

Title: **BT2 Vertical CNC Lathe
Complete Upgrade Retrofit
with SINUMERIK828D at the
Rosherville TGS Works**

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FIGURES

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1. INTRODUCTION

The manage maintenance base is based on best practices identified from the Equipment Reliability Process, existing within Eskom's best practices and operational experience, with inputs from a number of industry subject matter experts (SME). This is a generic process that provides standard capabilities that are utilised during operating and maintenance engineering phases of the assets lifecycle.

Effective maintenance entails a process whereby maintenance strategies are developed. These strategies include the maintenance and/or inspection execution process and their frequencies. The maintenance strategies further identify and categorize the maintenance to be conducted according to their criticality. Original Equipment Manufacturers (OEM's) develop the minimum inspection and maintenance requirement to ensure that the equipment operates within the design specifications and thus ensuring the expected life cycle of the equipment.

This scope makes provision for the Complete Upgrade of the BT2 Vertical Lathe by Retrofitting it with a SINUMERIK828D at the Rosherville TGS Works. The equipment shall be supplied and installed on the BT2 Vertical CNC Lathe Machine located at Rosherville Works.

2. SUPPORTING CLAUSES

2.1 SCOPE

This scope makes provision for the Complete Upgrade of the BT2 Vertical Lathe by Retrofitting it with a SINUMERIK828D at the Rosherville TGS Works. The equipment shall be supplied and installed on a BT2 Vertical CNC Lathe Machine located at Rosherville Works.

2.1.1 Purpose

The aim of this document is to define the scope of work for the BT2 Vertical Lathe by Retrofitting it with a SINUMERIK828D at the Rosherville TGS Works. The equipment shall be supplied and installed on a BT2 Vertical CNC Lathe Machine located at Rosherville Works.

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2.1.2 Applicability

N/A

2.2 NORMATIVE/INFORMATIVE REFERENCES

N/A

2.2.1 Normative

Parties using this document shall apply the most recent edition of the standards for best practices and in line with Eskom specifications that are indicated in this document.

- [1] SANS 1973-1 - Low-voltage switchgear and control gear ASSEMBLIES Part 1: Type-tested ASSEMBLIES with stated deviations and a rated short-circuit withstand strength above 10 kA
- [2] SANS 1973-3 - Low-voltage switchgear and control gear ASSEMBLIES Part 3: Safety of ASSEMBLIES with a rated prospective short-circuit current of up to and including 10 kA
- [3] SANS 10142 - 1 - The wiring of premises Part 1: Low-voltage installations
- [4] SANS 10142 - 2 - The wiring of premises Part 2: Medium-voltage installations above 1 kV a.c. not exceeding 22kV A.C. and up to and including 3 MVA installed capacity.
- [5] SANS 12100 - Safety of Machinery

2.2.2 Informative

Parties using this document shall apply and have knowledge of the most recent edition of the standards as listed below.

- [6] ISO 9001 - Quality Management Systems.
- [7] ISO 14001 – Effective Environmental Management System
- [8] OHSAS 18001 – Occupational Health and Safety Standards
- [9] OHS Act 85 of 1993, *specifically*: General Machinery Regulation (GMR), Electrical Installation Regulations (EIR), Electrical Machinery Regulations (EMR) and Driven Machinery Regulations (DMR)

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2.3 DEFINITIONS

Definition	Description
ERI	Eskom Rotek Industries SOC LTD, the Client
TGS	Turbo Gen Service, an ERI Business Unit
Plant Maintenance	A TGS Department responsible for maintenance effectiveness and control.

2.3.1 Disclosure Classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

The following are abbreviations and their descriptions are specific to this document.

Abbreviation	Description
CNC	Computer Numeric Control
RPM	Revolutions Per Minute (speed)
PM	Preventative Maintenance
CM	Corrective Maintenance
PdM	Predictive Maintenance
CMMS	Computerized Maintenance Management System

2.5 ROLES AND RESPONSIBILITIES

Roles	Responsibilities
Scope Compiler	Compilation of the scope of work
Functional Responsibility	Reviewing and acceptance of the scope
Support Personnel	Support and acceptance of the scope
Authorising Personnel	Reviewing and authorising the scope
Service Provider	Execution of the approved scope

2.6 PROCESS FOR MONITORING

Requirements	Monitoring Process
Computerised Management Process (SAP)	Monitoring of the execution progress

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2.7 RELATED/SUPPORTING DOCUMENTS

- 240-109494936 – Lathe Machines Maintenance Philosophy
- 240-109495432 – Vertical Boring Mill Maintenance Philosophy
- 240-109500246 – Horizontal Boring Mill Maintenance Philosophy

3. SCOPE OF WORK

3.1 BACKGROUND

The Rosherville Workshops has a number of machines used for production purposes. These machines, specifically the CNC machines utilise Siemens controllers and electronic components as per the OEM requirement. The controllers used have a built-in program and thus a replacement part must be compatible with the existing program.

3.2 SITE INFORMATION

The scope entails works to be executed at Eskom Rotek Industries SOC LTD located at 03 Lower Germiston Road on Roshland Road, Rosherville, Cleveland, Johannesburg South.

3.3 PLANT DESCRIPTION

The plant to be worked on is a BT2 Vertical CNC Lathe Machine located at the ERI TGS Workshop.

3.4 DETAILS OF THE WORKS

The specific tasks to be conducted are detailed below. The detailed tasks are the bare minimum and binding as the minimum contractual agreement between the Client and the Service Provider. OEM requirements that may, or may not, be different from the detailed scope will be considered as and when it may arise. Upon any realization of such, the Service Provider and the Client's Representative will agree on the most effective, feasible and cost effect manner to proceed.

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The full scope is for the BT2 Vertical Lathe by Retrofitting it with a SINUMERIK828D at the Rosherville TGS Works. The equipment shall be supplied and installed on a BT2 Vertical CNC Lathe Machine located at Rosherville Works

All OEM and Client's safety procedures must be adhered to. The supplied equipment must have a written warranty document clearly indicating the inclusion and exclusion of the warranty and the duration (start and end date of the warranty).

The intended scope is to retrofit the BT2 Vertical CNC Lathe specifically with a SINUMERIK 828D system. "With their unique CNC performance, the SINUMERIK 828D and SINUMERIK 828D BASIC CNC's set benchmarks when it comes to milling and turning on mid-range machines. The premium CNC technology opens up unique possibilities for even more productive workpiece milling and turning. With its SINUMERIK 828 controls, Machine Tool Systems offers compact CNC systems for standard milling and turning machines".

The work shall consist but not be limited to;

Supply, Install and Commission:

- SINUMERIK 828D and PLC
- SINQMICS S120 Digital Servo Motors and Drive System
- Mechanical Retrofit
- Electrical Retrofit

The proposed CNC retrofit for the BT2 Vertical CNC Lathe with the SINUMERIK828D CNC System from SIEMENS justification:

SINUMERIK828D CNC System and SIMATIC PLC System

- The proposed SINUMERIK828D Turning is the latest CNC control system from SIEMENS.
- It is a Full Function control system with programming aids, such as machining cycles and program simulation.
- Flexible connectivity by means of Ethernet, USB and CF Card.

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SINAMICS S120 DIGITAL SERVO SYSTEM

- All existing servo motors must be replaced with digital servo motor and drive system, integrated into the SINUMERIK828D System.
- Integrate Linear Scales for X and Z axis into the CNC system

MECHANICAL RETROFIT

- Re-design the drive trains for the X, Y and Z-Axis to accommodate the new CNC system.
- The new Servo Motors must be fitted with High Precision Servo Gear Heads, in accordance with the new Drive Train design.
- The lubrication system for the machine slides and drive train must be re-conditioned.
- The lubrication and Hydraulic Gear change system for the Table must be re-conditioned.
- All the slides ways, slide rollers and keeper plates must be checked for wear and damage.
- Installation and commissioning of the all the mechanical systems.

ELECTRICAL RETROFIT

- Re-design of the electrical system to accommodate the new CNC, PLC and Drives with a new set of Electrical Drawings in EPLAN.
- Replace electrical panels with new panels and new switch gear.
- Replace the machine wiring.
- Fit new operator pendant for each Ram onto machine platform.
- Installation and commissioning of all electrical systems.
- Operation Training on the new system for the Machinists and also Maintenance Staff.

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3.5 DELIVERABLES

The service provider shall supply, install and commissioning the controller at the Client's site in the presence of a Client's representative.

3.6 ASSESSMENT CRITERIA

Upon completion of the maintenance task, the Service Provider shall ensure that a Client's Representative, *to be identified as and when required*, inspects and signs off the work executed prior to the acceptance of the work as complete in accordance with the contract by the Client's Representative. The Service Provider shall ensure that records are kept for the duration of the contract while the Client's Representative shall ensure that records are kept safe for the duration as stipulated in the maintenance philosophy.

3.7 WARRANTY

The work performed is warranted to be free from defects in material and workmanship from date of completion of the work to the next scheduled period. The warranty shall cover:

3.7.1 New electrical and Mechanical parts as stipulated by OEM.

3.7.2 Workmanship for 6 Months after acceptance of work by the Client

3.7.3 The product must be used in accordance with manufacturer's recommendations and must not have been subject to abuse, lack of maintenance, misuse, negligence, or unauthorized repairs or alterations. Should any defect in material or workmanship occur during the above time period in any product, as determined by the supplier inspection of the product, the Service Provider, agrees, at its discretion either to replace (not including installation) or repair the part or product free of charge.

3.7.4. The inclusions and exclusions on the warranty must be clearly indicated

3.7.5. The start and end date of the warranty must be clearly indicated

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3.8 GENERAL CONSTRAINTS

The following are the general constraints that are to be considered:

3.9.1 Working in an operational environment where machines and equipment are being handled.

3.9.2 Minimizing down periods as production will still be taking place in and around the vicinity of the working area.

3.9.4 Accuracy of existing information may be outdated and need to be verified on site prior to proceeding with any work.

3.9 TERMS AND CONDITIONS

The successful Service Provider will be expected to adhere to the following minimum conditions:

- a) Adherence and compliance to the health and safety standards set out by the Client.
- b) Provide adequate PPE to its employees.
- c) Provide its own working and fully functional tools.
- d) Fully sign and complete the completion and handover form to be provided by the Client
- e) Issue the service report for the work done and fully signed by the responsible Technician or Supervisor.
- f) Provide valid identification and medicals for the personnel who would be work.
- g) Hand over the replacement (parts removed from the machine) parts to the Client.

4. AUTHORISATION

Name & Surname	Designation
Singobile Nene	Plant Maintenance Manager
Sisa Pantshwa	Plant Engineer
Nhlakanipho Blose	Maintenance Service Manager

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5. REVISIONS

Date	Rev.	Compiler	Remarks
May 2021	1	S Nene	BT2 Vertical CNC Lathe by Retrofitting it with a SINUMERIK828D at the Rosherville TGS Works

6. DEVELOPMENT TEAM

The following people were involved in the development and content of this document:

- Sinqobile Nene
- Sisa Pantshwa
- Nhlakanipho Blose

7. ACKNOWLEDGEMENTS

- Plant Maintenance Team

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