

Title: Technical Specification for  
Gourikwa & Ankerlig Power  
Station  
**Generator Journal Bearings**

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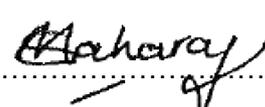
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## 1. BACKGROUND

Gourikwa Power Station consists of five OCGTs (Open Cycle Gas Turbines). These units are identical, with the three OCGTs being able to operate in SCO (Synchronous Condenser Operation) mode as these units contain a SSS clutch. Ankerlig Power Station consists of nine OCGTs. These units are identical, with the four OCGTs being able to operate in SCO mode. The shafts of the units rotate at 3000 rpm and are guided by six journal bearings for three Gourikwa and four Ankerlig units and four journal bearings for the remaining two Gourikwa and five Ankerlig units.

A generator journal bearing is located on both sides of the generator (Turbine End and Exciter End) on each of the fourteen units. These generator journal bearings are RENK Therm V89 EGXYQ 35-400. No spares are available for these generator journal bearings and therefore will have to be procured and stored as critical spares.

## 2. DESCRIPTION OF THE *GOODS*

### 2.1 *Employer's objectives*

The *Employer's* objective is to have spare generator bearings available if replacement is required.

### 2.2 Brief description of the *goods*

The scope of work includes the following:

The *Contractor* supplies and delivers 4 x generator journal bearings, 13 x generator journal bearing shaft labyrinth seals and small components (as per Section 3.2) to the *Employer's* site (Eskom Ankerlig Power Station).

## 3. WORK TO BE PERFORMED BY THE *CONTRACTOR* FOR THE *GOODS*

### 3.1 Specifications

The *Contractor* adheres to the following in providing the *goods*:

- a) The *Employer's* safety rules
- b) The *Employer's* codes of practice
- c) All the documentation stated in this document.

### 3.2 Scope of work

The *goods* include the following:

The *Contractor* supplies the *Employer* with four (4) of generator journal bearings with the bearing description tabled below. The bearings must be manufactured for a 399.42mm to 399.44mm bearing journal. The bearing must be manufactured for hydrostatic jacking, for shaft vibration measurement and for insulation checker.

Table 1

<b>Manufacturer</b>	RENK AG
<b>Bearing WM Material</b>	RENK Therm V89
<b>Bearing Designation</b>	EGXYQ 35-400*
<b>Shell Designation</b>	EZYQ 35-400 (RENK ID Number 763149)

\*Bearing Designation described in table below on the following page.

Table 2

Code		Code Description
Type	E	E
Housing	G	Smooth pedestal bearing
Heat Dissipation	X	Lubrication by oil circulation with external oil cooling for high oil throughput
Shape of Bore & Type of Lubrication	Y	Two-lobe bore (lemon shape) without oil ring
Thrust Part	Q	Without thrust part (non-locating bearing)
Size - Diameter	35-400	Diameter = 400mm (Journal Diameter = 399.42 - 399.44mm)

The *Contractor* supplies the *Employer* with eight (8) of generator journal bearing oil baffles with the following description:

RENK Oil Baffle 35-425 (RENK ID Nr. 747948)
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The *Contractor* supplies the *Employer* with eight (8) of generator journal bearing shaft labyrinth seals with the following description:

RENK Rigid labyrinth seal type 20 (protective system IP 44)
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The *Contractor* supplies the *Employer* with five (5) of generator journal bearing shaft labyrinth seals with the following description:

RENK Rigid labyrinth seal type 22 (protective system IP 55)
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The *Contractor* supplies the *Employer* with the following small components:

Table 3

#	Description	Qty.	RENK ID Nr.
1	Allen Cap Screw (Hexagon Socket Head Cap Screw) Material: Carbon Steel Size: M16 x 55 Grade 8.8 (Standard)	10	188746
2	Taper Pin Size: 14mm x 85mm	10	151841
3	Washer 12mm	10	350449
4	Hexagon Nut - M12	10	159980
5	Allen Cap Screw (Hexagon Socket Head Cap Screw) Material: Carbon Steel Size: M8 x 70 Grade 8.8 (Standard)	140	724611
6	Gasket 35	10	350321
7	Taper Pin Size: 16mm x 40mm	20	697493
8	8mm Washer Material: Carbon Steel	20	350446
9	Allen Cap Screw (Hexagon Socket Head Cap Screw) Material: Carbon Steel Size: M10 x 35 Grade 8.8 (Standard)	120	346917

#	Description	Qty.	RENK ID Nr.
10	10mm Washer Material: Carbon Steel	120	339865
11	Insulating Sleeve	120	350986
12	Insulating Disc	120	350985
13	Cable 2.5 x 800	5	695769
14	Allen Cap Screw (Hexagon Socket Head Cap Screw) Material: Carbon Steel Size: M4 x 10 Grade 8.8 (Standard)	5	247513
15	Cable Gland PG7	5	142151
16	Crimp Type Socket RB5	5	140506
17	Allen Cap Screw (Hexagon Socket Head Cap Screw) Material: Carbon Steel Size: M4 x 10 Grade 8.8 (Standard)	10	142876
18	Clamp 1 x 5	5	348407
19	Piping for Hydrostatic Jacking 35	40	745839
20	Cartridge of Non-return Valve 20	5	350594

The *Contractor* delivers the *goods* to the *Employer's* site (Eskom Ankerlig Power Station, Atlantis, Western Cape, South Africa)

### 3.3 Contractor's design

Not Applicable.

## 4. WORK TO BE PERFORMED BY THE *EMPLOYER*

### 4.1 Scope of work

The *goods* include the following:

#### 4.1.1 Inspection

The *Employer* has the right to perform various inspection, witness and hold points of the *goods* at the premises of the *Contractor* during the manufacturing and testing of the *goods*.

The *Employer* performs visual inspection with the delivery of the *goods* at the *Employer's* site (Eskom Ankerlig Power Station).

#### 4.1.2 Disassembly of current generator journal bearings

The *Employer* disassembles the current generator journal bearings when required.

#### 4.1.3 Installation of the generator journal bearings

The *Employer* installs the current or new generator journal bearings when required.

#### 4.1.4 Storage of the spare generator journal bearings and components

The *Employer* stores the spare generator journal bearings and components in a safe area on the *Employer's* plant (Eskom Ankerlig Power Station) after delivery of *goods* by the *Contractor*.

## 5. EMPLOYER'S PHILOSOPHY

### 5.1 Engineering philosophy

Fully operational capability of the OCGT (Open Cycle Gas Turbine) unit, improved reliability and maintainability of the centreline bearing system at Gourikwa and Ankerlig Power Station.

### 5.2 Maintenance philosophy

Spare generator journal bearings and components will ensure proper maintenance to be executed when replacement is required.

## 6. DRAWINGS

The following drawings are supplied to the *Contractor* for manufacturing purposes. The *Contractor* must have the detailed drawing available for manufacturing purposes

Table 4

Drawing Number:	Rev:	Title:
Drawing 0.85/5987	2	Generator Journal Bearing (RENK Therm V89 EGXYQ 35-400)
Drawing 0.86/9291	1	Rotor Complete

## 7. SPECIFICATIONS

The *Contractor* adheres to the following standards when providing the *goods*:

Table 5

Reference Number	Title	Date or revision	Tick if publicly available
240-53665024	Engineering Quality Manual	1	*
ESKASAAA3	Eskom approval of personnel performing quality related special processes on all Eskom plant.	1	*
SABS - ISO 9001:2015	Requirements for Quality management systems.	2015	*
SANS 4386-1	Plain bearings — Metallic multilayer plain Bearings - Part 1: Non-destructive ultrasonic testing of bond	2005	*
SANS 4386-3	Plain bearings — Metallic multilayer plain Bearings - Part 3: Non-destructive penetrant testing	2005	*
OHSA No. 85 of 1993	Occupational Health and Safety Act.	1993 as amended	√

\*Available on request.

## 8. CONSTRAINTS ON HOW THE *CONTRACTOR* PROVIDES THE *GOODS*

### 8.1 Factory Testing

Information on the required standards is tabled in Section 7. Should the *Contractor* use their own standards, these standards must be supplied to the *Employer* for acceptance within ten (10) days of tender award.

The *Contractor* performs factory testing.

- a) The *Contractor* supplies the technical data sheet specifying the white metal to be RENK Therm V89 to the *Employer* for acceptance.
- b) The *Contractor* records the inner diameter of the bearing and submits these recordings to the *Employer* for acceptance with the delivery of the bearings and components.

#### **8.1.1 Test Certificates**

The *Contractor* submits copies of all test certificates, indicating the result of all type tests performed, to the *Employer* for acceptance within ten (10) days of being performed.

#### **8.1.2 Manufacturing Tests**

Component materials and parts are routinely tested in accordance with the *Contractor's* QCP.

#### **8.1.3 Dimensions and Tolerances**

- a) The *Contractor* records the inner diameter of the finally machined bearings on a check sheet.

#### **8.1.4 White Metal Inspections**

- a) The *Contractor* inspects the white metal visually as discussed in Section 8.1.4.1.
- b) The *Contractor* performs ultrasonic testing on the white metal bonds as discussed in Section 8.1.4.2.
- c) The *Contractor* performs penetrant testing on the white metal surface after final machining as discussed in Section 8.1.4.3.

##### **8.1.4.1 Visual inspections**

- a) The surface of the machined bearing surface must be smooth, free of hitting marks, blisters, porosity, cracks, flaws, non-metallic or foreign inclusions.
- b) The *Contractor* performs visual inspections under good lighting conditions after the final machining of the white-metal surface. No casting defects such as dross, inclusions, cold laps or porosity are allowed. The *Contractor* submits a test report to the *Employer* for acceptance within five (5) days of execution of these inspections.

##### **8.1.4.2 Ultrasonic Testing (UT)**

- a) The *Contractor* performs ultrasonic testing (UT) according to SANS 4386-1:2005/ ISO 4386-1:1992. Should the *Contractor* use their own standards, these standards must be supplied to the *Employer* for acceptance.
- b) The *Contractor* performs ultrasonic testing (UT) after the white-metal bond is applied on the entire area of the white-metal bond.
- c) The *Contractor* ensures all areas of the lining to be 100% bonded.
- d) The *Contractor* ensures the UT results conforms to Class A of SANS 4386-1:2005. Should the *Contractor* use their own acceptance criteria, these acceptance criteria must be supplied to the *Employer* for acceptance.
- e) No bonding defects such as porosity, shrinkage or non-metallic inclusions are allowed. The *Contractor* submits a test report to the *Employer* for acceptance within five (5) days of execution of these inspections.
- f) The *Contractor* repairs all defects as discussed in Section 8.1.5.

#### 8.1.4.3 Penetrant Testing (PT)

- a) The *Contractor* performs penetrant testing (UT) according to SANS 4386-3:2005/ ISO 4386-3:1992. Should the *Contractor* use their own standards, these standards must be supplied to the *Employer* for acceptance.
- b) The *Contractor* performs liquid/ dye penetrant testing (PT) to test for possible surface-breaking discontinuities such as hairline cracks, pinholes and micro surface porosity after machining of the white-metal surface.
- c) The *Contractor* ensures the PT results conforms to Class A of SANS 4386-3:2005. Should the *Contractor* use their own acceptance criteria, these acceptance criteria must be supplied to the *Employer* for acceptance.
- d) The *Contractor* repairs all defects. Refer to Section 8.1.5.

#### 8.1.5 Rectification of defects

- a) Localised repairs to lining materials by patching or by spraying defective areas not permitted.
- b) The *Contractor* repairs all defects.
- c) The *Contractor* repeats the lining and testing process in the event of surface cracks, pinholes or porosity. No surface cracks or pinholes are allowed.

#### 8.1.6 Final inspections

- a) The *Contractor* ensures all oil ports, oil ways, holes, grooves and recesses is free of debris or any obstruction that may restrict oil flow.
- b) The *Contractor* ensures all edges and corners are free of burrs, rags and slivers.
- c) The *Contractor* ensures the bearing back to be free of burrs, bruises or other damage which may interfere with the correct seating of the bearing in the housing.
- d) The *Contractor* ensures the lining to be free from inclusions, porosity, blisters, blow holes and any defects which may reduce the integrity of the lining. No defects are allowed in the load carrying area and within 30mm of any jacking oil ports or oil ways.
- e) The *Contractor* ensures all surface finishes as per the drawings as tabled in Section 6. The *Contractor* records all measurements. Measurements may be witnessed by the *Employer*.
- f) All recorded measurements are submitted to the *Employer* within five (5) calendar days of being performed for acceptance.

#### 8.2 Labelling

The *Contractor* adds numbering by hard stamping the non-working surfaces with unique numbers identifying each set of generator journal bearings separately.

#### 8.3 Dispatch, delivery and offloading

- a) The *Contractor* delivers the *goods* safely to the *Employer's* site (Eskom Ankerlig Power Station, Atlantis, Western Cape, South Africa) without any damage.
- b) The *Contractor* ensures that all material and equipment is packaged, transported and delivered in such a way that the parts are not damaged by minor knocks.
- c) Each part is individually wrapped in a protective coating and packaged in crates.
- d) The contents of each crate are clearly marked.
- e) The *Contractor* repairs all damaged or defective components.

#### 8.4 Quality management

- a) The *Contractor* submits a high-level quality control plan (QCP) to the *Employer* for acceptance as part of the tender returnable documents.
- b) The *Employer* reserves the right to revise the Quality Control Plan after contract award.
- c) The *Contractor* submits the final QCP to the *Employer* for acceptance within one week after contract award.

### 8.5 Safety management

- a) The *Contractor* complies with the Occupational Health and Safety Act. (OHSA No. 85 of 1993)
- b) The *Contractor* takes every precaution to ensure safety and to protect the *goods* and temporary *goods*.
- c) The *Contractor* is responsible for the safety and security of his personnel, materials on site and the *goods* at all times.
- d) The *Contractor* adheres to the safety regulations pertaining to the *Employer's* Power Station.
- e) The *Contractor* provides all the required safety and personal protective equipment to his staff for the duration of the contract.

### 8.6 Environmental management

- a) The *Employer's* Power Station (Eskom Ankerlig Power Station) is situated in an environmentally sensitive area.
- b) The *Contractor* acquaints himself with all statutory and local environment regulations and adheres to these without exception.
- c) The *Contractor* complies with the Hazardous Chemical Regulations when using any hazardous chemicals, as well as complying with the requirements of the National Environmental Management Act of 1988.

### 8.7 Installation

#### 8.7.1 Security

General access to the *Employer's* Power Station (Eskom Ankerlig) is controlled and it is mandatory that the *Contractor* adhere to all security regulations in force during the period of the contract.

#### 8.7.2 Other construction activities

The *Contractor* notes that there may be other work taking place during the period when they are providing the *goods* to the *Employer's* Site and liaises with the other *Contractors* in this regard.

### 8.8 Title to site materials

The *Contractor* has no title to plant and/or materials resulting from him/her carrying out the *works*.

### 8.9 Documentation

#### 8.9.1 Pre-implementation documentation

The *Contractor* submits the following to the *Employer* for acceptance (within one week of contract award):

- a) Detailed quality control plan

The *Contractor* notes the following:

- a) Metric sizes, as specified by the International Standards Organization and agreed to by the South African Metrication Boards, are used.

### 8.9.2 Post-implementation documentation

The *Contractor* submits one hardcopy and one electronic version of all documentation described below on acceptance of the *goods* to the *Employer* for acceptance within five (5) calendar days of being performed.

- a) All material certificates.
- b) Calibration certificates.
- c) A dimensional check sheet indicating the final inner diameters of the generator journal bearings.
- d) A completed and signed-off quality control plan certificate.
- e) All test certificates of the tests performed on the manufactured components including the ultrasonic test results and penetrant test results.

### 8.10 Completion

Completion is when the following has been done by completion date:

- The *Contractor* has done everything required to provide the *goods*.
- The *Contractor* has delivered the *goods* and the *goods* are accepted by the *Employer*.
- The *Contractor* has provided all as-built documentation and are accepted by the *Employer*.
- The *Contractor* submitted all other docs as required to the *Employer* for acceptance.

## 9. REQUIREMENTS FOR THE PROGRAM

- a) The *Contractor* submits a high-level quality control plan (which may include a Gantt chart) detailing how the *works* are executed with a timeline included to the *Employer* for acceptance as part of the tender returnable documents.
- b) The *Contractor* submits the finalized program and quality control plan within one week after contract award.
- c) The program and quality control plan indicate the start date, completion date and duration of each activity.
- d) The *Contractor* indicates the following on their program and quality control plan submitted to the *Employer* for acceptance:
  - The time required from notification of work (contract award) to obtaining material.
  - Manufacturing of the *goods*.
  - Final inspection of the *goods*.
  - Delivery to the *Employer's* Site (Eskom Ankerlig Power Station, Atlantis, Western Cape, South Africa)
  - Statutory and other non-working days included in the contract period and occurring just after the contract period.

## 10. SERVICES AND OTHER PROVIDED BY THE *EMPLOYER*

The *Employer* provides the following to the *Contractor*:

### 10.1 Area for site establishment and storage

The *Employer* indicates a storage yard to the *Contractor*.

**All other services needed to provide the *goods*, are supplied by the *Contractor*.**