UIC CODE 541-08

4th edition, June 2007

Translation

OR

Brakes - Regulations concerning the manufacture of the different brake parts - Derailment detectors for wagons

Freins - Prescriptions concernant la construction des différents organes de frein - Détecteurs de déraillement pour wagons
Bremsen - Vorschriften für den Bau der verschiedenen Bremsteile - Entgleisungsdetektoren für Güterwagen

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

Leaflet to be classified in Volume:

V - Transport Stock

Application:

With effect from 1 June 2007
All members of the International Union of Railways

Record of updates

1st edition, December 2000	First issue exists only in French and German
2nd edition, August 2001	Approval of derailment detector EDT 100, Amendment to appendix A
3rd edition, November 2006	Publication of the Appendix A on the UIC website.
4th edition, June 2007	New limit values for the accelerations in points 1.1.1.1 and 1.1.1.2

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

Contents

Summary

The purpose of a derailment detector is to stop the train by activating automatic application of the brakes or to send a signal to the train driver when its triggering threshold has been reached following a wagon derailment.

The derailment detector cannot prevent derailments. Its presence on a vehicule should never be used as an excuse for cutting back or compromising on preventive vehicule maintenance.

The pneumatic derailment detector monitors vertical accelerations at wagon-body level and, when its triggering threshold is reached, opens a large aperture to exhaust the main brake pipe to atmosphere.

The electronic derailment detector does not necessarily cause the main brake pipe of the vehicle concerned to open. If the train is equipped with a train control-command and diagnosis system, the detector can transmit an advance warning and derailment signal to the driver.
(The relevant conditions have not yet been defined in this leaflet).

Accelerations occurring in normal service should not trigger the derailment detector.

It is crucial that, in the event of a derailment, the vertical acceleration occurring at the point where the derailment detector is to be fitted exceeds the triggering threshold of the detector. This applies irrespective of the load conditions and speed of the wagon.

The derailment detector should be designed to operate on lines that meet the quality standards laid down in *UIC Leaflet 518, Appendix D (QN1-QN3).*

1 - Pneumatic derailment detector

o 1.1 - Functional and technical data

1.1.1 - Triggering threshold (sensitivity)

1.1.1.1 - The derailment detector (see Glossary - page 11) must cut in at vertical accelerations ≥ 11,5 g in the frequency range of 0-100 Hz (see List of abbreviations - page 12).

1.1.1.2 - The derailment detector should not cut in at vertical accelerations ≤ 6,5 g in the frequency range of 0-100 Hz.

1.1.1.3 - Horizontal shocks of up to 30 g should not trigger the detector.

1.1.1.4 - The derailment detector must be able to operate in the temperature range of - 40 °C to + 70 °C.

1.1.1.5 - The derailment detector must be able to operate at a nominal pressure of between 4 and 6 bar in the main brake pipe (see Glossary - page 11).

1.1.1.6 - The detector should not be triggered by service and emergency braking (see Glossary - page 11) applications, or by brake release. Filling strokes from the driver's brake valve of up to 10 bar lasting 30 seconds should not accidentally trigger the detector, nor cause damage to it. The subsequent operation of the detector must not be affected.

1.1.1.7 - When the pneumatic derailment detector is triggered, an aperture of at least 19 mm diameter is opened between the main brake pipe and atmosphere, causing an automatic application of the brakes (see Glossary - page 11). The air draining capacity should be such that the pressure contained in a reservoir of 400 litres (connected in place of the main brake pipe) drops by 1.5 bar within a maximum of 3 seconds (see verification model in *UIC Leaflet 541-03, Appendix 1* (see Bibliography - page 13)).

1.1.2 - Status indicator device

1.1.2.1 - All derailment detectors should indicate their triggered state with a red light.

1.1.2.2 - This status indicator device must be visible from both sides of the wagon. If this is not possible for design reasons (e.g. articulated vehicle), the derailment detector must be visible from one side of the wagon. The other side of the wagon should carry an appropriate marking which will subsequently be included in *UIC Leaflet 545* (see Bibliography - page 13).

1.1.2.3 - The status indicator may only be reset manually and when the main brake pipe pressure is between 0 to 6 bar.

1.1.3 - Isolation

1.1.3.1 - It must be possible to isolate derailment detectors by means of an isolating cock.

1.1.3.2 - When in the "on" position, the handle of the isolating cock must be positioned vertically downwards.

1.1.3.3 - The isolating handle should be coloured yellow.

1.1.4 - Reset

Following triggering of the derailment detector and subsequent activation of automatic application of the brakes, the device must automatically return to its initial position (automatic reset) once the pressure in the main brake pipe has dropped to below 0,5 bar. This can be done by stopping the return air supply to the main brake pipe.

The status indicator device shall remain in the same position and will be manually reset.

1.2 - Fitting instructions

1.2.1 - Quantity

O **1.2.1.1 -** To ensure all possible derailed axles can be detected, derailment detectors should be fitted to both ends of the wagon.

R **1.2.1.2 -** When articulated vehicles or permanently-coupled units are used, it is recommended that a further derailment detector be mounted at a suitable point close to the intermediate running gear.

O 1.2.2 - Mounting

1.2.2.1 - Derailment detectors should be mounted on the wagon body (preferably on the headstock between the draw hook and the buffers) by means of a rigid mechanical connection.

1.2.2.2 - The derailment detector should be mounted in such a position that the isolating cock is easily accessible and the status indicator device clearly visible.

1.2.3 - Air volumes

O **1.2.3.1 -** The connecting pipes should have a clear cross section of at least 19 mm diameter.

R **1.2.3.2 -** Care should be taken to ensure that the increase in air volume inside the main brake pipe caused by the connecting pipes be kept as low as possible and that there be as few bends as possible.

R **1.2.3.3 -** The additional air volume generated by each derailment detector should not exceed the following limit values:

- Retrofitting of existing wagons $V_{total} = 500\ cm^3$
- New conventional-design wagons $V_{total} = 250\ cm^3$

O

1.2.4 - Markings / inscriptions on the wagon

1.2.4.1 - Wagons equipped with derailment detectors should carry a marking on both ends of the wagons on the sole-bar close to the detector, in accordance with *UIC Leaflet 545*.

NB : the marking in question is currently shown in Appendix B - page 9 to this leaflet but will subsequently be incorporated into *UIC Leaflet 545*.

1.2.4.2 - Wagons on which the derailment detectors are only visible on one side should carry a marking on the opposite side as specified in *UIC Leaflet 545*

NB : the marking in question is currently shown in Appendix C - page 10 of this leaflet but will subsequently be incorporated into *UIC Leaflet 545*.

1.2.4.3 - Derailment detectors should carry an identification plate.

1.3 - Series tests and service testing

O

1.3.1 - Series tests

All derailment detectors shall undergo a final test by the manufacturer. During the test, at the very least the limit values referred to in points 1.1.1.1 and 1.1.1.2 - page 2 should be checked at room temperature. The test bench should be calibrated accordingly.

R

1.3.2 - Service checks

To ensure that the derailment detector is working properly, the following checks are recommended:

- visual check of the following points during each full brake test:
  - derailment detector activated (isolating cock open)
  - status indicator button depressed;
- periodic check of the derailment detector fastenings and their proper working to the RU's requirement.

2 - Electronic derailment detector

reserved

3 - Type-approval for international traffic of derailment detectors directly connected to the main brake pipe

These derailment detectors must be approved by the UIC Study Group 5 "Braking".

3.1 - Approval procedure

Member railways shall submit requests for type approval of a derailment detector in international traffic to the UIC SG 5. A report summarising the tests concluded shall be provided (in two of the three UIC languages, 20 copies per language).

The SG 5 shall decide on the conditions for type approval and reserves the right to refuse approval under certain circumstances.

3.2 - Request for type-approval tests

This request should be accompanied with the following documents:

- a technical desciption of the derailment detector, its operation and testability;
- triggering values (sensitivity);
- application limits;
- standards applied;
- documents on reliability, maintainability, availability and safety (FMEA) fault-tree analysis (see List of abbreviations - page 12);
- a report on tests carried out on test bench;
- a report on tests in service.

3.3 - Type-approval tests

The nature and scope of tests are described below; the procedure for type-approval shall be defined by the UIC SG 5.

3.3.1 - Bench tests

The conditions specified in points 1.1.1.1, 1.1.1.2 and 1.1.1.4 - page 2 should be checked on a variable frequency vibrator allowing values to be recorded at temperatures of - 40° C, + 20° C and + 70° C. A main brake pipe with a variable pressure of 4 to 6 bar should also be connected. The conditions specified in points 1.1.1.3 and 1.1.1.5 to 1.1.1.7 - page 2 should be tested at room temperature.

3.3.2 - Service tests

Tests should be carried out in revenue service on a minimum of 20 vehicles for a period of one year. The test report must confirm among other things that no accidental triggering occurred in revenue service and that the detectors were checked for working condition at the end of the test.

3.4 - Type-approval

A list of approved derailment detectors shall be compiled by UIC and published in Appendix A - page 8.

UIC Headquarters shall keep the list of approved derailment detectors up-to-date.

The fitting of an approved derailment detector should be carried out in consultation with the manufacturer, the vehicle owner and the user RU, with due account taken of the specific characteristics of the vehicle.

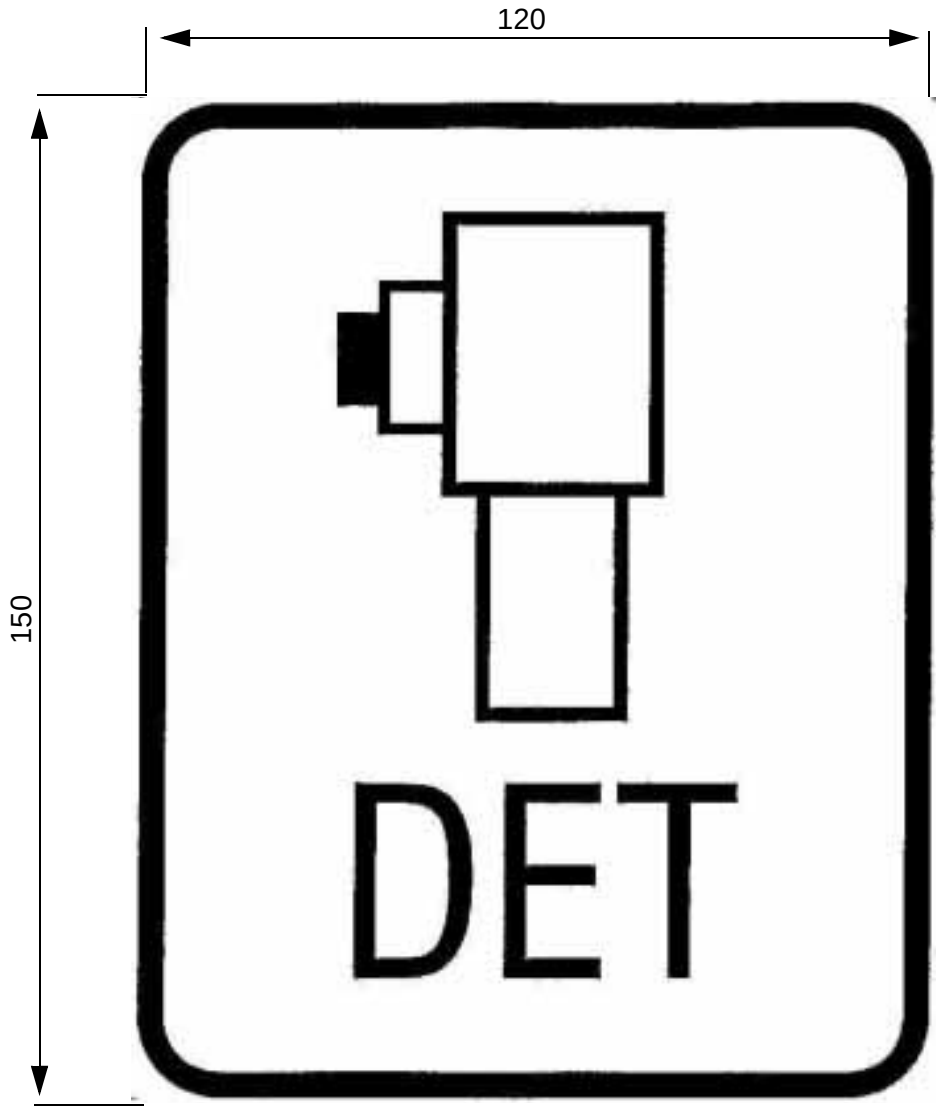
This leaflet only covers the mandatory or recommended technical conditions for the derailment detector. Its application is therefore not mandatory.

Appendix A - List of approved derailment detectors

The liste of approved derailment detectors can be consulted on the UIC website: http://www.uic.asso.fr/ Activities/Technology&Research/Catalogue of products technically approved by UIC.

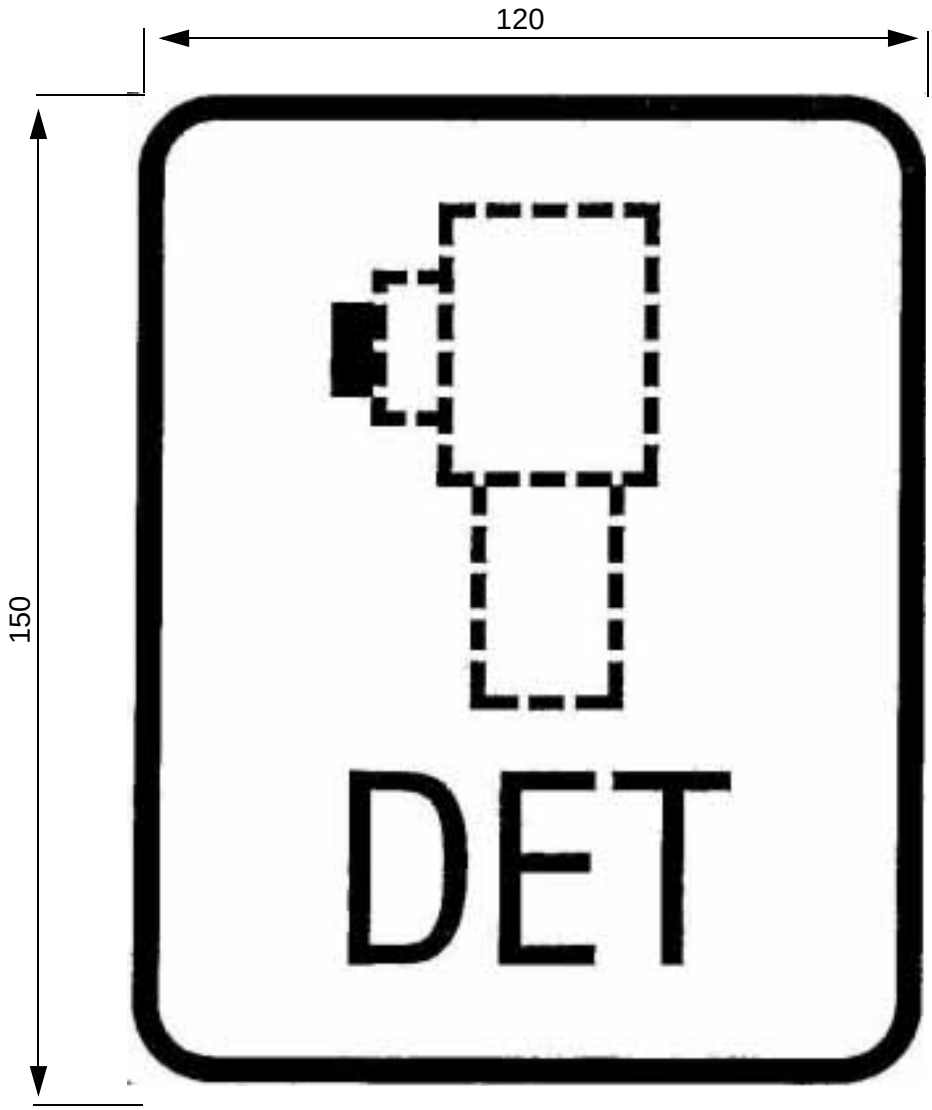
Appendix B - Marking / Inscription on the wagon

to be affixed to both sides of the wagon when the derailment detector is clearly visible



Appendix C - Markings / Wagon lettering and numbering

to be affixed to the side of the wagon on which the derailment detector is not clearly visible



Glossary

Derailment detector — Derailment detectors for wagons are devices that diagnose implausibly high vertical acceleration values on the vehicle and assume a derailment has occurred. As a result, automatic application of the brakes is activated or an alarm triggered. The derailment itself cannot be pre-empted.

Automatic application of the brakes
Activation of a rapid drop in main brake pipe pressure caused by the triggering of a monitoring device, e.g. derailment detector.

Full service braking — Maximum service braking with a drop in pressure of 1,5 bar in the main brake pipe.

Main brake pipe — Also known as train line, a continuous pipe of compressed air charged at a working pressure of 5 bar, which connects the driver's brake valve to the vehicle braking equipment in the train, controls the application and release functions, and recharges the auxiliary reservoir following braking.

Emergency braking — Rapid draining of the main brake pipe with the driver's brake valve in the rapid braking position to obtain the maximum braking effect.

Service braking — Based on the operating situation, graduated braking with a maximum drop in pressure of 1,5 bar in the main brake pipe and graduated release.

List of abbreviations

FMEA	Failure Modes and Effects Analysis
g	Standard value for gravitational acceleration; 1g = 9,80665 m/s^2
Hz	Hertz; Unit for measuring frequency, Hz = sec^{-1}
RU	Railway Undertaking

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Warning

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