

Technical Requirements for Electrical Equipment <small>Title</small> Technical Requirements for Solenoid Valves	Document TBE 112
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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.

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

This category is subject to general requirements as per TBE 100:1, 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 shall 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 shall be clearly stated in the tender and in maintenance instructions. Furthermore, any such components shall 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. Applicable standards are IEC/IEEE 60780-323 and IEC/IEEE 60980-344.

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 Standardisation

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 shall 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 shall be connected to fixed terminals in an easily accessible junction box. Cabling space shall be sufficiently generous to allow for simple and clearly arranged connections to be made.

Cable entry

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

PE conductors

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

2.6 Surface treatment

Upon request, the supplier shall supply specifications for surface treatment regarding resistance to chemicals and moisture.

2.7 Marking and marking plates

Design

Marking plates shall be designed according to suitable standards, e.g. VDE 0580/10.70. Text shall be in Swedish or English.

Materials

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

Information

The solenoid valve shall be labeled 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 shall be provided in addition to the documentation required as per TBE 100:1 and KBE 100-X:

- 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 shall be clearly marked or crossed out.