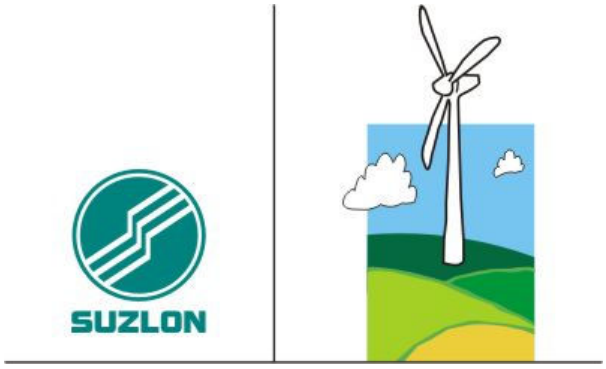

MAINTENANCE MANUAL
S52-600 KW, STV/LTV

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Scope

This document is valid only for SUZLON S52-600 kW turbine in following variant:

- 50 / 60 Hz
- Standard and low temperature version (STV / LTV)
- Lattice tower
- All grid variants

1 Introduction

The conventional components of a wind turbine - as shafts, bearing, gearbox and generator - require as much maintenance as other technical plants. The maintenance and its intervals are prescribed by the component manufacturers.

The maintenance activity on a WTG is of extreme importance and should be done with the utmost care and precision because of the following reasons:

1. The environmental conditions affecting wind turbines are extremely harsh – preferred sites are located e.g. in coastal areas with saline air, which causes increased corrosion at metal components.
2. Also, the load changes experienced by a WTG are much higher than any other machinery.

The above factors are very crucial in causing material fatigue and hence the maintenance activity must be done in a very systematic manner to ensure the life and performance of the WTG.

1.1 Structure of the Maintenance Manual

The Maintenance Manual consists of several documents. The first document is the Safety Manual, which has to be read carefully by every single person who works with, at or on a SUZLON wind turbine.

The central document is this document on hand. It describes all necessary maintenance works and their intervals to carry them out. Not experienced maintenance personnel should take this description with them during work.

Complex or difficult work steps are described detailed in Procedures. More experienced maintenance personal can just carry these Procedures with them to the turbine. The procedures are valid for all turbine types.

The maintenance work has to be reported in the maintenance checklist. This list must be filled during the maintenance work. Done work and remarks must be filled into the checklist. After completing maintenance work, the check list has to be handed over to the team leader for checking and eventual necessary actions. At last it has to be archived in the turbine history folder.

Bigger damages have to be recorded separately with the serial number of the component. The team leader has to be informed for further actions.

The done maintenance work has to be certified in the Turbine Logbook which is located in the bottom cabinet of each turbine.

Following documents form a complete Maintenance Manual. Please ensure to have them complete before preparing and performing the maintenance:

Safety Manual	WD 00060
Maintenance Manual for S52-600 kW	WD 00012
Maintenance Checklist for S52-600 kW	WD 00017

Lists:

Standard Tool List	WD 00108
Special Tool List for S52-600 kW	WD 00069
Lubrication Chart for S52-600 kW	WD 00053
Tool List for Maintenance for S52-600 kW	WD 00013
Spare Part List for S52-600 kW	WD 00014

Procedures:

Checking bolt connections	WD 00022
Component paint repair	WD 00023
Tower paint repair	WD 00024
Blade and nacelle cover paint repair	WD 00043
Blade maintenance	WD 00025
Blade repair	WD 00044
Checking backlash	WD 00045
Pitch battery test and exchange	WD 00027
Pitch drive oil issues	WD 00028
Gear box oil issues	WD 00030
Slip ring maintenance	WD 00031
Mechanical brake issues	WD 00032
Generator alignment	WD 00035
Yaw drive oil issues	WD 00037
Applying hub lock	WD 00040
On board crane handling	WD 00041
Grease exchange main bearing	WD 00048
Maintenance of earthing system country and local specific	WD 00042
Lattice tower torquing	WD 00021

1.2 About this document

This document is a guideline to the maintenance personnel for performing the preventive maintenance for the Suzlon S52-600 kW Wind Turbine Generator (WTG). This document gives the check points and works which must be undertaken at specific intervals of time to ensure that the WTG is operating successfully with the expected availability.

The Suzlon R&D Department welcomes any suggestion/corrections for improvement from users of this maintenance manual, via e-mail to documentation@suzlon-wind.de, so that they may be incorporated in the next revision of the manual.

The maintenance instructions on hand describe the maintenance works that have to be carried out component by component.

The necessary working steps are listed in charts with the following columns:

1.	**No.**	Number of the working step (corresponding to the working step number in the maintenance check list.
2.	**Determination**	Determination of the component that has to be maintained.
3.	**Maintenance interval**	Period of time after that the maintenance step has to be carried out:
	500 h ->	Once after the first 500 hours of operation (non-recurring).
	1/2 ->	Regularly every half year.
	1 ->	Regularly once a year.
	5 ->	Regularly every five years.
		The first maintenance must be carried out only after the turbine has been operating for 500 hours.
4.	**Working step**	Maintenance step that has to be carried out. In some cases, a more detailed description of the working steps can be found in procedures which are referred to. Otherwise and in addition, see the component manufacturer's maintenance instruction for further details.
5.	**Required status / -value**	The status the component / item have to have after successful maintenance.
6.	**What to do in case of deviations?**	The description of the steps that have to be carried out, if the component or status differs from the desired condition.

Please carry this manual with you while proceeding for maintenance work. Further details regarding lubricants and torques can be obtained from the turbine specific lubricant and torque lists (refer chapter 1.1).
The maintenance work must be reported in the Maintenance Checklist. For each maintenance interval 500 hours (non-recurring), half yearly, yearly and five yearly (recurring) please use the corresponding column in the Maintenance Checklist for the check points and remarks. The Maintenance Check list does not contain detailed explanations of the working steps.

2 Carrying out the maintenance work

The maintenance must be carried out by companies authorized by SUZLON only.

2.1 Preparation before maintenance

Before beginning the maintenance activities ensure the following:

Caution!	Read the safety manual (WD 00060) carefully before beginning any maintenance activity!

1. Read this maintenance manual carefully before beginning any maintenance work.
2. Compile all necessary documents, listed in chapter 1.1.
3. Evaluate the previous maintenance check lists.
4. Check up the latest data of wind turbine (latest errors, actual condition).
5. Check the type and grade of lubricant currently being used in the WTG (refer lubrication list) and ensure the same is available for re-filling if required.
   DO NOT use any other type/grade of lubricant other than those specified in the lubrication list.

Caution!	**DO NOT** mix different types of lubricants! Refill ONLY the same type/grade of lubricant that was in use previously!

6. Compile and inspect all needed tools, gauges and spare parts for completeness and usability. Refer the turbine specific Maintenance Tool List.
7. Pack the necessary tools and materials for transport by service car and on board crane.
8. Inform the WTG operating personnel in advance regarding the maintenance schedule to prevent accidental start up.
9. Keep the maintenance checklist ready.
10. Keep "Man at work in the nacelle" or "Man at work in the hub" board in the control room to prevent accidental start ups.

Caution!	Check the weather conditions for any signs of thunderstorm, prior to beginning any maintenance activity! **For all maintenance works:** Follow the instruction in the safety manual (WD 00060) under any circumstances and during every maintenance. Fill in the maintenance check list belonging to this manual carefully.

In case of complaints in any component, record the serial number and document it.

As a principle, the WTG has to be left clean after every maintenance work. Refer to the checklist, mentioned at the end of this document, which must be followed after completing all maintenance work and before leaving the turbine.

Caution!	In addition to the information provided in this manual, the maintenance instructions of the component manufacturers have to be followed under any circumstances.

2.2 General maintenance works

2.2.1 Checking torques

A major action during maintenance is the checking of torques. Mostly this must be done by samples. These sample bolts must be marked so that different bolts can be chosen at the next maintenance.
Due to the complexity of bolts and bolt connections attention must be paid on the way how to check torques. There is a special procedure defined of how to check torques. Please refer to WD 00022 and follow this procedure.

2.2.2 Paint damages

It is not mentioned in the following description of the maintenance works that all surfaces have to be checked for paint damages. This is a matter of course. Please refer to following procedures and follow them.:

Component paint repair	WD 00023
Tower paint repair	WD 00024
Blade and nacelle cover paint repair	WD 00043

3 Maintenance

3.1 Functional test of safety system

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviations?
1.	Emergency-off switch, tower bottom cabinet	1	Functional test, turbine in operation: Press the push-button, pull it out again after testing	Status "Safety chain open", "Emergency stop power cab." and braking program 6 have to occur	Search and remove error
2.	Emergency-off switch, tower bottom capacitor cabinet	1	Functional test, turbine in operation: Press the push-button, pull it out again after testing	Status "Safety chain open", "Emergency stop power cab." and braking program 6 have to occur	Search and remove error
3.	Emergency-off switch, tower bottom, TRCO cabinet (if applicable)	1	Functional test, turbine in operation: Press the push-button, pull it out again after testing	Status "Safety chain open", "Emergency stop power cab." and braking program 6 have to occur	Search and remove error
4.	Emergency-off switch, top cabinet	1	Functional test, turbine in operation: Press the push-button, pull it out again after testing	Status "Safety chain open", "emergency stop tower" and braking program 6 have to occur	Search and remove error
5.	Emergency-off switch, yaw platform (optional)	1	Functional test, turbine in operation: Press the push-button, pull it out again after testing	Status "Safety chain open", "emergency stop tower" and braking program 6 have to occur	Search and remove error
6.	Earth leakage protection device (RCCB), bottom cabinet	1/2	Press the test button provided and the device should trip.	Should trip.	Exchange if the device does not trip.
7.	Earth leakage protection device (RCCB), top cabinet	1/2	Press the test button provided and the device should trip.	Should trip.	Exchange if the device does not trip.

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviations?
8.	Over speed test FR1 Module	1	1. Change the setting of the FR1 Module to 05.0 Hz. 2. Reset the turbine to get speed. 3. Over speed error must occur at a generator speed of 454 rpm 4. Change setting to default = 19.8 Hz	With setting of 05.0 Hz: Over speed error with 7 rpm rotor speed or 454 rpm generator speed	Search and remove error
9.	Vibration sensor	1	Functional test, turbine in operation: Push the dog tail	Status "Safety chain open", "Vibration" and braking program 6 have to occur	Search and remove error
10.	Stop button hub	1	**Caution:** Do this test only with locked rotor. Move the blades to 60° via service menu. For this choose the page "Turbine - Service" in the menu. Press one push-button, pull it out again after testing and reset the turbine. Repeat the procedure with all stop buttons.	This action brings 2 blades into feathering position, the blade pointing towards the stop button remains in its original position	Search and remove error
11.	Battery capacity	1	Make a battery test via service menu. For this choose the page "Turbine - Service" in the menu. Observe the monitored battery voltage during the test. If voltage decrease to 200 V during test -> change the whole set of batteries of this blade	Voltage more than 200 V during battery test. No error during test	Exchange **all** batteries. Refer **footnote 1)** and **Procedure WD00027**
12.	Temperatures	1/2	Check the maximum temperatures listed in the control system and note them. Refer **footnote 2)** Reset the maximum list	Below the limits	Inform Suzlon O&M
13.	Fire extinguisher	1	Check whether it is time to maintain the fire extinguisher – see the label for this (valid for two years)	Maintenance label valid for further use	Hand over the fire extinguisher for maintenance

1) Battery exchange

The lifetime of batteries depends on charge and discharge characteristic and the surrounding temperature. Mentioned below are some ambient temperatures and the corresponding life of the batteries:
Mean operating temperature 15 °C -> every 4 years
Mean operating temperature 25 °C -> every 3 years
Mean operating temperature 30 °C -> every 2 years
Depending on the charge and discharge conditions, the lifetime differs from the above values, but never more than the lifetime mentioned.

Caution! All batteries of a battery bank must be changed at the same time, because the battery with the lowest capacity defines the capacity of the whole battery bank.

2) Temperature list

Component	Position	Warning limit [°C] (reduced power)	Shut down limit [°C]
Gear box	Oil sump	>78	>80
	Bearing high speed shaft driven side (HSS DE)	>98	>100
	Bearing high speed shaft not driven side (HSS NDE)	>98	>100
Generator	Winding L1	>148	>150
	Winding L2	>148	>150
	Winding L3	>148	>150
	Bearing DE	>98	>100
	Bearing NDE	>98	>100
Main bearing	Bearing	>48	>50

3.2 Operational Check

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviations?
1.	Operational behaviour of the generator	1/2	Audio check	No irregular noises or vibrations	Inform Suzlon O&M
2.	Operational behaviour of the gearbox	1/2	Listen and feel the behaviour during turbine operation	Normal sound and vibrations	Inform Suzlon O&M
3.	Operation of the yaw	1/2	Functional and audio test	No irregular noises	Inform Suzlon O&M
4.	Sound of rotor	1/2	Listen to the sound of the rotor (blades and hub) during rotation. Listen from nacelle and at 100 m distance.	No rattling, whistling, snapping or similar sounds during normal operation	Determine and remove error. If not possible inform Suzlon O&M.

3.3 Blades

Caution! Stop the WTG and lock the rotor before starting the works!

During blade maintenance please also refer Procedure WD00025 and WD00044.

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviations?
1.	Surface condition	1	Inspection of the surface with human cage or rope down. Refer **Procedure WD00025**	No damages, cracks or buckles	Inform Suzlon O&M in case of larger damages, otherwise refer **Procedure WD00025**
2.	Blade lamination check	1	Knock the blade to find out delaminations	No delaminations	Inform O&M
3.	Internal inspection	1	Internal check of the blade. Refer **Procedure WD00025**		
4.	Vent hole at the tip	1	Inspect the hole with a long, thin wire	About 100 mm deep and open	Open vent hole with a min. 80 mm long 5 mm-drill.
5.	Blade root cover	1	Visual inspection of sealing and tightness check	Tight, sealing o.k.	Determine and remove error
6.	Silicon seam at the blade root	1	Visual inspection	Closed	Repair in case of damage
7.	Blade stud condition check	1	Screw out one stud and check for corrosion	No corrosion. Mark the test stud. Choose a different stud at the next maintenance check.	Exchange O-ring. Inform Suzlon O&M
8.	Blade to slewing ring stud pretension	500 h 1	Check the tightening torques on the 5 indicator bolts (if existing). Otherwise make sample checks. Refer **Procedure WD00022**	Indicator bolt must be tight	Refer **Procedure WD00022.** Refer special torque list
9.	Protection caps	1	Visual inspection	Available	Add
10.	Spark gap	1	Check the spark gap distance at root, inspect the conducting joint.	Distance of 1 mm between arrester and blade bearing. No damages or corrosion No braise traces at the blade tips	Adjust and clean the clearance, exchange if necessary
11.	Corrosion around spark gap	1	Check the area around the blade spark gaps for corrosion.	No corrosion	Preserve

3.4 Hub

Caution! Stop the rotor and lock the rotor before starting the work at the blades!
The rotor lock must not be used at wind speeds exceeding **10 m/s**! If already locked, stop all work, leave the hub and unlock the rotor. Before starting work of longer duration, check the weather conditions!
Red cables are active even when the main switch is switched off (UPS- or battery buffered)

3.4.1 Nose cone

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Hub to nose cone connection	1	Looseness-check 4 samples	Tight	Re-tighten
2.	Connection between the nose cone parts	1	Looseness-check 4 samples	Tight	Re-tighten
3.	Sealing	1	Visual inspection	Silica seams must be sealed. and water tight	Renew
4.	Cracks in nose cone	1	Visual inspection	No cracks	Repair. Inform Suzlon O&M
5.	Hub door	1	Visual inspection for water tightness and proper closing	Water tight, joints and lock o.k. and closing	Repair

3.4.2 Hub

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Leak tightness	1/2	Visual inspection for water that might have leaked into the hub	Dry	Identify the leaking areas and seal
2.	Lightning rod - spinner - hub connection	1	Visual inspection for corrosion and re-tighten all bolts	Tight	Re-tighten
3.	Step to hub connection	1	Visual inspection, looseness check 4 samples	Tight	Re-tighten
4.	Fixing of the ladder	1	Visual inspection, looseness check 4 samples	Tight	Re-tighten
5.	Cracks and corrosion of hub body	1	Visual inspection. The area around the pitch drive mounting area has to be controlled closely	No cracks, no corrosion	Preserve in case of corrosion, inform Suzlon O&M immediately in case of cracks
6.	Hub to rotor shaft flange connection	1	Looseness check 4 samples, mark the sample bolts	80% of nominal torque, refer special torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
7.	Condition of slewing ring to hub connection	1	Visual sample check of corrosion. Take out a few caps to check for corrosion	No corrosion, caps filled with grease	Preserve
8.	Slewing ring to hub connection	1	Looseness check 4 samples per bearing, mark	80% of nominal torque, refer special torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
9.	Slewing ring and pinion teeth flanks	1	Visual inspection in the load area	No damages	Inform Suzlon O&M
10.	Slewing ring teeth	1/2	Consult the lubrication chart about the appropriate grease type	Greased evenly	Grease the slewing ring teeth
11.	Backlash	1	Check the backlash. Refer **Procedure WD00045**	The value must be between 0.3 to 0.4 mm	Adjust the backlash Refer **Procedure WD00045**
12.	Greasing of slewing ring	1/2	Manual lubrication. Consult the lubrication chart about the appropriate grease type and adjustment.		
13.	Check the tightness of limit switch/encoder box	1/2	Check the tightness	Assembled tightly	Re-tighten
14.	Pinion of the limit switch/encoder box	1/2	The teeth of the pinion and the slewing ring must engage fully to avoid slipping	Good position	Re-position
15.	Cable fixation outside the control cabinet	1	Check the tightness, visual inspection for damages, oil	Assembled tightly, undamaged, no oil	Fasten, exchange

3.4.3 Pitch drives

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Pitch drive to hub connection	1	Looseness check 4 samples per drive, mark	80% of nominal torque, refer special torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
2.	Check for leakage	1	Visual inspection	No leakage	Seal, replace the gasket
3.	Oil level	1/2	Visual inspection Refer **Procedure WD00028**	Full	Refill, check for leakage

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
4.	Oil sample	1	Take a 100 ml oil sample for analysis. Refer **Procedure WD00028** **Caution:** Refill the amount of oil that was taken!	Consider the lubricant manufacturers information	Oil exchange Refer **Procedure WD00028**
5.	Oil exchange	If necessary (depending on results of oil analysis, 4)	Regarding the oil type refer the lubrication chart. Refer **Procedure WD00028**		
6.	Terminal box	500 h	Re-tight the connections	Tight	Re-tight
		1	Looseness check	Tight	Re-tight

3.4.4 Battery boxes

Caution! The batteries are loaded. Disconnect the connecting cable before working at the batteries.

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Battery box to U-section connection	1	Visual inspection, looseness check	Tight	Re-tighten
2.	U-section to hub mounting connection	500 h	Re-tighten all bolts	100% of nominal torque, refer standard torque list.	Replace if broken.
3.		1	Visual inspection, looseness check	80% of nominal torque, refer standard torque list.	Re-tighten all bolts to 100% of nominal torque. Replace if broken.
4.	Tight assembly of the batteries	1/2	Open the battery box, check the condition of the rubber mat. **Caution:** There is voltage on the battery clips even if the fuses have been switched off.	Batteries assembled tightly, no damages or ageing of mats.	Exchange the mats
5.	Batteries	1/2	Check the batteries for external damage or leakage. **Caution:** There is voltage on the battery clips even if the fuses have been switched off.	No damage or leakage	Exchange Refer **footnote 1)** and **Procedure WD00027**

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
6.	Humidity	1/2	Check for humidity inside the battery boxes. **Caution:** There is voltage on the battery clips even if the fuses have been switched off.	Dry	Dry and seal
7.	Battery heating (if existing)	1	Check the functioning of the heater. Refer **foot note 3)**	Should be functional.	Exchange the heater
8.	Plugs and clamping connections of the battery cables	500 h 1/2	Re-fasten all clips and connections of the battery cables up to the pitch converter. **Caution:** There is voltage on the battery clips even if the fuses have been switched off.	No broken lugs, black powder, or discolourations of the cables/connections.	Exchange the battery, change the cables. Refer **Procedure WD00027**

3) Temperature sensors:

There is a temperature sensor inside each battery box with a setting of 5 °C. The heaters are activated if the temperature is lower than the adjusted value.

3.4.5 Hub cabinet

Caution! Switch off F1.5, F1.6 at the hub cabinet and Q2.2, F6.9, F9.1, F9.4, F9.6 at the top cabinet before working in hub cabinet!

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Check tight mounting of hub cabinet	1	Visual inspection, looseness sample check	Tight	Re-tighten
2.	Support beam for door protection	1	Shake	Assembled tightly	Fix the support beam after cabinet maintenance. Use self-locking nuts
3.	Fixing of the doors	1	Shake doors when they are open	Assembled tightly	Re-tighten the hinges. Fix the girder
4.	Leak tightness	1	Visual inspection of door seals, openings of the cabinet	Dry and closed	Determine the reasons and remove them
5.	Control cabinet	1	Visual inspection for discolourings or damages of the cables, clamps or components	No discolourings, no braise traces	Remove the reasons, exchange components if necessary
6.	Mounting plate	1	Check the tightness of the mounting plate	Tight	Re-tighten
7.	All electrical plugs and clamping connections inside the cabinet	500 h	Refasten all clamps and connections. **Caution:** Check only when the WTG is switched off! **Caution:** There is voltage on the battery clips even if the fuses have been switched off.	Fixed position	Re-fix
8.	Electrical plugs and clamping connections inside the cabinet	1	Sample check of some connections	Tight	Re-tighten all
9.	Cable glands	1	Sample check of some cable glands each cabinet	Tight, no gap between cable and gland	Re-tight all, close the gap
10.	Earth connection of cable glands	1	Visual inspection of proper connection between gland nut to housing and cable screen to gland	Good earth connection, no corrosion, no paint in between	Clean the connection
11.	Sensor, fan and heating function	1	Turn the thermostat and hygrostat adjustment for the functional check, return it to the original position after checking. Refer **footnote 4)**	Function as described below, refer **footnote 4)**. Fan is operating, smoothly , no abnormal noise or vibrations	Determine and remove the reasons. Change the faulty component
12.	Exchange all filter mats	1/2	Exchange		

4) Temperature and humidity sensors:

There are 2 temperature sensors and two hygrostats:

- Temperature sensor with a setting of 30 °C: Fans are activated if temperatures exceed the adjusted value.
- Temperature sensor with a setting of 10 °C: Heater(s) is(are) activated if the temperature is lower than the adjusted value.
- 1st Hygrostat with setting of 90%: Fans are activated if the humidity exceeds the adjusted value.
- 2nd Hygrostat with setting of 90%: Heater is activated if the humidity exceeds the adjusted value.

Caution! Replace the support beam for hub cabinet doors after cabinet maintenance.

3.5 Main bearing and shaft

3.5.1 Main bearing

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Grease collection tub of main bearing	1/2	Remove the old grease	Clean	Clean
2.	Central lubrication system for main bearing	1/2	Check the quantity of the grease and fill up the grease tank	Filled	Fill
3.	Grease exchange	5	Remove the old grease, refill the bearing. Consult the lubrication chart for quantity, grease type and adjustment. Refer **Procedure WD00048**		
4.	Main bearing housing	1	Visual inspection for cracks and corrosion	No cracks or corrosion	Clean and preserve against further corrosion. Inform Suzlon O&M in case of cracks
5.	Lock nut and lock element	1	Visual inspection	Proper position of the shaft nut and lock element, no cracks in the paint	Tighten hand-tight
6.	Main bearing to main frame connection	1	Looseness check 4 samples, mark the checked samples	80% of nominal torque, refer special torque list.	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
7.	Hub lock disc	1	Visual check for corrosion or damages	No corrosion or damages	Preserve in case of corrosion, inform Suzlon O&M in case of cracks or damages

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
8.	Hub lock pin holder to main frame connection	1	Looseness check of 2 samples, mark the checked samples	80% of nominal torque, refer standard torque list.	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
9.	Main bearing fan heater (if existing)	1	Check the functioning of the heater. Refer **footnote 5)**	Should be functional.	Exchange the heater

5) Temperature sensors:
There is a temperature sensor with a setting of 5 °C. The heater is activated if the temperature is lower than the adjusted value.

3.5.2 Rotor shaft and shrink disc

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Rotor shaft	1	Visual check for corrosion or damages	No corrosion, no cracks	Clean and preserve against further corrosion. Inform Suzlon O&M in case of cracks
2.	Rotor shaft to gearbox shaft connection	1/2	Visual check for sliding of main shaft and hollow shaft. Mark shaft and disk with one line and the actual date for later inspection.	Joint without damages in painting. Mark line is straight.	Make a new mark line with actual date for next inspection and Inform Suzlon O&M.
3.	Shrink disc	500 h	Re-tighten all bolts	100% of nominal torque, refer special torque list	Replace if broken.
4.		1/2	Looseness check 4 samples, mark the checked samples	80% of nominal torque, refer special torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.

3.6 Gearbox with connections

Caution! Cleanliness has to be maintained when working at the open gearbox. Clean the area around the inspection lid before opening it. Take care that nothing contaminates the gearbox oil.
Be careful not to drop anything into the gearbox when opening the inspection lid.

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Gear box mounts to main frame connection	500 h	Re-tighten all bolts	100% of nominal torque, refer special torque list	Replace if broken.
2.		1/2	Visual inspection for signs of a relative motion of mounts and bolt head	None	Check the entire bolt connection, thread depth and condition included, inform Suzlon O&M
3.		1	Looseness check 4 samples, mark the samples checked	80% of nominal torque, refer special torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
4.	End plate to gear box mounting	1/2	Visual inspection for signs of a relative motion of mounts and bolt head	None	Check the entire bolt connection, thread depth and condition included, inform Suzlon O&M
5.		1	Looseness check of all bolts	80% of nominal torque, refer special torque list.	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
6.	Rubber buffer	1/2	Visual inspection	No major wear of rubber	Replace
7.	Silica gel breather	1/2	Change	Silica gel breather with blue gel.	Exchange if pink. If there is just a vent plug, exchange this with a silica gel breather.
8.	Tooth system	1/2	The tooth system has to be checked only by specialized gearbox persons **Caution:** Be careful not to drop anything into the gearbox through the inspection lid.		

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
9.	Mechanical pump	1/2	The functioning of mechanical pump has to be checked only by specialized gearbox persons Visual inspection of the function from the inspection lid when the WTG is idling slowly **Caution:** Before opening, clean the area around the inspection lid. Work clean. If the gears are rotating too fast, hot oil may splash. Keep your hand on the emergency switch!	Delivers oil	Inspect the internal seals, search for the reasons and remove them, replace if necessary
10.	Oil cooler	1	Visual inspection of the cooling ribs	Clean	Clean with a vacuum cleaner
11.	Oil level	1/2	Visual check of oil level through oil level glass when the turbine has been standing still for 1 to 2 hours. Refer **Procedure WD00030** **Caution:** The level must be NEVER below the mid of oil sight glass. It is dangerous to overfill the gearbox oil	Above the mid of oil sight glass	Refill oil. Regarding the oil type refer the lubrication chart. Refer **Procedure WD00030**
12.	Oil sample	500 h 1/2	Take a 100 ml oil sample for analysis. Refer **Procedure WD00030.** **Caution:** Check the oil level after taking the sample. The level must be NEVER below the mid of oil sight glass.	Consider the lubricant manufacturers information	Oil exchange. Refer **Procedure WD00030**
13.	Oil exchange	2 years for mineral oil 3 years for synthetic oil	Regarding the oil type refer the sticker mentioned on the gearbox for lubricant type. Refer **Procedure WD00030**		
14.	Visual inspection of the housing	1/2	Visual inspection of joints, pipes and outer surface	No leakages, cracks, corrosion, damaged painting	Clean, preserve. Inform Suzlon O&M in case of cracks
15.	Coarse mesh filter	500 h 1	Clean. Refer **Procedure WD00030**	No large particles	Clean, in case of large steel particles inform Suzlon O&M

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
16.	Filter element	Change during every oil change or when the clogging indicator sounds an alarm	Look out for deposits in the filter (with magnet); in case of metal pieces search for the reason (bearing, tooth system, pump, etc.)	Exchange	Exchange. Search for the reason if pieces of metal are found in the filter. Inform Suzlon O&M Refer **Procedure WD00030**
17.	Hoses	1/2	Visual inspection. The guaranteed lifetime for hoses is 5 years. After this period the visual inspection should be very close. An exchange is necessary if found damaged or cut. To check the lifetime, check the manufacturing date marked on each hose.	No damage, cracks or leakage	Replace hoses if there is damage, brittleness, cracks or leaks.

3.7 Slip ring

3.7.1 Kraus slip ring – carbon brush technique

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Fixed position of the slip ring body	500 h	Re-tighten all bolts	100% of nominal torque, refer standard torque list	Replace if broken.
2.		1	Looseness check, mark the sample bolts checked	80% of nominal torque, refer standard torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
3.	Fixing fork	1/2	Visual inspection for damages and fretting patches	The holding cable must not jam but must move freely	Correct
4.	Cleaning	1/2	Clean the interior with a vacuum cleaner only. **Caution:** Do not touch the slip ring internals.	Clean	
5.	Terminals	500 h	Re-tighten all terminals and connections.		
6.	Internal inspection	1	Visual inspection	No damaged brushes	Exchange brushes. Refer **Procedure WD00031**
7.	Exchange of brushes	1	Exchange brushes. Refer **Procedure WD00031**		
8.					

3.7.2 Kraus slip ring – gold feather technique

Caution! The slip ring must not be opened otherwise guarantee expires!

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Fixed position of the slip ring body	500 h	Re-tighten all bolts	100% of nominal torque, refer standard torque list	Replace if broken.
2.		1	Looseness check, mark the sample bolts checked	80% of nominal torque, refer standard torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
3.	Fixing fork	1/2	Visual inspection for damages and fretting patches	The holding cable must not jam but must move freely	Correct
4.	Exchange of slip ring	7 to 10	Close inspection of the quality of the feathers and rings. Exchange complete slip ring if necessary.		

3.7.3 Stemmann slip ring

Caution! The slip ring must not be opened otherwise guarantee expires!

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Fixed position of the slip ring body	500 h	Re-tighten all bolts	100% of nominal torque, refer standard torque list	Replace if broken.
2.		1	Looseness check	80% of nominal torque, refer standard torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
3.	Fixing fork	1/2	Visual inspection for damages and fretting patches	The holding cable must not get stuck but move freely	Correct the alignment.
4.	Internal inspection	1	Visual inspection	No damaged brushes	Exchange slip ring. Refer **Procedure WD00031**
5.	Cleaning and lubricating	1	Clean with vacuum cleaner and lubricate. Refer **Procedure WD00031** Caution: Do not touch the slip ring internals.		
6.	Terminals	500 h	Re-tighten all terminals and connections.		
7.	Exchange of slip ring	7 to 10	Close inspection of the quality of the feathers and rings. Exchange complete slip ring if necessary.		

3.8 Fast shaft with brake

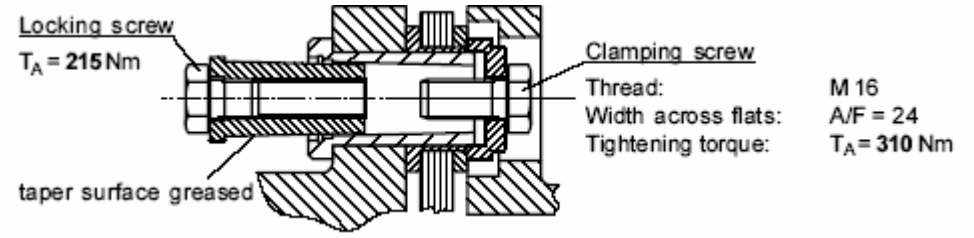
3.8.1 Brake

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Brake disc plane deviation	1	Check plane deviation of brake disk	Below 0.3 mm	Change brake disk.
2.	Brake disc	1/2	Visual inspection for overheating of tracks, corrosion, wear, rough tracks	No corrosion, overheating of tracks, wear, smooth surface	Determine and remove the reasons, inform Suzlon O&M in case of damage
3.	Air gap	1/2	Measure the clearance between passive calipers brake pad and the disc while the brake is open	Air gap of 1 mm	Adjust the air gap. Refer **Procedure WD00032**
4.	Housing	1	Visual inspection for cracks and corrosion	No cracks, corrosion	Clean and protect against further corrosion, inform Suzlon O&M in case of cracks
5.	Brake pads	1	Measure the thickness	Thickness of friction material + back plate has to exceed 27 mm	Replace brake pads. Refer **Procedure WD00032**
6.	Connection brake caliper to holder	1	Looseness check	80% of nominal torque, refer special torque list	Re-tighten all bolts to 100% of nominal torque. Replace if broken.
7.	Pad positioning screw	1	Looseness check	80% of nominal torque, refer special torque list	Re-tighten to 100% of nominal torque. Replace if broken.

3.8.2 Fast shaft

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Coupling assembly	1/2	Visual inspection for cracks	No cracks	Exchange
2.	Conical locking screw Refer **footnote 6)**	1	Looseness check 2 samples, mark the samples checked	80% of nominal torque, refer special torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
3.	Conical clamping screw Refer **footnote 6)**	1	Looseness check 2 samples, mark the samples checked	80% of nominal torque, refer special torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
4.	Fast shaft/coupling	1/2	Visual inspection for cracks and corrosion	No cracks, no corrosion	Exchange. Repair corrosion
5.	Safety rail/cover to fast shaft	1/2	Shake rail/cover to check for fixed position	Fixed position of rail/cover. For torques refer standard torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.

6) Detail of coupling



3.9 Generator

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Housing	1	Visual inspection for cracks and corrosion	No cracks or corrosion	Contact the manufacturer in case of cracks, remove the corrosion with a wire brush and preserve
2.	Generator rubber mount	1/2	Visual check for tear and extreme setting	No tear, no setting	Exchange
3.	Connection generator to generator rubber mount	1	Looseness check	80% of nominal torque, refer special torque list	Re-tighten bolts to 100% of nominal torque if found loose. Replace if broken.
4.	Connection generator rubber mount to distance plate	1	Looseness check	80% of nominal torque, refer special torque list	Re-tighten bolts to 100% of nominal torque if found loose. Replace if broken.
5.	Connection generator distance plate to cross beam	1	Looseness check 4 samples, mark the samples checked	80% of nominal torque, refer special torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
6.	Cooling system	1/2	Visual inspection for dirt	Clean	Clean the cooling pipes using round brushes
7.	DE-bearing	1/2	Grease the bearing. Regarding the grease type refer the lubrication chart	Bearings to be sufficiently greased.	
8.	NDE-bearing	1/2	Grease the bearing. Regarding the grease type refer the lubrication chart	Bearings to be sufficiently greased.	
9.	Power cable connection terminal box	500 h 1	Re-tighten the connections	Refer standard torque list	Re-tighten
10.	Stator / rotor terminals to insulator	500 h 1	Re-tighten the connections	Refer standard torque list	Re-tighten
11.	Generator alignment	500 h 1	Check the generator alignment. Refer **Procedure WD00035**	Aligned	Align. Refer **Procedure WD00035**

3.10 Yaw system

3.10.1 Yaw drives

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Drive housings	1/2	Visual inspection for cracks	No cracks	Inform Suzlon O&M
2.	Leakage	1/2	Visual inspection for leakages	No leakages	Seal
3.	Breather plug	1/2	Visual inspection	Clean and not blocked	Clean
4.	Oil sample	1	Take a 100 ml oil sample for analysis. Refer **Procedure WD00037** **Caution:** Refill the amount of oil that was taken!	Consider the lubricant manufacturers information	Exchange if necessary. Refer **Procedure WD00037**
5.	Oil exchange.	If necessary (depending on results of oil analysis, 5)	Refer lubrication chart about quantity and the appropriate oil type. Refer **Procedure WD00037**		
6.	Oil level	1/2	Visual inspection Refer **Procedure WD00037**	Oil level within the marked range	Top up oil
7.	Connection yaw drives to main frame	1	Looseness check 4 samples per drive, mark the samples checked	80% of nominal torque. Refer special torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
8.	Terminal box	500 h	Check fixing of cables	Hand tight	

3.10.2 Yaw bearing

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Gear rim and pinion teeth flanks	1/2	Visual inspection	No damages	Inform Suzlon O&M
2.	Grease the gear rim and the pinion	1/2	For the grease type refer the lubrication chart	Greased	
3.	Bolt connection gear rim to tower	500 h	Re-tighten all bolts	100% of nominal torque. Refer special torque list	Replace if broken.
4.		1	Looseness check 4 samples, mark the samples checked	80% of nominal torque. Refer special torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
5.	Lock plate to main frame	500 h	Re-tighten all bolts	100% of nominal torque. Refer special torque list	Replace if broken.

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
6.		1	Looseness check 4 samples, mark the samples checked	80% of nominal torque. Refer special torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
7.	Preload radial pressure plates	1	Looseness check 4 samples, mark the samples checked	80% of nominal torque. Refer special torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
8.	Lubrication system	1/2	Check and refill lubrication system. Refer lubrication chart about quantity and the appropriate grease type	Required quantity of grease should be present	Clean if necessary

3.11 Main Frame and Girder System

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Main frame	1	Visual inspection for cracks and corrosion	No cracks, no corrosion	Remove corrosion patches, take photos of cracks and send them to Suzlon O&M and Suzlon R&D.
2.	Girder system	1	Visual inspection for cracks and corrosion	No cracks, no corrosion	Remove corrosion patches, take photos of cracks and send them to Suzlon O&M and Suzlon R&D.
3.	Bolting main frame to girder system	500 h	Re-tighten all bolts	100% of nominal torque. Refer special torque list	Replace if broken.
4.		1	Looseness check 4 samples, mark the samples checked	80% of nominal torque. Refer special torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
5.	Girder system bolting connections	1	Looseness check 2 samples for all connection types, mark the samples checked	80% of nominal torque. Refer special torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.

3.12 Nacelle cover

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Damages at the cover wall	1	Visual inspection of ribs and connection areas	No damages	Inform Suzlon O&M
2.	Water leakage	1	Visual inspection	Dry	Define and remove the reasons
3.	Bolting at nacelle cover	1	Visual inspection / Hand checking of samples	Fixed	Re-torque according to standard torque list
4.	Bolting of the cover halves	1	Visual inspection / Hand checking of samples	Fixed	Re-torque according to standard torque list

3.12.1 Nacelle roof

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Position and tight closing of all hatches	1	Visual inspection	Sealed and closed	Repair, close
2.	Rail bolting	1	Visual inspection / Hand checking	Fixed position	Re-torque according to standard torque list
3.	Bolting of the ducts	1	Visual inspection / Hand checking	Fixed position	Re-torque according to standard torque list
4.	Fixation of the nacelle fan grills	1	Visual inspection / Hand checking	Fixed position	Re-torque according to standard torque list
5.	Cracks and corrosion at the anemometer holder	1	Visual inspection	No cracks, no corrosion	Remove corrosion, replace holder if necessary
6.	Fixation of the anemometer holder	1	Visual inspection / Hand checking	Fixed position	Re-torque according to standard torque list
7.	Bolting of anemometer and wind vane	1	Visual inspection / Hand checking	Fixed position	Re-torque according to standard torque list

3.13 Control system / Sensor system

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Alarm call	1/2	Carry out	Give notice to the CMS, let them check the alarm message	Remove error
2.	Rotor speed sensor	1	Check the position of sensor and the cable plug. Measure the distance between sensor and metal. Visual inspection for cleanliness	Fixed position, clean condition. Distance < 4 mm	Re-fix or adjust, clean
3.	Generator speed sensor	1	Check the position of sensor and the cable plug. Measure the distance between sensor and metal. Visual inspection for cleanliness	Fixed position, clean condition. Distance < 4 mm	Re-fix or adjust, clean
4.	Yaw sensors	1	Check the position of sensor and the cable plug. Measure the distance between sensor and metal. Visual inspection for cleanliness	Fixed position, clean condition. Distance < 4 mm	Re-fix or adjust, clean
5.	North position sensor	1	Check the position of sensor and the cable plug. Measure the distance between sensor and metal. Visual inspection for cleanliness	Fixed position, clean condition. Distance < 4 mm	Re-fix or adjust, clean
6.	Shake sensor at the rotor bearing	1	Check the position of sensor and of the cable plug. Visual inspection for cleanliness	Fixed position, clean condition. Weight has to be on top.	Re-fix or adjust, clean
7.	Vibration sensor	1	Check the position of sensor and the cable plug. Visual inspection for cleanliness	Fixed position, clean condition	Re-fix or adjust, clean
8.	Anemometer	1	Visual inspection for cleanliness, fixed position, fixed position of the cable plugs, plausibility of the displayed values	Fixed position, clean slot between the rotating and the stationary component of the device	Repair, replace if necessary

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
9.	Wind vane	1	Visual inspection for cleanliness, fixed position, fixed position of the cable plugs, plausibility of the displayed values	Conformance of the directions of the rotor shaft and the wind vane. Fixed position. Clean slot between the rotating and the stationary component of the device	Repair, replace if necessary

3.14 Electronic devices

Caution! Only work at the control cabinets when the main switch has been switched off! Red cables are active even if the main switch has been switched off (UPS- or battery buffered)!

3.14.1 Nacelle wiring

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Cracks, wear, oil on nacelle wiring	1	Visual inspection	No damages, no oil	Search and remove errors, clean
2.	Condition of the cable ducts	1	Visual inspection	O.k., no wearing of cables	Close the lid, repair, clean
3.	Power cable clamps	1	Check tightness of cable clamps	Tight	Re-tighten
4.	Nacelle fan	1	Functional check	Smooth running, good performance	Clean, exchange if necessary (about every 5 years)
5.	Nacelle fan	1	Visual check	Not dirty	Clean, if necessary
6.	Nacelle light	1	Functional check	Functioning	Repair

3.14.2 Top cabinet

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Stability	1	Visual inspection / Hand checking	Solid standing	Re-torque according to standard torque list
2.	Leak tightness	1	Visual inspection for humidity or moisture. Check the door seals	Dry, sealed	Exchange the seal, shut the openings
3.	Inside the cabinet	1	Visual inspection for heat discolourations or damages at cables, clamps or components	No discolouring, no smoke traces	Remove the reasons, exchange component if necessary
4.	Power connections and bus bars	500 h	Re-tighten all connections with given torques. Refer torque list inside the cabinets. **Caution:** Check only with switched off main switch. Be careful with red cables - battery buffered.	Tight	Re-fasten
5.	All electrical terminals and components connections inside the cabinet	500 h	Re-tighten all terminals and connections. **Caution:** Check only with switched off main switch. Be careful with red cables - battery buffered.	Hand-tight	Re-fasten
6.	Power connections and bus bars	1	Re-tighten all connections with given torques. Refer torque list inside the cabinets	Tight	Re-fasten
7.	All electrical terminals and components connections inside the cabinet	1	Sample check of some connections	Hand-tight	Re-fasten all connections
8.	Cable glands	1	Sample check of some cable glands in each cabinet	Tight, no gap between cable and gland	Re-tight all, close the gap
9.	Sensor, fan and heating function	1	Turn the thermostat and hygrostat adjustment for the functional check, return it to the original position after checking. Refer **footnote 7)**	Function as described below **7).** Fan is operating, smoothly.	Determine and remove the reasons. Exchange faulty component
10.	Exchange the filter mats	1/2	Exchange		
11.	Surge arrester	1/2	Check	Phoenix indicator should be green	Exchange if indicator is red

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
12.	Filter mats of the air conditioner, if existing	1/2	General cleaning	Clean	Clean, exchange if necessary
13.	Function of air conditioner if existing	1	Turn the thermostat and hygrostat adjustment for the functional check, return it to the original position after checking.	Fan is operating, smooth running.	Determine and remove the reasons. Exchange if necessary.

7) Temperature and humidity sensors:

There are 2 temperature sensors and two hygrostats:

- Temperature sensor with a setting of 30 °C: Fans are activated if temperatures exceed the adjusted value.
- Temperature sensor with a setting of 10 °C: Heater(s) is(are) activated if the temperature is lower than the adjusted value.
- 1st Hygrostat with setting of 90%: Fans are activated if the humidity exceeds the adjusted value.
- 2nd Hygrostat with setting of 90%: Heater is activated if the humidity exceeds the adjusted value.

3.14.3 Bottom cabinets and LVRT (if existing)

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Stability	1	Shake	Solid standing	Re-tighten
2.	Leak tightness	1	Visual inspection for humidity or moisture, check the door seals	Sealed	Exchange seals, shut openings
3.	Inside the cabinets	1	Visual inspection for heat discolourations or damages at cables, clamps or components	No discolouration, or damage.	Remove the reasons, exchange components if necessary
4.	Power connections and bus bars	500 h	Re-tighten all connections with given torques. Refer torque list inside the cabinets. **Caution:** Check only with switched off main switch. Be careful with red cables - battery buffered	Tight	Re-fasten
5.	All electrical terminals and components connections inside the cabinet	500 h	Re-tighten all terminals and connections. **Caution:** Check only with switched off main switch. Be careful with red cables - battery buffered	Hand-tight	Re-fasten

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
6.	Power connections and bus bars	1	Re-tighten all connections with given torques. Refer torque list inside the cabinets	Tight	Re-fasten
7.	All electrical terminals and components connections inside the cabinet	1	Sample check of some connections	Hand-tight	Re-fasten all connections
8.	Cable glands	1	Sample check of some cable glands in each cabinet	Tight, no gap between cable and gland	Re-tight all, close the gap
9.	Sensor, fan and heating function	1	Turn the thermostat and hygrostat adjustment for the functional check, return it to the original position after checking. Refer **footnote 8)**	Function as described in **footnote 8)** Fan is operating, smoothly.	Determine and remove the reasons. Exchange the faulty component
10.	Exchange filter mats	1/2	Exchange	Clean	
11.	Surge arrester	1/2	Check	Indicator should be green for Phoenix	Exchange if indicator is red
12.	Pre-fuses of the surge arrester	1/2	Check	Intact	Exchange

8) Temperature and humidity sensors:

There are 2 temperature sensors and two hygrostats:

- Temperature sensor with a setting of 30 °C: Fans are activated if temperatures exceed the adjusted value.
- Temperature sensor with a setting of 10 °C: Heater(s) is(are) activated if the temperature is lower than the adjusted value.
- 1st Hygrostat with setting of 90%: Fans are activated if the humidity exceeds the adjusted value.
- 2nd Hygrostat with setting of 90%: Heater is activated if the humidity exceeds the adjusted value.

3.15 On board crane

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Check support and housing for corrosion and cracks	1	Visual inspection Refer **Procedure WD00041**	No cracks, no corrosion	Clean and preserve against further corrosion, inform Suzlon O&M in case of cracks
2.	End switch	1	Functional test	Should shut down as soon as the switch is triggered	Repair or exchange
3.	Clean and lubricate chain	1	Clean and lubricate the chain	Lubricate with greased cloth while using	
4.	Chain	1	Visual check for damages or corrosion	No damages, no corrosion	Exchange chain

3.16 Potential equalization

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Earthing cable connection at top cabinet	1/2	Re-tighten all bolt connections	Tight, no corrosion, good electrical connection	Re-torque according to standard torque list, remove corrosion
2.	Earthing connection anemometer pole	1/2	Re-tighten all bolt connections	Tight, no corrosion, good electrical connection	Re-torque according to standard torque list, remove corrosion
3.	Earthing strip generator housing	1/2	Re-tighten all bolt connections	Tight, no corrosion, good electrical connection	Re-torque according to standard torque list, remove corrosion
4.	Earthing strip gearbox housing	1/2	Re-tighten all bolt connections	Tight, no corrosion, good electrical connection	Re-torque according to standard torque list, remove corrosion
5.	Spark gap rotor to tower	1/2	Check the distance, fixed position	Fixed, distance = 1 mm	Re-torque according to standard torque list, adjust
6.	Connection of earthing busbar in nacelle to main beam	1/2	Re-tighten all bolt connections	Tight, no corrosion, good electrical connection	Re-torque according to standard torque list, remove corrosion
7.	Connection of main earthing busbar to tower	1	Re-tighten all bolt connections	Tight, no corrosion, good electrical connection	Re-torque according to standard torque list, remove corrosion
8.	Connection earthing system to main earthing busbar – only for lattice towers	1	Check the connection of the two GI strips	Tight, no corrosion, good electrical connection	Re-torque according to standard torque list, remove corrosion

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
9.	Connection earthing system to tower bottom – only for lattice towers	1	Check the connection of the two GI strips	Tight, no corrosion, good electrical connection	Re-torque according to standard torque list, remove corrosion
10.	Connection earthing system between tower sections	1	Re-tighten all bolt connections	Tight, no corrosion, good electrical connection	Re-torque according to standard torque list, remove corrosion
11.	Earthing system	5 **Note:** Specific country regulations regarding earth resistance value takes precedence over this value.	Check the resistance. Disconnect, therefore, the connection between earthing system to turbine (4 GI strips to tower / main earthing busbar). Refer **Procedure WD00042**	R ≤ 10 Ω **Note:** Specific country regulations regarding earth resistance value takes precedence over this value.	Inform Suzlon O&M

3.17 Lattice tower

3.17.1 General visual inspection

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Check welding seams for cracks and corrosion	1	Visual inspection from the ladder	No cracks, no corrosion	Take photos, mark them and inform Suzlon O&M
2.	Corrosion or cracks	1	Visual inspection of the tower from the ladder	No cracks, no corrosion	Take photos, mark them and inform Suzlon O&M. Remove corrosions, if possible
3.	Paint damages at bottom	1	Visual inspection	No paint damages	Remove, if possible.

3.17.2 Tower bolting

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
4.	Check tightness of tower to nacelle bolts	500 h	Re-tighten all bolts	Refer special torque list	
5.		1	4 sample: Check and mark sample bolts checked	Refer special torque list	Re-tighten all bolts
6.	Check the tightness of the joints	500 h	Re-tighten all bolts	Refer special torque list	
7.		1	4 sample: Check and mark the sample bolts checked	Refer special torque list	Re-tighten all bolts

3.17.3 Tower cable and grounding

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Cable holder/cable duct	1	4 samples each tower section: Check for fixed position. Visual inspection for cracks and corrosion	Fixed, no cracks or corrosion	Re-tighten according to standard torque list. Exchange if necessary
2.	Cleanliness of cables	1	Visual inspection	Free of oil and grease	Clean
3.	Damaged insulation	1/2	Visual inspection especially inside the cable loop, cable holders and at the platforms	Undamaged insulation, no wearing of cables	Repair, determine and remove reasons
4.	Meshed cable support at the yaw platform	1/2	Strength check	Fixed	Re-tighten according to standard torque list.

3.17.4 Ladder and climbing protection

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
1.	Connection ladder to tower	1	Visual inspection for cracks and corrosion, looseness check 10 samples each section, mark the sample bolts checked	No corrosion, no damages, fixed position. 80% of nominal torque. Refer standard torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
2.	Connection ladder to ladder	1	Visual inspection for cracks and corrosion, looseness check 4 samples, mark the samples checked	No corrosion, no damages, fixed position. 80% of nominal torque. Refer standard torque list	Re-tighten all bolts to 100% of nominal torque if one found loose. Replace if broken.
3.	Ladder	1	Visual inspection for cracks and damages	No cracks, no damages	Exchange
4.	Ladder yaw platform to nacelle	1	Visual inspection for cracks and damages	No cracks, no damages	Exchange
5.	Safety system	1/2	Visual inspection for cleanliness and damages. Inspect for signs of abrasion against the ladder or structure	Clean, no mechanical damages or abrasion	Clean. Replace damaged carrier cable

No.	Determination	Maintenance interval	Working step	Required status / value	What to do in case of deviation?
6.	Slider / slider label	1	Inspection by a authorized person with certificate of the safety system manufacturer	The date on the label on slider must always be actual	

3.18 Leaving the Turbine

The following must be ensured before leaving the turbine after completing the maintenance work:

1. Reset summations
2. Switch off cabinet lights
3. Close all cabinet doors
4. Take down all tools and parts from nacelle
5. Clean nacelle from waste
6. Switch off nacelle lights
7. Close platform doors on the way down
8. Switch off cabinet lights at tower bottom
9. Close all cabinet doors
10. Take away all tools and parts from tower bottom
11. Clean waste from tower bottom.
12. Switch off tower lights
13. Close and lock tower door