

SVENSK STANDARD

SS-ISO 21498-2:2021

**Eldrivna vägfordon – Elektriska specifikationer och provningar
för system och komponenter i spänningsklass B –
Del 2: Elprovningar för komponenter (ISO 21498-2:2021,IDT)**

**Electrically propelled road vehicles — Electrical specifications
and tests for voltage class B systems and components —
Part 2: Electrical tests for components (ISO 21498-2:2021,IDT)**



sis Svenska
Institutet för
Standarder

Language: engelska/English

Edition: 1

This preview is downloaded from www.sis.se. Buy the entire standard via <https://www.sis.se/std-80028385>

Den här standarden kan hjälpa dig att effektivisera och kvalitetssäkra ditt arbete. SIS har fler tjänster att erbjuda dig för att underlätta tillämpningen av standarder i din verksamhet.

SIS Abonnemang

Snabb och enkel åtkomst till gällande standard med SIS Abonnemang, en prenumerationstjänst genom vilken din organisation får tillgång till all världens standarder, senaste uppdateringarna och där hela din organisation kan ta del av innehållet i prenumerationen.

Utbildning, event och publikationer

Vi erbjuder även utbildningar, rådgivning och event kring våra mest sålda standarder och frågor kopplade till utveckling av standarder. Vi ger också ut handböcker som underlättar ditt arbete med att använda en specifik standard.

Vill du delta i ett standardiseringsprojekt?

Genom att delta som expert i någon av SIS 300 tekniska kommittéer inom CEN (europeisk standardisering) och/eller ISO (internationell standardisering) har du möjlighet att påverka standardiseringsarbetet i frågor som är viktiga för din organisation. Välkommen att kontakta SIS för att få veta mer!

Kontakt

Skriv till kundservice@sis.se, besök [sis.se](https://www.sis.se) eller ring 08 - 555 523 10

© Copyright/Upphovsrätten till denna produkt tillhör Svenska institutet för standarder, Stockholm, Sverige. Upphovsrätten och användningen av denna produkt regleras i slutanvändarlicensen som återfinns på [sis.se/slutanvandarlicens](https://www.sis.se/slutanvandarlicens) och som du automatiskt blir bunden av när du använder produkten. För ordlista och förkortningar se [sis.se/ordlista](https://www.sis.se/ordlista).

© Copyright Svenska institutet för standarder, Stockholm, Sweden. All rights reserved. The copyright and use of this product is governed by the end-user licence agreement which you automatically will be bound to when using the product. You will find the licence at [sis.se/enduserlicenseagreement](https://www.sis.se/enduserlicenseagreement).

Upplysningar om sakinnehållet i standarden lämnas av Svenska institutet för standarder, telefon 08 - 555 520 00. Standarder kan beställas hos SIS som även lämnar allmänna upplysningar om svensk och utländsk standard.

Standarden är framtagen av kommittén för EI- och hybridfordon, SIS/TK 517.

Har du synpunkter på innehållet i den här standarden, vill du delta i ett kommande revideringsarbete eller vara med och ta fram andra standarder inom området? Gå in på www.sis.se - där hittar du mer information.

Den internationella standarden ISO 21498-2:2021 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av ISO 21498-2:2021.

The International Standard ISO 21498-2:2021 has the status of a Swedish Standard. This document contains the official English version of ISO 21498-2:2021.

LÄSANVISNINGAR FÖR STANDARDER

I dessa anvisningar behandlas huvudprinciperna för hur regler och yttre begränsningar anges i standardiseringsprodukter.

Krav

Ett krav är ett uttryck i ett dokumentets innehåll som anger objektivet verifierbara kriterier som ska uppfyllas och från vilka ingen avvikelse tillåts om efterlevnad av dokumentet ska kunna åberopas. Krav uttrycks med hjälpverbet ska (eller ska inte för förbud).

Rekommendation

En rekommendation är ett uttryck i ett dokumentets innehåll som anger en valmöjlighet eller ett tillvägagångssätt som bedöms vara särskilt lämpligt utan att nödvändigtvis nämna eller utesluta andra. Rekommendationer uttrycks med hjälpverbet bör (eller bör inte för avrådanden).

Instruktion

Instruktioner anges i imperativ form och används för att ange hur något görs eller utförs. De kan underordnas en annan regel, såsom ett krav eller en rekommendation. De kan även användas självständigt, och är då att betrakta som krav.

Förklaring

En förklaring är ett uttryck i ett dokumentets innehåll som förmedlar information. En förklaring kan uttrycka tillåtelse, möjlighet eller förmåga. Tillåtelse uttrycks med hjälpverbet får (eller motsatsen behöver inte). Möjlighet och förmåga uttrycks med hjälpverbet kan (eller motsatsen kan inte).

READING INSTRUCTIONS FOR STANDARDS

These instructions cover the main principles for the use of provisions and external constraints in standardization deliverables.

Requirement

A requirement is an expression, in the content of a document, that conveys objectively verifiable criteria to be fulfilled, and from which no deviation is permitted if conformance with the document is to be claimed. Requirements are expressed by the auxiliary shall (or shall not for prohibition).

Recommendation

A recommendation is an expression, in the content of a document, that conveys a suggested possible choice or course of action deemed to be particularly suitable, without necessarily mentioning or excluding others. Recommendations are expressed by the auxiliary should (or should not for dissuasion).

Instruction

An instruction is expressed in the imperative mood and is used in order to convey an action to be performed. It can be subordinated to another provision, such as a requirement or a recommendation. It can also be used independently and is then to be regarded as a requirement.

Statement

A statement is an expression, in the content of a document, that conveys information. A statement can express permission, possibility or capability. Permission is expressed by the auxiliary may (its opposite being need not). Possibility and capability are expressed by the auxiliary can (its opposite being cannot).

Contents

Page

| | |
|---|-------------|
| Foreword | vii |
| Introduction | viii |
| 1 Scope | 1 |
| 2 Normative references | 1 |
| 3 Terms and definitions | 1 |
| 4 Abbreviated terms | 3 |
| 5 General assumptions for voltage class B components | 3 |
| 6 Tests and requirements | 5 |
| 6.1 Test parameters and general test requirements | 5 |
| 6.1.1 Purpose..... | 5 |
| 6.1.2 Test setup..... | 5 |
| 6.1.3 Voltages | 5 |
| 6.1.4 Powers | 6 |
| 6.1.5 Temperatures..... | 6 |
| 6.1.6 Times and durations | 6 |
| 6.1.7 Standard tolerances | 7 |
| 6.1.8 Ambient conditions..... | 7 |
| 6.1.9 Wiring harness | 8 |
| 6.1.10 Load conditions..... | 8 |
| 6.1.11 Sampling rates and measured value resolutions..... | 8 |
| 6.1.12 Parameter monitoring | 8 |
| 6.1.13 Interface description | 8 |
| 6.1.14 Documentation..... | 8 |
| 6.2 DC supply voltage variation within operational range..... | 9 |
| 6.2.1 Purpose..... | 9 |
| 6.2.2 Test setup..... | 9 |
| 6.2.3 Test procedure..... | 9 |
| 6.2.4 Requirements..... | 10 |
| 6.3 Generated voltage slope..... | 11 |
| 6.3.1 Purpose..... | 11 |
| 6.3.2 Test setup..... | 11 |
| 6.3.3 Test procedure..... | 12 |
| 6.3.4 Requirements..... | 14 |
| 6.4 Immunity to voltage slope | 14 |
| 6.4.1 Purpose..... | 14 |
| 6.4.2 Test setup..... | 14 |
| 6.4.3 Test procedure..... | 15 |
| 6.4.4 Requirements..... | 16 |
| 6.5 Generated voltage ripple | 16 |
| 6.5.1 Purpose..... | 16 |
| 6.5.2 Test setup..... | 16 |
| 6.5.3 Test procedure..... | 17 |
| 6.5.4 Requirements..... | 19 |
| 6.6 Immunity to voltage ripple..... | 20 |
| 6.6.1 Purpose..... | 20 |
| 6.6.2 Test setup..... | 20 |
| 6.6.3 Test procedure..... | 21 |
| 6.6.4 Requirements..... | 22 |
| 6.7 Overvoltage | 22 |
| 6.7.1 Purpose..... | 22 |
| 6.7.2 Test setup..... | 22 |
| 6.7.3 Test procedure..... | 23 |

SS-ISO 21498-2:2021 (E)

| | | |
|--|-------------------------------------|-----------|
| 6.7.4 | Requirements..... | 24 |
| 6.8 | Undervoltage | 24 |
| 6.8.1 | Purpose..... | 24 |
| 6.8.2 | Test setup..... | 24 |
| 6.8.3 | Test procedure..... | 25 |
| 6.8.4 | Requirements..... | 26 |
| 6.9 | Voltage offset | 26 |
| 6.9.1 | Purpose..... | 26 |
| 6.9.2 | Test setup..... | 27 |
| 6.9.3 | Test procedure..... | 28 |
| 6.9.4 | Requirements..... | 29 |
| 6.10 | Generated load dump voltage | 30 |
| 6.10.1 | Purpose..... | 30 |
| 6.10.2 | Test setup..... | 30 |
| 6.10.3 | Test procedure..... | 30 |
| 6.10.4 | Requirements..... | 31 |
| 6.11 | Immunity to load dump voltage | 32 |
| 6.11.1 | Purpose..... | 32 |
| 6.11.2 | Test setup..... | 32 |
| 6.11.3 | Test procedure..... | 32 |
| 6.11.4 | Requirements..... | 34 |
| Annex A (informative) Test overview | | 35 |
| Annex B (informative) Testing at different temperatures | | 36 |
| Annex C (informative) Example values | | 37 |
| Annex D (normative) Artificial network..... | | 40 |
| Annex E (informative) Example for the setup of generated voltage ripple measurement | | 44 |
| Bibliography | | 48 |

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

A list of all parts in the ISO 21498 series can be found on the ISO website.

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.

The ISO 21498 series 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. This 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.

ISO 21498-1 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 ISO 21498-1 are used for voltage class B systems of all kinds of current or future electrically propelled road vehicles.

This document 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 document 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 2: Electrical tests for components

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 focuses on the characteristics at the DC voltage class B terminals of these components as specified in ISO 21498-1. It describes testing methods, test conditions and test requirements for components exposed to electrical behaviour caused by operation of electric loads and power sources.

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*

ISO 21498-1, *Electrically propelled road vehicles – Electrical specifications and tests for voltage class B systems and components – Part 1: Voltage sub-classes and characteristics*

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* (3.13) *electric circuits* (3.3)

[SOURCE: ISO 21498-1:2021, 3.1]

3.2

customer

party that is interested in using *voltage class B* (3.13) components or systems

[SOURCE: ISO 21498-1:2021, 3.2]

SS-ISO 21498-2:2021 (E)

3.3

electric circuit

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

[SOURCE: ISO 21498-1:2021, 3.3]

3.4

lower voltage limit

minimum voltage of a *voltage class B* ([3.13](#)) sub-class

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* ([3.2](#)) specifications, disregarding *transients* ([3.10](#)) and *ripple* ([3.8](#))

[SOURCE: ISO 21498-1:2021, 3.5]

3.6

power network

all components within *voltage class B* ([3.13](#)) DC network including their connections

[SOURCE: ISO 21498-1:2021, 3.6]

3.7

rechargeable energy storage system

RESS

rechargeable system that stores energy for delivery of electric energy for the electric drive

EXAMPLE Batteries, capacitors, flywheel.

[SOURCE: ISO 21498-1:2021, 3.7]

3.8

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

[SOURCE: ISO 21498-1:2021, 3.8]

3.9

supplier

party that provides *voltage class B* ([3.13](#)) components or systems

[SOURCE: ISO 21498-1:2021, 3.9]

3.10

transient

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

[SOURCE: ISO 21498-1:2021, 3.10]

3.11

upper voltage limit

maximum voltage of a *voltage class B* ([3.13](#)) sub-class

Note 1 to entry: *Maximum working voltages* ([3.5](#)) within a *voltage sub-class* ([3.15](#)) are less than or equal to the upper voltage limit.

3.12

voltage class A

classification of an electric component or circuit with a *maximum working voltage* (3.5) of ≤ 30 V AC (rms) or ≤ 60 V DC respectively

[SOURCE: ISO 21498-1:2021, 3.12]

3.13

voltage class B

classification of an electric component or circuit with a *maximum working voltage* (3.5) of (> 30 and $\leq 1\ 000$) V AC (rms) or (> 60 and $\leq 1\ 500$) V DC respectively

[SOURCE: ISO 21498-1:2021, 3.13]

3.14

voltage range

general term covering *voltage sub-class* (3.15), *working voltages* (3.16) and deviations from working voltages

[SOURCE: ISO 21498-1:2021, 3.14]

3.15

voltage sub-class

classification of an electric component or circuit with a DC voltage within the *voltage class B* (3.13)

3.16

working voltage

AC voltage (rms) or DC voltage that can occur in an electric system under normal operating conditions according to the *customer's* (3.2) specifications, disregarding *transients* (3.10) and *ripple* (3.8)

4 Abbreviated terms

| | |
|-----|-------------------------------------|
| DUT | device under test |
| EV | electrically propelled road vehicle |
| HV | high voltage |
| OS | operating status |
| LV | low voltage |

5 General assumptions for voltage class B components

General assumptions and definitions for voltage class B systems shall be as in ISO 21498-1.

[Figure 1](#) shows a generalized view on a voltage class B component. Some of the connections shown may not be available for all voltage class B components. All voltage profiles or voltage values in this document refer to the voltage between the “HV+” and “HV-” terminals of a voltage class B component, if not otherwise stated.

Due to the differences between different voltage class B components, [Table A.1](#) gives an overview on how the different tests, which are described in this document, are applicable. Not all tests are reasonable for all voltage class B components.

A voltage class B component may have multiple interfaces for each type of voltage (voltage class B DC, voltage class B AC, voltage class A, according to [Figure 1](#)). For example, a DC/DC converter may interface to two voltage class B electric circuits.