

Fig. 12 Fall arrester

- A On the safety rope next to the vertical ladder
- B On the fall arrest rail

8.1.2 Attaching the fall arrester

Safety rope next to the vertical ladder

- Completely loosen the knurled thumb screw on the fall arrester
- Push the ratchet down and open the fall arrester
- Place the open fall arrester around the safety rope
 - Make sure that the fall arrester is in the correct mounting position
 - The "up" arrow on the fall arrester must point upward

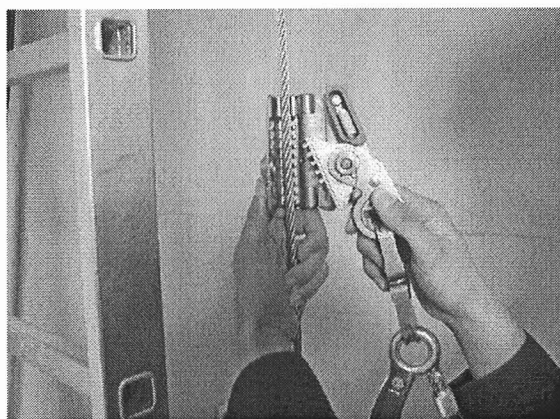


Fig. 13 Attaching the fall arrester to the safety rope

- Close the fall arrester so that the ratchet locks in place

Note: This is easier if you slightly lift the snap hook
- Manually retighten the knurled thumb screw
- Perform a functional test

Safety rope in the center of the vertical ladder ("Latchways" system)

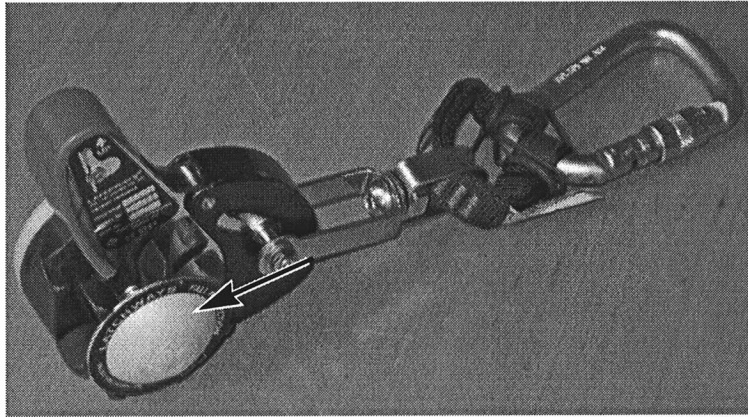


Fig. 14 Fall arrester "Latchways" system with tooth washer (arrow)

- Hook the fall arrester in the abdominal lug on the abdominal strap
- Use your right hand to hold the fall arrester in a hanging position, and use your thumb to operate the ratchet release mechanism

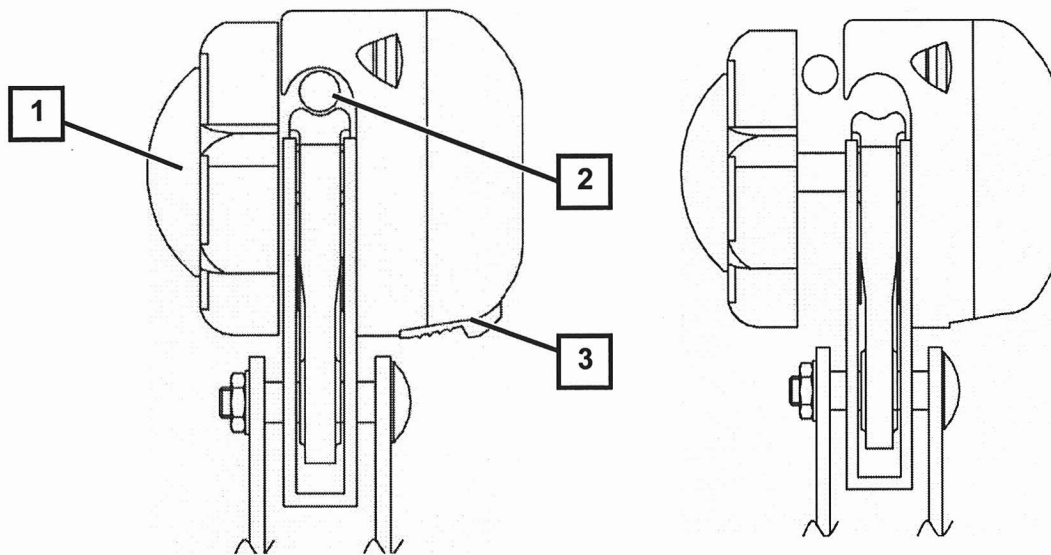


Fig. 15 Fall arrester, "Latchways" system (left closed, right open)

- 1 Tooth washer
- 2 Safety rope
- 3 Ratchet release mechanism

- Use your left hand to remove the left part of the fall arrester (tooth washer) to the side
- Slide the fall arrester onto the rope, so that the rope runs through the inside of the housing

- Operate the ratchet release mechanism with your thumb and press both halves of the fall arrester together
- Check that the fall arrester is properly locked, and can no longer be pulled apart
- Carry out a suspension test

Fall arrest rail with fall arrester

The fall arrester can be attached or removed at the top or bottom end of the fall arrest rail.

To remove the fall arrester, the ratchet on the fall arrest rail must first be opened, see Fig.16.

- Slide the fall arrester onto the fall arrest rail from below
Note: The snap hook must point towards the ground.
- Carry out a suspension test

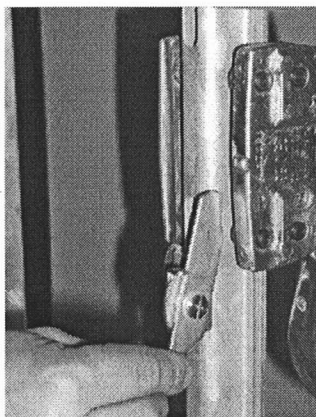


Fig. 16 Ratchet on the fall arrest rail

Fall arrester with release mechanism (Haca)

The fall arrester with release mechanism can be attached and removed at any point on the fall arrest rail.

- Open the cover
- Push in the locking pin
- Pull the right half of the fall arrester to the side
- Attach the fall arrester to the fall arrest rail
Note: The arrow on the fall arrester must point upwards
- Release the right half, so that both halves pull together
- Check that the rollers are sitting correctly on the fall arrest rail
Note: The locking pin must be completely disengaged again

- Carry out a suspension test

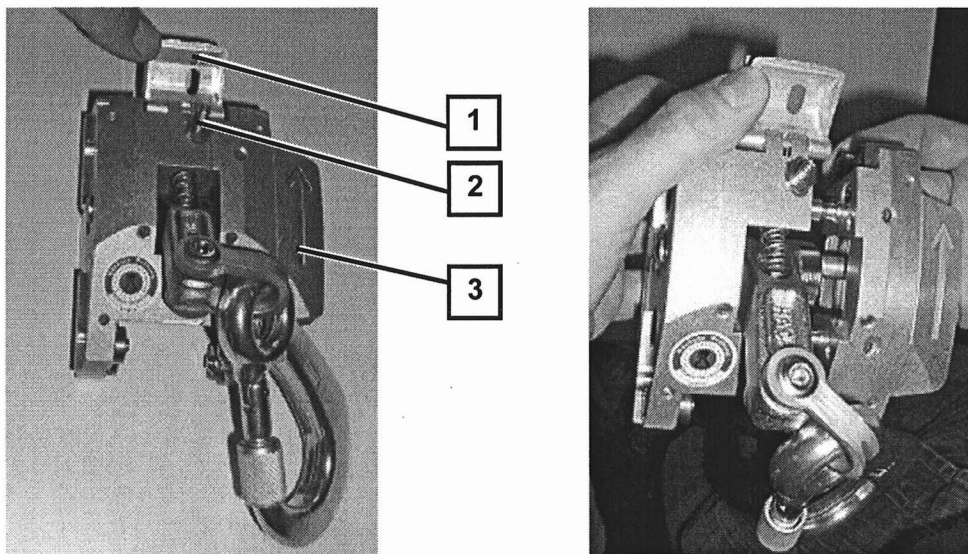


Fig. 17 Fall arrester (Haca)

- 1 Cover
- 2 Locking pin
- 3 Arrow marking

8.2 Rotor lock

The rotor lock is used to reliably mechanically lock the entire drive train. It prevents risks to persons working in the nacelle and rotor hub due to rotating parts of the drive train.

WTs of all turbine classes are equipped with a rotor lock on the rotor shaft.

This consists of 1 or 2 bolts and the rotor lock disk, which is located on the rotor shaft.

With the rotor at standstill, the bolt/s are inserted into one of the drill holes in the rotor lock disk.

WTs of turbine class K08 can have an additional rotor lock on the brake disk. This must only be used under certain conditions.

Notice: The rotor lock must only be operated by trained specialized personnel.

8.3 Attachment points

There are specific attachment points in the WT for the PPE to safeguard against falling. These attachment points are indicated with yellow paint, or with red paint in WTs that have been operational for a longer period of time.

In the nacelle, the attachment points are lifting lugs on rotor bearing and gearbox, see Fig.18.

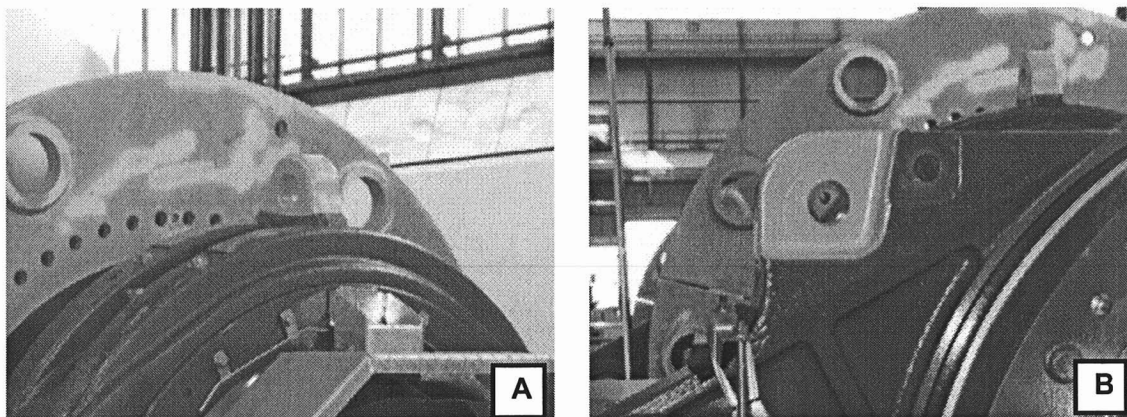


Fig. 18 Attachment points in the nacelle (example)

A Lifting lug on rotor bearing

B Lifting lug on gearbox

In WT's of turbine class K08, the lifting lugs on the generator are also permitted as attachment points, see Fig.19.

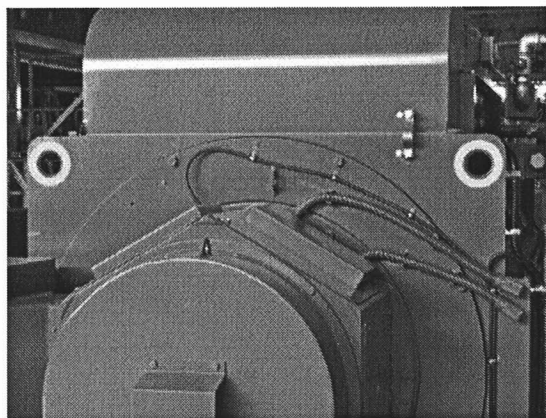


Fig. 19 Attachment points on generator (K08)

Additional attachment points K08 beta

WT's of turbine class K08 can be additionally equipped with a safety rope system, see Fig.20.

In this case, the safety rope serves as a continuous attachment point.

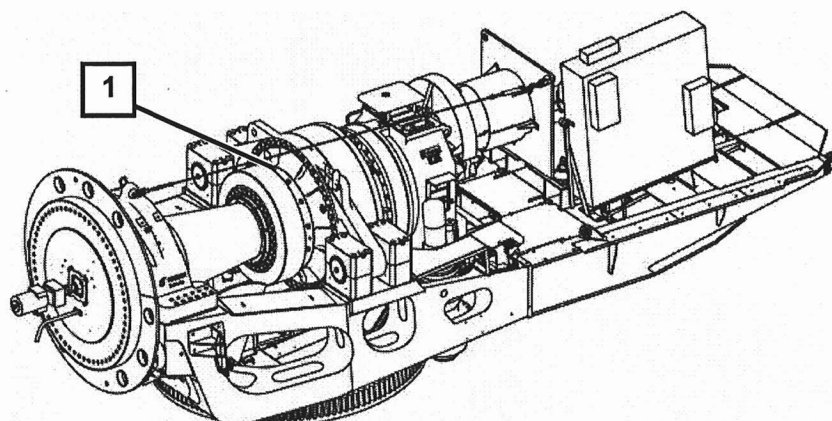


Fig. 20 WT with safety rope system (example)

1 Safety rope

If a sign indicates that the cross bolt for the front roof prop in a WT of the K08 beta turbine class is a permitted attachment point, this can be used to attach persons, particularly when rescuing a casualty in the nacelle.

Both roof props must be mounted in this case. Without props, the cross bolt is not permitted as an attachment point.

Eyebolts marked as attachment points are located in the tower and on the nacelle roof.

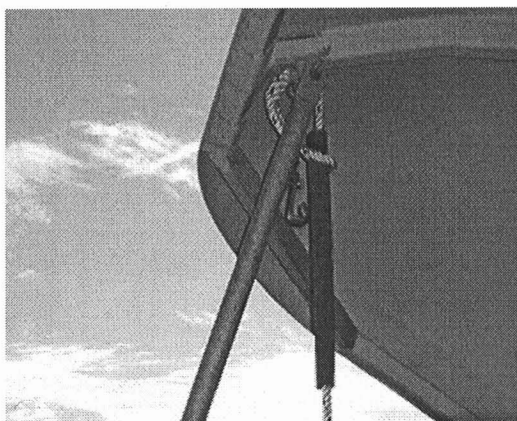


Fig. 21 Attachment point at the roof (K08 beta)

Additional attachment points for personal protection K08 gamma

- At the front of the machine frame
- Post 1 of the crane structure
- Post 4 of the crane structure (at the crane hatch)
- On the crane rail
- On the roof

- At the rotor hub access hatch

8.4 Emergency stop switches

There are several emergency stop switches in the WT. They serve to stop the WT as quickly as possible in hazardous situations.

Pressing an emergency stop switch interrupts the *safety chain* of the WT, which is a hard-wired series connection of various monitoring devices.

The interruption of the safety chain leads to an emergency stop of the WT. This brings the rotor to a standstill as quickly as possible and disconnects the generator and converter from the grid.

The emergency stop switches lock in place when pressed.

The knob must be turned to the right to reset the switch to its original position.

To return the WT to the operational state, the safety chain must be additionally reset directly on site.

The emergency stop switches are located at different points in the WTs of each turbine class. For detailed information, refer to the operating instructions of the respective WT.

8.5 Access hatch switch

Specific turbine types have an access hatch switch at the access hatch to the nacelle, see Fig.22.

This is activated when the access hatch is opened. It puts the WT into service mode and the rotor brake is applied.

In this way, the access hatch switch ensures that the rotor is at a standstill before entering the nacelle.

If, contrary to the regulations, the WT has not been stopped before ascending to the nacelle, the access hatch switch triggers one of the braking programs when the access hatch is opened. This stops the WT as quickly as possible.

Once the access hatch has been closed, the rotor brake is released again.

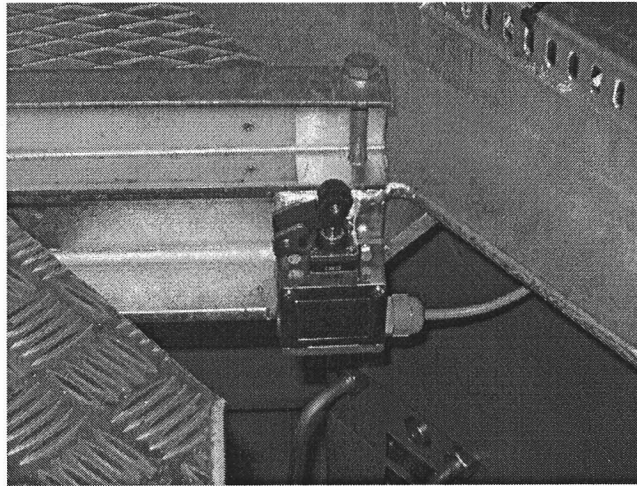


Fig. 22 Access hatch switch (example)

8.6 Area limit switches and battery disconnectors in the rotor hub

WTs with pitch systems (K07, K08) are equipped with various options for deactivating the pitch drives.

K07

The following is located on each pitch box for the respective pitch drive:

- 1 mains switch for disconnecting the pitch power supply
- 1 battery switch for disconnecting the battery voltage

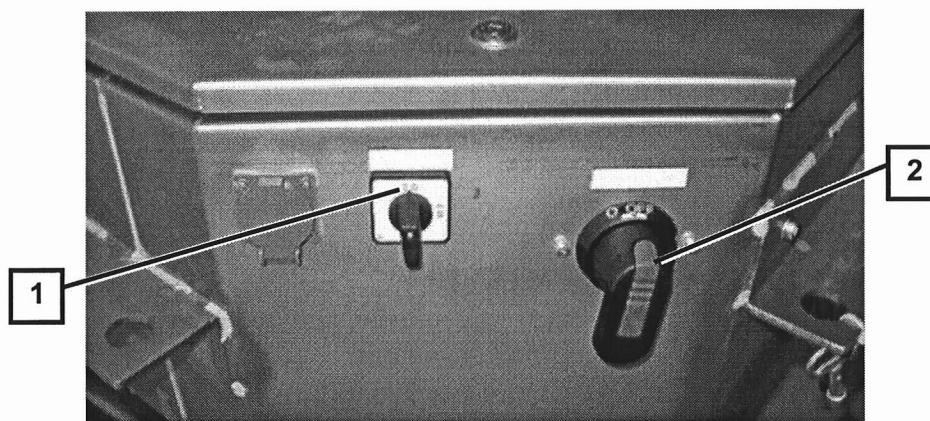


Fig. 23 Pitch box K07

- 1 Mains switch
- 2 Battery switch

If all battery switches are activated, a de-activation of one of the mains switches also leads to an emergency pitch run of all 3 pitch drives using the batteries - also including the pitch drive whose mains switch has been de-activated.

If the emergency pitch run for one of the pitch drives must be prevented, its battery switch must first be de-activated before one of the mains switches is de-activated.

K08 with 2 battery boxes per pitch drive

Each pitch box has 1 area limit switch for completely disconnecting the respective pitch drive.

At the same time, the pitch supply voltage for the other two pitch drives is disconnected but their emergency pitch run using battery voltage is also triggered.

The emergency pitch run can only be prevented if the fuses for the battery voltage in the respective pitch boxes are opened in advance.

Like the emergency stop switches, the area limit switches lock in place when pressed.

The knob must be turned to the right to reset the switch to its original position so that the pitch supply voltage is reconnected.

K08 with 1 battery box per pitch drive

Each pitch box has 1 area limit switch for completely disconnecting the respective pitch drive.

Each battery box has 1 battery disconnecter for disconnecting the battery voltage.

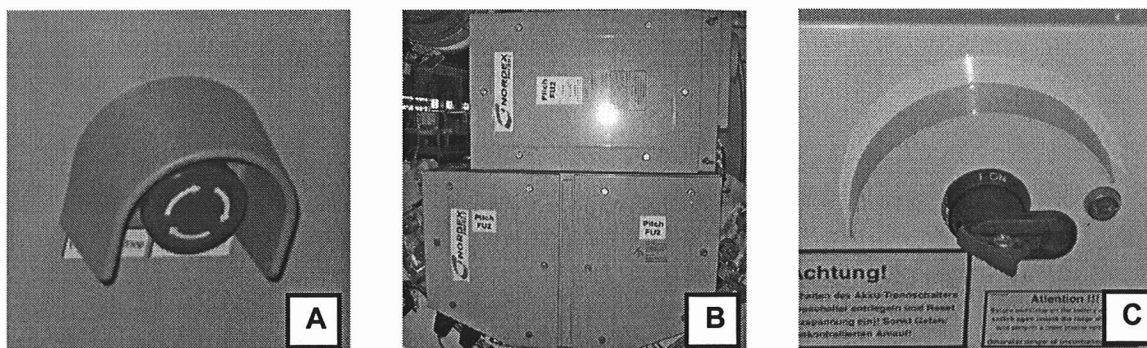


Fig. 24 Pitch boxes K08 (example)

- A Area limit switch
- B Battery box and pitch boxes
- C Battery disconnecter

Each area limit switch also disconnects the pitch supply voltage for the other two pitch drives. However, these remain connected to the battery voltage.

Activating an area limit switch also triggers an emergency pitch run for the other two pitch drives, provided all battery disconnectors are activated. This can be prevented by disconnecting any battery disconnector in advance.

Like the emergency stop switches, the area limit switches lock in place when pressed.

The knob must be turned to the right to reset the switch to its original position.

For pitch 1 systems, it is sufficient to release the area limit switch to re-activate the pitch supply voltage.

For pitch systems as of pitch 2, the blue reset button on pitch box 1 (pitch FU 1) must be additionally pressed afterwards.

If a previously de-activated battery disconnector is to be re-activated, the pitch supply voltage must be reconnected first before the battery disconnector is re-activated.

8.7 Rotor brake selector switch

WTs of turbine class K08 with active rotor brake are equipped with a "rotor brake selector switch" on the Topbox.

It is used for switching between automatic and manual operation of the rotor brake.

Switching over from automatic to manual operation triggers a fast braking and an immediate application of the rotor brake.

The rotor brake can now only be released by using the *Release Brake* button on the manual control unit.

The wind turbine control system can now no longer access the rotor brake.

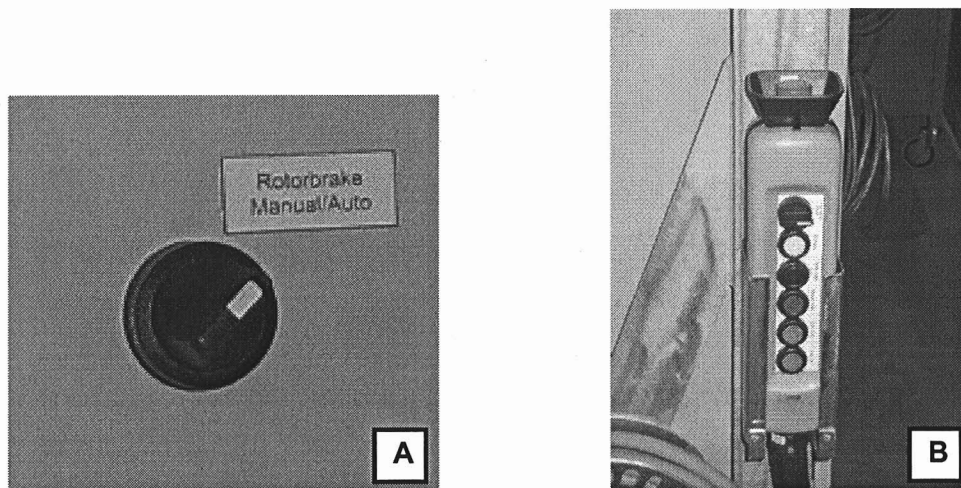


Fig. 25 Operational controls on the Topbox (example)

- A Rotor brake selector switch
- B Manual control unit

8.8 Emergency lighting

The WT is equipped with emergency lighting in the tower and nacelle if the power supply of the WT should fail.

The emergency lighting switches on automatically with a maximum delay of 15 seconds and ensures that the WT is lit for at least 1 hour.

This ensures a safe descend from the nacelle.

9. Behavior in specific situations

9.1 Grid failure



DANGER

FALLING HAZARD

There is a danger of falling and of injury when using the vertical ladder without sufficient lighting.

The emergency lighting in the WT is ensured for only 1 hour.

The descent into the tower base must be completed within one hour after the grid failure.



OBSERVE DOCUMENT

Work Instructions *F010_002 Wind Turbines Without Grid Connection or With Locked Drive-Train*

In the case of a grid failure, the lighting in the WT is automatically switched to emergency lighting.

If there is a grid failure during service work on the WT, and if it cannot be foreseen when the power supply will be restored, proceed as follows:

- Stop all work in the rotor hub and nacelle
- If the cabin roof is open, close and lock it
- Proceed as described in the Work Instructions *F010_002*
- Descend to the tower base
- Inform the responsible remote monitoring

9.2 Thunderstorm



DANGER

LIGHTNING STRIKE

During thunderstorms, there is a danger to life inside or close to the WT caused by lightning strike.

In case of an approaching thunderstorm, leave the WT or do not enter it.

Once the thunderstorm has passed, be aware of crackling noises as you approach the WT, as these are a result of electrostatic charging.

Only enter the WT when these noises have stopped.

A WT is at high risk from lightning strikes.

The WT itself is adequately protected against damage by comprehensive lightning protection measures. However, persons inside or in the proximity of a WT are still at risk.

- Initially, proceed as in a grid failure
- Leave and lock the WT
- Wait at a safe distance from the WT until the thunderstorm has passed

Do not re-enter the WT until the thunderstorm has passed.

9.3 Fire



FALLING TURBINE PARTS

In case of a fire in the nacelle or on the rotor, parts may fall off the wind turbine.

In case of a fire, nobody is permitted within a radius of 500 m from the turbine.



NOTE

The WT is equipped with ABC powder fire extinguishers for fighting incipient fires.

At least one fire extinguisher is located in the tower base near the door and another in the nacelle near the Topbox.

This makes it possible to extinguish burning solids and liquids, as well as fires in electrical systems of up to 1,000 V.

These fire extinguishers are not suitable for extinguishing a fire on the high-voltage elements, see Chapter 9.3.2 "Fire in medium-voltage switchgear or transformer".

9.3.1 Fire in the WT

- Remove any persons from the danger area
- If possible, disconnect the burning object from the grid
- Fight the fire with available means if there is any chance of success
- If the fire cannot be extinguished or if there is no chance of success, call the fire department
- Inform the responsible remote monitoring

9.3.2 Fire in medium-voltage switchgear or transformer



DANGER

HIGH VOLTAGE

Parts of the medium-voltage switchgear and the medium-voltage transformer are subject to high voltage.

Do **not** attempt to extinguish such fires with the fire extinguishers found in the WT.

These are only suitable for equipment up to 1,000 V.

- Immediately disconnect the WT
Note: If this is not possible, inform the responsible power utility and have the wind turbine disconnected from there.
- Evacuate the WT
- Call the fire department

9.4 Accident

- Remain calm
- Take care of your own safety
- Take action to prevent further casualties
- Rescue casualties from the danger area
- Perform first-aid
- Inform the rescue service
- Inform the responsible remote monitoring

Electrical accidents

- Immediately disconnect the voltage in the WT
Note: If this is not possible, the power utility must be informed to switch the wind turbine to zero potential
- Only use non-conductive devices for any rescue attempts
- Continuously check the consciousness and breathing (circulation) of casualties
- Always seek medical treatment, even after minor electrical accidents

9.5 Oil spill



WARNING

SLIP HAZARD

Move particularly carefully and, where possible, avoid stepping on oil-polluted surfaces.

- Stop the WT
- Inform the responsible remote monitoring

Further measures, to be carried out by service employees only

- Locate the leak
- If possible, seal the leak or block the flow of oil elsewhere
- Properly remove any escaped oil
- Replace damaged parts
- Remove any contamination
- If oil has penetrated into the soil, inform the responsible local authorities and agree further measures with them

9.6 Earthquake

If the WT is located in an area with earthquake hazard, the following rules of conduct must be observed.

Earthquakes during work on the WT

- Immediately leave the WT
- Wait at a safe distance until the end of the earthquake
- Do not re-enter the WT until it has been checked for damage and no safety risk has been established

After an earthquake

- Stop the WT
- Check the WT, particularly the tower and foundation, for external damage
- Inform the responsible remote monitoring, and agree further procedure with them

9.7 Leaving the nacelle in hazardous situations (abseiling)



NOTE

The following explanations only apply to NORDEX employees and employees of commissioned subcontractors.

The owner must create and use an own safety concept to be used on the WT. A corresponding training course can be taken at NORDEX to familiarize oneself with the abseiling equipment.

There are 2 escape routes out of the nacelle:

- Descending inside the tower via the vertical ladder
- Abseiling outside the tower, if descending inside the tower is not possible

Warning: Do not use the service lift during a fire or an earthquake.



- If the rotor has not been stopped prior to abseiling out of the nacelle, there is a danger to life
- Before abseiling, ensure that the rotor has been locked or, at the very least, is secured with the rotor brake

It is possible to abseil out of the nacelle as follows for WTs of turbine type

- K06 and K08 beta: When the roof is open, over the edge of the nacelle wall
- K07: Through the transport hatch in the rear part of the nacelle
- K08 gamma: Through the transport hatch (crane hatch) in the rear part of the nacelle or via the roof

9.7.1 Attaching the edge protection (K08 beta and K06)



NOTE

This edge protection is the edge protection of the abseiling equipment. In some WTs there is also an edge protection for using the working rope, which is stored in the nacelle.

- Take the edge protection out of the transport bag
- Fasten the safety rope of the edge protection to a fixed point
- Screw the edge protection to the nacelle wall

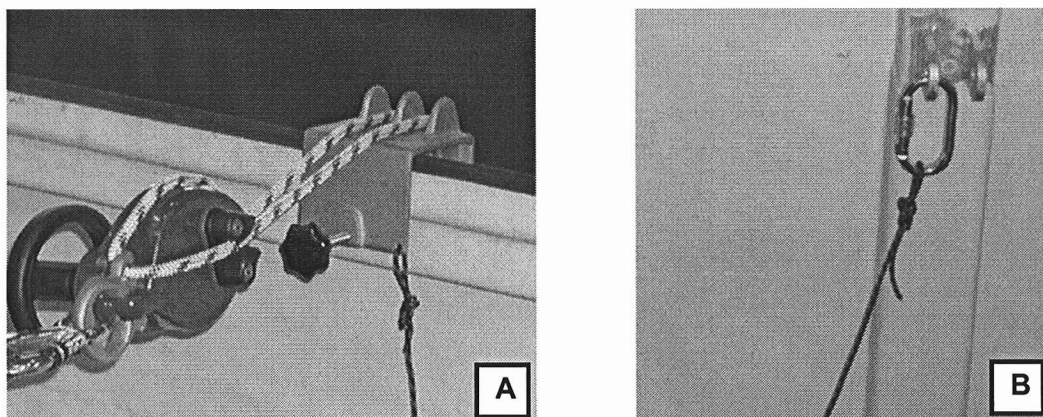


Fig. 26 Edge protection (example)

A On the nacelle wall (with rope ends already positioned)

B Safety rope of the edge protection

9.7.2 Fastening the descender

DANGER

JAMMING ROPE

Before using the rope, check it for knots and kinks

Otherwise there is a risk that the abseiled person does not reach the ground



NOTE

Depending on the equipment, the descender is attached with a webbing sling or a work-positioning lanyard.

The attachment point depends on the turbine type.

Finally, secure the rope in the cam cleat.

- Remove the webbing sling or the work-positioning lanyard from the transport bag
- Fasten the webbing sling or work-positioning lanyard
- Take the descender out of the transport bag
- Attach the descender, depending on the turbine type
 - see "Attaching the descender, K08 beta" page 57
 - see "Attaching the descender, K06" page 58
 - see "Attaching the descender, K07" page 59
 - see "Attaching the descender, K08 gamma" page 59
- Screw the knurled nut down to secure the hook of the descender to prevent accidental opening

- To secure it, guide the long end of the rope via the diverter hook through the cam cleat of the descender, see Fig.27
- Throw down the transport bag with the rope from the nacelle

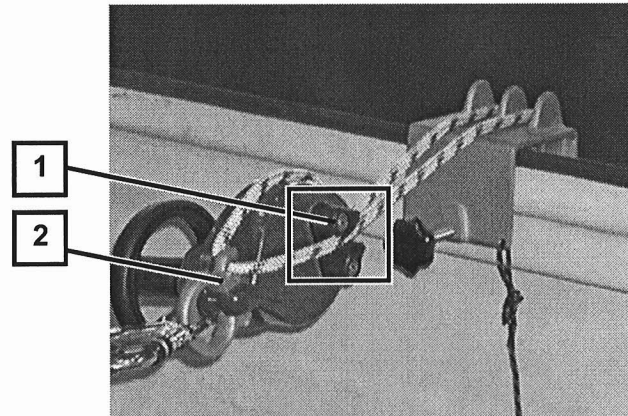


Fig. 27 *Securing the rope on the descender: rope end guided through cam cleat (example with edge protection)*

- 1 Cam cleat
- 2 Diverter hook

Attaching the descender, K08 beta

DANGER

The cross bolt on the front roof support is not suitable as an attachment point if the props are not mounted.

Only use the cross bolt as an attachment point when the props are mounted.



NOTE

If a sign indicates that the cross bolt for the front roof prop is a permitted attachment point, this can be used to attach persons, particularly when rescuing a casualty in the nacelle.

Prerequisite is that the roof has been secured with props as detailed in the regulations.

- Pull the webbing sling or work-positioning lanyard through the left lifting lug of the gearbox, see Fig.28
- Attach the hook of the descender to the work-positioning lanyard or webbing sling, see Fig.29

This foregoing document was electronically filed with the Public Utilities

Commission of Ohio Docketing Information System on

5/15/2012 4:09:23 PM

in

Case No(s). 12-0160-EL-BGN

Summary: Application of Champaign Wind LLC, Vol III, Part 27 electronically filed by Mr. Michael J. Settineri on behalf of Champaign Wind LLC