
1st edition, 2019-11

Railway application

Fixed installations

**Characteristics of direct current overhead contact systems
for lines operated at speeds between 160 km/h and 250 km/h**

International Railway Solution to be classified in volumes of UIC

VII - Fixed installations

Application:

With effect from 1st November 2019

All members of the International Union of Railways

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This IRS integrates in part the content of former UIC Leaflet 799-1, 1st edition, dated June 2000.

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The International Railway Solution

The International Railway Solutions (IRS) are structured in a General Part and in some eventual Application Parts.

The General Part is valid worldwide, while the Application Parts are valid for a specific railway application, based on a geographical or on a service implementation.

The eventual Application Parts may thus be added according to the current needs of the Railway Community.

Structure of the International Railway Solution:

**IRS 70799-1: Railway application - Fixed installations -
Characteristics of direct current overhead contact systems for lines operated
at speeds between 160 km/h and 250 km/h**

General Part

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Foreword

An International Railway Solution (IRS) is a document drawn up by consensus and applied on a voluntary basis which aims to facilitate and harmonise railway operation. IRSs are gradually replacing UIC leaflets.

Members of the International Union of Railways (UIC) participate in the creation of IRSs, of which they benefit in full. Furthermore, marketing to railway stakeholders contributes to the sharing and harmonisation of good practices, in accordance with UIC's primary goal.

While IRSs do not have the force of law, they are created and published in a professional manner and with technical approval on the basis of UIC procedures, and have full technical legitimacy in the railway sector.

The "General application" section constitutes the heart of the IRS and contains the working group's expertise applicable in the broadest manner. The addition of a "Specific application" aims to cover factors specific to a region, a type of service, etc.

While the application of this IRS is optional, some provisions shall be implemented in all cases to ensure correct application and maintain the system's cohesiveness. Certain operational circumstances require that specific provisions be systematically applied by all users of the document.

For the purposes of understanding, the user acknowledges that the expression of:

- obligation indicates requirements to be respected in order to comply with the expertise expressed in the document (usually "shall" in the present);
- recommendation indicates options that are favourable but not essential (usually "should" in the present);
- permission indicates options that are recognised but without consequence (usually "may" in the present);
- capacity indicates possibilities from a technical standpoint and not permissions or probabilities (usually "can" in the present).

Obligation, recommendation and capacity can be expressed in the negative to indicate prohibiting, non-recommendation and incapacity.

If applicable, notably for the purposes of compliance with a UIC approval, passages that are recommended or mandatory for the cohesiveness of the system will be accompanied by the letters "R" and "MCS" respectively.

This IRS reflects the following UIC working group expertise:

Energy and Traction experts group

It integrates in full or in part the following UIC leaflets:

It replaces Leaflet 799-1

It complements the following standards:

See [Normative references - page 4](#)

The following IRSs constitute a complementary series:

No complementary series

Summary

This IRS contains recommendations required to ensure reliable interaction between pantographs and 1 500 V and 3 000 V DC overhead equipment for lines operated at speeds of over 160 km/h, as well as the parameters for the qualification of pantograph-OCL interaction and the definition of the interaction qualification indicator.

The values recommended reflect the state of the art and experience gained by the railways in the field of high speed rail whilst ensuring reliability and cost effectiveness.

A section is devoted to simulation programmes and measurement methods and includes suggestions on criteria to assess the validity of simulation models used, details about measurement of the contact force and measurement of electric arcs.

The basic OCL parameters stipulated or recommended as well design parameters including those relating to conductors and the physical parameters given for the two speed ranges in km/h:

$160 < V \leq 200$, $200 < V \leq 250$, are set out so that these requirements may be applied to existing DC lines belonging to the European high speed network.

The basic parameters stipulated or recommended for OCL are classified into static, dynamic, electrical and climatic parameters.

The design parameters to be observed such as the design of supports, contact wire uplift at the support, sag at the reference temperature, permissible lateral deflection of the contact wire with maximum side wind, the number of spans per changeover of tensioning, contact wire run-in at stitches and contact wire tensioning are important for the OCL to operate properly at high speed.

Normative references

The following referenced documents are indispensable for the application of this document.

For dated references, only the edition cited applies.

For undated references, the latest edition of the referenced document (including any amendments) applies.

1. UIC Leaflets

International Union of Railways (UIC)

UIC Leaflet 505-1: Railway transport stock - Rolling stock construction gauge, 10th edition, Mai 2006

UIC Leaflet 508-1: Interaction between passenger rolling stock and fixed installations, 1st edition, January 1994

UIC Leaflet 600: Electric traction with aerial contact line, 4th edition, November 2003

UIC Leaflet 608: Conditions to be complied with for the pantographs of tractive units used in international services, leaflet withdrawn on 1.08.2019

UIC Leaflet 791: Quality assurance of overhead line equipment, 2th edition, January 1990

UIC Leaflet 794-1: Pantograph/overhead line interaction for DC - electrified railway lines, 1st edition, August 2001

UIC Leaflet 798: Integration periods over which parameters can be averaged, 1st edition, July 1996

2. European Standards

Association Française de Normalisation (AFNOR)

EN 50318: Railway applications - Current collection systems - Validation of simulation of the dynamic interaction between pantograph and overhead contact line, December 2002

European Union (EU)

Commission Regulation (EU) No 1301/2014 of 18 November 2014 on the technical specifications for interoperability relating to the 'energy' subsystem of the rail system in the Union, Official Journal of the European Union L 356/179 , 12.12.2014

3. International Standards

International Electrotechnical Commission (IEC)

IEC 60850:2007: Railway applications - Supply voltages of traction systems, Withdrawn

IEC 60913:2013: Railway applications - Fixed installations - Electric traction overhead contact lines, 2013-03-06

IEC 62486:2017: Railway applications - Current collection systems - Technical criteria for the interaction between pantograph and overhead contactline (to achieve free access), 2017-08-10

IEC 62917:2016: Railway applications - Fixed installations - Electric traction - Copper and copper alloy grooved contact wires, 2016-10-05

IEC 62846:2016: Railway applications - Current collection systems - Requirements for and validation of measurements of the dynamic interaction between pantograph and overhead contact line, 2016-10-04

List of abbreviations

FEM	Finite Element Method
OCL	Overhead Contact Line
TSI	Technical Specifications of Interoperability