UIC Code 611

OR

6th edition, February 2001

Translation

Regulations governing acceptance of electric locomotives, power cars and multiple-unit sets for running on international services

Règles à observer en vue de l'agrément des locomotives, automotrices et rames automotrices électriques pour leur circulation en service international
Vorschriften für die Zulassung elektrischer Lokomotiven, Triebwagen und Triebwagenzüge zum Einsatz im internationalen Verkehr

Union Internationale des Chemins de fer
Internationaler Eisenbahnverband
International Union of Railways

UIC

Leaflet to be classified in Section :

VI - Traction

Application :

With effect from 1st January 1997
All members of the International Union of Railways

Record of update :

6th edition, February 2001 Retyped in FrameMaker

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

Warning

Printed by the International Union of Railways (UIC)
16, rue Jean Rey 75015 Paris - France, February 2001
Dépôt Légal February 2001

ISBN 2-7461-0280-3 (French version)
ISBN 2-7461-0281-1 (German version)
ISBN 2-7461-0282-X (English version)

Contents

Summary

Owing to the diversity of railway installations and operating instructions, the use of electric locomotives and power cars which may run over the electrified lines of different railways not only requires compliance with national legislation, but also observance of regulations permitting the unrestricted exchange of tractive units.

This leaflet contains the regulations governing acceptance of electric locomotives, power cars and multiple-unit sets for running on international services.

1 - General

The acceptance of electric locomotives, power cars and multiple-unit sets for running on international services is governed by agreements between the railways concerned. Compliance with the standards specified in this leaflet will in principle lead automatically to acceptance so far as the aspects covered in these UIC standards or leaflets are concerned.

This acceptance will be limited in each case to certain circumstances covered by sections of the relevant standards or UIC leaflets, and which may differ from case to case.

It will also be necessary to check at intervals that the agreement is still valid in the light of any updating of the standards or leaflets concerned.

Any deviation from the specified standards or UIC leaflets shall require special agreement between the railways concerned.

The same shall apply to points for which no standard or leaflet is specified, or for aspects not covered in the standards or leaflets concerned.

This leaflet also repeats the specific regulations to which multi-system vehicles must conform.

2 - Scope of application

These regulations apply to locomotives, power cars and multiple-unit sets running over certain electrified lines of different railways and which may, in particular, be of "multi-system" design, i.e. capable of operating under at least two power-supply systems.

o 3 - Matters to be covered by agreements prior to the use of locomotives, power cars and multiple-unit sets on international services

3.1. - Vehicle gauge:*UIC Leaflets 505-1* or *506*.

3.2. - Maximum load per axle and per linear metre.

Reserved: *UIC Leaflet 660* (point 3.3) applies.

3.3. - Running over switches and crossings.

3.4. - Running over small radius curves: *UIC Leaflet 645*.

3.5. - Buffing and draw gear: *UIC Leaflet 520* (conventional coupling) or *522* (automatic coupling). For the latter see point 4.1 - page 7 of the present Leaflet.

Buffer head dimensions: *UIC Leaflet 527-1*.

3.6. - Rail guards, sand distributors.

3.7. - Braking: *UIC Leaflets 540*, *541-03*, *541-04*, *541-05*, *541-06*, *541-07*, *541-1*, *541-2*, *541-3*, *541-4*, *541-5*, *542*, *543*, *544-1*, *544-2*, *545*, *546* and *547* apply.

- Description of the braking system and braking power, evaluated as specified in the above leaflets.

Pending: Braking systems which do not rely on frictional contact (*UIC Leaflet 541-06* applies).

3.8. - Traction and electric braking performance which are not necessarily identical under all power supply systems.

Pending: *UIC Leaflet 660* (points 5.1, 5.2 and 5.3) applies.

- force/speed curves as a function of the supply voltage: see point 4.2 - page 7 of this Leaflet.

3.9. - Conditions of current collection, including those applicable when the train is stationary and during starting: *UIC Leaflet 608* applies.

Collection quality: Pending.

3.10. - Conditions which must be observed to prevent any interference with the functioning of signalling and telecommunications circuits, and of generators and motors which are part of the supply system (impedance, harmonics, etc.): *UIC Leaflets 512*, *737-3* and *737-4* apply.

3.11. - The most severe conditions which the protection and disconnection devices must withstand (short-circuit impedance, conditions for sub-station disconnection, etc.).

Pending.

3.12. - Special conditions, such as climatic conditions, to which the vehicles may be exposed.

3.13. - Supply voltage (form, overvoltage, ...) including that from regenerative braking: *UIC Leaflet 600* applies.

3.14. - Automatic control system: *UIC Leaflets 641* and *651* (point 4.3.2.6) apply.

3.15. - Other essential safety devices (repeating and recording of signals, automatic train stop, ...)

Pending: *UIC Leaflet 660* (points 2.1 and 2.2) applies.

3.16. - Characteristics of display units and speed recorders.

3.17. - Measures to be taken to avoid risks of accident to persons from contact with live parts (prevention of access, locking, earthing, etc.): *European Standard EN 50153* and *UIC Leaflets 533*, *552* apply. See point 4.3 - page 7 of the present Leaflet.

3.18. - Train signals (visible, audible and radio) and external lighting: *UIC Leaflets 532*, *534*, *643* and *644*.

Pending: *UIC Leaflet 660* (points 2.7 and 3.9.1) applies.

3.19. - Plates, inscriptions, markings and symbols for staff: *UIC Leaflets 545* and *640* apply. See point 4.7 - page 8 of the present Leaflet.

3.20. - Electric power supply to trains: *UIC Leaflets 550* and *552* apply.

3.21. - Basic wiring diagram of the main and auxiliary circuits.

3.22. - Power factor: *UIC Leaflet 660* (point 1.6) applies.

3.23. - Emergency device for raising the pantograph. See point 4.5 - page 8 of this Leaflet.

3.24. - Safe running and standard of ride: *UIC Leaflets 515-0*, *515-1*, *515-3*, *515-4*, *515-5*, *518*, *615-0*, *615-1* and *615-4* apply.

3.25. - Alarm signals: *UIC Leaflet 541-1* applies.

Pending: Alarm signal with emergency-brake override.

3.26. - Internal (driver - train staff) or external (ground to train radio) public address and communication systems: *UIC Leaflets 556*, *558*, *568*, *751-1*, *752* and *751-3* apply.

3.27. - Equipment for fire prevention and firefighting in the traction units concerned: *UIC Leaflet 642* applies.

3.28. - External noise generated by the traction unit in use:

- while stationary,

- at maximum speed.

Pending: *UIC Leaflet 660* (point 8.1) applies.

3.29. - Measures for the comfort and protection of staff (design of the driving cab, ergonomics, overall view, lighting, air-conditioning, noise, ...): *UIC Leaflet 651* applies.

Pending: *UIC Leaflet 660* (point 3.5.2 and 3.5.3) applies.

3.30. - Loading of the vehicle body: *UIC Leaflets 566* and *651* apply.

Pending: *UIC Leaflet 660* (points 3.5.2 and 3.5.3) applies.

3.31. - Couplings for the electrical and compressed-air lines: *UIC Leaflet 648* applies.

3.32. - Characteristics of wheels and axles: *UIC Leaflet 510-2* applies.

3.33. - Clearances to be provided at the ends of vehicles: *UIC Leaflet 521* applies.

3.34. - Technical features of vehicles:

- running gear: *UIC Leaflets (81 series)* apply,
- suspensions, buffing and draw gear: *UIC Leaflets (82 series)* apply,
- braking equipment: *UIC Leaflets (83 series)* apply,
- rolling stock: *UIC Leaflets (84 series)* apply,
- traction units: *UIC Leaflets (85 series)* apply.

4 - Regulations requiring special attention in the formulation of agreements between the railways concerned

4.1 - Buffing and draw gear

If power cars are equipped with coupling gear which does not conform to the provisions of *UIC Leaflet 520*, then emergency equipment on the power car (match coupling) shall enable power cars to be hauled, in an emergency, by traction units with couplers conforming to *UIC Leaflet 520*.

4.2 - Performance levels

The power of tractive units and the tractive forces corresponding to the running speeds used in timetable planning shall be specified, for the various supply systems, on the basis of the voltage ratings listed in *UIC Leaflet 600*.

The limit values for current collection depending on the available voltage shall also be specified.

4.3 - Precautions for the protection of staff

High-voltage equipment shall be accessible only after appropriate measures have been taken to eliminate all risk to staff.

These measures, conforming to the provisions of *European Standard EN 50153*, shall not only cut off the power from the supply network, but shall also ensure special protection against:

- spontaneous power backfeed,
- residual voltages due to capacitors or rotating machines,
- fall of contact wire,
- induced voltages,
- etc.

The measures adopted to meet the provisions of *Standard EN 50153* may vary, depending on the operating procedures and practices of the railways concerned. They shall be set out in multilateral agreements which take national regulations into account.

Pending: *UIC Leaflet 660* (point 7.4) applies.

4.4 - Electrical power supply to trains and safety equipment

Locomotives shall be capable of supplying trains with electric power under the conditions defined in *UIC Leaflet 552*.

A protective device against overvoltages which could damage the train busbar shall be provided on tractive units.

The safety of staff responsible for handling the train busbar couplers shall be ensured by measures similar to those described under point 4.3 - page 7 above.

4.5 - Emergency device for raising the pantograph

An emergency device (independent compressed-air supply, pump, battery-operated compressor, direct manual control, etc.) shall be provided to ensure that the pantograph can be raised even when there is a lack of compressed air in the main air reservoirs (starting after long stationary period).

4.6 - Power cars and multiple-unit sets

With regard to the agreements covering sections of power cars and multiple-unit sets reserved for passengers, the railways shall take into consideration the relevant UIC Leaflets, in particular *Leaflets 513*, *550-1*, *553*, *555*, *557*, *560*, *561*, *562*, *563*, *564-1*, *564-2*, *565-1*, *565-2*, *565-3*, *567*, *567-1*, *567-2*, *567-3*, *580* and the *RIC Regulations*.

Pending: *UIC Leaflet 660* (point 3.6.1: pressure sealing), (point 6.1: closing of doors) and (point 9.2: acoustic comfort) applies.

4.7 - Notices and inscriptions for staff

All information on tractive units shall be either in the form of pictograms (*UIC Leaflet 640*) or in the national languages of each country in which the vehicles are intended to run.

If the information is in text form, the railways shall agree to provide a translation either on the actual inscriptions or in a reference list for the staff.

5 - Special regulations applicable to multi-system locomotives

o 5.1 - Limits of voltage and frequency variations

The whole of the electrical equipment shall continue to operate correctly throughout the entire range of voltage and frequency variations likely to occur in the different power supply systems. The limits of these voltage and frequency variations are defined in *UIC Leaflet 600*. Railways shall specify the maximum values which the voltage may reach, even for a short time, when tractive units with regenerative braking are likely to run over the same supply section as multi-system tractive units.

Pending: *Standard EN 50163.*

o 5.2 - Electrical equipment components

The various components of the electrical equipment of multi-system tractive units shall be designed and dimensioned to operate normally with the current and voltage levels of the various supply systems they are likely to encounter, and under the special conditions of certain lines.

All pantographs and the various parts of the roof cable(s) shall be insulated for the maximum voltages to earth likely to occur in the overhead line.

If the tractive unit can be operated with alternating current, a disconnecting switch shall be interposed ahead of the disconnecter used for direct current. This disconnecting switch shall have a spark gap between the open contact blades corresponding to the maximum single-phase high voltage to be taken into consideration. This disconnecting switch shall be in the open position when the roof cable is not live or when a.c. voltage is present.

5.3 - Precautions for the changeover from one power-supply system to another

o **5.3.1. -** At the interfaces between the different power-supply systems, a "neutral section" insulated from the adjoining sections shall be provided. The length of this section and its design shall be determined by mutual agreement between the railways concerned.

o **5.3.2. -** The device provided on power cars, multiple-unit sets and locomotives for the changeover of the supply voltage shall permit the changeover to be made while the tractive unit is in motion.

o **5.3.3. -** Devices for system selection, so-called "system sensors" connected to the roof cable, shall be provided.

These system sensors shall have a dual function:

- automatic disconnection on the vehicle if the voltage disappears from the roof cable,

- prevention of closure of the power-circuit contactors and disconnecting switches if the circuits of the tractive unit are switched for a nominal voltage differing from that present at the roof cable.

The system sensors shall contain a voltage and/or frequency relay.

O **5.3.4. -** The voltage changeover operation shall involve, before running into the neutral section, opening of the main circuit-breaker and separation, from the roof cable, of all equipment connected to it except for the system sensors. Where this opening is not effected manually, it shall take place automatically on passing through the neutral section.

O **5.3.5. -** The operation shall include the lowering of pantographs:

- if required under the conditions of *UIC Leaflet 608*,

- if there is a risk of creating, via the raised pantographs, an electrical connection between two catenaries separated by the neutral section.

O **5.3.6. -** After passing through the neutral section, the re-energization shall involve operation of one or more switches or changeover switches, raising of the pantograph(s) as necessary, and closing of the master circuit-breaker or interrupter.

5.3.7. - It is recommended that a display unit be provided to inform the driver for which power-supply system the tractive unit is prepared.

Bibliography

1. Minutes of meetings

International Union of Railways
"Rolling Stock Committee: Question 5/A/FIC - Leaflet 611 - Regulations for the acceptance of electric locomotives, power cars and multiple-unit sets for running on international services. Point 2.1 - Approval of revised leaflet", Paris, March 1996

2. European standards

EN
"EN 50153 Standard: Railways applications. Rolling stock. Protective provisions relating to electrical hazards", 1996

"EN 50163 Standard: Railways applications. Supply voltages of traction systems", 1995