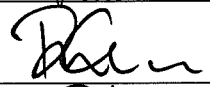
ESKOM

KOEBERG OPERATING UNIT

SPECIFICATION ENGINEERING

Specification Title

NAMCO LIMIT SWITCHES PART NO. EA180-14502 FOR SAFETY CLASS 1E APPLICATIONS (HARSH ENVIRONMENT)

PREPARED BY:		**MV PHALANE**
REVIEWED BY:		**PN CLARK**
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KOEBERG OPERATING UNIT

SPECIFICATION ENGINEERING

	APPROVED: N Ryland	DATE: 2014/11/20
REVISION	**PREPARED BY**	**REVIEWED BY**
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RECORD OF REVISIONS

Rev	Date	Description of Revision	Prep.	Rev.	Appr.
1	2018-02-28	Include Operating lever part number, add reference IEEE 383, change body material to Die-cast Bronze, correct contacts to 2 N.O., 2 N.C. and changed from Q1 qualified to 1E qualified.	MVP	PNC	AMAS

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1.0 SCOPE

1.1 General

1.1.1 This specification describes the quality assurance requirements for procurement of the NAMCO limit switches, part number EA180-14502, for harsh environments, for use in class 1E applications (inside and outside containment) at Koeberg Nuclear Power Station.

1.1.2 If any conflict arises between this specification and other referenced documents, the Contractor/Vendor/Supplier shall not proceed, but shall request clarification, in writing, from the approved Eskom buyer.

1.2 Scope of Supply

The supply shall consist of the following equipment:

- NAMCO Limit Switches, part number EA180-14502
- Operating lever, part number EL060-53300
- Plug-in cable assemblies, 4-pin female quick connector, part number EC290-44020

The manufacturer shall be responsible for:

- Qualification;
- Documentation;
- Packaging, storage and transportation.

1.3 Definitions

1.3.1 Class 1E - The safety classification of electric equipment and systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling, and containment and reactor heat removal, or are otherwise essential in preventing significant release of radioactive material to the environment.

1.3.2 Harsh Environment - An environment expected as the result of the postulated service conditions appropriate for the design basis and beyond design basis accidents of the station. Harsh environments are the result of a loss of coolant accident (LOCA) or high energy line breaks (HELB) inside the containment and post-LOCA or HELB outside the containment.

2.0 REFERENCES

2.1 Mandatory

2.1.1 10CFR50 Appendix B - Quality Assurance Criteria for Nuclear Power Plants and Fuel Processing Plants

2.1.2 10CFR21 - Reporting of Defects and Non-compliance

2.1.3 ASME NQA-1 - Quality Assurance Requirements for Nuclear Facility Applications

2.1.4 IEEE 323 - IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations

2.1.5 IEEE 344 - IEEE Recommended Practices for Seismic Qualifying Class 1E Equipment for Nuclear Power Generating Stations

2.1.6 IEEE 383 - IEEE Standard for Qualifying Electric Cables and Splices for Nuclear Facilities

2.2 Useful

2.2.1 KSA-010 - Nuclear Safety, Seismic, Environmental, Quality and Importance Classification

2.2.2 DSG-318-033 - Specification for Seismic qualification of Electrical and Mechanical Equipment

2.2.3 ISO 9001 - Quality Management Systems

2.2.4 KBA 0022E02 021 - List of Equipment to be Qualified to Post-DBA Containment Conditions

2.2.5 KBA 1222E02 038 - General Specification for Qualification to DBA Conditions

2.2.6 KBA1222E02 008 - Qualification of Safety-Related Electrical Equipment (Class 1E) General Seismic Test Specification

3.0 DESIGN REQUIREMENTS

3.1 Interfaces

Port size (limit switch) : 1-inch 11-½ NPT threaded conduit boss

3.2 Dimensional Requirements

Height : 167.1 mm
Width : 109.5 x 65 mm

3.3 Service Conditions

3.3.1 Normal Environmental Conditions (Inside Containment)

Temperature	:	15 to 55°C
Pressure	:	101 kPa (absolute)
Humidity	:	55 to 100%
Radiation	:	250 kGy (for normal operation during the 40 years operating life of the plant)

3.3.2 Normal Environmental Conditions (Outside Containment)

Temperature	:	15 to 35°C
Pressure	:	Atmospheric
Humidity	:	40 to 80%
Radiation	:	Background

3.3.3 Accident Conditions

Temperature (max.):		156°C
Pressure (max.)	:	550 kPa (absolute)
Humidity	:	100%
Radiation	:	600 kGy (integrated dose for 1 year)

3.3.4 Seismic resistance

The equipment is required to operate during and after a Safe Shutdown Earthquake (SSE). The seismic test results shall meet the Koeberg Single Envelope Response Spectrum (Appendix A).

4.0 MANUFACTURING REQUIREMENTS

4.1 Physical Requirements

Materials:

Body material	:	Die-cast Bronze
Enclosure rating	:	NEMA 4

4.2 Functional Requirements (Limit switch)

Electrical rating	:	600 Volts (max.)
Torque to trip	:	3.62 N.m
Contacts	:	2 N.O., 2 N.C.
Operation	:	Short travel, Clockwise (CW) operation
Trip travel	:	6°30′
Reset travel	:	4°
Total travel	:	36°

With Pre-wired Receptacle Assembly: Bayonet Male CONNECTOR, 4 pins, 16AWG

4.3 Electrical connection (Plug-in cable assembly – Class 1E)

- 600V / 90°C rated 4 conductor 16AWG stranded nuclear grade cable
  - With plug-in Quick Connector: Bayonet Female SOCKET, 4 pins, 16AWG
- Cable length – 20 feet (part number EC290-44020)

4.4 Marking and Identification

Each item shall be clearly marked to indicate the following:

- The manufacturer's name
- The instrument type
- The part number
- The serial number
- The voltage

4.5 Verification and Test

The equipment shall be verified and tested by the manufacturer. The results of the tests performed shall be included in the Quality Assurance Data Package (QADP).

5.0 QUALITY REQUIREMENTS

5.1 Engineering Quality Requirements

The equipment supplied is required to be safety class 1E qualified in accordance with IEEE-323, IEEE-344 and IEEE-383.

5.2 Quality Assurance Terms and Requirements

The specified limit switches are 1E qualified according to Koeberg Quality classification programme.

In addition to Quality terms and requirements contained in this specification, the following standards and regulations shall apply to the required supplies, including design, purchasing, manufacturing, inspection, testing and shipping:

- 10CFR50 Appendix B
- 10CFR21
- ASME NQA-1
- ISO 9001

6.0 DOCUMENTATION

The following documentation shall be submitted by the supplier for approval, information or delivered with the components, as required hereunder:

6.1 Documentation for approval

- Quality Control Plan
- Test procedures
- Packaging, shipping and storage procedures

6.2 Documentation for information

- Component technical specification sheets
- Installation, operation, maintenance and trouble-shooting manuals
- QA manual

6.3 Component data package content

- Inspection points program filled out and approved as performed
- Manufacturing inspection certificates
- Certificates of Conformity (see Note 1)
- Factory acceptance test certificates
- Eskom Quality release, also signed off by manufacturer
- Deviation notices / non-conforming conditions, if any

NOTE 1: Certificates of Conformity (C.O.Cs) must certify that the detailed supplies are manufactured in accordance with the technical specifications of contract, order or sub-order, and that all inspections, operations and tests having been completed, comply in every respect with the relevant particular specifications, drawings and relevant standards and regulations in force. C.O.Cs must include reference to:

- Purchase order number
- Qualification test report number
- Specifications and / or drawings applied
- List of components included in the supply

- Designation of the supplied equipment
- Serial or batch number of the supplied equipment

6.4 Documentation to be submitted on initial purchase of equipment

When the equipment is procured for the first time, the supplier / manufacturer shall provide the following documentation:

6.4.1 Environmental Qualification (EQ) test reports

6.4.2 Nuclear safety and Seismic qualification test reports

7.0 PACKAGING AND SHIPPING

7.1 All packaging, shipping, receiving, storage and handling shall comply with ASME NQA-1-2004 Subpart 2.2 - Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plants.

7.2 The packaging shall be labelled with the equipment name and number, the purchase order number, and other information required for identification.

8.0 APPENDICES

Appendix A: Koeberg Single Envelope Response Spectrum (KBA1222E02008 Fig 3)

APPENDIX A

Koeberg Single Envelope Response Spectrum
(KBA1222E02008 Fig 3)

1 PAGE

Reference	Rev
DSG-312-201	1

FRAMATOME

K.BY

N° IS/EC -DC- 0137

REVISION A

SPECTRA : Horizontal-Vertical SSE

DAMPING : 5 %

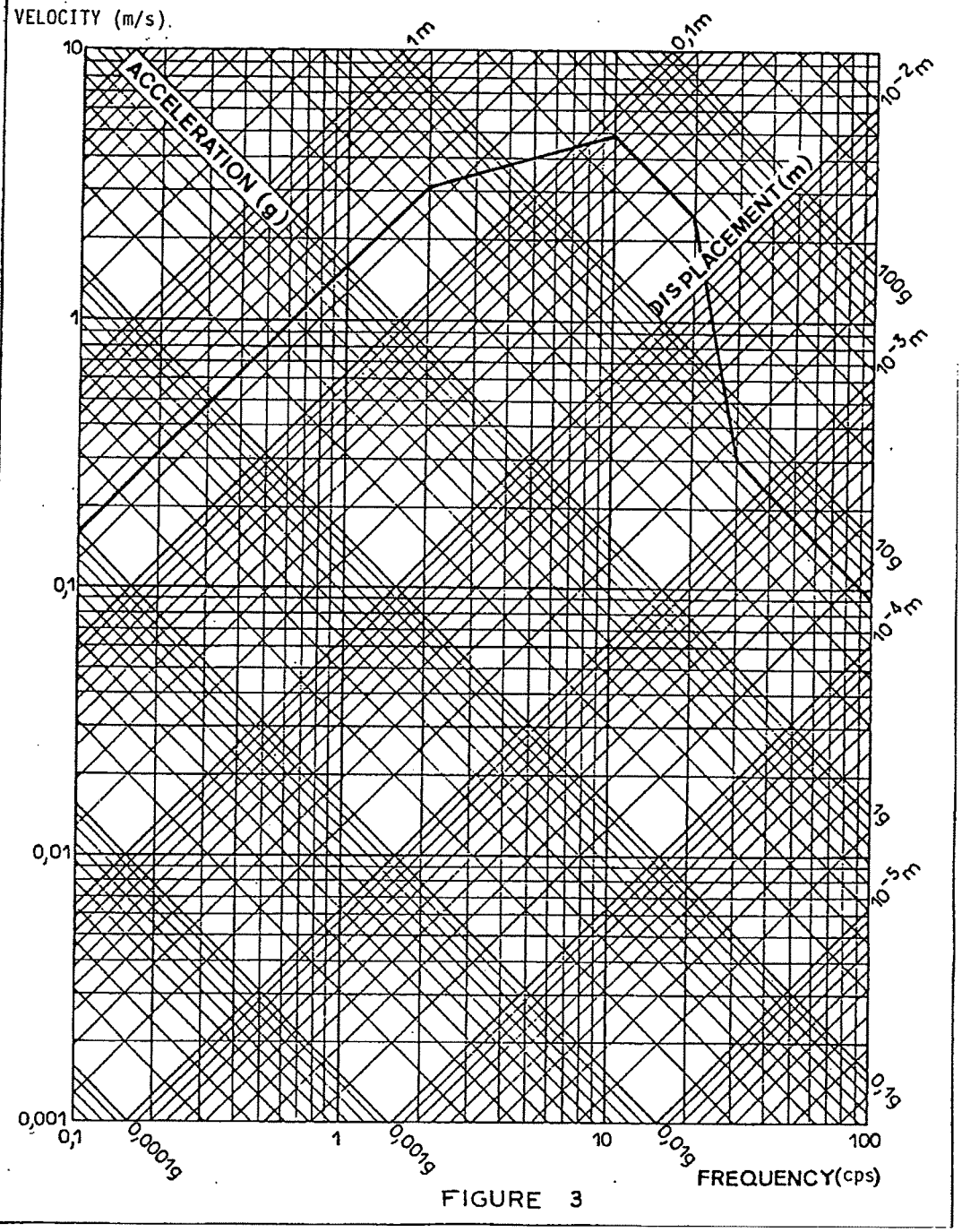

FIGURE 3