

UIC CODE

6 0 0

4th edition, November 2003

Translation

O R

Electric traction with aerial contact line

Traction électrique avec ligne de contact aérienne
Elektrischer Zugbetrieb mit Fahrleitung



UNION INTERNATIONALE DES CHEMINS DE FER
INTERNATIONALER EISENBAHNVERBAND
INTERNATIONAL UNION OF RAILWAYS

Leaflet to be classified in Volumes:

VI - Traction

VII - Way and Works

Application:

With effect from 1 January 1981, except as regard:

- future vehicles (1.1.94)

- existing vehicles (1.1.96)

All members of the International Union of Railways

Record of updates

3rd edition, January 1981

with its Amendment dated 1.1.94.

4th edition, November 2003

Retyped in FrameMaker.

Important: the articles (points) in this leaflet have been renumbered in the new edition. The first digit of each point has been increased by one (i.e. 0 becomes 1, 1 becomes 2, and so on). Please take account of this when using cross-references from other leaflets.

The person responsible for this leaflet is named in the UIC Code

Contents

Summary	1
1 - Scope	2
2 - Special signals for electric traction.....	3
2.1 - Protection of catenary sections to be crossed with restrictions	3
2.2 - Signals recommended for the protection of catenaries	3
2.3 - System changeover signals.....	4
3 - Values and permissible variations in current voltage and frequency	5
3.1 - On lines electrified with standardised voltage.....	5
3.2 - On lines electrified with other current systems	5
4 - Contact lines.....	6
4.1 - Constructional design of catenary lines	6
4.2 - Position of contact wires in relation to the track and clearances required for the pantographs	6
5 - Gap section of contact lines between different railway systems.....	7
6 - Means for warning staff of the danger presented by high voltage	8
7 - Steps to be taken to prevent disturbances caused by earth return currents	9
8 - Installations to be provided to enable a driver to repair, if necessary, a locomotive or a motor coach brought to a standstill under a line normally alive	10
Bibliography	11

Summary

The provisions of this leaflet apply to the current electric traction arrangements for joint stations and joint sections on which locomotives and power cars of different railways may be called upon to run.

The provisions relating to nominal voltages and nominal frequencies and their tolerance range (point 3.1), however, are applicable over the whole of the railway system.

1 - Scope

The regulations set out in the present leaflet are only applicable to joint sections, joint stations or parts of joint stations on which locomotives or motor coaches of different railway systems may be called upon to run.

By "joint section" is meant the section of line extending between the frontier and the station adjoining the frontier where the changeover of the electric traction system is effected, or the changeover of train crews in the case where the electric traction system is the same on both systems.

The regulations in point [3.1 - page 5](#) are, however, applicable to the whole extent of the railway systems.

2 - Special signals for electric traction


o 2.1 - Protection of catenary sections to be crossed with restrictions


The ends of the sections to be crossed with the current cut-off or the overhead current collectors in the lowered position (gap section, damaged section of the contact line, etc.) must be protected by means of signals (other protection means may be used by bilateral agreement).

R 2.2 - Signals recommended for the protection of catenaries

The following signals are recommended:


2.2.1 - Warning signals for the cutting out of current (open circuit-breaker or disconnecting link)


 (open U) at the beginning of the gap section

 (closed U) at the end of the gap section

These signals shall be placed close to the ends of this section.

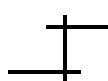
2.2.2 - Warning signals for the operation of pantographs

 (a horizontal bar) at the beginning of the section to be crossed with lowered overhead current collectors

 (a vertical bar) at the end of the section to be crossed with lowered overhead current collectors


These signals shall be placed close to the ends of the section.

If the use of a distant signal is necessary, this signal must be as follows:

 two horizontal bars, staggered in relation to the centre-line of the signal, the upper one to the right, the lower one to the left

The position of this signal shall be determined by reference to the maximum speed of trains, the lowering speed of the pantographs and the local conditions.

2.2.3 - Signal at the end of the contact line

 (a horizontal bar) at the end of a contact line when this does not coincide with the end of a track.

2.2.4 - Each Railway shall define, for its own use, the colours., dimensions, and external form of these signals.

However, in order to draw a clear distinction between the warning signal for lowering the pantographs and the signal at the end of a contact line, the latter shall, as far as possible, be designed to conform with the external shape as given in point **2.2.3 - page 3**.

o **2.3 - System changeover signals**

At all events, the Railways concerned shall communicate with each other in order to define, by mutual agreement, the special method of signalling which they deem relevant to adopt in joint stations and sections, e.g. panels showing the type of current or the nominal value of the supply voltage.

3 - Values and permissible variations in current voltage and frequency

3.1 - On lines electrified with standardised voltage

Over the whole network of the Railways, current voltage and frequency may vary within the limits laid down in the following table:

	Voltage					Frequency	
	Nominal	Minimum instantaneous	Lowest	Highest	Maximum instantaneous	Nominal	Tolerances
	V	V	V	V	V	Hz	Hz
Lines fed with direct current	600 ^a 750 1 500 3 000		400 500 1 000 2 000	720 900 1 800 3 600	770 950 1 950 3 900		
Lines fed with alternating current	15 000	11 000	12 000	17 250	18 000 ^b	16 2/3	16 1/6 to 17
Single-phase	25 000	17 500	19 000	27 500	29 000	50	49 to 51

a. Future direct-current traction systems for tramways and feeder railway lines must comply with one of the following 3 rated voltages: 750 V, 1 500 V or 3 000 V.

b. Provisional value.

3.2 - On lines electrified with other current systems

On lines electrified with currents systems other than those specified above, the Railways concerned shall conclude agreements on the values and permissible variations in voltage and, where applicable, in frequency.

4 - Contact lines

4.1 - Constructional design of catenary lines

- R** 4.1.1 - The constructional design contact lines shall be determined by each Railway in accordance with its own criteria. As regards railways electrified with 25 kV 50-cycle current, *UIC Leaflet 606-2* (see [Bibliography - page 11](#)) shall apply.
- O** 4.1.2 - The constructional design must permit the running of traction units of other Railways observing the rules set out in *UIC Leaflet 608 and 611* (see [Bibliography - page 11](#)).
- O** 4.1.3 - If required, restrictions (such as prohibiting the simultaneous use of several pantographs while the train is running at high speed) shall be the subject of agreements between the Railways concerned.

O 4.2 - Position of contact wires in relation to the track and clearances required for the pantographs

4.2.1 - The minimum height of contact wires shall be determined according to the regulations specific to each Railway concerned; however, in the static condition, the lower part of contact wires must be situated at a minimum distance above the highest of the loading gauges and rolling stock gauges of the Railways concerned.

This minimum distance shall be:

- 200 mm for nominal voltages of 750 - 1 500 - 3 000 V;
- 300 mm for the nominal voltage of 15 000 V.

As regards the nominal voltage of 25 000 V, see *UIC Leaflet 606-2*.

4.2.2 - The maximum height above rail shall not exceed 6 500 mm.

4.2.3 - The maximum stagger of the contact line shall be determined according to the regulations specific to the various Railways concerned which, under identical conditions, adopt the smallest stagger.

4.2.4 - A Railway cannot call upon another Railway to leave a clearance of more than 3 000 mm for the passage of its own pantographs.

o **5 - Gap section of contact lines between different railway systems**

The Railways concerned shall conclude agreements to define the characteristics of the gap section of contact lines.

o **6 - Means for warning staff of the danger presented by high voltage**

In joint stations and sections served by the staff of several Railways, it is necessary to show all the usual warning signs used by each Railway (e.g. skull and lightning symbol; lightning symbol and "Danger of death"). These warning signs shall be placed wherever the regulations of each Railway concerned so require.

o **7 - Steps to be taken to prevent disturbances caused by earth return currents**

As regards joint stations and sections, these measures shall, in each case, form the subject of bilateral agreements.

R 8 - Installations to be provided to enable a driver to repair, if necessary, a locomotive or a motor coach brought to a standstill under a line normally alive

If the Railways deem it necessary, special installations shall be provided in joint stations which make it possible, without interfering with operating in the station, to check and, where necessary, to repair, without danger, the parts of locomotives or motor coaches which are normally at the voltage of the overhead contact line, or which are situated in the vicinity of parts normally subjected to this voltage.

The operating procedure for these installations shall be contained in bilateral agreements.

Bibliography

1. UIC leaflets

International Union of Railways (UIC)

UIC leaflet 605: Protection from corrosion - Measures to be taken on direct current catenaries to reduce the risks on adjacent piping and cable systems, 2nd edition of 1.1.81

UIC leaflet 606-2: Installation of 25 kV and 50 or 60 Hz overhead contact lines, 4th edition of 1.1.86

UIC leaflet 608: Conditions to be complied with for the pantographs of tractive units used in international services, 3rd edition, April 2003

UIC leaflet 611: Regulations governing acceptance of electric locomotives, power cars and multiple-unit sets for running in international services, 6th edition, February 2001

2. Minutes of meetings

International Union of Railways (UIC)

Traction and Rolling Stock Committees (Question 5/A/FIC - Approval of the new version of Leaflet 600 "Electric traction with aerial line"), June 1980

Traction and Rolling Stock Committees (Question 5/A/FIC - Revision of Leaflets. Point 3.1 - Leaflet 600 "Electric traction with aerial contact line"), May 1993

Warning

No part of this publication may be copied, reproduced or distributed by any means whatsoever, including electronic, except for private and individual use, without the express permission of the International Union of Railways (UIC). The same applies for translation, adaptation or transformation, arrangement or reproduction by any method or procedure whatsoever. The sole exceptions - noting the author's name and the source - are "analyses and brief quotations justified by the critical, argumentative, educational, scientific or informative nature of the publication into which they are incorporated".

(Articles L 122-4 and L122-5 of the French Intellectual Property Code).

© International Union of Railways (UIC) - Paris, 2003

Printed by the International Union of Railways (UIC)
16, rue Jean Rey 75015 Paris - France, November 2003
Dépôt Légal November 2003

ISBN 2-7461-0575-6 (French version)
ISBN 2-7461-0576-4 (German version)
ISBN 2-7461-0577-2 (English version)