DRAFT INTERNATIONAL STANDARD

ISO/DIS 21498-1

ISO/TC **22**/SC **37**

Secretariat: **DIN**

Voting begins on:
2020-01-29

Voting terminates on:
2020-04-22

Electrically propelled road vehicles — Electrical specifications and tests for voltage class B systems and components —

Part 1:
Voltage sub-classes and characteristics

ICS: 43.120

This document is circulated as received from the committee secretariat.

Reference number
ISO/DIS 21498-1:2020(E)

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Published in Switzerland

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Foreword

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This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 37, *Electrically propelled vehicles*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The requirements for voltage class B electric circuits that are used for electric power transfer for the propulsion of electric road vehicles and their characteristics are significantly different to those of voltage class A electric circuits. Moreover, the range of voltage class B is too wide to be used for a component design regarding to voltage.

This standard divides voltage class B in a set of voltage sub-classes to enable a component design for each voltage sub-class regarding to voltage. It provides appropriate descriptions and definitions for requirements and characteristics of voltage class B systems for electrically propelled vehicles.

The voltage sub-class itself and the component characteristics have a large cost impact on the component design and on the overall design of the electric system. Additionally, a high variety of different voltage sub-classes and operating conditions impedes the use of an existing component in different vehicle models. The standardisation of voltage sub-classes and characteristics and the reduction of varieties will enable the reduction of component and system costs. It allows the decoupling of the system or component designs of a voltage class B electric circuit from the design of the electric energy source. Finally, the exchange of components from different suppliers for different customers is facilitated.

Part 1 of this standard provides definitions of and for voltage sub-classes and characteristics for rechargeable energy storage systems (RESS) and electric propulsion systems. It defines specific values for these sub-classes based on maximum working voltage. Voltage sub-classes listed in this document are used for voltage class B systems of all kinds of current or future electrically propelled road vehicles.

Part 2 of this standard provides electrical tests for electric and electronic components at voltage class B used for electrically propelled road vehicles. All relevant characteristics are covered considering usual driving scenarios as well as deviations from normal operation. The descriptions are generalized and include purpose, setup, procedure and requirements for the tests.

The specifications in this standard are not intended to restrict the development of component performance or technology. The given definition of sub-classes does not exclude the use of other maximum operating voltages for an individual system design.

Electrically propelled road vehicles — Electrical specifications and tests for voltage class B systems and components —

Part 1:
Voltage sub-classes and characteristics

1 Scope

This document applies to voltage class B electric propulsion systems and connected auxiliary electric systems of electrically propelled road vehicles. It applies to electric circuits and components in these systems.

This document provides specifications of voltage sub-classes related to DC electric circuits. It also provides specifications of characteristics which are relevant for design and operation of systems and components for the voltage sub-classes.

NOTE This document does not cover electrical safety (see ISO 6469, ISO 17409)

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the cited edition applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TR 8713, *Electrically propelled road vehicles — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TR 8713 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
component operating status
general functional behaviour of components which depend directly on the voltage in voltage class B electric circuits

3.2
customer
party that is interested in using voltage class B components or systems

3.3
electric circuit
entire set of interconnected electric/electronic parts through which electrical current is designed to flow under normal operating conditions

3.4
lower voltage limit
minimum voltage of a voltage class B sub-class disregarding transients and ripple

3.5
maximum working voltage
highest value of AC voltage (rms) or of DC voltage that can occur under any normal operating conditions according to the customer's specifications, disregarding transients and ripple

3.6
rechargeable energy storage system
RESS
rechargeable system that stores energy for delivery of electric energy for the electric driveExamples to entry: batteries, capacitors, flywheel

3.7
ripple
set of unwanted periodic deviations with respect to the average value of the measured or supplied quantity, occurring at frequencies which can be related to that of components within a system

3.8
supplier
party that provides voltage class B components or systems

3.9
transient
phenomenon or quantity which varies between two consecutive steady states during a short time interval compared to the time-scale of interest

3.10
upper voltage limit
maximum voltage of a voltage class B sub-class disregarding transients and ripple

Note 1 to entry: Maximum working voltages within a voltage sub-class are less than or equal to the upper voltage limit.

3.11
voltage class A
classification of an electric component or circuit with a maximum working voltage of ≤ 30 V AC (rms) or ≤ 60 V DC respectively

3.12
voltage class B
classification of an electric component or circuit with a maximum working voltage of (> 30 and ≤ 1 000) V AC (rms) or (> 60 and ≤ 1 500) V DC respectively

3.13
voltage range
general term covering voltage sub-class, working voltages and deviations from working voltages

3.14
voltage sub-class
classification of an electric component or circuit with a DC voltage within the voltage class B

3.15
working voltage
AC voltage (rms) or DC voltage that can occur in an electric system under normal operating conditions according to the customer's specifications, disregarding transients and ripple.

4 Abbreviated terms

OS Operating Status

5 General assumptions for the voltage class B system

The DC voltage class B system in electrically propelled road vehicles consists of electric components and the wiring harness that connects the components. Its main parts are the electric energy source and the electric drive. The primary function of the DC voltage class B system is the supply of electric energy to propel the EV. Other functions are charging of a RESS, supply of voltage class A electric circuits and auxiliary components.

The main energy flow in the DC voltage class B system is caused by the electric drive, the energy source and an external DC power supply if any. Besides that, the high current load, transients and ripple in the system mostly originate from these components. Therefore they have major influence on the design of the DC voltage class B system.

An example of a voltage class B system is shown in Figure 1. The actual configuration of the voltage class B electric circuit of the electric propulsion system and its connected auxiliary electric components is vehicle-specific and specified by the customer.

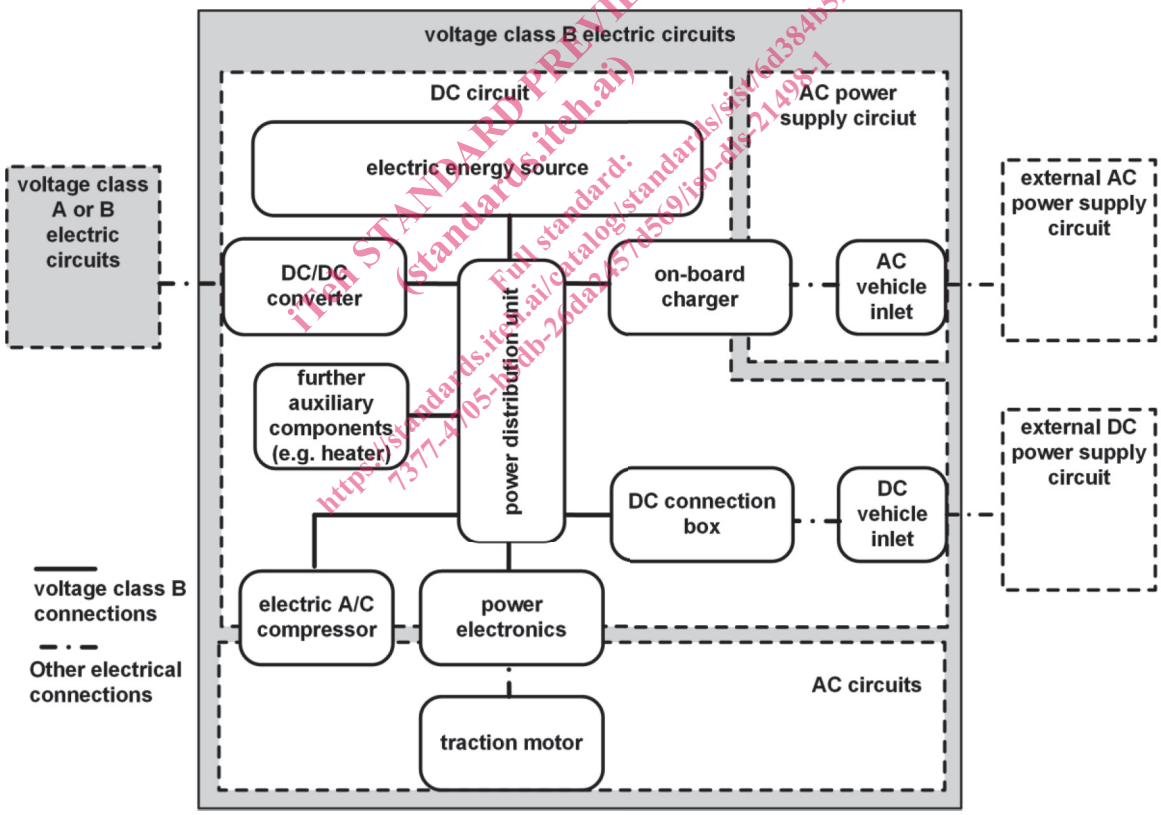

Figure 1 — Example of an electric system for an EV

6 Voltage sub-classes

The specifications and requirements on voltage sub-classes shall apply to electric circuits, systems and components of voltage class B.

The specifications and descriptions of voltages for a component shall apply to the voltage at its terminals to the voltage class B electric circuit, if not otherwise stated in this document.