Technical Specification for the rewinding of an steam turbine generator stator for the Uniper Leiden Power Plant

The document is prepared by DNV Netherlands B.V., Energy Systems

Reviewed and updated accordingly by Uniper Benelux N.V.

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1 INTRODUCTION

The installation of Uniper Benelux B.V (hereinafter referred to as "Uniper") in Leiden comprises a steam turbine generator and two gas turbine generators.

Uniper intends to keep the above-mentioned E-installations safe and operational in the coming years.

DNV Energy has carried out an inspection of the steam turbine generator (3MKA10) of the Leiden power plant carried out in September 2020

Given the age, the number of operating hours, the diagnostic measurements performed and visual inspections, Uniper has concluded that the stator winding is in a poor condition and is no longer reliable.

Uniper intends to rewind the identical spare stator, which has been stored for a long time in the power station in The Hague. After rewinding this stator will be installed in PowerStation Leiden during a planned shutdown in 2023.

To collect the winding data and to investigate the present of Asbestos, partly the winding head and partly a top and bottom bar are dismounted (see image at the enclosure).

There is no asbestos present in the stator, a "non-asbestos certificate" is present (see enclosure).

The four space heaters must be renewed (current heater, see image in enclosures)

A flux measurement (at 0,8 Tesla) was performed on-site to check the current stator core condition with no abnormal findings.

This document describes the" scope of Work" (SOW) for the rewinding of the spare stator.

2 PREAMBLE

This technical specification is applicable the rewinding of the spare stator to be installed at the steam turbine generator of the Uniper Leiden Power Plant.

As a responsible organisation Uniper strives to create a working environment that safeguards the health and safety of everyone connected with our business. We make safety an integral part of everything we do based upon the principle "We don't hurt people". (Citation: Uniper Generation Fleet Safety Management)

The CONTRACTOR is responsible for the complete and professional performance of the work scope and for the proper rewinding in accordance with the latest state of the art / good engineering practice. It is the objective of the overhaul to provide a fully functional and operationally reliable generator.

The CLIENT requires the CONTRACTOR to provide, from the beginning of Contractor's work technical specification, direct feedback of experience in order to enable the CLIENT to consider, already during the outage planning phase, options for technical, economic and process optimization of rewinding of the stator windings.

The CLIENT is entitled to have its interests represented by a third party, for instance DNV Energy.

3 PLANNING

The rewinding project will start at contract award in august 2022

At week 28 -2023 the rewound stator must present on power plant in Leiden or in the storage location in Den Haag, before the outage

4 CONFIDENTIALY

The CONTRACTOR commits itself to keep all information contained in the Technical Specification strictly confidential. The CONTRACTOR is hereby instructed that any documents handed over or disclosed to the CONTRACTOR under this Technical Specification shall only be used for the performance of the scope of work specified hereinafter.

5 ADRESS OF THE PLANT LOCATIONS

Location of the stored spare generator stator:

Uniper Benelux N.V.

Site name: Den Haag

De Constant Rebecqueplein nr 20

NL-2318 RC Den Hague

Location where the to be newly rewound stator is to be installed:

Uniper Benelux N.V.

Site name: Leiden

Maresingel 21e

NL-2316HB Leiden

An access protocol has been drawn up for people who wish to enter Uniper sites. Everyone must be able to identify themselves with a valid passport or ID.

Please note a driver's license is not accepted!

A contractor who comes to carry out work is also obliged to provide a valid VCA certificate. This must be shown on the first visit.

Please note that as a **visitor or contractor,** you must register 24 hours in advance at the relevant location via the hyperlink:
https://uniper.work/

It is mandatory to follow the gate instruction and then answer safety questions.
The obligation of personal protective equipment on the UNIPER sites is at least: **fire retardant** clothing with long sleeves, a helmet, safety goggles and safety shoes.

6 DATA OF THE CURRENT GENERATORS

6.1 Data of the in-use generator (Leiden)

Manufacture	Smit Slikkerveer
Type / serial number	DTG / 37645
Year of manufacturing	1952
S_N [kVA] / Kw	37500 / 30.000
U_N [V]	10500
I_N [A]	2060
cos ϕ	0,80
f_N [Hz]	50
Total Mass / stator / rotor	54 T / 41 T / 13 T
Rated speed [rpm]	3000
Rotor voltage	220 V
Rotor current	680 A

6.2 Data of the to be rewound generator (The Hague)

Manufacture	Smit Slikkerveer
Type / serial number	DTG / 37640
Stator Core year of manufacturing	1953
Stator winding year of manufacturing	2022
S_N [kVA] /kW	37500 / 30.000
U_N [V]	10500
I_N [A]	2060
cos ϕ	0,80
f_N [Hz]	50
Stator mass / support frame	41 T / 6 T
Rated speed [rpm]	3000

The windings of this stator are original, in 1984 the stator is re-wedged by the OEM

6.3 Description of the spare stator to be rewound (The Hague)

The original stator winding, manufactured in 1953, was insulated with a Mica foil-Asphalt insulation, therefore presumably with a class B insulation. The main insulation between bare copper and slot is equal to 4,75mm (increase of 9,5mm on the bare copper conductor).

The original construction of the winding consisted of straight bars (no Roebel transposition), where conductor's transposition was made at the end of the bars by brazing the single copper conductors accordingly (2 stacks of 30 conductors).

The end-winding support system is made of wooden blocks supported by metallic tie rods hold on the stator core. Air baffles are fixed to the outer stator end-winding basket to guarantee the air flow.

The client is aware the challenges related to the rewinding on such an obsolete design with an up-to-date insulation system and manufacturing technology. Hence the client is open to receive and discuss the best available techno-economical offer.

THE STATOR WINDING SHALL BE MECHANICALLY ROBUST TO:

-WITHSTAND THE SHORT CIRCUIT CURRENT WITHOUT DAMAGE;

-WITHSTAND UP TO 250 START/STOP PER YEAR

The following proposal for the QA/QC plan is indicative and to be reviewed by the parties based on the actually proposed solution, The QA/QC plan is based on Resin-Rich type coils bars and it is intended to be reviewed whether a GVPI solution is proposed.

The existing generator is equipped with Partial Discharge on-line sensors that will be maintained for monitoring purposes after the rewinding.

7 ROLES AND STANDARDS

The measurements shall at least comply with the requirements:

- IEC 60034 Rotating electrical machines – all relevant standards
- IEEE 43-2013 Measurement of Insulation Resistance and Polarization Index
- KEMA S13/14 version 2010 KEMA specification for hydrogen, liquid and air-cooled synchronous a.c. generators with rated voltage 5 kV and above*
- KEMA S22 version 2021 DNV KEMA specification for diagnostic measurements on rotating electrical machines*
- VGB standard for end-winding vibrations

Kema specifications can purchased by Esther.Kokmeijer@dnv.com

8 CHECKLISTS AND TESTS

Clarification

X - To do
P - Protocol
VI - Visual Inspection
W - Witness Point

Who provides What:

8.1 Transport of components (lifting, hoisting, shipment)

Description	CLIENT	CONTRACTOR	Comments
Material, spares and component shipment (e.g. unloading, uploading, craning) on site between warehouse, workshop and turbine hall		X	Contractor has to be announce the date of the transport one week before
Loading operation of CONTRACTOR site equipment prior to commencement and after completion of inspection activities.		X	Contractor has to be announce the date of the transport one week before
Turbine hall crane operation by skilled and certified personnel (hoist plan and/or rotor pull-out procedure should be delivered in advance, for review)		X	Use of the turbine hall crane is not solely for CONTRACTOR and needs to be synchronised with other works during outage time. The CONTRACTOR is obliged to be able and with according to documented qualification to operate the turbine hall crane in every shift.
Material, spares and component shipment (e.g. unloading, uploading, craning) off site between plant and workshop		X	
Transport packaging / preservation inside and outside the site		X	
Lift truck 3.5T		X	
Driving licence for lift truck		X	
Pallet truck		X	
All lifting plans must be made by Contractor and delivered in advance for review by Client		X	

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9 GENERAL SCOPE OF WORK

The following scope of work for the rewinding of the stator does not absolve the CONTRACTOR from his responsibility to carry out all works required for the proper scope of work according to the latest state of the art/good engineering practice.

Before starting work, it is to be assured that:

- The work permit is in place and the working conditions are well prepared
- All method statements and risk assessments for all works are in place
- All manufacturing and test procedures are available for review, at least four weeks before commencement of the activities.
- All necessary parts from the fixed scope of works have to be delivered and installed by the CONTRACTOR. Before the rewinding the integrity and rightness of the spare parts delivered by the CLIENT has to be confirmed by the CONTRACTOR
- Contractor must deliver an Project organisation plan with contact persons and contact data

10 REWINDING OF THE STATOR

The Contractor shall be is responsible for the complete and professional performance of the rewinding of the stator winding.

ITP Clarification

X	–	To do	PT	–	Dye Penetrate Test
P	–	Protocol	UT	–	Ultrasonic Test
VI	–	Visual Inspection	W	–	Witness point with CLIENT
E	–	Electrical Test			

The scope of work requires the rewinding of the stator according to the following characteristics:

- Class F insulation system;
- Only glass-mica tape is allowed for the main ground-wall insulation unless separately discussed;
- Stress grading insulation is applied to the stator coils/bars;
- The impedance of the new stator must be comparable with that of the original stator;
- TO THE STATOR REWINDING THAT THE STATOR WINDING SHALL BE MECHANICALLY ROBUST TO:
- WITHSTAND THE SHORT CIRCUIT CURRENT WITHOUT DAMAGE;
- WITHSTAND UP TO 250 START/STOP PER YEAR;
- Efficiency: Old stator losses are rated at 97,97%. New stator losses should be better and stated with at least with 2 digits after the comma.
- The stator winding mechanical natural resonance frequencies must be within the ranges noticed in the VGB document
- Manufacturing of six new stator bushings. The current in-use bushings are subjected to PD- markings.

The following works shall be carried out but not limited to:

SOW	ITP	Client point	Remarks
Transport from Uniper Powerplant to the contractor workshop	X		
Incoming checks, checking the winding data. *If the contractor wants to perform Flux test it must be notified in the bid.*	X,P		
Removing of the stator bars without damaging the stator core or the slots	X,P	W	Witness after completion
Flux test on the cleaned stator core	X,P	W	manufacturing and test procedures are available for review
Manufacturing of the stator coils or bars	X,P	W	manufacturing and test procedures are available for review
Manufacturing of 2x sample coils/bars for quality assurance testing – coils/bars are chosen by the customer from the production batch	X,P	W	manufacturing and test procedures are available for review
Re-use the stator winding supports if maybe possible, upon proposed design and NDT conditions assessment of the re-used parts	P		manufacturing and test procedures are available for review
Installation of 6x Thermo Couples (TC) located in the expected axial hottest point of the stator and distributed uniformly in radial position, TC must be placed between upper and lower coils bars, and there must be two TCs per stator phase. Also wire out to an equivalent junction box at the same place due to cable lengths	X,P		manufacturing and test procedures are available for review
Stator rewinding	X	W	manufacturing and test procedures are available for review
Stator wedging	X	W	manufacturing and test procedures are available for review
End-winding support system installation	X		manufacturing and test procedures are available for review
End-winding connections brazing – where applicable	X	W	manufacturing and test procedures are available for review
Connection of parallel rings and stator winding phase and neutral connections	X		manufacturing and test procedures are available for review
Finishing of end-windings	X		manufacturing and test procedures are available for review
Electrical tests during manufacturing	X,P	W	manufacturing and test procedures are available for review
Cleaning of the laminated core and housing / flanges	VI,X	W	

Delivery and installation of new space heaters Also wire out to an equivalent junction box at the same place due to cable lengths	X		
Delivery of six new bushings	X	W	manufacturing and test procedures are available for review
Electrical tests on the bushings	X		manufacturing and test procedures are available for review
The bolts / tread ends from the generator covers and the inspection hatches with English thread must be replaced with metric thread.	X	W	
The stator housing repainted at RAL 5007*	X	W	Note: The outer shields are not available during the rewinding.*
QA/QC tests during manufacturing of the stator winding including the sample bars/coils	X,P	W	manufacturing and test procedures are available for review
QA/QC acceptance tests at the completion of the stator rewinding (FAT)	X,P	W	manufacturing and test procedures are available for review
Long storage protection for indoor	X		
Transport from contractor workshop to Uniper Powerplant	X		

**The outer and inner shields are in use at the Generator in Leiden as of this moment. Repainting is not possible at this very moment.*

Following documentation has to be delivered two weeks after delivery of the stator to the client *

- Dimension records for de- and reassembly
- * Fact finding reports has to be delivered two working days after the finding
- Proposed rewinding design, including relevant drawings
- Reports and used materials datasheets, certificates etc.
- All work items which are marked above by a ‘E and P’
- All electrical measurements as notice

11 ELECTRICAL MEASUREMENTS AT THE BARS AND WINDING DURING THE MANUFACTURING AND THE FAT:

11.1 Stator core tests

SOW	ITP	Client point	Remarks
After removal of the stator winding and cleaning the stator core, a full flux measurement including an Infra-red measurement by IR camera must performed. • by 0,8 Tesla during at least 30 minutes • by 1,2 Tesla during at least 30 minutes.	E,P	W	Record of hot spots and stator core losses
After the installation of all bars into the slots, a full flux measurement including an Infra-red measurement by IR camera must performed. • by 0,8 Tesla during at least 30 minutes • by 1,2 Tesla during at least 30 minutes	E,P	W	Record of hot spots and stator core losses

11.2 Test during production of the stator winding coils/bars

SOW	ITP	Client point	Remarks
Strand to strand electrical test between adjacent conductors before taping	E, P		Pass-fail 220Vac-1sec
High voltage withstand test on finished coils/bars	E, P	W	Pass/fail 3Un+1 60 seconds
Stress grading resistance on finished coils bars	E, P	W*	TBD with contractor
Dissipation factor test on finished coils/bars	E, P	W*	IEC 60034-27-1 Test up to 1,4 Un DF0,2Un<0,007 DF 1,0Un<0,01
Partial Discharge test on finished coils/bars	E, P	W*	IEC 60034-27-1 Test up to 1,4 Un PDIV>1,0Un
Strand to strand electrical test between adjacent conductors on finished bars	E,P	W*	Pass-fail 220Vac-1sec

**Witnessing is intended to part of the production batch Sample bars and the electrical tests*

11.3 Tests on sample coils/bars

The coils bars production batch for the rewinding of the stator, or the finished stator in case of GVPI, is accepted upon successful results on the sample coils testing described in this paragraph.

A minimum of two sample coils/bars must be produced for testing. The sample coils/bars are chosen by the client within the production batch.

Before the testing, the sample coils are expected to have undergone the same testing as the production coils/bars.

All sample bars should manufacture during the production of the batch

In case of GVPI stator, sample coils/bars are to be processed together with the stator and equipped with low voltage electrodes mimicking the stator slot and its dimensions.

After the test all sample coils/bars must be delivered to Uniper for investigation.

The prescribed tests are intended to be performed in the following chronological order.

The following works shall be carried out but not limited to:

SOW on sample coils / bars	ITP	Client point	Remarks
5x heating/cooling cycles from ambient temperature to 155˚C	E, P	W	No mechanical damage allowed
Dissipation factor and capacitance measurement (tan δ)	E, P	W	IEC 60034-27-1 Test up to 1,4 Un DF0,2Un<0,007 DF 1,0Un<0,01
Partial Discharge test on finished coils/bars	E, P	W	IEC 60034-27-1 Test up to 1,4 Un PDIV>1,0Un
High voltage breakdown test main insulation tests up to	E, P	W	IEC60034-15 Vb>2x(2Un+1) kV
Strand to strand electrical breakdown test between adjacent conductors	E, P	W	Vb> 220Vac

11.4 Tests during rewinding and Factory Acceptance Tests

The following tests are intended as acceptance tests for the stator and the bushings.

The following works shall be carried out but not limited to.

SOW	ITP	Client point	Remarks
Wedge tightness test	E, P	W	
Measure insulation resistance and polarization index of each phase of the stator winding at room temperature 5000V, DC.	E, P	W	IEEE43 IR>1GOhm PI>5
Dissipation factor and capacitance measurement (tan δ) of each single phase and all together (0.2 Ur steps up to 1.4 Ur)	E, P	W	IEC 60034-27-1 Test up to 1,4 Un DF0,2Un<0,01 DF 1,0Un<0,015
Partial discharge measurement (PD) of each single phase and all phases together both at line and star-point side (0.2 Ur steps up to 1.4 Ur)	E, P	W	IEC 60034 27-1 PDIV>0,8Un PD at 1,0Un<1nC No surface PD allowed
Measure winding resistance at the individual phases	E, P	W	
Thermo Couple insulation test, 1000 V, DC, 1 minute	E, P	W	
Thermocouple testing	E, P	W	
Space heater Insulation test, 1000 V, DC, 1 minute	E, P	W	
Functional test of the space heaters	X	W	
High voltage withstands stator acceptance test	E, P	W	(2Un+5) kV – 60 seconds No breakdown or flash over allowed
After installation in the mounting plate the bushings must be PD free till 2 x Un.	E,P	W	<10 pC
High voltage withstands bushings acceptance test	E, P	W	(2Un+5) kV – 60 seconds No breakdown or flash over allowed
Following documentation has to be delivered two weeks after delivery of the stator to the client * • Dimension records for de- and reassembly • * Fact finding reports has to be delivered two working days after the finding • Reports and used materials datasheets, certificates etc. • All work items which are marked above by a 'E and P' • All electrical measurements as notice			

12 GENERATOR BUSHINGS

Six (6) bushings must be manufactured, according to the spare model. Or another suitable way to connect to the flexibles.

The position of the copperbar into the bushing is 90 degrees rotated in comparison with existing bushings.

The new bushings must become identical as the current bushings

Also, a new mounting plate and new locking devises will be delivered.

The new delivers bushings must be interchangeable with the current bushings.

1 spare bushing (not in use)

Spare-generator leads.

Generator bushing connections of the currently IN USE Generator in Leiden. (hence the 90 degree rotation)

13 QUALITY ASSURANCE DURING THE REWINDED OF THE STATOR

Quality Assurance (QA) shall be based on the CONTRACTOR's Quality Management (QM) system. The QM system shall at least comply with the requirements of NEN-EN-ISO 9001:2015 and NEN-EN-ISO 14001 for environmental requirements. CONTRACOR's QA shall also cover all the CONTRACTOR's suppliers and subcontractors. The CONTRACTOR shall be responsible for planning, implementation, monitoring and documentation of the QA for its entire scope of supply and services. The CONTRACTOR shall have in place its own responsibly QA supervisory and technical personnel, duly qualified for the scope of supply and services. Even if the CLIENT puts into place its own quality supervision, the CONTRACTOR shall remain fully responsible for quality assurance.

The CONTRACTOR shall prepare a non-conformance report for each quality defect and inform the CLIENT immediately. The non-conformance report shall contain the following information:

- Description of non-conformity/the quality defect;
- Classification of the quality defect, including reasons for the classification made;
- Description of the impact on the stator winding / generator functional unit;
- Description of the corrective action to be taken, including reasons;
- Impact on dates and deadlines.

Together with the BID an example of QA /QC document will have to be delivered.

Each and any deviation from the specified quality shall be classified by the CONTRACTOR as follows:

- Class 1: The non-conformance of the Scope of Work (SOW) will be corrected by the CONTRACTOR on the CONTRACTOR's own responsibility; the CLIENT will be informed.
- Class 2: Non-conformances that may result in additional work and expense will be corrected by the CONTRACTOR on the CONTRACTOR's own responsibility; consultation and coordination with the CLIENT is mandatory.

The CLIENT reserves the right to inspect the presented documents related to the Scope of Work or have them inspected by a skilful and independent THIRD PARTY, and to expand the Scope of Work in consultation with the CONTRACTOR.

The CONTRACTOR shall submit with its Bid a description of the main elements of its project-specific quality assurance programme (organization, responsible/contact persons).

13.1 Inspection and Test Protocol (ITP) and fact finding

The CLIENT's Inspection and Test Protocol (ITP) covers the scope of fact finding, measurements, inspections and tests to be performed by the CONTRACTOR, the CLIENT and the Third-party witness points to be considered by the CONTRACTOR.

On the basis of its technical expertise and experience, the CONTRACTOR shall prepare a project-specific Inspection and Test Protocol (ITP) which must duly reflect the scope specified by the CLIENT in the present Technical Specification.

The CONTRACTOR shall update the ITP to reflect any subsequent technical changes /additions to the ITP that become necessary as a result of inspection findings. The CONTRACTOR shall inform all parties involved (e.g., subcontractors) of any changes or additions made to the ITP.

The CONTRACTOR is required to submit the project-specific ITP document shall at least contain the following information:

- Time and location of fact-finding measurements and tests/inspections.
- Reporting points and CLIENT / Third-party witness points;
- Testing centre, testing methods and procedures, main focus(es) of the inspection/test;
- Document numbers of the applicable testing procedures and test specifications;
- Recording.

Together with the BID an example of ITP document will have to be delivered.

CONTRACTOR's testing procedures and test specifications must be available before commencement of the activity and the CLIENT shall have the right to inspect such procedures and specifications. The procedures and specifications must cover the following testing and inspection requirements:

- Scope of application;
- Applicable standards and codes (standards, directives and codes of practice);
- Qualification of testing/inspection personnel;
- Preconditions for safe and reliable testing;
- Acceptance levels;
- Testing and procedural instructions.

The CONTRACTOR is responsible for performing all fact-finding work, fact finding, measurements, inspections and tests, for prompt recording and evaluation of results, and for preparing the reports. The records and reports shall be prepared and shall be kept available for inspection by the CLIENT at any time; on request, copies of all records and reports shall be supplied to the CLIENT during the project. The CLIENT / Third-party shall have the right to inspect (in advance) at its discretion the testing procedures/test specifications and manufacturing documents for the component parts and subassemblies of the CONTRACTOR.

The CONTRACTOR shall derive from the findings and test results, the measures required and present them to the CLIENT in writing within two working days. The CONTRACTOR shall document the findings, tests/inspections and the measures agreed in the findings follow-up matrix. The CLIENT / Third-party and the CONTRACTOR shall aim at carrying out a joint fact-finding effort upon complete disassembly of the components.

The records and reports compiled by the CONTRACTOR shall contain all information necessary for evaluation. The location and sizes of the findings/flaws shall be identified by stating the precise position in the form of quadrants (e.g. 03:00 hrs) and the size. In case of photographic documentation, a clear allocation of the photo shall be ensured, and a scale shall be included in the photo.

The CONTRACTOR commits itself to notify the CLIENT in writing of any findings necessitating additional supplies and/or services within 1 workday from their identification at the latest, and to submit to the CLIENT within 3 days an offer covering the additional supplies and/or services (including optional variants, if any).

13.2 Warranty, new material and new components

All rewinding components and material shall be designed for a service life equivalent to a Class F insulation System and Class B temperature rise. All new components and especially the winding materials, must be suitable for the operating conditions at least 60000 running hours.

The new winding must be covered by a 2-year warranty after commissioning.

The potentially expected change in design of the stator winding shall be properly documented by drawings and functional descriptions and verifications for CLIENT's review, before commencement of the work.

Any other design changes/adjustments made to component parts or materials and/or subassemblies must not cause any additional operational restrictions. Any design changes/adjustments made to component parts or materials and/or subassemblies shall be documented in the final documentation.

13.3 Documentation:

The CONTRACTOR shall compile the complete final documentation and present it and hand it over to the CLIENT by the agreed date after completion of the rewinding; one electronic copy of the complete final documentation on a data carrier shall be handed over to the CLIENT.

The documentation shall reflect the "as built" status. Any documents reflecting merely the planning/engineering status shall be explicitly identified as such. The documentation shall include, but is not limited to:

- Documentation of the dimensions measured and recorded after arrival in the workshop during the incoming check.
- Documentation of findings, records of tests and inspections carried out.
- Documentation of welded joints (including welding procedure specifications) for the electrical connection made in the winding heads
- Documentation of design changes made to the component parts
- Documentation of risk assessments within the meaning of the Machinery Directive 2006/42/EC;
- Material certificates for installed new parts and winding materials.
- Qualification test certificates and calibration certificates of used instruments and testers.

13.4 Detailed time schedule

After contract award, the CONTRACTOR shall prepare, on the basis of the contractual dates and deadlines, a detailed time schedule.
The detailed time schedule shall reflect the CONTRACTOR's planned sequence of the rewinding of the stator.
The CONTRACTOR shall present and explain the detailed time schedule to the CLIENT in advance.

The detailed time schedule shall reflect at least the following milestones:

- Transport to workshop
- starting with the incoming check
- disassembly stator winding
- cleaning the stator core
- stator core full flux test after cleaning
- production of the (sample) bars
- sample bar testing
- bottom and top bat badge testing interturn test
- stator core full flux test after install or the stator bars and re-wedging
- during the installation of the winding head supports
- the electrical measurements of the bars.
- the electrical measurements of the stator.
- the electrical measurements of bushings
- the FAT
- transport to Uniper Powerplant
- CLIENT / THIRD PARTY witness points, as specified in the Inspection and Test Plan (ITP)

The detailed time schedule filed as a basic version shall be constantly followed up by the CONTRACTOR and promptly updated as necessary (e.g., to reflect changes in milestone dates, dates changed due to findings or optional work ordered) and the updated version shall be marked with a new revision index and forwarded to the CLIENT. The detailed time schedule shall at least be updated after new findings.

14 MACHINERY DIRECTIVE

The CONTRACTOR shall carry out a risk assessment for each and any change made to the stator winding, in order to analyse whether such changes are expected to result in significant additional risks or changes in existing risks and thus whether such change will result in a significant modification to the stator winding.

In the event, that the CONTRACTOR within the scope of its work makes a significant modification to the stator winding within the meaning of the Machinery Directive (2006/42/EC), the Contractor shall proceed as described hereinafter

The CONTRACTOR shall document the results of all risk assessments in writing and submit and explain them to the CLIENT prior to making the relevant modification.

15 TRANSPORT AND LONG THERM STORAGE OF THE STATOR

Transport from and to Uniper Powerplant(s) must performed by the contractor.

Total weight of the stator is 41 ton, and the support base frame is 6 Ton

A transport insurance for the replacement of the stator must be included.

The stator support frame will be delivered by Uniper

After rewinding, the stator shall be storage indoor (not heated) warehouse of Uniper (The Hague or Leiden TBD).

All necessary covering must be delivered by the contractor to protect the stator against transport damage and contamination.

220 Voltage for connection of the space heaters is present in the warehouse, the connection to the grid will be performed by Uniper.

16 ENCLOSURES

- winding diagram
- images of the spare stator and in use generator
- image of the current space heaters
- non asbestos conformation
- image of the spare bushing
- visual and measurement reports
- Flux test report
- Drawings

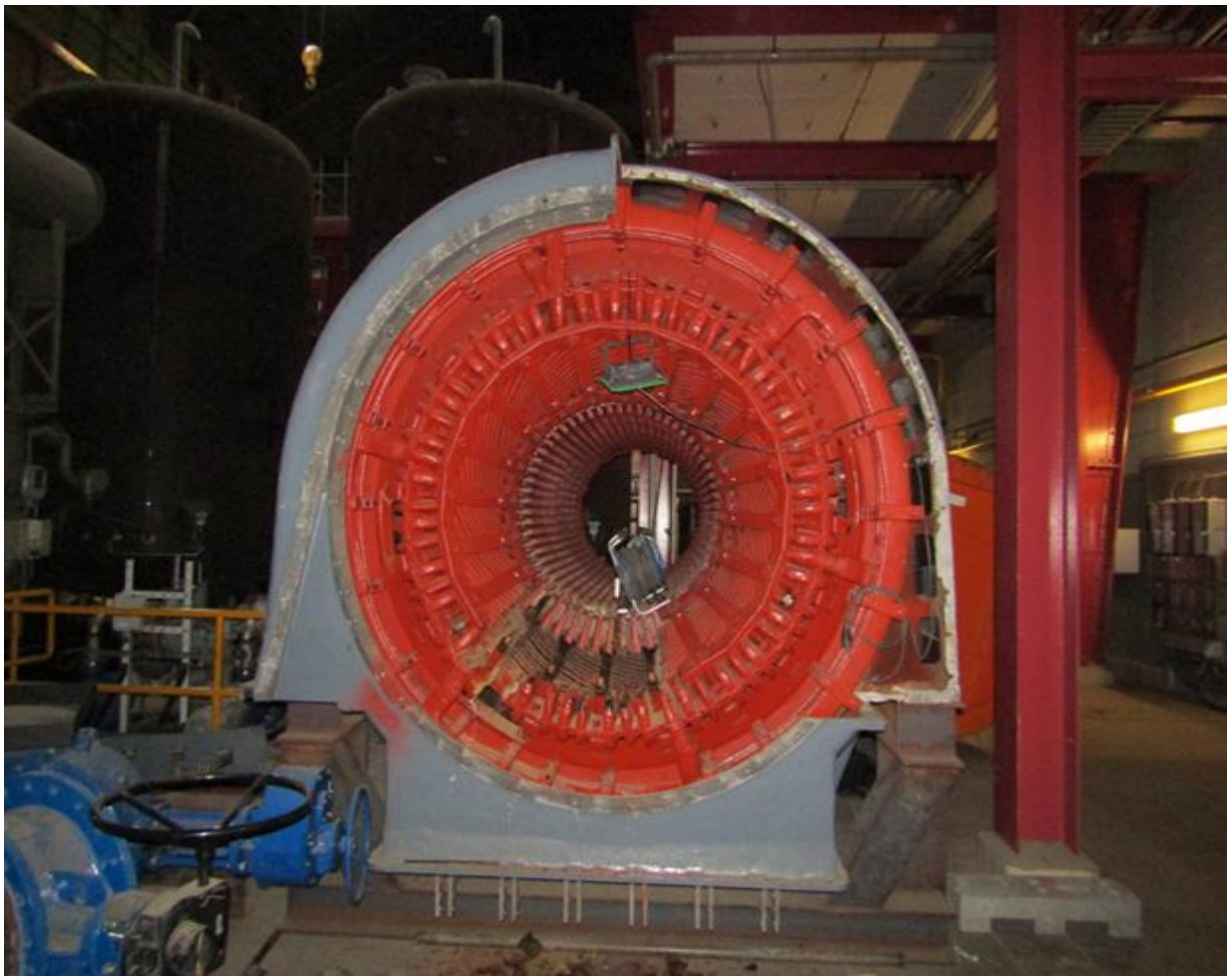
16.1 Indication of dimensions and extra images

16.1.1 Indication dimensions of the spare generator:

- length 3750 mm
- width including lifting points 3000 mm
- height including stator connections 3000 mm
- stator core length 2190 mm
- winding heads DE/NDE 750 mm
- Inner diameter stator core 845 mm

16.1.2 Images of spare stator

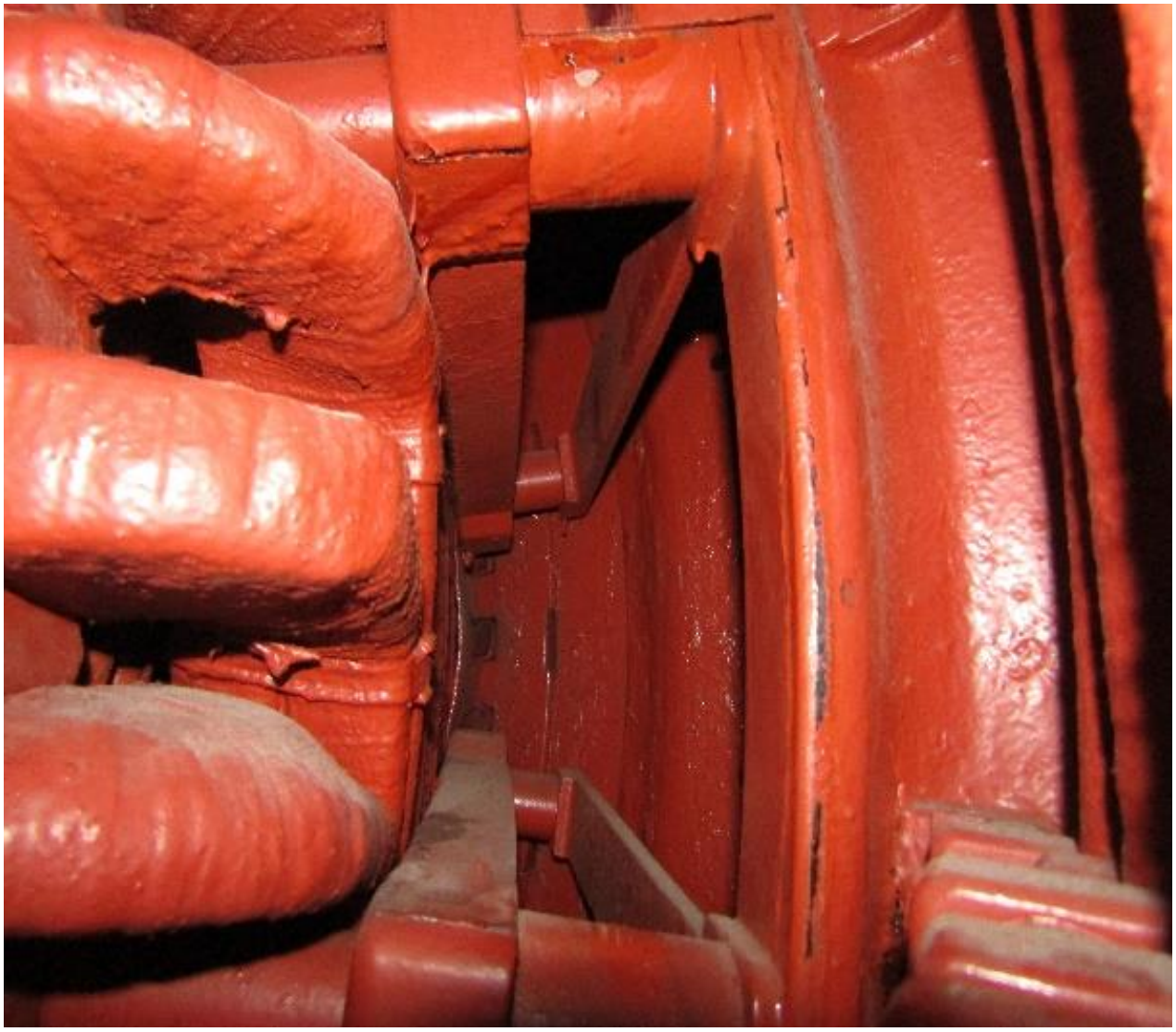
Tag plate spare stator at The Hague



Connection end (CE) spare stator

Windinghead CE during dismounting of the stator bars

Top – and bottom bar partly removed for investigation



Windinghead support system

One of four spaceheater

Images of current in-use generator in Leiden

Tagplate

Exciter machine

Statorhousing with liftingpoints