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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 7409.4-2023

**Excitation systems for synchronous machines - Part 4:
Technical requirements of excitation systems for medium and
small synchronous machines**

同步电机励磁系统 第4部分：中小型同步电机励磁系统技术要求

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Foreword

This document was issued on 7 September 2023 by the State Administration for Market Regulation; Standardization Administration of the PRC and takes effect on 1 April 2024.

It is a GB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies when assessing a submission.

1 Scope

GB/T 7409.4-2023 is Part 4 of the Chinese series on excitation systems for synchronous machines, and sets the technical requirements for medium and small machines. The excitation system is what controls the field current, and through it the terminal voltage and the reactive power a generator delivers; it is also what has to force the field up in the first cycles of a fault to keep the machine in step, and then bring it back without hunting. On smaller machines - distributed generation, industrial sets, synchronous motors and condensers - the same duties must be met with far simpler and cheaper equipment. The standard sets the general requirements and conditions of use, the performance requirements for the excitation systems of synchronous generators and separately of synchronous machines, the test rules, the equipment completeness, the marking, packaging, transport and storage, and the production and quality assurance requirements. It took effect on 1 April 2024.

This document specifies the general requirements and usage conditions for the excitation systems for medium and small synchronous machines, the performance requirements for the

excitation systems for synchronous generators, the performance requirements for the excitation

systems for synchronous machines, the test rules, equipment completeness, marking, packaging,

transportation and storage, as well as mass production and quality assurance, etc.

This document is applicable to the design and manufacturing of the excitation systems for 50

Hz and 60 Hz synchronous machines in the following scopes:

---hydraulic generators below 10,000 kW;

---turbine generators below 6,000 kW;

---internal combustion generators of 3,200 kW and below;

---synchronous machines below 10,000 kW.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only

versions with a specified date are applicable to this document. In terms of references without a

specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 191-2008 Packaging - Pictorial Marking for Handling of Goods

GB/T 755 Rotating Electrical Machines - Rating and Performance

GB/T 1094 (all parts) Power Transformers

GB/T 3797-2016 Electrical Control Assemblies

GB/T 7409.1-2008 Excitation Systems for Synchronous Electrical Machines - Definitions

GB/T 7409.2-2020 Excitation Systems for Synchronous Electrical Machines - Part 2: Models

for Power System Studies

The time required from the start of disturbance, until the difference between the generator terminal voltage and the steady-state value does not exceed $\pm 3\%$ of the rated value (or otherwise specified) and remains within this area.

NOTE: the unit is second (s).

4 General Requirements

In addition to satisfying the requirements of this document, the excitation system shall also comply with the stipulations of GB/T 755. The excitation systems for the synchronous machines shall also comply with the stipulations of GB/T 3797-2016.

5 Conditions of Use

5.1 The excitation systems specified in this document shall be installed indoors or in a climate-protected outdoor location. The mobile power supply can be installed in a climate-protected outdoor location. Users shall consult with the manufacturer for climate protection measures for outdoor installation.

5.2 The operating altitude does not exceed 1,000 m.

NOTE: for the excitation systems used at altitudes higher than 1,000 m, the users shall consult with the manufacturer.

5.3 The requirements for ambient air temperature are as follows:

- a) The indoor ambient air temperature is $\pm 5^{\circ}\text{C} \sim 40^{\circ}\text{C}$, and the outdoor ambient air temperature is $\pm 15^{\circ}\text{C} \sim 40^{\circ}\text{C}$;
- b) The daily average value of ambient air temperature does not exceed 35°C .

NOTE 1: if the indoor ambient air temperature is lower than $\pm 5^{\circ}\text{C}$, but not lower than $\pm 10^{\circ}\text{C}$, or the outdoor ambient air temperature is lower than $\pm 15^{\circ}\text{C}$, but not lower than $\pm 25^{\circ}\text{C}$

°C, the users shall declare to the manufacturer.

NOTE 2: if the ambient air temperature exceeds 40 °C, or the indoor temperature is lower than

15 °C and the outdoor temperature is lower than 25 °C, the users shall consult with the manufacturer.

5.4 The monthly average maximum relative humidity in the wettest month of the location of use is 90%, and the monthly average minimum temperature in that month is 25 °C.

5.5 It shall be used in an environment with clean air and no explosion hazard, and there shall

be no gas or conductive dust in the surrounding air that is sufficient to corrode metal and destroy

insulation.

5.6 Other special conditions of use shall be determined through negotiation between the users

and the manufacturer.

6 Performance Requirements for Excitation Systems for

Synchronous Generators

6.1 Long-term Load Capacity

When the excitation voltage and current of the synchronous generators do not exceed 1.1 times

the rated values, the excitation systems shall be able to continuously operate for a long time.

6.2 Maximum Voltage Multiple

The requirements for the maximum voltage multiple are as follows:

- a) For the excitation systems for hydraulic generators and turbine generators, it is generally not less than 1.6;
- b) For the excitation systems for internal combustion generators, it is generally not less than 1.5;
- c) When there are special requirements, the users shall consult with the manufacturer.

NOTE 1: for the voltage source controllable rectifier excitation systems (unless otherwise