

(COA) Conditionned Oriented Assessment

Technical assessment of a complete turbine excluding tower outside and rotor blades

Contractor: 8.2 France

Expert: Romain Violy

Date of expertise: 25/02/2015

Reference: 0033-091V2/15

Validated by: Anthony Moreau

Date of validation: 17/03/2015



WTG-Type: REpower MD77-1.5MW

Wind farm and no. In farm: Menil La Horgne, E5-R70620

Site: France-55190-Menil la Horgne

Object: (COA) Conditionned Oriented Assessment
Scope: Technical assessment of a complete turbine excluding tower outside and rotor blades

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Wind farm and no. In farm: Menil La Horgne, E5-R70620
Site: France-55190-Menil la Horgne

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Reference: 0033-091V2/15
Report name: Ménil la Horgne E5
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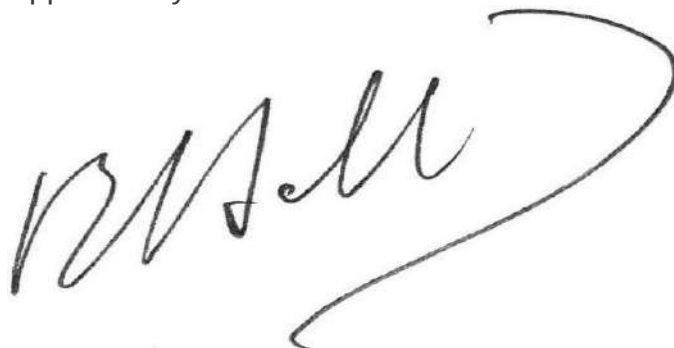
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A. General data

A.1 Data's of the expertise

Weather conditions: Sunny; 2°C; 3-6 m/s

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A.2 Expert report

This expertise is stored until 2025 at the contractor.

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All data, which has been received in the scope of this contract will be used by the contractor only project oriented and will not be handed over to any third party.

The contractor reserves the right to use the data for internal use and statistics.

A.3 Legend

Explanatory notes to the remarks:

- V = checked, no remarks;
- P = action, fault/defect;
- PP = rework, heavy defect;
- PPP = correction is necessary; immediate action is necessary; safety is affected;
- E = recommendation;
- I = information.

Explanation of the findings:

- Good condition / some defects / light defects;
- Noticeable defects;
- Poor / many shortcomings / heavy deficiencies.

B. Wind turbine data

B.1 Production data

Nominal power: 1500 kW

Hub height: 85 m

Rotor diameter: 77 m

Hours of operation: 65 790 h

Consumption: 17 653 kWh

Produced energy: 24 416 911 kWh

B.2 Main components

Component	Manufacturer	Type	SN / Number
Switch gear	ABB	Safering Type CCV	20062252770006
Transformer	Pauwels	DFRBB5	2006103826
Tower	SIAG GmbH	MD77/85IEC3A	85m, 3 sections
Ground controller	Mita-Teknik	WP3050	200616650
Frequency converter	Converteam	REPOWER 1,5MW MD70/77	05N3293784001
Nacelle bearing	Drecon	AK40.2764	S01225
Nacelle frame	Siag CZ	Maschinenträger	903
Yaw brake	Svendborg Brakes	BSAB 90-S-401	7 calipers
Yaw motor	Bonfiglioli	BN 112 M 6 FD	3 units
Yaw gear	Bonfiglioli Trasmital	711T4WS012A959P1003 units TLCVAD	
Hydraulic station	Hawe	AGGREGAT A 5 051 S	Not identified 00
Service crane	Star Liftket	051/55	622885
Main brake	Svendborg Brakes	BSAK 300-MS30S-200	1 caliper
Gearbox	Moventas	PLH-1300MD77	061218
Gearbox oil	Mobil	Mobilgear SHC XMP 320	400 l.
Generator	VEM	DASAA-5023-4UL	2350751/2006
Pitch motor	SSB	GHTIF-0716.2625.81	3 units
Pitch gear	Bonfiglioli Trasmital	706T3WFXLGS027B13 1P100T	3 units
Blade bearing	Drecon	BL40.1900.00G0	3 units
Blade	LM Blades	37.3P	3967, 3902, *****

B.3 Additional equipments

Component	Manufacturer	Type	SN / Number
Rescue device	Skylotec	Milan A-024	2557
Aviation light	Delta Box	LEDEO	WTG not equipped

C. Bases of expertise

C.1 Expertise basis

- EN 50308
- European machinery guideline
- French work code
- ICPE rules
- IEC 61400-1

C.2 Table of checks

- Access roads and other access facilities have been checked for safety and usability.
- Documentation has been viewed and checked for integrity and plausibility (random check).
- Electrical system: The accessible components (e.g. inverter, control cabinets) have been checked visually.
- Equipment and facilities for health and safety for the service-personnel has been checked for availability, functioning and safety.
- Grid connection: The accessible components have been checked visually.
- Identification and labelling of the turbine and its components was checked for completeness and plausibility.
- Maintenance jobs, repairs and examinations have been evaluated according to the available documentation.
- The components of the nacelle and the hub system have been inspected visually for defects (e.g. cracks, corrosion, leakage, lubrication, wear, abrasion).
- The electrical components of the controller system and the safety-system have been checked mainly by means of performance tests.
- The foundation has been examined visually. It was checked, whether the visible and accessible parts of the foundation were free from relevant damages (e.g. corrosion, cracks, spalling, cavities or holes).
- - The gearbox has been inspected as far as the components are accessible. The main focus was on leakage, lubrication.
- It was checked, whether the visible and accessible parts of the tower are free from relevant damages (like e.g. corrosion, cracks, spalling, cavities or holes, weak welding). Tower bolts have been checked visually and by tapping for looseness.
- The operating performance of the turbine has been checked for extraordinary states (e.g. noise emission, temperatures, power performance, yaw system, oscillations, vibrations).
- The transformer station (transformer and switchgear) has been examined by a visual inspection.
- The outside of the tower have been examined with binoculars from the ground.

D. Details of expertise

D.1 Surrounding



- | | | |
|----|---|---|
| 1 | I | Identification and labels : ICPE warning sign close to the wind turbine. Stick on the tower. Should be put in a better place not to close to the turbine. |
| 3 | P | 📷 Foundations and tower, Tower outside : Outside tower lamp. Defective. To repair. |
| 4 | V | Identification and labels : WTG identification. Present. |
| 7 | P | 📷 Foundations and tower, Tower outside : 1st tower section. Paint damage. Corrosion present. Should be repaired. |
| 11 | E | 📷 Foundations and tower, Tower outside : Tower access stairs. A welding point should be performed at the global bolts for prevention of theft. |



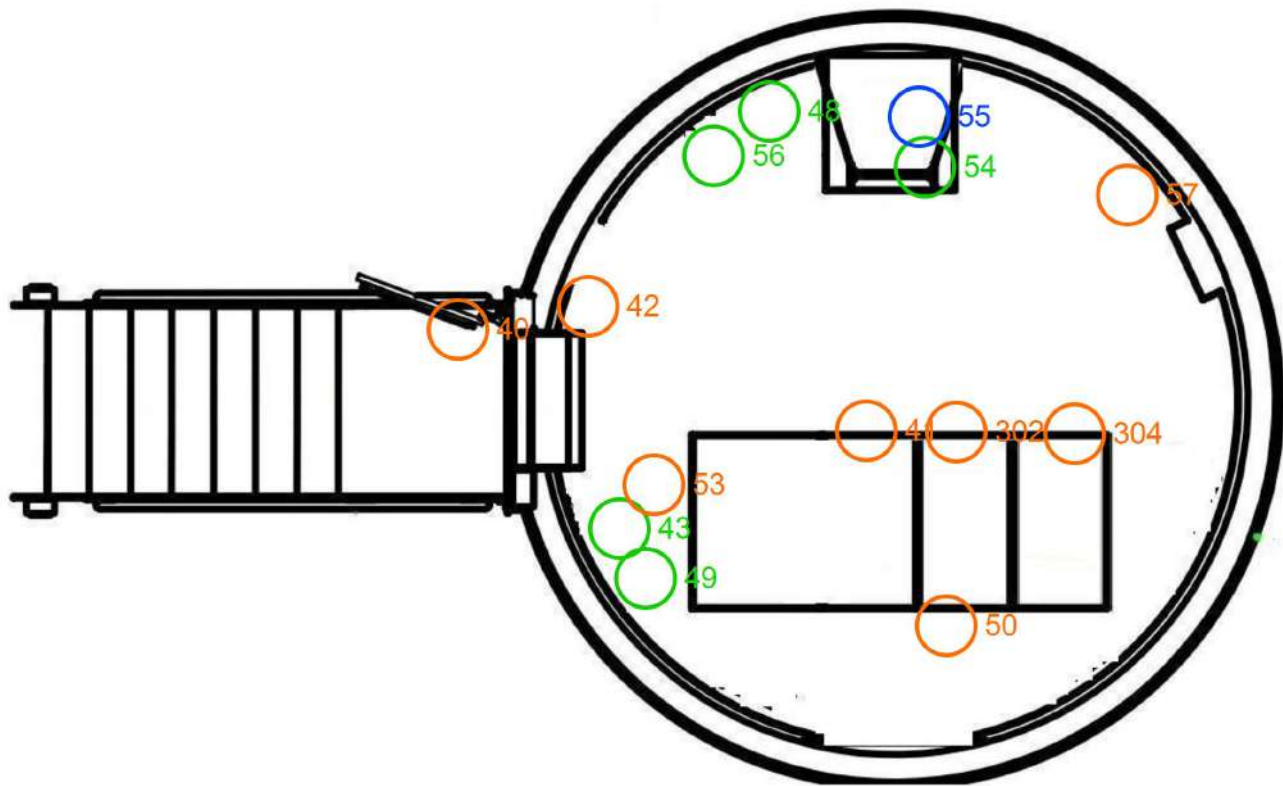
D.2 HV station



- 330 V Grid connections, High Voltage switchgear : SF6 gaz. Correct pressure.
- 332 V Grid connections : Power cabinets fuses. Properly greased.
- 333 E  Grid connections : HV room. Cracks and mildew are observed. A cleaned and a new coating protection is required.



D.3 Entrance platform

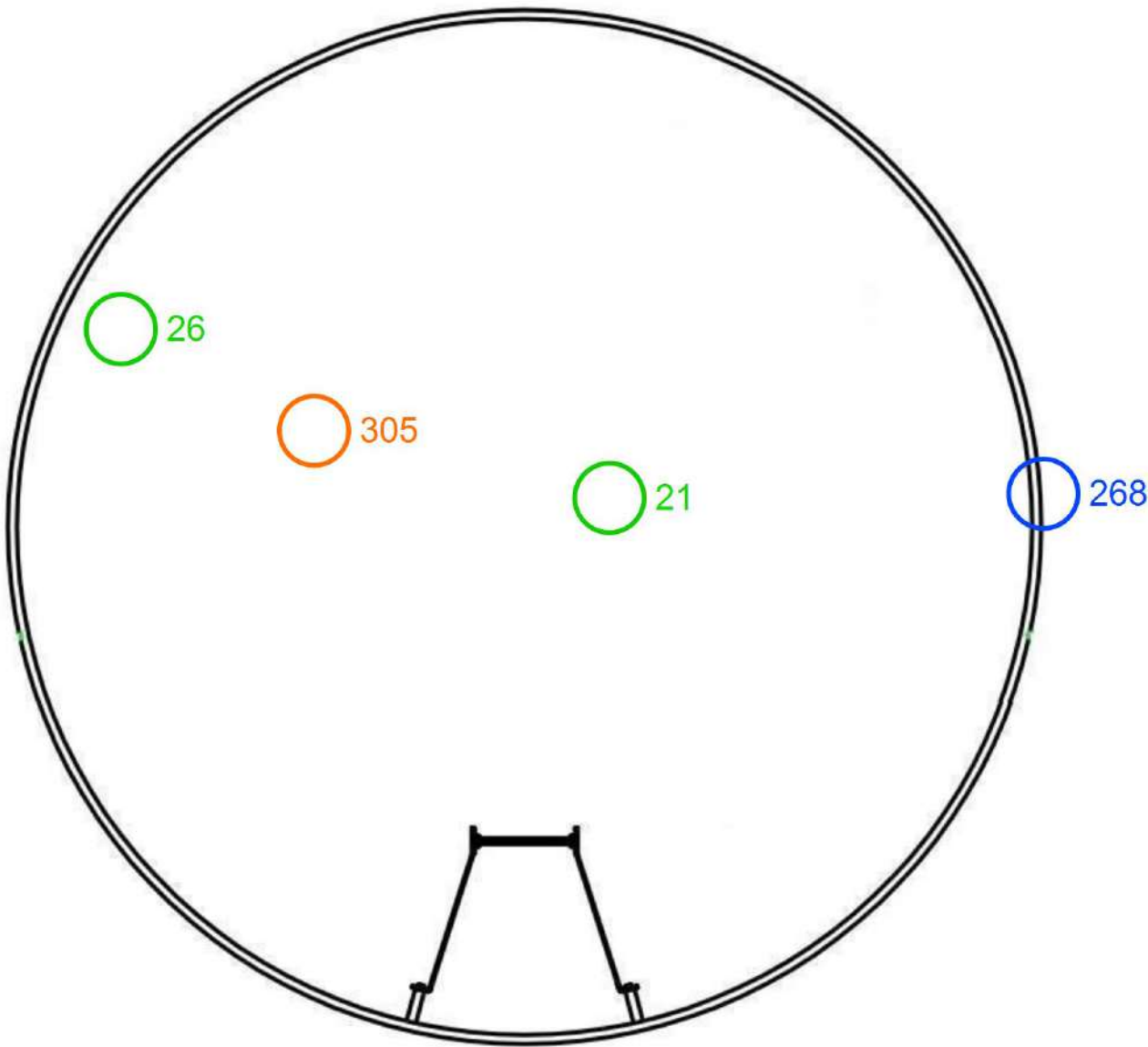


- 40 P Foundations and tower, Entrance : Entrance door. Antipanic opening system. Missing.
- 41 P  Identification and labels : REpower Hotline number. Partially erased.
- 42 P Identification and labels : CE Nameplate. Do not follow the recommendations of IEC 61400-1 and European Machine Directive .
- 43 V Health, safety and ascent systems : First aid kit. Present.
- 48 V Health, safety and ascent systems : Evacuation plan. Present.
- 49 V Health, safety and ascent systems : Fire extinguisher. Present. Checked.
- 50 P  Grid connections, Access / Marking / Handling : Interlocking keys. Interlocking key must be solidary with a welded ring.
- Number of switch cycles : 576.
- 53 P Documentation : Operation manual and technical documentation. Must be translated in french.
- 54 V  Health, safety and ascent systems : Ladder and safety line. Periodic inspection : effective.
- 55 E Health, safety and ascent systems, Ascent and security systems : Climb assistance. A climb assist system could be a good improvement in the turbine due to the tower height.
- 56 V  Health, safety and ascent systems : Safety stickers. Present.
- 57 P Identification and labels : Max. load sticker. Missing.

- 302 P Identification and labels : Entrance platform. Too many informations are stuck on the controller cabinet door's. It has to be clarify.
- 304 P Health, safety and ascent systems : Checking labels In german. Must be translated in french.



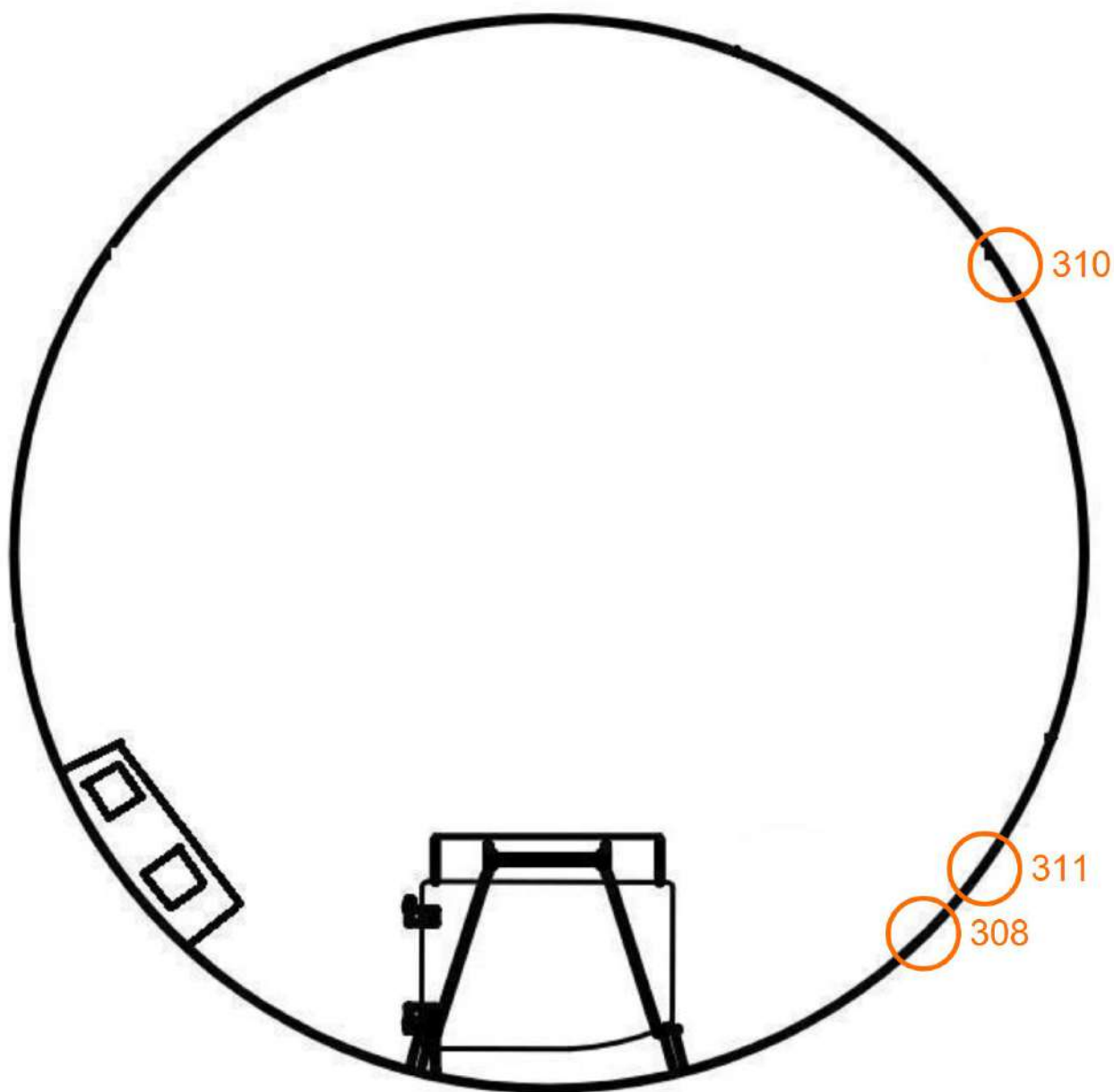
D.4 Cellar



- 21 V Grid connections, Transformer : Visual state. Good condition.
- 26 V 📷 Foundations and tower, Bolts and flanges : Flange basement section-1st tower section. Bolts protected by wax.
- 268 E 📷 Foundations and tower, Cables / Electrical installations : Earthing wires. The main beam connections should be protected with wax.
- 305 P Foundations and tower, Cables / Electrical installations : Cable duct. Not sealed.



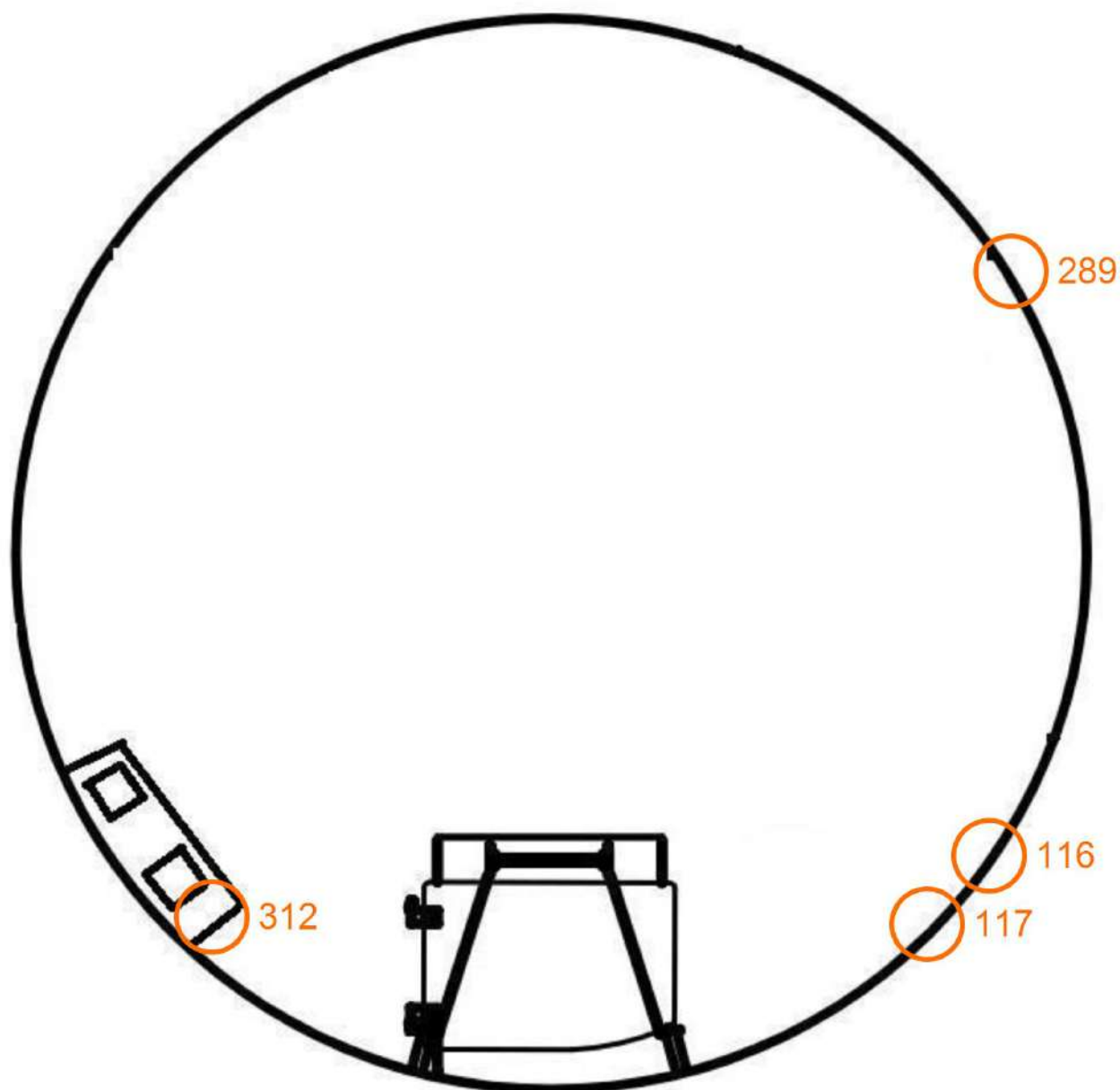
D.5 Tower platform sections 1-2



- 308 P Identification and labels : Safety stickers. Missing.
- 310 P  Foundations and tower, Bolts and flanges : Flange Coating scratch. A new coating protection should be applied.
- 311 P Identification and labels : Maximum load sticker. Missing.



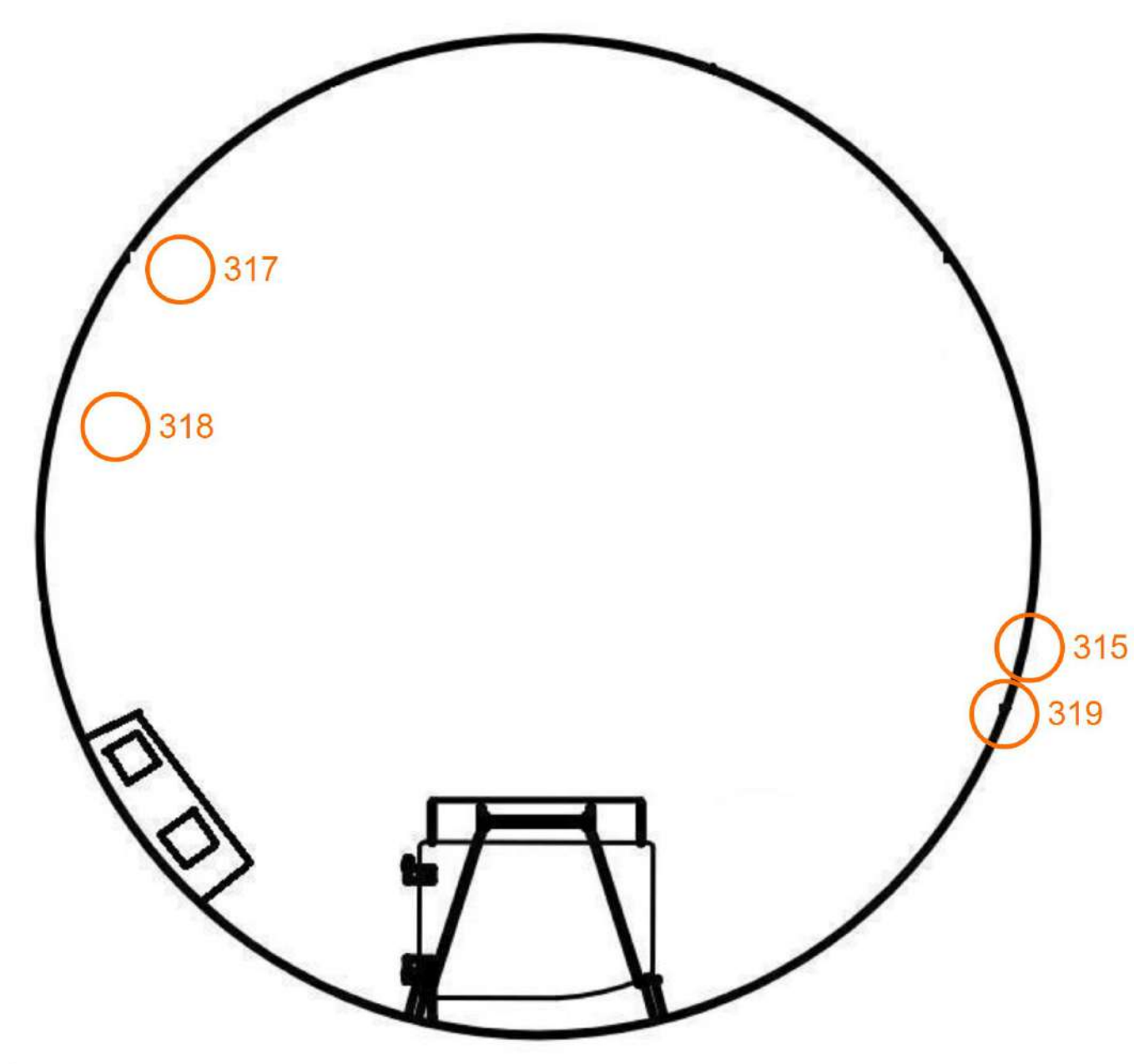
D.6 Tower platform sections 2-3



- 116 P Identification and labels : Max. load sticker. Missing.
- 117 P Identification and labels : Safety stickers. Missing.
- 289 P 📷 Foundations and tower, Bolts and flanges : Corrosion protection. Seriously damaged. To repair.
- 312 P 📷 Foundations and tower, Cables / Electrical installations : Stator bus bar One cover is damaged.



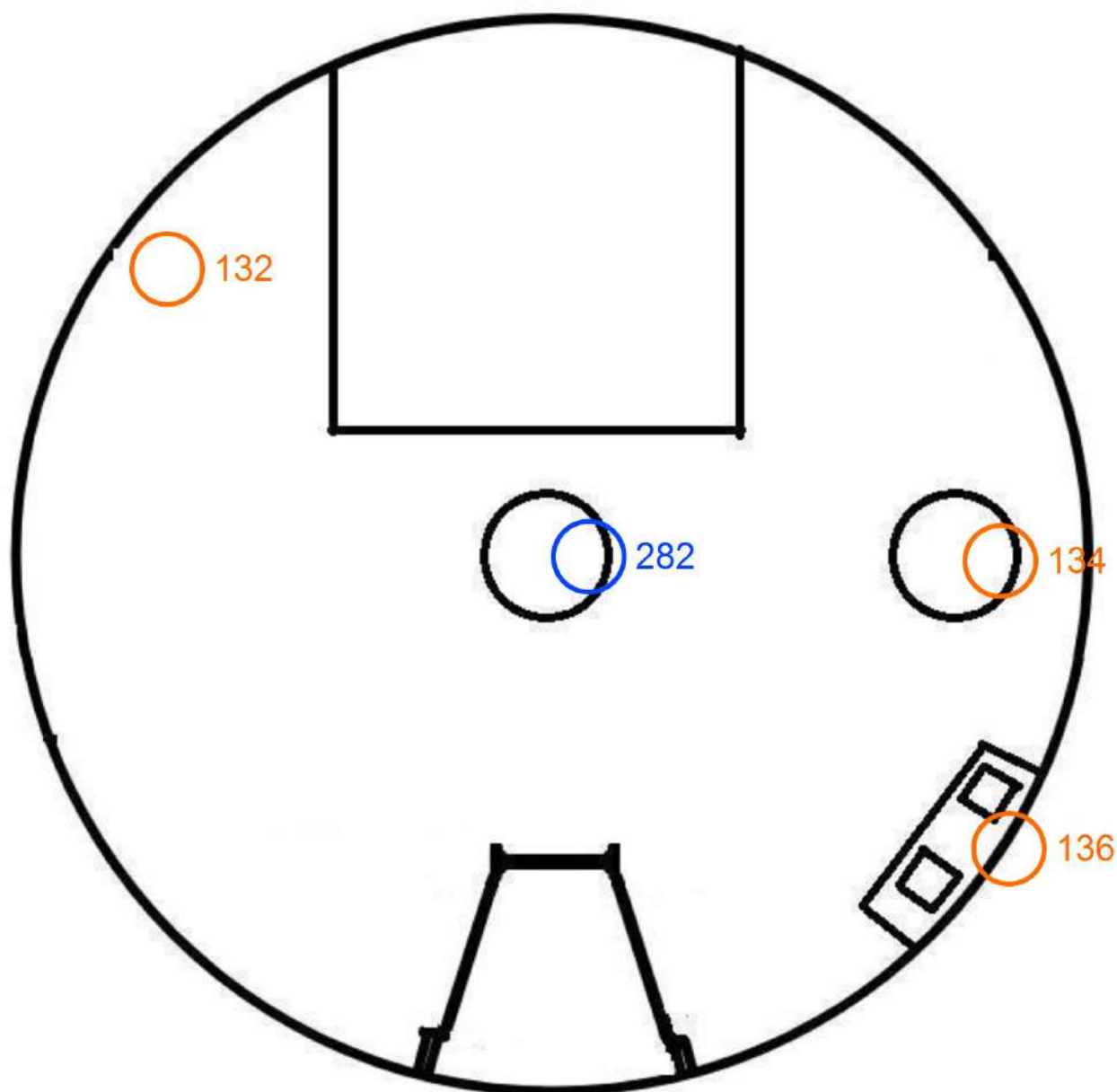
D.7 Tower platform sections 3-4



- 315 P Identification and labels : Safety stickers. Missing.
- 317 P 📷 Foundations and tower, Bolts and flanges : Corrosion protection. Seriously damaged. To repair.
- 318 P 📷 Foundations and tower, Tower inside : Tower wall Damaged. The concerned area must be repaired.
- 319 P Identification and labels : Max load sticker. Missing.



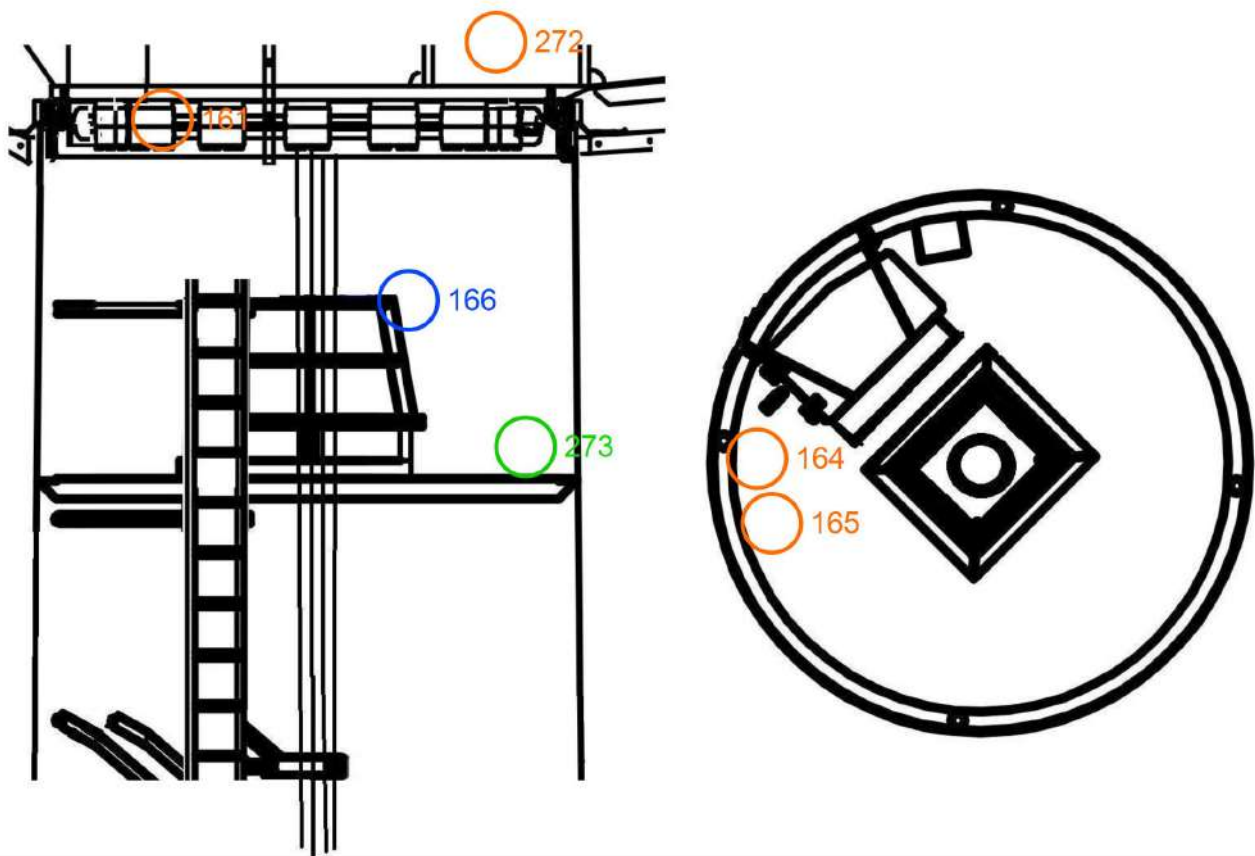
D.8 Loop platform



- 132 P Identification and labels : Max. load sticker. Missing.
- 134 P Health, safety and ascent systems : Loop platform. Important gap between the platform and the loop cable. Do not follow the recommendations of the EN 50308. Must be retrofited.
- 136 P 📷 Foundations and tower, Tower inside : Tower wall corrosion protection. Damaged. To repair.
- 282 I 📷 Foundations and tower, Cables / Electrical installations : Cables loop conditions. Acceptable and harmless abrasion.



D.9 Yaw platform

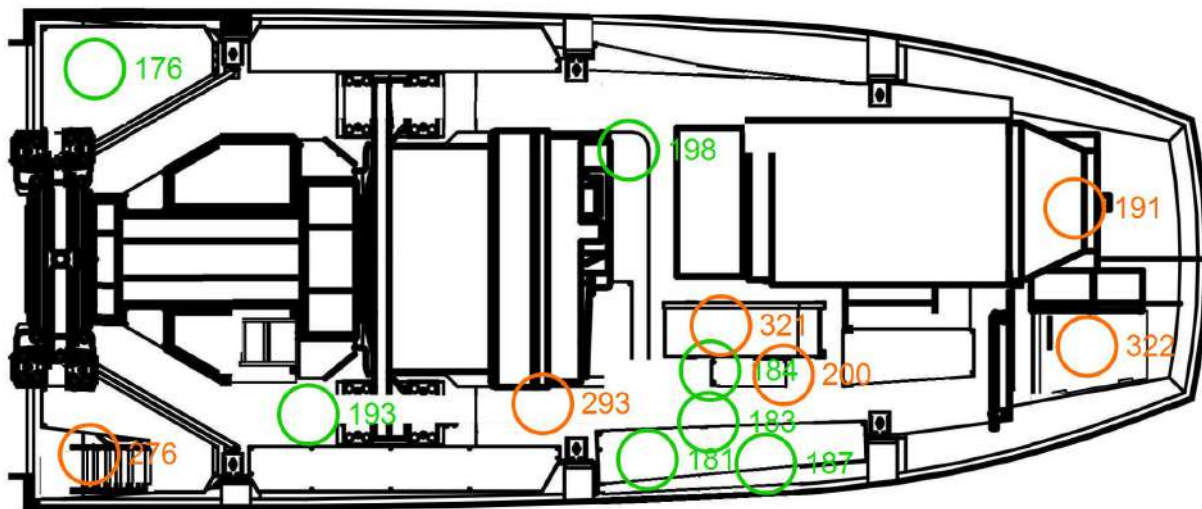


- 161 P  Nacelle, Yaw plate / Yaw system : Yaw brake disk. Grease contamination. The nacelle bearing sealing get tired. To exchange.
- 164 P Identification and labels : Safety stickers. Missing.
- 165 P Identification and labels : Max. load sticker. Missing.
- 166 E Foundations and tower, Platforms inside installation : Acces ladder. Should be equipped with anti slip pads.
- 272 P  Nacelle, Hydraulics : Hydraulic station. Corrosion at the accumulator.
- 273 V Foundations and tower, Platforms inside installation : Additional stool. Present.

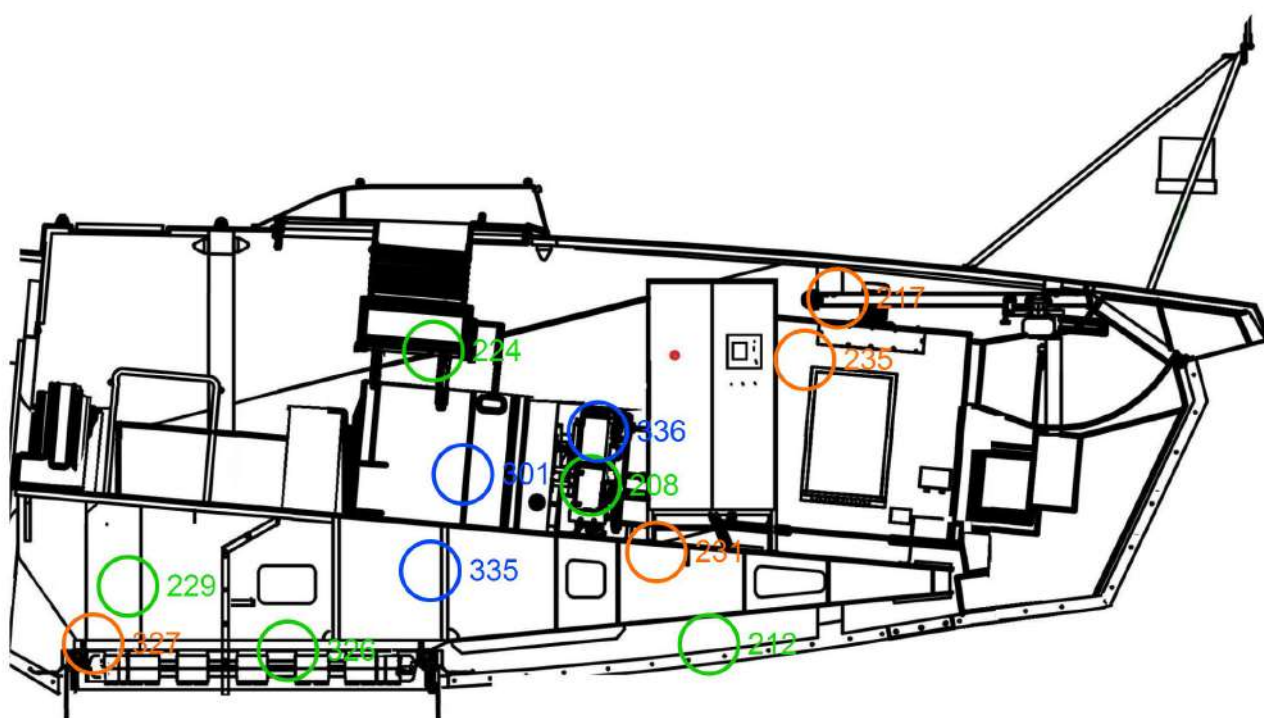
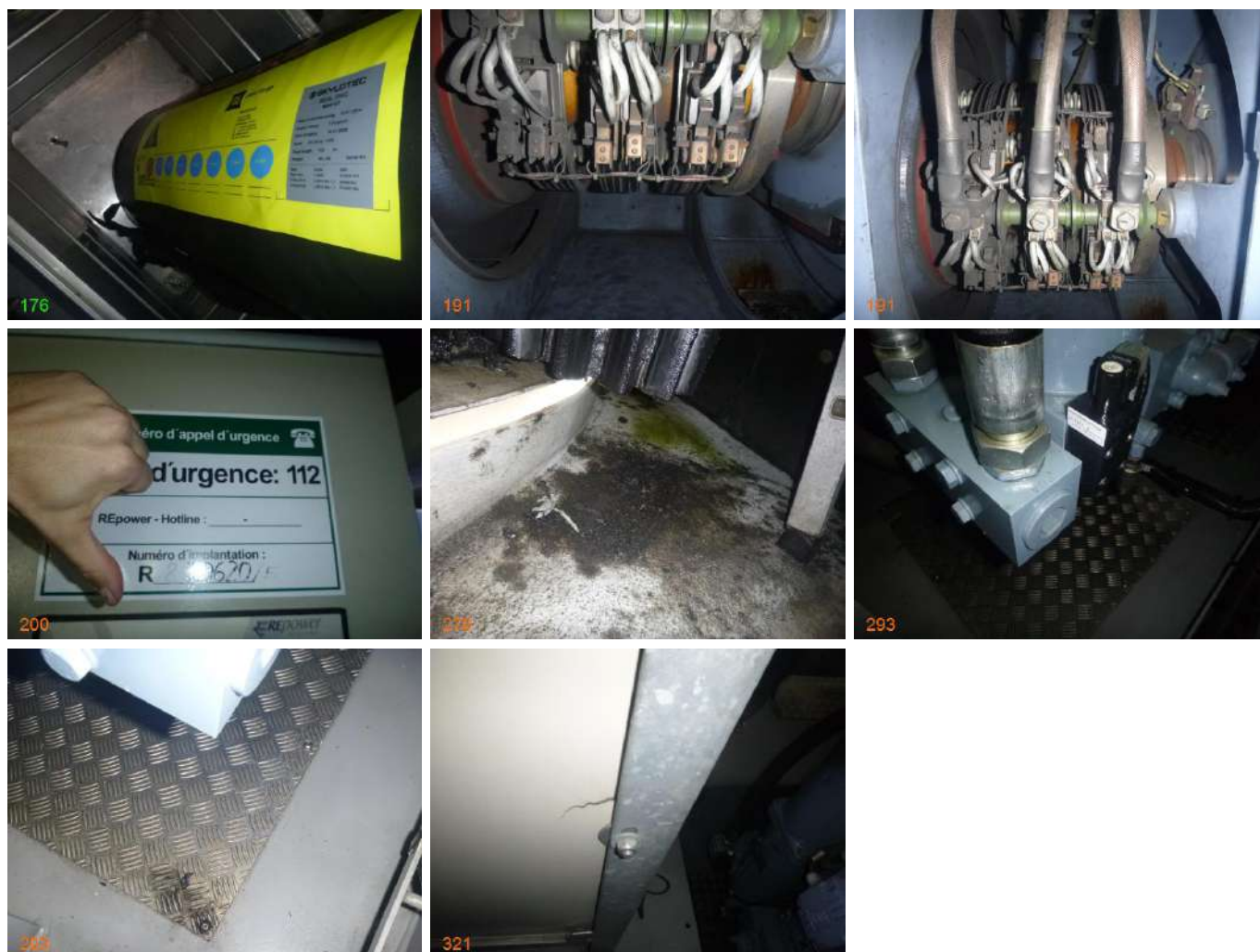




D.10 Nacelle



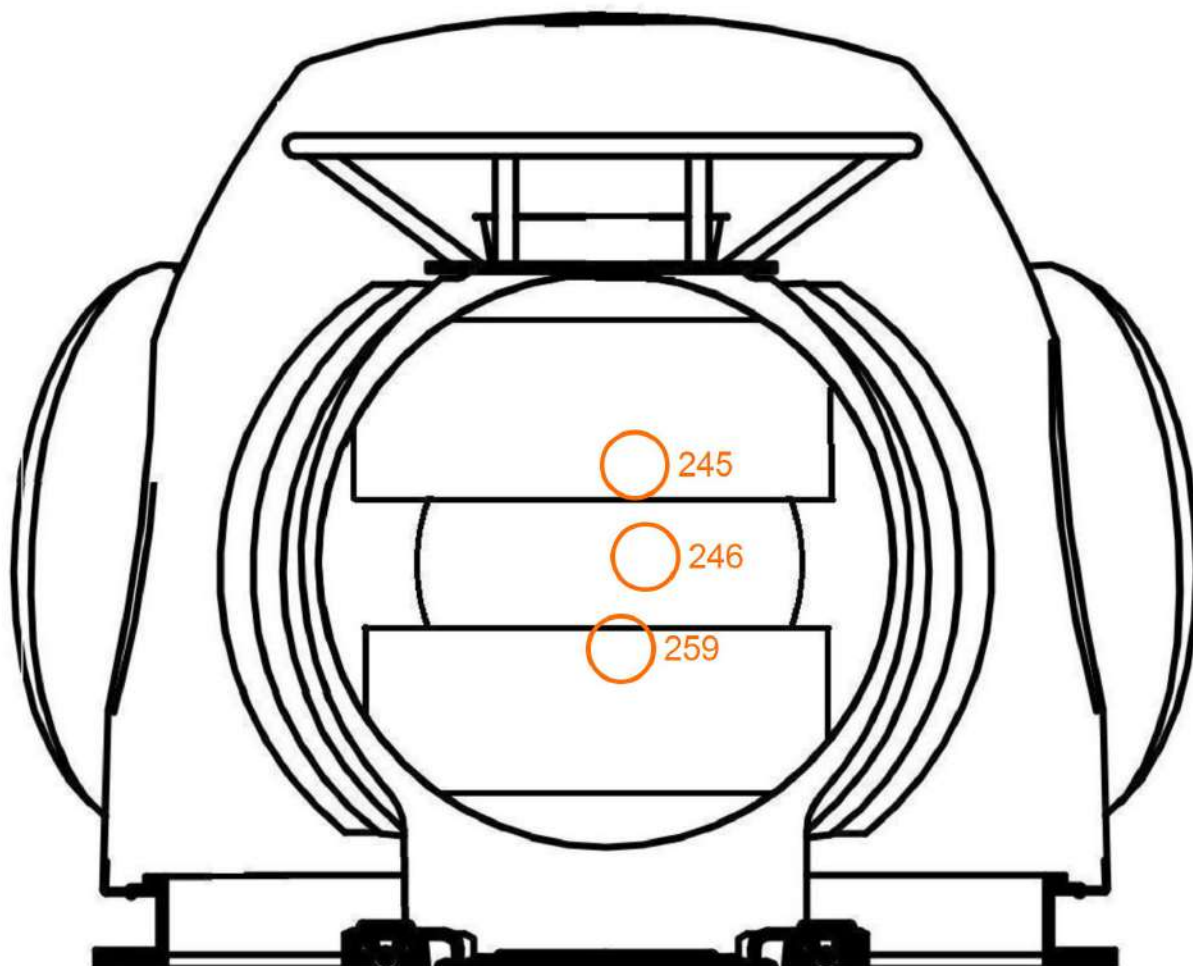
- 176 V Health, safety and ascent systems : Evacuation kit. Present and checked.
- 181 V Health, safety and ascent systems : Fire extinguisher. Present and checked.
- 183 V Health, safety and ascent systems : Evacuation plan. Present and translated.
- 184 V Production performances and security systems : Emergency stops. Tested and functional.
- 187 V Health, safety and ascent systems : First aid kit. Present.
- 191 P Drivetrain, Generator : Generator slipring. Carbon Brushes. Irregular wear.
- 193 V Nacelle, Platforms inside installation : Cleanliness. Good condition.
- 198 V Drivetrain, High speed shaft brake : Brake disk. Good geometry.
- 200 P Identification and labels : REpower Hotline number. Erased.
- 276 P Nacelle, Nacelle housing : Yaw gearing area. Seriously contaminated with excess of grease. To clean.
- 293 P Drivetrain, Gearbox / lubricating system : Gear oil main block filter. Leakage. To eliminate.
- 321 P Nacelle, Electrical cabinets : Top controller cabinet. Important cracks at the rear cabinet's wall. Retrofit must be performed.
- 322 P Nacelle, Chassis / Structure : Service crane hatch. No information regarding the maximum load on the hatch.



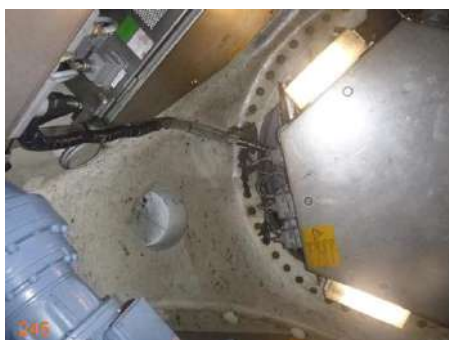
- 208 V Drivetrain, Gearbox : Oil level. Ok.
- 212 V [Ⓜ] Nacelle, Nacelle housing : Lower nacelle casing. Clean
- 217 P Health, safety and ascent systems : On board hoist. Rail. No restriction displayed for the use as an attachment point for the PPE against fall. Ask to REpower the proof that the rail can be used as an attachment point for the PPE against fall.
- 224 V Drivetrain, Gearbox / lubricating system : Cooler. Good conditions.
- 229 V Nacelle, Yaw plate / Yaw system : Yaw gear. Oil level. Ok.
- 231 P [Ⓜ] Nacelle, Chassis / Structure : Coating protection. Important paint flaking. To repair.
- 235 P [Ⓜ] Nacelle, Cables / Electrical installations : Nacelle hand lamp. Missing.
- 301 I Drivetrain, Gearbox : Vidéo endoscopy. See additionnal report. réf: Ménil la Horgne_E5_R70620_VE report
- 326 V Nacelle, Yaw plate / Yaw system : Yaw gearing. Properly greased.
- 327 P [Ⓜ] Lightning protection equipment : Nacelle/tower continuity. The brushes are contaminated with excess of grease. The supports are contaminated with corrosion. To correct.
- 335 I Maintenance and services : Vibration. A vibration spot was made. A report was done.
- 336 I Drivetrain, High speed shaft : alignment. see report ref: MLH E5-70620



D.11 Hub



- 245 P  Hub system : Hub enclosure. Contaminated with excess of grease. To clean.
- 246 P Identification and labels : Blade root platform. Maximum admissible load. Missing.
- 259 P Identification and labels : Warning and informations stickers. Must be translated in french.





E. Results of expertise

E.1 Conclusions

● Overall impression of the turbine :

The overall impression of the turbine is good.

● Stability static conditions :

The stability is not affected by the above named faults and defects.

● Safety systems :

The examination of the safety systems did not show deviations.

● Operation of the turbine :

The operation of the turbine did not show noticeable problems.

● Maintenance and service :

The inspection showed minor deviations in the matters of maintenance and service.

- Hub enclosure and yaw gearing areas contamination.
- Corrosion at the tower flanges.
- Cracks at the top controller rear wall.

● Health and safety :

The inspection did not show obvious deviations in the matters of health and safety.

- Safety stickers are not completed in the tower.
- Conditions of safety at the cables loop's platform.

● Drive train :

The inspection did not show remarkable deviations or defects.

- The results of the separate video endoscopy of the gearbox must be taken in consideration.
- The results of the separate generator alignment check must be taken in consideration.

● Video endoscopy of the gearbox:

The inspection showed some remarkable deviations:

The inspection shows a few obvious deviations or defects:

- On the load side of the gearing of the sun wheel and of one planet wheel exist lines with grey staining.

- Scratches detected on the rolling elements from the rotor

- Distinct grooves and scores detected on the rolling elements from the bearings HSS.

● Shaft alignments

Report summary.

Both LSS & HSS shafts show deviations which are out of range and should therefore be corrected.

● Vibrations Analysis :

The inspection did not shows deviation :

● Further operation of the turbine:

If the named faults and defects and the clearance of the open topics are eliminated within the period prescribed the turbine may be operated without any restrictions.

E.2 Recommendations

Following actions have to be taken short term:

All faults and defects have to be reworked within the next maintenance.

- Tower flanges damages must be repaired.
- Anchoring point for abseil device must be clarified.
- Additional protection must be installed at the cables loop's platform.
- Yaw gearing area must be cleaned from excess of grease.
- Hub enclosure must be cleaned from grease leakages.
- Oil leakage at the gear oil main block filter must be eliminated.
- Nacelle main carrier's paint flaking must be repaired.
- Periodic inspections on the gearbox should be done
- REpower hotline number stickers marking must be refreshed.
- The high speed shaft alignment must be re-worked.

Duties of the operator responsibility Owner:

The operator is responsible for the safe operation.

The operator is responsible for health and safety at the WTG as well.

To fulfil his duties he should obtain all missing documents and certificates. Furthermore the operator has to initiate the remedy of the deficiencies. Open questions have to be clarified.

The contractor does not know the details of sales- and maintenance contracts between operator and manufacturer/service-operator. Therefore the client is obliged to evaluate the remarks of this report for further action subject to the responsibilities.