

Application of Warning and Safety Signs

Anyone using this document must read this document in its entirety before performing any work.

Any questions or concerns regarding any of the instructions contained in this document must be referred to Vestas.

Turbine type	Mk version
V105-3.3/3.45 MW	Mk 2C
V112-3.0 MW	Mk 0-1 all
V112-3.3/3.45 MW	Mk 2 all
V117-3.3/3.45 MW	Mk 2 all
V126-3.3/3.45 MW	Mk 2 all

History of this document

Version no.	Date	Description of changes
04	2015-05-29	Turbine table updated.

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1 Safety

All work relating to a Vestas turbine, including work methods and practices, employee training and protective measures, and use of tools and equipment, shall be in accordance with the requirements of the applicable governmental and private occupational safety and health codes and standards. Employers engaged in such work are also required to be familiar with and comply with the 'Vestas Corporate OH&S Manual' and documents holding specific turbine safety instructions for the relevant turbine type. Vestas shall not be responsible for any liabilities arising from failure to comply with such requirements. Vestas reserves the right to inspect such work to ascertain such compliance.

Item no.	Quantity	Description
		Standard PPE

Table 1-1: Required PPE

2 Educational Requirements of Service Technician

At least two of the service technicians working in a wind turbine are required to possess valid course certificates for the 'Vestas Basic Safety Training for Service Technicians', including basic safety theory, first aid, fire prevention and fire fighting, emergency descent and any additional safety courses owing to local requirements.

At least one service technician must possess the wind turbine-specific course certificate for the turbine in question.

Some tasks require one or more advanced training modules or job-specific training as described in the Vestas 'Technical Training Programme'. The person planning a specific task must ensure that the service technicians involved possess the proper know-how for completion of that task.

3 Abbreviations and Technical Terms

Abbreviation	Explanation
GIM	Generator Interface Module
LOTO	Lockout-Tagout
MSDS	Material Safety Data Sheet
OH&S	Occupational Health & Safety
PPE	Personal Protective Equipment
SBU	Sales Business Unit
UPS	Uninterruptible Power Supply

Table 3-1: Abbreviations

Term	Explanation
Lockout-Tagout	A safety procedure which ensures that dangerous machines are properly shut off and not started up again prior to the completion of the maintenance or servicing work.

Table 3-2: Explanation of terms

4 Referenced Documentation

4.1 Safety Documents

Document no.	Title
0000-0496	Vestas Corporate OH&S Manual
0001-0410	Personal Protective Equipment Sheets
0006-5254	Safety Regulations for Operators and Technicians, V112-3.0 MW
0036-5891	Safety Regulations for Operators and Technicians, 3.3/3.45 MW Turbines

Table 4-1: Safety documents

4.2 Reference Documents

Document no.	Title
None	

Table 4-2: Reference documents

5 Purpose

The purpose of this document is to indicate where warning and safety signs are to be placed in the nacelle, hub and tower in order to verify that signs are present.

Missing signs must be applied in accordance with the instructions in this document.

6 Note











This section is not relevant to this procedure.

7 Tools

Item no.	Quantity	Description
	1	Roller or plastic scraper

Table 7-1: Tools

8 Spare Parts

Item no.	Quantity	Description	Warning/Safety Sign
208001	1*	Ear protection required	
208004	1	Safety footwear required	
208005	1	Safety helmet required	
208006	5	Safety harness required	
208028	1	Eye protection required	
208056	1	Safety harness required when climbing	
208003	1	No access for unauthorised personnel	
208007	1† 2*	Fire extinguisher	
208008	1	No smoking	
208053	1‡	Only one person on ladder	

Item no.	Quantity	Description	Warning/Safety Sign
208058	1 [§]	Only one person on the ladder in each tower section	
208010	1 [†] 2 [*]	First aid kit and eye rinse	
208011	1	Emergency exit	
208015	3 + 1 per platform in the tower	Emergency exit, arrow down	
208016	1 [*]	Survival equipment	
208020	1	Rescue equipment	
208021	1	Arrow 1	
208014	1 per platform in the tower	Maximum load 1 tonne (1000 kg) ERP: MAX LOAD ON INTERNAL PLATFORM	

Table 8-1: Signs to be applied on-site










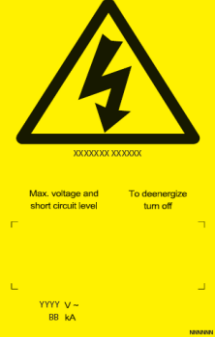
* Only offshore.

† Only onshore.

‡ If the fall arrest system on the ladder is based on wire.

§ If the fall arrest system on the ladder is based on rail.

Item no.	Description	Warning/Safety Sign
208027	Rotor lock required	

Item no.	Description	Warning/Safety Sign
22836	Do not step here	
208009	No flash photography	
208029	Do not step here	
10207092	Lift only when empty	
70531701	Direction of rotation	
208022	Rescue anchor point	
23072	Hot surface	
110366	Maximum load 150 kg	
118934	Electrical warning, universal	
119015	Electrical warning, slip ring system	










Item no.	Description	Warning/Safety Sign
119442	Hazardous voltage - LOTO procedures required	
208013	Electrical hazard	
208017	Rotating parts	
208023	Hot surfaces	
208057	High voltage	
10203108	SWL 9500 kg	
10203128	SWL 990 kg	
70531374	High voltage	
70531373	No lifting (to secure load during transport)	

Table 8-2: Additional signs already applied

9 Consumables

Item no.	Quantity	Description
None		

Table 9-1: Consumables

10 Weights

This section is not relevant to this procedure.

11 Estimated Time Use

The estimated time use for applying labels is four man-hours.

12 Applying the Warning and Safety Signs

- ✓ Before applying the signs, make sure to clean and dry the surfaces where the signs have to be placed.



Figure 12-1: Folding the foil back



Figure 12-2: Pressing down the edge of the foil

1. Fold the foil on the back of the label approximately 20 mm. See Figure 12-1, p. 9.
2. Press the edge of the foil down to make a fold. See Figure 12-2, p. 9.



Figure 12-3: Placing the sign in correct position



Figure 12-4: Using a roller to make the sign stick

3. Place the sign in the correct position. See Figure 12-3, p. 9.
4. Use a roller or a plastic scraper on the edge where the foil has been pulled back to make the sign stick. See Figure 12-4, p. 9.



Figure 12-5: Pulling the foil



Figure 12-6: Running the roller on the sign

5. Pull the foil off the back of the sign. See Figure 12-5, p 10.
6. While removing the foil, run the roller or scraper down the middle of the sign so that the sign sticks to the surface. See Figure 12-6, p 10.



Figure 12-7: Rolling towards right-hand side



Figure 12-8: Rolling towards left-hand side

7. Roll or scrape from the middle of the sign towards the right-hand side. See Figure 12-7, p 10.
8. Roll or scrape from the middle of the sign towards the left-hand side. See Figure 12-8, p 10.

13 Placing the Signs, Tower

13.1 Placing Sign on Outside of the Tower



Figure 13-1: 208003 - No access for unauthorised personnel

- ▶ Place the sign to the left of the tower door as shown in Figure 13-1, p. 11.

13.2 Placing Signs Inside the Tower

13.2.1 Placing Signs in the Bottom Platform

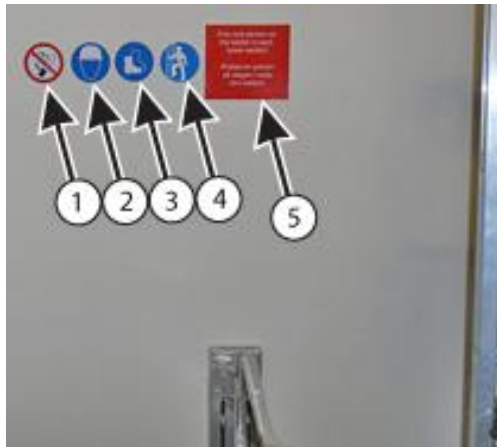


Figure 13-2: Bottom platform

- | | | | |
|----------|--|----------|--|
| 1 | 208008 - No smoking | 2 | 208005 - Safety helmet required |
| 3 | 208004 - Safety footwear required | 4 | 208056 - Safety harness required when climbing |
| 5 | 208058 - Only one person on the ladder in each tower section | | |

- ▶ Place all the signs to the left of the ladder approximately 170 cm above the platform. See Figure 13-2, p. 11.



Figure 13-3: 208011 - Emergency exit

- ▶ Place the emergency exit sign above the tower door. See Figure 13-3, p. 12.

13.2.2 Placing Signs at Each Platform (Except Bottom Platform)



Figure 13-4: 208015 - Emergency exit (arrow down)

- ▶ Place the sign on the left-hand side of the ladder approximately 170 cm above the platform as shown in. See Figure 13-4, p. 12.

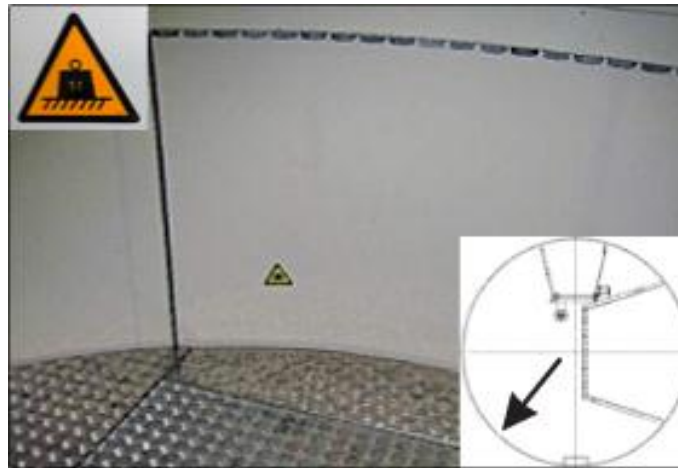


Figure 13-5: 208014 - Maximum load on platform

- ▶ Place the sign approximately 30 cm above the platform opposite the ladder or lift as shown in Figure 13-5, p. 13

14 Placing Signs in the Nacelle

14.1 Placing Signs on the Nacelle Cabinets

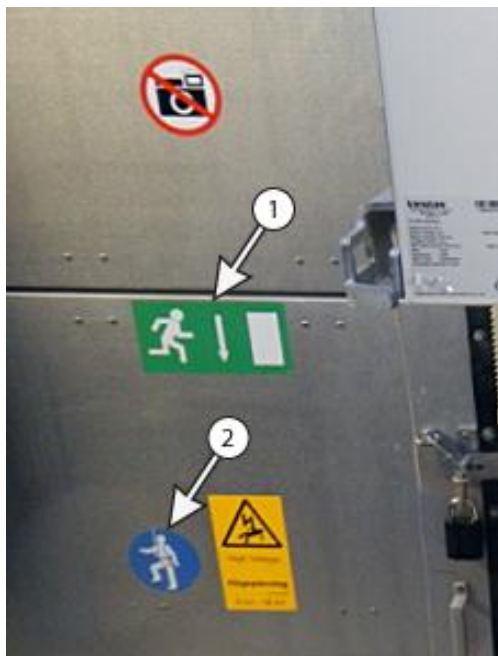


Figure 14-1: Transformer doors

- 1 208015 - Emergency exit (arrow down)
- 2 208006 - Safety harness required

► Place the signs on the transformer doors as shown in Figure 14-1, p. 14.

14.2 Placing Signs in the Drive Train Area



Figure 14-2: Fire extinguisher location and sign placement

- 1 Fire extinguisher
- 2 208007 - Fire extinguisher sign

► Place the sign near the fire extinguisher to the left of the gearbox when facing the rotor as shown in See Figure 14-2, p. 14.

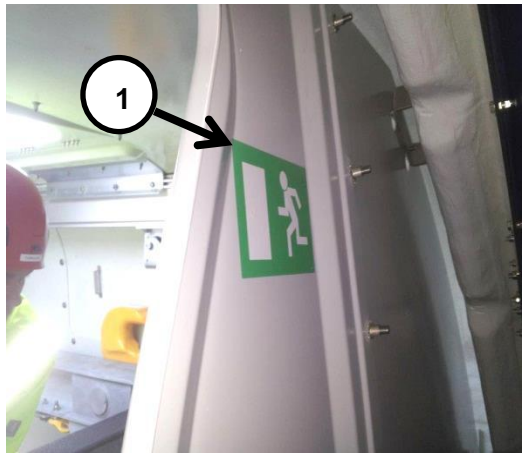


Figure 14-3: Hub to the nacelle (right side of the door)

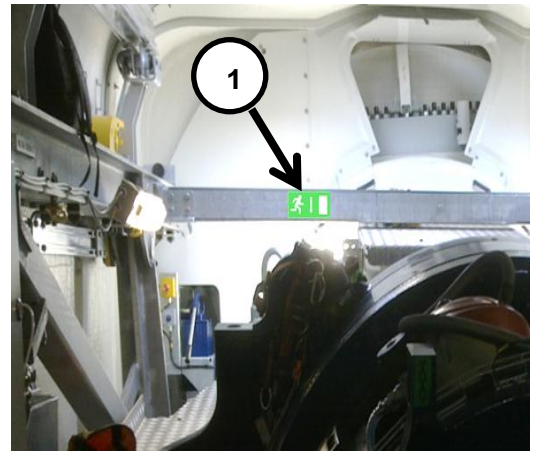


Figure 14-4: Left-hand side hub cover

1 Emergency exit

1 Emergency exit

► Place the signs correctly inside the hub on the right side of the door as shown in Figure 14-3, p. 15. **Error! Reference source not found.**

15 Placing Additional Signs for Offshore Turbines



Figure 15-1: 208001 - Ear protection required

NOTE This sign is only placed on offshore turbines equipped with a foghorn.

► Place the sign on the outside of the tower as shown in Figure 15-1, p. 15.



Figure 15-2: 208016 - Survival equipment

- Place the sign approximately 170 cm above the platform in the tower where the survival kit is placed. See Figure 15-2, p. 16.

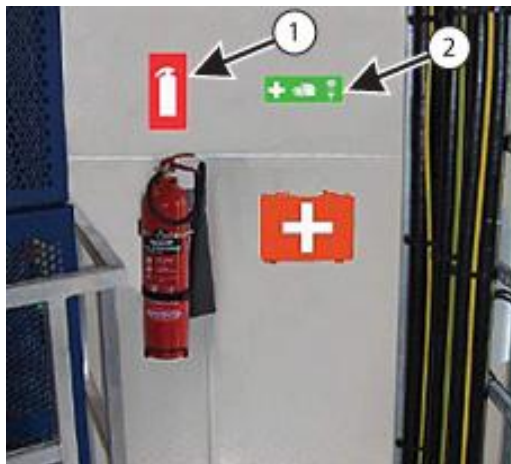


Figure 15-3: Bottom tower platform

- 1 208007 - Fire extinguisher
- 2 208010 - Eye rinse and first aid kit

NOTE Make sure that there is enough wall space below the signs for the actual fire extinguisher and first aid kit (minimum 80 x 80 cm).

1. Place the signs next to the lift approximately 170 cm above the bottom platform. See Figure 15-3, p. 16.
2. If enough wall space is not available next to the lift, place the signs elsewhere on the tower wall approximately 170 cm above the bottom platform where adequate space is available.

16 Reference – Additional Signs Already Applied

NOTE Signs and/or sign locations may be modified based on availability or to meet local regulations.

The signs in this section should have been applied during the manufacturing process or may be specific to the region. They are listed here as a point of reference.

16.1 Placing Signs Inside Tower



Figure 16-1: Optional door signs and tape mark striping

1 Push bar to open

2 Door handle striping



Figure 16-2: 119442 - Hazardous voltage - LOTO procedures required on the tower control cabinet

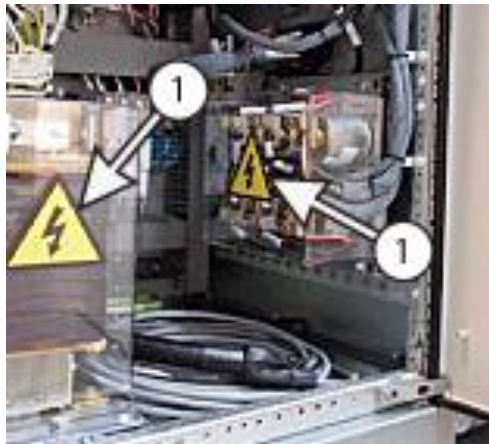


Figure 16-3: Inside the tower control cabinet

1 208013 - Electrical hazard



Figure 16-4: Under UPS location in the tower control cabinet

1 208023 - Hot surfaces

16.2 Placing Signs in Nacelle Cabinets



Figure 16-5: Outside on the auxiliary power supply

1 119442 - Hazardous voltage - LOTO procedures required



Figure 16-6: Inside of the auxiliary power supply on plexiglass

1 208013 - Electrical hazard



Figure 16-7: Additional transformer door signs

- 1 208057 - High voltage
- 2 208009 - No flash photography

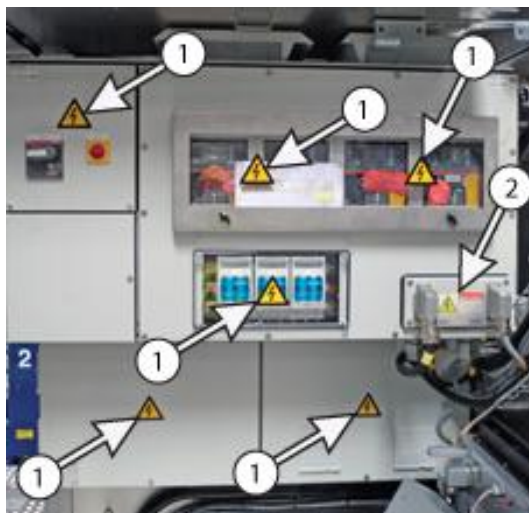


Figure 16-8: Outside the grid interface module cabinets

- 1 208013 - Electrical hazard
- 2 118934 - Electrical warning, universal

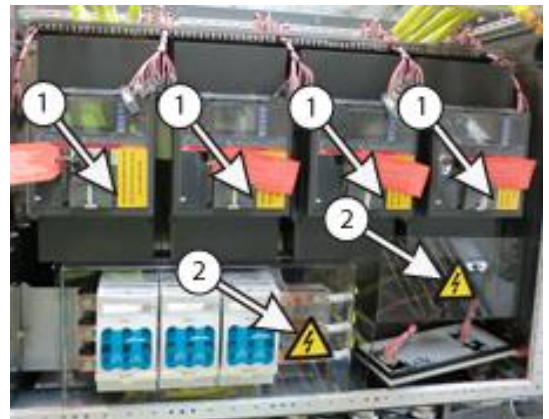


Figure 16-9: Inside the grid interface module cabinet

- 1 Manufacturer safety risk signs
- 2 208013 - Electrical hazard



Figure 16-10: 119442 - Hazardous voltage - LOTO procedures required on the control module



Figure 16-11: 119442 - Hazardous voltage - LOTO procedures required on the nacelle control cabinet

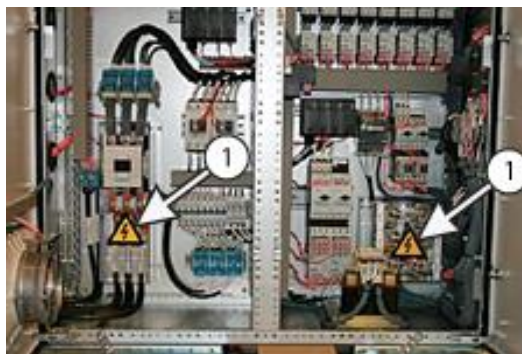


Figure 16-12: Base plates inside the nacelle control cabinet

1 208013 - Electrical hazard

16.3 Placing Signs in Generator Area

✓ This section is only applicable for V112-3.0 MW turbines.

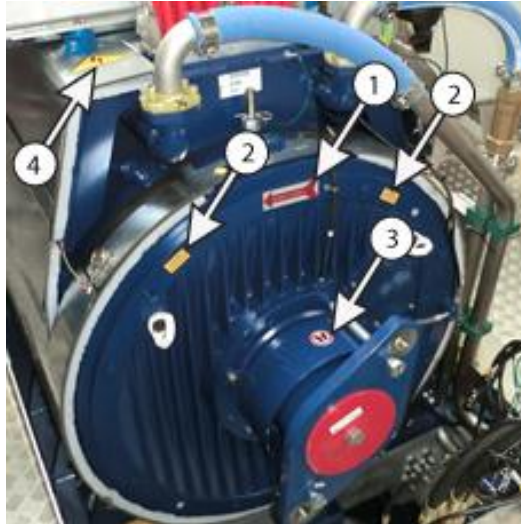


Figure 16-13: Generator end facing the gearbox

- | | | | |
|---|--|---|---|
| 1 | 70531701 - Arrow sign, direction of rotation | 2 | 70531373 - No lifting (to secure load during transport) |
| 3 | 22836 - Do not step here | 4 | 70531374 - High voltage |



Figure 16-14: GIM units facing the nacelle control units

- | | |
|---|----------------------------|
| 1 | 208013 - Electrical hazard |
|---|----------------------------|

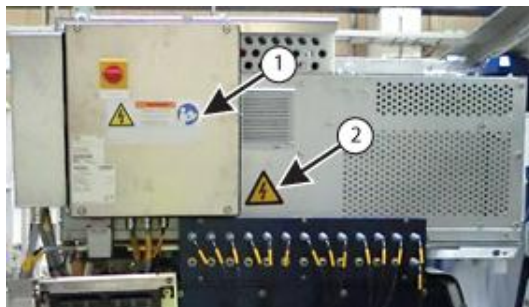


Figure 16-15: GIM end unit facing the transformer room

- | | | | |
|---|-----------------------|---|----------------------------|
| 1 | 119442 - High voltage | 2 | 208013 - Electrical hazard |
|---|-----------------------|---|----------------------------|

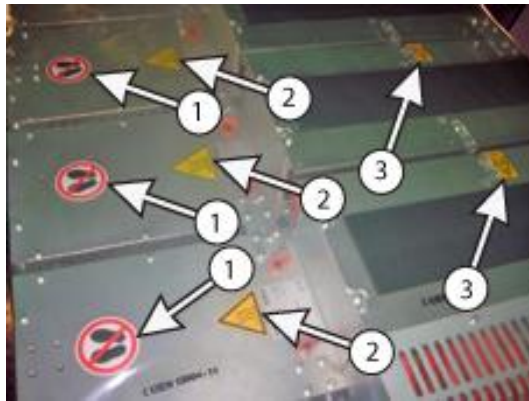


Figure 16-16: Top view of the GIM units

- 1 22836 - Do not step here (3 of 4 shown)
- 2 23072 - Hot surfaces (3 of 4 shown)
- 3 110366 - Max load 150 kg (2 of 4 shown)

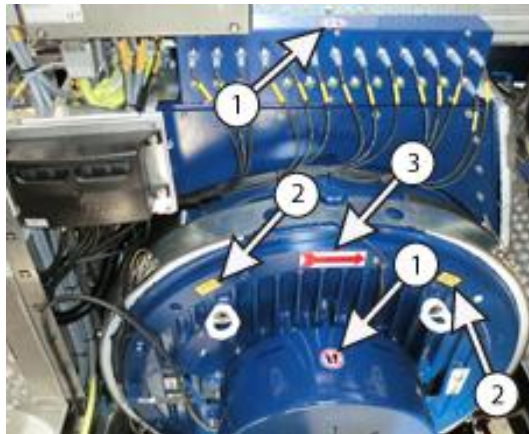


Figure 16-17: Generator end facing the transformer room

- 1 22836 - Do not step here
- 2 70531373 - No lifting (to secure load during transport)
- 3 70531701 - Arrow sign, direction of rotation

16.4 Placing Signs in Drive Train Area

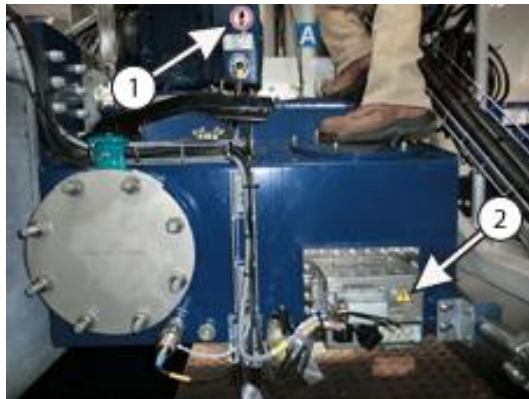


Figure 16-18: Main oil tank

- 1 208029 - Do not step here
- 2 208013 - Electrical hazard



Figure 16-19: 10207092 - Lift only when empty for gravitation tank



Figure 16-20: Fire extinguisher location

- 1 Carbon dioxide warning sign
- 2 Fire extinguisher

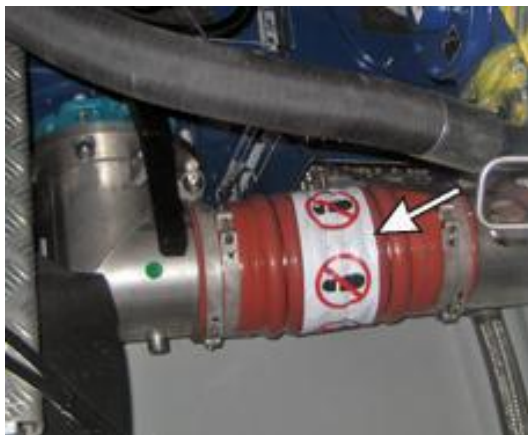


Figure 16-21: 208029 - Do not step here sign wrapped around the gearbox oil drain pipe

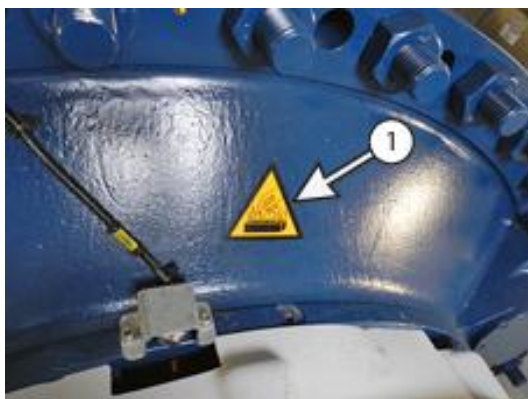


Figure 16-22: Gearbox front end

1 208023 - Hot surfaces



Figure 16-23: Gearbox side



Figure 16-24: Gearbox rear end

1 208023 - Hot surfaces



Figure 16-25: Gearbox inspection plate



Figure 16-26: 119015 - Electrical warning, slip ring system

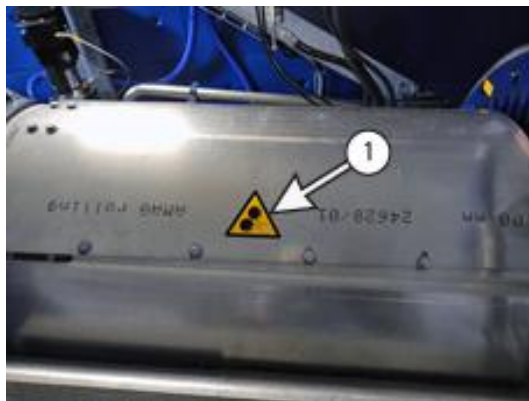


Figure 16-27: Slip ring cover

1 208017 - Rotating parts

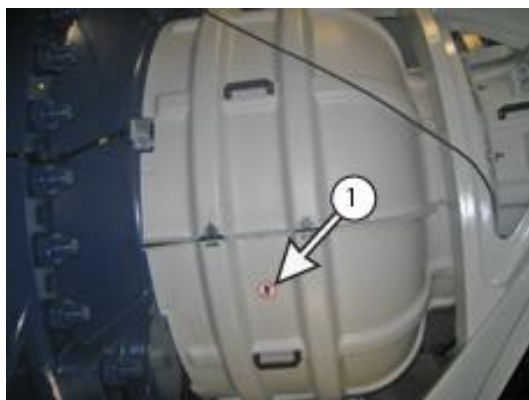


Figure 16-28: Drive train cover, gearbox-side

Figure 16-29: Drive train cover, hub-side

1 208029 - Do not step here

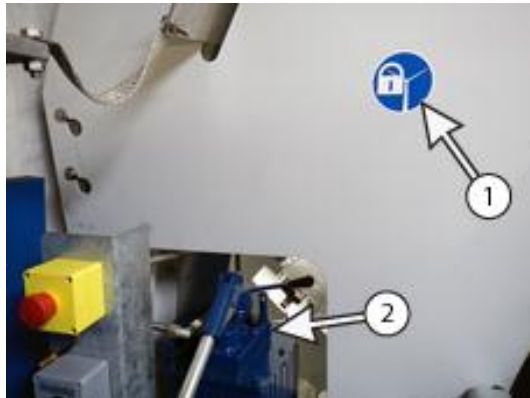


Figure 16-30: Rotor lock system next to the hub cover

- 1 208027 - Rotor lock required
- 2 Rotor lock mechanism



Figure 16-31: Hub cover left side

- 1 208017 - Rotating parts

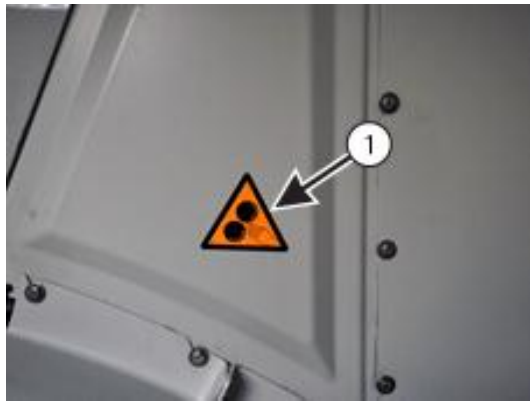


Figure 16-32: Hub cover right side

- 1 208017 - Rotating parts

16.5 Placing Signs on Traverse Girder



Figure 16-33: Traverse girder - back

- 1 10203108 - SWL 9500 kg



Figure 16-34: Traverse girder - front

16.6 Placing Signs in Hub

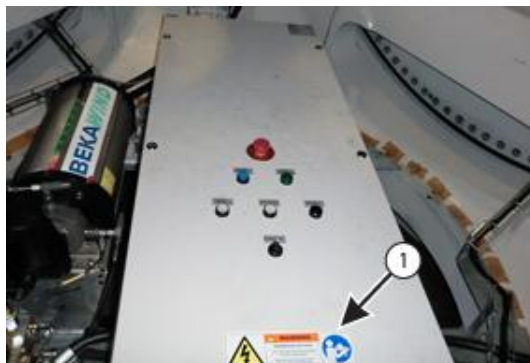


Figure 16-35: Hub controller

- 1 119442 - Hazardous voltage - LOTO procedures required



Figure 16-36: Hub

- 1 208022 - Rescue anchor point (3x)