	96.1	96.0	95.9	95.8
3.15 kHz	76.2	76.0	77.6	82.2	86.0	90.8	92.4	92.8	93.3	93.6	94.4	95.0	95.5	95.8	96.0	96.1	96.1	96.1
4 kHz	73.8	73.5	74.8	79.7	83.6	88.9	90.7	91.2	91.8	92.3	93.3	94.2	94.8	95.3	95.7	96.0	96.2	96.3
5 kHz	71.3	70.9	71.8	77.0	81.0	86.9	88.8	89.4	90.1	90.8	92.0	93.2	94.0	94.7	95.2	95.7	96.1	96.3
6.3 kHz	68.4	67.8	68.4	73.9	78.1	84.5	86.6	87.3	88.2	88.9	90.5	91.9	93.0	93.9	94.6	95.3	95.8	96.2
8 kHz	65.1	64.3	64.5	70.3	74.7	81.7	84.1	84.9	85.9	86.8	88.7	90.4	91.8	92.9	93.8	94.7	95.4	96.0
10 kHz	61.7	60.8	60.6	66.7	71.2	78.9	81.4	82.4	83.5	84.6	86.7	88.8	90.4	91.8	92.9	94.0	94.9	95.6
A-wgt	93.2	93.6	96.5	100.0	103.2	105.9	106.9	106.9	106.9	106.9	106.9	106.9	106.9	106.9	106.9	106.9	106.9	106.9

Table 4: V136-4.2MW PO1-0S, expected 1/3 octave band performance (Blades without serrated trailing edge)

Original Instruction: T05 0067-4732 VER 03

T05 0067-4732 Ver 03 - Approved- Exported from DMS: 2020-06-17 by FRPIC

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Original Instruction: T05 0067-4732 VER 03

3.3 Results V136 4.0 MW, SO1

Frequency	Hub height wind speeds [m/s]																	
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s	16 m/s	17 m/s	18 m/s	19 m/s	20 m/s
6.3 Hz	15.6	15.3	16.1	19.9	23.7	27.1	26.5	27.2	28.1	29.0	29.9	30.7	31.3	32.0	32.5	33.1	33.4	33.8
8 Hz	22.4	22.3	23.2	26.9	30.6	33.9	33.4	34.0	34.9	35.7	36.4	37.1	37.7	38.3	38.7	39.2	39.5	39.9
10 Hz	28.5	28.4	29.4	33.0	36.8	39.9	39.5	40.0	40.8	41.5	42.2	42.8	43.3	43.8	44.2	44.7	45.0	45.3
12.5 Hz	34.2	34.1	35.3	38.8	42.6	45.6	45.3	45.7	46.4	47.0	47.6	48.2	48.6	49.1	49.4	49.8	50.1	50.3
16 Hz	40.2	40.1	41.4	44.9	48.6	51.5	51.2	51.6	52.2	52.8	53.3	53.8	54.1	54.6	54.8	55.2	55.4	55.6
20 Hz	45.2	45.2	46.5	50.0	53.7	56.5	56.3	56.6	57.2	57.7	58.1	58.5	58.8	59.2	59.4	59.7	59.9	60.1
25 Hz	50.0	50.0	51.4	54.8	58.4	61.1	61.0	61.3	61.8	62.2	62.6	62.9	63.2	63.5	63.7	63.9	64.1	64.3
31.5 Hz	54.5	54.5	56.0	59.4	63.0	65.6	65.6	65.8	66.2	66.6	66.9	67.2	67.4	67.6	67.8	68.0	68.2	68.3
40 Hz	58.8	58.9	60.4	63.8	67.4	69.9	69.9	70.0	70.5	70.7	71.0	71.2	71.4	71.6	71.7	71.9	72.0	72.1
50 Hz	62.5	62.6	64.2	67.5	71.1	73.5	73.6	73.7	74.1	74.3	74.5	74.7	74.8	75.0	75.1	75.2	75.3	75.4
63 Hz	66.0	66.1	67.8	71.0	74.6	77.0	77.1	77.1	77.5	77.6	77.8	77.9	78.0	78.2	78.3	78.4	78.4	78.5
80 Hz	69.2	69.4	71.1	74.3	77.8	80.1	80.3	80.3	80.6	80.7	80.9	81.0	81.0	81.1	81.2	81.3	81.3	81.4
100 Hz	71.9	72.0	73.8	77.0	80.5	82.8	83.0	83.0	83.2	83.3	83.4	83.5	83.5	83.6	83.6	83.7	83.7	83.7
125 Hz	74.2	74.4	76.2	79.3	82.9	85.1	85.3	85.3	85.5	85.6	85.6	85.7	85.7	85.7	85.7	85.8	85.8	85.8
160 Hz	76.4	76.6	78.4	81.6	85.1	87.2	87.5	87.4	87.7	87.7	87.7	87.7	87.7	87.7	87.8	87.8	87.8	87.8
200 Hz	78.1	78.3	80.1	83.2	86.8	88.9	89.2	89.1	89.3	89.3	89.3	89.3	89.3	89.3	89.3	89.3	89.3	89.3
250 Hz	79.4	79.6	81.5	84.6	88.1	90.2	90.5	90.4	90.6	90.5	90.5	90.5	90.5	90.5	90.5	90.5	90.4	90.4
315 Hz	80.4	80.6	82.5	85.6	89.1	91.2	91.5	91.4	91.5	91.5	91.5	91.5	91.4	91.4	91.4	91.4	91.4	91.3
400 Hz	81.1	81.3	83.2	86.3	89.8	91.8	92.2	92.0	92.2	92.2	92.1	92.1	92.1	92.0	92.0	92.0	92.0	92.0
500 Hz	81.4	81.6	83.5	86.6	90.1	92.1	92.4	92.3	92.5	92.4	92.4	92.4	92.4	92.3	92.3	92.3	92.3	92.2
630 Hz	81.4	81.6	83.4	86.5	90.0	92.1	92.4	92.3	92.4	92.4	92.4	92.3	92.3	92.3	92.3	92.3	92.2	92.2
800 Hz	81.0	81.2	83.0	86.1	89.6	91.6	91.9	91.8	92.0	92.0	92.0	92.0	91.9	91.9	91.9	91.9	91.9	91.9
1 kHz	80.2	80.5	82.2	85.3	88.8	90.9	91.2	91.1	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.3
1.25 kHz	79.2	79.4	81.1	84.2	87.7	89.8	90.1	90.0	90.2	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.3
1.6 kHz	77.7	77.8	79.5	82.6	86.1	88.3	88.5	88.5	88.7	88.8	88.8	88.8	88.9	88.9	88.9	88.9	89.0	89.0
2 kHz	75.9	76.1	77.7	80.9	84.3	86.5	86.8	86.7	87.0	87.1	87.1	87.2	87.3	87.3	87.3	87.4	87.4	87.5
2.5 kHz	73.8	74.0	75.6	78.7	82.2	84.5	84.7	84.7	84.9	85.1	85.2	85.3	85.3	85.4	85.5	85.5	85.6	85.6
3.15 kHz	71.3	71.5	73.0	76.2	79.7	82.0	82.1	82.2	82.5	82.6	82.8	82.9	83.0	83.1	83.2	83.3	83.4	83.4
4 kHz	68.4	68.5	70.0	73.2	76.7	79.1	79.1	79.2	79.6	79.8	80.0	80.2	80.3	80.4	80.5	80.7	80.8	80.9
5 kHz	65.3	65.4	66.8	70.0	73.5	76.0	76.0	76.1	76.5	76.8	77.0	77.3	77.4	77.6	77.7	77.9	78.0	78.1
6.3 kHz	61.7	61.8	63.1	66.4	69.9	72.4	72.4	72.6	73.0	73.3	73.6	73.9	74.1	74.4	74.5	74.7	74.9	75.0
8 kHz	57.7	57.7	59.0	62.3	65.8	68.4	68.3	68.6	69.0	69.4	69.8	70.1	70.4	70.7	70.9	71.1	71.3	71.4
10 kHz	53.6	53.6	54.7	58.0	61.6	64.3	64.1	64.5	65.0	65.4	65.9	66.3	66.6	66.9	67.1	67.4	67.6	67.8
A-wgt	90.9	91.1	92.9	96.0	99.5	101.6	101.9	101.8	102.0	102.0	102.0	102.0	102.0	102.0	102.0	102.0	102.0	102.0

Table 5: V136-4.0MW SO1, expected 1/3 octave band performance, (Blades with serrated trailing edge)

T05 0067-4732 Ver 03 - Approved- Exported from DMS: 2020-06-17 by FRPIC

VESTAS PROPRIETARY NOTICE

Original Instruction: T05 0067-4732 VER 03

3.4 Results V136 4.0 MW, SO2

Frequency	Hub height wind speeds [m/s]																	
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s	16 m/s	17 m/s	18 m/s	19 m/s	20 m/s
6.3 Hz	15.6	15.3	16.1	19.9	23.2	24.1	24.6	26.0	26.9	27.7	28.4	28.9	29.1	29.5	30.1	30.4	30.8	31.2
8 Hz	22.4	22.3	23.2	26.9	30.1	31.0	31.4	32.6	33.5	34.2	34.8	35.2	35.5	35.8	36.3	36.6	37.0	37.2
10 Hz	28.5	28.4	29.4	33.0	36.2	37.1	37.4	38.5	39.3	39.9	40.5	40.8	41.0	41.3	41.8	42.0	42.4	42.6
12.5 Hz	34.2	34.1	35.3	38.8	42.0	42.8	43.2	44.1	44.8	45.3	45.8	46.1	46.3	46.6	47.0	47.2	47.5	47.7
16 Hz	40.2	40.1	41.4	44.9	48.0	48.8	49.1	49.9	50.5	51.0	51.4	51.7	51.8	52.0	52.4	52.6	52.8	53.0
20 Hz	45.2	45.2	46.5	50.0	53.1	53.8	54.1	54.8	55.3	55.7	56.1	56.3	56.5	56.7	56.9	57.1	57.3	57.5
25 Hz	50.0	50.0	51.4	54.8	57.9	58.6	58.8	59.4	59.8	60.2	60.5	60.7	60.8	61.0	61.2	61.4	61.6	61.7
31.5 Hz	54.5	54.5	56.0	59.4	62.5	63.1	63.3	63.8	64.2	64.5	64.7	64.9	65.0	65.1	65.3	65.5	65.6	65.7
40 Hz	58.8	58.9	60.4	63.8	66.8	67.4	67.6	68.0	68.3	68.6	68.8	68.9	69.0	69.1	69.2	69.4	69.5	69.6
50 Hz	62.5	62.6	64.2	67.5	70.6	71.1	71.2	71.6	71.9	72.0	72.2	72.3	72.4	72.5	72.6	72.7	72.8	72.9
63 Hz	66.0	66.1	67.8	71.0	74.1	74.6	74.7	75.0	75.2	75.3	75.5	75.5	75.6	75.7	75.8	75.8	75.9	76.0
80 Hz	69.2	69.4	71.1	74.3	77.3	77.8	77.9	78.1	78.3	78.4	78.5	78.5	78.6	78.6	78.7	78.7	78.8	78.8
100 Hz	71.9	72.0	73.8	77.0	80.0	80.5	80.5	80.7	80.8	80.9	81.0	81.0	81.0	81.1	81.1	81.1	81.2	81.2
125 Hz	74.2	74.4	76.2	79.3	82.4	82.8	82.8	83.0	83.1	83.1	83.1	83.2	83.2	83.2	83.2	83.3	83.3	83.3
160 Hz	76.4	76.6	78.4	81.6	84.6	85.0	85.0	85.2	85.2	85.2	85.2	85.2	85.2	85.2	85.2	85.3	85.3	85.3
200 Hz	78.1	78.3	80.1	83.2	86.3	86.7	86.7	86.8	86.8	86.8	86.8	86.8	86.8	86.8	86.7	86.7	86.7	86.7
250 Hz	79.4	79.6	81.5	84.6	87.6	88.0	88.0	88.0	88.0	88.0	88.0	88.0	88.0	88.0	88.0	87.9	87.9	87.9
315 Hz	80.4	80.6	82.5	85.6	88.6	89.0	89.0	89.0	89.0	89.0	88.9	88.9	88.9	88.9	88.9	88.9	88.9	88.8
400 Hz	81.1	81.3	83.2	86.3	89.3	89.6	89.6	89.7	89.6	89.6	89.6	89.6	89.6	89.5	89.5	89.5	89.5	89.5
500 Hz	81.4	81.6	83.5	86.6	89.6	89.9	89.9	90.0	89.9	89.9	89.9	89.8	89.8	89.8	89.8	89.8	89.8	89.7
630 Hz	81.4	81.6	83.4	86.5	89.5	89.9	89.9	89.9	89.9	89.9	89.8	89.8	89.8	89.8	89.8	89.8	89.7	89.7
800 Hz	81.0	81.2	83.0	86.1	89.1	89.4	89.4	89.5	89.5	89.5	89.5	89.4	89.4	89.4	89.4	89.4	89.4	89.4
1 kHz	80.2	80.5	82.2	85.3	88.3	88.7	88.7	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8
1.25 kHz	79.2	79.4	81.1	84.2	87.2	87.6	87.6	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8	87.8
1.6 kHz	77.7	77.8	79.5	82.6	85.6	86.1	86.1	86.2	86.3	86.3	86.4	86.4	86.4	86.4	86.4	86.5	86.5	86.5
2 kHz	75.9	76.1	77.7	80.9	83.9	84.3	84.3	84.5	84.6	84.7	84.7	84.8	84.8	84.8	84.9	84.9	84.9	85.0
2.5 kHz	73.8	74.0	75.6	78.7	81.7	82.2	82.3	82.5	82.6	82.7	82.8	82.9	82.9	82.9	83.0	83.0	83.1	83.1
3.15 kHz	71.3	71.5	73.0	76.2	79.2	79.7	79.8	80.1	80.2	80.4	80.5	80.6	80.6	80.7	80.8	80.8	80.9	80.9
4 kHz	68.4	68.5	70.0	73.2	76.2	76.7	76.8	77.2	77.4	77.6	77.7	77.8	77.9	78.0	78.1	78.2	78.3	78.4
5 kHz	65.3	65.4	66.8	70.0	73.0	73.6	73.7	74.2	74.4	74.6	74.8	75.0	75.1	75.2	75.3	75.4	75.5	75.6
6.3 kHz	61.7	61.8	63.1	66.4	69.4	70.0	70.1	70.7	71.0	71.3	71.5	71.7	71.8	71.9	72.1	72.2	72.4	72.5
8 kHz	57.7	57.7	59.0	62.2	65.3	65.9	66.1	66.7	67.1	67.5	67.8	68.0	68.1	68.2	68.5	68.6	68.8	68.9
10 kHz	53.6	53.6	54.7	58.0	61.1	61.8	62.0	62.7	63.2	63.6	63.9	64.2	64.3	64.5	64.8	64.9	65.1	65.3
A-wgt	90.9	91.1	92.9	96.0	99.0	99.4	99.4	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5

Table 6: V136-4.0MW SO2, expected 1/3 octave band performance, (Blades with serrated trailing edge)

T05 0067-4732 Ver 03 - Approved- Exported from DMS: 2020-06-17 by FRPIC

VESTAS PROPRIETARY NOTICE

Original Instruction: T05 0067-4732 VER 03

3.5 Results V136 4.0 MW, SO11

Frequency	Hub height wind speeds [m/s]																	
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s	16 m/s	17 m/s	18 m/s	19 m/s	20 m/s
6.3 Hz	15.8	15.6	16.3	19.6	20.4	22.6	24.1	25.4	26.7	27.5	28.2	28.8	29.3	29.8	30.0	30.8	31.3	31.8
8 Hz	22.6	22.5	23.3	26.4	27.2	29.3	30.8	32.0	33.3	34.0	34.5	35.1	35.6	36.1	36.1	36.9	37.4	37.8
10 Hz	28.7	28.5	29.5	32.5	33.3	35.3	36.8	37.9	39.0	39.7	40.2	40.7	41.1	41.5	41.6	42.3	42.7	43.1
12.5 Hz	34.4	34.3	35.4	38.2	39.0	41.0	42.4	43.5	44.5	45.1	45.6	46.0	46.4	46.7	46.8	47.4	47.8	48.1
16 Hz	40.3	40.3	41.5	44.1	45.0	46.8	48.2	49.3	50.2	50.7	51.1	51.5	51.8	52.1	52.2	52.7	53.0	53.3
20 Hz	45.4	45.3	46.6	49.1	50.1	51.8	53.2	54.2	55.0	55.5	55.8	56.1	56.4	56.7	56.8	57.2	57.5	57.7
25 Hz	50.1	50.1	51.5	53.8	54.8	56.5	57.8	58.8	59.5	59.9	60.2	60.5	60.7	61.0	61.0	61.4	61.6	61.8
31.5 Hz	54.6	54.6	56.1	58.3	59.3	60.9	62.2	63.2	63.9	64.2	64.5	64.7	64.9	65.1	65.1	65.4	65.6	65.8
40 Hz	58.9	59.0	60.5	62.6	63.6	65.2	66.4	67.4	68.0	68.3	68.5	68.7	68.8	69.0	69.0	69.3	69.4	69.6
50 Hz	62.6	62.7	64.3	66.3	67.3	68.8	70.1	71.0	71.5	71.8	71.9	72.1	72.2	72.3	72.4	72.6	72.7	72.8
63 Hz	66.0	66.2	67.8	69.7	70.8	72.3	73.5	74.3	74.8	75.1	75.2	75.3	75.4	75.5	75.5	75.7	75.7	75.8
80 Hz	69.3	69.4	71.1	72.9	74.0	75.4	76.6	77.5	77.9	78.1	78.2	78.3	78.3	78.4	78.4	78.5	78.6	78.7
100 Hz	71.9	72.1	73.8	75.6	76.7	78.1	79.2	80.1	80.5	80.6	80.7	80.7	80.8	80.8	80.8	80.9	81.0	81.0
125 Hz	74.3	74.4	76.2	77.9	79.0	80.4	81.5	82.3	82.7	82.8	82.9	82.9	82.9	83.0	83.0	83.0	83.0	83.1
160 Hz	76.5	76.6	78.4	80.1	81.2	82.5	83.7	84.5	84.8	84.9	84.9	84.9	84.9	85.0	85.0	85.0	85.0	85.0
200 Hz	78.1	78.3	80.1	81.7	82.8	84.2	85.3	86.1	86.4	86.5	86.5	86.5	86.5	86.5	86.5	86.5	86.5	86.4
250 Hz	79.4	79.6	81.5	83.0	84.2	85.4	86.5	87.3	87.6	87.7	87.7	87.7	87.7	87.7	87.7	87.6	87.6	87.6
315 Hz	80.4	80.6	82.5	84.1	85.2	86.4	87.5	88.3	88.6	88.7	88.6	88.6	88.6	88.6	88.6	88.6	88.5	88.5
400 Hz	81.1	81.3	83.2	84.7	85.8	87.1	88.2	89.0	89.2	89.3	89.3	89.3	89.2	89.2	89.2	89.2	89.2	89.1
500 Hz	81.4	81.6	83.5	85.0	86.1	87.4	88.5	89.3	89.5	89.6	89.6	89.5	89.5	89.5	89.5	89.5	89.4	89.4
630 Hz	81.4	81.6	83.4	85.0	86.1	87.3	88.4	89.2	89.5	89.6	89.5	89.5	89.5	89.5	89.5	89.4	89.4	89.4
800 Hz	81.0	81.2	83.0	84.5	85.7	86.9	88.0	88.8	89.1	89.2	89.2	89.1	89.1	89.1	89.1	89.1	89.1	89.1
1 kHz	80.2	80.4	82.2	83.8	84.9	86.2	87.3	88.1	88.4	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.4	88.4
1.25 kHz	79.2	79.4	81.1	82.8	83.8	85.2	86.3	87.1	87.4	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
1.6 kHz	77.6	77.8	79.5	81.2	82.3	83.6	84.7	85.5	85.9	86.0	86.1	86.1	86.1	86.1	86.1	86.2	86.2	86.2
2 kHz	75.9	76.1	77.7	79.5	80.5	81.9	83.0	83.8	84.2	84.4	84.4	84.5	84.5	84.6	84.6	84.6	84.7	84.7
2.5 kHz	73.8	74.0	75.6	77.4	78.4	79.8	81.0	81.8	82.2	82.4	82.5	82.6	82.6	82.7	82.7	82.8	82.9	82.9
3.15 kHz	71.3	71.5	73.0	74.9	75.9	77.3	78.5	79.4	79.8	80.1	80.2	80.3	80.4	80.4	80.5	80.6	80.7	80.8
4 kHz	68.4	68.5	70.0	71.9	72.9	74.4	75.6	76.5	77.0	77.3	77.4	77.6	77.7	77.8	77.8	78.0	78.1	78.2
5 kHz	65.3	65.4	66.8	68.8	69.8	71.3	72.5	73.5	74.0	74.3	74.5	74.7	74.9	75.0	75.0	75.3	75.4	75.6
6.3 kHz	61.8	61.8	63.2	65.3	66.2	67.8	69.1	70.0	70.6	71.0	71.2	71.4	71.6	71.8	71.8	72.1	72.3	72.5
8 kHz	57.7	57.8	59.0	61.3	62.2	63.8	65.1	66.0	66.8	67.2	67.4	67.7	67.9	68.2	68.2	68.5	68.8	69.0
10 kHz	53.6	53.6	54.8	57.1	58.0	59.7	61.0	62.0	62.8	63.3	63.6	63.9	64.2	64.4	64.5	64.9	65.2	65.4
A-wgt	90.9	91.1	92.9	94.5	95.6	96.9	98.0	98.8	99.1	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2

Table 7: V136-4.0MW SO11, expected 1/3 octave band performance, (Blades with serrated trailing edge)

T05 0067-4732 Ver 03 - Approved- Exported from DMS: 2020-06-17 by FRPIC

VESTAS PROPRIETARY NOTICE

Original Instruction: T05 0067-4732 VER 03

3.6 Results V136 4.0 MW, SO12

Frequency	Hub height wind speeds [m/s]																	
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s	16 m/s	17 m/s	18 m/s	19 m/s	20 m/s
6.3 Hz	15.8	15.6	16.3	19.6	22.0	24.9	26.0	26.8	27.7	28.5	29.0	29.5	29.8	30.3	30.9	31.5	32.0	32.2
8 Hz	22.6	22.5	23.3	26.5	28.9	31.6	32.7	33.5	34.2	35.0	35.4	35.9	36.1	36.5	37.0	37.6	38.1	38.2
10 Hz	28.7	28.5	29.5	32.6	34.9	37.5	38.6	39.3	40.0	40.7	41.0	41.4	41.7	42.1	42.5	43.0	43.4	43.5
12.5 Hz	34.4	34.3	35.4	38.3	40.6	43.2	44.2	44.9	45.4	46.0	46.4	46.7	46.9	47.3	47.6	48.1	48.5	48.6
16 Hz	40.3	40.3	41.5	44.3	46.6	49.0	50.1	50.6	51.1	51.6	51.9	52.2	52.4	52.7	53.0	53.4	53.7	53.8
20 Hz	45.4	45.3	46.6	49.4	51.6	53.9	55.0	55.5	55.9	56.4	56.6	56.9	57.0	57.3	57.6	57.9	58.2	58.3
25 Hz	50.1	50.1	51.5	54.1	56.3	58.6	59.6	60.0	60.4	60.8	61.0	61.2	61.4	61.6	61.8	62.1	62.3	62.4
31.5 Hz	54.6	54.6	56.1	58.6	60.9	63.0	64.0	64.4	64.7	65.1	65.2	65.4	65.5	65.7	65.9	66.1	66.3	66.4
40 Hz	58.9	59.0	60.5	63.0	65.2	67.2	68.2	68.6	68.8	69.1	69.2	69.4	69.5	69.6	69.8	70.0	70.1	70.2
50 Hz	62.6	62.7	64.3	66.7	68.9	70.8	71.8	72.2	72.4	72.6	72.7	72.8	72.9	73.0	73.1	73.3	73.4	73.4
63 Hz	66.0	66.2	67.8	70.1	72.3	74.2	75.2	75.5	75.7	75.8	75.9	76.0	76.1	76.1	76.2	76.4	76.5	76.5
80 Hz	69.3	69.4	71.1	73.4	75.5	77.4	78.3	78.6	78.7	78.9	78.9	79.0	79.0	79.1	79.2	79.2	79.3	79.3
100 Hz	71.9	72.1	73.8	76.0	78.2	80.0	80.9	81.2	81.3	81.4	81.4	81.4	81.5	81.5	81.6	81.6	81.7	81.7
125 Hz	74.3	74.4	76.2	78.4	80.5	82.3	83.2	83.5	83.5	83.6	83.6	83.6	83.6	83.6	83.7	83.7	83.7	83.7
160 Hz	76.5	76.6	78.4	80.6	82.7	84.5	85.4	85.6	85.6	85.6	85.6	85.6	85.6	85.7	85.7	85.7	85.7	85.7
200 Hz	78.1	78.3	80.1	82.2	84.4	86.1	87.0	87.2	87.2	87.2	87.2	87.2	87.2	87.2	87.2	87.2	87.2	87.2
250 Hz	79.4	79.6	81.5	83.6	85.7	87.4	88.3	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.3	88.3	88.3
315 Hz	80.4	80.6	82.5	84.6	86.7	88.3	89.2	89.4	89.4	89.4	89.3	89.3	89.3	89.3	89.3	89.3	89.2	89.2
400 Hz	81.1	81.3	83.2	85.2	87.3	89.0	89.9	90.1	90.0	90.0	90.0	90.0	89.9	89.9	89.9	89.9	89.9	89.8
500 Hz	81.4	81.6	83.5	85.5	87.6	89.3	90.2	90.3	90.3	90.3	90.3	90.2	90.2	90.2	90.2	90.2	90.1	90.1
630 Hz	81.4	81.6	83.4	85.5	87.6	89.2	90.1	90.3	90.3	90.2	90.2	90.2	90.2	90.2	90.2	90.1	90.1	90.1
800 Hz	81.0	81.2	83.0	85.1	87.1	88.8	89.7	89.9	89.9	89.9	89.8	89.8	89.8	89.8	89.8	89.8	89.8	89.8
1 kHz	80.2	80.4	82.2	84.3	86.4	88.1	89.0	89.2	89.2	89.2	89.2	89.2	89.2	89.2	89.2	89.2	89.1	89.1
1.25 kHz	79.2	79.4	81.1	83.2	85.3	87.0	88.0	88.2	88.2	88.2	88.2	88.2	88.2	88.2	88.2	88.2	88.2	88.2
1.6 kHz	77.6	77.8	79.5	81.7	83.8	85.5	86.4	86.7	86.7	86.7	86.8	86.8	86.8	86.8	86.8	86.9	86.9	86.9
2 kHz	75.9	76.1	77.7	79.9	82.0	83.8	84.7	85.0	85.0	85.1	85.1	85.2	85.2	85.2	85.3	85.3	85.4	85.4
2.5 kHz	73.8	74.0	75.6	77.8	79.9	81.7	82.7	82.9	83.0	83.1	83.2	83.3	83.3	83.4	83.4	83.5	83.6	83.6
3.15 kHz	71.3	71.5	73.0	75.3	77.4	79.3	80.2	80.5	80.7	80.8	80.9	81.0	81.0	81.1	81.2	81.3	81.4	81.4
4 kHz	68.4	68.5	70.0	72.3	74.4	76.4	77.3	77.6	77.8	78.0	78.1	78.3	78.3	78.4	78.6	78.7	78.8	78.9
5 kHz	65.3	65.4	66.8	69.2	71.3	73.3	74.3	74.6	74.9	75.1	75.3	75.4	75.5	75.6	75.8	75.9	76.1	76.2
6.3 kHz	61.8	61.8	63.2	65.6	67.8	69.8	70.8	71.2	71.5	71.8	72.0	72.1	72.2	72.4	72.6	72.8	73.0	73.1
8 kHz	57.7	57.8	59.0	61.5	63.7	65.8	66.8	67.3	67.6	68.0	68.2	68.4	68.5	68.7	69.0	69.2	69.5	69.5
10 kHz	53.6	53.6	54.8	57.4	59.5	61.8	62.8	63.3	63.7	64.1	64.4	64.6	64.8	65.0	65.3	65.6	65.9	65.9
A-wgt	90.9	91.1	92.9	95.0	97.1	98.8	99.7	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9

Table 8: V136-4.0MW SO12, expected 1/3 octave band performance, (Blades with serrated trailing edge)

T05 0067-4732 Ver 03 - Approved- Exported from DMS: 2020-06-17 by FRPIC

VESTAS PROPRIETARY NOTICE

Original Instruction: T05 0067-4732 VER 03

3.7 Results V136 4.0 MW, SO13

Frequency	Hub height wind speeds [m/s]																	
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s	16 m/s	17 m/s	18 m/s	19 m/s	20 m/s
6.3 Hz	15.8	15.4	15.7	17.5	19.2	21.3	22.4	23.7	24.3	25.7	26.0	26.6	27.3	27.4	27.6	27.7	29.3	29.3
8 Hz	22.6	22.3	22.6	24.3	25.9	27.9	29.1	30.3	30.9	32.1	32.4	32.9	33.5	33.7	33.8	33.9	35.3	35.3
10 Hz	28.7	28.4	28.7	30.3	31.8	33.8	34.9	36.1	36.7	37.8	38.0	38.5	39.0	39.2	39.3	39.4	40.6	40.6
12.5 Hz	34.4	34.1	34.5	36.0	37.4	39.3	40.5	41.6	42.2	43.2	43.4	43.8	44.3	44.4	44.5	44.6	45.6	45.7
16 Hz	40.3	40.1	40.5	42.0	43.3	45.0	46.3	47.3	47.9	48.7	48.9	49.3	49.7	49.8	49.9	50.0	50.9	50.9
20 Hz	45.4	45.2	45.6	47.0	48.2	49.9	51.2	52.2	52.7	53.5	53.6	54.0	54.3	54.4	54.5	54.5	55.3	55.3
25 Hz	50.1	49.9	50.3	51.7	52.8	54.4	55.8	56.7	57.2	57.9	58.0	58.3	58.6	58.7	58.7	58.8	59.5	59.5
31.5 Hz	54.6	54.5	54.9	56.2	57.2	58.8	60.2	61.1	61.6	62.1	62.3	62.5	62.7	62.8	62.9	62.9	63.4	63.5
40 Hz	58.9	58.8	59.2	60.5	61.5	63.0	64.4	65.2	65.7	66.2	66.3	66.5	66.7	66.7	66.8	66.8	67.2	67.3
50 Hz	62.6	62.6	62.9	64.1	65.1	66.5	67.9	68.8	69.3	69.7	69.7	69.9	70.0	70.1	70.1	70.1	70.5	70.5
63 Hz	66.0	66.1	66.4	67.6	68.5	69.9	71.3	72.1	72.6	72.9	73.0	73.1	73.2	73.2	73.3	73.3	73.6	73.6
80 Hz	69.3	69.3	69.7	70.8	71.6	73.0	74.5	75.2	75.7	75.9	76.0	76.1	76.1	76.2	76.2	76.2	76.4	76.4
100 Hz	71.9	72.0	72.4	73.5	74.3	75.6	77.0	77.8	78.2	78.4	78.5	78.5	78.6	78.6	78.6	78.6	78.8	78.8
125 Hz	74.3	74.3	74.7	75.8	76.6	77.8	79.3	80.0	80.5	80.6	80.7	80.7	80.7	80.7	80.7	80.7	80.8	80.8
160 Hz	76.5	76.5	76.9	78.0	78.7	79.9	81.5	82.2	82.6	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.8	82.8
200 Hz	78.1	78.2	78.6	79.6	80.3	81.5	83.0	83.8	84.2	84.3	84.3	84.2	84.2	84.2	84.2	84.2	84.2	84.2
250 Hz	79.4	79.5	79.9	80.9	81.6	82.8	84.3	85.0	85.4	85.5	85.5	85.5	85.5	85.5	85.5	85.4	85.4	85.4
315 Hz	80.4	80.5	81.0	81.9	82.6	83.8	85.3	86.0	86.4	86.4	86.4	86.4	86.4	86.4	86.4	86.4	86.3	86.3
400 Hz	81.1	81.2	81.6	82.6	83.3	84.4	86.0	86.7	87.0	87.1	87.1	87.1	87.0	87.0	87.0	87.0	86.9	86.9
500 Hz	81.4	81.5	81.9	82.9	83.6	84.7	86.3	86.9	87.3	87.4	87.4	87.3	87.3	87.3	87.3	87.3	87.2	87.2
630 Hz	81.4	81.5	81.9	82.9	83.5	84.7	86.2	86.9	87.3	87.3	87.3	87.3	87.3	87.3	87.3	87.3	87.2	87.2
800 Hz	81.0	81.1	81.5	82.5	83.1	84.3	85.8	86.5	86.9	87.0	87.0	86.9	86.9	86.9	86.9	86.9	86.9	86.9
1 kHz	80.2	80.3	80.7	81.7	82.4	83.6	85.1	85.8	86.2	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3
1.25 kHz	79.2	79.3	79.7	80.7	81.4	82.6	84.1	84.8	85.2	85.3	85.3	85.3	85.3	85.3	85.3	85.3	85.4	85.4
1.6 kHz	77.6	77.7	78.1	79.1	79.9	81.1	82.6	83.3	83.7	83.9	83.9	83.9	83.9	83.9	83.9	83.9	84.0	84.0
2 kHz	75.9	76.0	76.3	77.4	78.2	79.4	80.9	81.6	82.0	82.2	82.2	82.3	82.4	82.4	82.4	82.4	82.5	82.5
2.5 kHz	73.8	73.9	74.2	75.3	76.1	77.4	78.8	79.6	80.0	80.3	80.3	80.4	80.5	80.5	80.5	80.5	80.7	80.7
3.15 kHz	71.3	71.4	71.7	72.8	73.7	75.0	76.4	77.2	77.6	77.9	78.0	78.1	78.2	78.2	78.3	78.3	78.6	78.6
4 kHz	68.4	68.4	68.7	69.9	70.8	72.2	73.5	74.4	74.8	75.2	75.3	75.4	75.5	75.6	75.6	75.6	76.0	76.0
5 kHz	65.3	65.3	65.6	66.8	67.8	69.2	70.5	71.4	71.8	72.3	72.4	72.6	72.7	72.8	72.8	72.9	73.3	73.3
6.3 kHz	61.8	61.7	62.0	63.3	64.3	65.8	67.1	68.0	68.4	69.0	69.1	69.3	69.5	69.6	69.6	69.7	70.2	70.2
8 kHz	57.7	57.6	58.0	59.2	60.3	61.9	63.1	64.1	64.5	65.2	65.3	65.6	65.9	65.9	66.0	66.0	66.7	66.7
10 kHz	53.6	53.5	53.8	55.1	56.3	57.9	59.1	60.1	60.6	61.3	61.5	61.8	62.1	62.2	62.3	62.3	63.1	63.1
A-wgt	90.9	91.0	91.4	92.4	93.1	94.3	95.8	96.5	96.9	97.0	97.0	97.0	97.0	97.0	97.0	97.0	97.0	97.0

Table 9: V136-4.0MW SO13, expected 1/3 octave band performance, (Blades with serrated trailing edge)

T05 0067-4732 Ver 03 - Approved- Exported from DMS: 2020-06-17 by FRPIC

VESTAS PROPRIETARY NOTICE

3.8 Results V136 4.0 MW, LO1

Frequency	Hub height wind speeds [m/s]																	
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s	16 m/s	17 m/s	18 m/s	19 m/s	20 m/s
6.3 Hz	15.6	15.3	16.1	19.9	23.8	28.5	30.1	30.4	30.9	31.4	32.1	32.8	33.4	34.0	34.5	35.0	35.4	35.8
8 Hz	22.4	22.3	23.2	26.9	30.7	35.2	36.8	37.1	37.5	37.9	38.6	39.2	39.7	40.3	40.7	41.2	41.5	41.9
10 Hz	28.5	28.4	29.4	33.0	36.9	41.2	42.7	43.0	43.4	43.7	44.3	44.9	45.3	45.8	46.2	46.6	46.9	47.2
12.5 Hz	34.2	34.1	35.3	38.8	42.7	46.9	48.3	48.6	48.9	49.2	49.7	50.2	50.6	51.1	51.4	51.7	52.0	52.3
16 Hz	40.2	40.1	41.4	44.9	48.7	52.8	54.2	54.4	54.7	54.9	55.4	55.8	56.2	56.5	56.8	57.1	57.3	57.6
20 Hz	45.2	45.2	46.5	50.0	53.8	57.7	59.1	59.3	59.5	59.8	60.1	60.5	60.8	61.1	61.4	61.6	61.8	62.0
25 Hz	50.0	50.0	51.4	54.8	58.5	62.4	63.7	63.9	64.1	64.3	64.6	64.9	65.2	65.5	65.6	65.9	66.0	66.2
31.5 Hz	54.5	54.5	56.0	59.4	63.1	66.9	68.1	68.3	68.5	68.6	68.9	69.2	69.4	69.6	69.8	69.9	70.1	70.2
40 Hz	58.8	58.9	60.4	63.8	67.5	71.1	72.4	72.5	72.6	72.8	73.0	73.2	73.4	73.5	73.7	73.8	73.9	74.1
50 Hz	62.5	62.6	64.2	67.5	71.2	74.8	76.0	76.1	76.2	76.3	76.5	76.6	76.8	76.9	77.0	77.1	77.2	77.3
63 Hz	66.0	66.1	67.8	71.0	74.7	78.2	79.4	79.4	79.5	79.6	79.7	79.9	80.0	80.1	80.2	80.3	80.3	80.4
80 Hz	69.2	69.4	71.1	74.3	77.9	81.4	82.5	82.6	82.6	82.7	82.8	82.9	83.0	83.0	83.1	83.2	83.2	83.3
100 Hz	71.9	72.0	73.8	77.0	80.6	84.0	85.1	85.2	85.2	85.3	85.3	85.4	85.4	85.5	85.5	85.6	85.6	85.6
125 Hz	74.2	74.4	76.2	79.3	83.0	86.3	87.4	87.4	87.5	87.5	87.5	87.6	87.6	87.6	87.7	87.7	87.7	87.7
160 Hz	76.4	76.6	78.4	81.6	85.2	88.5	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.7	89.7	89.7	89.7	89.7
200 Hz	78.1	78.3	80.1	83.2	86.9	90.1	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2
250 Hz	79.4	79.6	81.5	84.6	88.2	91.4	92.5	92.5	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.3	92.3
315 Hz	80.4	80.6	82.5	85.6	89.2	92.4	93.4	93.4	93.4	93.4	93.4	93.4	93.3	93.3	93.3	93.3	93.3	93.2
400 Hz	81.1	81.3	83.2	86.3	89.9	93.0	94.1	94.1	94.1	94.1	94.0	94.0	94.0	93.9	93.9	93.9	93.9	93.9
500 Hz	81.4	81.6	83.5	86.6	90.2	93.3	94.4	94.4	94.3	94.3	94.3	94.3	94.2	94.2	94.2	94.2	94.2	94.1
630 Hz	81.4	81.6	83.4	86.5	90.1	93.2	94.3	94.3	94.3	94.3	94.3	94.2	94.2	94.2	94.2	94.2	94.1	94.1
800 Hz	81.0	81.2	83.0	86.1	89.7	92.8	93.9	93.9	93.9	93.9	93.9	93.8	93.8	93.8	93.8	93.8	93.8	93.8
1 kHz	80.2	80.5	82.2	85.3	88.9	92.1	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2
1.25 kHz	79.2	79.4	81.1	84.2	87.8	91.0	92.1	92.1	92.2	92.2	92.2	92.2	92.2	92.2	92.2	92.2	92.2	92.2
1.6 kHz	77.7	77.8	79.5	82.6	86.2	89.5	90.6	90.6	90.6	90.7	90.7	90.7	90.8	90.8	90.8	90.8	90.9	90.9
2 kHz	75.9	76.1	77.7	80.9	84.4	87.7	88.9	88.9	89.0	89.0	89.1	89.1	89.2	89.2	89.3	89.3	89.3	89.4
2.5 kHz	73.8	74.0	75.6	78.7	82.3	85.7	86.8	86.9	86.9	87.0	87.1	87.2	87.2	87.3	87.4	87.4	87.5	87.5
3.15 kHz	71.3	71.5	73.0	76.2	79.8	83.2	84.4	84.4	84.5	84.6	84.7	84.8	84.9	85.1	85.1	85.2	85.3	85.4
4 kHz	68.4	68.5	70.0	73.2	76.8	80.3	81.5	81.5	81.7	81.8	81.9	82.1	82.2	82.4	82.5	82.6	82.7	82.8
5 kHz	65.3	65.4	66.8	70.0	73.6	77.2	78.4	78.5	78.6	78.8	79.0	79.2	79.4	79.5	79.7	79.8	79.9	80.1
6.3 kHz	61.7	61.8	63.1	66.4	70.0	73.6	74.9	75.0	75.2	75.4	75.6	75.9	76.1	76.3	76.5	76.6	76.8	76.9
8 kHz	57.7	57.7	59.0	62.3	65.9	69.6	70.9	71.1	71.3	71.5	71.8	72.1	72.4	72.6	72.8	73.0	73.2	73.4
10 kHz	53.6	53.6	54.7	58.0	61.7	65.5	66.9	67.0	67.3	67.5	67.9	68.3	68.6	68.9	69.1	69.4	69.5	69.8
A-wgt	90.9	91.1	92.9	96.0	99.6	102.8	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9

Table 10: V136-4.0MW LO1, expected 1/3 octave band performance, (Blades with serrated trailing edge)

Original Instruction: T05 0067-4732 VER 03

T05 0067-4732 Ver 03 - Approved- Exported from DMS: 2020-06-17 by FRPIC

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Original Instruction: T05 0067-4732 VER 03

3.9 Results V136 4.0 MW, LO2

Frequency	Hub height wind speeds [m/s]																	
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s	16 m/s	17 m/s	18 m/s	19 m/s	20 m/s
6.3 Hz	15.6	15.3	16.1	19.9	23.8	27.8	27.2	28.6	28.8	29.5	30.5	31.2	31.7	32.3	32.8	33.3	33.7	34.1
8 Hz	22.4	22.3	23.2	26.9	30.7	34.6	34.1	35.3	35.5	36.1	37.0	37.7	38.0	38.6	39.1	39.5	39.8	40.2
10 Hz	28.5	28.4	29.4	33.0	36.9	40.6	40.1	41.3	41.4	42.0	42.8	43.3	43.7	44.2	44.6	44.9	45.3	45.6
12.5 Hz	34.2	34.1	35.3	38.8	42.7	46.2	45.9	46.9	47.0	47.5	48.2	48.7	49.0	49.4	49.8	50.1	50.4	50.7
16 Hz	40.2	40.1	41.4	44.9	48.7	52.1	51.9	52.7	52.8	53.2	53.9	54.3	54.5	54.9	55.2	55.5	55.8	56.0
20 Hz	45.2	45.2	46.5	50.0	53.8	57.1	56.9	57.7	57.8	58.1	58.6	59.0	59.2	59.6	59.8	60.1	60.3	60.5
25 Hz	50.0	50.0	51.4	54.8	58.5	61.8	61.7	62.3	62.4	62.7	63.1	63.4	63.6	63.9	64.1	64.3	64.5	64.7
31.5 Hz	54.5	54.5	56.0	59.4	63.1	66.2	66.2	66.7	66.8	67.0	67.4	67.7	67.8	68.1	68.3	68.4	68.6	68.7
40 Hz	58.8	58.9	60.4	63.8	67.5	70.5	70.5	70.9	71.0	71.2	71.5	71.7	71.8	72.0	72.2	72.3	72.4	72.6
50 Hz	62.5	62.6	64.2	67.5	71.2	74.1	74.2	74.6	74.6	74.8	75.0	75.2	75.3	75.4	75.6	75.7	75.8	75.9
63 Hz	66.0	66.1	67.8	71.0	74.7	77.6	77.7	78.0	78.0	78.1	78.3	78.4	78.5	78.6	78.7	78.8	78.9	79.0
80 Hz	69.2	69.4	71.1	74.3	77.9	80.7	80.9	81.1	81.1	81.2	81.4	81.5	81.5	81.6	81.7	81.7	81.8	81.8
100 Hz	71.9	72.0	73.8	77.0	80.6	83.4	83.6	83.7	83.7	83.8	83.9	84.0	84.0	84.0	84.1	84.1	84.2	84.2
125 Hz	74.2	74.4	76.2	79.3	83.0	85.7	85.9	86.0	86.0	86.1	86.1	86.1	86.2	86.2	86.2	86.3	86.3	86.3
160 Hz	76.4	76.6	78.4	81.6	85.2	87.9	88.1	88.2	88.2	88.2	88.2	88.2	88.2	88.2	88.2	88.3	88.3	88.3
200 Hz	78.1	78.3	80.1	83.2	86.9	89.5	89.8	89.8	89.8	89.8	89.8	89.8	89.8	89.8	89.8	89.8	89.7	89.7
250 Hz	79.4	79.6	81.5	84.6	88.2	90.8	91.1	91.1	91.1	91.0	91.0	91.0	91.0	91.0	91.0	91.0	90.9	90.9
315 Hz	80.4	80.6	82.5	85.6	89.2	91.8	92.1	92.0	92.0	92.0	92.0	92.0	91.9	91.9	91.9	91.9	91.9	91.8
400 Hz	81.1	81.3	83.2	86.3	89.9	92.4	92.8	92.7	92.7	92.7	92.6	92.6	92.6	92.6	92.5	92.5	92.5	92.5
500 Hz	81.4	81.6	83.5	86.6	90.2	92.7	93.0	93.0	93.0	92.9	92.9	92.9	92.9	92.8	92.8	92.8	92.8	92.8
630 Hz	81.4	81.6	83.4	86.5	90.1	92.6	93.0	92.9	92.9	92.9	92.9	92.8	92.8	92.8	92.8	92.8	92.7	92.7
800 Hz	81.0	81.2	83.0	86.1	89.7	92.2	92.5	92.5	92.5	92.5	92.5	92.5	92.4	92.4	92.4	92.4	92.4	92.4
1 kHz	80.2	80.5	82.2	85.3	88.9	91.5	91.8	91.8	91.8	91.8	91.8	91.8	91.8	91.8	91.8	91.8	91.8	91.8
1.25 kHz	79.2	79.4	81.1	84.2	87.8	90.4	90.7	90.7	90.8	90.8	90.8	90.8	90.8	90.8	90.8	90.8	90.8	90.8
1.6 kHz	77.7	77.8	79.5	82.6	86.2	88.9	89.1	89.2	89.2	89.3	89.3	89.3	89.4	89.4	89.4	89.4	89.5	89.5
2 kHz	75.9	76.1	77.7	80.9	84.4	87.1	87.4	87.5	87.5	87.6	87.7	87.7	87.7	87.8	87.8	87.9	87.9	88.0
2.5 kHz	73.8	74.0	75.6	78.7	82.3	85.1	85.3	85.4	85.5	85.6	85.7	85.8	85.8	85.9	86.0	86.0	86.1	86.1
3.15 kHz	71.3	71.5	73.0	76.2	79.8	82.6	82.7	83.0	83.0	83.1	83.3	83.4	83.5	83.6	83.7	83.8	83.9	83.9
4 kHz	68.4	68.5	70.0	73.2	76.8	79.7	79.7	80.1	80.1	80.3	80.5	80.7	80.8	80.9	81.0	81.1	81.2	81.3
5 kHz	65.3	65.4	66.8	70.0	73.6	76.6	76.6	77.0	77.1	77.3	77.6	77.8	77.9	78.1	78.2	78.4	78.5	78.6
6.3 kHz	61.7	61.8	63.1	66.4	70.0	73.0	73.0	73.5	73.6	73.8	74.2	74.5	74.6	74.8	75.0	75.2	75.3	75.5
8 kHz	57.7	57.7	59.0	62.3	65.9	69.0	68.9	69.5	69.6	69.9	70.4	70.7	70.8	71.1	71.3	71.5	71.7	71.9
10 kHz	53.6	53.6	54.7	58.0	61.7	64.9	64.8	65.5	65.6	65.9	66.4	66.8	67.0	67.3	67.6	67.8	68.1	68.3
A-wgt	90.9	91.1	92.9	96.0	99.6	102.2	102.5	102.5	102.5	102.5	102.5	102.5	102.5	102.5	102.5	102.5	102.5	102.5

Table 11: V136-4.0MW LO2, expected 1/3 octave band performance, (Blades with serrated trailing edge)

T05 0067-4732 Ver 03 - Approved- Exported from DMS: 2020-06-17 by FRPIC

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4. Limitations

The values as stated in the present document are to be regarded as “best estimates” for the octave band performance for the turbine. The values are to be regarded as informative and cannot in any way be used as guaranteed for any projects.

The complete document can be handed out as pdf and must always be referred to using the complete document DMS number.

5. Recalculation to 10 m wind speeds

In case 10 m height wind speed references are required, recalculation of the stated values can be made using the following procedure:

1. The stated hub height wind speeds are recalculated to 10 m reference height.
2. Integer 10 m height wind speed related sound power levels are calculated using linear interpolation between the nearest non-integer values.

Recalculation is made using procedures as defined in IEC 61400-11 ed.3. Appendix D.

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