

CENTRO DE ESTUDIO DE LOS RECURSOS ENERGÉTICOS



SISTEMA DE ADQUISICIÓN DE DATOS PARA AEROGENERADOR DE EJE VERTICAL EN EMPLAZAMIENTO URBANO (1º PARTE)

**Mg. Ing. Rafael Oliva (UNPA-UARG y L&R
Ingeniería - Argentina)**



Edificio del CERE - Primera Etapa
Construido el año 1998 por proyecto FONDEF.

**Facultad de Ingeniería
Universidad de Magallanes**

28-10-2020 de 9 a 10hs

- **A.1) INTRODUCCIÓN — ENERGÍA EÓLICA GENERAL Y DE BAJA POTENCIA**
- **A.2) CONFIGURACIÓN Y MEDICIÓN DE CURVA DE POTENCIA EN AEROGENERADORES DE BAJA POTENCIA — SISTEMAS OFF GRID - NORMATIVA**
- **A.3) PROPUESTA DE SISTEMA DE MEDICIÓN PARA VAWT 700 — BASADO EN DATALOGGER CAMPBELL SCIENTIFIC CR850**
- **A.4) DISEÑO GENERAL DE LA INSTALACIÓN Y RESULTADOS ESPERADOS**



CENTRO DE ESTUDIO DE LOS RECURSOS ENERGÉTICOS - CERE

INTEGRANTES FDI- EE



- **CERE – UMAG**
COORDINACION:
-ING MARÍA ROSA
GALLARDO
-DR. HUMBERTO
VIDAL



2. EQUIPO DEL PROYECTO Y APOYO INSTITUCIONAL

2.1 RESPONSABLE DEL PROYECTO

Nombre estudiante: Leonardo Vergara K.

Teléfono : +56 9 787 802 18

Correo electrónico: leonardovergaraka@gmail.com

2.2 CARRERAS Y/O FACULTADES PARTICIPANTES

Carreras	Facultades
Ingeniería Mecánica	Ingeniería: Leonardo Vergara Katalina Aguilar Ignacio Paredes
Ingeniería Eléctrica	Ingeniería: Felipe Vásquez Jorge Colivoro Natalia Almonacid Alejandro Gutiérrez



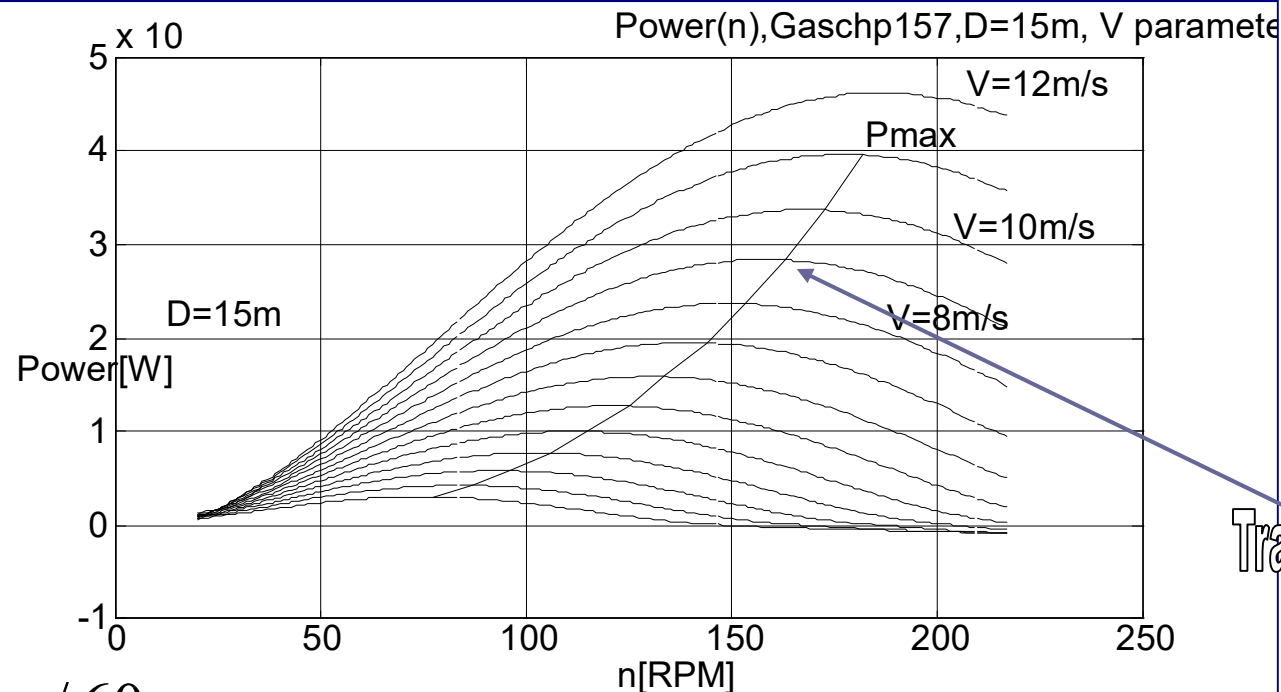


MPPT Eólica (Seguimiento de punto óptimo)

$$P_{mec} = \left(\frac{1}{2} \rho S V^3\right) C_p (\Omega R / V) \quad \text{con } V = \text{parámetro}$$

$$P_{MAX} = \left(\frac{1}{2} \rho S C_{pMAX}\right) (\Omega^3 R^3 / \lambda_{opt}^3) = K_1 \Omega^3$$

Lambda= λ



$$\Omega = 2\pi n / 60$$

CENTRO DE ESTUDIO DE LOS RECURSOS ENERGÉTICOS - CERE

Sistemas On-Grid y Off-Grid



CONFIGURACION DEL ENSAYO CERE UMAG



CENTRO DE ESTUDIO DE LOS RECURSOS ENERGÉTICOS - CERE

Ensayo de aerogenerador tipo VAWT HIBRIDO - UMAG



DS-700 VAWT Information

Specifications Controller I Controller II **Controller III** Documents and Downloads

DS-700 Off Grid Tied Wind Charge Controller

Model:	WD481000
Rated Output:	700 Watt
Max. Output:	1000 Watt
Input:	3 phase AC input
Voltage and Current range:	Special design to meet DS-700 Wind Generator operation range
Power Control:	With MPPT feature
Output:	Charge to 48Vdc Battery Bank with minimum 200Ah capacity Max. charging current 20A
Protection Features:	1. Wind turbine over-speed protection 2. Input over voltage protection 3. Battery over charge protection 4. Battery low voltage protection 5. Over temperature protection
Power consumption:	1 Watt (Standby Model)
LCD Display	
Communication:	RS-485 data port
Dimensions (L x W x H in mm):	200 x 142 x 50
Weight:	12 Kgs

Especificaciones
técnicas
Controlador
VAWT700



CENTRO DE ESTUDIO DE LOS RECURSOS ENERGÉTICOS - CERE

Ensayo de aerogenerador tipo VAWT HIBRIDO - UMAG



DS-700 VAWT Information

Specifications	Controller I	Controller II	Controller III	Documents and Downloads
General Information				
P/N:	DS07-S000-00-1		Rated Power:	700W
Rated Wind Speed:	12 m/s		Rated Speed:	405 rpm
Cut-In Wind Speed:	<3 m		Cut-Out Wind Speed:	15 m/s
Survival Wind Speed:	60 m/s(3 seconde gust)			
Dimension/Weight				
Rotor Diameter:	1.93m		Rotor Height:	1.6 m
Mast Height(Not Included):	3m (Min. recommended)		Total Height:	4.6m (Min.)
Total Weight:	60 Kgs		(Mast not included)	
Rotor Specification				
External Darrieus:	3 Blades			
Internal Savonius:	2 Layers			
Material of Blades:	Anodized Aluminum			
Material of Axis:	Galvanized Steel SS400/Anodized Aluminum			
Generator Specification				
Generator Type:	AC, 3 Phase, Synchronism PMG			
Rated Output:	700W			
Braking System				
Automatic Braking:	Over speed short circuit braking system			
Manual Braking:	3-phase short-circuit manual brake switch(Added-on;Optional)			
Operation Environment				
Generator Temperature:	-20~40°C			
Controller Temperature:	-10~40°C			
Ambient Humidity:	95% max.			
Special Notes				
<ul style="list-style-type: none">Information and specification are subject to change without notice!The information provided is based on the use of our standard 4m mast, please consult your local certified engineer if you are going to install with the mast higher than 3m.Please follow your local regulations to install the DS-700 at proper location. Always consult your local certified civil engineer or structural engineer if you are planning to install the DS-700 on top of the roof.				

Especificaciones
técnicas
(mecánicas y
eléctricas)
VAWT700



OFF GRID SYSTEM

Specifications of Charger Controller



Model	MAX-1500
Output	48Vdc
Functions	<ul style="list-style-type: none"> ● Hybrid Charger (Wind 1000W , PV 1000W) ● MPPT (Wind) , PWM (PV) ● Auto Brake control ● States indicator ● RS485 communication port
Battery (Option)	12Vdc 100Ah x4 Deep Cycle Battery or LED Battery

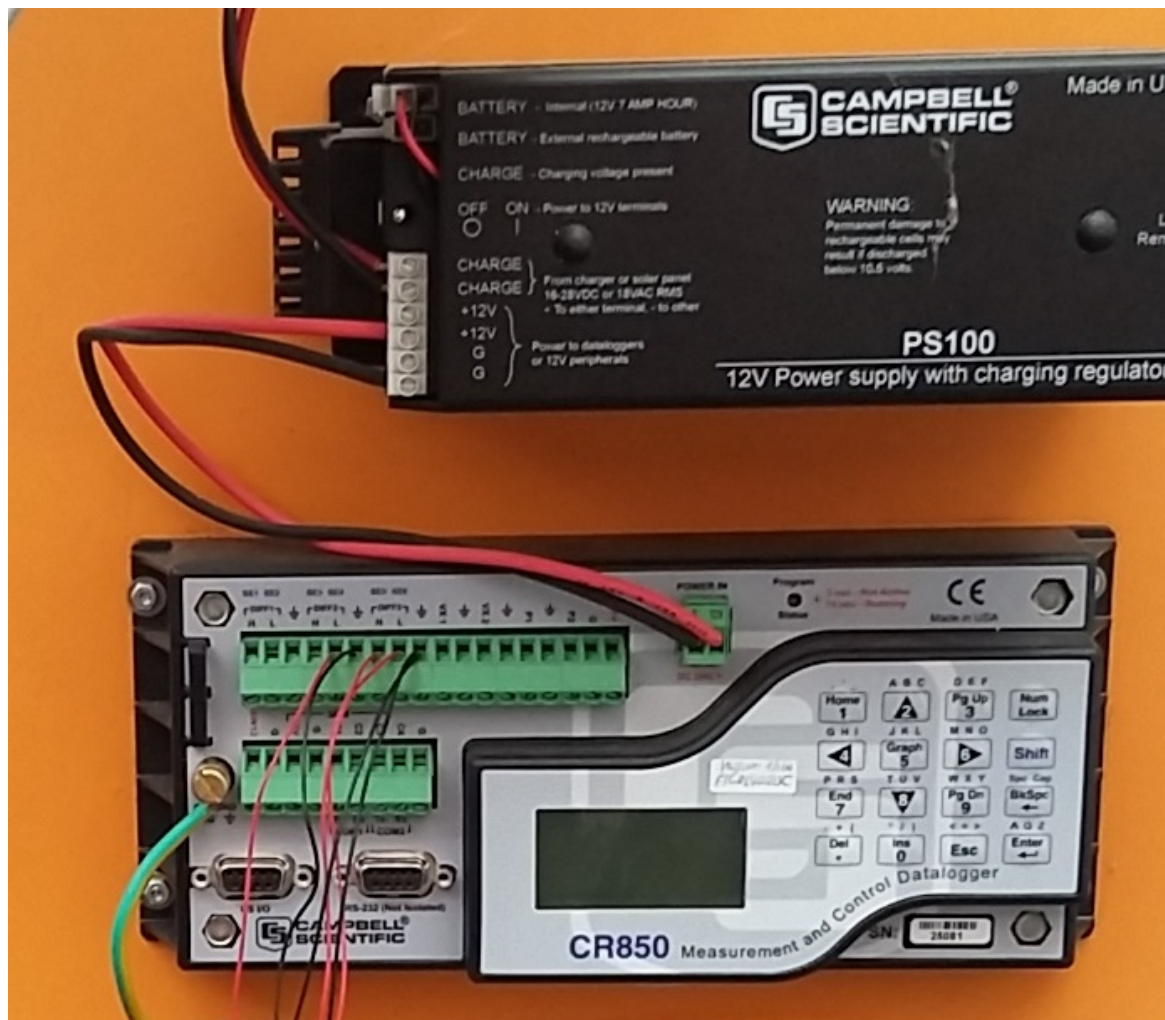
Ensayo Propuesto
VAWT700

CENTRO DE ESTUDIO DE LOS RECURSOS ENERGÉTICOS - CERE

Ensayo de aerogenerador tipo VAWT HIBRIDO - UMAG



CR850 + PS100

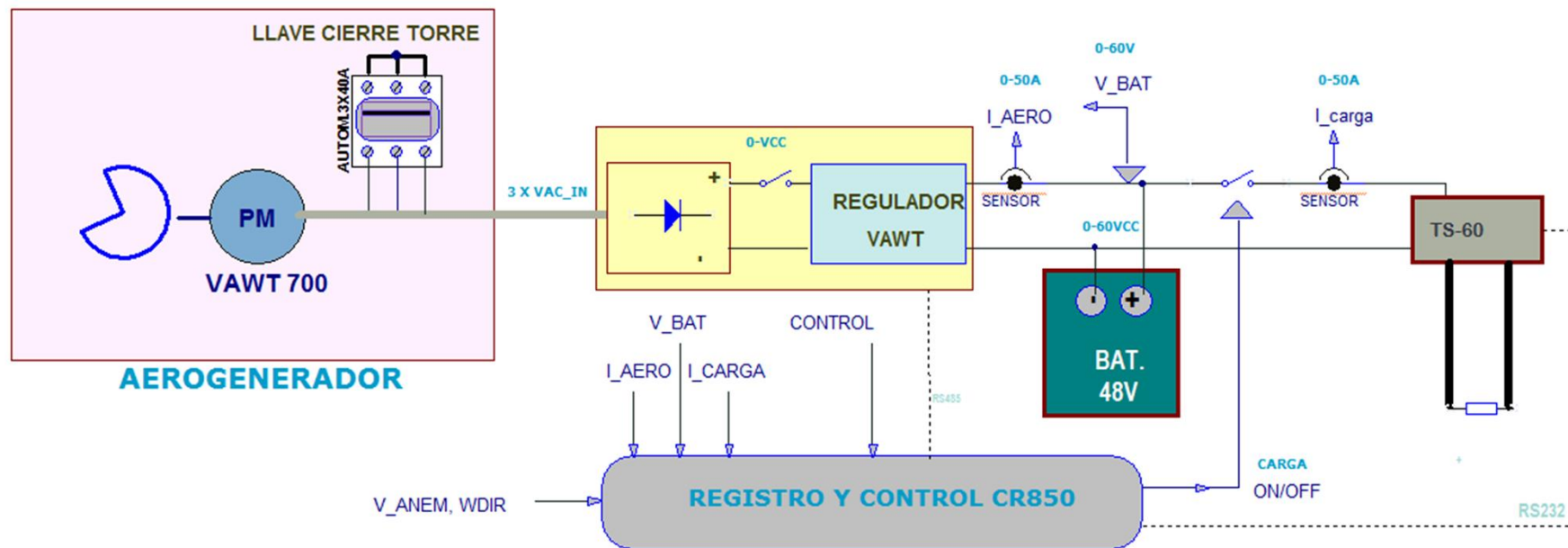


EQUIPOS DE CERE-UMAG



Ensayo Propuesto
VAWT700

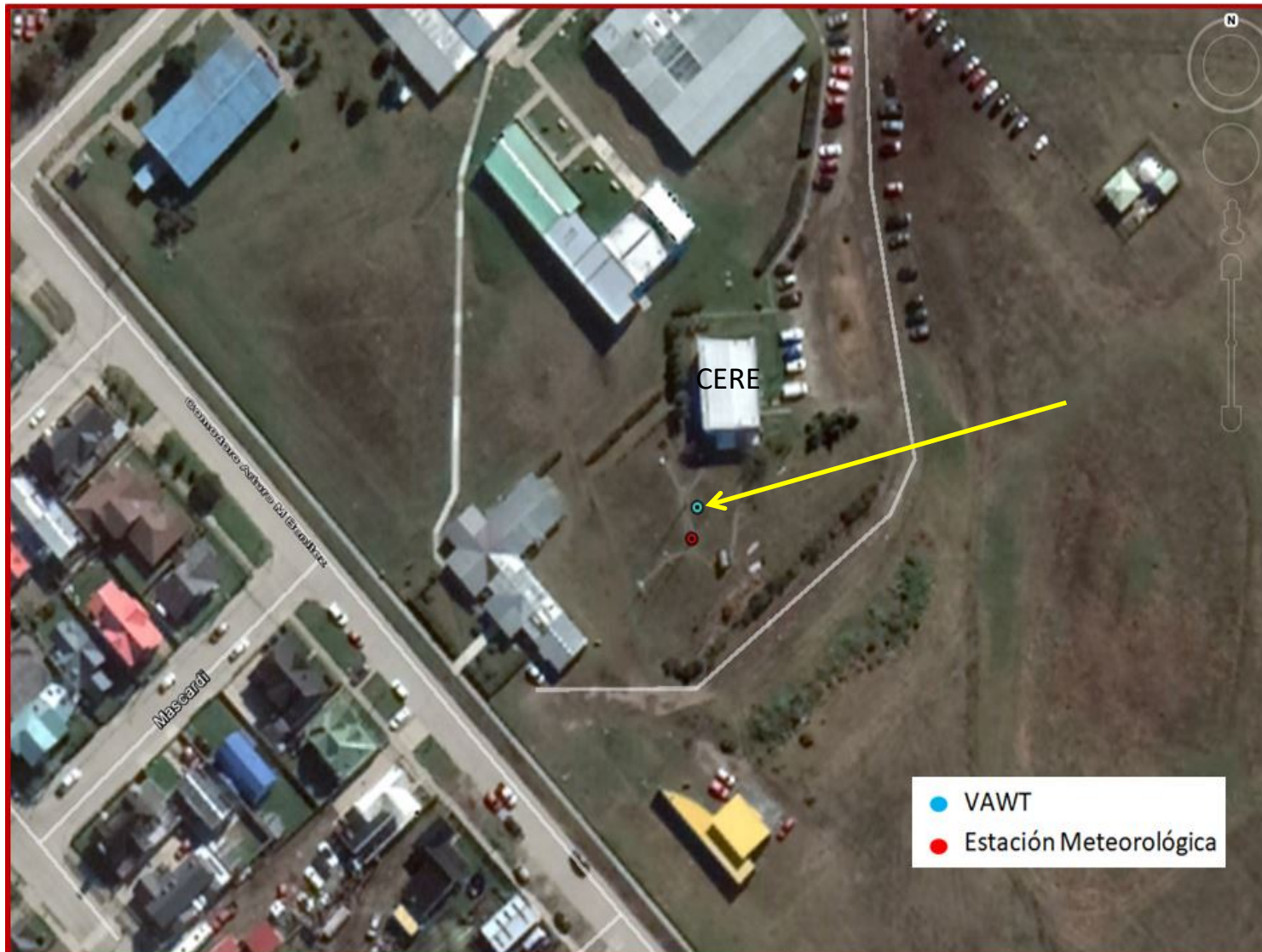
FDIEE / EOLICA - VAWT 700
CERE/UMAG
R.OLIVA - V1 10-2020



PRESENTACION ANEXA Y CAMARA CR850

CENTRO DE ESTUDIO DE LOS RECURSOS ENERGÉTICOS - CERE

Ensayo de aerogenerador tipo VAWT HIBRIDO - UMAG



- Selección de sitio donde será localizada la estación de campo en ambiente urbano.

- Selección de sitio donde será localizada la estación meteorológica.

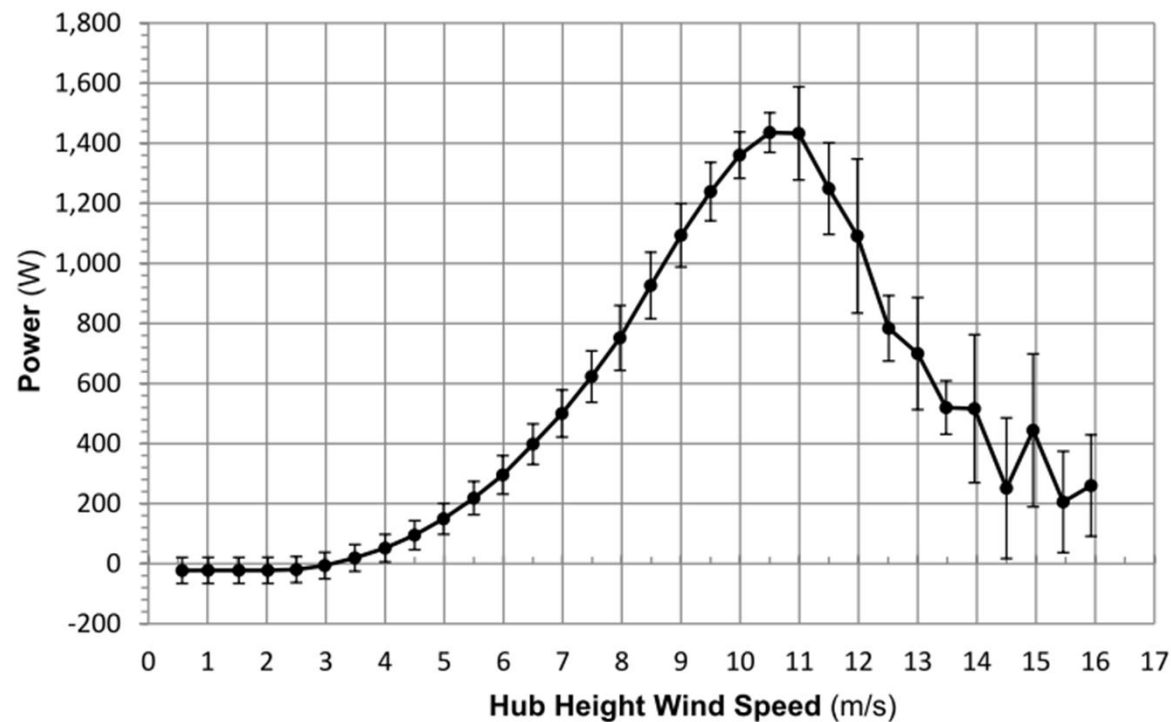
(H.Vidal 2019)



Ensayo Propuesto
VAWT700
(Reporte SWCC
para DS3000)

4. Power Curve

DS3000 Power Curve
with Combined Standard Uncertainty
Database A, swept area = 10.6 m^2
Reference air density: 1.225 kg/m^3





5. Tabulated Power Curve

Database A Corrected to a sea level air density of 1.225 kg/m ³					Category A	Category B	Combined
Bin	Hub Height Wind Speed	Power Output	Cp	1-minute samples	Standard Uncertainty, Si	Standard Uncertainty, Ui	Standard Uncertainty, Ci
	<i>m/s</i>	<i>kW</i>			<i>kW</i>	<i>kW</i>	<i>W</i>
1	0.57	-22.5	-19.3	295	0.0	43.5	43.5
2	1.01	-22.4	-3.4	633	0.0	43.3	43.3
3	1.53	-22.4	-1.0	1253	0.0	43.3	43.3
4	2.02	-22.3	-0.4	1604	0.0	43.3	43.3
5	2.50	-19.5	-0.2	2093	0.1	43.3	43.3
6	2.98	-6.2	0.0	1761	0.3	43.5	43.5
7	3.49	19.2	0.1	1449	0.5	44.0	44.0
8	4.00	51.8	0.1	1190	0.8	44.6	44.6
9	4.50	94.9	0.2	1237	0.9	45.9	45.9
10	4.99	149.4	0.2	1154	1.3	48.4	48.4
11	5.50	218.6	0.2	912	1.8	51.5	51.5
12	5.99	295.8	0.2	772	2.3	55.3	55.4
13	6.50	398.0	0.2	696	3.0	63.9	64.0
14	6.99	500.2	0.2	733	3.2	67.4	67.5


CENTRO DE ESTUDIO DE LOS RECURSOS ENERGÉTICOS - CERE

Ensayo de aerogenerador tipo VAWT HIBRIDO - UMAG



Ensayo Propuesto VAWT700



Small Wind Certification Council (ICC-SWCC™)	
Small Wind Turbine Certification	
Manufacturer: HI VAWT Technology	
Wind Turbine Model: DS3000 (240 VAC, 3-phase, 60 Hz)	
Certification Number: SWCC-18-02	
Rated Annual Energy	
Estimated annual energy production assuming an annual average wind speed of 5 m/s (11.2 mph), a Rayleigh wind speed distribution, sea-level air density and 100% availability. Actual production will vary depending on site conditions.	
Rated Sound Level	
The sound level that will not be exceeded 95% of the time, assuming an annual average wind speed of 5 m/s (11.2 mph), a Rayleigh wind speed distribution, sea-level air density, 100% availability and an observer location 60 m (~ 200 ft) from the rotor center.	
Rated Power	
The wind turbine power output at 11 m/s (24.6 mph) at standard sea-level conditions.	
Certified to be in Conformance with: AWEA Standard 9.1 -- 2009	
For ICC-SWCC Summary Report, Certificate and current certification status visit: www.smallwindcertification.org	