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ESKOM

KOEBERG NUCLEAR POWER STATION

DESIGN ENGINEERING GROUP

Specification Title:

**ULTRASONIC FLOWMETER
FOR ASG BALANCE PISTON LEAK-OFF FLOW**

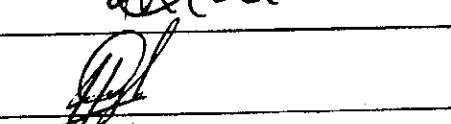
(ASME Section III; Division 1 - Subsection ND)

PREPARED BY:



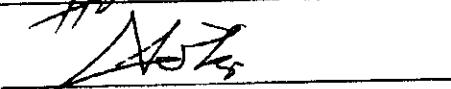
PN Clark

REVIEWED BY:



JH van Dyk

APPROVED BY:

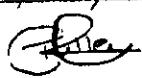


AM Kotze

DATE:

2010/02/10

DATA CAPTURED:



C Tolley

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KOEBERG NUCLEAR POWER STATION

DESIGN ENGINEERING GROUP

APPROVED:	AM Kotze	DATE:
PARAGRAPHS	PREPARED BY	REVIEWED BY
All	PN Clark	JH van Dyk

RECORD OF REVISIONS

Rev.	Date	Description of Revision	Prepared By	Rev.	Appr.
0	2010-02-10	Original	PNC	JH v D	AMK

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1.0 SCOPE

1.1 Objective

This specification lists the requirements for the procurement of an ultrasonic flowmeter, using the transit time differential measurement method, for the Auxiliary Feed Water System (ASG) balance drum flow rate measurement of both units at Koeberg Nuclear Power Station.

1.2 Scope And Supply Boundaries

1.2.1 Scope of the equipment to be supplied

The supply consists of the following equipment:

- Ultrasonic flowmeter.

The ultrasonic flowmeter shall be supplied with the pressure retaining part conforming to ASME Boiler & Pressure Vessel Code 2007; Section III; Division 1 - Subsection ND

The ultrasonic flowmeter shall be supplied with 3" 150lb flanges conforming dimensionally to ASME/ANSI B16.5 for simple raised face flanges

Each ultrasonic flowmeter shall be clearly and permanently identified (e.g. an engraved metal plate) indicating:

- The manufacturer's name;
- The flowmeter type;
- The serial number;
- The measurement range.

1.2.2 Scope of Supply

The supplier shall be responsible for:

- Manufacture;
- Testing and qualification;
- Documentation;
- Packaging, storage and transport;
- Technical support;
- Customs formalities for export purposes.

1.2.3 Commercial Considerations

Manufacturer or Supplier shall state clearly what, if any, the extent of responsibility of any local agent will be. ESKOM prefers to deal directly with the manufacturer.

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1.3 Definitions

ASME -The purpose of ASME is to ensure that the equipment installed has been designed and manufactured as a class 3 pressure retaining component, and is capable of maintaining the pressure boundary, and performing its specified functions under normal operating and accident conditions.

2.0 REFERENCES

The manufacturer or supplier shall comply with the referenced documents listed in section 2.0 and all conditions of this specification.

2.1 Mandatory

- 2.1.1 ANSI/ASME NQA-1-2000 Quality Assurance Programme Requirements for nuclear facilities.
- 2.1.2 ASME Boiler & Pressure Vessel Code 2007; Section III; Division 1 - Subsection ND
- 2.1.3 ASME/ANSI B16.5 - 1998 - Pipe Flanges and Flanged Fittings

2.2 Useful

2.2.1 International

- ANSI N45.2.2 Level B Spare Parts Shelf Life.

2.2.2 ESKOM Reference Documents

- KBA0022E00082: Instrumentation Specification; Ultrasonic Flowmeters.
- DSG-317-094: Specification for Chemical Products and Materials used at KNPS.
- KSA-106: Requirements for Protective Coatings for use at Koeberg Nuclear Power Station.

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3.0 DESIGN REQUIREMENTS

3.1 Operating Conditions

3.1.1 Normal ambient conditions:

Temperature : 15°C to 35°C
 Pressure : Atmospheric
 Humidity : 35% to 95% at above temperature

3.1.2 Process conditions:

Temperature : 55°C
 Pressure : 10 bar
 Fluid : Demineralized and degassed condensate
 Conductivity of fluid : $\geq 0.1 \mu\text{S}/\text{cm}$

3.1.3 Seismic Resistance

The electronic part is not required to operate during or after a seismic event or under nuclear accident conditions, but the integrity of the mechanical part must be maintained during and/or after a design basis earthquake.

3.1.4. Measurement Range

0 to 30m³/h

3.2 General Characteristics

3.2.1 Power Supply

220 V $\pm 10\%$ 50Hz $\pm 1\text{Hz}$

3.2.2 Output Signal

4 to 20 mA.

3.2.3 Electrical Connection

Cable

3.2.4 Measurement Tube

Austenitic stainless steel AISI 316L;

Flow direction indicated by an arrow;

Length 350 mm (flange to flange)

Note: There shall be no detectable leakage during the factory hydrotest at 1.5 times the design pressure.

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3.3 Performance

Note: The values of the various errors quoted in this paragraph are expressed as a percentage of the specified measurement range.

3.3.1 Accuracy

≤ 1,0%

3.3.2 Manufacturer Technical Sheets:

Technical sheets shall be the reference for all characteristics not specified here. All technical data sheets must be submitted with the tender documents. Any modification of technical sheets by the manufacturer must be notified to Koeberg.

3.4 Installation

Mounted in line between two flanges.

3.5 Process Connections

3" 150lb flanges conforming dimensionally to ASME/ANSI B16.5.

3.6 Materials

3.6.1 Measuring Tube : Austenitic Stainless Steel AISI 316L.

3.6.2 Flange : Carbon Steel ASTM A105

3.7 Electronic Converter

Minimum environmental protection rating IP 65.

3.8 Weight (maximum)

25 kg

3.9 Adjustments

Controls must be easily accessible.

3.10 Painting

Standard, silver paint.

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4.0 MANUFACTURING REQUIREMENTS

4.1 Sub-Contracting

4.1.1 Basic Products

A Technical Procurement Specification (TPS) shall be used for the procurement of all basic products (bars, sheet metal, filler metal etc.). This document shall define:

- The manufacturing procedure;
- The examination and testing during and after manufacturing.
- A certified material test report shall be provided for metallic components which must indicate cobalt content.
- Test certificates shall be provided for forgings.

4.1.2 Electronic Components

- A TPS must be used for the procurement of all electronic components.
- Electronic components that are critical to performance stability must, where necessary, be qualified to ensure long-term performance stability.

4.1.3 Sub-Contracted Flowmeters

The manufacturer or supplier may not sub-contract the manufacture of the flowmeters pressure retaining part covered in this specification.

4.2 Verification And Testing

The supplier shall ensure that sub-contractors comply with the requirements in this section.

The manufacturer shall perform all inspections, tests, aging or other services necessary to guarantee the performance stated in his technical sheets.

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Note: The manufacturer shall supply a production file, consisting of:

4.2.1 The Manufacturing, Inspection and Test Plan (MITP)

These lists shall be prepared for each type of equipment. Each manufacturing operation or test shall be clearly specified in the MITP. Each operation mentioned shall be given a document reference which specifies the operation.

4.2.2 The Manufacturing and Testing Procedures

These procedures shall correspond to the main operations mentioned in the MITP;

These procedures shall indicate, in particular:

- The welding and weld inspection methods;
- The acceptance criteria for testing.

4.2.3 The Test Certificates or Test Reports

These documents correspond to the main manufacturing or testing operations and should be available for perusal:

- The weld examination certificates;
- Liquid penetrant testing (all the welds which cannot be checked by ultrasonic or radiographic testing);
- The compliance certificates for seals;
- The hydrotest certificates;
- The calibration certificates;

5.0 ENGINEERING QUALIFICATION REQUIREMENTS

5.1 ASME Requirements

The ultrasonic flowmeters pressure retaining part shall be designed and manufactured to conform to ASME Boiler & Pressure Vessel Code 2007; Section III; Division 1 - Subsection ND

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5.2 Quality Assurance

- 5.2.1 All the ultrasonic flowmeters are classified as safety class 3 and must conform to ASME Boiler & Pressure Vessel Code 2007; Section III; Division 1 - Subsection ND
- 5.2.2 The manufacturer or supplier is required to implement a quality assurance program which is consistent with, and meets the requirements of ISO 9001.
- 5.3.3 ESKOM approval is required for the dispositioning of any non-conformances to procurement requirements or to ESKOM-approved documents, except where the item can be re-worked to full compliance. Proposed dispositions for repair or "use-as-is" shall be identified on an APPLICATION FOR CONCESSION or PRODUCTION PERMIT FORMAT or equivalent, and submitted to ESKOM, Koeberg Nuclear Power Station for approval.
- 5.3.4 ESKOM reserves the right of access to supplier or sub-supplier facilities and records for the purpose of inspection or audit.

6.0 TRAINING

- 6.1 Detailed Training Manual to be supplied or alternatively, on-site training to be provided

7.0 DOCUMENTATION

7.1 Documents to be submitted with quote

For each type of flowmeter proposed:

- The technical data sheet;
- The operating manual;
- The general drawing;
- Lists of spare parts recommended to comply with the operating conditions for a minimum of 5 years;
- Accreditation or Certification indicating independent acceptance of the supplier's quality assurance programme;
- Manufacturers commitment to supporting the proposed ultrasonic flowmeters for the future, in terms of replacements and spares;
- Manufacturers recommended maintenance requirements to ensure qualification.

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7.2 Documents to be submitted on delivery of equipment

7.2.1 The Technical Procurement Specification for the basic products

7.2.2 By type of equipment, the production file consisting of:

- The MITPs;
- The examination certificates or reports.

8.0 PACKAGING AND SHIPPING

The supplier is responsible for packaging in accordance with a recognized international standard for transportation to South Africa, and for the transportation to a mutually agreed port of shipment.

9.0 INSTALLATION

The works on the site are entrusted to Koeberg. The ultrasonic flowmeters are to be installed in the standard orientation.

10.0 APPENDICES

Appendix A - Typical installation

Full details of all deviations from this specification must be submitted to ESKOM (KOEBERG) in writing for clearance prior to manufacture / dispatch of the product.

APPENDIX A

