1. SII-Prepare for service (yearly)

Document no.: 0093-1903 V11
Class: CONFIDENTIAL
Type: T09
Date: 2025-10-31

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For answers to questions about Vestas products or publications, contact your local Vestas representative.

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Wind turbine type

Read the full document before you start to do work.

Send questions or concerns about the document to Vestas Wind Systems A/S.

Wind turbine type	Mk version
EnVentus™	Mk 0A

Change description

Description of changes
Updated section 9 *Consumables*, page 16.

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1 Safety

0011358041

All work relating to a Vestas wind turbine, including work methods and practices, employee training and protective measures, and use of tools and equipment, shall be in accordance with the requirements of the applicable governmental and private occupational safety and health codes and standards. Employers engaged in such work are also required to be familiar with and comply with the wind turbine-specific 'Safety regulations for operators and technicians' manual for the relevant wind turbine type. Vestas shall not be responsible for any liabilities arising from failure to comply with such requirements. Vestas reserves the right to inspect such work to ascertain such compliance.

The service technician must read and understand the PPE sheets for each of the chemicals used or work done in this instruction. The PPE sheets describe the correct personal protective equipment to wear for the specific work. If in doubt about the PPE requirements for the work, contact the site responsible or the line manager and confirm the correct procedure before starting the work.

Read the full document before you start to do work.

If you have any doubts about technical or safety issues while you do the work, stop your activities and contact your supervisor or local HSE. Make sure that you register the findings on the dedicated platform – ENABLON.

1.1 Emergency stop buttons

0027448390

Note the locations of the emergency stop buttons to use if there is an emergency situation.

++01 -610-02-S1	Ground control panel
++03 -610-02-S2	Nacelle control panel
+D -610-02-S3	Yaw lubrication
+D -610-02-S4	Manual brake switch
+D -610-02-S5	Nacelle ladder A – left
+D -610-02-S6	Nacelle ladder A – right
++73.F1 -610-02-S7	Converter cabinet
+D -610-02-S8	Nacelle ladder B – left
+D -610-02-S9	Nacelle ladder B – right
++05 -135-S1	Hub control panel
++70 -135-S2	Hub entrance

When you push an emergency stop button, the controller changes to the STOP mode. Thus, there is no power supply to the contactor solenoids, and the blades are fully feathered.

If the mode selector is in position 2, 3, or 4, it shows 'Man in Turbine' mode, and if an emergency stop push button is activated, the disc brake is applied. If the mode selector is in position 1, and an emergency stop push button is activated, the disc brake will not apply.

If an emergency stop button is activated, the gear lubrication and water pumps will first stop for 10 seconds after the brake is applied. The fans on the permanent magnet generator will not be stopped, if the emergency stop button is activated.

Service lift

An emergency stop button is installed in the service lift. This button is applicable to the service lift only. Conversely, the emergency stop buttons in the wind turbine are not applicable to the service lift.

Service crane

An emergency stop button is installed in the service crane. This button is applicable to the service crane only. Conversely, the emergency stop buttons in the wind turbine are not applicable to the service crane.

1.2 HV switchgear trip button

0027590600

Note the HV switchgear trip button locations that follow:

-420-02-S2 : HV switchgear trip button on the ground control panel

-420-02-S3 : HV switchgear trip button on the nacelle control panel

When you push an HV switchgear trip button, the HV switchgear will be disconnected. Thus, the wind turbine is disconnected from the grid and the blades are fully feathered. Only the emergency lighting and components powered by the UPS will remain energised.

1.3 Rotor locking system

0029088699

The blades must be fully feathered.

The rotor locking system is not locked, when the wind turbine is ready for start-up. The rotor locking system must, however, be locked, when you go into the hub or do work on moving parts, such as the slip rings and the main shaft.

The brake must be engaged by use of the switch button 235-S1 for the manual activation of the brake. The manual activation of the brake is only possible when the mode selector is not in position 1.

If the mode selector is in position 4, the enable controller outputs selector -615 08-S4 in nacelle control panel ++03 must be in position 1 and the safety reset push button + +03-610-S2 must be pressed to build up the brake pressure.

1.4 Disconnection from the main grid

0011412104

If it is necessary to disconnect the wind turbine from the main grid, speak to the electricity grid company first.

When you do the LOTO procedure on the tower controller and replace the tower SCP, the switchgear will trip and the switchgear must be connected again.

1.5 Emergency or evacuation light

0011412133

Before you start to do work in the wind turbine, make sure that the backup system for the lamps is functional.

Use the hand-held battery lamps when you do work in the wind turbine, until the backup system for the lamps is checked.

2 Educational requirements of service technician

0011358855

At least 2 of the service technicians who do work in a wind turbine must be able to prove that they have a valid GWO basic safety training certificate.

At least 1 service technician must hold the wind turbine-specific training course certificate for the wind turbine in question.

Some tasks require one or more advanced training modules or job-specific training, as described in the Vestas 'Technical training programme'. The person who plans a specific task must make sure that the service technicians involved have the proper know-how for the completion of that task.

3 Abbreviations and technical terms

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Table 3.1: Abbreviations

Abbreviation	Explanation
ERP	Enterprise resource planning
GWO	The Global Wind Organisation
HPU	Hydraulic power unit
HV	High voltage
LOTO	Lockout-tagout
PPE	Personal protective equipment
SCP	Safety controller partition
SDS	Safety data sheet
SIF	Service inspection form
SPRA	Standardised procedure risk assessment
UPS	Uninterruptible power supply

Table 3.2: Explanation of terms

Term	Explanation
None	

4 Referenced documentation

4.1 Safety documents

0027457684

Table 4.1: Safety documents

Document no.	Title
0001-0410	Personal protective equipment sheets
0004-4159	Standardised procedure risk assessment (SPRA)

Document no.	Title
0092-3874	Rotor locking system
0092-3919	Safety regulations for operators and technicians
0094-2383	Mode selector system
	Relevant SDS for the chemicals used in this document
	Appropriate LOTO document

4.2 Reference documents

0027457683

Table 4.2: Reference documents

Document no.	Title
920098	Torque wrench settings
935145	Torque settings for electrical equipment
960501	Bolt connections
0001-1995	User guide operating manual
0001-1996	Service guide, menu 11–19 operating manual
0001-1997	Service guide, picture 21 and onwards
0004-1976	Bolts torque-fibreglass parts
0024-9649	Installation and removal of fishnet
0058-8187	Installation and removal of fishnet on blades with serrations
0065-3482	Standard service tools
0093-1909	SIF for yearly inspection

Unless it is specified differently, see 920098 ‘Torque wrench settings’ for information about bolt types and bolt lubrication, and see 960501 ‘Bolt connections’ for information about torque values.

5 Purpose

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The purpose of this document is to give the instructions for how to prepare the wind turbine for the yearly inspection.

6 Note

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See ‘Safety regulation for operators and technicians’ in section ‘Reference documents’ for the maximum service wind speed allowed to do the test and inspection of the wind turbine.

To do a test and inspection of the wind turbine relation to functional safety test, it is necessary to get access to both the nacelle and the hub.

Wind speed for work in hub – work in hub (all the 3 blades pitched to 95°) and work in nacelle – work in hub (all the 3 blades pitched to 95°) must be examined.

The wind turbine must be yawed up against the wind. If service picture 11 is active, auto yaw must be enabled.

7 Tools

0027617840

For standard service tools, see 0065-3482 ‘Standard service tools’.

Table 7.1: Tools

Item no.	Quantity	Description
150435	1	ERP: ADAPT. F 3/4" FEMCO DRAINPLUG
213831	1	ERP: WIRE BRUSH
217942	1	ERP: HAMMER, NYLON WOOD HNDL 50X340MM 898G
227620	1	ERP: RING FIXED SPANNER 10MM ACESA
227635	1	ERP: RING FIXED SPANNER 13MM ACESA
227645	1	ERP: RING FIXED SPANNER 15MM ACESA
227655	1	ERP: RING FIXED SPANNER 17MM ACESA
227665	1	ERP: RING FIXED SPANNER 19MM ACESA
227675	1	ERP: RING FIXED SPANNER 21MM ACESA
227690	1	ERP: RING FIXED SPANNER 24MM ACESA
227705	1	ERP: RING FIXED SPANNER 27MM ACESA
227720	1	ERP: RING FIXED SPANNER 30MM ACESA
227730	1	ERP: RING FIXED SPANNER 32MM ACESA
227760	1	ERP: RING FIXED SPANNER 41MM ACESA
227772	1	ERP: RING FIXED SPANNER 60MM ACESA
238210	1	ERP: ADJUSTABLE SPANNER 6" BAHCO
238220	1	ERP: ADJUSTABLE SPANNER 8" BAHCO
238230	1	ERP: ADJUSTABLE SPANNER 10" BAHCO
238300	1	ERP: TORQUE INSERT, RATCHET 1/2"DRV 9X12MM
238302	1	ERP: RATCHET HEAD 3/4" 14x18 735/40
238320	1	ERP: TORQUE INSERT, RING 14X18 19MM
238354	1	ERP: SOCKET WRENCH ½" TECOS T-1224M
238422	1	ERP: LOCK RING FOR IMP.SOCKET 3/4"
238455	1	ERP: IMPACT SOCKET 41MM 3/4"
238456	1	ERP: IMPACT SOCKET 46MM 3/4"
238468	1	ERP: IMPACT SOCKET 50MM 1"
238470	1	ERP: IMPACT SOCKET 60MM 1"
238473	1	ERP: IMPACT SOCKET 46mm 1½"
238474	1	ERP: IMPACT SOCKET 50mm 1½"
238475	1	ERP: IMPACT SOCKET 55mm 1½"
238476	1	ERP: IMPACT SOCKET 60mm 1½"

Item no.	Quantity	Description
238477	1	ERP: IMPACT SOCKET 65mm 1½"
238478 or 238493	1 1	ERP: IMPACT SOCKET 70mm 1½" ERP: IMPACT SOCKET 70mm 1½" RECESS
238492	1	ERP: IMPACT SOCKET 70mm 1" RECESS
242873	1	ERP: ALLEN TOP 1/2" 6MM GEDORE
242875	1	ERP: 8MM GEDORE ALLEN KEY SOCKET ½
242876	1	ERP: ALLEN TOP 1/2" 10mm BELZER
242998	1	ERP: MULTIGRIP PLIERS 315mm
250134	2	ERP: BAR,WRECKING,CROW,STEEL,600 mm
294252	1	ERP: PLIER, CIRCLIP 19-60 EXT A2
294264	1	ERP: PLIER, SLIP JOINT WATER PUMP 250MM
294275	1	ERP: SOCKET FOR ½" 17MM
294288	1	ERP: SOCKET FOR ½" 19MM LONG
294303	1	ERP: ALLEN SOCKET FOR ½" 17MM
299016	1	ERP: ADAPTER, SKT IMP, 1"F TO 1-1/2"M
768745	1	ERP: EARTH CONDUCTOR JUMPER 32M BL.
897009	1	ERP: OIL SAMPLING HOSE KIT
10100538	1	ERP: ITH M64 TENSIONER
10100745	1	ERP: GONIOMETER ANGULAR DISPL. M42
10101330	1	ERP: HANDLE, BACKUP TORQ WRENCH TORCUP
10101332	1	ERP: WRENCH, TORQ BACKUP MANUAL 60MM
10101333	1	ERP: WRENCH, TORQ BACKUP MANUAL 70MM
10101334	1	ERP: WRENCH, TORQ BACKUP MANUAL 80MM
10101335	1	ERP: WRENCH, TORQ BACKUP MANUAL 90MM
10101336	1	ERP: WRENCH, TORQ BACKUP MANUAL 100MM
10102143	1	ERP: GONIOMETER ANGULAR DISPL. M36
10102522	1	ERP: GONIOMETER ANGULAR DISPL. M48
10102523	1	ERP: GONIOMETER ANGULAR DISPL. M56
10102524	1	ERP: GONIOMETER ANGULAR DISPL. M64
10103115	1	ERP: PROBE, VIDEO BORESCOPE 3.9MM
10104020	1	ERP: MAINTENANCE LUB. KIT
20030370	1	ERP: TORQUE TOOL YOYO
20032133*	1	ERP: CUSTOM ARM F PLARAD MXEC75
20032250	1	ERP: BATTERY TORQUE TOOL 500Nm
20032355†	1	ERP: CUSTOM ARM F HYTORC EDGE8
20034665‡	1	ERP: CUSTOM ARM F SWEENY RSL6

Item no.	Quantity	Description
20035673§	1	ERP: CUSTOM ARM F HYTORC MXT5
20033150	1	ERP: BATTERY TORQUE TOOL 1500Nm 230V KIT ITH
20033155	1	ERP: REACTION BAR ITH
20033252‖	1	ERP: BATTERY TORQUE TOOL 1500Nm 110V KIT ITH
20033580	1	ERP: REACTION BAR F ELON SUPPORT TE-150 ATC
20033587	1	ERP: HEX BIT SOCKET 3/4" 17mmx130mm
20034520	1	ERP: TENSIONER M48 SPECIAL LIGHTWEIGHT ITH
20034550	1	ERP: TENSIONER M24 PL 62mm AF36
20034605	1	ERP: TENSIONER M36 PL 85mm AF55
20038985	1	ERP: SOCKET,HEXAGON BIT,3/4 in,17 mm,62 mm
20038986	1	ERP: SOCKET,ADJUSTABLE,3/4 in,17 mm,62mm
20039658	1	ERP: BOLT MEASUREMENT KIT
20040139	1	ERP: GAUGE, GO OR NO GO, 24 mm,68 mm,STEEL
23843401	1	ERP: SOCKET, IMP 1-1/2" DRV 80MM 6PT
T2187200	1	ERP: SOCKET, IMP 1" DRV 36MM DEEP
VT185800	3	ERP: FEELER GAUGE SET 0.05-1mm
VT185823	1	ERP: GAUGE, FEELER, SET 0.05-1MM
VT186964	1	ERP: HIGH PRESSURE PUMP 230V
VT187010	1	ERP: TORQUE WRENCH 2-10Nm
VT187109	1	ERP: TORQUE WRENCH 10-50MM
VT187113	1	ERP: TORQUE WRENCH 40-200Nm 730/20
VT187177	1	ERP: TORQUE WRENCH 80-400Nm
VT187284	1	ERP: TORQUE WRENCH 300-1000Nm
VT189666	1	ERP: HYDRAULIC PUMP 800 BAR
VT189683	1	ERP: HYDR. PUMP 800B. VAX1-Z 230V
VT189695	1	ERP: HYDRAULIC PUMP VAX 3,5Z
VT204089	1	ERP: HYDR. WRENCH PLARAD MXEC200TS
VT205979	1	ERP: SOCKET IMP DRV 2-1/2" AF 90MM
VT205980	1	ERP: SOCKET, IMP 2-1/2" DRV 100MM 6PT
VT299999	1	ERP: KIT, DRAIN PUMP F GEARBOX V112
VT718467 or VT187091	1	ERP: TORQUE TOOL MAX60NM ERP: TORQUE WRENCH 20-100NM
VT730321	1	ERP: WRENCH, TORQ HYDR 36MM HX
VT730323	1	ERP: HYDR.WRENCH RSL4 1" FIRK.
VT730398	1	ERP: WRENCH, TORQ HYDR 3/4IN SQ 271-1884Nm
VT730440	1	ERP: BOLTTENSIONER M30 HYDRATIGHT

Item no.	Quantity	Description
VT730600	1	ERP: TENSIONING M36 HUB BOLT
VT730706	1	ERP: HYDR. HOSE 1500B. 10M
VT730708	1	ERP: HYDR. HOSE DOUBLE 800B. 10M
VT730903	1	ERP: PLARAD MXEC75
VT742118	1	ERP: FLASH FOR TEST OF ARC DETECTOR
VT20001975	1	ERP: DRILL 18V DCD985M2
VT20002024	1	ERP: GONIOMETER ANGULAR DISPL,M16
VT20005737	1	ERP: BACK-UP WRENCH EXTENDED
VT20006867	1	ERP: LADDER THREE STEP
VT20011897	1	ERP: GONIOMETER ANGULAR DISPL M24
VT20024711	1	ERP: TENSIONER M33 PL 73-90 AF50
VT20024713	1	ERP: TENSIONER M48 PL 95-105 AF75
VT70002142	1	ERP: LAMP, LOW-E SPOTLIGHT
VT70003293	2	ERP: SOCKET IMPACT 1.1/2"X75MMSHORT
238442	1	ERP: SOCKET, 3/4" DRV 30mm 6PT
238466	1	ERP: IMPACT SOCKET 41MM 1"
238467	1	ERP: IMPACT SOCKET 46MM 1"
294271	1	ERP: SOCKET, 1/2" DRV 13MM 6PT
294293	1	ERP: SOCKET, HEX BIT 1/2" DRV 5MM LONG
20026967	1	ERP: SINGLE HOSE 2000 bar 5m
20026971	1	ERP: TENSION PUMP 400V 2000 bar
20032273	1	ERP: BOLT TENSIONER M20 ITH
UST460061	1	ERP: SOCKET, IMP 1/2" DRV 16MM 6PT
UST460329	1	ERP: SOCKET, HEX BIT 3/8" DRV 3MM
UST540002¶	1	ERP: HEAD TORCUP TU 7
VT182110	1	ERP: MICROMETER SCREW 25-50mm
VT187231	1	ERP: TORQUE WRENCH 140-760Nm W CERT
VT187311	1	ERP: TORQUE WRENCH 750-2000Nm
VT20004388	1	ERP: FLASHLIGHT AKKU ULA 14,4-18LED
VT70002117	1	ERP: TORQUE INSERT, RATCHET 3/8"DRV 9X12MM
238301	1	ERP: RATCHET HEAD ½" 14x18 735/20
VT187091	1	ERP: TORQUE WRENCH 20-100Nm
294296	1	ERP: ALLEN SOCKET FOR ½" 6MM
242877	1	ERP: ALLEN TOP 1/2" 12MM GEDORE
VT187281	1	ERP: TORQUE WRENCH 520-1000 NM
238446	1	ERP: SOCKET, 3/4" DRV 36MM 6PT
VT20024712	1	ERP: TENSIONER M36 PL 80-95 AF55

Item no.	Quantity	Description
VT717921	1	ERP: TORQUE TOOL M24 735Nm N4PM
VT718799	1	ERP: TENSIONING TOOL M24 TORQUE ARM BB
242878	1	ERP: ALLEN TOP 1/2" 14MM GEDORE
10104020	1	ERP: MAINTENANCE LUB. KIT
10104030	1	ERP: MAINTENANCE LUB. KIT US
219501	1	ERP: FILL PUMP W/STR.JOINT
238353	1	ERP: SOCKET WRENCH 1/4"TECOS T0636M
290221	1	ERP: MAGNETIC FOOT DIAL GAUGE STAND
VT184256	1	ERP: DIAL GAUGE 0.01-10mm
109114	1	ERP: METER CONN.ERMETO EMA 3-R-1/4"
60078010	1	ERP: REDUCING ADAPTOR 3/4"BSP X 1/4
100475	1	ERP: FEMCO DRAINPLUG
VT189691	1	ERP: PRESSURE GAUGE 0-10BAR R DIGITAL
	1	Marking colour set
	1	Camera

*) The item CUSTOM ARM F PLARAD MXEC75 (item no. 20032133) must be used only along with the item PLARAD MX-EC75.

†) The item CUSTOM ARM F HYTORC EDGE8 (item no. 20032355) must be used only along with the item HYTORC EDGE8.

‡) The item CUSTOM ARM F SWEENY RSL6 (item no. 20034665) must be used only along with the item SWEENY RSL6/RSL5000.

§) The item CUSTOM ARM F HYTORC MXT5 (item no. 20035673) must be used only along with the item HYTORC MXT-5.

‖) The item BATTERY TORQUE TOOL 1500Nm 110V KIT ITH (item no. 20033252) can be used in the United States region as an alternative tool for the item BATTERY TORQUE TOOL 1500Nm 230V KIT ITH (item no. 20033150).

¶) The item HEAD TORCUP TU 7 (item no. UST540002) can be used in the United States region as an alternative tool for the item PLARAD MXEC75 (item no. VT730903).

Some tools in this tools section can vary in shape and technical specification from region to region due to local requirements.
If in doubt, contact your local tools warehouse for tools applicable to your region.
This note may not be applicable for any special tools used in this procedure.

8 Spare parts

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Table 8.1: Spare parts for service after 1 year of operation

Item no.	Quantity	Description
108133	1	ERP: O-RING 55.56x3.53 EPDM SH 90
109113	2	ERP: FILTER,AIR INSERT

Item no.	Quantity	Description
141023	1	ERP: GR. CONT. "DISPOSABLE" SKF 3kg
149156	4	ERP: SHELL GADUS S5 T460 1.5
149264	3	ERP: KLUBERPLEX AG11-462 600GR KIT
149266	4	ERP: KLÛPERPLEX BEM 41-132 600GR
149994	1	ERP: GREASE KLUBERPL AG11 462 450GR
360024	3	ERP: RITTAL COARSEFILTER 120x120x12
753366	3	ERP: GROUND BRUSH
10205189	1	ERP: FILTER 150 MY
10206938	1	ERP: BRAKE PAD ASSY
10207981	10	ERP: BRUSH/BRUSHHOLDER W/SCREWS BGB
14913950	1	ERP: CONT. DISPOSABLE SKF 5KG
14925850	3	ERP: KLÜBERPLEX BEM 41-141 5.0KG
29008687	1	ERP: O-RING VITON D187,3x7 SH90
29008759	1	ERP: SEAL VITON D191x8x2,3 SH70 THD
29050768	As necessary	ERP: SCREW-IN FILTER G3/4" 1000MY
29086210	2	ERP: FILTER F CUBE POWER COOLING
29084254	4	ERP: BATTERY VRLA 12V 12AH
29084907	As necessary	ERP: GEAR OIL HOSE ø12 L= 621 MM
29086210	2	ERP: FILTER F CUBE POWER COOLING
29005679	1	ERP: UPS SYSTEM COMBINED 3MW
29088200	1	ERP: UPS SYSTEM COMBINED 3MW
29084411	1	ERP: LIGHT CONTR 230VAC 1KVA UL
29084412	1	ERP: LIGHT CONTR 230VAC 0.5KVA UL
29057023	1	ERP: CONTROL CABINET LIGHT SYSTEM
60014621	5	ERP: FILTERPAD PFM2X000-54 119X119MM
60020252	1	ERP: OFFLINE FILTER
75950233	2	ERP: FILTER 435x410 F. DOOR
S092044	1	ERP: FILTER M. PF 2000/3000 210x210
S092676	3	ERP: FILTERPAD PFANNENB. PFA 40.000
29134380	1	ERP: HYDR FILTER 3mu 630LPM 10BAR
29196162	1	ERP: HYDR FILTER 40 MICRON 80LPM 20BAR
29185925	1	ERP: SEALKIT ASSY HWP
109084	1	ERP: BREATH.FILTER MAHL PI0121 SM-L
189528	1	ERP: FAN 292M3/H 230V 50HZ EMC
189529	1	ERP: FILTER EXH 252X252MM EMC
29124361	1	ERP: FILTERPAD F PF 43.000 FAN
60078010	1	ERP: REDUCING ADAPTOR 3/4"BSP X 1/4

Item no.	Quantity	Description
109114	1	ERP: METER CONN.ERMETO EMA 3-R-1/4"
29141386	1	ERP: BATTERY MODULE 24 VDC
29002077	1	ERP: FUSE, CONTROL POWER ATDR30
29058693	1	ERP: DC UPS CONTROL UNIT 24V 20A
29149958	1	ERP: EN54 SENSOR BOARD FOR DC UPS
29208324	12–14*	ERP: BRAKE SMALL KIT, BONFIGLIOLI†
29208325	12–14*	ERP: BRAKE SMALL KIT, LAFERT†
29150739	3	ERP: FILTER,AIR,EN 779,10 µm

*) Depending on the number of motors in the wind turbine

†) Depending on the motor supplier in the wind turbine

Table 8.2: Spare parts for service after 2 years of operation

Item no.	Quantity	Description
105500	3	ERP: METAL DETECT SWI NO M18X1.5 IEC 4400
108133	1	ERP: O-RING 55.56x3.53 EPDM SH 90
109113	2	ERP: FILTER,AIR INSERT
130539	4	ERP: FILTER SIZE 1000 10MY,DIN24550
131477	3	ERP: PFTT BUSHING PL3/4-M18*1
141023	1	ERP: GR. CONT. "DISPOSABLE" SKF 3kg
149156	4	ERP: SHELL GADUS S5 T460 1.5
149264	3	ERP: KLUBERPLEX AG11-462 600GR KIT
149266	4	ERP: KLÛPERPLEX BEM 41-132 600GR
149994	1	ERP: GREASE KLUBERPL AG11 462 450GR
360024	3	ERP: RITTAL COARSEFILTER 120x120x12
753366	3	ERP: GROUND BRUSH
10205189	1	ERP: FILTER 150 MY
10206938	2	ERP: BRAKE PAD ASSY
10207981	10	ERP: BRUSH/BRUSHHOLDER W/SCREWS BGB
14913950	1	ERP: CONT. DISPOSABLE SKF 5KG
14925850	3	ERP: 14925850
29008687	2	ERP: O-RING VITON D187,3x7 SH90
29008759	2	ERP: SEAL VITON D191x8x2,3 SH70 THD
29016725	1	ERP: SEAL KIT F RETURN LINE FILTER
29016726	1	ERP: HYDR FILTER 3mu DIN 24550-400
29020328	1	ERP: O-RING kit
29050768	As necessary	ERP: SCREW-IN FILTER G3/4" 1000MY

Item no.	Quantity	Description
29086210	2	ERP: FILTER F CUBE POWER COOLING
29084254	8	ERP: BATTERY VRLA 12V 12AH
29084907	As necessary	ERP: GEAR OIL HOSE ø12 L= 621 MM
29088200	1	ERP: UPS SYSTEM COMBINED 3MW
60014621	5	ERP: FILTERPAD PFM2X000-54 119X119MM
75950233	2	ERP: FILTER 435x410 F. DOOR
76000524	1	ERP: PI 8308DRG FILTERELEMENT
S092044	1	ERP: FILTER M. PF 2000/3000 210x210
S092676	3	ERP: FILTERPAD PFANNENB. PFA 40.000
132503	2	ERP: BONDED SEAL 3/8"BSP M16
29186057	1	ERP: GLASS FIBER MESH 3MICRON

Spare parts for service during the next 18 years are different.

9 Consumables

0027641279

Table 9.1: Consumables

Item no.	Quantity	Description
294057	As necessary	ERP: SAFETY MASK, 3M FFABE1P3D
234900	As necessary	ERP: ALCOHOL DENATURED 93% 1/2 LITRE
S096181	As necessary	ERP: CLEANING COMPOUND,SOLV,AQUA PETROSOL,5L
198004	As necessary	ERP: CLOTH,CLEANING,PAPER,355 mm,155 mm
160020	1	ERP: CORROSION INHIBITOR,KEMA ZN-595,500ML
160019	1	ERP: PAINT,SPRAY,BELTON,RAL 5003,400 ml
298200	1	ERP: RUST ARRESTING COATG,SUVO NONNAFTA,5L CA
149053	1	ERP: RUST ARRESTING COATG,KEMA ELS-33,500 ML
149394	As necessary	ERP: ANTIFREEZE-PREMIXED 50/50, 20 L
231082	As necessary	ERP: SOLO SMOKE DETECTOR TESTER 250ML
230099	As necessary	ERP: FS-35A FROSTSPRAY 300ML
149190	As necessary	ERP: GREASE,KLUBERPLEX BEM 41-132,400G
149156 or 29102565	11 (if pump is empty)	ERP: GREASE, SHELL GADUS S5 T460 1.5,380G or ERP: GREASE SHELL GADUS S5 T460 1.5
149263 or 29092990	7 (if pump is empty)	ERP: GREASE,KLUBERPLEX AG11 462,600G or ERP: GREASE,KLUBERPLEX AG11 462,450G
14925850	As necessary	ERP: GREASE,KLUBERPLEX BEM 41-141,5KG

Item no.	Quantity	Description
29021547	As necessary	ERP: SHELL OMALA S4 WE 320 10L
298202	As necessary	ERP: DEGREASER V V75
221004	As necessary	ERP: ADHESIVE,LOCTITE 270,50ml
221007	As necessary	ERP: THREADLOCKER LOCTITE 242 50ML
29210369	As necessary	ERP: SHELL GADUS S5 V110KP 1 5KG

10 Weights

0011449217

This section is not relevant to this procedure.

11 Estimated time use

0011449216

This section is not relevant to this procedure.

12 Work sequence of the scheduled service inspection tasks

0024576767

The scheduled service inspection tasks come in sections with numbers that give a standard work sequence. The work sequence starts with how to prepare for service and ends with how to complete the work. The user can change the standard work sequence of the sections other than the functional safety test between start and finish sections. The user is fully responsible for the changed work sequence.

If the optimised work sequence is not the most satisfactory method to do the scheduled service, it is not mandatory. It is highly appreciated that the technicians share their feedback with the service lean department to improve the quality of the sequences.

Email : lean-sequence@vestas.com

Functional safety test

The functional safety test, which includes the test of emergency stop buttons, must be completed as the first test before the scheduled service starts, and it must be done once every 12 months. A longer interval cannot be accepted between the functional safety tests.

It is mandatory to do the yearly test of all the emergency stop buttons in the wind turbine, one after the other, and before other tests that use an emergency stop button, such as test of the brake.

The emergency stop buttons are then safe to use in emergency situations, and as part of other tests and inspections.

13 Prepare for service

0027452634

13.1 Rotor lock

13.1.1 Location of the service technician

0027169907

Operate the rotor lock system from the left-hand side of the nacelle.

The location of the service technician in the nacelle is given in the figure that follows.

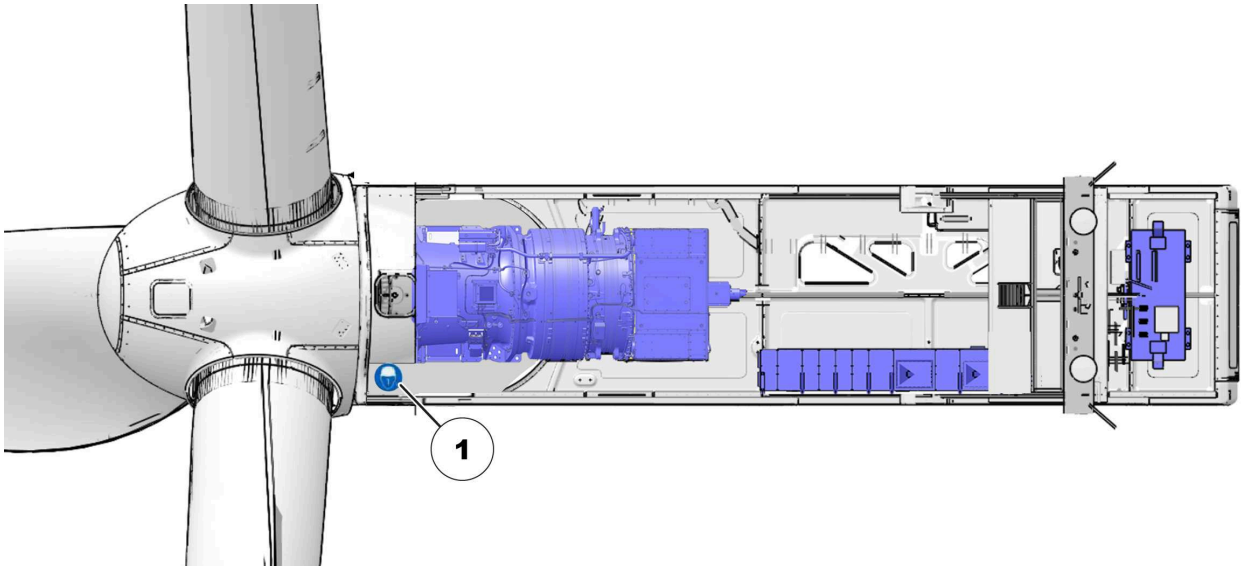


Figure 13.1: Top view of the nacelle

1 Area of operation for the service technician

13.1.2 Procedure to lock the rotor

0025648317

Risk related to rotating parts! SPRA ID No. 5.01

- Stop the wind turbine to prevent unintended start and remote operation.
- Obey the applicable LOTO procedures.
- Lock the rotor mechanically according to applicable LOTO procedures to prevent all rotation of the parts before you start to do the work.

Risk of damage to the rotor lock!

- Do not try to lock the rotor when the rotor turns.
- Always engage the mechanical brake before you lock the rotor.

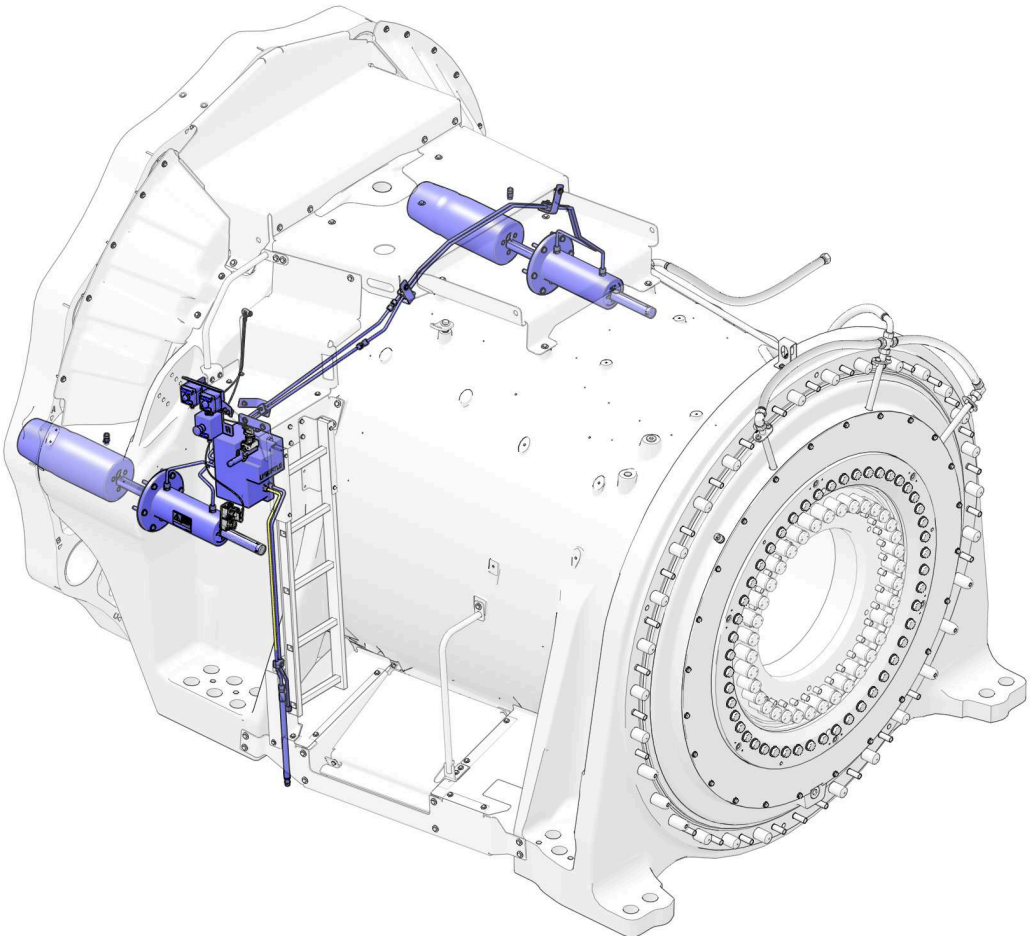
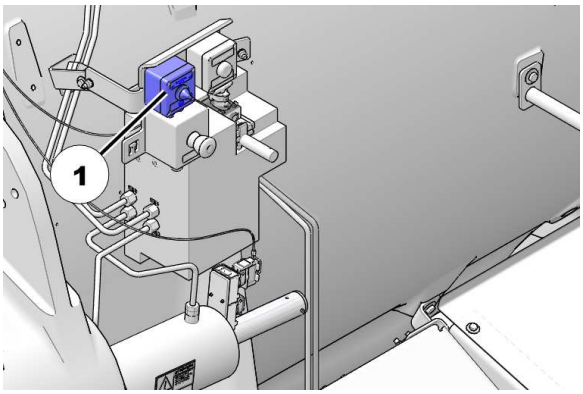


Figure 13.2: Rotor locking system

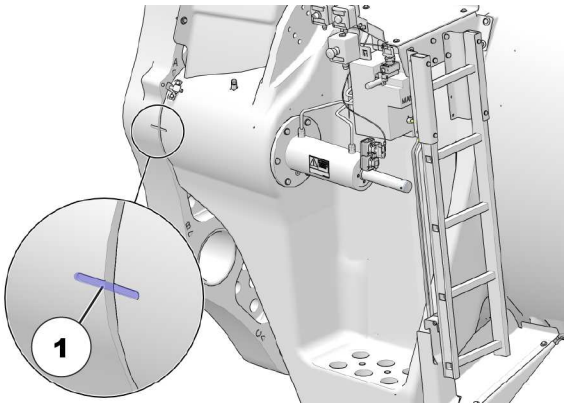
1 Operate the manual brake switch (1) to engage the mechanical brake.



2 Release the mechanical brake to adjust the rotor to align the rotor lock marks.

3 Engage the mechanical brake when the rotor lock marks (1) are aligned.

When the mark on the rotor lock disc is aligned with the reference mark, the rotor lock pins can be engaged.



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4 Use the valve handle to open the manual valve in the rotor lock manifold.

---

5 Make sure to do the steps that follow before you activate the HPU in the nacelle:

a Turn the mode selector switch to position 4.

b Activate the -615 08-S4 ‘Enable Controller Outputs’ selector in the ++03 nacelle control panel.

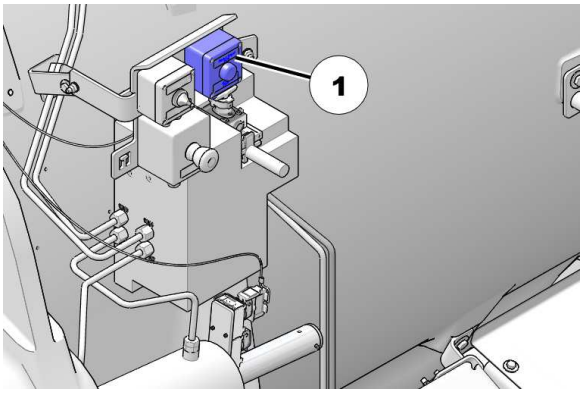
c Push the reset button.

---

6 Push the manual pressure switch (1) constantly to activate the HPU.

The manual pressure switch is a momentary switch.

Pressurised flow to the HPU is necessary to activate the rotor lock.



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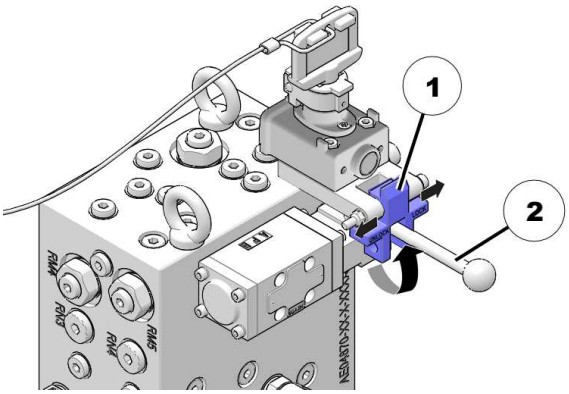
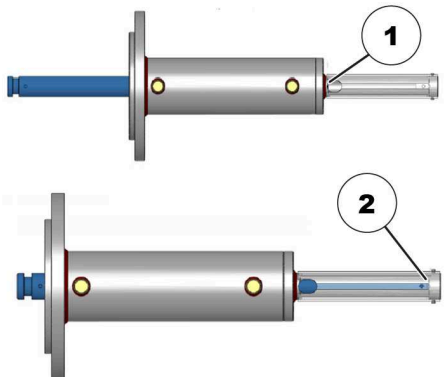
7 Lift the locking plate (1) and move the handle (2) to the lock position (engage).



8 Do a visual inspection to see if the 2 rotor lock pins are fully engaged.

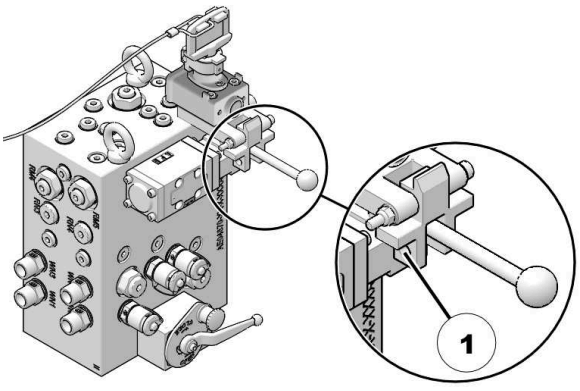
The transparent cover on the hydraulic cylinders shows the position of the piston rod. The cylinder cover includes additional marks for fully engaged (1) and disengaged (2) positions.



9 After the rotor lock pins are fully engaged, use the valve handle to close the manual valve.

The manual valve must be in the open position when the rotor lock is used and must be in the closed position at all other times.

10 Do the LOTO procedure at position (1) after the rotor lock pins are engaged.



13.2 To install fishnet on the blades

0016349400

Before you start service, repair, or a replacement task, install the fishnet on the blades according to ‘Installation and removal of fishnet’ or ‘Installation and removal of fishnet on blades with serrations’ in section ‘Reference documents’ to prevent blade damage caused by edgewise vibration.

13.3 General rules for service inspection

13.3.1 Hearing protection

0011411821

Risk of high noise! SPRA ID No. 9.03

- Do not use the tools for a longer time than what is given in the user manual.
- Maintain the tools as given in the user manual.
- Examine the noise level in the user manual for the tool.
- Use the necessary PPE that is given in PPE sheet 10.

Make sure that you use hearing protection when the wind turbine is in operation or when you do work at a noise level of more than 80 dB. For example, when the hydraulic pump is in operation.

- Do not use hearing protection when you examine the gear and/or the generator for noise.

13.3.2 Hydraulic tools

0011411820

Risk of high-pressure fluid! SPRA ID No. 9.01

- Only qualified persons are allowed to do the work.
- Make sure that the pressure system is calibrated and examined in intervals by a qualified person.
- Do a visual check of the system for abnormalities before you start the work. Include gaskets and seals in the check.
- Examine the pressure before you start the work.
- Do not connect the high-pressure hose before the bolt-tensioning cylinder is seated and correctly attached to the nut.
- Do not hold pressure hoses by hand when tools are in operation.
- Use the necessary PPE that is given in PPE sheet 15.

Risk related to rotating parts! SPRA ID No. 9.02

- Obey the manufacturer’s instructions to operate the equipment.
- Keep fingers and other body parts away from operation areas.
- Under normal conditions where communication between 2 service technicians (tool operator and torque wrench handler) can be established, the operation of the torque wrench must be done by 2 service technicians. Only under the condition that clear communication between 2 service technicians cannot be established, operation (both operating and handling of the torque wrench) by a single service technician is allowed.
- Use the necessary PPE that is given in PPE sheet 15.

Risk of high-pressure fluid! SPRA ID No. 9.04

- Do not allow the pressure to exceed the predefined pressure.
- Stay clear of the cylinders and pressurised hoses.

- Make sure that you handle the hydraulic tools carefully.

13.3.3 Tightening torque

0016734769

13.3.3.1 To do a check of the bolts

0015246520

See ‘Torque wrench settings’ for information on bolt types and bolt lubrication.

See ‘Bolt connections’ for information about torque values.

See 0004-1976 ‘Bolts torque-fibreglass parts’ for information about torque settings for bolts in the fibreglass parts.

- Before you do a check of the bolts, read the section ‘How to use this document’ in ‘Torque wrench settings’ or ‘Bolt connections’.
- See 935145 ‘Torque settings for electrical equipment’ for information about torque settings for the electrical components.

When you tighten all the bolts in the assembly, apply the original torque values.

Visually examine all the load-transmitting bolted connections at each service inspection.

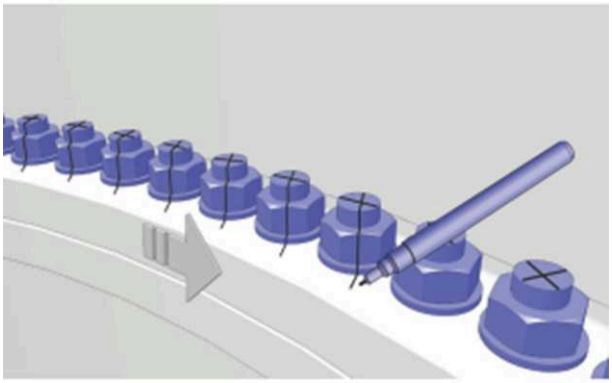
13.3.3.2 To make a mark on the bolts after tightening

0011411819

Risk of damage to the bolts!

- Make sure that the correct torque is applied.
- The bolts must not be marked before they are tightened to the correct torque value.
- When you identify bolts and nuts with marks, make sure that the marking extends from the top surface, down the side, and onto the mating surface. This to make sure that future inspections can verify that the bolt or the nut has not come loose.

- Tighten the bolts.
- Make a mark on the bolts after they are tightened with the final torque. This makes it easy to find the bolts which are not tightened to final torque.



13.4 To prepare the wind turbine

0029155106

1 Disable the auto yaw.

2 Do the LOTO procedure as it is necessary for the service inspection.

3 Lift all the necessary tools and equipment into the nacelle.

13.5 To do a check of the warning log

0015246521

- Do a check of the warning log in the menu **7: WARNINGLOG** for warnings on the controller panel.