Technical Requirements for Electrical Equipment	Beteckning / Document TBE 112
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Contents

1 Introduction

These Technical Requirements list the requirements for solenoid valves for use in nuclear power plant applications.

The said valves can be divided into two categories.

Category 1

This is the most common category and comprises solenoid valves used to open and shut pneumatically controlled process valves. These solenoid valves are normally fitted in small bore pipes in plant air systems or instrument air systems with low design pressures and low design temperatures.

In TBM Appendix 3 “General rules for quality classification of equipment for Swedish nuclear power plants“ which is in accordance with the SKI document SKIFS 1994:1, exceptions from the classification rules have been made for these valves. The reason being that application of tried and tested standard components is considered to provide safety and operating advantages and that the classification requirements are functionally motivated rather than pressure vessel related.

The solenoid valves are to meet Swedish Pipe Codes (RN) and Swedish Pressure Vessel Codes (TKN) or equivalent codes and standards stipulated in other countries and to be marked with materials specifications and pressure class.

This category is subject to general requirements as per TBE 100, specific requirements as per Technical Specifications and this TBE and control requirements as per KBE IP xxx with supplementary examination procedures KBE EP xxx.

Category 2

This category comprises solenoid valves fitted in-line in process systems, often working with high pressures and high temperatures.

The requirement level is dependent on the system quality class and in addition to TBE and KBE requirements, also requirements as per TBM and KBM (Technical Requirements and Quality Requirements for Mechanical equipment respectively) shall apply.

2 Product Requirements

2.1 General requirements

Design life, interchangeability

Solenoid valves are to be designed for an average design life of a minimum 40.000 cycles and/or 25 years. If certain components used in the valve cannot meet these requirements or if a component, due to ageing effects occurring under specific environmental conditions, has a shorter design life than the rest of the valve, then these circumstances are to be clearly stated in the tender and in maintenance instructions. Furthermore, any such components are to be easily accessible and interchangeable.

Fastenings

Fastenings made of plastic materials are not acceptable.

2.2 Nuclear regulation requirements

For certain safety related solenoid valves (functional class 1E) environmental qualification as per nuclear regulations are required. Examples of such regulations are IEEE 323, IEEE 344 and IEC 60780.

Supplementary Swedish requirements are described in specified TBE and KBE documents. Verification of these requirements and requirements to meet other nuclear requirements shall be carried out according to the given Inspection Plan (KBE IP-xxx).

2.3 Standardization

Apart from what has been specified under paragraphs 1 and 2.2 the following alternative standards are applicable:

VDE 0580	Elektromagnetische Geräte Allgemeine Bestimmungen
UL 429	Electrically Operated Valves

2.4 Function requirements

Supply voltage

The product shall be designed for the voltage specified in Technical Specifications. The voltage may continuously deviate from the nominal value within a range of 85 - 110 %.

Insulation class

The insulation class of the coil in the solenoid valve is to meet the requirements for withstanding continuous current at 110 % supply voltage at ambient temperature and at the medium temperature specified in Technical Specifications. If ambient temperature is not specified, this should be assumed to be +55°C.

Time constant

The time constant (L/R) of a solenoid valve should be no greater than 40 ms at nominal voltage unless otherwise specified by the Purchaser.

Special material requirements

Requirements for materials in contact with the medium and other technical data such as valve capacity, design pressure, connection dimensions and function are listed in the Technical Specifications.

2.5 Connections

2.5.1 General requirements

Junction box

Unless otherwise specified, solenoid valves cabling is to be connected to fixed terminals in an easily accessible junction box. Cabling space is to be sufficiently generous to allow for simple and clearly arranged connections to be made.

Cable entry

Connection cables are to be led in through a cable gland. Valves to be used inside the reactor containment are to be sealed with fluoride rubber (Viton) or EPDM rubber.

PE conductors

Terminals for connection of PE conductors are to be provided. Terminals are to be clearly marked with the earthing symbol.

2.5.2 Screw connections

Number of conductors per connection

As regards external connections, no more than one conductor is permitted to be connected to each terminal.

As regards internal connections, no more than two conductors are permitted to be connected to the same screw connection terminal.

Wiring protection

Terminals are to have wire protection between screws and conductors. This means the screws may not press directly against the parts.

2.6 Surface treatment

Upon request, the supplier will supply specifications as to surface treatment applied in regard to resistance to chemicals and moisture.

2.7 Marking and marking plates

Design

Marking plates are to be designed according to suitable standards, e.g. VDE 0580/10.70. Text is to be in Swedish. In certain cases English or German would be acceptable.

Materials

Marking plates are to be made of durable material which will not fade and the text is to remain legible for the entire working life of the product. Paper labels are not per-mitted. It is unacceptable for outer marking plates to be fastened with glue.

Information

Solenoid valves are to carry identification including name of manufacturer, type designation and serial number. Each alteration to design shall be represented by an equivalent alteration to marking.

3 Documentation

The following documentation is to be provided in addition to the documentation required as per TBE 100 and KBE 100:

- Specifications with detailed electrical and mechanical data.
- Instructions for maintenance and repairs.
- Drawings clearly showing the design of the valve with all dimensions given in millimetres.

Descriptions, drawings etc. of other constructions, besides those pertaining to the supplied product, appearing in the documentation are to be clearly marked or crossed out.