

In addition, WTs with active brake can also be equipped with a rotor lock on the brake disk.

13.2.1 Rotor lock on the rotor shaft

WARNING

If the mechanical design allows it, the rotor lock bolt must always be secured in both positions (inserted and retracted) using the securing bolt.

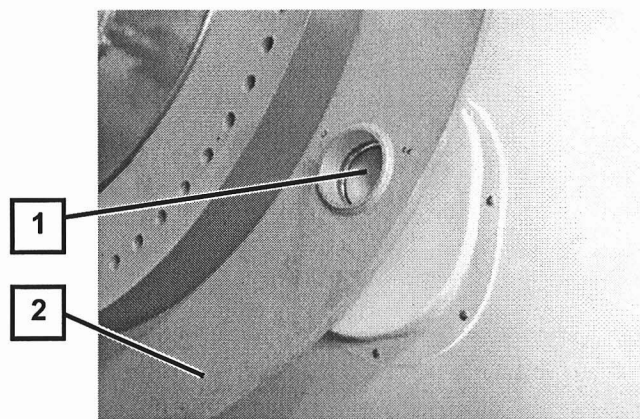


Fig. 59 Rotor lock on rotor shaft (WTs of turbine class K08)

- 1 Rotor lock bolt
- 2 Rotor lock disk

Aligning the rotor

- Ensure that the manual control for the rotor brake is activated, the rotor brake is closed, and the rotor is locked



NOTE

For instructions on operating the rotor brake without hydraulic pressure, see Chapter 13.1 "Operating the rotor brake without system pressure"

- By actuating the *Release Brake* button on the manual control unit of the Topbox, temporarily release the rotor brake and position the rotor so that one of the markings on the rotor shaft is aligned with the marking on the rotor bearing housing, see Fig.60

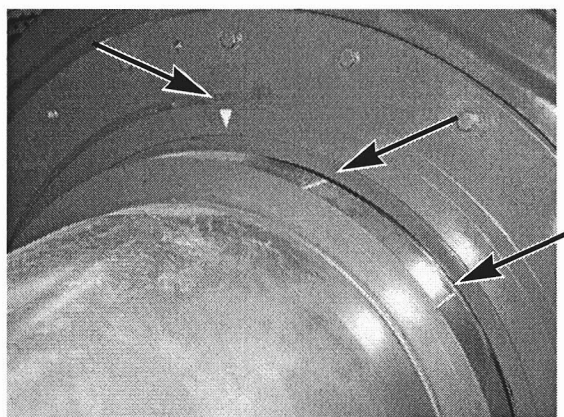


Fig. 60 Markings on rotor shaft and rotor bearing housing

- Make sure that the rotor brake is applied again

If system pressure is available, the rotor brake is applied as soon as the *Release Brake* button on the manual control unit is released.

If no system pressure is available, the rotor brake must be manually applied again after the manual release.

- Remove the securing bolt from the mechanism of the rotor lock bolt, see Fig.61



Fig. 61 Securing bolt on rotor lock bolt

- Remove the extension pipe from the bracket and attach it onto the lever of the hand pump

Locking the rotor with the active rotor brake

- Shift the lever of valve 610 on the hydraulic unit to the "Rotor lock" position

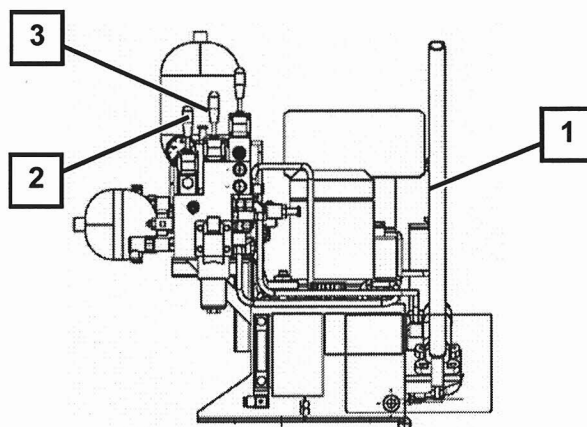


Fig. 62 Hydraulic unit for active rotor brake

- 1 Extension pipe for hand pump
- 2 Valve 600
- 3 Valve 610

- Shift the lever of valve 600 into the "Extend locking cylinder" position and hold. The lever is spring-centered and does not lock so that it would return automatically to the center position.

NOTICE

DAMAGE TO THE MECHANICAL STRUCTURE

Prior to inserting the rotor lock, the rotor must be stopped and precisely aligned in accordance with the markings.

- Extend the rotor lock bolt into the rotor lock disk by operating the hand pump
- If the pump resistance increases noticeably, check whether the rotor lock bolt has been correctly inserted into the rotor lock disk. Otherwise, retract the rotor lock bolt and re-align the rotor
- Release the lever of valve 600 so that it returns to the center position
- Secure the rotor lock bolt with the securing bolt

Locking the rotor with the passive rotor brake

NOTICE

DAMAGE TO THE MECHANICAL STRUCTURE

Prior to inserting the rotor lock, the rotor must be stopped and precisely aligned in accordance with the markings.

- Turn the lever of valve 280 on the hydraulic unit to the right as far as it will go, see Fig.63
- Pull the lever of valve 290 on the side of the hydraulic unit upwards, see Fig.63

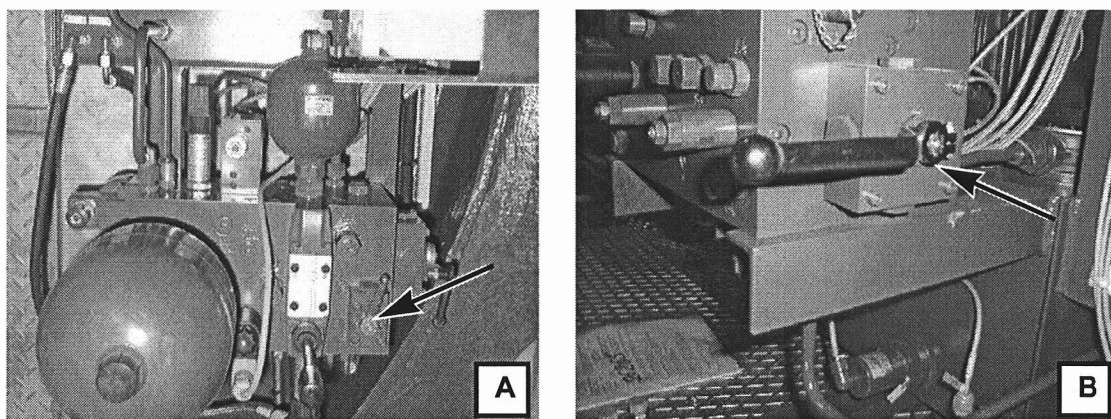


Fig. 63 Locking the rotor

A Valve 280

B Valve 290

- Extend the rotor lock bolt into the rotor lock disk by operating the hand pump
- If the pump resistance increases noticeably, check whether the rotor lock bolt has been correctly inserted into the rotor lock disk. Otherwise, retract the rotor lock bolt and re-align the rotor
- Secure the rotor lock bolt with the securing bolt

Releasing the rotor lock

To release the rotor lock, proceed as follows:

- Make sure that the rotor brake is applied
- Adjust the valves on the hydraulic unit

Active brake:

- Shift the lever of valve 610 to the "Rotor lock" position
- Shift the lever of valve 600 into the "Retract locking cylinder" position and hold

Passive brake:

- Push the lever of valve 290 on the side of the hydraulic unit downwards
- Use the hand pump to retract the rotor lock bolt from the rotor lock disk
- If the pump resistance increases noticeably, make sure that the rotor lock bolt has been retracted from the rotor lock disk

Otherwise:

- Temporarily release the rotor brake by actuating the "Release brake" button on the manual control unit of the Topbox in order to release the tension



NOTE

For instructions on operating the rotor brake without hydraulic pressure, see Chapter 13.1 "Operating the rotor brake without system pressure"

- Make sure that the rotor brake is applied again
- Continue to pump until the rotor lock bolt is fully retracted
- Only for active brake:
 - Release the lever of valve 600 so that it returns to the center position
 - Shift the lever of valve 610 to the center position
- Remove the extension pipe from the hand pump and place it in the bracket
- Secure the rotor lock bolt with the securing bolt

13.2.2 Rotor lock on brake disk

The rotor lock on the brake disk is only available for WT's with active rotor brake.

NOTICE

RISK OF TURBINE DAMAGE

The rotor lock on the brake disk must only be used with the following restrictions:

- The 10-minute average wind speed is less than 12 m/s.
- It is not permitted to leave the WT while the rotor is locked on the brake disk.
- It is not permitted to perform any work in the rotor hub, on the rotor brake or on torque-transferring components and their respective bearing seats.
- The rotor blades are in feathering position and must not be pitched.
- The rotor brake is applied.

To lock the rotor on the brake disk, proceed as follows:

- Ensure that the manual control for the rotor brake is activated, the rotor brake is applied, and the rotor is locked



NOTE

For instructions on operating the rotor brake without hydraulic pressure, see Chapter 13.1 "Operating the rotor brake without system pressure"

- By actuating the *Release Brake* button on the manual control unit of the Topbox, temporarily release the rotor brake and align the brake disk so that the rotor lock bolt can be inserted through the brake caliper halves
- Make sure that the rotor brake is applied again
- Remove the rotor lock bolt from the bracket on the brake caliper and insert it through the two brake caliper halves and the brake disk

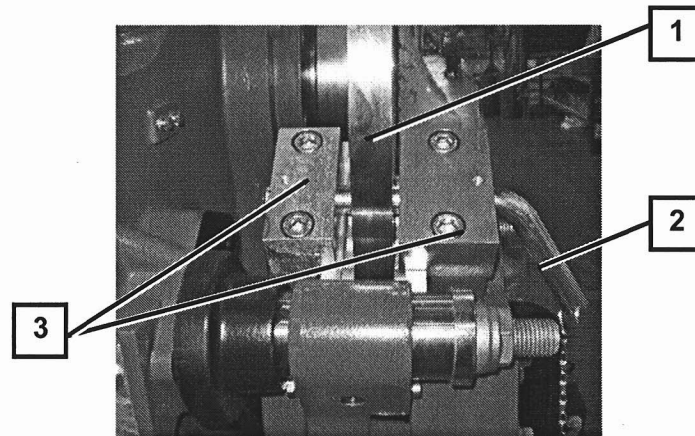


Fig. 64 Rotor lock on brake disk

- 1 Brake disk
- 2 Rotor lock bolt
- 3 Brake caliper halves

⚠ WARNING

Risk of injury and damage to the mechanical structure.
Prior to inserting the rotor lock bolt, the rotor must be stopped.

- Secure the rotor lock bolt with the spring cotter
- To release the rotor brake, proceed in reverse order.
- Make sure that the rotor brake is applied
 - Remove the spring cotter from the rotor lock bolt
 - Remove the rotor lock bolt and store it in the bracket on the brake caliper

13.3 Operating the roof

The roof on WT's of turbine class K08 can be opened.

It is necessary to open it in order, for example, to transport pieces of equipment into the nacelle or perform various maintenance work.

The roof is fastened to the right nacelle wall (when looking towards the rotor hub) by means of hinges, and secured with 2 locks on the left nacelle wall.

To open the roof, open the locks, then open the roof via the hinges using the hydraulic system, and secure it with 2 props.

Opening the roof



DANGER

FALLING HAZARD

There is a danger of falling when the roof is open.

While staying in a fall hazard area, secure yourself at one of the marked attachment points in the nacelle.

WARNING

Hazard of personal injury and damage to the nacelle.

The roof of the nacelle offers a large surface for the wind to act upon.

- Opening the roof is only permitted at 10 minute average wind speeds up to 12 m/s
- With freshening wind, do not open the roof downwind



NOTE

If it rains, the nacelle should be positioned perpendicular to the wind direction so that the roof is opened against the wind, offering some degree of protection.

It is recommended to open the cabin roof as a team of two. Proceed as follows:

- Inform all persons in the nacelle that you intend to open the roof
- Open the two locks on the left nacelle wall

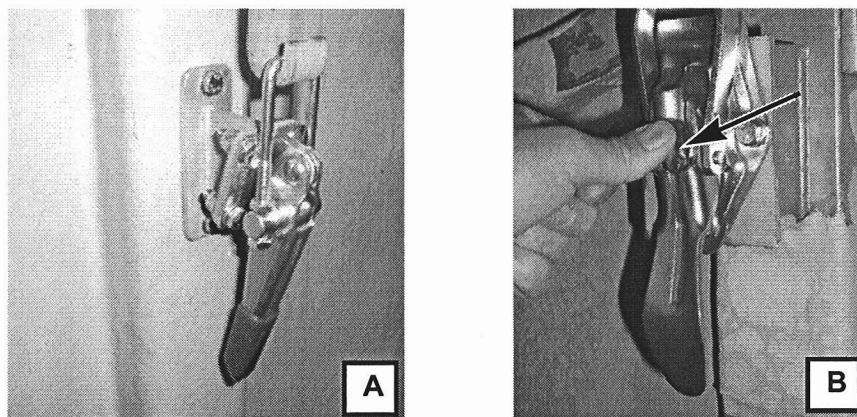


Fig. 65 Lock on the left nacelle wall

A Old design

B New design with locking mechanism (arrow)

In the new design, slide the locking mechanism upwards, thus releasing the latch.

- Using the hydraulic system, open the roof so far that the bolts of the roof lock can still be easily reached

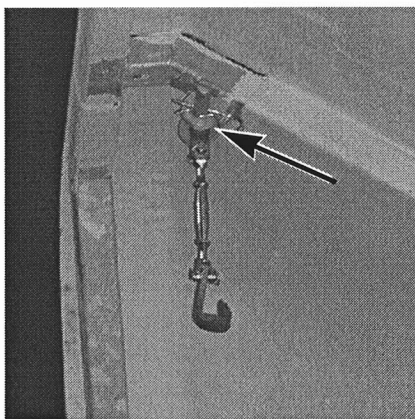


Fig. 66 Bolt for roof prop, example N90/2500

- Remove the props from the brackets on the left nacelle wall and push them onto the bolts of the roof locks
Ensure that the props are secured on the bolts.
- Continue to open the roof until the props can be pushed onto the bolts for the locks on the nacelle wall

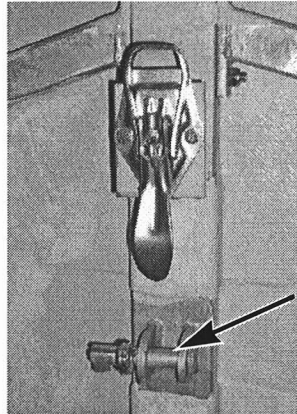


Fig. 67 Bolt for prop on nacelle wall

- Place the props on the bolts of the locks on the nacelle wall
Ensure that the props are secured on the bolts.

Closing the roof

- Ensure that the edge of the nacelle wall is clear and the roof can be closed without obstruction
- Remove the props from the bolts on the nacelle wall
- Lower the roof using the hydraulic system until the props can be removed from the roof
- Remove the props and place them on the brackets
- Lower the roof completely
- Hook the two locks of the roof lock into the left nacelle wall and lock them

13.4 Operating the roof hydraulics for turbine class K08

The roof on a WT of turbine class K08 can be operated using system pressure or the hand pump of the hydraulic unit.

However, the handling of the hydraulic unit for a WT with active rotor brake is slightly different from that for WTs with passive rotor brake.

13.4.1 WTs with active brake

Opening the roof



NOTE

For opening the roof, see Chapter 13.3 "Operating the roof".
Only the operation of the roof hydraulics is described here.

- Shift the lever of valve 610 to the center position

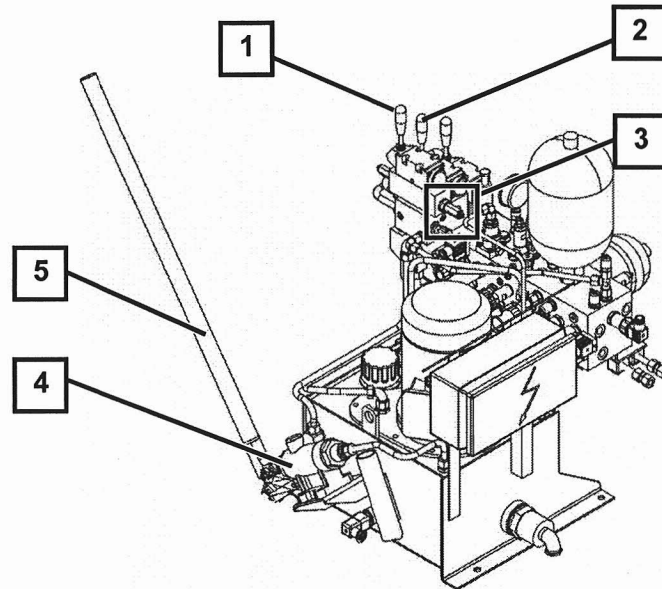


Fig. 68 Hydraulic unit for active rotor brake

- 1 Valve 640
- 2 Valve 610
- 3 Hand wheel 670
- 4 Hand pump
- 5 Extension pipe

- Provide hydraulic pressure:
 - Operation with system pressure: Slightly open the hand wheel 670
 - Operation with the hand pump: Remove the extension pipe from the bracket, attach it onto the lever of the hand pump and start pumping



NOTE

The hand wheel 670 has a throttling function. It can be used to control the speed at which the roof moves.

- Release the hydraulic pressure. To do this, shift the lever of valve 640 to the "Open roof" position and hold
The roof opens slowly.



NOTE

Valve 640 is spring-centered and does not lock. It returns automatically to the center position

- Once the required roof position has been reached, release the lever of the valve 640 so that it returns to the center position

The roof remains in this position

- Only for operation with system pressure:
Close the hand wheel 670

Closing the roof

- Shift the lever of valve 610 to the center position
- Provide hydraulic pressure:
 - Operation with system pressure: Slightly open the hand wheel 670
 - Operation with the hand pump: Remove the extension pipe from the bracket, attach it onto the lever of the hand pump and start pumping
- Release the hydraulic pressure. To do this, shift the lever of valve 640 to the "Open roof" position and hold
 - ▶ The roof closes slowly
- Once the required roof position has been reached, release the lever of the valve 640 so that it returns to the center position
 - ▶ The roof remains in this position

Once the roof has been closed:

- Only for operation with system pressure:
Close the hand wheel 670
- Only for operation with hand pump:
Remove the extension pipe from the hand pump and place it in the bracket

13.4.2 WTs with passive brake

Opening the roof

- Only for operation with system pressure:
Open valve 240.2

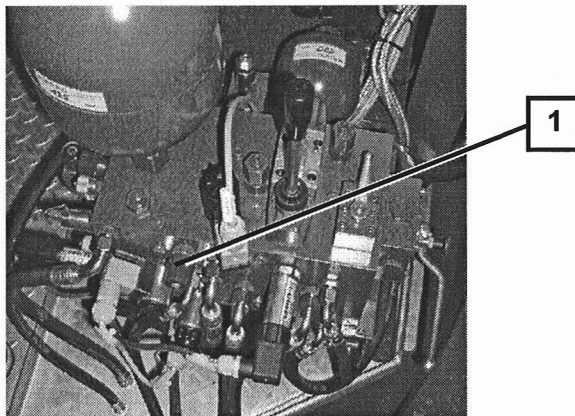


Fig. 12 Hydraulic unit for passive rotor brake

1 Valve 240.2

- Only for operation with hand pump
 - Shift the lever of the valve 280 counter-clockwise to the left
 - Remove the extension pipe from the bracket, attach it onto the lever of the hand pump and start pumping

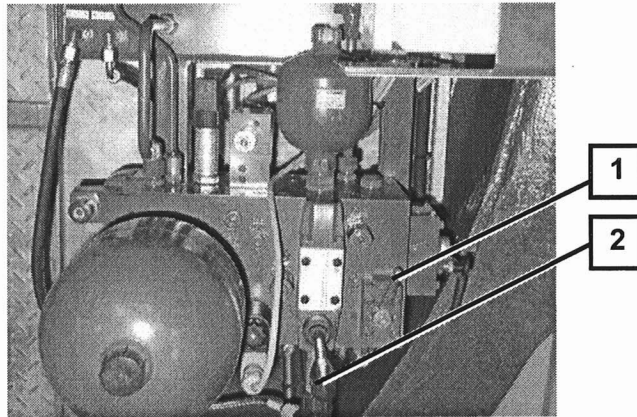


Fig. 69 Hydraulic unit for passive rotor brake

- 1 Valve 280
- 2 Valve 310

- Release the hydraulic pressure: Shift the lever of valve 310 towards the rotor shaft
 - The roof opens slowly
- Once the required roof position has been reached, shift the lever of valve 310 away from the rotor shaft
 - The roof remains in this position

Closing the roof



NOTE

For closing the roof, see Chapter 13.3 "Operating the roof"

To close the roof, proceed as follows:

- Only for operation with system pressure: Open valve 240.2
- Only for operation with hand pump
 - Shift the lever of the valve 280 counter-clockwise to the left
 - Remove the extension pipe from the bracket, attach it onto the lever of the hand pump and start pumping

- Release the hydraulic pressure: Shift the lever of valve 310 towards the rotor shaft
 - ▶ The roof closes slowly
- Once the required roof position has been reached, shift the lever of valve 310 away from the rotor shaft
 - ▶ The roof remains in this position

Once the roof has been closed:

- Only for operation with system pressure: Close valve 240.2.
- Only for operation with hand pump:
 - Shift the lever of valve 280 clockwise into the right position again
 - Remove the extension pipe from the hand pump and place it in the bracket

13.5 Entering the rotor hub

It is necessary to enter the rotor hub in order to perform maintenance or repair work on the rotor blades and pitch system.

In the case of WT's of turbine class K08, you must cross the rotor hub on the outside.

In the interest of the safety of the person performing the work, a second person who can operate the WT controls must be located in the nacelle.

WARNING

Work on the drive train and in the rotor hub is only permitted at 10 minute average wind speeds of less than 12 m/s.

WARNING

If the rotor is suddenly set into motion, this may result in life-threatening or severe injuries.

Before entering the rotor hub always lock the rotor on the rotor shaft using the rotor lock, and ensure that the rotor brake is also applied.

For operating the rotor lock, see Chapter 13.2 "Operating the rotor lock"



WARNING

FALLING OBJECTS

Make sure that nobody is present in the area underneath the turbine when climbing onto the rotor hub. Make sure that there are no loose parts that may fall down. Secure any tools you carry on you.

13.5.1 Attaching the hub rope

In the case of WT's of turbine class K08, the respective service employee must be secured using the hub rope when crossing the rotor hub, see Chapter 7.2 "Additional equipment for service employees (K06 and K08)".

- Make sure that the additional equipment required for crossing the rotor hub is in sound condition, and any test badges are valid



⚠ DANGER

FALLING HAZARD

A PPE either with an invalid test badge or which has been damaged or strained by a fall must no longer be used.

Replace the PPE immediately and have it checked by an expert.

K08 without safety rope system

- Pull the webbing sling through the lifting lug on the rotor bearing

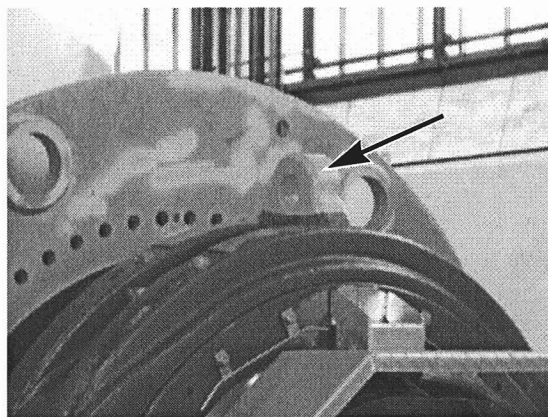


Fig. 70 Lifting lug on rotor bearing

- Hook the hub rope into both ends of the webbing sling using the large snap hooks and secure it

K08 with safety rope system

- Hook and secure the hub rope with the large snap hook directly onto the attachment lug of the safety rope system on the rotor bearing lifting lug

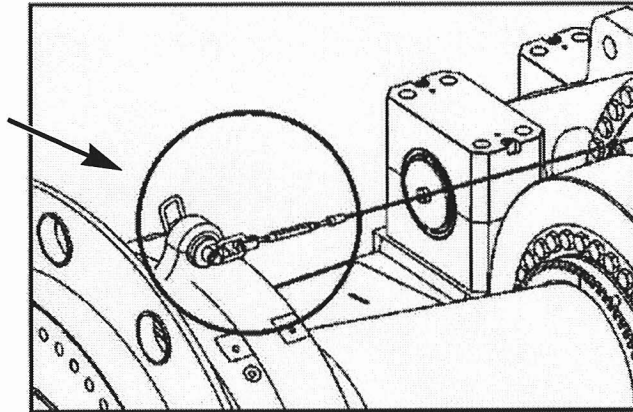


Fig. 71 Attachment lug of swivel hoist ring of safety rope system

13.5.2 Crossing the rotor hub



⚠ DANGER

FALLING HAZARD

There is a danger of falling when the roof is open.

While staying in a fall hazard area, secure yourself at one of the marked attachment points in the nacelle.



⚠ DANGER

FALLING HAZARD

When crossing the rotor hub, always use the hub rope attached to the rotor bearing to secure yourself against falling.

For extra safety, use the lanyard with energy absorber.



⚠ DANGER

FALLING HAZARD

If icing occurs on the hub ladder, this increases the risk of injury due to slipping and falling into the safety harness.

Stop crossing the rotor hub.



⚠ DANGER

FALLING HAZARD

Incorrect attachment to the hub cage can cause injury or material damage if a person slips.

Only use the hub cage brackets as attachment points.



DANGER

FALLING HAZARD

In the rotor hub is a danger of falling within 2 m of the rotor hub access.
When working in this area secure yourself using the lanyard with energy absorber

To access the rotor hub, proceed as follows:

- If it is not already open, open and secure the roof, see Chapter 13.3 "Operating the roof"
- Check whether the rotor is locked in such a way that one of the hub ladders is at the top position

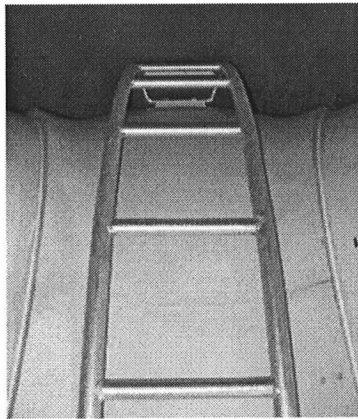


Fig. 72 Hub ladder in position

- If this is not the case, release the rotor lock, turn the rotor hub and lock the rotor again, see Chapter 13.2 "Operating the rotor lock"
- Ensure that the hub rope is attached to the lifting lug on the rotor bearing
- Check the the guided-type fall arrester for proper functioning
- Hook the snap hook of the guided-type fall arrester of the hub rope into the chest lug of the safety harness and secure it
- Visually check the hub ladder. Check for any missing screws, deformations, breaks or damaged welding seams
- Prior to using the hub ladder, rectify any damage which impairs the safety and stability of the hub ladder
If this is not possible, stop crossing the rotor hub and commission the necessary repair work.
- Release the lanyard with energy absorber, which is attached to the backplate of the safety harness with a snap hook, from the attachment point in the nacelle, and connect it to the hub ladder for extra security

- Climb onto the hub ladder. During this process, make sure that the hub rope is protected against mechanical damage by the protective tube at the contact point on the rotor lock disk.
- On the hub ladder, move with appropriate care toward the rotor hub access. Move the guided-type fall arrester along step by step, so that in the event of slipping the height of fall is as low as possible
- Detach the lanyard with energy absorber and attach it further down on the hub ladder
- Proceed in this manner until you reach the hub cage

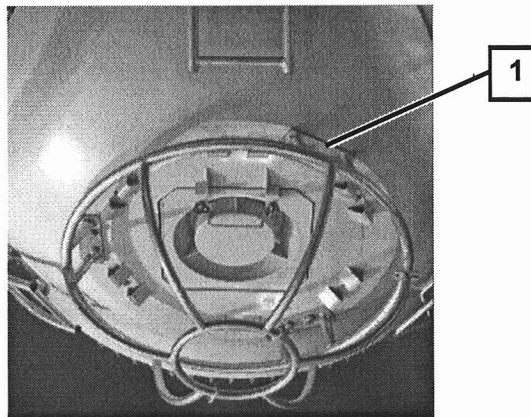


Fig. 73 Hub cage in front of the access hatch

1 One of the three brackets (attachment points)

- Visually check the hub cage. Check for any missing screws, deformations, breaks or damaged welding seams.
In the case of any damage, the service employee must decide whether to continue the access into the rotor hub or to abort. The damage must always be reported to the responsible employee.
- Enter the hub cage and attach the lanyard with energy absorber to a hub cage bracket for extra security
- Loosen the cage nuts on the access hatch and fold the fastening bolt
- Fold the access hatch inwards until the locking mechanism locks in place
- Release the lanyard with energy absorber from the last attachment point and enter the rotor hub
- Make sure that the access hatch is properly secured by means of the retention hook
- Attach the lanyard with energy absorber at a suitable location in the rotor hub
- Detach the guided-type fall arrester of the hub rope from the safety harness and hook it to the hub cage

For the return into the nacelle, secure yourself and proceed in the same manner as described above:

- Hook the guided-type fall arrester of the hub rope in the chest lug of the safety harness
- Release the lanyard with energy absorber from the attachment point in the rotor hub, and attach it to one of the hub cage brackets for extra security
- Climb out of the rotor hub into the hub cage
- Close the access hatch, fold the fastening bolt, and tighten the cage nuts
- Leave the hub cage and move up the hub ladder. In the process, move the guided-type fall arrester along step-by-step, and feed the lanyard with energy absorber after it
- Enter the nacelle
- Release the lanyard with energy absorber from the hub ladder and attach it to an attachment point in the nacelle
- Release the hub rope from safety harness and attachment point

13.6 Transporting objects into the nacelle

NORDEX WT's are equipped with an on-board crane for transporting objects into the nacelle. Objects can also be transported using the working rope.



DANGER

SUSPENDED LOAD

Danger of injury due to falling objects.

Do not stand or walk under suspended loads.

NOTICE

RISK OF DAMAGE TO NACELLE AND SPONGE RUBBER SEAL

Do not guide the working rope over the unprotected edge of the nacelle wall.

Use an edge protection.

The on-board crane must only be operated by instructed persons.

On-board cranes can differ in design from one WT to the next. Always refer to the operating instructions stored in the WT.

If the working rope is used on WT's of turbine type K08, use the edge protection, see Chapter 13.6.2 "Using the edge protection for the working rope".

If the edge protection is not available, other arrangements must be made so as not to damage the edge of the nacelle wall and the sponge rubber seal on the wall.

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