ESPE
Energy Expertise

FX EVO 23-60

Wind Turbine Generator

Rev: 2021 - January

HWTG

GENERAL INFORMATION		
Type		Horizontal Axis Wind Turbine
Nominal Power	kW	59,90
Model		FX EVO 32-60 / FX
Design and built to IEC Standard		CEI EN IEC61400-1
Wind Class		IEC IIIA
Cut-in Wind Speed	m/s	2,5
Rated Wind Speed	m/s	8,5
Cut-out Wind Speed	m/s	25
Working Temperature		da -10°C a +40°C
Humidity		Up to 95%
Enviromental condition		equivalent to continental non-polluted according to IEC 60721-2-1
Solar irradiation		1000 W/m2
Air density		1,225 kg/m3 a 15°C / 18%
Total weight of WTG	kg	23.100
Tower weight (30 m)	kg	15.000
Nacelle weight (including rotor)	kg	8.100

ROTOR BLADES		
Nr of blades	nr	3
Rotor diameter	m	23,0
Swept area	m2	415,27
Blades material		FRP (Fiberglass Reinforced Polymer)
Rotation speed	rpm	55
Rotation speed range	rpm	15-55
Rotation speed (max)	rpm	75
Rotation direction		Counterclockwise
Blade profile		NREL S809 with EH100 Ogee Tip
Yaw directionality		Active with anti torque cable device
Hub type		Spherical high-performance cast design, engineered for endless dynamic stress of the rotor
Colour		White RAL9016

GENERATOR		
Type		Direct Drive
Generator type		Synchronous radial flux permanent magnet generator - external use
Nominal power	kW	59,90
Voltage		300-410V AC
Cooling system		Conventional air cooling

Noise: Apparent noise level and Noise System Control (Opt.): See table #03 behind

NACELLE	
Type	Painted steel coupled to the tower, with yaw ring bearing
Covering	Fiberglass, aerodynamic shape
Colour	White RAL9016

INVERTER	
Type	AC/DC/AC dual feed Transformer Less
Input voltage	max 480V three-phase 100 Hz
Output voltage	400V three-phase
Certification	IEC-021

CONTROL AND SUPERVISION	
Control system	Industrial PLC
Supervision system	Remotely controlled SCADA
Connection	modem GPRS/UMTS/ADSL /Wifi
Power Curve Control Kit (Opt)	HW and SW for real time check of certified power curve

TOWER	
Type	Flanged / slip joint
Height	lower than 34.5 m
Colour	Zinced / White RAL9016 (optional)
Technical room	Located at the base of the tower

SAFETY	
Negative Device Control	Blades pitched to safety stop position, thanks to the elastic energy accumulating system
Negative Brakes	Rotation braking with elastic energy accumulating brake calipers for both, yaw and rotor movements
Safety Rotor Lock	Parking rotor block with mechanical interference
Active Yaw Control	Setting the WTG perpendicular to the wind direction during operational mode. Protecting the WTG in case of sharp atmospheric conditions, setting the safety stop position
Access to the nacelle	Easy access to ghe nacelle without mobile elevating work platform (MEWP), thanks to external certified ladder and circular platform rest, under the nacelle
Circular platform rest	Walkable platform rest, prepared for winch, designed for external visual inspection

PITCH CONTROL	
PITCH-CONTROL (patent pending #VI2013A000128)	Hydraulic linear actuator with variable speed
PITCH-MATRIX®	Innovative MATRIX based, high speed, active pitch adjustment

LPS (lightning protection system): Design and built according to IEC 61400-24, External LPS on blades and nacelle, internal LPS with surge supressors.

Hydraulic motor: Management of mechanical movements: Energy storage system with a single hydraulic motor: 8 seconds ON, 600 seconds OFF

* this datasheet is subject to changes at any time.

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Power Curve and CP

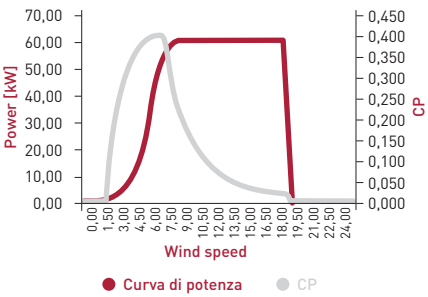
WINDSPEED [m/s]	POWER** [m/s]	CP**
0,00	0,00	0,000
0,50	0,00	0,000
1,00	0,00	0,000
1,50	0,00	0,000
2,00	0,06	0,029
2,50	0,79	0,196
3,00	1,90	0,273
3,50	3,40	0,308
4,00	5,50	0,334
4,50	8,28	0,353
5,00	11,87	0,369
5,50	16,11	0,376
6,00	21,09	0,379
6,50	27,03	0,382
7,00	33,81	0,383
7,50	41,76	0,384
8,00	50,69	0,384
8,50	59,72	0,378
9,00	59,90	0,319
9,50	59,90	0,271
10,00	59,90	0,233
10,50	59,90	0,201
11,00	59,90	0,175
11,50	59,90	0,153
12,00	59,90	0,135
12,50	59,90	0,119
13,00	59,90	0,106
13,50	59,90	0,095
14,00	59,90	0,085
14,50	59,90	0,076
15,00	59,90	0,069
15,50	59,90	0,062
16,00	59,90	0,057
16,50	59,90	0,052
17,00	59,90	0,047
17,50	59,90	0,043
18,00	59,90	0,040
18,50	59,90	0,037
19,00	59,90	0,034
19,50	59,90	0,031
20,00	59,90	0,029
20,50	59,90	0,027
21,00	59,90	0,025
21,50	59,90	0,023
22,00	59,90	0,022
22,50	59,90	0,020
23,00	59,90	0,019
23,50	59,90	0,018
24,00	59,90	0,017
24,50	59,90	0,016
25,00	59,90	0,015

AEP - Annual Energy Production

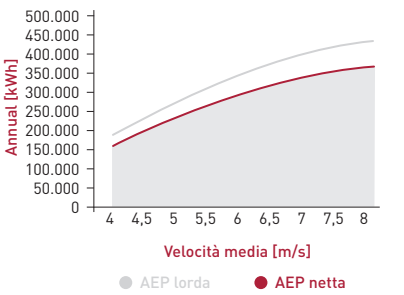
Average Wind Speed [m/s]	GROSS Annual Energy Production[kWh]*	NET Annual Energy Production[kWh]*
4	111.549	94.173
4,5	149.683	126.532
5	188.486	159.450
5,5	226.253	191.425
6	261.588	221.391
6,5	294.069	248.932
7	323.611	273.933
7,5	350.025	296.330
8	373.554	316.277

*** ESTIMATED PRODUCTION WITH AVAILABILITY OF 100%**
This table does not guarantee Annual Energy Production, as AEP depend on environmental conditions.

Power Curve and CP for WTG FX23



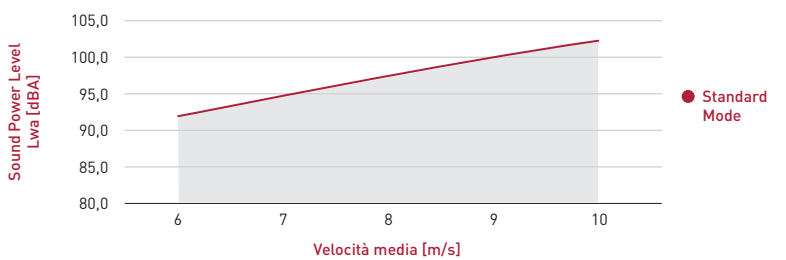
AEP for FX23



Sound Power Level [dBA] - At hub height

Average Wind Speed [m/s]	STANDARD MODE	LOW NOISE MODE *
<6	< 91,7	nd
6	91,7	nd
7	94,1	nd
8	96,8	nd
9	99,8	nd
10	101,8	nd

Sound Power Level Lwa [dBA]



** data relating to the power curve and the CP coefficient are actually taken from the validation being carried out by accredited laboratory ILAC-MRA, according the IEC61400-12