

## Rail Industry Standard RIS-2716-RST | Issue One | March 2026 [proposed] | Draft 1i

## Rolling Stock Subsystem and Interfaces to DC Conductor Rail Energy Subsystem

This document sets out requirements and guidance for all rolling stock operating over the Great Britain (GB) mainline 750 V dc conductor rail energy subsystem.

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## Rolling Stock Subsystem and Interfaces to DC Conductor Rail Energy Subsystem

#### Synopsis

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#### Issue record

Issue	Date	Comments
One	March 2026 [proposed]	Original document. Created from the relevant non-national technical rule (NTR) content of GMRT2113 issue one and associated content in GMGN2613.

Revisions have not been marked by a vertical black line in this issue because this is a new document.

#### Superseded documents

The following Railway Group documents are superseded, either in whole or in part as indicated:

Superseded documents	Sections superseded	Date when sections are superseded
GMRT2113 Issue One	3.5.5, 4.4.2	March 2026 [proposed]
GMGN2613 Issue One	G 3.5.12, G 4.4.2	March 2026 [proposed]

#### Supply

The authoritative version of this document is available at <u>www.rssb.co.uk/standards-catalogue</u>. Enquiries on this document can be submitted through the RSSB Customer Self-Service Portal <u>https://customer-portal.rssb.co.uk/</u>

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## Part 1 Purpose and Introduction

#### 1.1 Purpose

- 1.1.1 This document is applicable to rolling stock operating over the Great Britain (GB) mainline 750 V direct current (dc) conductor rail energy subsystem and sets out the interface requirements for the 750 V dc conductor rail energy subsystem that can be route specific.
- 1.1.2 This document details an industry-agreed process to support technical compatibility between rolling stock and the 750 V dc conductor rail energy subsystem at route level and for the provision of information related to this interface. Conformity with the requirements in this document can be used by railway undertakings (RUs) to help them discharge their legal obligations concerning compatibility between the rolling stock subsystem and dc energy subsystem.
- 1.1.3 This document provides guidance on requirements that define the interface and the need for cooperation between different categories of duty holder to manage risk safely.
- 1.1.4 This document can be adopted by RUs, rolling stock owners and original equipment manufacturers (OEM) under their respective safety/quality management system or when specifying products and services.
- 1.1.5 The requirements in the document are not applicable to the following types of vehicle:
  - a) Rolling stock that operates solely on 25 kV ac or unelectrified lines;
  - b) On-track plant within the scope of RIS-1530-PLT;
  - c) On-track machines within the scope set out in GMRT2400;
  - d) On-track machines fitted with shoes for safety purposes.
- 1.1.6 This document is complementary to GMRT2113, which sets out requirements as national technical rules (NTRs) to achieve technical compatibility between rolling stock and the 750 V dc conductor rail energy subsystem.

#### 1.2 Application of this document

- 1.2.1 Compliance requirements and dates have not been specified because these are the subject of internal procedures or contract conditions.
- 1.2.2 If you plan to do something that does not comply with a requirement in this document, you can ask a standards committee to comment on your proposed alternative. To get their opinion, submit an application to RSSB. You can find advice and guidance on using alternative requirements on RSSB's website.

#### 1.3 User's responsibilities

1.3.1 Industry experts representing railway industry stakeholders are involved in the process for setting the content of documents that are prepared in accordance with the procedures set out in the Railway Standards Code and Manual.

- 1.3.2 Users of documents published by RSSB are expected to be competent or should take specialist advice before following or applying any practices or principles contained within them and are reminded of the need to consider their own responsibilities to ensure safe systems of work and operation, health and safety at work and compliance with their own duties under health and safety legislation. While documents published by RSSB can be used to help inform and devise safe practices and systems of work, their content has not been designed or prepared for:
  - a) Reliance by any specific person or organisation; and
  - b) Application or use in all possible operational or working environments.
- 1.3.3 No representation, warranty, guarantee, confirmation or other assurance is given or made (whether expressly or implicitly) that compliance with all or any documents published by RSSB is sufficient in itself to ensure safe systems of work or operation or to satisfy such responsibilities or duties.
- 1.3.4 Users and duty holders remain responsible at all times for assessing the suitability, adequacy and extent of any measures they choose to implement or adopt and RSSB does not accept, and expressly disclaims, all and any liability and responsibility except for any liability which cannot legally be limited.

#### 1.4 Structure of this document

- 1.4.1 This document sets out a series of requirements that are sequentially numbered. This document also sets out the rationale for the requirement, explaining why the requirement is needed and its purpose and, where relevant, guidance to support the requirement. The rationale and the guidance are prefixed by the letter 'G'.
- 1.4.2 Some subjects do not have specific requirements but the subject is addressed through guidance only and, where this is the case, it is distinguished under a heading of 'Guidance' and is prefixed by the letter 'G'.

#### 1.5 Approval and authorisation of this document

- 1.5.1 The content of this document will be approved by Rolling Stock Standards Committee on 13 November 2025 [proposed].
- 1.5.2 This document will be authorised by RSSB on 17 December 2025 [proposed].

### Part 2 Requirements for all rail vehicles required to operate over the 750 V dc conductor rail energy subsystem

#### 2.1 Heat emissions

2.1.1 Where heat from vehicles is emitted below or to the side of a vehicle, it shall not raise the surface temperature of a dc conductor rail guard board to greater than 70 °C for more than five minutes.

#### Rationale

G 2.1.2 Hot emissions from a vehicle might cause damage to vulnerable conductor rail system components.

#### Guidance

- G 2.1.3 The 70° C temperature is calculated starting from an ambient of 40 °C. The temperature to be measured is the surface temperature of the guard board.
- G 2.1.4 The rise in temperature of the guard board as a result of heat emissions from a vehicle can be calculated with respect to the dimensions of the guard board.

## Part 3 Electrical requirements for 750 V dc electric rail vehicles

#### 3.1 Current collection

3.1.1 Where rolling stock is fitted with retractable current collectors, they shall all be retracted or deployed throughout the train formation when controlled from the active cab.

#### Rationale

G 3.1.2 This results in rolling stock with retractable current collectors being operated in a configuration that is compatible with fixed equipment located on track on non-dc lines.

#### Guidance

G 3.1.3 An indication in the cab that all current collectors have been retracted or deployed on a train set, and that there is no fault with the system, can be useful for the driver.

# Part 4 Mechanical requirements and guidance for 750 V dc electric rail vehicles

#### 4.1 Raised height

4.1.1 The current collector shall be capable of being raised from the lineside and, once raised, retained in a position which is greater than the working height of the current collector as set out in GMRT2113 issue two, clause 4.3.2.

#### Rationale

- G 4.1.2 The ability to secure current collectors clear of the conductor rail is necessary under some failure conditions of the onboard traction supply system in order to facilitate train movement to clear the running line.
- G 4.1.3 Being able to raise and secure current collectors at a position no less than 227 mm above the plane of the running rails aids compatibility with ac and non-electrified railways, where infrastructure features can differ.

#### Guidance

- G 4.1.4 On rolling stock with retractable current collectors, requirement 4.1.1 is usually achieved, but can still be necessary on occasions when the retraction equipment fails.
- G 4.1.5 Current collector designs typically include features that allow for straps to be placed through the collector shoe holder and tied up to the collector beam.

## Part 5 Condition monitoring

#### 5.1 DC conductor rail condition monitoring

#### Guidance

- G 5.1.1 The dc conductor rail can become worn over time as a result of the continuous interface with collector shoes and the significant amount of current passed through the interface.
- G 5.1.2 Historic RSSB research and in-service trials conducted to monitor the dc interface, but the technology readiness level (TRL) of the equipment was low and problems during its installation resulted in it not being fully implemented and there was no output from the research project.
- G 5.1.3 It can be beneficial to instrument current collector equipment to monitor the interface between a collector shoe and the dc conductor rail. For example, when a collector shoe reconnects with a dc conductor rail ramp end after a gap, the collector shoe can accelerate beyond the ramp end into free space if there is significant wear on the conductor rail, also known as scalloping. This is a feature of the interface that could be measured using an accelerometer and rectified before it becomes a significant event.
- G 5.1.4 Closed-circuit television (CCTV) installed on board rolling stock can monitor the third rail, and if used in conjunction with thermal imaging, can result in defects being identified which might not be apparent by visual inspection, such as loose fishplates that are overheating as a result of a poor connection.
- G 5.1.5 Most modern rolling stock includes 'shoe loss detection', which monitors when current collector elements have become detached from the vehicle. These systems typically alert both the driver and maintenance teams.

#### Definitions

collector shoe	Part of the shoegear making contact with the conductor rail. Source: <i>IEC 60050-811, definition 811-32-20</i>
contact line	Conductor system for supplying electric energy to vehicles through current collecting equipment. Source: <i>IEC 60050-811, definition 811-33-01</i>
current collector	Equipment fitted to the vehicle and intended to collect current from a contact wire or conductor rail. Source: <i>IEC 60050-811, definition 811-32-01</i>
750 V dc conductor rail	The DC conductor rail energy subsystem consists of:
energy subsystem	a) Substations: connected on the primary side to the high-voltage grid, with transformation of the high voltage to a voltage and / or conversion to a power supply system suitable for the trains. On the secondary side, substations are connected to the railway contact line system.
	b) Sectioning locations: electrical equipment located at intermediate locations between substations to supply and parallel contact lines, and to provide protection, isolation and auxiliary supplies.
	c) Contact line system: a system that distributes electrical energy to the trains running on the route and transmits it to the trains by means of current collectors. The contact line system is also equipped with manually or remotely controlled disconnectors which are required to isolate sections or groups of the contact line system according to operational necessity. Feeder lines are also part of the contact line system.
	d) Return circuit: all conductors which form the intended path for the traction return current and which are additionally used under fault conditions. Therefore, so far as this aspect is concerned, the return circuit is part of the energy subsystem and has an interface with the infrastructure subsystem.
defect	Non-fulfilment of specified or intended usage requirements, which can prevent a component or part of a system from accomplishing its design purpose.
	<b>Note:</b> A defect can lead to a fault in a component or system.
failure	An unwanted event where the system or component cannot, or is prevented from, functioning and / or performing as required. Source: <i>RIS-0707-CCS</i>
fault	Impairment of a component, or part of a system, to perform a required function, which may lead to an error.

# Rolling Stock Subsystem and Interfaces to DC Conductor Rail Energy Subsystem

	<b>Note:</b> this includes 'transient faults' which may occur once and subsequently disappear.
	<b>Note:</b> The fault can present itself via an indication to users.
interface	The common physical or conceptual boundary between two systems or between two parts of the same system. Source: <i>IEC 60050-716, definition 716-01-07</i>
railway undertaking (RU)	Has the meaning given to the term 'transport undertaking' in the Railways and Other Guided Transport Systems (Safety) Regulations 2006 as amended, but is limited to any private or public undertaking the principal business of which is to provide rail transport services for goods and/or passengers, with a requirement that the undertaking must ensure traction. Source: <i>ROGS</i>
rolling stock	All vehicles with or without motors. Source: <i>IEC 60050-811, definition 811-02-01</i>
subsystem [railway system]	A subdivision (in whole or in part) of the railway system as specified in the Railways (Interoperability) Regulations 2011 (as amended). Subsystems can be structural or functional.
vehicle	Any single item of rolling stock, e.g. a locomotive, a coach or a wagon. Source: <i>BS EN 50388-1:2022, definition 3.1.15</i>

#### References

The Standards catalogue gives the current issue number and status of documents published by RSSB: <u>http://www.rssb.co.uk/standards-catalogue</u>.

The governance arrangements for Railway Group Standards, Rail Industry Standards, National Operations Publications, and industry recommendations for revisions to National Technical Specification Notices are set out in the Railway Standards Code. Detailed management arrangements are in the complementary Standards Manual. Both documents are available on the RSSB website.

RGSC 01	Rail Safety and Standards Board (2024), Railway Standards Code
RGSC 02	Rail Safety and Standards Board (2024), Standards Manual
Railway Group Standards	
GMRT2113	Rolling Stock Subsystem and Interfaces to DC Conductor Rail Energy Subsystem
Other relevant documents	
GLRT1212	DC Conductor Rail Energy Subsystem and Interfaces to Rolling Stock Subsystem
GMRT2400	Engineering Design of On-Track Machines in Running Mode
RIS-1530-RST	On-Track Plant, Trolleys and Associated Equipment
RIS-1852-ENE	DC Conductor Rail Energy Subsystem and Interfaces to Rolling Stock Subsystem