

Standards Overview

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Overview of used standards and directives

The following overview shows standards, directives and the regulatory environment that are taken into account for products and systems in the vehicle sector.

Notes: The project- and product-specific agreements, e.g. technical data in the offer descriptions, data sheets and component descriptions, are binding. Changes or additions to standards and guidelines are not shown due to clarity.

General railway vehicle guideline

EN 50155:2021 (DIN EN 50155:2022-06): Railway applications - Rolling stock - Electronic equipment

Information: The international Edition IEC 60571 Ed. 3.0 2012-09 is covered by testing but not explicitly verified by test reports.

Environmental conditions

Operating temperature class OT3 acc. to EN 50155:
-25°C to +70°C (ST0 or ST1: +15°C/10 min.)

Relative humidity acc. to EN 50155:

For location 1 (weather protected) or 2 (low IP degree) acc. to EN 50155: Not relevant

For location 4 (non weather-protected, e.g. exterior camera) acc. to EN 50155:

Yearly average up to 75 %, 30 days a year 95 %, occasionally up to 100 %

Vibration and shock acc. to EN 61373:2010 + AC 2017-09 (DIN EN 61373:2011-04 + Ber.1 2018-01):
Broad-band random vibration and shock, category 1, class B, values independent of the mounting position

Degrees of protection provided by enclosures (IP code) acc. to EN 60529

Storage of components, e.g. spare parts, acc. to EN 60721-3-1:

Class 1K21: Stored in locations which are fully protected against the elements
(additional classes 1Z1, 1B1, 1C2, 1S10, 1M10)

Electrical operating conditions

Voltage supply acc. to EN 50155:

Typical 24V_{DC} or 110V_{DC} (or wide range), not relevant for PoE components;

Minimum / maximum continuous voltage 0.7 U_n / 1.25 U_n; temporary variation 0,6 U_n / 1,4 U_n;

Power supply interrupts ≤10ms (S2); Change over class C1

Electromagnetic compatibility (EMC) acc. to EN 50121-3-2:2016 + A1:2019 (DIN EN 50121-3-2:2017-11 + A1:2020):
emission (ports and disturbance field strength / enclosure), immunity (burst, surge, ESD, fields, ports)

Information: The international Edition IEC 62236-3-2 Ed. 3.0 2018-02 is covered by testing but not explicitly verified by test reports.

Radio compatibility from railway vehicle with rail radio services

acc. to rule EMV 06 (EBA, EBC, VDV, DB), 2.0 / 09.05.2019 (relevant in the German rail network / EBA)

Dielectric strength acc. to EN 50155:

Design with consideration of the requirement PD2 of EN 50124-1;
Insulation measurement test between groups at 500 VDC, crit. R > 20 Ω;
Voltage withstand test at 1000 V_{AC} / 1500 V_{DC} (Un ≥72 V) or 500 V_{AC} / 750 V_{DC} (Un <72 V), 60s, no disruptive discharge

Further guidelines in the railway sector

Preventive fire protection:

Use of fire-resistant, self-extinguishing, predominant halogen- and PVC-free materials;
Compliance with EN 45545-2:2020, Hazard level HL1, HL2 and mostly HL3;
Evidence with FCIL (UNIFE); fire & smoke test reports for cables, PCBs, plastic parts and varnishes;
Fire test reports may not be older than 5 years for series delivery acc. to TSI LOC&PAS (1302/2014 EU).

TSI PRM (1300/2014 EU, last amending 2023/1694) Technical specification of interoperability relating to 'persons with reduced mobility' for interoperability constituent:

- Call for aid device (Passenger Intercom Unit) through EC Declaration of Conformity (module CA)
- Int. and external displays through internal evaluation

ERADIS - European Railway Agency Database of Interoperability and Safety,
Registration of the TSI PRM interoperability constituents

Welding acc. to EN 15085:

CL4: design, purchase, assembly, resale of welded components of certification level CL1

Bonding acc. to DIN 6701 → EN 17460:

Class A1: Purchase, trade and assembly of bonded components

Class A3: Design, process planning, manufacturing

Software Development and documentation acc. to „Basic Integrity“ EN 50657

IACS-Security requirements for end devices for train data communication, standards series IEC 62443

RAMS process acc. to EN 50126-1

Functional safety:

realization and verification of safety functions of the Passenger Information System (PIS) in SIL 1 and SIL 2 in the standards environment EN 50126, EN 50657, EN 50129, SIRF is possible after consultation.

Protective measures in relation to electrical hazards in compliance with EN 50153

in particular, protection against direct and indirect contact (chap. 5 & 6) e.g. through insulation or earthing.

Protective layer for printed circuit board assemblies in compliance with EN 50155

no protective coating (for commercial components in mass production, e.g. CPU module, memory module, radio module, TFT)

Regulatory environment

EMC Directive (2014/30/EU)

applied harmonized standards EN 50121-3-2

RoHS Directive (2011/65/EU)

Restriction of the use of certain hazardous substances in electrical and electronic equipment

Remark: Transportation for persons does not apply to the directive

RED - Radio Equipment Directive (2014/53/EU)

Only relevant if radio modules are integrated.

REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals (1907/2006 EU)

If applicable, with registration of the components in the ECHA SCIP database.

EU Declaration of conformity including CE marking

e.g. according to 2022/C 247/01 the 'Blue Guide' on the implementation of EU product rules 2022

For components in busses:

Type approval acc. to UN/ECE Regulation R10 (EMC) with E1 approval number;

UN/ECE Regulation R118 (burning behaviour of used materials)