



Attachment 5

Certificate of Design Compliance for Selected Turbine Model

Type Certificate

Registration no. 44 220 21850888-TC-IEC-b, Rev. 9

This Certificate is issued to GE Wind Energy GmbH
Holsterfeld 16
48499 Salzbergen
Germany

For the wind turbine GE 6.1-158, GE 5.x-158, GE 4.X-158

WT Class IEC S

This Certificate attests compliance with the below cited certification scheme and standards.

Certification scheme:

IEC 61400-22 "Wind turbines - Part 22: Conformity testing and certification", Edition 1.0, 2010-05

In combination with:

IEC 61400-1 "Wind Turbines - Part 1: Design requirements", Third Edition, 2005-08 and Amendment 1, 2010-10

The wind turbine type is specified on pages 3 - 29 of this Certificate.

Any change in the design, the production and erection or the manufacturer's quality system has to be approved by TÜV NORD CERT GmbH. Without approval this Certificate loses its validity.

Provided that valid Component Certificates of the Rotor Blades are available, this Certificate is valid until: 2027-01-30 (First issue: 2022-01-31)

(under the condition of regular maintenance according to chapter 6.5.2 of IEC 61400-22)

Essen, 2024-07-25

TÜV NORD CERT GmbH
Certification Body, Wind Energy
Am TÜV 1 | 45307 Essen
email: windenergy@tuev-nord.de

TÜV®

Dr. F. Messer



Form P20-F-2005, Rev.07 / 05.23

THE CERTIFICATE IS BASED ON THE FOLLOWING REFERENCE DOCUMENTS:

Conformity Statements:

TÜV NORD	44 220 19711611-TDB-IEC	Design Basis	Rev. 7	2023-01-12
TÜV NORD	44 220 21850888-D-IEC-b	Design Evaluation	Rev. 10	2024-07-25
TÜV NORD	44 220 19288026-M-IEC	Manufacturing Evaluation	Rev. 14	2023-11-24
TÜV NORD	44 220 19288026-T-IEC	Type Testing	Rev. 5	2024-02-08
TÜV NORD	44 220 21554772-CC-IEC	Component Certificate for LM77.4P3 (valid until 2026-12-09)	Rev. 1	2022-06-20
TÜV NORD	44 220 21884831-CC-IEC	Component Certificate for LM77.4P6 / IMS (valid until 2026-12-09)	Rev. 0	2021-12-10

Final Evaluation Report:

TÜV NORD	ER-811 850888-020-02-10	GE6.1-158, GE5.x-158, GE4.x-158 (60Hz)	Rev. 10	2024-07-25
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WIND TURBINE TYPE SPECIFICATION:

Machine parameters:

Model	GE6.1-158, GE5.x-158, GE4.x-158
Type	Horizontal axis wind turbine with variable rotor speed
Wind turbine manufacturer and country	GE Wind Energy GmbH, Germany
Power regulation	Independent electromechanical pitch system for each blade
Variable Rating Concept	Torque and Thrust based
Rotor diameter	158 m
Rotor orientation	Upwind
Number of rotor blades	3
Rotor tilt	4°
Cone angle	5°
IEC WT class	S
Operating wind speed range $V_{in} - V_{out}$	3 – 25 m/s (reduced power mode above V_{HWSNR})
Operating range rotational speed	6 – 12 rpm
Lightning protection class	Protection class 1 as per IEC 61400-24
Software version	see Control & Safety System

Electrical network conditions:

Normal supply voltage and range	33 kV, 34.5 kV $\pm$ 10%
Normal supply frequency and range	60 Hz $\pm$ 3 Hz
Voltage imbalance	4%
Maximum duration of electrical power network outages	no information
Number of electrical network outages	290/ year

Other environmental conditions:

Normal climate conditions (STW)	
Operational temperature range	-15°C - +40°C (Start: - 10°C, derated above 35°C)
Survival temperature range	-20°C - +50°C
Cold climate conditions (CWE)	
Operational temperature range	-30°C - +40°C (Start: - 10°C, derated above 35°C and below - 15°C)
Survival temperature range	-40°C - +50°C
Air density	see table below
Relative humidity of the air	up to 95%
Solar radiation	1000 W/m ²
Ice conditions	STW: No ice considered CWE: see table below
Earthquake model and parameters	not considered

Wind turbine configurations:

Configuration	1 (PRD 68)	2 (PRD 69)	3 (PRD 35)	4 (PRD 136)
Max Rated Power	5530 kW	5530 kW	5530 kW	6130 kW
Variable Rating	possible variable rating from 5530 kW down to 4500 kW	possible variable rating from 5530 kW down to 4500 kW	possible variable rating from 5530 kW down to 4500 kW	possible variable rating from 6130 kW down to 4830 kW
Hub Height	107.4 m	125.4 m	101 m	125.4 m
Frequency	60 Hz	60 Hz	60 Hz	60 Hz
Rated wind speed	11.55 m/s	11.55 m/s	11.55 m/s	12 m/s
Rated rpm	9.7 rpm	10.1 rpm	10.1 rpm	10.1 rpm
IEC WT class	S	S	S	S
Design Lifetime WT	20 years ⁽⁴⁾	25 years ^(3,4)	25 years ^(3,4)	25 years ^(3,4)
I_{ref}	Specific turbulence profile ⁽²⁾	Specific turbulence profile ⁽²⁾	Specific turbulence profile ⁽²⁾	Specific turbulence profile ⁽²⁾
V_{ave}	9.5 m/s ⁽¹⁾	9.6 m/s ⁽¹⁾	10.2 m/s ⁽¹⁾	7.2 m/s ⁽¹⁾
V_{ref}	28.0 m/s	28.0 m/s	36.4 m/s	40 m/s
V_{e50}	39.2 m/s	39.2 m/s	50.96 m/s	56 m/s
Mean inflow	0.3°	2.7°	6.9°	2.7°
Air density	1.156 kg/m ³	1.138 kg/m ³	1.104 kg/m ³	1.096 kg/m ³
Climate	STW	STW	STW	STW
Ice conditions	none	none	none	none
V_{HWSNR}	15 m/s	15 m/s	15 m/s	18 m/s
Special blade feature:	-	-	-	-

Configuration	5 (PRD 142)	6 (PRD 169)	7 (PRD 153)
Max Rated Power	6130 kW	6130 kW	6130 kW
Variable Rating	possible variable rating from 6130 kW down to 4830 kW	possible variable rating from 6130 kW down to 4830 kW	possible variable rating from 6130 kW down to 4930 kW
Hub Height	101 m	117 m	101 m
Frequency	60 Hz	60 Hz	60 Hz
Rated wind speed	12 m/s	11.55 m/s	12 m/s
Rated rpm	10.1 rpm	10.1 rpm	10.1 rpm
IEC WT class	S	S	S
Design Lifetime WT	25 years ^(3,4)	20 years	25 years ^(3,5,6)
I_{ref}	Specific turbulence profile ⁽²⁾	Specific turbulence profile ⁽²⁾	Specific turbulence profile ⁽²⁾
V_{ave}	7.2 m/s ⁽¹⁾	7.9 m/s	7.25 m/s
V_{ref}	40 m/s	39.9 m/s	39.9 m/s
V_{e50}	56 m/s	55.86 m/s	55.86 m/s
Mean inflow	6.9°	1.6°	0.7°
Air density	1.104 kg/m ³	1.089 kg/m ³	1.103 kg/m ³
Climate	STW	STW / CWE	STW/CWE
Icing conditions	none	168 hours/year	168 hours/year
V_{HWSNR}	18 m/s	18 m/s	18 m/s
Special blade feature:	-	-	optional VGs Extension for LM77.4P3

⁽¹⁾Reported V_{ave} corresponds to the value used for Extreme Loads. For Fatigue Loads, refer to corresponding evaluation report in the Design Evaluation Conformity Statement

⁽²⁾Details available in loads evaluation report in the Design Evaluation Conformity Statement

⁽³⁾Design lifetime of components relevant for operation of safety functions: 20 years, replacement required to continue

⁽⁴⁾Design lifetime pitch drive: 15 years when equipped with LM77.4P3 blades or LM77.4P6 blades

⁽⁵⁾Design lifetime pitch drive: 20 years when equipped with LM77.4P3 blades

⁽⁶⁾ Design lifetime pitch drive: 15 years when equipped with LM77.4P3 (Extended VGs) blades (PRD153)

MAJOR COMPONENTS:

Manufacturing site(s) for hub and nacelle assembly:

- (1) GE GE Wind Energy, Salzbergen, Germany
- (2) GE Wind Energy Equipment Manufacturing (Shenyang), China
- (3) GE Energia Renováveis Ltda, Camaçari, Brazil
- (4) GE Vernova Operations LLC, Schenectady, NY, USA

Nacelle cover

Designed by:
GE Part no.:
450W4798G002 (Brackets)

GE Renewable Energy
450W4473G001 (Cover)

Alternative

GE Part no.:

450W4473G003 (Cover)
450W4798G004 (Brackets)

Alternative

GE Part no.:

451W6589G001 (Cover)
450W4798G004 (Brackets)

Alternative

GE Part no.:

453W0897G001 (Cover)
450W4798G004 (Brackets)

Alternative

GE Part no.:

450W4473G004 (Cover)
450W4798G005 (Brackets)

Alternative

GE Part no.:

453W5175G001 (Cover)
450W4798G005 (Brackets)

Blade

For configurations 1-7

Designed by:
Designation:
Material:

Blade length:
Number of blades:
Drawing no.:
GE PN (root group, version 1):
GE PN (tip group, version 1):
alternative:
GE PN (root group, version 2):

LM Wind Power Group
LM77.4P3 Gen A
E-glass and carbon fibre reinforced polyester
77.491 m
3
DR-09345/A6, Rev. A6
451W4184G001-G018
451W4182G001-G014

454W9440G001

GE PN (tip group, version 2):	455W0060G001
alternative:	
GE PN (root group, version 3):	454W7941G001-G005
GE PN (tip group, version 3):	454W9251G001-G012
Specification:	BS-01170/A5, Rev. A5
Attachments:	Vortex Generators / Serrations / LNTE T-spoilers / Stiffner plate

Alternative for configurations 1-7

Designed by:	LM Wind Power Group
Designation:	LM77.4P3 Gen B
Material:	E-glass and carbon fibre reinforced polyester
Blade length:	77.491 m
Number of blades:	3
Drawing no.:	DR-09345/A6, Rev. A6
GE PN (root group):	454W3270G001-G012
GE PN (tip group):	451W4182G001-G014
Alternative:	
GE PN (root group):	454W9440G002
GE PN (tip group):	455W0060G001
Alternative:	
GE PN (root group):	454W9248G001-G012
GE PN (tip group):	454W9251G001-G012
Specification:	BS-01170/A5, Rev. A5
Attachments:	Vortex Generators / Serrations / LNTE T-spoilers / Stiffner plate

Alternative for configuration 7

Designed by:	LM Wind Power Group
Designation:	LM77.4P3 Gen B (VG Extn)
Material:	E-glass and carbon fibre reinforced polyester
Blade length:	77.491 m
Number of blades:	3
Drawing no.:	DR-09345/A6, Rev. A6
GE PN (root group, version 1):	455W1820G001-G010
GE PN (tip group, version 1):	454W9251G001-G012
alternative:	
GE PN (root group, version 2):	456W6183P001/P002/P004/P005/P007
GE PN (tip group, version 2):	454W9251G001-G012
Specification:	BS-01170/A5, Rev. A5
Attachments:	Extended Vortex Generators / Serrations / LNTE T-spoilers / Stiffner plate

Alternative for configurations 1-6

Designed by:	LM Wind Power Group
Designation:	LM77.4P6 with IMS
Material:	E-glass and carbon fibre reinforced polyester
Blade length:	77.491 m
Number of blades:	3
Drawing no.:	DR-15590/A4, Rev. A4
GE PN:	452W3948G001 452W3948G002
Specification:	BS-01369/A2, Rev. A2
Attachments:	Vortex Generators / Serrations / LNTE T-spoilers / Stiffner plate

Alternative for configurations 1-6

Designed by:	LM Wind Power Group
Designation:	LM77.4P6 without IMS
Material:	E-glass and carbon fibre reinforced polyester
Blade length:	77.491 m
Number of blades:	3
Drawing no.:	DR-15590/A4, Rev. A4
GE PN:	452W8900G001-G004 454W5940G001-G005 454W9316G001-G002
Specification:	BS-01510/A2, Rev. A2
Attachments:	Vortex Generators / Serrations / LNTE T-spoilers / Stiffner plate

Manufacturer/Site:	LM Wind Power A/S All manufacturing sites covered by same global Manufacturing process and ISO9001 certificate 10000451440-MSC-DANAK-DNK
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Blade bearing

Type:	Ball bearing slewing ring
Designed by:	GE Renewable Energy
Designation:	448W4841G001/G002
Drawing no.:	448W4841, Rev. A, dated 2020-01-08
Manufacturer/Site:	(1) Tianma (Chengdu) Precision Machinery Co. Ltd., Chengdu, P.R. China (2) Shilla Brazil Industria de Rolament de Giro Ltda, Tiete, Brazil (3) SKF do Brazil Ltda, Cajamar, Brazil

Alternative

Designed by:

GE Part no.:

Drawing no.:

Manufacturer/Site:

GE Renewable Energy

452W1372G001

453W6327G001

452W1372, Rev. C, dated 2022-01-10

453W6327, Rev. -, dated 2021-10-25

(1) Shilla Brazil Industria de Rolament de Giro Ltda, Tiete, Brazil

(2) SKF do Brazil Ltda, Cajamar, Brazil

(3) Liebherr Components GmbH, Biberach, Germany

(4) Tianma (Chengdu) Precision Machinery Co. Ltd., Chengdu, P.R. China

Alternative

Designed by:

GE Part no.:

Drawing no.:

Manufacturer/Site:

GE Renewable Energy

453W1204G001

453W1204, Rev. A, dated 2022-04-12

(1) SKF do Brazil Ltda, Cajamar, Brazil

(2) Liebherr Components GmbH, Biberach, Germany

(3) Shilla Brazil Industria de Rolament de Giro Ltda, Tiete, Brazil

(4) Tianma (Chengdu) Precision Machinery Co. Ltd., Chengdu, P.R. China

Alternative

Designed by:

GE Part no.:

Drawing no.:

Manufacturer/Site:

GE Renewable Energy

457W0239G001

457W0239, Rev. -, dated 2023-09-29

(1) SKF do Brazil Ltda, Cajamar, Brazil

(2) Liebherr Components GmbH, Biberach, Germany

(3) Shilla Brazil Industria de Rolament de Giro Ltda, Tiete, Brazil

(4) Tianma (Chengdu) Precision Machinery Co. Ltd., Chengdu, P.R. China

Pitch Motor

Designed by:

GE Part no.:

GE VSPN:

Designation:

AMD /Nidec

448W0101P001

448W3984P001

1175.291.1256

Alternative

Designed by:	AMD /Nidec
GE Part no.:	451W6807P002
GE VSPN:	451W6808P002
Designation:	1175.291.1682

Pitch drive

Type:	3-stage planetary gearbox
Designed by:	Bonfiglioli Trasmital
Designation:	2T709T3157A02
Drawing no.:	I7090T012600, Rev. D, dated 2019-02-01
GE Part no.:	446W6974P001
GE VSPN:	446W6973P001
Manufacturer/Site:	(1) Bonfiglioli Riduttori S.p.A., Bologna, Italy

Alternative

Designed by:	Liebherr Components Biberach GmbH
Designation:	DAT 350/2491 V2 (12805547)
Drawing no.:	268 491 3000 99 2, Rev.02, dated 2019-10-14
GE Part no.:	446W6974P001
GE VSPN:	448W3394P001
Manufacturer/Site:	(1) Liebherr Machinery (Dalian) Co., Ltd., China (2) Liebherr Components GmbH, Biberach, Germany

Alternative

Designed by:	SEW Eurodrive Brasil
Designation:	PW022
Drawing no.:	2422 433 2.30.1, Rev.00, dated 2019-06-08
GE Part no.:	446W6974P001
GE VSPN:	449W7381P001
Manufacturer/Site:	(1) Sew-Eurodrive Brasil Ltda, Indaiatuba, Brazil

Alternative

Designed by:	NGC
Designation:	FDX104E-01-00R3
Drawing no.:	FDX104E-01-00R3, Rev. B, dated 2020-06-18
GE Part no.:	446W6974P001
GE VSPN:	451W2061P001
Manufacturer/Site:	(1) Nanjing High Speed & Accurate Gear, Nanjing, China

Pitch lock

Type:	Blade Locking Device
Designed by:	GE Renewable Energy
GE Part no.:	449W5494
	450W2224
Drawing no.:	449W5494, Rev. -, dated 2019-08-22
	450W2224, Rev. -, dated 2020-01-09

Hub

Type:	Cast
Designed by:	GE Renewable Energy
Designed by:	GE Renewable Energy
Material:	acc. to spec. B50WE001
GE Part no.:	449W9972G001 (serial, standard)
	450W0325G001/G003 (Serial. IMS)
	451W4185G001/G003
	454W5903G001
	457W1688G001
Drawing no. (machining):	449W9972, Rev. -, dated 2020-01-31
	450W0325, Rev. -, dated 2020-01-31
	451W4185, Rev. A, dated 2021-10-12
	454W5903, Rev. -, dated 2022-06-08
	457W1688, Rev. -, dated 2024-01-03
Drawing no. (casting):	449W9971, Rev. -, dated 2019-11-15
Manufacturer/Site:	(1) Jiangsu FAW Foundry Co. Ltd, Wuxi, Jiangsu, P.R. China
	(2) Himile Mechanical Science and Technology Co. Ltd, Shandong, P.R. China
	(3) Stepan ind de Maquinas e Motoresl, Campinas, Brazil
	(4) Jiangsu Sinojit Wind Energy Technology Co. Ltd., Jiangyin City, P.R. China

Main shaft

Type:	Forged
Designed by:	GE Renewable Energy
Material:	34CrNiMo6, WTG-113 acc. to spec.
GE Part no.:	450W3625G001/G002
	454W2923G001/G002
Drawing no.:	450W3625, Rev. -, dated 2020-06-10
	454W2923, Rev. -, dated 2020-06-10
Manufacturer/Site:	(1) Tongyu Heavy Industry Co. Ltd, Yucheng City, P.R. China
	(2) Jinlei Technology Co. Ltd., Laiwu City, Shandong, P.R. China
	(3) Mecanizados Tar, S.L., Arrona-Zestoa, Spain

Main bearing

Type:	Spherical roller bearing
Designed by:	NTN Bearing Corporation of America
GE Part no.:	448W2212P001 456W6326P001 456W6327P001
GE VSPN:	5MX4-240/1120BPX3V4S30
Designation:	240/1120BPX3V4S30
Drawing no.:	19-01937, Rev. -, dated 2019-03-15 23-03183-A, Rev. -, dated 2024-01-19
Manufacturer/Site:	(1) NTN Houdatsushimizu Corporation, Ishikawa, Japan (2) NTN Waelzlager Europa GmbH, Erkrath, Germany

Alternative

Designed by:	Schaeffler Technologies AG & Co. KG
GE Part no.:	448W2212P001 456W6326P001 456W6328P001
GE VSPN:	F-623433.03.PRL-WPO-J48BB
Designation:	F-623433.03.PRL-WPO
Drawing no.:	EDD F-623433.03.PRL-WPO-J48BB 000, Rev. AE, dated 2019-03-21 EDD F-623433.03.PRL-WPO 000, Rev. 00, dated 2023-11-21
Manufacturer/Site:	(1) Schaeffler Technologies AG & Co. KG, Schweinfurt, Germany (2) Schaeffler Technologies AG & Co. KG, Brasov, Romania

Low Speed Coupling

Type:	Shrink disc
Designed by:	Stüwe GmbH & Co KG
GE Part no.:	446W5714P001 449W0153P001
GE VSPN:	HSD 890-23-2
Designation:	HSD 890-23-2, Rev. 1, dated 2018-01-31
Main Drawing no.:	
Manufacturer/Site:	(1) Stüwe GmbH and Co. KG, Hattingen, Germany

Alternative

Designed by:	Rexnord Tollok
GE Part no.:	446W5714P001

GE VSPN: 449W0156P001
 Designation: TLK622 890x1310 Y2360
 Main Drawing no.: Y2360, Rev. -, dated 2018-01-29
 Manufacturer/Site: (1) Rexnord Tollok S.r.l., Masi Torello, Italy

Alternative

Designed by: Luoyang Haozhi Machinery Co.,Ltd
 GE Part no.: 446W5714P001
 GE VSPN: 449W0155P001
 Designation: FN890-23B
 Main Drawing no.: 446W5714P001 (FN890-23B), Rev. 2,
 dated 2019-01-21
 Manufacturer/Site: (1) Luoyang Haozhi Machinery Co. Ltd.,
 Luoyang, P.R. China

Alternative

Designed by: SIT S.p.A
 GE Part no.: 446W5714P001
 GE VSPN: 449W0154P001
 Designation: SIT-LOCK 14 4.8/5.3-158
 Main Drawing no.: 300320/10/CL, Rev. -, dated 2021-10-01
 Manufacturer/Site: (1) SIT S.p.A., Cusago, Italy

Gearbox

Type: planetary helical gearbox
 Designed by: ZF Wind Power Antwerpen
 GE Part no.: 451W6174P003
 451W6174P005
 451W6174P007
 GE VSPN: 451W6175P001 (Hydac Pump / Filter)
 451W6175P003 (Hydra Specma Pump /Filter)
 451W6175P005 (P001 + Planet Brg. Sensor)
 451W6175P007 (P003 + Planet Brg. Sensor)
 451W6175P009 (P001 + Housing Modification)
 451W6175P011 (P003 + Housing Modification)
 Designation: EH0941A-0X2 (JB-Version)
 Gear ratio: 142.86
 Main drawing no.: 097-EH0941A021, Rev. A, dated 2021-06-17
 Sectional drawing no.: 098-EH0941A021, Rev. A, dated 2020-06-23
Restriction: **Released for configurations without VG
 Extensions only**
 Manufacturer/Site: (1) ZF Wind Power Antwerpen N.V. Lommel,
 Belgium
 (2) ZF Wind Power Coimbatore pvt. Ltd.,
 Coimbatore, India

Alternative

Type:	planetary helical gearbox
Designed by:	ZF Wind Power Antwerpen
GE Part no.:	451W6174P011
GE VSPN:	451W6177P001 (Hydac Pump / Filter) 451W6177P003 (Hydra Specma Pump / Filter)
Designation:	EH0941B-0X2 (TRB-Version)
Gear ratio:	142.86
Main drawing no.:	097-EH0941A021, Rev. A, dated 2021-06-17
Sectional drawing no.:	098-EH0941B011, Rev. A, undated
<u>Restriction:</u>	Released for configurations without VG Extensions only
Manufacturer/Site:	(1) ZF Wind Power Antwerpen N.V. Lommel, Belgium (2) ZF Wind Power Coimbatore pvt. Ltd., Coimbatore, India

Alternative

Type:	planetary helical gearbox
Designed by:	Moventas Gears Oy
GE Part no.:	451W6174P001
GE VSPN:	451W6176P001 (Hydac Pump + Hydac Filter) 451W6176P003 (Hydac Pump + Agro-Hytos Fil.)
Designation:	PPH-5700
Gear ratio:	143.079
Main drawing no.:	GDRM107213, Rev. B, dated 2019-09-09
Sectional drawing no.:	GDRM105685, Rev. -, dated 2018-04-11
<u>Restriction:</u>	Released for configurations without VG Extensions only
Manufacturer /Site:	(1) Moventas Gearx Oy, Jyväskylä, Karkkila, Finland

Alternative for configurations 1-7

Type:	planetary helical gearbox
Designed by:	ZF Wind Power Antwerpen
GE Part no.:	451W0528P003 453W3938P001
GE VSPN:	451W0529P001 (Hydac Pump + Filter) 453W3946P001 (Hydac Pump + Filter) 451W0529P003 (Hydra Specma Pump + Filter) 453W3946P003 (Hydra Specma Pump + Filter)
Designation:	EH0941A-004 EH0941A-014
Gear ratio:	142.86

Main drawing no.:
Sectional drawing no.:
Manufacturer/Site:

097-EH0941A003, Rev. C, 2022-12-06
098-EH0941A003, Rev. A, undated
(1) ZF Wind Power Antwerpen N.V. Lommel,
Belgium
(2) ZF Wind Power Coimbatore pvt. Ltd.,
Coimbatore, India

Alternative

Type:
Designed by:
GE Part no.:

planetary helical gearbox
Flender GmbH
451W6174P013
453W3938P003
453W3947P001 (Hydac Lubrication)
452W7004P001 (Hydac Lubrication)
453W3947P003 (Hydra Specma Lubrication)
452W7004P003 (Hydra Specma Lubrication)
PDAJ 3750

Designation:
Gear ratio:
Main drawing no.:

142.73
F2E01045927A / AA, Rev.001,
dated 2022-08-05
F2E01082750A / AB, Rev.002,
dated 2022-08-04

Sectional drawing no.:

Restriction:

Released for configurations without VG Extensions only

Manufacturer/Site:

(1) Flender GmbH, Voerde, Germany
(2) Flender Ltd. China, Tianjin, China

Gearbox support

Type:
Designed by:
GE Part no.:

Cast part
GE Renewable Energy
451W2612G001
454W0959G001
455W0592G001
Material: SSDI class C acc. to spec. A50WE053
451W2612, Rev. B, dated 2021-06-01
454W0959, Rev. A, dated 2022-11-03
455W0592, Rev. A, dated 2022-11-03
451W4798, Rev. -, dated 2020-07-30

Main drawing no. (machining):

Main drawing no. (casting):

Gearbox Elastomer Bearing

Type:
Designed by:

GE Part no.:
Designation:
Main drawing no.:

Elastomer bearing
ESM Energie- und
Schwingungstechnik Mitsch GmbH
449W5051P001 (Serial)
UB17_001_02
UB17_001_02, Rev. -, dated 2019-07-30

Generator Elastomer Bearing

Type:	Generator isolation mount
Designed by:	ESM Energie- und Schwingungstechnik Mitsch GmbH
GE Part no.:	448W9164P001
Designation:	ML01_003_44
Main drawing no.:	ML01_003_44_KD, dated 2019-03-15

Generator coupling

Type:	Friction clutch
Designed by:	Flender GmbH
GE Part no.:	449W3630P001/P002
GE VSPN:	449W3633P001
Designation:	ARV-4 KZR 570-4
Main drawing no.:	A5E47722315A_AB, Rev.002, dated 2020-04-21
Manufacturer/Site:	(1) Flender GmbH, Bocholt, Germany

Alternative

Type:	Friction clutch
Designed by:	KTR-Group
GE Part no.:	449W3630P002
GE VSPN:	449W3632P002
Designation:	RADEX-N 220 NANA 4 special
Main drawing no.:	M 809751, Rev. 0, dated 2020-07-13
Manufacturer/Site:	(1) KTR Kupplungstechnik GmbH, Rheine, Germany

Rotor brake

Type:	Hydraulic braking system
Designed by:	KTR Group
GE Part no.:	449W3580P001 (Serial)
GE VSPN:	449W3583P001 (Serial)
Designation:	KTR-STOP YAW M C-40
Number of brakes:	1
Position:	High speed shaft
Drawing no.:	M 777412, Rev.1, dated 2019-08-16
Manufacturer/Site:	(1) KTR Brake Systems GmbH, Schloss Holte Stukenbrock, Germany

Alternative

Designed by:	Svendborg Brakes
GE Part no.:	449W3580P001
	449W3258P001
GE VSPN:	449W2412P001
	449W3259P001

Designation:	BSAB90 / CB90R
Number of brakes:	1
Drawing no.:	Position: High speed shaft 490-6914-801, Rev. A, dated 2019-04-04 490-6909-801, Rev. A, dated 2020-03-03
Manufacturer/Site:	(1) Svendborg Brakes A/S, Vejstrup, Denmark (2) Altra Industrial Motion do Brasil S.A., Cotia, Brazil (3) Svendborg Brakes (Shanghai), Shanghai, China

Alternative

Designed by:	Antec
GE Part no.:	449W3580P001
GE VSPN:	451W2168P001
Designation:	HE-2-90/110
Number of brakes:	1
Position:	High speed shaft
Drawing no.:	20.104.587, Rev. J, dated 2020-09-23
Manufacturer/Site:	(1) Antec Eolica Fabricacao e Comercio de Freios Ltda, Camacari, Brazil

Low Speed Rotor Lock Disc

Type:	Manual rotor lock disc
Designed by:	GE Renewable Energy
GE Part no.:	448W2972P001
Drawing no.:	448W2972, Rev.-, dated 2019-01-04
Manufacturer/Site:	(1) Shandong Weiteng Machine Co Ltd., Weifang, Shandong, China (2) Energy Hardware Holdings, LLC (Shanghai Aerotech), P.R. China (3) Liyang Flying Industry Co. Ltd., Liyang City, Jiangsu Province, P.R. China (4) Wheels India Limited, Chennai, India

Low Speed Rotor Lock Pin

For configurations 1-3

Type:	Manual Rotor Lock Pin
Designed by:	Svendborg Brakes A/S
GE Part no.:	448W4722P001
GE VSPN:	448W4730P001
Drawing no.:	490-6366-802, Rev.-, dated 2018-05-04
Manufacturer/Site:	(1) Svendborg Brakes A/S, Vejstrup, Denmark (2) Svendborg Brakes Shanghai Co. Ltd.,

Shanghai, China
(3) Altra Industrial Motio do Brasil, Cotia, Brazil

Alternative for configurations 1-3

Designed by:

GE Part no.:

GE VSPN:

Designation:

Drawing no.:

Manufacturer/Site:

KTR Group

448W4722P001

448W4731P001

KTR-STOP RL M-B-355-214 (740101)

740101, Rev. 0, dated 2018-09-12

(1) KTR Brake Systems GmbH, Schloss Holte Stukenbrock, Germany

Alternative

Designed by:

GE Part no.:

Drawing no.:

Manufacturer/Site:

GE Renewable Energy

451W7440G001

453W4704G001

456W2403G001

451W7440, Rev. -, dated 2020-09-16

453W4704, Rev. -, dated 2021-09-17

456W2403, Rev. -, dated 2023-03-01

(1) Svendborg Brakes A/S, Vejstrup, Denmark
(2) Altra Industrial Motio do Brasil, Cotia, Brazil

(3) Svendborg Brakes (Shanghai) Co. Ltd, Shanghai, China

(4) CSIC Heisheng Technology Co Ltd., Yichang, China

(5) Dellner Bubenzer Germany Wind GmbH, Dorsten, Germany

(6) Antec Eolica Fabricacao e Comercio de Freios Ltda., Camacari, Brazil

(7) KTR Brake Systems GmbH, Schloss Holte Stukenbrock, Germany

High Speed Rotor Lock

Type:

Designed by:

GE Part no.:

Main Drawing no.:

Manufacturer/Site:

Manual rotor lock

GE Renewable Energy

448W2230G001

448W2230, Rev.-, dated 2018-10-17

(1) Duomo Euroservices S.L., Santiago, Toledo, Spain

(2) Shenyang Sunny Lion Equipment Co. Ltd., Shenyang, China

(3) Dalian E & T., Development Zone,

Jingshang Mould Co., Ltd., Dalian, China
(4) Energy Hardware Holdings, LLC
(Shanghai Aerotech), P.R.China

Bolted Connection Hub-Main Shaft

Type:	Double-row bolted connection
Designed by:	GE Renewable Energy
GE Part no.:	450W9911G001
Drawing no.:	451W1408, Rev. -, dated 2020-06-03

Main frame

Type:	Cast
Designed by:	GE Renewable Energy
GE Part no.:	450W8034G001 452W9306G001 452W7091G001 453W7241G001 454W0334G001 454W8894G001 457W0545G001
Material:	SSDI class C acc. to spec. A50WE053
Main Drawing no. (machining):	450W8034, Rev. B, dated 2020-12-02 452W9306, Rev. -, dated 2021-05-17 452W7091, Rev. -, dated 2021-03-19 453W7241, Rev. A, dated 2022-03-04 454W0334, Rev. -, dated 2022-01-28 454W8894, Rev. -, dated 2022-08-18 457W0545, Rev. -, dated 2023-10-06
Main Drawing no. (casting):	450W8033, Rev. -, dated 2020-06-02 453W7240, Rev. -, dated 2021-11-18 454W8893, Rev. -, dated 2022-08-18
Manufacturer/Site:	(1) Jiangsu Sinojit Wind Energy Technology Co. Ltd, Jiangsu, P.R. China (2) Jiangsu FAW Foundry Co. Ltd, Wuxi, Jiangsu, P.R. China (3) GE Energias Renovaveis Ltda, Brazil (4) Himile Mechanical Science and Tech- nology Co. Ltd, Shandong, P.R. China

Pillow Block

Type:	Cast
Designed by:	GE Renewable Energy
GE Part no.:	451W4791G001

Material:	452W7093G001
Main Drawing no. (machining):	453W7242G001
	454W8897G001
	SSDI class C acc. to spec. A50WE053
	451W4791, Rev. A, dated 2020-12-02
	452W7093, Rev. -, dated 2021-03-19
	453W7242, Rev.-, dated 2022-03-07
	454W8897, Rev. -, dated 2022-08-17
Main Drawing no. (casting):	452W1636, Rev. -, dated 2020-11-27
	454W8896, Rev. -, dated 2022-08-17
Manufacturer/Site:	(1) Wuxi Rhester Machinery Co. Ltd., Wuxi, Jiangsu, China
	(2) Jiangsu Sinojit Wind Energy Technology Co. Ltd, Jiangsu, China
	(3) Himile Mechanical Science and Technology Co. Ltd, Shandong, P.R. China
	(4) Shandong Weiteng Machine Co. Ltd., Weifang, Shandong, P.R. China
	(5) Baettr Lem A/S, Lem, Denmark

Generator frame

Type:	Welded part
Designed by:	GE Renewable Energy
GE Part no.:	452W4085G001
Material:	S355J2 or ASTM A572 Grade 50 (steel)
Main Drawing no. (fabrication):	452W4084, Rev. -, dated 2021-02-04
Main Drawing no. (machining):	452W4085, Rev. -, dated 2021-02-05
Manufacturer/Site:	(1) Liyang Flying Industry Co. Ltd. Jiangsu Province, P.R. China
	(2) Himile Mechanical Science and Technology, Shandong, P.R. China
	(3) Painco Industria e Comercio S/A, rio das Pedras, Brazil
	(4) Wuxi Rhester Machinery Co. Ltd., Wuxi, Jiangsu, China
	(5) ATES CELIK INSAAT TAAHHÜT PROJE MÜH. SAN. CE TIC A.S., BERGAMA / IZMIR, Turkey

Alternative

Designed by:	GE Renewable Energy
GE Part no.:	453W0577G001
	453W3848G001
Material:	S355J2 or ASTM A572 Grade 50 (steel)
Main Drawing no. (fabrication):	452W4084, Rev. A, dated 2021-03-18
	453W3847, Rev. A, dated 2021-10-14

Main Drawing no. (machining): 453W0577, Rev. -, dated 2021-06-23
453W3848, Rev. A, dated 2021-10-14
Manufacturer/Site: see above

Alternative

Designed by: GE Renewable Energy
GE Part no.: 454W2102G001
Material: S355J2 or ASTM A572 Grade 50 (steel)
Main Drawing no. (fabrication): 454W2101, Rev. A, dated 2022-07-13
Main Drawing no. (machining): 454W2102, Rev. A, dated 2022-07-13
Manufacturer/Site: see above

Yaw system

Type: Active, yaw bearing slewing ring with 4 active yaw drives and 20 hydraulic brakes

Yaw drive

Type: 4 stage planetary gearbox
Designed by: Bonfiglioli Transmital
GE Part no.: 449W3493P001
456W3344P001
GE VSPN: 449W3495P001
456W3367P001
Designation: 714T4 (JB00004586)
714T4 (JB00039356)
Drawing no.: I7140T012700, Rev. -, dated 2019-05-23
CD00025633, Rev. C, dated 2023-08-24
Manufacturer/Site: (1) Bonfiglioli Riduttori S.p.A., Bologna, Italy
Manufacturer motor: Bonfiglioli
Designation motor: BN132MB 6

Alternative

Designed by: SEW Eurodrive Brasil
GE Part no.: 449W3493P001
452W6636P001
GE VSPN: 450W1703P001/P002
452W7635P001
Designation: PW067 / PW067L
Drawing no.: 2422 441 3.30.1, Rev.00, dated 2019-07-08
2422 441 5.30.1, Rev.00, dated 2020-08-31
Manufacturer/Site: (1) Sew-Eurodrive Brasil Ltda., Indaiatuba, Brazil
Manufacturer motor: SEW Eurodrive
Designation motor: DRN132M6

Alternative

Designed by:
GE Part no.:

GE VSPN:
NGC PN:
Drawing no.:

Manufacturer/Site:

Manufacturer motor:
Designation motor:

NGC
449W3493P001
452W6636P001
449W8163P001/P002
110200000326 / 110200000328
SYW07A010101 / SYW07A010301, Rev. A,
dated 2020-09-10
(1) Nanjing High Speed & Accurate Gear,
Nanjing, China
LEOG / Marathon
AKEJ132M2-6H / LEB 132MD-6

Alternative

Designed by:
GE Part no.:

GE VSPN:
Designation:
Drawing no.:
Manufacturer/Site:
Germany

Manufacturer motor:
Designation motor:

Liebherr Components Biberach GmbH
449W3493P001
452W6636P001
450W7982P001
DAT 450/3462-4MA0 (13401783)
368 462 4000 99 0, Rev. 08, dated 2021-01-26
(1) Liebherr Components GmbH, Biberach,
(2) Liebherr Machinery (Dalian) Co., Ltd.,
P.R. China
LEOG
AKEJ132M2-6H

Yaw bearing

Type:
Designed by:
Designation:

Drawing no.:

Manufacturer/Site:

Ball bearing slewing ring
GE Renewable Energy
448W3840G001
449W9228G001
454W8188G001
455W2003G001
448W3840, Rev. -, dated 2018-11-21
449W9228, Rev. -, dated 2021-01-26
454W8188, Rev. -, dated 2022-07-25
455W2003, Rev. A, dated 2023-07-13
(1) Tianma (Chengdu) Precision Machinery
Co. Ltd., Chengdu, P.R. China
(2) CS Bearing Co. Ltd., Kyoungnam, Korea
(3) Shilla Corporation, Cheonan-si,
Chungnam, South Korea

- (4) Shilla Brazil Industria de Rolament de Giro Ltda, Tiete, Brazil
- (5) SKF do Brazil Ltda, Cajamar, Brazil
- (6) Changzhou Shilla Machinery Manufacturing Co. Ltd., Changzhou, China

Yaw brakes

Type:	Yaw brake
Designed by:	JHS Jungblut GmbH & Co.KG
	GE Part no.: 446W7576P001
	456W9419P001
GE VSPN:	446W7577P001
	456W9420P001
Designation:	JHS-08-1x100
	JHS-YBA-8-120-0-2106-AP
Drawing no.:	VA002274, Rev. D, dated 2018-09-06
	VA004749, Rev. -, dated 2023-10-12
Manufacturer/Site:	(1) Dellner Bubenzer Germany Wind GmbH, Dorsten, Germany
	(2) KTR Brake Systems GmbH, Schloss Holte Stukenbrock, Germany

Passive Cooler

Type:	passive cooler with plate heat exchanger
Designed by:	HydraSpecma (previously Ymer Technology)
GE PN Cooler:	452W0376P001 (1070.0087)
	453W1497P001 (1070.0087)
	453W4029P001 (1070.0104)
	453W6400P001 (1070.0112)
	457W0285P001 (1070.0104)
	457W0280P001 (1070.0087)
	457W0295P001 (1070.0112)
Designation cooler:	3000x1274x63
GE PN Heat Exchanger:	452W0379P001
	454W0579P001
Designation Heat Exchanger:	840x394x450 – 1071.0491
HydraSpecma Drawing Cooler No.:	1070.0087, Rev. D, dated 2021-01-22
	1070.0104, Rev. B, dated 2021-09-15
	1070.0112, Rev. A, dated 2021-11-05
GE Drawing Cooler no.:	450W8866, Rev. -, dated 2020-11-09
	453W1944, Rev. -, dated 2021-07-26
	453W4314, Rev. -, dated 2021-09-13
	457W0387, Rev. -, dated 2023-10-05
	457W0386, Rev. -, dated 2023-10-05
GE Drawing Heat Exchanger:	452W1013, Rev. -, dated 2020-11-17

Hydraulic system

Type:	Hydraulic system
Designed by:	HAWE-Hydraulik
GE Part no.:	447W8054P001 (STW)
	449W3384P001 (CWE)
GE VSPN:	448W3498P001 (STW)
	453W5827P001 (STW)
	449W3391P001 (CWE)
	453W5828P001 (CWE)
Designation:	17-111-H-01-00 (8801 0270-00) (STW)
	17-111-H-02-00/UL (8801 1646-00) (STW)
	17-111-H-01-01 (8801 0506-00) (CWE)
	17-111-H-02-01 (8801 1645-00) (CWE)
Main drawing no.:	00_DE-D00018518, Rev. 00 (STW)
	00_DE-D00071337, Rev. 00 (STW)
	00_DE-D00025855, Rev. 00 (CWE)
	00_DE-D00071343, Rev. 00 (CWE)
Circuit Diagram no.:	00_DE-D00018005, Rev. 01 (STW)
	00_DE-D00067395, Rev. 00 (STW)
	00_DE-D00024437, Rev. 01 (CWE)
	00_DE-D00067394, Rev. 00 (CWE)

Alternative

Type:	Hydraulic system
Designed by:	Svendborg Brakes
GE Part no.:	447W8054P001 (STW)
	449W3384P001 (CWE)
GE VSPN:	449W2454P001 (STW)
	449W3392P001 (CWE)
Designation:	1110-0027-801 (STW)
	1110-0027-802 (CWE)
Main Drawing no.:	1110-0027-801, Rev. -, dated 2019-03-22 (STW)
	1110-0027-802, Rev. -, dated 2019-10-31 (CWE)
Circuit Diagram no.:	1110-0027-601, Rev.C, dated 2019-04-25 (STW)
	1110-0027-602, Rev. -, dated 2019-11-05 (CWE)

Alternative

Type:	Hydraulic system
Designed by:	Hine S.A.
GE Part no.:	447W8054P001 (STW)
GE VSPN:	452W3416P001 (STW)
Designation:	HR002761
Main Drawing no.:	B1-9216, Rev. F, dated 2021-11-08 (STW)
Circuit Diagram no.:	B1-11259, Rev. -, dated 2021-03-30 (STW)

Generator

for configurations 1-3

Type:	Asynchronous doubly-fed induction
Designed by:	Indar
GE Part no.:	448W9503P004
GE VSPN:	448W9505P002
Designation:	NAR710G6B60NS2 (3002045)
Rated power:	5733 kW
Rated frequency:	60 Hz
Rated speed:	1444 rpm
Rated voltage:	6000 V (stator)
Insulation class:	F
Degree of protection:	IP34 (generator) IP23 (slip ring)
Manufacturer/Site:	(1) Indar Electric S.L., Beasain, Gipuzkoa, Spain

Alternative for configurations 4-7

Type:	Asynchronous doubly-fed induction
Designed by:	Indar
GE Part no.:	452W6597P002
GE VSPN:	452W1605P002
Designation:	NAR710G6SB60N
Rated power:	5733 / 6049 / 6357 kW
Rated frequency:	60 Hz
Rated speed:	1444 rpm
Rated voltage:	6000 V (stator)
Insulation class:	F
Degree of protection:	IP34 (generator) IP23 (slip ring)
Manufacturer/Site:	(1) Indar Electric S.L., Beasain, Gipuzkoa, Spain

Alternative for configurations 1-7

Type:	Asynchronous doubly-fed induction
Designed by:	Winergy
GE Part no.:	452W6597P002
GE VSPN:	447W9924P003
Designation:	W1G53000345
Rated power:	6357 kW
Rated frequency:	60 Hz
Rated speed:	1444 rpm
Rated voltage:	6000 V (stator) 489 V (rotor)
Rated current:	510 A (stator) 1532 A (rotor)
Insulation class:	F

Degree of protection: IP34 (generator)
IP23 (slip ring)
Manufacturer/Site: (1) Siemens d.o.o. Belgrade, Subotica, Serbia

Converter

Designed by: GE Power Conversion
Designation: 151X1258KA01SA03
151X1258KA01SA04
151X1258KA01SA05
GE Part no.: 448W0372P003
448W0372P004
448W0372P005
Power: 4.5 to 6.1 MW
Rated voltage (grid side): 690 V AC
Rated current (grid side): 1050 A
Rated voltage (machine side): 0 to 825 V AC
Rated current (machine side): 2400 A
Degree of protection: IP 21 (cabinet)
IP 41 (bridge cabinet)
IP 22 (filter and inductor cabinet)
IP 21 (AC entry cabinet)
Manufacturer/Site: (1) GE Power and Water, Hai Phong City, Vietnam
(2) GE Shenyang, Liaoning, P.R. China
(3) Jabil do Brasil Industria Electroeletronica Ltda, Betim, Brazil

Transformer

Type: dry type
Designed by: Hainan Jinpan Smart Technology (JST)
Rated power: 6228 kVA
Degree of protection: IP 00 (degree not yet defined)
Location: Inside nacelle
Manufacturer/Site: (1) Hainan Jinpan Electric Co. Ltd. (JST), Haikou, P.R. China
(2) JST Power Equipment Inc., Nogales, Mexico

GE Part no.	GE VSPN	Supplier Designation	Rated voltage (HV)
452W0495P001	452W0496P001	316010893001	33-34.5 kV
452W0495P003	452W0496P003	316010913001	
452W0495P002	452W0496P002	316010903001	34.5 kV
452W0495P004	452W0496P004	316012383001	

Medium voltage Switchgear

Manufacturer:	Schneider Electric
Designation:	DVCAS 38.5 (operation from -30°C to 40°C)
Rated voltage:	38.5 kV
Rated current:	630 A
Location:	Inside tower
Manufacturer/Site:	(1) Schneider Electric, Libourne, France (2) Schneider Electric, Stezzano, Italy (3) Schneider Electric, Mungia, Spain

Alternative

Manufacturer:	Schneider Electric
Designation:	RM6 (operation from -25°C to 45°C)
Rated voltage:	24 kV
Rated current:	630 A
Location:	Inside tower
Manufacturer/Site:	see above

Alternative

Manufacturer:	Schneider Electric
Designation:	Flusarc (operation from -25°C to 55°C)
Rated voltage:	36 kV
Rated current:	630 A
Location:	Inside tower
Manufacturer/Site:	see above

Alternative

Manufacturer:	Ormazabal
Designation:	cgm.3 (operation from -30°C to 40 °C)
Rated voltage:	38 kV
Rated current:	600 A
Location:	Inside tower
Manufacturer/Site:	(1) Ormazabal, Igorre, Spain (2) Ormazabal do Brasil, Sao Paulo, Brazil

Alternative

Manufacturer:	ABB
Designation:	SafePlus 36 (operation from -25°C to 40°C)
Rated voltage:	40.5 kV
Rated current:	630 A
Location:	Inside tower
Manufacturer/Site:	(1) ABB, Skien, Norway (2) ABB Eletrificacao Ltda, Sorocaba, Brazil

Tower HH107.4 (Conf. 1)

Type:	Tubular steel tower
Designed by:	GE Renewable Energy
Sections:	5
Length:	104.785 m
Main drawing no.:	447W2844, Rev. B
Foundation specification:	Foundation_Load_Drawing_5.5-158_60Hz_107.4mHH_PRD068_EN_r01

Tower HH125.4 (Conf. 2, 4)

Type:	Tubular steel tower
Designed by:	GE Renewable Energy
Sections:	5
Length:	122.705 m
Main drawing no.:	449W9393, Rev. - 451W1779, Rev. A (alternative) 451W2505, Rev. - (alternative)
Foundation specification:	(1) Foundation_Load_Drawing_5.5-158_60Hz_125.4mHH _PRD069_EN_r01 (2) Foundation_Load_Drawing_6.1-158_60Hz_125.4mHH_PRD136_EN_r02

Tower HH101 (Conf. 3, 5)

Type:	Tubular steel tower
Designed by:	GE Renewable Energy
Sections:	4
Length:	98.345 m
Main drawing no.:	449W5216, Rev. -
Foundation specification:	(1) Foundation_Load_Drawing_5.5-158_60Hz_101mHH_PRD035_EN_r01 (2) Foundation_Load_Drawing_6.1-158_60Hz_101mHH_PRD142_EN_r01

Tower HH101 (Conf. 7)

Type:	Tubular steel tower
Designed by:	GE Renewable Energy
Sections:	4
Length:	98.345 m

Main drawing no.: 452W7380, Rev. A, dated: 2023-05-03
 Foundation specification: (1) Foundation_Load_Drawing_6.1-158_60Hz_101mHH_PRD153_EN_RevB

Tower HH117 (Conf. 6)

Type: Tubular steel tower
 Designed by: GE Renewable Energy
 Sections: 5
 Length: 114.305 m
 Main drawing no.: 452W3871, Rev. -, dated: 2021-09-13
 Foundation specification: (1) Foundation_Load_Drawing_6.1-158_60Hz_117mHH_PRD169_EN_r01

All Towers

Manufacturers/Sites: (1) Torres Eolicas do Nordeste SA, Jacobina, Brazil
 (2) Ventower Industries, Monroe, Michigan, USA
 (3) GRI Tower Brazil Estruturas Metalicas S.A., Cabo de Santo Agostinho, Brazil
 (4) Marmen Inc., Brandon, South Dakota, USA

Manuals

see Evaluation Reports on Safety System and Manuals
 For the Rotor Blade LM77.4P3: see manuals BM-00207/A8 and SI-00922/B9
 Service instruction for LM77.4P6 with IMS: UK-SI-50057_A2

Control and safety system

Designed by: GE Renewable Energy
 Hardware: Mark VIe
 Software: V5.7.10

Note:

Please refer to the mentioned evaluation reports for revision control of drawings/documents, detailed drawings, detailed design documents and other requirements and conditions.

- End of Certificate -