## Wind World W2700

Wind World W2700 150kW. Built year 1991/92.

| | |
|---|---|
| **Type** | W2700 |
| **Built year** | 1991/92 |
| **Nominel effect** | 150 |
| **Hub height** | 30 m. |
| **Rotor diameter** | 27 m. |
| **Pcs** | 2 |
| **Available** | November 2013 |
| **Voltage/grid frequency** | 400V/50Hz |
| **Power control** | Stall |

# Wind World 150kW

## *W2700 Model*




# Presumed climatic, erecting and running parameters for Wind World W-2700/150 kW

**Climatic conditions**

Normal climate

| | |
|---|---|
| A-parameter: | 7.48 m/s |
| B-parameter: | 1.9 |
| Terrain class: | 0.01 |
| Intensity of turbulence: | 22% |
| Density: | 1.28 kg/m³ |

Extreme climate:

| | |
|---|---|
| Terrain class: | 0.01 |
| Calculated extreme wind speed (10 min.) | 40.8 m/s |
| Intensity of turbulence: | 22% |
| Density: | 1.28 kg/m³ |

**Erecting conditions:**

| | |
|---|---|
| Minimum distance between 2 individual turbines: | 3 rotor diameters |
| Minimum distance to neighbour turbine in turbine park: | 5 rotor diameters |
| Maximum slope of hill: | 5° |
| Corrosion class (DIF instruction NP-154-R): | 3 |
| Foundation | |
| Ground water level over foundation level: | Yes |
| Ground water level under foundation level: | Yes |

**Operational data:**

| | |
|---|---|
| Calculated life time: | 20 years |
| Cut-in wind speed (10 min.): | 4 m/s |
| Cut-out wind speed (10 min.): | 25 m/s |
| Maximum over speed (for a short period): | 53 rpm. |
| Maximum mean yaw error: | 10° |
| Maximum dispersal/scattering on yaw error: | 10° |
| Temperature interval for production running: | -10° to 30° C |

**Special conditions:**

See “list over outstanding conditions” (enclosure B5-B107-1)

# Technical specifications for Wind World W-2700/150 kW

**Main specifications:**

| | |
|---|---|
| Rotor diameter: | 27.0 m |
| Number of blades: | 3 |
| Power regulation: | Stall |
| Synchronous rotor speed: | 35.4 rpm |
| Position of rotor: | Up-wind |
| Nominal power: | 150 kW |
| Hub height: | 31.2 m or 41.3 m |

**Weight:**

| | |
|---|---|
| Blade: | 790 kg. |
| Rotor (including hub and blades): | 5,700 kg. |
| Nacelle (excl. rotor): | 6,800 kg. |
| Tubular tower 30.2 m: | 13,500 kg. |
| Tubular tower 40.3 m: | 19,000 kg. |
| Gear: | 3,000 kg. |
| Generator: | 1.225 kg. |

**Rotor**

| | |
|---|---|
| Coning: | 0° |
| Tilt: | 4° |
| Blade angle: | -2° |

**Blade:**

| | |
|---|---|
| Make, type: | LM, 12HHT |
| Material: | GRP |
| Blade lenght: | 11.5 m |
| Blade profile: | NACA 63-200 |
| Aerodynamic brake: | Turning blade tip, hydraulic |
| Reflecting ratio: | Class III |

**Hub:**

| | |
|---|---|
| Type: | Cast |
| Material: | GGG 40.2 |

**Main shaft:**

| | |
|---|---|
| Type: | Forged |
| Material: | 34CrNiMo6 |

**Main bearings:**

| | |
|---|---|
| Front bearings (built in the gear): | Spherical roller bearings |
| Make, type: | FAG or SKF, 23952 CAC/W33 |
| Back bearings (built in the gear): | Spherical roller bearings |
| Make, type: | FAG or SKF, 23044 CC/W33 |

**Main gear:**

| | |
|---|---|
| Make, type: | Wind World, WW400-1 |
| Ratio: | 1:21.164 |
| Lubricating system: | Splash/centrifugal lubrication |
| Amount of oil: | 80 l. |

**Coupling:**

| | |
|---|---|
| Gear-generator: | Flexible |
| Make, type: | Fenner, HRC 280 FF |

**Generator:**

| | |
|---|---|
| Make, type: | Brooks, J7-D355S 150 |
| Nominal power: | 150kW |
| Synchronous rotation speed: | 750 rpm |
| Insulation class: | F |
| Protection class: | IP54 |

**Mechanical brake:**

| | |
|---|---|
| Type: | Disc brake |
| Position: | The fast shaft of the gear |
| Numbers of callipers: | 1 |
| Make, type: | Demag, SSB |

**Machine foundation:**

| | |
|---|---|
| Type: | Welded, integrated gear |
| Corrosion protection: | Painted |

**Yaw system:**

| | |
|---|---|
| Yaw bearing: | Ball fifth wheel |
| Make, type: | Heosch Rothe Erde<br>062.20.1094.502.01.1503 |
| Yaw motor: | Electric motor 0.37 kW |
| Make, type: | Sever IEC 80 B5 |
| Yaw gear: | Planetary gear |
| Make, type: | Bonfiglioli, 306 L2 |
| Yaw speed: | 1.2°/sec. |
| Yaw brake | Friction brake |

**Tower:**

| | |
|---|---|
| Type: | Conical tubular tower |
| Height: | 30.2 m. or 40.3 m. |
| Corrosion protection: | Painted |

**Control:**

| | |
|---|---|
| Make, type: | Sentic, Mark 4 |

# Power curve and energy production for Wind World W-2700/150 kW

**Remarks:**

The measurement has not been taken and veryfied according to the present basis for approval of wind turbines.

The measurement was not available by issuing.

# Noise measuring on W-2700/150 kW

**Remarks:**

Noise measuring made by “Acoustica as” enclosed (2 pages)

Noise measue summary for Wind World W-2700/150 kW wind turbine

1. The measuring is done accrediting no. 134 of Danish accredit system by:

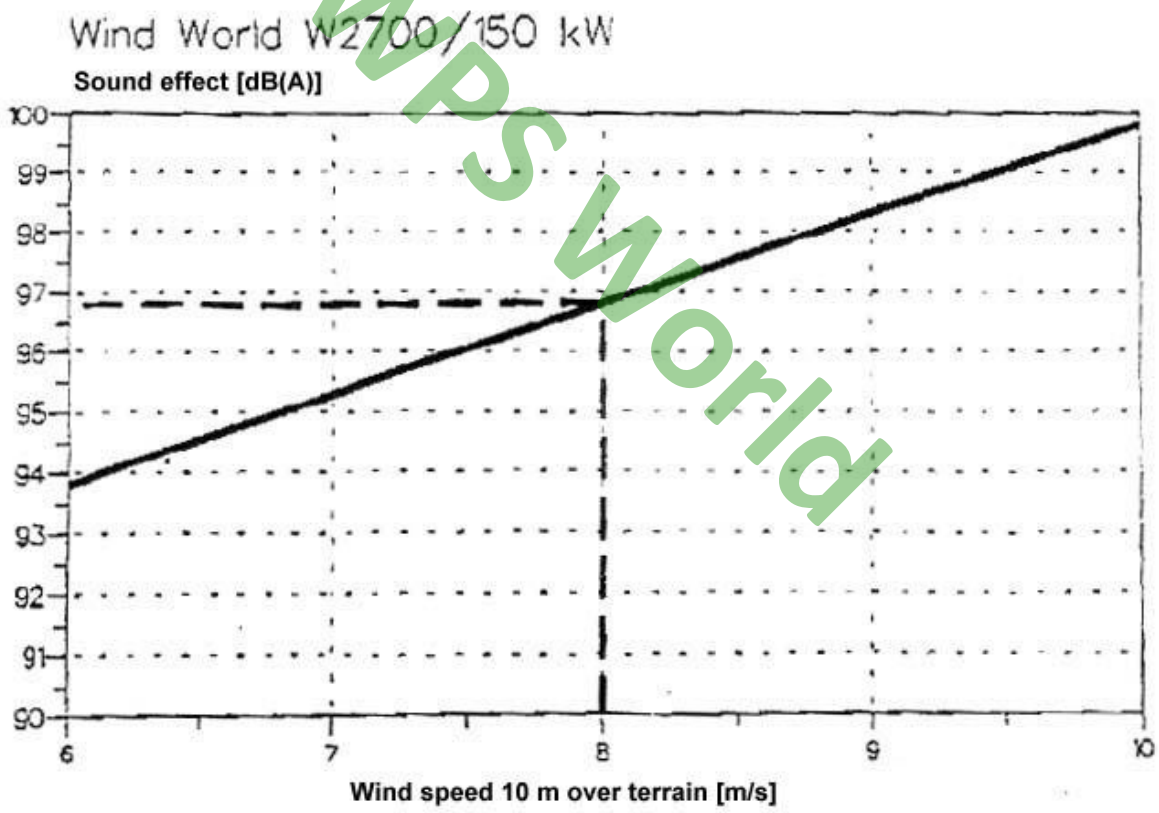
   Acoustica as
   Sohngårdsholmsvej 2
   9000 Aalborg
   Phone no.: 98 11 30 11, fax no.: 98 11 73 74

2. This summary is made the 10th of July 1992

3. The noise measuring is reported in Acoustica's rapport no. P8.008.92, dated 08.05.1992

4. The type of turbine is Wind World W-2700/150 kW

5. The measuring is made according to the departmental order no. 304 of the 14th of May 1991 by the Ministry of Environment. The distance to the turbine base was 46.5 m during the measuring.



6b. The measuring show the following results by the reference wind speed 8 m/s, given as the A-weighted sound effect $L_{WA,ref.}$

| $L_{WA,ref.}$ [dB re 1 pW] | | | |
|---|---|---|---|
| 1/1 | Oktavo | 63 Hz | 72.5 |
| 1/1 | Oktavo | 125 Hz | 81.4 |
| 1/1 | Oktavo | 250 Hz | 87.4 |
| 1/1 | Oktavo | 500 Hz | 92.4 |
| 1/1 | Oktavo | 1 Hz | 92.2 |
| 1/1 | Oktavo | 2 Hz | 87.4 |
| 1/1 | Oktavo | 4 Hz | 81.8 |
| 1/1 | Oktavo | 8 Hz | 70.0 |
| | Total noise | | 96.8 |



6c. The noise from the wind turbine contains no clear audible noise in 46.5 meters distance. No corrections are made.

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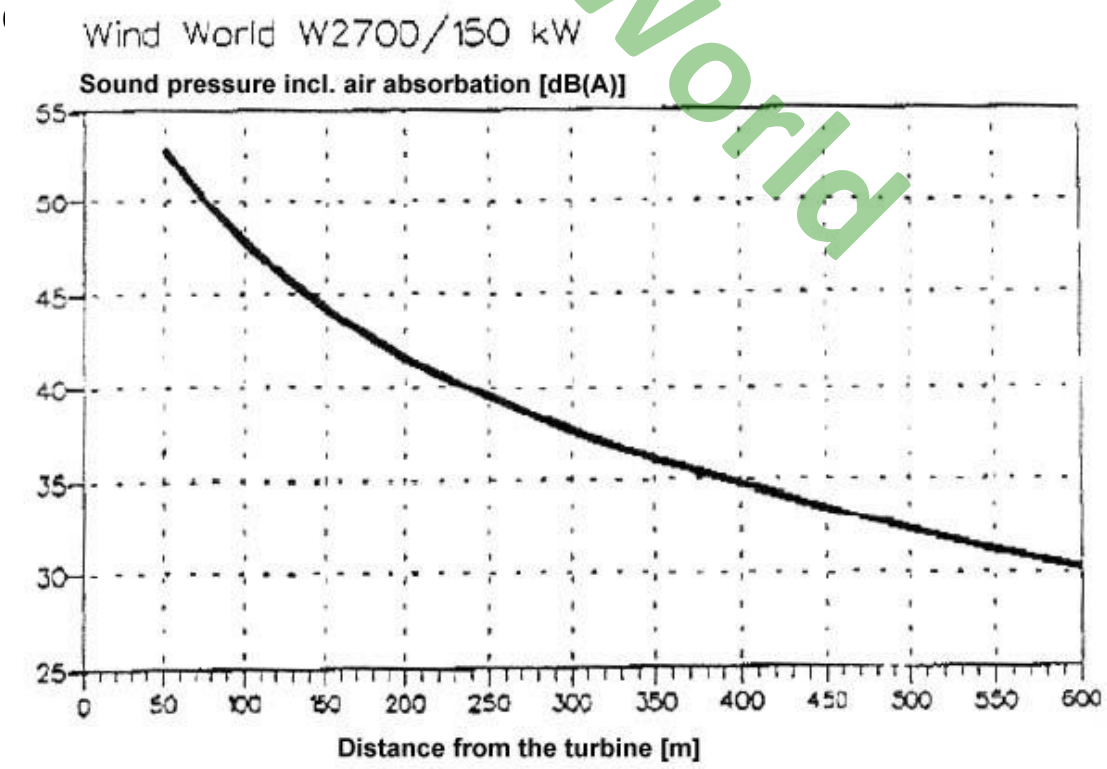

# W-2700/150 kW
# HYDRAULICS



**Doc.: B0905-01.44**

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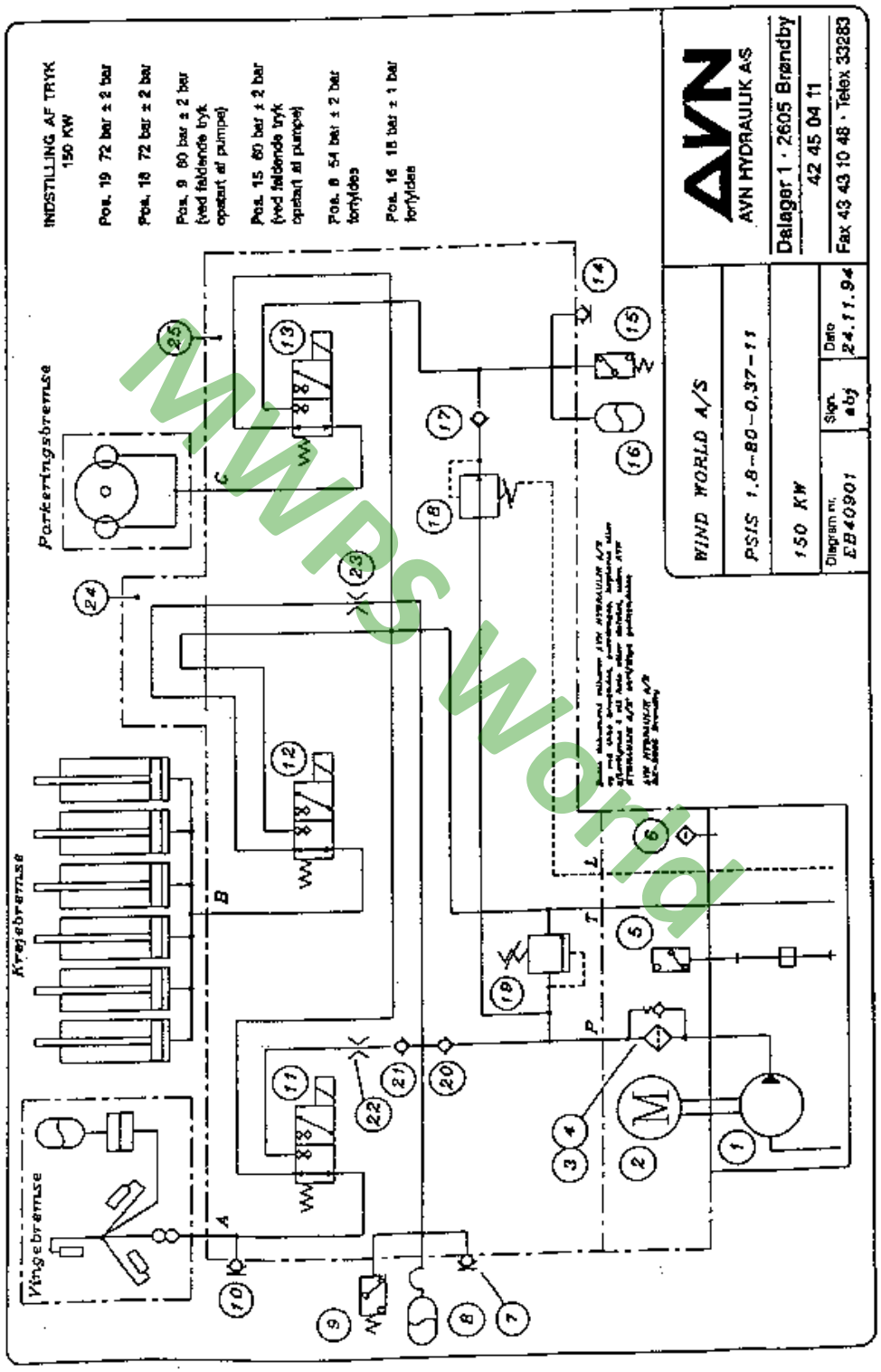
# 01.01.00 Hydraulic diagram:



# 01.02.00 Part list to the hydraulic diagram

AVN HYDRAULIK A·S

| Part list for diagram no.: EB40901<br>Wind World A/S<br>PSIS 1.8-90-0.37-11 150 kW | | | |
|---|---|---|---|
| **POS** | **PCS.** | **Description** | **Type** |
| 1 | 1 | Pump | 1-ISP 1.2/GF/D |
| 2 | 1 | Electric motor | 4AP71-4-B5-2/3 0.37 kW |
| 3 | 1 | Pressure filter | LC 5/02 with bypass (5 bar) |
| 4 | 1 | Level monitor | HMC-V = 135 mm |
| 5 | 1 | Air/filling filter | TCO 301 |
| 7 | 1 | Test nipple | 20.10.66 ¼ pipe thread |
| 8 | 1 | Accumulator | D1.4-140 prefilled to 54 bar ± 2 bar (supplied loose) |
| 9 | 1 | Pressure monitor | DS-412/150-C5/NOC |
| 10 | 1 | Test nipple | 20.10.66 ¼ pipe thread |
| 11 | 1 | Valve | V3D-CE (V389604A00) + 24 VDC (C1664020C2) |
| 12 | 1 | Valve | V3D-CE (V389604A00) + 24 VDC (C1664020C2) |
| 13 | 1 | Valve | V3D-CE (V389604A00) + 24 VDC (C1664020C2) |
| 14 | 1 | Test nipple | 20.10.66 ¼ pipe thread |
| 15 | 1 | Pressure monitor | HDE50P1-2X/50Z14 |
| 16 | 1 | Accumulator | D0.32-1660 (32-511) prefilled to 18 bar ± 1 bar |
| 17 | 1 | Stop valve | OD.44.02.00.09.01 |
| 18 | 1 | Reducing valve | C3B-25-ZN |
| 19 | 1 | Pressure valve | VM 15 (V3.889.04.02) |
| 20 | 1 | Stop valve | OD.44.02.00.09.01 |
| 21 | 1 | Stop valve | OD.44.02.00.09.01 |
| 22 | 1 | Nozzle | Ø 2.0 |
| 23 | 1 | Nozzle | Ø 2.0 |
| 24 | 1 | Aluminium block | AH-2213 |
| 25 | 1 | Aluminium block | AH-2213 |
| | | | |

# W-2700/150 kW
# Tightening of bolts



**Doc.: B0905-01.43**

# 01.01.0 TIGHTENING OF BOLTS:

## LUBRICATION OF THREADS

Thread and surfaces of bolts and nuts are to be lubricated with ”NEVER-SEEZ ANTI-SEIZE & LUBRICATION COMPOUND”.

## TIGHTNING

Tightening with a torque wrenches.

**Tightening loads for a 30 m tower:**

| JOINT | BOLT | TYPE | LOAD |
|---|---|---|---|
| | | | |
| Foundation / Tower | M30 | 8,8 | 1100 |
| Tower bottom / top | M24 x 130 | 8,8 | 555 |
| Tower / top – unit | M16 x 90 | 8,8 | 165 |
| Main shaft 7 Hub | M27 x 180 | 8,8 | 800 |
| Hub / Blades | M24 x 1370 | 8,8 | 555 |

**Tightening loads for a 40 m tower:**

| JOINT | BOLT | TYPE | LOAD |
|---|---|---|---|
| | | | |
| Foundation / Tower | M30 | 8,8 | 1100 |
| Tower bottom / top | M24 x 130 | 8,8 | 555 |
| Tower / top - unit | M16 x 90 | 8,8 | 165 |
| Main shaft 7 Hub | M27 x 180 | 8,8 | 800 |
| Hub / Blades | M24 x 1370 | 8,8 | 555 |

Special tightening moment:

| JOINT | BOLT | TYPE | LOAD |
|---|---|---|---|
| | | | |
| Clamping ring Parking brake | M8 | 10,9 | 29 |

If no other tightening moments are given then the bolts should be tightened according to the following charts:

| | | |
|---|---|---|
| For: | Steel set, | DIN 933 – 8.8 |
| | Steel bolt, | DIN 931 – 8.8 |
| | Washer HB200 | |
| | Hardened/tempered washer | DIN 6916 |
| | Steel nut | DIN 934 – 8 |
| | Lock nut | DIN 985 – 8 |

| Thread M | P (mm) | As ($mm^2$) | Moment (Nm) |
|---|---|---|---|
| | | | |
| 3 | 0.5 | 5.0 | 1 |
| 3.5 | 0.6 | 6.8 | 2 |
| 4 | .07 | 8.8 | 2 |
| 5 | .08 | 14.2 | 3 |
| 6 | 1.0 | 20.1 | 5 |
| 7 | 1.0 | 28.9 | 8 |
| 8 | 1.3 | 36.6 | 20 |
| 10 | 1.5 | 5.8 | 40 |
| 12 | 1.8 | 84.3 | 67 |
| 14 | 2.0 | 115.0 | 110 |
| 16 | 2.0 | 157.0 | 165 |
| 18 | 2.5 | 192.0 | 230 |
| 20 | 2.5 | 245.0 | 320 |
| 22 | 2.5 | 303.0 | 430 |
| 24 | 3.0 | 353.0 | 555 |
| 27 | 3.0 | 459.0 | 800 |
| 30 | 3.5 | 561.0 | 1110 |
| 33 | 3.5 | 694.0 | 1500 |
| 36 | 4.0 | 817.0 | 1900 |
| 39 | 4.0 | 976.0 | 2450 |

Ref.: Bolt catalogue from Arvid Nilsson Boskin A/S,
Publisher May 1990

# W-2700/150 kW
# Safety instructions



**Doc.: B0905-01.46**

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## SAFETY

# 01.00.00 SAFETY:

## The following safety instructions should be read and absolutely respected/kept.

# 01.01.00 GENERAL:

A wind turbine connected to the network has possible situations of dangerous character if the basic rules for safety are not respected/kept or not treat the installation with care.

The following safety instructions should be read and absolutely respected/kept.

Furthermore there are special tasks and operations, which can imply possibilities for a dangerous situation to arise. When safety instructions are given then these should be respected/kept prior to any carrying out of inspection or test of the systems.



## 01.01.01 Stay around the turbine

Keep always children under surveillance by adults.

Omit any longer stays in the area closer then 40 m from the turbine.

If the blades are covered with ice, it can be dangerous to go/walk under the rotor and close to the turbine.

By any visit to the turbine, avoid (as much as possible) to stand directly under the rotor level during operation.

**The door to the turbine is to be kept locked**, so it prevents unauthorized persons to get access to the turbine or operate the control box.

## 01.01.02 Access to the turbine and stay inside

Helmet and suitable shoes to climb up in the turbine are prescribed.

Remote monitoring is to be switched off/control put into ”SERVICE MODE” prior to inspection or work inside the turbine.

If securing fall device is available in the turbine tower, then this is to be used by climbing up.

Safety belt is to be used when working with open nacelle top.

No personal is to stand under the ladder while another persons are climbing or work from the ladder.

Tools, lubricants and repair parts should be placed in a bag or box and secured properly during hoisting or lowering through the safety hatch in the nacelle. If any effects/goods are

carried personally on the access ladder then they should be tightened to the belt. No tools or small components are to be carried loosely in pockets when going up or down the ladder.

Oil, dirt etc. is always to be removed and components cleaned, pertly due to safety reasons and partly to easier to locate leakages.

## 01.01.03 Precautions against fire

To reduce probability for fire in the turbine the following preventive instructions are followed:

- Order and cleaning reduce the risk for fire.
- Electric installations are kept clean and protected for any irrelevant influences.
- Always remove cotton waste or other cloths used for oil, paint and cleaning fluid – they can self-ignition.
- Smoking and use off open fire is not permitted in the turbine.

In an unfortunate situation fire can break out in the turbine, if this happens then the main disconnecting knife switch is to be turned off as fast as possible.

# 01.02.00 TURBINE CONTROL AND HIGH-CURRENT

Prior to inspection or work with the high-current side of the control make sure that the network is cut off on the main switch by the transformer station or by the meter cubicle.

**NOTE:** The turbine disconnecting knife switch, switches off the voltage to the terminals in the generator terminal box. If the turbine disconnecting knife switch is in then set voltage to the terminals, even if the main switch is not in. (the turbine is stopped)

# 01.03.00 PRECAUTIONS TO TAKE BY FIRE

In any case of fire in or near the turbine, disconnect the knife switch in the turbine or the main disconnection switch by the transformer station. If this is not possible, contact the electricity company (service) to get switched off the electricity supply to the turbine.

2 dry-powder extinguishers are installed in the turbine. One 6 kg dry-powder extinguisher on the rear bulkhead in the cabin/nacelle and one 2 kg dry-powder extinguisher on the side of the control in the bottom of the tower.

If any fire occurs, estimate if it can be extinguished by means of the nearest dry-powder extinguisher.

The small dry-powder extinguisher in the bottom of the tower can reach 4 meters and the big dry-powder extinguisher in the cabin/nacelle can reach 6-8 meter. By continuous usage the dry-powder extinguisher will be empty in 9-10 seconds.

Both extinguishers are effective to putt out fires in:

- Petrol, oil, tar etc.
- Electric systems up till 1000 V
- Natural gas, car gas, bottled gas etc.

# 01.04.00 PRECAUTIONS TO TAKE BY RUN-AWAY

By run away (overdrive) or fire the turbine is evacuated in an area of approx. 300 m radius and the area is closed off.  Do not try to ”rescue” the turbine. The turbine can be compensated/re-placed, human lives cannot.

# 01.05.00 PRECAUTIONS TO TAKE BY THUNDER

During thunder with risc off lightening the turbine **MUST** be evacuated. When the thunder is over, wait for minimum 1 hour before going back to the turbine. Do not go nearer/closer the turbine if it still ”crackles and whistles” due to wet blades by the rain after the thunder.

# 01.06.00 EVACUATION FROM THE CABIN/NACELLE



If any emergency occurs in the cabin/nacelle and an evacuation from the cabin/nacelle is impossible through the tower, use the descending equipment placed in a box in the back of the bulkhead in the cabin/nacelle. The evacuation can be done through the front of the cabin/nacelle by opening the roof/top of the cabin/nacelle.

Do the following:

1. The box with the safety equipment placed in the back of the cabin/nacelle is opened and the drum/roller is taken out.
2. By the means of the hook, fasten the rope to the lifting device sitting on the notch fitting for the rotor.
3. The front end of the cabin/nacelle roof/top is lifted and the drum/roller is thrown out.
4. Fasten the safety belt under the arms and pull the buckle towards yourself.
5. Hold the roop under the handle. Crawl out over the edge.
6. Let go off the rope and slide down. The descending will now take place without any problems.
7. Start the descending. To regulate the speed, pull the handle.
8. Stopping: Pull the bottom part of the rope. A person standing on the ground pulls the rope can also stop the descending.

### IMPORTANT: ONLY ONE PERSON ON THE ROPE AT A TIME

# 01.07.00 LABELLING AND SIGNS IN THE TURBINE

A table with safety instructions is placed in the bottom of the tower. The purpose of the table is to bring peoples attention to the different safety instructions that are to be respected by stay and work in the turbine. The table is shown in next pages.

Furthermore there is a a green reference sign clearly showing the emergency exit in the cabin/nacelle. The sign is placed on the cabin/nacelle wall over the emergency exit.

## 01.07.01 Precautions against fire

Referring to the high-voltage regulations there is warning signs on in control box. The signs on the box and the signs in the box can be seen on the following pages.

# SAFETY INSTRUCTIONS !!!!

**The following safety instructions are to be read prior to climbing up into the turbine.**

**Common Information:**

- Unauthorized persons are not permitted into the turbine.
- Please note, that any climbing up into the turbine and stay in the turbine is combined with risks and is done on own responsibility.
- Do not touch any moving or electric parts in the turbine.

**Prohibition:**

- Smoking and use of open fire is PROHIBITED anywhere in the turbine.
- No cloths saturated in oil or other inflammable fluids are to lay around in the turbine.

**Command:**

- Helmet has to be worn during work and stay in the turbine.
- The turbine HAVE to be stopped during climbing up or stay in the turbine.
- Securing fall device HAVE to be used during climbing up or descenting.
- Suitable shoes to climb HAVE to be used.

**Fire equipment:**

- There is a 2 kg dry-powder extinguisher on the side of the control box in the bottom of the tower.
- There is a 6 kg dry-powder extinguisher on the bulkhead in the back of the cabin.

**Emergency exit and auxiliary equipment:**

- There is one emergency exit in the front of the cabin/Nacelle. The emergency exit is marked with a green sign.
- There is evacuation equipment in a box in the back of the cabin/nacelle. The equipment is used by evacuation through the emergency exit.

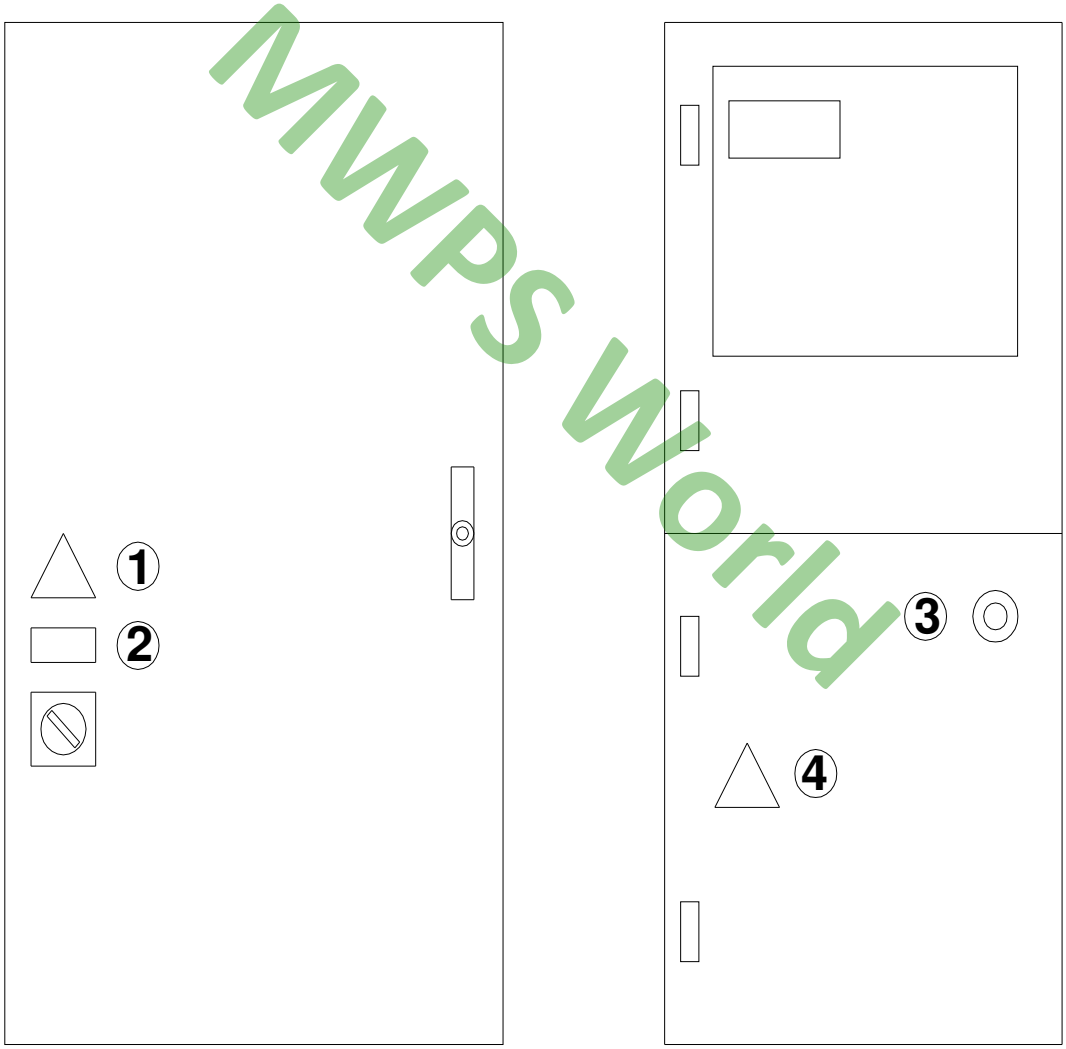
## Signposting on the control box

1. Caution. The voltage on the earth leak circuit breaker with overload switch in position OFF.

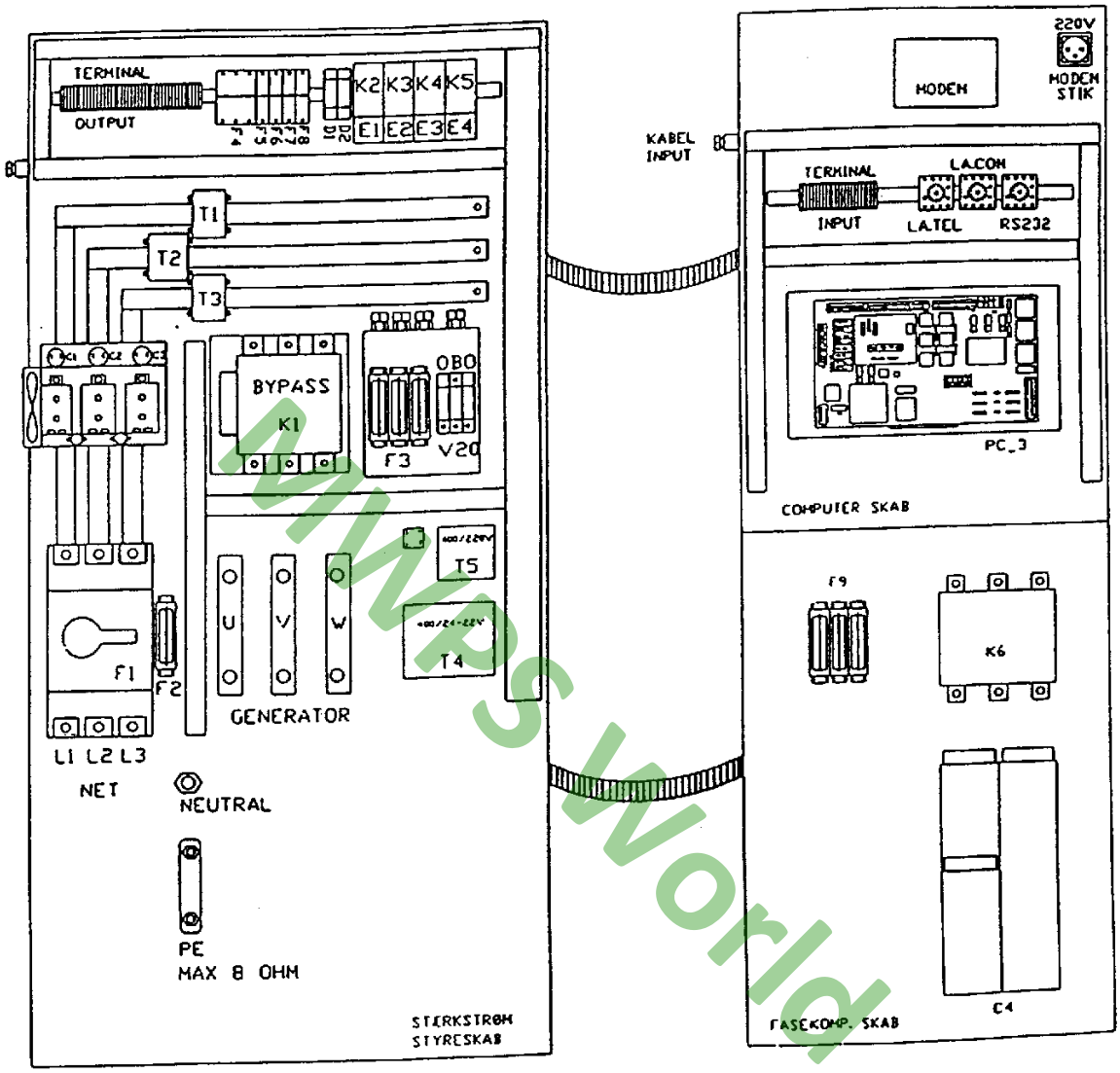
2. Maximum safety fuse 500 A.

3. Emergency stop.

4. Caution. Voltage on the capacitor approx. 60 seconds after switching off the network.



# Signposting in the control box



# 01.08.00 NOTCHING DEVICES

To ensure that parts that are moving during operation of the turbine do not move when the turbine is stopped and there is works performed on or at the moving parts, there is designed an notching device for the rotor and yaw system.

## 01.08.01 Notching of the rotor

In the front of the gearbox, just above the main shaft, there is fastened a galvanized notch fitting. The fitting is fastened to the front plate of the gearbox with 2 pcs. M24 bolts and turns, when not used, inwards to the gearbox.

When working with the following parts of the turbine the notch fitting HAVE to lock the rotor:

- Work by the blades.
- Work on and by the hub.
- Work by the shafts and bearings in the gearbox.
- Work by the brake disc and brake calibres.
- Work by the coupling between the gear and the generator.

By notching of the rotor, remove the 2 pcs. M24 bolts that keeps the fitting into place. The fitting is turned and the point/tip of the fitting is placed between two of the bolt heads on the main shaft, after this the 2 pcs. M24 bolts again tighten the fitting to the gearbox. After this the main shaft is notched.

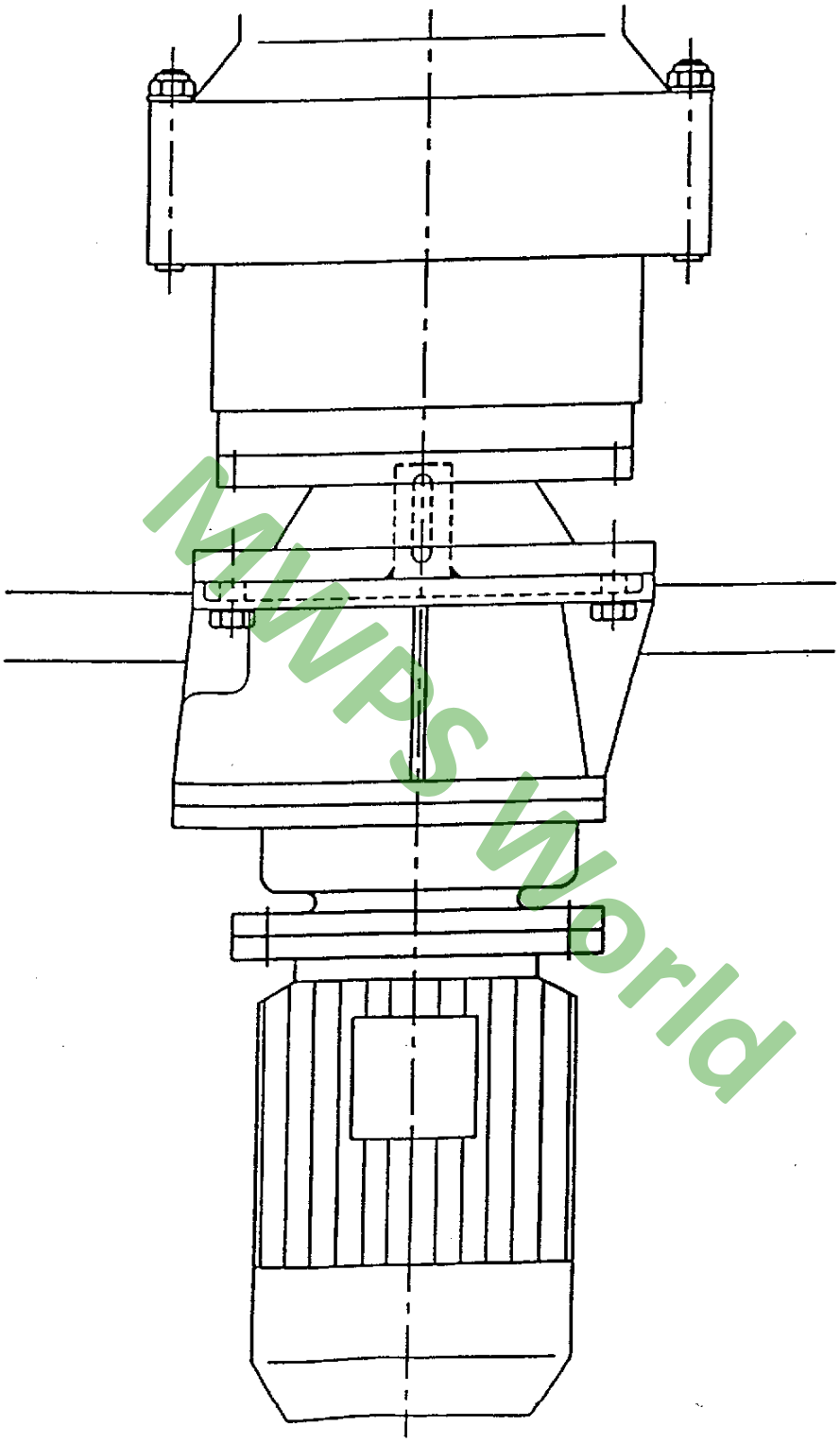
## 01.08.02 Notching of the yaw system

On the yaw plate there is mounted a notch fitting formed as a stub shaft with a locking plate.
When working with the following parts of the turbine the yaw motor hav HAVE to be notched:

- Work by yaw brakes/brake disc.
- Work by retightening of external bolts.
- Work by the yaw ring/gear

By notching the one part of the yaw gear is de-mounted, that is gearwheel and motor. After this the notch fitting is mounted by placing the stub shaft in the corresponding hole in the planet gear. The fitting is fastened by the means of 2 pcs. M10 bolts. See notching on next page. The notch fitting is shown with dotted lines.

Exception to the above is working with lubrication of the rim of gearwheel, ball fifth wheel and re-tightening of hydraulic.



# W-2700/150 kW Commissioning (start/run-in) procedure



**Doc.: B0905-01.42**

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## COMMISSIONING PROCEDURE

# 01.00.00 COMMISSIONING PROCEDURE

During the commissioning of the turbine please refer to ”WM-2000, START-UP PROCEDURE” Doc.: B0905-01.24

# 01.01.00 GEARBOX

## 01.01.04 Oil filter

Check that the oil filter is mounted correctly and that there is free run through it. The oil pumps is turned manually and check through the inspection hatch if the oil is getting through to the spreading bar and to bearings.

## 01.01.05 Oil level

The oil level of the gearbox is checked. If the oil level is not correct, please make sure that it is filled or tapped to obtain the right level.

## 01.01.06 Oil pump motor

The direction of rotation of the motor is checked. The cool shield of the motor is checked and make sure that nothing is loose on the motor.

## 01.01.07 Oil pump

The pump is checked for any leakages. Clean the pump with a piece of white cloth to ensure no leakage.

## 01.01.08 Oil tube/fittings

All oil tubes and fittings are checked for correct assembly and for any leakages. All joints are cleaned with a piece of white cloth. This cloth is not to have any traces of oil after such check. To fasten pipefittings only use fork spanners. Always hold again (contra) with a spanner while tightening/fastening with another spanner. **IT IS NOT PERMITTED TO USE ADJUSTABLE SPANNER ON THE GEAR BOX**

## 01.01.09 Gear temperature/transmission

The temperature of the gearbox is noted after 1 hour of operation and again after 2 hours of operation. Minimum 2 manual measuring checks the temperature indication.

## 01.01.10 Bearings

Check during point 01.01.01 that oil goes/floats to the bearings

# 01.02.00 YAW SYSTEM

## 01.02.01 Twist sensor / Gear

As a check of the yaw systems twist sensor do the following ”WM-2000, START-UP PROCEDURE” Doc.: B0905-01.24

## Note

The easiest way to yaw the front panel on the control is opened and the connection terminals are manually short-circuited to perform yawing, which is very time consuming.

Yaw **against** the clock: The **pink** and the **brown** terminals are connected

Yaw **along** the clock: The **green** and the **brown** terminals are connected.

## 01.02.02 Twist switch

Check if the twist switch is working by letting the turbine yaw 4 rounds. THIS IS DONE UNDER CONSTANT SURVEILLANCE/MONITORING OF THE CABLES.

## 01.02.03 Yawing

It is checked that the turbine yaws correctly into the wind. This is done by yawing the turbine approx. –15° AND +15° out of the wind, and hereafter check if the wind turbine automatically yaws into the wind. Note down the turbine position.

## 01.02.04 Yaw motor

Check is the motor is fastened correctly and all cables are fastened correctly with cable relievers.

## 01.03.04 Disc brake

The disc brake is checked visually for correct assembly.

## 01.03.05 Hydraulic station

Check that all clamps and wires are assembled correctly and that there are no leakages by the station. The station is wiped clean with white cloth and if there are any leakages, they are tightened with a fork spanner. The adjustment of the station is checked according to enclosures about the station.

## 01.03.06 Hydraulic motor

The motor is checked for correct direction of rotation and correct assembly. The terminal box and the connection of cables are also checked.



## 01.03.07 Hydraulic oil

Check for correct level of oil.

## 01.03.08 Hydraulic hoses

Check the hydraulic hoses for correct fastening and for any leakages. **NEVER USE AN ADJUSTABLE SPANNER – ALLWAYS HOLD AGAINST (KONTRA) WITH A FORK SPANNER.**

## 01.03.09 Rotate union joint

The rotate union joint is checked for any leakages, see point 01.03.08

## 01.03.10 Pressure switch

The pressure switch is checked and adjusted according to the manufacturers instructions.

## 01.03.11 Hydraulic valves

Check that all hydraulic valves are correctly connected and adjusted.

## 01.03.12 Pressure release valve

Check that the pressure release valve opens at correct pressure for blades and brake system.

# 01.04.00 BLADES

## 01.04.01 Visual check of blades

The blades are checked for visible damages and impurities. Do also check for any noise made by any excess adhesive. Do note if there is any noise caused by the blades.

## 01.04.02 Testing of the blades

Check that all pivoting tip brakes deploys at braking caused by rotational speed when operating. At re-start check that all tip brakes go back into correct position towards the blade without any difficulty. The first couple of brakings are done as regular brakings.

## 01.04.03 Brakes

Check that brake calibre couples in at right time and that the brakes/brake shoes are placed and working correctly.

# 01.05.00 GENERATOR

## 01.05.01 Air inlet

Check that there is free air inlet into the turbine.

## 01.05.02 Generator cooling

Check that the ventilator behind the generator runs in the right direction (that is sucking a big amount of air into the cool shield jacket by the generator.

## 01.05.03 Generator coupling

Check that no bad noise comes from the coupling during operation.

## 01.05.04 Cable connections

**THE GENERATORS TERMINAL BOX IS NOT TO BE OPENED UNTILL IT IS ASSURED THAT THE MAIN SWITCH IS LOCKED IN OFF POSITION.** Prior to adjusting/tightening of the cable connections in the generator, check with a pole finder for any tension/voltage on the terminals. Then adjust / tighten all connections. Cables relievers are checked. Cable connection on lightning protector is checked for correct assembly. **WATCH OUT FOR ISOLATED SURFACES DUE TO PAINT.**

## 01.05.05 Adjusting

The assembly of the generator is adjusted/tightened and the terminal box is checked for loose screws etc.

# 01.06.00 CONTROL/ELECTRIC SYSTEM

## 01.06.01 Documentation

Go through the final test made by the supplier of the terminal board. Copy of the material is given to the utility company.

## 01.06.02 Final test

The final test, given by the supplier of the terminal board is performed. See ”WM-2000, START-UP PROCEDURE” Doc.: B0905-01.24. Note that this test depends on which country the turbine is erected.

## 01.06.03 Emergency stop button

The emergency stop button is tested. By activating the overload circuit breaker is released that disconnects all sensors/switches, which stops the turbine.

**Technical information on wind turbine for power plant and electrical contractor**

| | |
|---|---|
| Turbine manufacturer: | Wind World A/S |
| Type: | W-2320-2800/150 kW |
| Blade diameter: | 23,20m, 27,00m, **28,00m**. |
| Effect regulation: | Stall |
| Hub height: | *30.30 m*. |
| Type of tower: | Tubular |
| Maksimum production: | 164 kW (see enclosed effect curve) |

Generator (single stator winding):

| | |
|---|---|
| Manufacturer: | ABB MOTORS ASEA |
| Type: | Asynchronous, MBV 355 SB-6 |
| No. of poles / RPM: | 6/1000 rpm. |
| Rated voltage: | 400 V. |
| Rated current: | 262 A. |
| Rated capacity: | 150 kW |
| Turbine overload switch: | 300 A (Maximum 315 A). |
| Recommended turbine fuse: | 315 A. |

Generators usage of reactive power:

| | |
|---|---|
| Idling: | 64 quart. |
| Full load: | 112 quart. |

Capacitor battery:

| | |
|---|---|
| Rated voltage: | 500 V. |
| Rated frequency: | 50 Hz. |
| Rated capacity: | 60 quart. |

Current-limiting connection equipment:

| | |
|---|---|
| Manufacturer: | Sentic |
| Type: | Thyristor connect and disconnection |

Highest current at synchronous connections of the generator:

| | |
|---|---|
| Root mean square (RMS) value: | 314 A. |

Motor start is not used on stationary/still turbines.

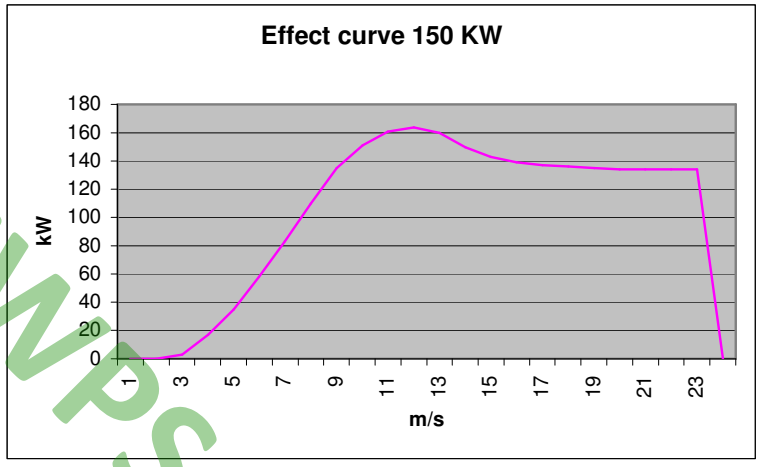
Furthermore no deviation from the demands/requirements in DEFU-KR 77 part 3.

**Effect curve for Wind World W-2320 - W2800 wind turbine with 150 kW generator**

| | |
|---|---|
| Rotor diameter: | 23,20 m. 27,00 m. 28,00 m. |
| Rotor area: | 423 m² 572 m² 616 m² |
| Rotational speed: | 41.5 rpm. |
| Blades: | LM 11 H. |
| Installed effect: | 150 kW |

W-2700

| m/s | KW |
|---|---|
| 3.0 | 0.0 |
| 4.0 | 0.0 |
| 5.0 | 3.0 |
| 6.0 | 17.0 |
| 7.0 | 35.0 |
| 8.0 | 58.0 |
| 9.0 | 83.0 |
| 10.0 | 110.0 |
| 11.0 | 135.0 |
| 12.0 | 151.0 |
| 13.0 | 161.0 |
| 14.0 | 164.0 |
| 15.0 | 160.0 |
| 16.0 | 150.0 |
| 17.0 | 143.0 |
| 18.0 | 139.0 |
| 19.0 | 137.0 |
| 20.0 | 136.0 |
| 21.0 | 135.0 |
| 22.0 | 134.0 |
| 23.0 | 134.0 |
| 24.0 | 134.0 |
| 25.0 | 134.0 |
| 26.0 | 0 |






The figures apply to standard conditions: 15° Celcius and 760 mm Hg.

**Wind World supplies:**

Turbine control mounted on stand bolted on to the turbine foundation with expansion bolts.
2 parallel plastic pipes for cable in the foundation. See drawing 3-30446 view A-A.

Turbine control box:

Klockner-Moeller type 160x80x30x IP55  Built by:
1 door 120x80 in the bottom (high-current part)
2 doors 40x40 in the top (computer part and phase advancer)

Terminal board for electric contractor:
R-S-T : 3 terminals for M12 bolt connection
0 : 1 terminal for M8 bolt connection
Earth : 1 terminal for M8 bolt connection (from the earthing rod)

Terminal board for generator cables (Wind World work)
2xR-S-T : 6 terminal for M8 bolt connection
0 : 1 terminal M8 (electric contractors earth connection)

Protection for over voltage :
0B0 type V 15 S. M8 bolt connection

Overload switch:
Klockner-Moeller type NZM9 – 315 KL-M

The cable of the turbine generator (2 pcs. parallel 4x50 quart. Cu) er provided with cable shoes and are inserted/lead in the middle of the bottom of the turbine control box.

**Contractor supplies:**

**General:**

1 Cable connection between transformator station and meter cubicle.

2 Meter cubicle provided with main switch and fuses.

3 Cable connections between meter cubicle and turbine control box.

4 Earthning with cable connection in copper to the turbine control box.

5 Supply of voltage for vibration of concrete during the making of the turbine and for erection of turbines.

See also drawing no. 3-30446 ”Placing of turbine control box and electric meter cubicle”.

**Installation instruction:**

Re. point 1: The access/admission to the meter cubicle from the transformator side is made with a single or two parallel cables dimensioned according to the distance as regards the count of ampere.

Re. point 2: Placing I:

A: The meter cubicle is placed outside the tower in connection with the transformation station. It is arranged with the local power station how the cable connection is established.

B: The meter cubicle is placed outside the tower between the transformer station and the turbine. The electric contractor or power station supplies the cable connection, which can be made with a single or two parallel cables dimensioned according to the distance as regards the count of ampere.

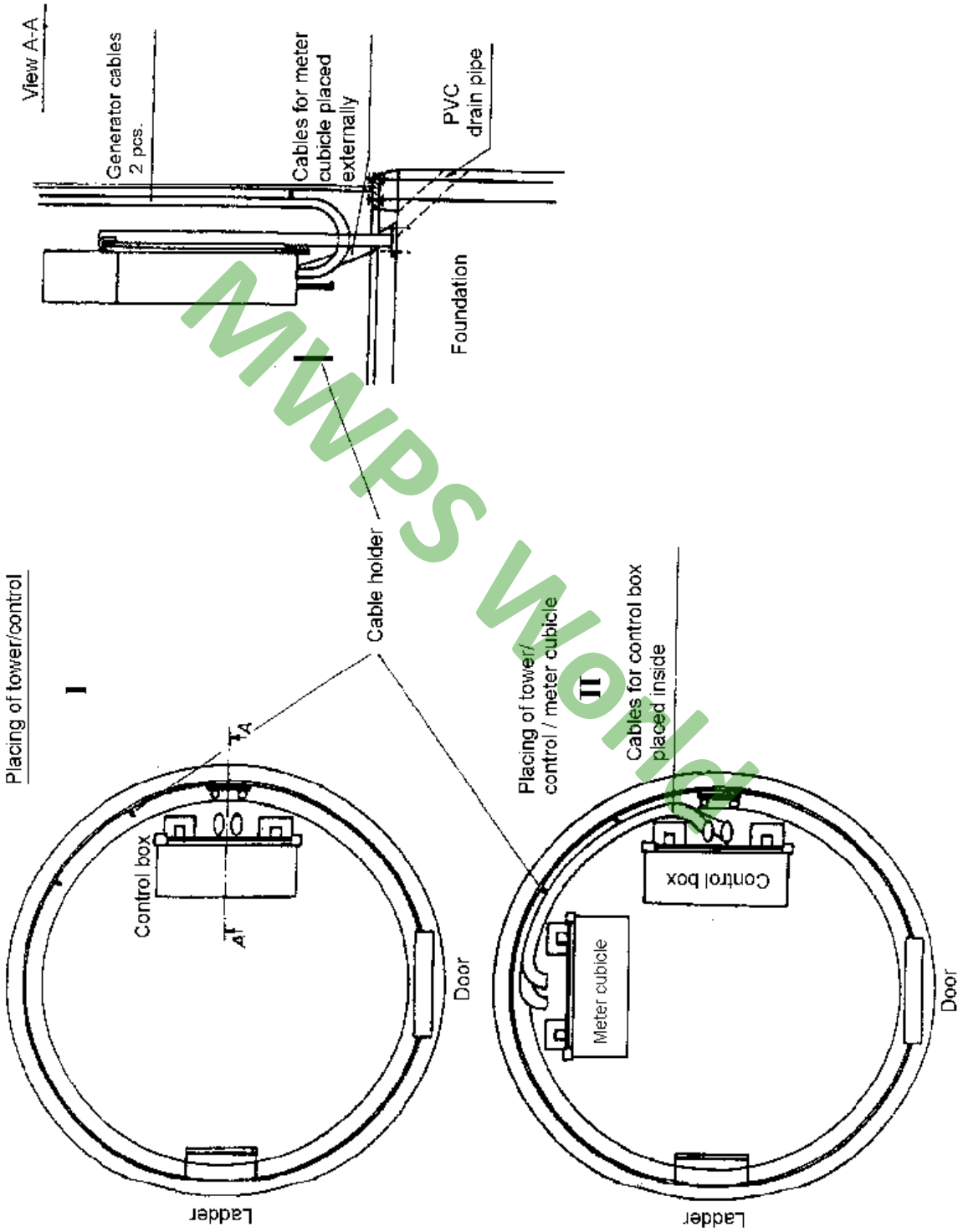
Placing II:

The meter cubicle is placed inside the turbine tower. The electric contractor can make/get a stand for bolting into the foundation exactly like Wind World use for turbine control box. The power station is asked for putting up key box externally on the turbine tower. Cable connection to the meter cubicle as placing I.B.

Re. point 3: The access/admission to the turbine control box from the meter cubicle is made with 2 pcs. 4x95 quart. Al, 2 pcs. 4x150 quart. Al or 2 pcs. Cu cables. The cables are provided with cable shoes and are inserted from the left in the bottom of the box.

Re. point 4: The earthening is done with a earthening rod and 50 quart. Cu cables with cable shoes for assembly in the left side of the turbine control box.
The earthening should have a resistance of 3-5 ohm.

## Placing of turbine control and electric meter cubicle
## Drawing no.: 3-30446



**Regarding page A:**

Titel: Current diagram
Wind world W-2700/W-2800
Power supply
Panel A1 & A2
Mark 4

---

**Regarding page B:**

Titel: Current diagram
Wind world W-2700/W-2800
Measuring of effect /power
Panel A1
Mark 4

| Danish | English |
|---|---|
| Spændingstransformer | Voldtage transformer |
| Strømtransformer | Effect/power transformer |

---

**Regarding page C:**

Titel: Key diagram
Wind world W-2700/W-2800
Emergency stop
Panel A1
Mark 4

| Danish | English |
|---|---|
| Nødstopsstryk Tavle A1 | Emergency stop  Panel A1 |
| Nødstopsstryk Tavle A1 | Emergency stop  Panel A1 |
| Arbejdsstrømudløser | Working current release |

---

**Regarding page D:**

Titel: Key diagram
Wind world W-2700/W-2800
Output terminal
Panel A1
Mark 4

| Danish | English |
|---|---|
| Arbejdsstrømudløser | Working current release |
| Hovedkontaktor | Main switch |
| Krøje venstre | Yaw left |
| Krøje højre | Yaw right |
| Hydraulikpumpe | Hydraulik pump |
| Gearoliepumpe | Gear oil pump |
| Kondensator 1 | Capacitor 1 |
| Kondensator 2 | Capacitor 2 |
| Kondensator 3 | Capacitor 3 |
| Kondensator 4 | Capacitor 4 |

**Regarding page E:**

Titel: Key diagram
Wind world W-2700/W-2800
Output terminal
Panel A1
Mark 4

| Danish | English |
|---|---|
| Vingebremse | Balde brake |
| Skivebremse | Disc brake |
| Krøjebremse | Yaw brake |
| Thyristortænding (Fase L1) | Thyristor ignition (Phase L1) |
| Thyristortænding (Fase L2) | Thyristor ignition (Phase L2) |
| Thyristortænding (Fase L3) | Thyristor ignition (Phase L3) |

**Regarding page F:**

Titel: Key diagram
Wind world W-2700/W-2800
Input terminal
Panel A1
Mark 4

| Danish | English |
|---|---|
| Bypass | Bypass |
| Krøje højre | Yaw right |
| Krøje venstre | Yaw left |
| Hydraulikpumpe | Hydraulic pump |
| Gearoliepumpe | Gear oil pump |
| Termorelæ, krøjemotor | Thermal relay, yaw motor |
| Termorelæ, hydraulikpumpe | Thermal relay, hydraulic pump |
| Termorelæ, gearoliepumpe | Thermal relay, gear oil pump |
| Kondensator 1 | Capacitor 1 |
| Kondensator 2 | Capacitor 2 |
| Kondensator 3 | Capacitor 3 |
| Kondensator 4 | Capacitor 4 |

---

**Regarding page G:**

Titel: Key diagram
Wind world W-2700/W-2800
Input terminal
Panel A2
Mark 4

| Danish | English |
|---|---|
| Slidføler | Wear sensor |
| Hydraulik niveau | Hydraulic level |
| Gearoilietryk | Gear oil pressure |
| Generatortemperatur | Generator temperature |
| Gearolietemperatur | Gear oil temperature |
| Vindfane | Wind vane |
| Anemometer | Anemometer |

---

**Regarding page H:**

Titel: Key diagram
Wind world W-2700/W-2800
Input terminal
Panel A2
Mark 4

| Danish | English |
|---|---|
| RPM 1 | RPM 1 |
| RPM 2 | RPM 2 |
| Generatortemp. | Generator temperature |
| Vibrationer | Vibrations |
| Krøjestop højre | Yaw stop right |
| Krøjestop venstre | Yaw stop left |
| Vingetryk | Blade pressure |
| Bremsetryk | Brake pressure |
| Nødstop | Emergency stop |

---

**Regarding page I:**

Titel: Key diagram
Wind world W-2700/W-2800
Input terminal
Panel A2
Mark 4

| Danish | English |
|---|---|
| Betjeningsknapper | Operation buttons |

---

**Regarding page J:**

Titel: Key diagram
Wind world W-2700/W-2800
Internal connections
Mark 4

| Danish | English |
|---|---|
| Optisk fiber | Optical fiber |

---

**Regarding page K:**

Titel: Placing of components
Wind World
Mark 4

| Danish | English |
|---|---|
| STIK 1 | Connector 1 |
| TLF. | Phone |
| LYS | Light |
| STIKDÅSE | Connector socket |
| STIK 2 | Connector 2 |
| LYS I TÅRN | Light in tower |
| KABELINDFØRING | Cable lead in |

---

**Regarding page L:**

Titel: MODEM CABLE
Wind World Mark 4

| Danish | English |
|---|---|
| HAN | Male |
| HUN | Female |

---

**Regarding ”Page CAD 0”:**

| Danish | English |
|---|---|
| KABELSNOVAGT | Cable twist guard |
| VIBERATIONSVAGT | Vibration guard |
| BREMSESKIVE | Disc brake |
| RPM 1 GEN. | RPM 1 generator |
| RPM 1 ROTOR. | RPM 2 rotor |
| SLIDFØLER | Wear sensor |
| GEAR | Gear |
| OLIETRYK | Oil pressure |
| TEMPERATUR | Temperature |
| OLIEPUMPE | Oil pump |
| PRESSOSTAT VINGETRYK | Pressure switch blade pressure |
| PRESSOSTAT BREMSETRYK | Pressure switch brake pressure |
| OLIENIVEAU TEMPERATUR | Oil level temperature |
| HYDRAULIKPUMPE | Hydraulic pump |
| NØDSTOP | Emergency stop |
| TOPBOKS | Upper box |
| MOTORKABEL | Motor cable |
| LYSLEDER | Fiber optic light guide |
| STYRING | Control |
| KABINETAG | Cabin / nacelle roof |
| ANEMOMETER | Anemometer |
| VINDFANE | Wind vane |
| KRØJEENDESTOP VENSTRE | Yaw end stop left |
| KRØJEENDESTOP HØJRE | Yaw end stop right |
| KRØJEMOTOR | Yaw motor |
| TANDKRANS | Sprocket / toothed ting |
| TERMISTOR | Thermistor |
| TEMPERATUR | Temperature |
| GENERATOR | Generator |

---

**Regarding ”Page CAD 1”:**

Nothing to translate

---

**Regarding ”Page CAD 2”:**

Nothing to translate

---

**Regarding ”Page CAD 3”:**

| Danish | English |
|---|---|
| OPTION | Option |
| MODEM | Modem |
| STRØMFORSYNING – MODEM | Current supply – modem |
| OVERSPÆNDINGSBESKYTTELSE | Over voltage protector |
| UD | Out |
| IND | In |
| LINIE UD | Line out |
| TLF. LINIE IND | Phone line in |

---

**Regarding ”Page CAD 4”:**

| Danish | English |
|---|---|
| TILGANG FRA SIKRINGSLISTE | Inlet from fuse list |
| BELYSNING OG STIKK. | Light and connector |
| STYRESYSTEM (COMPUTER) | Lead voltage (computer) |
| STYRESPÆNDING | Lead voltage |
| KONTAKTORER | Contactor |
| VENTILER | Valves |
| HOVEDAFBRYDER | Main switch |
| OVERSPÆNDINGSBESKYTTELSE | Over voltage protector |
| STRØMMÅLING | Measuring of current |
| NØD BUND | Emergency bottom |
| KABELSNOVAGT | Cable twist guard |
| NØD TOP | Emergency top |

---

**Regarding ”Page CAD 5”:**

| Danish | English |
|---|---|
| FRA SIDE 4 | From page 4 |
| HJÆLPEMOTOR | Auxiliary motor |
| KRØJEMOTOR VENSTRE | Yaw motor left |
| KRØJEMOTOR HØJRE | Yaw motor right |
| HYDRAULIKPUMPE | Hydraulic pump |
| GEAROLIEPUMPE | Gear oil pump |
| SPÆNDINGSMÅLING | Measuring of voltage |
| TIL SIDE 6 | To page 6 |

---

**Regarding "Page CAD 6":**

| Danish | English |
|---|---|
| GENERATOR BYPASSKONTAKTOR | Generator bypass contactor |
| GENERATOR THYRISTORINDKOBLING | Generator thyristor contection |
| GENERATOR ÅBEN - - FORB. | Generator open - - connected |
| FASEKOMP. 1 | Phase advancer 1 |
| FASEKOMP. 2 | Phase advancer 2 |
| FASEKOMP. 3 | Phase advancer 3 |
| FASEKOMP. 4 | Phase advancer 4 |
| GENERATOR | Generator |

---

**Regarding "Page CAD 7":**

| Danish | English |
|---|---|
| TILGANG 3 x 400 V | Ïnlet 3 x 400 V |
| MAKSIMALAFBRYDER | Overload switch |
| COMPUTERFORSYNING | Computer supply |
| BELYSNING | Light |
| STRØMTRANSFORMER | Current transformer |
| OVERSPÆNDINGSAFLEDER | Lightning arrester |

---

**Regarding "Page CAD 8":**

| Danish | English |
|---|---|
| MOTORKREDSE | Motor circuit |
| STYRESPÆNDING | Lead voltage |
| BELYSNING OG STIKK. | Light and power socket |

---

**Regarding "Page CAD 9":**

| Danish | English |
|---|---|
| VENSTRE KRØJEKONTAKT | Left yaw switch |
| HØJRE KRØJEKONTAKT | Right yaw switch |
| HYDRAULIKPUMPE | Hydraulic pump |
| GEAROLIEPUMPE | Gear oil pump |

---

**Regarding ”Page CAD 10”:**

| Danish | English |
|---|---|
| KONDENSATOR 1 | Capacitor 1 |
| KONDENSATOR 2 | Capacitor 2 |
| KONDENSATOR 3 | Capacitor 3 |
| KONDENSATOR 4 | Capacitor 4 |
| 12.5 kvar | 12.5 quart. |

---

**Regarding ”Page CAD 11”:**

| Danish | English |
|---|---|
| SPÆNDINGSTRANSFORMER | Voltage transformer |
| STRØMTRANSFORMER | Current transformer |
| D1. RELÆPRINT | D1. relay circuit board |

---

**Regarding ”Page CAD 12”:**

| Danish | English |
|---|---|
| THYRISTOR | Thyristor |
| GENERATOR | Generator |
| BYPASS KONTAKTOR | Bypass contactor |
| SE TEGN. SIDE | See drawing page |

---

**Regarding ”Page CAD 13”:**

| Danish | English |
|---|---|
| HOVEDAFBRYDER | Main switch |
| GENERATOR | Generator |
| RELÆKORT | Relay board |

---

**Regarding ”Page CAD 14”:**

| Danish | English |
|---|---|
| RELÆPRINT | Relay circuit board |

---

**Regarding "Page CAD 15":**

| Danish | English |
|---|---|
| VINGEBREMSE | Blade brake |
| SKIVEBREMSE | Disc brake |
| KRØJEBREMSE | Yaw brake |
| THYRISTORTÆNDING (FASE L1) | Thyristor ignition (phase L1) |
| THYRISTORTÆNDING (FASE L2) | Thyristor ignition (phase L2) |
| THYRISTORTÆNDING (FASE L3) | Thyristor ignition (phase L3) |

---

**Regarding "Page CAD 16":**

| Danish | English |
|---|---|
| TOPBOKS | Top box |
| MODEMFORSYNING | Modem supply |
| RELÆPRINT | Relay circuit board |

---

**Regarding "Page CAD 17":**

Nothing to translate.

---

**Regarding "Page CAD 18":**

| Danish | English |
|---|---|
| ARBEJDSSTRØMUDLØSER | Working current release |
| IKKE BRUGT | Not used |
| KRØJ HØJRE | Yaw right |
| KRØJ VENSTRE | Yaw left |
| HYDRAULIKPUMPE | Hydraulic pump |
| FASEKOMPENSERING | Phase advancing/compensating |
| PARALLELKONTAKT | Parallel contact |
| IKKE BRUGT | Not used |
| IKKE BRUGT | Not used |
| GEAROLIEPUMPE | Gear oil pump |
| TIL SIDE 19 | To page 19 |

---

**Regarding "Page CAD 19":**

| Danish | English |
|---|---|
| FRA SIDE 18 | From page 18 |

---

**Regarding "Page CAD 20":**

| Danish | English |
|---|---|

| | |
|---|---|
| PARALLELKONTAKT | Parallel contact |
| IKKE BRUGT | Not used |
| IKKE BRUGT | Not used |
| KRØJ HØJRE | Yaw right |
| KRØJ VENSTRE | Yaw left |
| HYDRAULIKPUMPE | Hydraulic pump |
| GEAROLIEPUMPE | Gear oil pump |
| FASEKOMPENSERING | Phase advancing/compensating |
| IKKE BRUGT | Not used |
| IKKE BRUGT | Not used |
| TIL SIDE 21 | To page 21 |
| INDGANGE | Input terminal |
| TAVLE | Board / panel |

---

**Regarding ”Page CAD 21”:**

| Danish | English |
|---|---|
| FRA SIDE 20 | From page 20 |
| TERMORELÆ, KRØJEMOTOR | Thermal relay, yaw motor |
| TERMORELÆ, HYDRAULIKPUMPE | Thermal relay, hydraulic pump |
| TERMORELÆGEAROLIEPUMPE | Thermal relay, oil pump |
| INDGANGE | Input terminal |
| TAVLE | Board / panel |

---

**Regarding ”Page CAD 22”:**

| Danish | English |
|---|---|
| NØDSTOPSKREDSE | Emergency stop circuits |
| BLÆSER | Fan /ventilator |
| NØDSTOPSTYRK,TAVLE A1 | Emergency stop, Board/panel A1 |
| NØDSTOPSTYRK,NACELLE | Emergency stop, Nacelle |
| KABELSNOVAGT | Cable twist guard |
| ARBEJDSSTRØMUDLØSER | Working current release |

---

**Regarding "Page CAD 23":**

| Danish | English |
|---|---|
| VINGEBREMSE | Blade brake |
| SKIVEBREMSE | Disc brake |
| KRØJEBREMSE | Yaw brake |
| KABELSNOVAGT | Cable twist guard |
| NØDSTOP I NACELLE | Emergency stop in nacelle |
| FIBER | Fibre |

---

**Regarding "Page CAD 24":**

| Danish | English |
|---|---|
| STIK | Connector |
| LYS | Light |
| GEAROLIEPUMPE | Gear oil pump |
| HYDRAULIKPUMPE | Hydraulic pump |
| KRØJEMOTOR | Yaw motor |

---

**Regarding "Page CAD 25":**

| Danish | English |
|---|---|
| STYRING | Control |
| KRØJEMOTOR | Yaw motor |
| HYDRAULIK | Hydraulic |
| GEAROLIEPUMPE | Gear oil pump |
| TÆNDLEDNING LYS | Ignition wire light |
| NUL – LYS + STIKK. | Neutral - light + plug contact |
| FASE - STIKK. | Phase - plug contact |
| F1 STYRESPÆNDING | F1 Guide/lead voltage |
| N1 STYRESPÆNDING | N1 Guide/lead voltage |
| NØDSTOPKREDS | Emergency stop circuit |
| KRØJEBREMSE | Yaw brake |
| VENTILER | Valves |
| SKIVEBREMSE | Disc brake |
| VINGEBREMSE | Blade brake |
| LYS-LEDER FIBER | Optical fibre |

---

**Regarding ”Page CAD 26”:**

Nothing to translate.

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**Regarding ”Page CAD 27”:**

| Danish | English |
|---|---|
| GEAROLIEPUMPE | Gear oil pump |
| IKKE BRUGTE | Not used |
| IKKE BRUGTE | Not used |
| GENERATORTEMPERATUR | Generator temperature |
| IKKE BRUGTE | Not used |
| IKKE BRUGTE | Not used |
| IKKE BRUGTE | Not used |
| IKKE BRUGTE | Not used |
| TIL SIDE 28 | To page 28 |

---

**Regarding ”Page CAD 28”:**

| Danish | English |
|---|---|
| FRA SIDE 27 | From page 27 |
| VINGETRYK | Blade pressure |
| BREMSETRYK | Brake pressure |
| IKKE BRUGT | Not used |
| IKKE BRUGT | Not used |
| KRØJESTOP VENSTRE | Yaw stop left |
| IKKE BRUGT | Not used |
| KRØJESTOP HØJRE | Yaw stop right |
| IKKE BRUGT | Not used |
| TIL SIDE 29 | To page 29 |

---

**Regarding "Page CAD 29":**

| Danish | English |
|---|---|
| FRA SIDE 28 | From page 28 |
| TIL SIDE 30 | To page 30 |
| NØDSTOP | Emergency stop |
| GEAROLIETRYK | Gear oil pressure |
| IKKE BRUGT | Not used |
| HYDRAULIKVAGT | Hydraulic guard |
| VIBRATIONSFØLER | Vibration sensor |
| ANEMOMETER | Anemometer |
| HYDRAULIKVAGT -<br>IKKE PÅ NYERE MØLLER<br>LUS FRA 92 – 39 – 40 MONTERES | Hydraulic guard -<br>Not used on newer/recent turbines<br>Bug from 92 – 39 – 40 is mounted |

---

**Regarding "Page CAD 30":**

| Danish | English |
|---|---|
| FRA SIDE 30 | From page 30 |
| VINDFANE – RETNING | Wind vane – direction |
| GENERATOR PCT | Generator PCT |
| RPM 1 GENERATOR | RPM 1 generator |
| RPM 2 ROTOR – VINGE | RPM 2 rotor – blade |
| VINDFANE – CENTER | Wind vane – center |
| BREMSE SLIDFØLER | Brake wear sensor |

---

**Regarding "Page CAD 31":**

| Danish | English |
|---|---|
| KRØJ | Yaw |
| DRIFT | Operation |
| STOP | Stop |
| START | Start |
| MOTOR | Motor |
| BETJENINGSKNAPPER TOPBOX | Operation buttons topbox |

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**Regarding "Page CAD 32":**

Nothing to translate.

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**Regarding ”Page CAD 33”:**

| Danish | English |
|---|---|
| KØREPLADE | Operation plate |
| MODEM | Modem |
| PLAST | Plastic |
| MODTAGER | Receiver |

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**Regarding ”Page CAD 34”:**

| Danish | English |
|---|---|
| STYRING | Control |
| KRØJEMOTOR | Yaw motor |
| HYDRAULIK | Hydraulic |
| GEAROLIEPUMPE | Gear oil pump |
| TÆNDLEDNING LYS | Ignition wire light |
| NUL – LYS + STIKK. | Neutral - light + plug contact |
| FASE - STIKK. | Phase - plug contact |
| F1 STYRESPÆNDING | F1 Guide/lead voltage |
| N1 STYRESPÆNDING | N1 Guide/lead voltage |
| NØDSTOPKREDS | Emergency stop circuit |
| KRØJEBREMSE | Yaw brake |
| VENTILER | Valves |
| SKIVEBREMSE | Disc brake |
| VINGEBREMSE | Blade brake |
| LYS-LEDER FIBER | Optical fiber |

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**Regarding ”Page CAD 35”:**

| Danish | English |
|---|---|
| STIK | Connector |
| LYS | Light |
| GEAROLIEPUMPE | Gear oil pump |
| HYDRAULIKPUMPE | Hydraulic pump |
| KRØJEMOTOR | Yaw motor |

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**Regarding ”Page CAD 36”:**

| Danish | English |
|---|---|
| VINGEBREMSE | Blade brake |
| SKIVEBREMSE | Disc brake |
| KRØJEBREMSE | Yaw brake |
| KABELSNOVAGT | Cable twist guard |
| NØDSTOP I NACELLE | Emergency stop in nacelle |
| FIBER | Fiber |

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**Regarding ”Page CAD 37”:**

| Danish | English |
|---|---|
| GEAROLIETEMPERATUR | Gear oil temperature |
| IKKE BRUGT | Not used |
| IKKE BRUGT | Not used |
| GENERATOR TEMPERATUR | Generator temperature |
| IKKE BRUGT | Not used |
| IKKE BRUGT | Not used |
| IKKE BRUGT | Not used |
| IKKE BRUGT | Not used |

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**Regarding ”Page CAD 38”:**

| Danish | English |
|---|---|
| NØDSTOP | Emergency stop |
| GEAROLIETRYK | Gear oil pressure |
| IKKE BRUGT | Not used |
| HYDRAULIKVAGT | Hydraulic guard |
| VIBRATIONSFØLER | Vibration sensor |
| ANEMOMETER | Anemometer |

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**Regarding ”Page CAD 39”:**

| Danish | English |
|---|---|
| VINDFANE – RETNING | Wind vane – direction |
| GENERATOR PCT | Generator PCT |
| RPM 1 | RPM 1 |
| RPM 2 | RPM 2 |
| VINDFANE – CENTER | Wind vane – center |
| BREMSE SLIDFØLER | Brake wear sensor |

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**Regarding ”Page CAD 40”:**

| Danish | English |
|---|---|
| VINGETRYK | Blade pressure |
| BREMSETRYK | Brake pressure |
| IKKE BRUGT | Not used |
| IKKE BRUGT | Not used |
| KRØJESTOP VENSTRE | Yaw stop left |
| IKKE BRUGT | Not used |
| KRØJESTOP HØJRE | Yaw stop right |
| IKKE BRUGT | Not used |

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**Regarding ”Page CAD 41”:**

| Danish | English |
|---|---|
| KRØJ | Yaw |
| STOP | Stop |
| START | Start |
| MOTOR | Motor |
| BETJENINGSKNAPPER | Operation buttons |