
 DANISH WIND TURBINE TRADITIONS	Service and Maintenance	Document no.	KVA-A-008-01
		Revision date.	2024.05.23
	Service and Maintenance	Revision no.	3
	Appendix 1.	Page	1/8

KVA 10-10 and KVA 10-15 WIND TURBINE

SERVICE & MAINTENANCE MANUAL



 <small>DANISH WIND TURBINE TRADITIONS</small>	Service and Maintenance	Document no.	KVA-A-008-01
		Revision date.	2024.05.23
	Service and Maintenance	Revision no.	3
	Appendix 1.	Page	2/8


Service for KVA 10-10 and KVA 10-15 wind turbine, must be done every 2nd year.

Inspection for KVA 10-10 and KVA 10-15 wind turbine, must be done every year.

It is important to use torque wrenches with a valid certificate.

Never enter the wind turbine without it has been stopped!

Control of:	KVA Wind 10-10 / KVA Wind 10-15	Done
Date:		
Work person:		
Customer:		
Address:		
Turbine type:		
Hydraulic:	Check the oil level on the hydraulic reservoir. Check the hydraulic hoses for cracks and leaks. Check if the accumulator works. Change the oil after 4 years of duration.	
Electric check:	Check cable clamps on control and converter. Check if cable twist fits with PLC (e.g. 900 gr = 3 turns). Check the shake-sensor. Check fuses connection points. Check the cable fasteners on the top and bottom tower.	
Bolts:	Check bolts in the bottom mast versus the molding box (M30 - 1310 Nm). Check bolts between bottom- and top-mast, inside (M27 - 961 Nm). Check bolts between topmast and yaw plate (M24 - 665 Nm). Check the bolts on the blade attachment to the hub (M16 - 197 Nm). Check bolts between nacelle and catch-fork (M20 -385 Nm). Check the bolts on the yaw gear (M14 - 128 Nm). Check bolts at the bearing houses (M24 – 665 Nm front – M20 – 385 Nm rear). Check bolt on the vibration damper at the generator (M16 – 197 Nm).	
Tower:	Check welds for any breakage – Check tower for damage / galvanize	
Hub:	Check the pitch arm and ball joint, lubricate under the rubber protection. Check tolerance for hub with dial gauge (Min. 0,1 mm – Max. 0,5 mm)	
Blades:	Check blades for damage – Check the grout / Packing for cracks.	
Braking system:	Check the brake disc for marks. Check brake pads on the caliber (min. 8 mm thickness). Clean for brake dust.	
Grease lubrication:	Lubrication of rotor with 3 pump strokes. Lubrication of pitch shaft bearing with 3 strokes. Change lubricating cup and set to 12 on scale.	
Yaw plate:	Check the tolerance between the yaw plate and the catch fork. If the blur is more than 2mm, you must remove one smooth plate.	

	Service and Maintenance	Document no.	KVA-A-008-01
		Revision date.	2024.05.23
	Service and Maintenance	Revision no.	3
	Appendix 1.	Page	3/8

Inspection

Inspection must be done every year, if its operating at a place where there are no people living nearby. It is only visible inspection, so no tools or machinery are needed. Look for differences on the tower, blades etc. Look after oil spill or other substances. Listen to the turbine under operation, is it different? then stop the turbine and investigate. Check the controller for alarms or other suspicions.

Information

When you are doing service on a KVA 10-10 / KVA 10-15, you must make sure, that you have read and understood the task of how to service the turbine.


To assure this, please read carefully the manual and the service section.

It is important that the tool comply with KVA Wind's recommendations, that the equipment is approved and with the required certificate. Contact optionally KVA Wind for assistance or purchasing of tools.

NEVER crawl in the turbine, unless the turbine is braked and is standing still/not operating.

Lubricants

- Agip top 2000 – super longtime grease for the grease gun.
- SKF system 24 automatic lubricator (LAGD60/WA2). Remember to set the scale on 12.
- Eni ARNICA 32 hydraulic oil. **Duration time 4 years.**
- Würth HHS 2000 lubricating grease (spray).
- CRC Silicone pro spray

 <small>DANISH WIND TURBINE TRADITIONS</small>	Service and Maintenance	Document no.	KVA-A-008-01
		Revision date.	2024.05.23
	Service and Maintenance Appendix 1.	Revision no.	3
		Page	4/8

Explanation and pictures for service

Check accumulator for hydraulic pressure

To check the pressure in the accumulator, proceed as following:

1. Set the turbine to manual operation.
2. Set pitch in -10 degrees.
3. Disconnect the power to the controller, and then the blades should pitch to 80 degrees.

When the turbine controller is connected to power again, the turbine will automatically start the hydraulic pump to make normal pressure again.



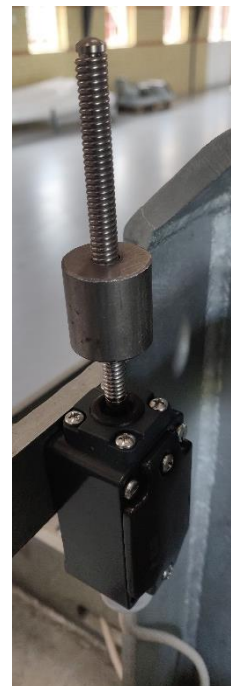
Check shake-sensor


Check the cable to the shake-sensor for breakage and check that the Weight of the spring is stuck.

It must sit 15 mm from the top shake-sensor to the bottom plumb.

Test: When the turbine is in stop mode, then try to push to the shake-sensor.

If it works, there will be an alarm on the tablet, that the shake-sensor has been activated.



 <small>DANISH WIND TURBINE TRADITIONS</small>	Service and Maintenance	Document no.	KVA-A-008-01
		Revision date.	2024.05.23
	Service and Maintenance	Revision no.	3
	Appendix 1.	Page	5/8

Check hub and ball joint

The hub must be checked for blur. This is done by taking

The tip of the blade and move it back and forth to feel if the hub is “loose”.

The ball joints must also be checked for blur and must be lubricated with floating grease under the rubber at both ends.

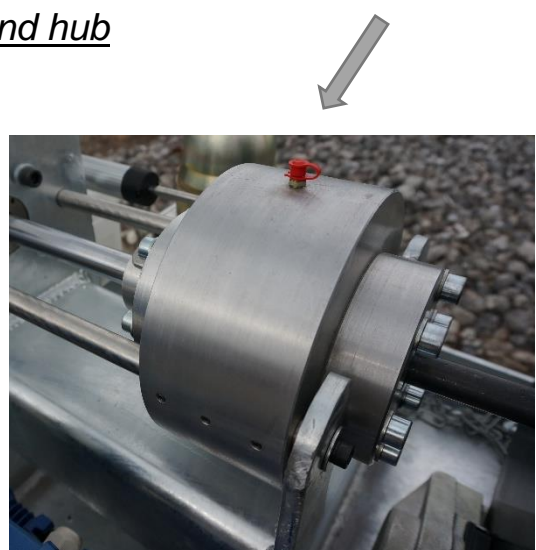
Also, give the rubber some silicone spray.




Lubrication of pitch slider, bearing housing and hub

The pitch slider must have three pump strokes in its grease nipple with TOP 2000 grease.

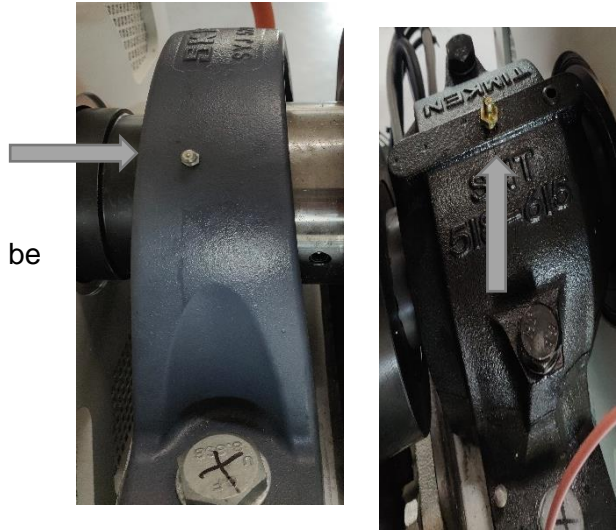
(Note: if the Grease nipple is defect or leaky, it shall be replaced!)



 KVA Wind Int. <small>DANISH WIND TURBINE TRADITIONS</small>	Service and Maintenance	Document no.	KVA-A-008-01
		Revision date.	2024.05.23
	Service and Maintenance	Revision no.	3
	Appendix 1.	Page	6/8

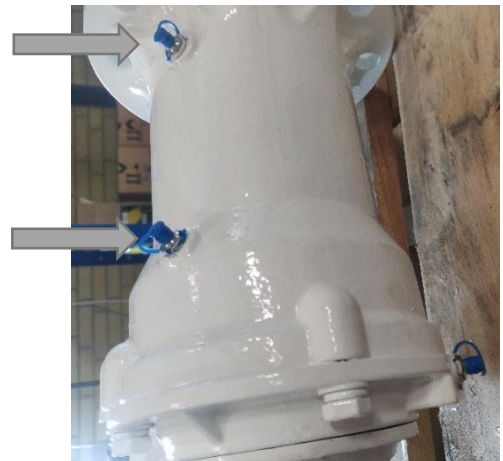
Both bearing houses have a grease nipple each.
They must have three pump strokes each.


(Note: if the Grease nipple is defect or leaky, it shall be replaced!)



The hub must have three pump strokes of TOP 2000 grease
in each of its grease nipples (three).

(Note: if the Grease nipple is defect or leaky, it shall be replaced!)




 KVA Wind Int. <small>DANISH WIND TURBINE TRADITIONS</small>	Service and Maintenance	Document no.	KVA-A-008-01
		Revision date.	2024.05.23
	Service and Maintenance	Revision no.	3
	Appendix 1.	Page	7/8

Check for wear and tear in hubs.

To check the hubs, you need to measure if there is blur or slip. Take a dial gauge and measure the distance when the blade is hanging down and pointing up.

Min. 0,1 mm – Max. 0,5 mm

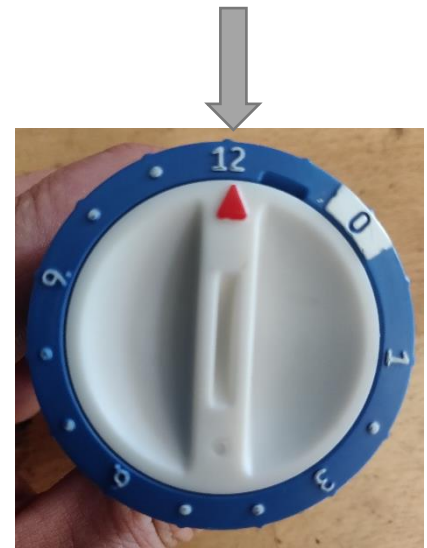


 KVA Wind Int. <small>DANISH WIND TURBINE TRADITIONS</small>	Service and Maintenance	Document no.	KVA-A-008-01
		Revision date.	2024.05.23
	Service and Maintenance Appendix 1.	Revision no.	3
		Page	8/8

SKF grease cups


There are used two grease cups at the turbine of type **SKF system 24 Automatic lubricator LAGD60/WA2.**

When replacing, remember to set the scale to 12!



The grease cup is located approx. in the middle at the bottom of the base frame.
It is used to lubricate the yaw plate.
Remember to change!



 <small>DANISH WIND TURBINE TRADITIONS</small>	Service and Maintenance	Document no.	KVA-A-008-01
		Revision date.	2024.05.23
	Service and Maintenance	Revision no.	3
	Appendix 1.	Page	9/8

Torque for bolts and nuts.

Preloads and tightening torque for fasteners of steel

Preloads and tightening torque for steel shank screws with full loadability with head contact area sizes like DIN 912, 931, 933, 934, ISO 4762, 4014, 4017, 4032*

The following are taken into account in table values for M_s :

- a) Friction coefficient $\mu_{total} = 0.14^*$
 - b) Utilisation of the minimum yield strength = 90%
 - c) Torsion torque when tightening
- (* The friction coefficient of $\mu_{total} = 0.14$ is generally assumed for screws and nuts in standard commercial deliveries)

Additional lubrication of the thread considerably changes the friction coefficient and brings about unspecified tightening ratios! Tightening methods and tools have different spreads (→ Tab. 1/VDI 2230-1, Tab. A8).

Table 5: Typical values for shank screws/bolts with coarse thread, friction coefficient $\mu_{total} = 0.14$

Dimensions P	Stress area AS (mm ²)	Preloads F_v (kN) for property class					Tightening torque M_s (Nm) for property class					
		4.6	5.6	8.8	10.9	12.9	4.6	5.6	8.8	10.9	12.9	
M 4	0.7	8.78	1.28	1.71	4.30	6.30	7.40	1.02	1.37	3.3	4.8	5.6
M 5	0.8	14.2	2.10	2.79	7.00	10.3	12.0	2.0	2.7	6.5	9.5	11.2
M 6	1.0	20.1	2.96	3.94	9.90	14.5	17.0	3.5	4.6	11.3	16.5	19.3
M 8	1.25	36.6	5.42	7.23	18.1	26.6	31.1	8.4	11.0	27.3	40.1	46.9
M 10	1.5	58.0	8.64	11.5	28.8	42.2	49.4	17.0	22.0	54.0	79.0	93.0
M 12	1.75	84.3	12.6	16.8	41.9	61.5	72.0	29.0	39.0	93.0	137.0	160.0
M 14	2.0	115.0	17.3	23.1	57.5	84.4	98.8	46.0	62.0	148.0	218.0	255.0
M 16	2.0	157.0	23.8	31.7	78.8	115.7	135.4	71.0	95.0	230.0	338.0	395.0
M 18	2.5	193.0	28.9	38.6	99.0	141.0	165.0	97.0	130.0	329.0	469.0	549.0
M 20	2.5	245.0	37.2	49.6	127.0	181.0	212.0	138.0	184.0	464.0	661.0	773.0
M 22	2.5	303.0	46.5	62.0	158.0	225.0	264.0	186.0	250.0	634.0	904.0	1057.0
M 24	3.0	353.0	53.6	71.4	183.0	260.0	305.0	235.0	315.0	798.0	1136.0	1329.0
M 27	3.0	459.0	70.6	94.1	240.0	342.0	400.0	350.0	470.0	1176.0	1674.0	1959.0
M 30	3.5	561.0	85.7	114.0	292.0	416.0	487.0	475.0	635.0	1597.0	2274.0	2662.0
M 33	3.5	694.0	107.0	142.0	363.0	517.0	605.0	645.0	865.0	2161.0	3078.0	3601.0
M 36	4.0	817.0	125.0	167.0	427.0	608.0	711.0	1080.0	1440.0	2778.0	3957.0	4631.0
M 39	4.0	976.0	151.0	201.0	512.0	729.0	853.0	1330.0	1780.0	3597.0	5123.0	5994.0
M 42	4.5	1117.0	212.0	265.0	584.0	832.0	974.0	1605.0	2006.0	4413.0	6285.0	7354.0
M 45	4.5	1302.0	249.0	311.0	684.0	974.0	1140.0	2005.0	2506.0	5512.0	7851.0	9187.0
M 48	5.0	1468.0	280.0	350.0	770.0	1096.0	1283.0	2424.0	3030.0	6667.0	9495.0	11112.0
M 52	5.0	1753.0	335.0	419.0	922.0	1314.0	1537.0	3116.0	3896.0	8570.0	12206.0	14284.0
M 56	5.5	2024.0	387.0	484.0	1064.0	1516.0	1774.0	3883.0	4854.0	10678.0	15208.0	17797.0
M 60	5.5	2356.0	452.0	565.0	1242.0	1770.0	2071.0	4818.0	6022.0	13249.0	18870.0	22082.0
M 64	6.0	2669.0	511.0	639.0	1406.0	2003.0	2344.0	5802.0	7252.0	15955.0	22724.0	26592.0
M 68	6.0	3047.0	585.0	732.0	1610.0	2293.0	2683.0	7012.0	8765.0	19282.0	27462.0	32137.0
M 72	6.0	3451.0	665.0	831.0	1828.0	2603.0	3046.0	8379.0	10474.0	23043.0	32819.0	38405.0
M 76	6.0	3881.0	749.0	936.0	2059.0	2933.0	3432.0	9903.0	12378.0	27232.0	38785.0	45387.0
M 80	6.0	4335.0	838.0	1047.0	2304.0	3282.0	3840.0	11610.0	14514.0	31930.0	45476.0	53216.0
M 90	6.0	5580.0	1083.0	1353.0	2977.0	4240.0	4962.0	16796.0	20995.0	46188.0	65783.0	76980.0
M 100	6.0	6983.0	1359.0	1698.0	3736.0	5322.0	6227.0	23381.0	29226.0	64297.0	91574.0	107161.0