

UIC CODE

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2nd edition, April 2002

Translation

OR

Conditions for the acceptance of draw-only automatic couplers

*Conditions d'homologation pour l'attelage automatique de simple traction
Zulassungsbedingungen für die automatische Zugkupplung*



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

Leaflet to be classified in Volumes :

IV - Operations

V - Traction stock

Application :

With effect from 1 July 1995

All members of the International Union of Railways

Record of updates

1st edition, July 1995

First edition

2nd edition, April 2002

Retyped in FrameMaker and Appendix A, the List of Abbreviations and Glossary added

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

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Printed by the International Union of Railways (UIC)

16, rue Jean Rey 75015 Paris - France, April 2002

Dépôt Légal April 2002

ISBN 2-7461-0247-1 (French version)

ISBN 2-7461-0248-X (German version)

ISBN 2-7461-0249-8 (English version)

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Summary

The UIC developed an automatic buffing and draw coupler (UIC 69E/Intermat automatic coupler) for the European railways jointly with the OSJD in the 1960s. The migration to the automatic coupler which was to take place in a single brief period given the type of system concerned, has been suspended to date for financial reasons.

When more simple financial solutions were sought for an automatic coupler, an automatic draw-only coupler was proposed which:

- transmits only traction forces and with which side buffers are retained,
- couples the main brake pipe automatically,
- includes an integrated mixed coupler so that it can be coupled manually with vehicles equipped with screw couplers in order to allow for gradual migration.

The following acceptance conditions have been drawn up for use of automatic draw-only couplers in international traffic. Point 2 specifies the acceptance tests required to ascertain compliance with acceptance conditions.

1 - Technical and operational conditions for the draw-only automatic coupler (DAC)

o 1.1 - General

1.1.1 - The DAC (see [List of abbreviations - page 24](#)) may transfer only the traction forces. The compressive forces will be absorbed by the side buffers.

1.1.2 - The DAC should be so designed that it can be installed on vehicles prepared in accordance with *UIC Leaflet 530-1 and 567-3* respectively for automatic buffing and draw coupling, while retaining the non-continuous draw-gear as defined in *UIC Leaflet 520* and the side buffers of *UIC Leaflet 526-1, 526-2, 526-3 and 528* respectively.

1.1.3 - The DAC should be directly compatible with current screw coupling systems (mechanical and pneumatic), without requiring physical modifications to vehicles equipped with screw couplings. In the case of vehicles not constructed in accordance with UIC regulations, modifications may be necessary. The conditions covering the design of combined couplers are set out in points [1.7 - page 7](#) and [1.8 - page 8](#).

1.1.4 - The DAC should be so designed as to permit coupling to an automatic buffing and draw coupling, which in turn may be directly coupled to an SA3 coupler. If this condition is not satisfied, the reasons for this should be stated and possible solutions, together with their costs and implementation times, should be indicated.

1.1.5 - All variants of the DAC must be directly compatible with one another from the mechanical, pneumatic and, where applicable, electrical standpoint. Variants of the DAC shall not affect operating conditions. The principles of interaction are set out in [Appendix A - page 12](#), Coupling and Uncoupling.

1.1.6 - The DAC shall be so constructed and installed on vehicles that:

- the side buffers do not impede coupling or uncoupling on curves or the negotiation of curves, in accordance with the conditions of point [1.3 - page 4](#);
- in train running, no jerks or surges may be initiated which could create greater risks than those currently accepted for existing couplers used for each of the various train classes and speeds concerned.

1.1.7 - It should be possible to discharge individual open freight wagons equipped with DAC on wagon tipping installations.

1.1.8 - It should be possible for all operations necessary to actuate the DAC to be carried out by one person alone without moving from one side of the track to the other. Exceptions to this may be granted if both couplers need to be in the "long position" to negotiate curves of radius ≤ 135 m.

1.1.9 - The space currently provided for coupling/uncoupling screw couplings (Berne rectangle) shall, so far as possible, be maintained. Limited use of this space may be authorised by the UIC after examination. This examination shall cover in particular:

- the assessment of risks,
- the drafting of operating instructions,

- the development of any special equipment,
- the defining of an operating procedure for the CDC (see List of abbreviations - page 24).

1.1.10 - Temperature and environmental factors shall not affect the functioning and operation of the DAC (see List of abbreviations - page 24) more adversely than when screw couplings are used.

1.1.11 - The weight of the DAC shall not exceed 200 kg per coupler.

1.1.12 - Vehicles and loads may not be damaged by the buffing impacts occurring during the splitting-up of a train, nor should these impacts exceed the maximum values for conventional couplers.

1.2 - Actuation of the DAC

- **1.2.1** - The risks of errors, omissions or faulty operation of the DAC by operating staff shall not be greater than those arising from corresponding operations with conventional couplers.
- 1.2.2** - Appendix B - page 13 gives a comparison of the activities and functions involved in the various operations.
- **1.2.3** - Each DAC shall be provided with a device to permit the safe and easy release, from each side of the track, of DACs coupled together, by operation of only one device.
- **1.2.4** - When vehicles are at a standstill or moving at a speed of up to 1,8 m/s with a tensile force of zero N, it must be possible to release the DAC. It must also be possible to release the DAC when vehicles at a standstill are under a moderate tensile force.
- 1.2.5** - The locking control mechanism should as far as possible be standard for all vehicles.
- 1.2.6** - Actuation operations
 - **1.2.6.1** - The operations necessary for actuation should be identical for all freight vehicles.
 - 1.2.6.2** - Variations in the mode of operation may be authorised for passenger vehicles and traction units.
- 1.2.7** - Positioning of handles
 - **1.2.7.1** - The handles of the locking mechanism should be placed as far as possible to the vehicle side and as close as possible to the vehicle end.
 - 1.2.7.2** - For passenger coaches it is recommended that the locking mechanism be designed so as to make unauthorised uncoupling difficult.
- **1.2.8** - The actuating mechanism for the locking system shall permit the deflections of the coupler which occur in operation including the associated spring travel.
- **1.2.9** - The actuating mechanism shall be so designed that the shunter's platform may be used safely, both when the vehicle is moving and also when at a stand.
- **1.2.10** - The locking mechanism shall be so dimensioned that forces of 1000 N may be transferred at the handle without plastic deformation.

- **1.2.11** - The "coupling impossible" position shall not be cancelled unintentionally, even under buffing impacts.
 - **1.2.12** - The construction and layout of the actuating mechanism shall allow for enlargement of the left-hand end step of freight wagons (*UIC Leaflet 535-2*).
 - **1.2.13** - It shall be possible to adjust the locking mechanism of the DAC ([see List of abbreviations - page 24](#)) so that, after release, the following conditions are satisfied:
 - the coupler heads shall remain released until the vehicles are separated;
 - the coupler heads shall, as desired, either be ready for coupling or incapable of coupling again after the vehicles are separated.
 - **1.2.14** - Adjustment of the "coupling impossible" position with 2 hands is permissible. It shall be possible to cancel the "coupling impossible" position using one hand, up to a vehicle speed of 3 m/s.
 - **1.2.15** - The design and layout of the locking mechanism should allow for automation of the setting and cancelling of the "coupling impossible" position and the release of the DAC.
 - **1.2.16** - It shall be possible to recognise the position of the locking mechanism from either side of the vehicle by means of a simple indicator, so that in the event of faults or of any incidents in the train, the position of the locking mechanism may be clearly established.
 - **1.2.17** - The normal position of the actuating mechanism shall be clearly recognisable.
 - **1.2.18** - It must be possible to override the horizontal force of the resetting mechanism of the DAC in the centre position by a force exerted directly by hand. It shall be possible to fix the DAC in the deflected position, in order to facilitate coupling on tight curves. This fixing shall automatically release after coupling, at the latest during coupler deflections against the deflected position, e.g. when running on straight line. Safe vehicle running shall not be impaired by this facility.
 - **1.2.19** - Any risks threatened by incorrect operation shall be investigated.
 - **1.3 - Coupling on and negotiation of curves, humps in marshalling yards and ferry ship ramps**
 - **1.3.1** - The complete coupling of two vehicles with DAC shall take place automatically, apart from the exceptions allowed for under points [1.3.3 - page 4](#) and [1.3.9 - page 5](#), without assistance or supervision, at the moment of coming together.
 - **1.3.2** - Correct coupling shall be ensured:
 - on straight and curved track, in accordance with condition 1.3.3, at buffing speeds of 2 km/h up to at least 7 km/h;
 - on curves, in accordance with point [1.3.5 - page 5](#), at walking pace (roughly 5 km/h).
- The DAC shall however withstand buffing speeds of up to 15 km/h without damage.
- **1.3.3** - With provision for the handling area specified under point [1.4.2 - page 5](#), it shall be possible for vehicles with DAC to be coupled as follows:

- without manual assistance:
 - on straight track,
 - on curves and at the transition between straight line and curves,
 - of 150 m radius for freight wagons, locomotives and service vehicles,
 - of 250 m for passenger coaches and service vehicles of coach design;
- with manual assistance:
 - on curves and reverse curves of at least 190 m radius without an intermediate straight section,
 - on curves and reverse curves of at least 150 m radius with a minimum 6 m intermediate straight section.

1.3.4 - It shall be possible, with vehicles previously coupled in the close coupled position, to negotiate:

- curves and reverse curves of at least 190 m radius without an intermediate straight section,
- curves and reverse curves of at least 150 m radius with a 6 m intermediate straight section.

1.3.5 - Coupling on tight curves and also negotiation of such curves shall be possible under the same conditions as for screw couplings (maximum length of the screw coupling, less one turn of the screw), using aids where necessary.

1.3.6 - The DAC (see [List of abbreviations - page 24](#)) shall not release unintentionally. On negotiation of tight curves, a DAC not in the long position shall not release unintentionally; nor may it be so damaged, or so damage the vehicle, that a dangerous situation could arise.

1.3.7 - It shall be possible for coupled vehicles to pass over marshalling humps with the profile specified in [Appendix C - page 15](#), without risk of uncoupling.

1.3.8 - It shall be possible to uncouple vehicles on all sides of the marshalling hump, taking condition [1.2.4 - page 3](#) into account; passenger coaches may be in the "long-coupled" position if necessary.

1.3.9 - It shall be possible to push vehicles with unlocked DAC over all points of the marshalling hump without risk of damage to the DAC.

1.3.10 - The DAC shall be so designed and installed that coupled vehicles may negotiate ferry ship ramps with a maximum ramp incline of 3°30', with a maximum twist of 5° over 24 m length, without risk of uncoupling.

1.4 - Coupler heads (characteristics, design)

- **1.4.1** - The coupler head shall be designed on the basis of the Willison (see [Glossary - page 25](#)) principle.
- **1.4.2** - The side handling area of the DAC measured from the centre line of the vehicle, shall be 190 mm to both sides.
- **1.4.3** - DACs shall still couple reliably with a vertical difference of 120 mm at the coupler centre lines.
- **1.4.4** - The height of the coupler head, measured from the centre line to the top edge of the coupler, shall however not exceed 200 mm.

- **1.4.5** - The DAC (see [List of abbreviations - page 24](#)) shall meet the following specifications:
 - minimum yield point 500 kN;
 - minimum tensile strength 1000 kN.
- 1.4.6** - The coupler mechanism shall contain as few springs as possible.
- **1.4.7** - The fracture or relaxation of a spring shall not lead to the unintended release of the DAC.
- **1.5 - Installation of the coupler on vehicles**
 - 1.5.1** - The height of the centre line of the DAC measured vertically over top of rail in the rest position shall be:
 - at least 950 mm with fully-loaded vehicles and at the limit of wear;
 - no more than 1045 mm with empty vehicles and in new condition.
 - 1.5.2** - The uncoupled DAC shall never, at points on the track at which coupling must be possible (point [1.3.3 - page 4](#)), assume a position in which damage to DAC and vehicles may occur in the event of coupler failure.
- **1.6 - Automatic coupling of the air pipe**
 - 1.6.1** - The DAC shall be so designed that, on coupling of two vehicles, the main brake pipe is automatically coupled simultaneously.
 - 1.6.2** - It shall be possible to open and close by hand the air shut-off cocks of vehicles equipped with DAC, from either side of the vehicle, without having to step between vehicles.
 - 1.6.3** - The handles of the operating device for the air shut-off cock of the main brake pipe shall be placed as far as possible to the vehicle side and as close as possible to the vehicle end, and shall be clearly distinguished from the handle of the locking mechanism.
 - 1.6.4** - The position of the air shut-off cocks shall be clearly visible from both sides of the vehicle. In accordance with *UIC Leaflet 541-1*, the indicator should be horizontal for "air shut-off cock open" and vertical for "air shut-off cock closed".
 - 1.6.5** - The operations necessary for actuation of the air shut-off cocks shall be identical for all DAC-equipped vehicles.
 - 1.6.6** - The operating device for the air shut-off cock shall not allow ill-considered or unintentional actuation.

1.6.7. - The main brake pipe of the DAC (see List of abbreviations - page 24) shall not have any tighter curvature than the UIC brake-hose coupling between the orifice seal of the hose coupling and the air shut-off cock, and shall be arranged so as to be free from water pockets when uncoupled. The free passage of air through the full hose cross-section of 32 mm diameter shall be ensured; in justified cases, the hose cross-section may be adapted to the circumstances of the UIC brake-hose coupling. The principle is that the flow resistance in the area of the coupling point (including air shut-off cocks) during venting by emergency braking from 5,0 bar to 3,5 bar shall not be more adverse than that obtained with the present brake coupling connection.

1.6.8 - In the event of accidental train division, the main brake pipe shall not automatically be sealed. It must immediately vent automatically.

1.6.9 - The orifice seal of the hose coupling shall be capable of replacement, using simple aids if necessary, without separation of the vehicles.

1.6.10 - The hose couplings shall be leakproof between 0,8 bar underpressure and 10 bar overpressure.

1.7 - Mechanical combined draw coupler (CDC)

- **1.7.1** - The CDC (see List of abbreviations - page 24) is used for manual physical connection of vehicles with DAC and those with screw couplings. It is permissible to step between the vehicles for this purpose.
- **1.7.2** - The CDC is designed to transmit only traction forces. Compressive forces are absorbed by the side buffers.
- **1.7.3** - The CDC shall not restrict the free formation of trains and sets of wagons.
- **1.7.4** - The CDC shall not impede the coupling of two vehicles with DAC.
- **1.7.5** - It shall be possible for all operations involved in use of the CDC to be performed safely and with reasonable expenditure of effort by one person alone. The time required for this shall not exceed that needed in connection with the current screw coupling system.
- **1.7.6** - The CDC shall not restrict the "Berne rectangle".
- **1.7.7** - The CDC shall be of simple design and low weight.
- **1.7.8** - In the coupled state or after uncoupling, the CDC may assume no position in which it could be damaged or might cause damage to vehicles or their components, even with the buffers fully compressed.
- **1.7.9** - The operation and handling of the CDC shall be no more adversely affected by temperature and environmental factors than is the case with screw coupling operation.
- **1.7.10** - The coupling and uncoupling of vehicles using CDCs, also the negotiation of curves, marshalling humps and ferry ship ramps, shall be possible under the same boundary conditions as for screw coupling operation.
- **1.7.11** - The uncoupling of the CDC shall also be possible on moving vehicles under the same boundary conditions as for screw coupling operation (e.g. separation on the marshalling hump).

- **1.7.12** - The CDC (see [List of abbreviations - page 24](#)) shall not release unintentionally.
- **1.7.13** - The CDC shall permit the close coupling of vehicles for train running, and coupling in the "long" position for safe negotiation of tight curves and in preparation for separation of vehicles. Close coupling should be effected automatically when the vehicles are pushed up. Manual release of the "close-coupled" position is permissible.
- **1.7.14** - The CDC shall meet the following specifications:
 - minimum yield point 500 kN,
 - minimum tensile strength 850 kN.
- **1.7.15** - The CDC shall not adversely affect vehicle running nor lead to damage to vehicle, permanent way or load.
- **1.7.16** - The CDC shall be integrated in the DAC (see [List of abbreviations - page 24](#)).
- **1.8 - Combined air coupler (CAC)**

1.8.1 - The CAC (see [List of abbreviations - page 24](#)) shall permit the manual connection and separation of the main brake pipe between DAC and vehicles with screw coupling, when the vehicles are mechanically coupled. It is permissible to step between the vehicles for this purpose.

It shall be possible to operate the air shut-off cocks of both the vehicle with DAC and of that with screw coupling in such a way that further stepping between the buffers is unnecessary.

1.8.2 - The CAC shall be a component which is securely connected to the DAC-equipped vehicle, but which is also easily interchangeable.

1.8.3 - The CAC shall not impede the coupling of two vehicles with DAC.

1.8.4 - The combined air coupler connection shall be leakproof between 0,8 bar underpressure and 10 bar overpressure.

1.8.5 - The CAC shall not release unintentionally. In the event of accidental train division, the CAC connection shall separate automatically. At the same time, the main brake pipe shall not automatically be sealed. It must immediately vent automatically. Here, any damage to the CAC and the brake-hose coupling on vehicles with screw coupling shall be avoided as far as possible.

1.8.6 - The conditions of point [1.6.7 - page 7](#) also apply to the CAC.

1.9 - Servicing and maintenance of the DAC

○ **1.9.1** - The fault-free operation of the DAC (see [List of abbreviations - page 24](#)) shall be ensured, under normal operating loads, at least over the period between inspections, without requiring e.g. lubrication in service, admission to depot for lubrication or servicing of wearing components, or checks on materials and on functioning capability.

1.9.2 - Service life shall be as long as possible, so that essentially only wearing parts require replacement during periodic maintenance.

1.9.3 - Parts which are especially prone to wear shall as far as possible be easily replaced.

2 - Acceptance tests of the draw-only automatic coupler (DAC)

The functioning capability, safe operation and reliability of the DAC (see [List of abbreviations - page 24](#)), including its mechanical and pneumatic accessories (combined couplers) for ensuring direct interaction with the screw coupling, are to be verified by tests.

These tests shall be so conducted as to ascertain that the conditions defined in point 1 - [page 2](#) of this leaflet have been fully met. A distinction is made between:

- obligatory tests (approval tests to be conducted under the auspices of the ERRI (see [List of abbreviations - page 24](#))) and
- optional tests (special tests conducted by individual railways to test the behaviour of the DAC in connection with special operational handling of vehicles).

The basis for the international approval of the DAC shall be the results obtained in the obligatory tests, in which the functioning and behaviour in service of the screw coupling system should serve as a guide to evaluation.

The optional tests shall be taken into account as appropriate in the course of international approval. The obligatory tests shall be conducted:

- on test rigs,
- with vehicles and
- with trains.

The following tests are obligatory:

2.1 - Tests on test rigs

(See also [Appendix D - page 16](#))

2.1.1 - Handling area of the DAC;

2.1.2 - Static strength of the DAC and the CDC (see [List of abbreviations - page 24](#));

2.1.3 - Strength of the DAC and CDC under dynamic loading during train running.

2.2 - Tests with vehicles

(See also [Appendix E - page 18](#))

2.2.1 - Coupling and uncoupling;

2.2.2 - Operation of the locking mechanism;

2.2.3 - Negotiation of curves;

- 2.2.4 - Tests in the climatic chamber;
- 2.2.5 - Strength of the DAC under shock loading;
- 2.2.6 - Static strength of the locking mechanism.

2.3 - Tests with trains

(See also Appendix **F - page 21**)

- 2.3.1 - Formation and splitting of trains;
- 2.3.2 - Negotiation of ferry ship ramps;
- 2.3.3 - Dynamic forces;
- 2.3.4 - Winter trials under operating conditions;
- 2.3.5 - Operational trials.

The main features of the tests listed above are summarized in Appendices **D - page 16** to **F - page 21**. Details with regard to conduct of testing, also presentation and evaluation of test results, are set out in documents produced by ERRI Working Group B 51.1.

Appendix A - Basic principles for compatibility of the DAC

As specified in point 1.1.5 - page 2, the DAC (see List of abbreviations - page 24) variant must be fitted with a main brake pipe (BP), a main air supply pipe (MASP) and an electrical connector. This coupler must satisfy the following requirements (numbering based on corresponding paragraphs in main body of leaflet):

- 1.6 **Automatic coupling of the air pipe**
- 1.6.1 The DAC shall be so designed that, on coupling of two vehicles, the main brake pipe, the main air supply pipe and the electrical connector are automatically coupled together.
- 1.6.8 In the event of accidental train division, the main brake pipe and main air supply pipe shall not automatically be sealed. They must immediately vent automatically.
- 1.6.9 The orifice seal of the hose couplings for main brake pipe and main air supply pipe shall be capable of replacement using simple aids if necessary without separation of the vehicles.
- 1.6.10 The hose couplings of both pipes (main brake pipe and main air supply pipe) shall be leakproof between 0,8 bar underpressure and 10 bar overpressure.
- 1.6.11 The electrical connector must be able to accommodate the functions of the four conductors of the electro-pneumatic brake (conductors 1 to 4) and conductors A and B.
- 1.6.12 The electrical connector must also be able to accommodate the functions of all nine conductors of the UIC coupling.
- 1.7.16 The CDC (see List of abbreviations - page 24) shall be integrated into the DAC. There shall be no contact or interference between the CDC, the air pipe connections and the electrical connector.
- 1.8.5 The CAC (see List of abbreviations - page 24) shall not release unintentionally. In the event of accidental train division, the CAC connection shall separate automatically. At the same time, the main brake pipe and main air supply pipe shall not automatically be sealed. They must immediately vent automatically. Here, any damage to the CAC and the air pipe connections on vehicles with screw coupling shall be avoided as far as possible.
- 1.10 **Combined Electrical Coupler (CEC)**
- 1.10.1 The CEC must allow manual coupling and separation of two vehicles, one of which is fitted with the DAC. To this end, staff are permitted to pass between the vehicles.
- 1.10.2 Wagons that are fitted with this variant of the DAC must have headstocks equipped with the installations specified in (draft) *UIC Leaflet 541-5* for the electrical connector.
- 1.10.3 The CEC must not release unintentionally. The automatic release of the electrical connector must not be hindered by any form of mechanical locking device, irrespective of the circumstances in which the uncoupling takes place.

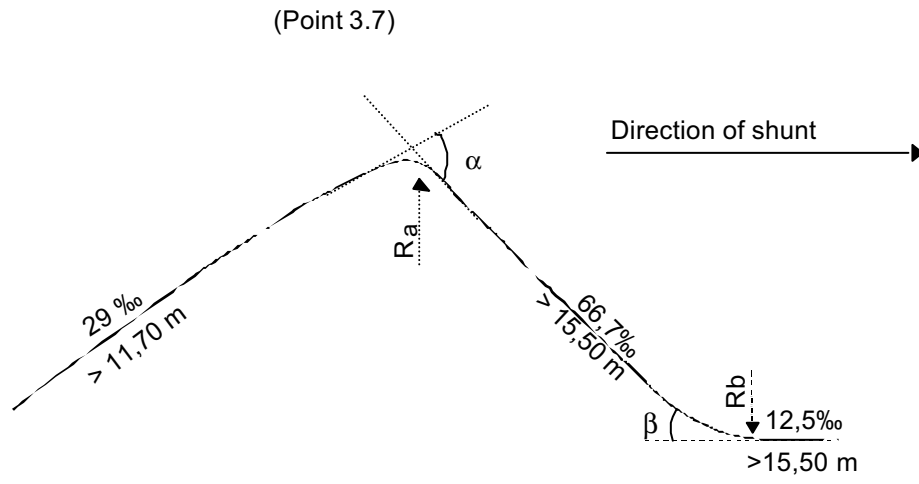
Appendix B - Mode of operation of the screw coupling in comparison with the DAC

Operation coupling	Screw coupling	Automatic draw-only coupler
Coupling	<ul style="list-style-type: none"> - Approach - Pushing up - Remove link from hook* - Hang link on draw hook* - Screw up tight* - Suspend air hoses* - Couple air hoses* - Open air shut-off cocks* 	<ul style="list-style-type: none"> - Approach - Coupling (long position) - Push up - Coupling → short position - Couple main brake pipe - Open air shut-off cocks*
Uncoupling	<ul style="list-style-type: none"> - Close air shut-off cocks* - Release air hoses* - Push up (if necessary) - Loosen screw* - Remove link* - Hang link in hook provided* - Separate vehicles 	<ul style="list-style-type: none"> - Close air shut-off cocks* - Release* - Separate vehicles
Negotiation of tight curves	<ul style="list-style-type: none"> - Push up (if necessary) - Loosen screw* - Negotiate curve - Push up - Tighten up screw* 	<ul style="list-style-type: none"> - Set long position* - Negotiate curve - Cancel long position - Push up

Operation coupling	Screw coupling	Automatic draw-only coupler
Splitting of train on hump	<ul style="list-style-type: none"> - Vent brakes* - Push up (if necessary) - Loosen screw at coupling point for separation* - Uncouple brake hoses* - Separate screw couplings on hump using pole* 	<ul style="list-style-type: none"> - Vent brakes* - Release DAC at coupling point for separation
Train formation in sorting siding	<ul style="list-style-type: none"> - Push up wagons (if necessary) - Couple screw coupling* - Couple air hoses* 	<ul style="list-style-type: none"> - Push up wagons (if necessary)
Fly shunting	<ul style="list-style-type: none"> - Approach - Push off 	<ul style="list-style-type: none"> - Set lock to "coupling impossible" - Approach - Push off

The operations marked * are performed manually.

Appendix C - Profile of gravity hump for testing draw-only automatic couplers



$R_a = 250\text{m}$
 $R_b = 300\text{m}$
 $\alpha = 5^\circ 28'$
 $\beta = 3^\circ 6' 24''$

Appendix D - Tests on the test rig

D.1 - Handling area of the DAC

1. Purpose of testing

Testing of satisfactory automatic coupling (mechanical and pneumatic) in accordance with vehicle and track geometry.

2. Section 1 conditions

to be checked:

1.4.2 - page 5, 1.4.3 - page 5, 1.6.10 - page 7.

3. General test conditions

Adjustment of the couplers in a geometrical test rig relative to their horizontal position with respect to the track axis, with superimposition of difference in height, axial and vertical angles in coupling of short and long vehicles on track geometry with minimum curve radii of 150 m.

D.2 - Static strength of the DAC and CDC

1. Purpose of testing

Proof of adequate resistance to deformation and fracture.

2. Section 1 conditions

to be checked:

1.4.5 - page 6, 1.7.14 - page 8.

3. General test conditions

"Long" and "close" coupled positions.

D.3 - Strength of the DAC and CDC under dynamic loading as during train running

1. Purpose of testing

Proof of adequate fatigue resistance.

2. Section 1 conditions

to be checked:

1.9.1 - page 9, 1.9.2 - page 9.

3. General test conditions

Load collective based on:

- representative train weights and lengths;
- representative topography;
- 1,5 million kilometres run;
- a minimum 90% probability of survival.

Appendix E - Tests with wagons

E.1 - Coupling and uncoupling

1. Purpose of testing

Verification of safe and reliable connection and separation of vehicles.

2. Section 1 conditions

to be checked:

1.1.6 - page 2, 1.1.8 - page 2, 1.1.9 - page 2, 1.1.12 - page 3, 1.2.1 - page 3, 1.2.4 - page 3, 1.2.9 - page 3, 1.2.15 - page 4, 1.2.16 - page 4, 1.2.17 - page 4, 1.2.18 - page 4, 1.3.1 - page 4, 1.3.2 - page 4, 1.3.3 - page 4, 1.3.5 - page 5, 1.5.2 - page 6, 1.6.1 - page 6, 1.6.6 - page 6, 1.7.4 - page 7, 1.7.5 - page 7, 1.7.8 - page 7, 1.7.10 - page 7, 1.7.13 - page 8, 1.8.3 - page 8.

3. General test conditions

- track geometry in accordance with Point 1 - page 2;
- DAC/DAC and DAC/CDC (CAC (see List of abbreviations - page 24)) combinations;
- long and short vehicles with difference in height;
- buffing speeds in accordance with Point 1;
- each test shall be performed at least 5 times for each vehicle combination, track geometry and speed.

E.2 - Functioning of the locking mechanism

1. Purpose of testing

Verification of the "released", "coupling impossible" and "long coupling" positions.

2. Section 1 conditions

to be checked:

1.2.4 - page 3, 1.2.11 - page 4, 1.2.13 - page 4, 1.2.14 - page 4.

3. General test conditions

- "release" with varying track geometry and with long and short vehicles;
- "coupling impossible" and "long position" with a minimum buffing speed of 7 km/h.

E.3 - Negotiation of curves

1. Purpose of testing

Verification of satisfactory coupler behaviour in negotiating curved track.

2. Section 1 conditions

to be checked:

1.2.8 - page 3, 1.3.4 - page 5, 1.3.5 - page 5, 1.6.10 - page 7, 1.7.10 - page 7, 1.8.4 - page 8.

3. General test conditions

- curves and reverse curves of 190 m and 150 m in "close-coupled" position;
- curves of low radius (< 150 m) in the "long" position;
- DAC/DAC and DAC/CDC (CAC) (see List of abbreviations - page 24), combinations;
- long and short vehicles;
- airtight hose coupling.

E.4 - Testing in the climatic chamber

1. Purpose of testing

Verification of satisfactory coupling and uncoupling of the DAC and CDC/CAC under winter operating conditions.

2. Section 1 conditions

to be checked:

1.1.10 - page 3, 1.7.9 - page 7.

3. General test conditions

Classification of winter operating conditions:

- a. snowstorm with temperatures < 0°C;
- b. running through drifted snow in calm weather (without precipitation);
- c. snowed-in couplers with vehicles at a stand (sticky wet snow, snow thickness ≤ 25 mm and > 25 mm);
- d. temperatures fluctuating around freezing point (-5°C to + 5°C) with and without snow;
- e. ice formation;
- f. low temperatures.

E.5 - Strength of the DAC under shock loading

1. Purpose of testing

Verification of the strength of the DAC under repeated shocks in operation.

2. Section 1 conditions

to be checked:

1.3.2 - page 4, 1.9.1 - page 9, 1.9.2 - page 9.

3. General test conditions

- buffing tests, DAC (see List of abbreviations - page 24) in "ready for coupling" position;
- number of buffing impacts based on:
 - representative buffing speeds;
 - a number of couplings and uncouplings on the basis of a 20 year life.

E.6 - Static strength of the locking mechanism

1. Purpose of testing

Verification of sufficient resistance to deformation to maintain proper functioning.

2. Section 1 conditions

to be checked:

1.2.10 - page 3.

3. General test conditions

Application of a 1000 N force on the handle in the directions and at the points where it is applied in practice.

Appendix F - Tests with trains

F.1 - Formation and splitting of trains

1. Purpose of testing

Testing of the handling and functioning of the DAC and CDC/CAC (see [List of abbreviations - page 24](#)) in the marshalling yard.

2. Section 1 conditions

to be checked:

[1.1.8 - page 2](#), [1.1.12 - page 3](#), [1.2.1 - page 3](#), [1.2.4 - page 3](#), [1.2.9 - page 3](#), [1.2.11 - page 4](#), [1.2.13 - page 4](#), [1.2.14 - page 4](#), [1.2.16 - page 4](#), [1.2.17 - page 4](#), [1.2.19 - page 4](#), [1.3.1 - page 4](#), [1.3.2 - page 4](#), [1.3.6 - page 5](#), [1.3.7 - page 5](#), [1.3.8 - page 5](#), [1.3.9 - page 5](#), [1.4.3 - page 5](#), [1.6.1 - page 6](#), [1.6.2 - page 6](#), [1.6.3 - page 6](#), [1.6.4 - page 6](#), [1.6.6 - page 6](#), [1.6.9 - page 7](#), [1.7.3 - page 7](#), [1.7.5 - page 7](#), [1.7.10 - page 7](#), [1.7.11 - page 7](#), [1.7.12 - page 8](#), [1.7.13 - page 8](#), [1.8.1 - page 8](#), [1.8.5 - page 8](#).

3. General test conditions

- marshalling yard with and without hump;
- test train formed of vehicles with DAC and screw coupling;
- shunting and fly shunting of individual wagons and rakes of wagons;
- constant and variable humping speed; maximum humping speed in accordance with section 1;
- uncoupling on the hump and before the hump.

F.2 - Negotiation of ferry ship ramps

1. Purpose of testing

Verification of the satisfactory behaviour of the DAC and CDC/CAC in movement on and off ferries.

2. Section 1 conditions

to be checked:

[1.3.10 - page 5](#), [1.7.10 - page 7](#).

3. General test conditions

- test location: ramps of ferry boats and ships;
- track geometry and adjustment of ferry boat ramp in line with chapter 1;
- long and short vehicles in empty and loaded condition.

F.3 - Dynamic forces

1. Purpose of testing

Verification of the safe riding of trains with the DAC and CDC/CAC (see [List of abbreviations - page 24](#)) under the effects of longitudinal compressive forces during braking.

2. Section 1 conditions

to be checked:

[1.1.6 - page 2](#), [1.2.1 - page 3](#), [1.2.19 - page 4](#), [1.6.7 - page 7](#), [1.6.8 - page 7](#), [1.8.5 - page 8](#), [1.8.6 - page 8](#).

3. General test conditions

- comparison tests with two identically-formed trains equipped with ring spring buffers on the one hand and rubber buffers on the other hand, simulating a train with DAC;
- for train formation see ERRI document B 177 RP1;
- train in G/G, P/P, G/P and LL brake positions;
- service and emergency braking;
- with normal and exceptional longitudinal play.

F.4 - Winter trials under operating conditions

1. Purpose of testing

Functioning and operability of the DAC and CDC/CAC under adverse winter operating conditions.

2. Section 1 conditions

to be checked:

[1.1.10 - page 3](#), [1.7.9 - page 7](#).

3. General test conditions

Train formation and train running.

F.5 - Operational trials

1. Purpose of testing

Verification of the functioning capability, safety in operation and reliability of the DAC and CDC/CAC in service.

2. **Section 1 conditions**

to be checked:

All those that can be verified in operation.

3. **General test conditions**

- train running and train formation;
- test train formed of:
 - freight wagons with DAC and screw coupling,
 - empty and loaded wagons,
 - various types of wagon;
- varying wagon order;
- test duration approx. 1 year.

List of abbreviations

AC	Air Coupling
BP	Main Brake Pipe
CAC	Combined Air Coupler
CDC	Combined Draw-only Coupler
CEC	Combined Electrical Coupler
DAC	Draw-only Automatic Coupler
ERRI	European Rail Research Institute
MASP	Main Air Supply Pipe
ORE	Office for Research and Experimentation (predecessor of ERRI)
OSJD	Organisation for Collaboration between Railways
SC	Screw Coupler
UIC	Union Internationale des Chemins de fer (International Union of Railways)

Glossary

Air coupling	Air coupling housed in the coupler head for automatic coupling of air pipes.
Automatic long/short changeover device	System that changes the coupler head position from long to short (or short to long) automatically.
Basic position	DAC uncoupled and ready for coupling.
Brake coupling	Brake hose with connector head.
Combined Air Coupler	Device for coupling air pipes when the DAC is connected up to a screw coupling.
Combined Coupler	General term used to describe the Combined Draw-only Coupler and the Combined Air Coupler.
Combined Draw-only Coupler	Articulated bar housed in the coupler head to allow coupling between the DAC and a screw coupler.
Control rod	Part of the locking mechanism, ending in a handle and connected to the coupler head.
"Coupling impossible" position	Position in which automatic coupling is not possible.
Draw-only Automatic Coupler	Automatic coupler used for transmitting tensile forces only.
Forwarding zone	Area of track on marshalling yard sorting sidings used to push wagons together.
Locking mechanism	Part of the DAC used to select a range of positions: <ul style="list-style-type: none"> - basic position, - long position, - "coupling impossible" position.
Locking position indicator	Indicates that the DAC has locked correctly.
Long position	Position of the DAC to allow train to negotiate or permit coupling on tight curves. Corresponds to the loose screw coupler mode.
Pads	Elastomer spring components.
Pedal	Device actuated by the opposite coupler to trigger the automatic operations.
Pedal lever	Actuate/triggers the various automatic operations of the DAC.

Range of operation	Area within which the DAC can be coupled automatically without outside assistance.
Rotary cam	Raises or lowers the intermediate part of the automatic long/short position changeover system.
Retaining shackle	Shackle positioned below the draw hook to ensure the CDC is properly coupled.
SA3 coupler	Type of automatic buffing and draw coupler used in the CIS countries.
Short Long position indicator	Device indicating whether the DAC is in the short or long position.
Short position	Position of the DAC for train running. Corresponds to the tight screw coupler mode.
Stop cock controls	Devices located on each side of a vehicle for manual operation (opening and closing) of the air stop cocks.
Support	System that keeps the DAC horizontally and vertically in position on the headstock.
Twist hook	Locking mechanism on the combined air coupler.

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International Union of Railways

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Leaflet 526-1: Wagons - Buffers with a stroke of 105 mm, 2nd edition of 1.7.98

Leaflet 526-2: Wagons - Buffers with a stroke of 75 mm, 1st edition of 1.1.81 and 2 Amendments

Leaflet 526-3: Wagons - Buffers with a stroke of 130 mm and 150 mm, 2nd edition in course of preparation

Leaflet 528: Buffer gear for coaches, 7th edition of 1.1.91 and Amendment No. 1

Leaflet 530-1: Constructional conditions for wagons to be observed with a view to fitting the automatic coupler of the Member Railways of the UIC and OSJD respectively, 2nd edition of 1.4.82 and 3 Amendments

Leaflet 535-2: Standardisation and positioning of steps, end platforms, gangways, handrails, tow hooks, automatic coupler and brake valve controls on wagons in connection with the fitting of the automatic coupler of the UIC Member Railways and OSJD Member Railways, 3rd edition of 1.1.78 and 7 Amendments

Leaflet 541-1: Brakes - Regulations concerning the construction of the various brake components, 5th edition of 1.7.73 - Reprint dated 1.4.79 and 29 Amendments

Leaflet 541-5: Brakes - Electropneumatic brake (Ep brake) - Electropneumatic emergency brake override (EBO), 2nd edition of 1.1.97

Leaflet 567-3: Constructional arrangements on coaches with a view to the application of the automatic coupler on the UIC Member Railways and on the OSJD Member Railways, 1st edition of 1.1.83 and 1 Amendment

2. Minutes of meetings

International Union of Railways

Rolling Stock Committee (Question 45/B/40 - Point 10.5 - Approval of Leaflet 522-2), Berlin, May 1995