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Railway application

Fixed installations

**Characteristics of AC overhead contact systems for
high speed lines worked at speeds of over 200 km/h**

International Railway Solution to be classified in volumes of UIC

VII - Fixed installations

Application:

With effect from 1st October 2019

All members of the International Union of Railways

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First issue.

This IRS integrates in full the content of former UIC Leaflet 799, 1st edition, dated March 2002.

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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: Railway application - Fixed installations - Characteristics of AC overhead contact systems for high speed lines worked at speeds of over 200 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 harmonize 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 harmonization 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 recognized but without consequence (usually "may", "need not" 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

It complements the following standards:

Energy and traction experts group

The following IRSs constitute a complementary series:

no complementary series

Summary

This IRS contains requirements and recommendations to ensure reliable interaction between the pantograph and AC overhead equipment at speeds of over 200 km/h.

The recommendations contained in the IRS are in line with the state of the art and reflect the experience gained by the railways in high speed rail transport whilst ensuring reliability and cost effectiveness.

Account has been taken of the stipulations laid down for international traffic in the Technical Specifications for Interoperability for the "Energy" subsystem (version c.f. Normative references).

Pantographs with a bow profile corresponding to all that defined in the TSIs and IEC 62486 can be used in conjunction with the overhead contact systems defined in this IRS.

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

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

3. International Standards

International Electrotechnical Commission (IEC)

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

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

IEC 62498-2:2010: Railway applications - Environmental conditions for equipment - Part 2: Fixed electrical installations), 08-2010

List of abbreviations

α	Doppler factor
χ	Amplification factor
σ	Standard deviation
$e_{\max}$	Maximum elasticity
$e_{\min}$	Minimum elasticity
$F_{\max}$	Maximum permissible contact force of pantograph
$F_{\min}$	Minimum permissible contact force of pantograph
m_{fd}	Specific mass of the contact wire
m_{ts}	Specific mass of the messenger wire
r	Reflection factor
TSI	Technical Specifications for Interoperability
U	Degree of variability
v_b	Design speed
v_c	Wave propagation speed
$v_{\max}$	Maximum design speed
Z_{fd}	Tensile load in the contact wire
Z_{ts}	Tensile load in the messenger wire

**Railway application - Fixed installations -
Characteristics of AC overhead contact systems
for high speed lines worked at speeds of over
200 km/h**

General Part

1 - General conditions

1.1 - Scope

New high speed lines will preferably be built with AC systems. This leaflet contains requirements and recommendations for the overhead systems of such high speed lines and for those of the upgraded lines and other lines concerned for speeds over 200 km/h, taking into account the existing situation on the railways.

On existing lines that are a constituent part of the European high speed network, attempts should be made to satisfy these requirements.

1.2 - Definitions

1.2.1 - Speed ranges

The OCL characteristics are sub-divided into three speed ranges:

$$200 < v \leq 250 \text{ km/h}$$

$$250 < v \leq 300 \text{ km/h}$$

$$v > 300 \text{ km/h}$$

1.2.2 - Voltage and frequency levels

The values given in this leaflet apply to the following systems defined by IEC 64850 (see Normative references - page 4):

25 000 V, 50 Hz,

25 000 V, 60 Hz,

15 000 V, 16 2/3 Hz.

1.2.3 - Rolling stock profile

The requirements and recommendations contained in this leaflet refer to application of the "GC" gauge profile according to UIC Leaflet 508-1 (see Normative references).

1.2.4 - Pantograph/OHL interaction

The parameters to be satisfied by the pantograph and OCL in order to ensure pantograph/OCL interaction are contained in IEC 62486 (see Normative references).