Questions & Answers on the Digital Automatic Coupling (DAC)

Publication date |Version	05.2026 | V 1.0
Use	Technical background information
Language	English
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Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Europe's Rail Joint Undertaking. Neither the European Union nor the granting authority can be held responsible for them. The project DACFIT is supported by the Europe's Rail Joint Undertaking and its members.

Introduction

The European DAC initiative is a framework of several complementary projects with the common goal to prepare the Digital Automatic Coupling (DAC) development and roll-out. These projects, like EDDP, FP5-TRANS4M-R, DACFIT, FP5-DACtiVate, are currently ongoing or have already been completed. Further projects are planned.

The DACFIT project with its focus on data analysis for DAC migration preparation is an integral part of this framework. However, these FAQs do not constitute a deliverable of the DACFIT project in its' own right but inform about potential questions regarding the DAC development and migration and provide the answers. The aim of this is to establish a common understanding of the DAC-related topics in Europe.

Experts have answered over 150 questions on DAC for all interested readers. These cover the following areas:

1. Rail freight transport today
2. Current challenges: Rail freight transport | Transport and environmental policy
3. European initiatives: General information | Europe's Rail | European DAC Delivery Programme (EDDP) | DAC4EU
4. Technology and deployment: General information | Alternative concepts | DAC coupling head | Usage of the DAC | Special features of freight wagons
5. Migration: General information | Freight wagons | Locomotives | Infrastructure
6. Overarching topics: Legal aspects | Financing | Market | Industrial policy

Many thanks to all the experts for their valuable input.

Are there any other questions that haven't been answered here? Please feel free to email our editorial team. Thank you very much.

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1 Rail freight transport today (5)

1.1 How does the coupling and uncoupling of freight wagons work in European rail freight transport today?

In most European countries, the so-called screw coupling is used for coupling and uncoupling freight wagons. The technology dates back to the 19th century and is very labour-intensive.

To connect two vehicles, employees have to go into the so-called "Bern rectangle". This is the area between and under the side buffers and the screw coupling of two freight wagons or locomotives in contact with each other that must be kept clear.

In the “Bern rectangle”, they hook the shackle of the screw coupling of one wagon, which weighs around 30 kg, into the draw hook of the neighbouring wagon. The connection is then shortened by turning a spindle until the side buffers are slightly pressed in. Then the two ends of the main brake pipe are manually connected and opened.

When uncoupling, the main brake pipe is closed by setting the isolating cocks. Then the hoses of the pipe are disconnected by hand and the connection between the two freight wagons is loosened by turning the spindle. Finally, the shackle of the coupling of one wagon is lifted out of the draw hook of the neighbouring wagon and attached to the wagon.

1.2 How does the coupling and uncoupling of freight wagons work in rail freight transport outside Europe today?

In most countries outside Europe, freight wagons are coupled with automatic couplings and sometimes they are also uncoupled.

Different technologies are used. Some of the systems are over 100 years old (e.g. in the USA) and usually have only a mechanical coupling. They are significantly less labour-intensive than the screw coupling.

Screw couplings are only used in very few countries, e.g. in some African countries.

1.3 What are the disadvantages of the screw coupling compared to automatic couplings?

The coupling and uncoupling of freight wagons with screw couplings is carried out exclusively by hand.

Putting together a freight train with freight wagons is extremely labour-intensive and very risky for the shunting workers.

The screw coupling has lower tensile forces than automatic couplings and, therefore, does not allow freight trains to be as long and heavy as in the USA, for example, where a variant of the automatic coupling is used.

It would theoretically be possible to connect power and data lines by hand in addition to the screw coupling. However, this would only increase the amount of shunting work and slow down the preparation of trains.

1.4 Why are automatic couplings only sporadically used in rail freight transport in Western and Central Europe today?

There have been several attempts to introduce automatic couplings in the European standard gauge countries; most recently in the 1970s and in the 1990s.

After these initiatives failed, partly for strategic reasons, many players in the European rail freight sector lacked faith in the introduction of an automatic coupling.

They are, therefore, only used today in isolated traffic, e.g. due to higher train loads.

It was only the sector's visibly increasing activities in the direction of digitalisation and automation which opened up the view for innovations again in recent years.

1.5 How far has rail freight transport in Europe progressed in terms of digitalisation and automation (locomotives, freight wagons)?

Rail freight transport in Europe is still characterised by many manual activities, but several applications are already in use that aim to improve efficiency through digitalisation and automation.

The degree of automation is already high, particularly in train formation facilities, and will continue to advance in the coming years. For example, camera bridges

support automated freight wagon diagnostics. With the help of artificial intelligence (AI), potential damage to the vehicles can be detected in good time.

Automatic shunting locomotives are equipped with sensor and control technology that allows them to shunt completely automatically. In other words, the train driver observes what is happening and only intervenes in emergency situations.

In the future, automated train operation (ATO) will be used for long-distance journeys. Train control will be taken over entirely or partially by a computer on the vehicle. In October 2025, the one-year phase of test runs of an ATO project began in the Netherlands.

2 Current challenges (7)

a. Rail freight

2.1 What are the current issues facing European rail freight transport?

European rail freight transport is a very low-margin business. Major players in the market have been generating losses for years. Inter- and intramodal competition is strong.

Therefore, labour-intensive wagonload transport, in particular, either needs public support or will be drastically reduced or discontinued altogether as it is already the case in many European countries. As a result, the share of rail freight transport in the modal split is declining.

In order to stop this downward trend, European rail freight transport is trying to leverage efficiency potential. This is to be achieved primarily through the increased use of digitalisation and automation.

Easier and cheaper access to railway infrastructure is also very important. Like passenger transport, European rail freight transport needs attractive train paths. This can reduce delays and make the offer more attractive for shippers.

The rapid and targeted expansion of the rail infrastructure – taking into account the interests of European rail freight transport – is another important issue. The foreseeable improvements in train control (keyword: ERTMS) must be introduced in the most cost effective manner and with as little risk as possible.

The aim must be to achieve capacity gains for rail freight transport by using technologies such as the DAC or ERTMS on the existing rail infrastructure.

2.2 What are the trends in European rail freight transport in the medium to long term?

The European Commission wants to double the transport performance of rail freight transport by 2050 compared to 2015. Whether this goal can be achieved depends on the decisions of the European transport policy in the coming years and how much public money is invested in the interests of European rail transport.

If the modal shift targets of European transport policy are to be achieved and the necessary measures can be taken, it is very likely that European rail freight transport will be able to gain market share from the road sector. Increases are expected in intermodal and wagonload transport.

To this end, the digitalisation and automation of European rail freight transport must be promoted, access to railway infrastructure improved and the necessary infrastructure projects implemented as quickly as possible.

b. Transport and environmental policy

2.3 What are the challenges facing European transport and environmental policy?

European rail freight transport is declining but is to be strengthened. In terms of CO2 emissions, it is nine times better than road freight transport and can make a significant contribution to achieving the climate and modal shift targets.

The electrification of road freight transport is far from being mature or cost-efficient and will still consume seven times more energy than rail freight transport.

Automation and digitalisation will make it possible to make rail freight transport more efficient and attractive for logistics service providers and shippers. Society will also benefit from this.

At the same time, the train path quality for European rail freight transport must be improved and infrastructure expansion must be promoted.

This will increase the growth potential of single wagonload traffic and strengthen the role of intermodal transport.

2.4 What contribution can rail freight transport make to meeting the challenges of European transport and environmental policy?

The European transport sector continues to produce too many greenhouse gases. In contrast to other sectors of the economy, emissions have even increased in recent decades.

The decarbonisation of mobility is, therefore, an important goal of European environmental policy. It is in line with the Paris Climate Agreement.

Rail transport already meets this goal today. It is significantly more climate-friendly than other modes of transport. A large part of the transport performance is already provided by electric traction.

This share is to be further increased by electrification of lines in the coming years.

At the same time, the plan is to gradually switch to sustainable sources of primary energy or alternative drives for non-electrified lines.

2.5 Is DAC already anchored in European transport and environmental policy?

Yes, in several respects:

- The DAC was the subject of a funding project within the framework of Shift2Rail, the former European R&D programme for rail transport.
- In summer 2020, the European DAC Delivery Programme (EDDP) was set up under the umbrella of Shift2Rail.
- In December 2020, the European Commission published the Sustainable and Smart Mobility Strategy. The DAC is mentioned there as a new technology that should help to increase the attractiveness of rail freight transport.
- As part of Europe's Rail, the current European R&D programme for rail transport, work has been underway on the TRANS4M-R project since autumn 2022. The DAC is an important part of the approximately 95 MEUR project.
- The revised Technical Specification for Interoperability (TSI) for the Freight Wagon Subsystem was adopted by the EU Member States in spring 2023. It now contains a reference in the recitals to the planned introduction of DAC.
- In spring 2023, the EU Member States agreed on the new working programme for the Connecting Europe Facility (CEF). According to this, studies on DAC can be funded with CEF funds.
- In July 2023, the European Commission published a proposal to make freight transport more sustainable ("Greening Freight Package"). The accompanying political text contains a reference to the planned introduction of the DAC and considers it a "game changer" for European rail freight transport.
- In mid-April 2024, former Italian Prime Minister Enrico Letta published the report on the future of the EU internal market commissioned by the European Council. In his report, Letta also refers to the most important

technological prerequisites for rail transport – (1) the European Rail Traffic Management System (ERTMS), (2) the Digital Automatic Coupling (DAC) and (3) Digital Capacity Management (DCM) – and calls for good governance to ensure their implementation.

- The revised Trans-European Transport Networks (TEN-T) Regulation regulates future technical and, in some cases, operational requirements for transport infrastructure. It refers to the DAC as one of the priorities for the expansion of the rail infrastructure. The regulation was published in June 2024.
- In August 2024, the European Commission submitted the multi-annual revision framework for the Technical Specifications for Interoperability to the European Union Agency for Railways (ERA). According to the list of actions, the development of a DAC specification – including the definitions of interoperability constituents and transition regime – is required. The first step is to prepare a technical document for Pioneer DAC trains by 2026. In a second step in 2028, the final specifications including the requirements for the introduction and migration of the DAC must be available.
- The Draghi report commissioned by the European Commission was published in mid-September 2024. The authors propose a new industrial strategy for Europe. The report is also dedicated to digital progress and calls for adequate funding for important technological requirements for rail transport, such as the Digital Automatic Coupling (DAC). The report forms the basis for the work programme of the future European Commission.
- In September 2024, the European Climate, Infrastructure and Environment Executive Agency (CINEA) published a call for proposals for the Connecting Europe Facility (CEF). Interested companies were invited to submit applications for studies on DAC for rail freight transport - including validation of the system in commercial operations.
- In July 2025, CINEA published the list of projects to be awarded funding under the 2024 CEF call for proposals, including the Pioneer DAC Trains (PioDAC) project submitted by the Swedish infrastructure manager Trafikverket. It is to receive around EUR 25 million in funding.
- In October 2025, CINEA signed the grant agreement for the PioDAC project. The Swedish infrastructure manager Trafikverket is responsible for project management. The commercial freight trains are operated by railway undertakings from Germany, Italy, Luxembourg, Norway, Austria, Sweden and Slovenia. Further information on Pioneer DAC Trains can be found in section 4.f.

- In mid-December 2025, the European Parliament adopted its own-initiative report on military mobility. The report calls on the European Commission to address obstacles to smooth rail operations throughout the EU, including the slow introduction of ERTMS and Digital Automatic Coupling (DAC). Both technologies would increase capacity for civil transport, are also relevant for military mobility, and should therefore be improved.

2.6 Can the DAC contribute to achieving the EU's climate targets?

The DAC can contribute to achieving the EU's climate targets. However, the measures to increase the attractiveness of rail freight transport must not be limited to the promotion of DAC alone.

More funding is needed for the introduction of ERTMS, public money for the development of rail infrastructure and much stricter legislation to internalise the external costs caused by road transport.

The DAC is only one of several contributions to achieving the EU's climate targets, but it is nevertheless a very important one.

2.7 Are the objectives of European transport and environmental policy also achievable with the screw coupling?

The goals of European transport and environmental policy are very ambitious. The transport performance of rail freight transport is to be doubled by 2050.

Experts doubt whether this requirement can also be fully achieved with the screw coupling. This is mainly attributed to the low level of automation in rail freight transport. The situation is further exacerbated by the shortage of skilled workers, especially in the operational area.

Only new technologies such as the DAC are able to improve the degree of automation and achieve a higher traffic performance on the existing rail infrastructure with fewer staff.

3 European initiatives (21)

a. General

3.1 Who is driving the developments of DAC in Europe?

The developments of DAC in Europe are primarily driven by the European rail freight sector. This includes railway undertakings, wagon keepers, manufacturers from the railway supply industry and the associated European and national associations.

The activities are supported by the European Commission, the European Union Agency for Railways (ERA), the Europe's Rail Joint Undertaking (EU-Rail JU) and individual EU Member States; above all Germany through the funding of the DAC4EU project.

The implementation of the various activities often takes place within the framework of funding projects. These and their interaction are explained in more detail in the answer to question 3.4.

The introduction of the DAC is also the focus of the Topical Working Group Freight @ DAC, which was set up by ERA on behalf of the European Commission. It prepares the legal anchoring of the DAC in the relevant Technical Specifications for Interoperability (TSI) and coordinates with the activities under the umbrella of the EU-Rail JU and the work of the relevant standardisation bodies of CEN and CENELEC, among others.

3.2 Which DAC projects are there?

Various projects with clearly defined areas of responsibility have been established to prepare for the common goal of introducing DAC. These are largely realised within the framework of European, but also national projects. The projects complement each other in terms of content. Therefore, interfaces have been defined. Those involved are in regular dialogue on milestones, findings and results.

- The DAC4EU project is financed by the German Federal Ministry for Transport (BMV). Within the framework of this project, various coupling types were tested, and a selection decision was prepared. Following the decision in favour of the Scharfenberg coupler, the current focus is on the operational

testing of the DAC. Further information on DAC4EU can be found in section 3.d.

- The European DAC Delivery Programme (EDDP) is supported by the Europe's Rail Joint Undertaking (EU-Rail JU). The goals of the EDDP are to promote cooperation in the sector, to ensure transparency and opportunities for consultation and to prepare decisions (e.g. the selection of the design for the coupler head). In addition, relevant topics are discussed in working groups. Further information on the EDDP can be found in section 3.c.
- The "FP5-TRANS4M-R" project focuses on the technology development of DAC. It is co-funded by the European Union as part of the Europe's Rail Joint Undertaking (EU-Rail JU). Further information on "FP5-TRANS4M-R" can be found in section 3.b.
- The DACFIT project focuses on the preparation of the migration. It is also funded by the Europe's Rail Joint Undertaking (EU-Rail JU). Further information on DACFIT can be found in the answer to question 3.14.
- The FP5-DACtiVate project focuses on the validation of the DAC through tests and the integration of hybrid coupling solutions in locomotives. It is also funded by the Europe's Rail Joint Undertaking (EU-Rail JU). Further information on FP5-DACtiVate can be found in the answer to question 3.15.
- The DACcord project is responsible for the stakeholder management, the organisation and the implementation of the European DAC Delivery Programme (EDDP). It is funded by the Europe's Rail Joint Undertaking (EU-Rail JU).
- The TARO project was a national Austrian project funded by the Austrian Research Promotion Agency and the Federal Ministry for Climate Action. The goal of the project was to analyse the results of the test runs with the DAC4EU demonstrator train in Austria.
- The PioDAC project is running since November 2025 and focuses on the preparation and use of the so-called Pioneer DAC Trains. This is the first commercial operation of DAC on a larger scale. Railway undertakings from seven European countries are involved in this project. Further information on the Pioneer DAC Trains can be found in section 4.f.
- A follow-up project to "FP5-TRANS4M-R" is expected to take place as part of Europe's Rail from 2027 on. It will focus on increasing the technology readiness level of DAC. Further information can be found in the answer to question 3.12.

b. Europe’s Rail

3.3 What is Europe’s Rail?

Europe's Rail is the European partnership for research and innovation in rail transport under the Horizon Europe programme (2020 to 2031) and the successor programme to the Shift2Rail Joint Undertaking. It was launched in 2021 on the basis of a Council regulation.

By the end of 2031, the European Union and 27 organisations from business and science will provide around €1.2 billion in funding to advance research and development activities in rail transport. The so-called innovation pillar and the so-called system pillar are available as instruments for this purpose.

Concrete projects are implemented in the innovation pillar. In the system pillar, a functional system architecture, harmonised operating concepts and technical specifications are developed. The results are to be transferred into the technical regulations in order to achieve the overarching goal of a Single European Railway Area (SERA).

Europe's Rail is managed by the Europe's Rail Joint Undertaking (EU-Rail JU). The EU-Rail JU is a public-private partnership (PPP) between the European Union, represented by the European Commission, and 27 organisations from business and science.

3.4 What role does Europe's Rail play in DAC development?

Europe's Rail is the driving force behind the introduction of DAC in Europe. DAC is the main task of the “FP5-TRANS4M-R” project, which is anchored in the innovation pillar of Europe's Rail.

Moreover, DAC is covered by the system pillar of Europe’s Rail.

In addition, the Europe's Rail Joint Undertaking manages the European DAC Delivery Programme (EDDP) and other projects relevant to DAC.

See also answer to question 3.4.

3.5 What is "FP5-TRANS4M-R"?

The "Europe's Rail Flagship Project 5 – Transforming Europe's Rail Freight" (in brief: “FP5 TRANS4M-R”) is one of several projects funded under the Europe's Rail Innovation Pillar. It was launched in 2022, runs until 2026 and is dedicated to rail freight transport.

The consortium for the implementation of the funding project includes 76 European organisations. Among them are

- large railway undertakings, such as e.g. DB Cargo (Germany) or Rail Logistics Europe (France),
- infrastructure managers, such as ÖBB-Infrastruktur (Austria) and Trafikverket (Sweden),
- industrial partners, such as Siemens (Germany), Alstom (France), Dellner (Sweden) and Voith (Germany),
- research institutions, such as the German Aerospace Center (DLR) and
- rail freight customers, such as Procter & Gamble.

Within “FP5-TRANS4M-R”, 16 innovations for rail freight transport, so-called "technical enablers", are being developed. Particularly noteworthy are the specification of the DAC, solutions for automated shunting and simplified data exchange, cross-border planning of the timetable and planners for multimodal transport services.

3.6 What concrete results are to be achieved under “FP5-TRANS4M-R”?

“FP5-TRANS4M-R” aims to achieve results such as:

- DAC demonstrators,
- an interoperable power supply and communication system for locomotives and freight wagons,
- a harmonised operating procedure for the full digital freight train (FDFT) / intelligent freight train,
- the recognition of the train composition,
- the automatic coupling and uncoupling of freight wagons controlled by a locomotive,
- monitoring of the train integrity and determining the length of the train, and
- the specifications for fully automated shunting with a DAC.

3.7 Who decides within “FP5-TRANS4M-R” and how do sector organisations which are not involved take part?

The highest decision-making body within the project of “FP5-TRANS4M-R” is the Steering Committee. It consists of representatives of the project partners.

Non-participating organisations are involved via the European DAC Delivery Programme (EDDP). For this purpose, so-called sounding boards are held.

In this way, the part of the sector that is not involved in “FP5-TRANS4M-R” can be directly involved in current developments and decisions.

The final decision-making body for European rail freight transport is the Supervisory Board of the EDDP. All relevant European sector associations are represented.

3.8 What DAC tests are planned as part of “FP5-TRANS4M-R”?

The following DAC tests are planned as part of “FP5-TRANS4M-R”:

- Independent testing of the products by the manufacturers with a focus on functionality,
- Tests of the adapted products in the Train Test Lab, the project's own test environment with a focus on system integration, interchangeability between manufacturers, operability in general and railway safety, and
- the demonstration of the further adapted products in so-called demonstrator trains in order to test functionality, interchangeability between manufacturers and railway safety under real conditions.

3.9 Who finances the DAC activities within the framework of “FP5-TRANS4M-R”?

The DAC activities within the framework of “FP5-TRANS4M-R” are financed by the European Union and the participating companies in equal parts within the framework of the public private partnership (PPP) Europe’s Rail.

3.10 Are further DAC activities required within the framework of Europe's Rail after "FP5-TRANS4M-R"?

In Europe's Rail, funding projects are tendered in three cycles, which are also called waves. 1st cycle: 2022 to 2026, 2nd cycle: 2027 to 2028, 3rd cycle 2029 to 2031. "FP5-TRANS4M-R", FP5-DACtiVate and DACFIT are all assigned to the 1st cycle.

The first call for proposals for the 2nd cycle funding projects was published in October 2025. With regard to the DAC, the focus here is on increasing the technology readiness level of the DAC and the "DAC Basic Package", as well as the initial implementation of further automation functions such as multi-traction/distributed power systems.

Negotiations for participation in this project with a consortium comparable to "FP5-TRANS4M-R" are currently underway.

3.11 What is the system pillar and what role does it play in the DAC development?

The system pillar is part of Europe's Rail and aims to develop the functional system architecture, harmonised operating concepts and technical specifications.

The topics go beyond the DAC and are relevant to the rail system as a whole. In any case, the planned introduction of the DAC is one of several key topics.

Positions with technical information and requirements are developed and checked for their usability in the innovation pillar.

The results will be incorporated into the harmonisation of the technical legal framework. The aim is to create the Single European Railway Area (SERA).

3.12 What is DACFIT?

DACFIT is a project funded by Europe's Rail Joint Undertaking (EU-Rail JU). The focus of the project is on migration preparation.

The consortium is led by DB Cargo (Germany) and comprises a total of seven companies from across Europe: k + v, Fraunhofer IML, VPI European Rail Service (Germany), Instytut Kolejnictwa (Poland), VUKV (Czech Republic) and BME ITS (Hungary). The project was launched in October 2024 and will run for 24 months.

The project objective is to be achieved primarily through data analyses:

- Quantitative and technical analysis of vehicle data,
- Detailed analysis of the retrofitting processes,
- Analysis of the European workshop infrastructure for retrofitting and development of a retrofitting strategy,
- Creation of a comprehensive "Retrofit Capacity Plan" integrating the collected data - for this purpose, a Decision Support System ("DAC Migration DSS") will be developed.

The DACFIT project is in close cooperation with the European DAC Delivery Programme (EDDP) and the "FP5-TRANS4M-R" project.

3.13 What is FP5-DACtiVate?

FP5-DACtiVate is a project funded by Europe's Rail Joint Undertaking (EU-Rail JU). The focus is on the validation of the DAC through tests and the integration of hybrid coupling solutions in locomotives.

The consortium is led by DB AG (Germany) and comprises twelve partners from Germany, Austria, Poland, Spain, Italy, Sweden and Belgium, plus affiliated companies of the partners. The project was launched in December 2024 and will run for 25 months.

The main objectives of FP5-DACtiVate are:

- Validation tests for the DAC (derailment, crash, climate chamber),
- Demonstration of the modularity and interchangeability of the DAC components,
- Hybrid coupling platforms for mainline and shunting locomotives and
- Enabling comprehensive validation of wagon on-board units.

The FP5-DACtiVate project is in close cooperation with the European DAC Delivery Programme (EDDP) and the "FP5-TRANS4M-R" project.

c. European DAC Delivery Programme (EDDP)

3.14 What is the European DAC Delivery Programme (EDDP)?

The EDDP is an open platform for the introduction of DAC in Europe. It was established in summer 2020 under the umbrella of Shift2Rail, the European

research and development programme for rail transport, and will continue to operate under its successor, Europe's Rail.

3.15 Who is involved in the European DAC Delivery Programme (EDDP)?

The Supervisory Board is chaired by a representative of the European Commission. The sector associations (e.g. CER) are represented.

The Programme Board is chaired by a representative of Europe's Rail. Leading companies that have a great interest in the development of the DAC are represented, including large railway undertakings (such as DB Cargo), large wagon keepers (such as VTG), the four potential coupling suppliers (Dellner, Faiveley Wabtec, Knorr Bremse, Voith) and major manufacturers of locomotives (Alstom, Siemens).

In addition, all rail freight companies and institutions are invited to participate in the various work packages of the EDDP.

3.16 What are the objectives of the European DAC Delivery Programme (EDDP)?

The objectives of the EDDP are to promote cooperation in the sector, to ensure transparency and opportunities for participation, and to prepare decisions (e.g. the selection of the design for the coupler head). In addition, several topics are discussed in working groups.

By autumn 2022, the EDDP had eight working groups. With the establishment of Europe's Rail, the activities related to technology, testing and vehicle authorisation were transferred to the “FP5-TRANS4M-R” project.

Under the umbrella of the EDDP, the activities on migration and economic evaluation ("cost benefit analysis" or "EU Investment Plan") will be continued. They are supplemented by working groups on stakeholder management, deployment management and Pioneer DAC Trains.

3.17 What is DAC4EU and who is involved?

DAC4EU stands for "Digital Automatic Coupling for Europe" and is a European consortium with seven partners.

Members of the DAC4EU consortium are Deutsche Bahn and its subsidiary DB Cargo (Germany), the Swiss and Austrian railway undertakings SBB Cargo and Rail Cargo Austria, as well as the wagon keepers Ermewa, GATX Rail Europe and VTG.

In June 2020, the consortium was awarded the contract for the research project "DAC Demonstrator for Rail Freight Transport" of the German Federal Ministry for Transport (BMV).

In September 2024, an extension of the project until mid-2026 with funding of 8.25 MEUR was approved by the BMV.

3.18 Which DAC prototypes have been / will be tested within the framework of DAC4EU?

In Phase I of the project (June 2020 to July 2021), a total of 12 freight wagons with four different designs of DAC prototypes from the manufacturers

- CAF (SA3 system),
- Dellner (latch type system),
- Faiveley Wabtec (Schwab system) and
- Voith (Scharfenberg System)

were tested at the TÜV Süd test site in Görlitz.

Following the selection decision by the EDDP in September 2021, 20 wagons were successively equipped with Dellner's latch type system and Voith's Scharfenberg system.

Tests with these two prototypes have been carried out since August 2021. During this time, optimisations and further developments have already been carried out.

Since autumn 2023, prototypes from the manufacturer Knorr Bremse have also been integrated into the demonstrator train and have since been included in the test programme.

3.19 In which countries has DAC4EU already carried out trips with the demonstrator train?

In addition to Germany, Austria and Switzerland, as consortium partner countries, the DAC4EU demonstrator train was operated in Poland, the Czech Republic, France, Luxembourg, Serbia, Hungary, Belgium, and the Netherlands.

The aim is to involve as many countries as possible in the operational testing to examine the DAC prototypes for their suitability under national conditions in operational processes, infrastructure and topology.

3.20 Who finances the DAC4EU project?

The DAC4EU project is financed by the German Federal Ministry for Transport (BMV) with around 25 MEUR.

The project will currently run for a total of six years (from June 2020 to June 2026).

3.21 What tests were carried out in the DAC4EU project?

In Phase I of the project (June 2020 to July 2021), individual comparative tests were carried out with each of the four DAC prototypes at the TÜV Süd test site in Görlitz. These included coupling and uncoupling at different speeds (from 2 km/h to 12 km/h) as well as driving on different track geometries and coupling and uncoupling in such geometries.

Furthermore, tests were carried out in a climatic chamber to test the effects of different weather conditions on the prototypes. For this purpose, coupling and uncoupling tests were carried out at temperatures from +45° C to -25° C (including snow, ice, slush).

The test concept and a description of how the experiment was carried out can be found on the DAC4EU website: https://www.dac4.eu/dac-en/project-phases/detailed-tests-phase-i

Further details can be found in the Phase I Interim Report: https://www.bmv.de/SharedDocs/DE/Artikel/E/dak-demonstrator.html

In Phase II of the project (until December 2022), the DAC selected by the EDDP in September 2021 were subject to real operational processes. To this end, the

demonstrator train was tested in seven countries and at over 25 locations on various shunting yards and in railway sidings.

The test concept and a description of how the experiment was carried out can be found on the DAC4EU website: https://www.dac4.eu/dac-en/project-phases/in-service-testing-phase-ii

Further details can be found in the Phase II Interim Report: https://www.bmv.de/SharedDocs/DE/Artikel/E/dak-demonstrator-phase-2.html

In Phases III and IV (until August 2024) additional functional tests have been carried out to test optimised individual components, as well as further driving and manoeuvring tests in order to also test them in operation.

This included, among other things, detailed tests such as acoustic measurements, measurements on a rail scale, flow measurements, tests with bank engines / helper engines, various measurement runs and the navigation on a ferry boat ramp.

The test concept and a description of how the experiment was carried out can be found on the DAC4EU website: https://www.bmv.de/SharedDocs/DE/Artikel/E/dak-demonstrator-phase-3-und-4.html

Further details can be found in the Phase III and IV Interim Report: https://www.bmv.de/SharedDocs/DE/Artikel/E/dak-demonstrator-phase-3-und-4.html

Since September 2024, phases V and VI have again focused on advancing the next steps towards a series-ready DAC and testing under real operating conditions. Since March 2025, the Westfälische Landes-Eisenbahn (WLE) has been operating two pairs of DAC wagons in commercial service with the support of the DAC4EU project, with more wagons to follow.

4 Technology and deployment (58)

a. General

4.1 What is the DAC, what should it look like in the future?

DAC stands for Digital Automatic Coupling.

The DAC is not only intended to automatically establish a mechanical connection between the vehicles, but also to automatically connect the pipe for the braking system as well as the power and data lines.

This advanced technology is intended to combine the overdue automation of coupling and uncoupling with the digitalisation of rail freight transport.

4.2 What is the difference between an automatic coupling and a DAC?

The DAC is an automatic coupling that is intended to connect the power and data lines in addition to the mechanical connection.

With the help of DAC, rail freight transport can realise the advantages of automation and digitalisation.

4.3 What are the requirements for the DAC?

The requirements for the DAC are aimed at improving rail freight transport and further focus on safety and reliability. The current level is to be maintained or even improved in some places.

The assembly of the DAC and the associated components should not lead to an increase in weight and mass. In the case of locomotives, this requirement is not feasible in many cases – because the side buffers are left in place. Solutions must, therefore, be found for vehicle authorisation and operation on the infrastructure that do not entail unreasonable restrictions (e.g. speed restrictions).

The train length should also not be negatively affected.

The aim is also not to change the maintenance intervals of the vehicles. This applies to the multi-year periods between freight wagon inspections. It is currently still being examined whether adjustments are necessary in the visual inspection (e.g. wagon inspector), lubrication measures or maintenance for electrical components.

As part of the European DAC Delivery Programme (EDDP), the requirements were collected in the so-called AUCO list and used to select the DAC design.

The content of the requirements has been revised as part of "FP5-TRANS4M-R" and adapted to the current status of the project. For this purpose, a uniform requirements management system has been set up, in which all requirements can now be processed.

These requirements are further sharpened through intensive testing. The results are reflected in the specification work of "FP5-TRANS4M-R" and incorporated into the parallel work of the relevant European standardisation groups.

4.4 What are the advantages of the DAC compared to the screw coupling?

The DAC enables the automatic establishment of a mechanical, pneumatic and electrical connection as well as the transmission of higher tensile and compressive forces.

The automation made possible by the DAC also increases occupational safety and makes operation much easier, so that effort and other physical strain on the shunting personnel are greatly reduced. This makes the job profile of the shunter more attractive.

The DAC is the "enabler" for digitalisation and automation in rail freight transport by making power and data connections available across all wagons. This is intended to lead to increased efficiency in rail freight transport.

4.5 What are the benefits of electricity and data on a freight wagon?

A power and data connection to freight wagons is the prerequisite for the digitalisation and automation of rail freight transport. The aim is to create a European standard for energy supply and data communication.

The standardised development of automation components contributes to increasing efficiency in the three benefit dimensions of DAC: operational, train running and customer railway sidings.

4.6 What train lengths should be possible with power and data connections using DAC?

For the power supply, a maximum of 50 wagons can be supplied by one locomotive and a maximum of 835 m train length overall.

For data transmission, the maximum is 104 vehicles (100 wagons + 4 locomotives) or a train length of 1’670 m.

4.7 How is electromagnetic compatibility with track-side train detection systems ensured?

Concepts for power and data transmission are integrated without interferences on the infrastructure. Electromagnetic compatibility was already specifically investigated during the initial test runs.

The demonstrator trains will validate that the systems are free from any interference with existing systems in operation.

4.8 What is the load capacity (tensile and compressive forces) of the DAC?

The yield strength of the DAC is 2’000 kN in the direction of pressure and 1’000 kN in the direction of tension.

4.9 Is the load capacity of the DAC (tensile and compressive forces) higher than that of the screw coupling system?

The strength requirements of the DAC in the direction of pressure correspond to the values of the screw coupling system with side buffers. They are also limited by the load capacity of the wagon.

The longitudinal compressive forces, which can be safely transmitted during the train running, are about twice as high as in case of the screw coupling.

The operationally usable tensile forces of the DAC are in the range of the values for the AK69 and thus significantly higher than the values for the screw coupling. In this way, capacity increases can be achieved (e.g. trains with a mass of over 5'000 tonnes).

4.10 What are the challenges for developing and installing hybrid couplers on locomotives?

When developing a hybrid coupler, both the requirements for a DAC and the requirements for a screw coupler must be taken into account. Functionality and safety must be fully guaranteed in both modes. Furthermore, mode switching must be safe and easy.

The side buffers must still be present for the screw coupling mode. Since a hybrid coupler is significantly larger than a screw coupler, the Berne rectangle is partially restricted. See also the answer to question 1.1.

A hybrid coupler is also significantly heavier than a screw coupler. The additional components (including electrical and electronic components) result in an additional vehicle weight of approximately 1'500 kg.

Moreover, in the case of a DAC, the compressive forces are absorbed by the centre of the vehicle. This results in a change in the load on the vehicle structure, both during operation and in the event of a collision, which must also be taken into account.

These aspects have an impact on the approval of retrofitted locomotives. How these challenges are to be addressed can be found in the answer to question 6.11.

There are currently two major challenges when installing a hybrid coupler in a locomotive: (1) the design diversity of the European fleet and (2) the lack of a generally standardised installation space as in the case of freight wagons.

4.11 What are the pros and cons of an automatic coupler without a digital part?

A purely mechanical system would be significantly less complex and therefore easier to implement. However, the main added value of the DAC comes from the digital functions that are only made possible by the digitisation of each individual wagon in a single train.

4.12 Why aren't plugs for power and data lines simply added to the screw coupling?

With the screw coupling, it is not possible to automate rail freight transport to the necessary extent, as the coupling and uncoupling of wagons requires a high level of manual effort.

If plugs for power and data are added to this system, then the manual effort for coupling and uncoupling increases further, as in addition to connecting the mechanical screw coupling and the brake pipes, the electrical cables must also be connected manually.

The increases in efficiency in operation due to the additional power and data lines would have to outweigh all the efficiency disadvantages of the screw coupling, including the additional effort for the manual coupling of the electrical cables, in order for the concept to be economically viable.

According to all expectations, this is not the case. Therefore, the DAC concept is being pursued, a combination of automatic mechanical centre buffer coupling with automatically coupled power and data lines.

4.13 Why is there no use of proven automatic couplings which are already used in rail freight transport outside Europe?

The Janney and SA3 automatic coupling systems being widely used outside Europe do not offer the required range of functions of the DAC. They are in operation in the following regions:

- Janney: North and South America, Australia, China, large parts of Asia.
- SA3: Successor States of the Soviet Union, Iraq, Iran.

Both the Janney and SA3 couplings are couplings with a low degree of automation. This means that only the mechanical connection is established automatically. The brake pipes have to be coupled manually.

In Europe, the SA3 coupling was further developed in the second half of the 20th century. These couplings can also automatically connect brake pipes as well as power and data lines (AK69e, C-AKv).

However, the technical implementation of these functionalities is relatively complex, and the number and size of the electrical contacts is also very limited.

4.14 Why is there no use of proven digital automatic couplings which are already used in rail passenger transport?

Mechanical part: The tensile and compressive forces transmitted are higher in rail freight transport than in rail passenger transport. The environment in rail freight transport is more robust. Also, the number of couplings in rail freight transport is much higher than in rail passenger transport. Thus, a DAC from rail passenger transport would not meet the operational requirements of rail freight transport.

Electrical part: In rail passenger transport, various electric couplings are used on locomotives, which are not suitable for use in rail freight transport for various reasons.

As a rule, the electric couplings used in rail passenger transport have a large number of electrical contacts for the transmission of electrical signals and for the connection of data bus systems between the locomotives.

The electric couplings in rail passenger transport are usually located on the side or above the mechanical coupling.

In the case of lateral mounting, two electric couplings are required on each side of the wagon so that the wagons can be coupled to each other in any orientation. Although this provides redundancy, it increases costs because both couplings transmit the same signals. For rail freight transport, it was decided that a single electric coupling should be used, located above the mechanical coupling.

In order to be used on wagons with drive-over flaps for the transportation of road vehicles, the electric coupling must not protrude too far above the mechanical coupling at the top of which it is mounted. It must, therefore, be very flat. This

specification is not achieved by the electric couplings used in rail passenger transport due to the high number of electrical contacts.

After all, the electric coupling for rail freight transport is not only intended to transmit signals, but also to provide electric power with a voltage of 400 V AC. This places special demands on the insulation and design of the electric coupling, which are usually not met by couplings used in rail passenger transport.

4.15 Why is the UIC solution C-AKv not used?

The manufacturer of the C-AKv did not introduce the UIC solution in the course of the DAC4EU project for the following reasons:

- Complex manufacturing,
- Low modularity,
- High weight,
- High costs over the life cycle,
- Difficult integration of the electric coupling,
- Difficult integration of fully automatic uncoupling solutions.

4.16 What are advantages and disadvantages of wheelset generators compared to the DAC?

At European level, a supply voltage of 400 V AC was specified for the power supply system on the digital freight train. The power is supplied via a power distribution line (PDL) throughout the train and the PDL is connected between the wagons by electric couplers, which also pass through the Ethernet-based data bus system.

The supply voltage is switched on by the leading locomotive during train preparation and generally remains active throughout the entire journey in order to supply the electronic components required for operation on each wagon and to charge the buffer batteries. These batteries provide the electrical energy required for shunting operations and when wagons are in a siding.

In principle, the electrical energy required for a wagon could also be generated by a wheelset generator. Such generators are installed on one axle of the wagon and convert kinetic energy into electrical energy when the wagon is moving. Without PDL, each DAC freight wagon has to be equipped with a generator. Each generator only feeds the on-board power supply of the respective wagon, for which a low on-board power supply voltage of 48 V DC, for example, is sufficient.

The more complex electrical protection measures required for 400 V AC are not necessary. In terms of availability, the system with wheelset generators is independent of any interruptions in the PDL, but each vehicle depends on the functioning of the respective generator, which in consequence must provide high availability.

As a result of the working principle, wheelset generators only supply electrical energy when the wagons are rolling, while the PDL is fed by the locomotive also when the train is stationary, e.g. when it stops on a passing loop.

In practice, this means that a higher buffer battery capacity is required when using wheelset generators to cover time intervals without power supply (e.g. when the train is not moving). Wagons with discharged batteries can be powered via the supply line when stationary, which is not possible with wheelset generators.

With regard to the wagon equipment, it should be noted that the electric coupling is still required even if the PDL is omitted and only wheelset generators are used, as the communication system needs a physical data connection due to the requirements of safety critical functions such as train integrity and automatic uncoupling.

This means that when wheelset generators are used, the contacts for connecting the supply line in the electric couplings are omitted, but not the electric coupling as a whole and the potential savings for the electric couplings are therefore not particularly high. On the other hand, the use of wheelset generators entails costs for equipment and maintenance that are not needed with the use of a PDL.

Both concepts - PDL and wheelset generators - offer specific advantages and disadvantages. When wheelset generators are used, the overall wagon equipment is more complex, and the maintenance costs are higher. The lack of supply in standstill would have to be compensated for by larger buffer batteries. This is offset by higher costs for electrical protection with 400 V AC and the provision of the required power from the leading locomotive.

4.17 Are there alternative solutions for data transfer? What are their advantages and disadvantages?

As part of “FP5-TRANS4M-R”, PowerLine+ is being tested as an alternative to Single Pair Ethernet. With this technology, data is sent via power lines. The advantage is that no separate data cables are required. The disadvantage is that it is a proprietary technology from a single manufacturer.

4.18 Why is a uniform DAC coupler head needed?

A uniform DAC coupler head ensures that freight wagons from different manufacturers can continue to be coupled to each other.

Especially in single wagonload traffic, freight wagons from different manufacturers run in a single train. From an operational point of view, this variety can only be controlled if there is a uniform DAC coupler head.

With the standardisation of the system, it is possible to harmonise rail freight transport across Europe in terms of technology and operations and to advance its digitalisation and automation.

4.19 Has the DAC coupler head already been determined? If so, by whom?

The European DAC Delivery Programme (EDDP) decided on the Scharfenberg or latch type design in September 2021.

This decision was made after evaluating and verifying extensive detailed tests within the framework of the DAC4EU project and a demonstrator from the Swedish infrastructure manager, Trafikverket.

4.20 On what basis was the DAC coupler head determined?

A detailed list of criteria has been developed as part of the European DAC Delivery Programme (EDDP). It contains a functional description as well as requirements for operational processes and safety.

As part of the DAC4EU project, an intensive test programme was carried out with four DAC prototypes. Similar test runs took place on the network of the Swedish infrastructure manager Trafikverket.

The results were assessed considering the list of criteria and formed the basis for the EDDP's selection decision in September 2021. It was made in favour of the Scharfenberg or latch type system.

4.21 Is the DAC coupler head compatible with the screw coupling?

No, but a hybrid coupler is to be developed that can be used for coupling railway vehicles with DAC as well as with a screw coupler.

This system is to be installed primarily in locomotives. See also answer to question 4.10.

4.22 Is the DAC coupler head compatible with the SA3?

No, the Scharfenberg or latch type system is only compatible with each other, but not with other systems, such as the SA3.

4.23 Is the DAC from rail freight compatible with the centre buffer couplings used in rail passenger transport?

The technical regulations for the Scharfenberg or latch type design apply to both rail freight transport and rail passenger transport.

Mechanically, the DAC from rail freight transport is compatible with the Scharfenberg or latch type design from rail passenger transport. However, no targeted tests have yet been carried out.

What is known, however, is that concepts for the hybrid coupling in rail freight transport are already in use as a towing solution for rail passenger transport. The manufacturers of the DAC have assured full mechanical compatibility.

The electric coupling as part of the DAC meets the special requirements for use on freight wagons:

- Flat design,
- Mounting on the top of the mechanical coupling,
- Suitability for 400 V AC power supply and
- Provision of the necessary contacts for data transmission on the freight train.

The electric couplings used in rail passenger transport meet other requirements and are, therefore, not compatible with the DAC from rail freight transport.

4.24 Does the Scharfenberg coupling also work in snow and ice?

As part of the DAC4EU project, successful coupling and uncoupling tests were carried out in a climatic chamber in Phase I.

The prototypes were tested at temperatures as low as -25° C and with 3 to 5 mm of ice on the couplings.

See Annex 4 of the report (Englisch version to be found below German documents): https://bmdv.bund.de/SharedDocs/DE/Artikel/E/dak-demonstrator.html

Comparable tests are planned with the revised electric couplings.

4.25 How high is the mass delta due to the change from screw coupling to DAC?

According to current calculations, including electrical components, the mass difference resulting from the switch from screw couplings to DAC totals between 315 and 395 kg per retrofitted freight wagon, depending on the respective supplier.

DAC suppliers state that they are working on measures to reduce this additional weight, in particular through material optimisation. However, practical evidence of this has not yet been provided.

4.26 What is the maximum air pressure for which the pneumatic part of the DAC is designed?

The DAC enables coupling of both brake pipe (BP) and main reservoir pipe (MRP). Pneumatic components of the DAC are designed for 5 bar concerning BP connection and 10 bar concerning MRP connection.

4.27 What reliability is the DAC aimed for?

A detailed analysis of the reliability, availability, maintainability and railway safety of the DAC is currently being carried out ("RAMS analysis").

Defining the requirements for reliability is a complex task. It must be determined in different operating scenarios. In other words: during coupling, uncoupling, train running and in the transmission of electricity and data.

The decisive factor is that the requirements for the DAC regarding operational or even safety critical incidents should be in the same order of magnitude as is the case with the screw coupling.

For example, a significant increase in unwanted train separations cannot be tolerated.

The tests so far show that this goal could be achieved. However, the proof and investigation of reliability in all operating scenarios will remain a central task of the test projects for the time being.

4.28 Do freight wagons equipped with the DAC have to go to the workshop more often for maintenance work than before?

One requirement for the DAC is that the maintenance intervals must not be changed compared to the screw coupling.

However, a concrete statement is not yet possible at this point of time.

Currently, the empirical values are based on tests with prototypes, the development of which has not yet been completed.

d. DAC deployment

4.29 How does the operational staff benefit from DAC?

The DAC allows the automation of rail freight transport and thus the simplification of operational processes.

The elimination of manual coupling and uncoupling reduces the physical strain on employees. This can make working conditions more attractive.

Despite the shortage of skilled workers, increasing transport volumes can be handled.

4.30 Does the DAC work on a hump yard?

Yes, the DAC is designed for operation on a hump yard.

To this end, the DAC is to be further developed to include the "prevent coupling" function. It prevents unintentional recoupling if the coupler heads of neighbouring, uncoupled freight wagons touch each other again.

The first prototypes of the DAC did not yet have the "prevent coupling" function.

4.31 How is unauthorised operation of the push button prevented?

The push buttons can only be activated when the train composition has been decommissioned. This happens when the locomotive driver switches to shunting mode. Activation of the push buttons during train travel is prevented on system-side.

Thus, the train status automatically prevents the push buttons from being activated or pressed while the train is in motion, unless uncoupling is explicitly permitted.

Even when push buttons are unlocked, they must be pressed in a specific combination to trigger a decoupling. This also prevents unintentional activation.

4.32 Will remote uncoupling also be possible?

Yes, remote uncoupling will be possible.

The implementation of this function is firmly planned but first requires the creation of suitable framework conditions to ensure the safe and, in particular, cyber-secure execution of this safety-critical function. Intensive work is currently underway on these prerequisites.

Once they have been defined and technically implemented, remote uncoupling can be introduced.

4.33 Why is the so-called buffer position needed?

The buffer position – known as "prevent coupling" – prevents the recoupling of the already separated coupling points when activated.

Without buffer position, the coupling points of freight wagons that have already been separated could interlock again and consequently also couple.

This is due to, among other things, running dynamics and specific behaviour of load, e.g. the sloshing of liquid cargo.

This function can be used both on the hump yard and in the push-off operation.

The function is comparable to a permanent uncoupling command, which is implemented either via an actuator or a locking mechanism.

In order to enable automatic coupling again in due course, the function has an automatic reset, e.g. by means of an infrastructure-side contact.

4.34 Does DAC have an impact on load security?

Tests carried out so far have not shown any effects on load security. However, this aspect still needs to be analysed in detail.

4.35 Can the DAC compensate for different loading weights?

Yes, like the screw coupling, the DAC can compensate for permissible height differences between two freight wagons.

This requirement must be met so that both empty and loaded freight wagons can be transported in a single freight train.

Loading can therefore be carried out as before.

4.36 Can the DAC also be used at small stations without automation?

Yes, the DAC can also be used at small stations without automation.

As part of the DAC4EU test runs, a track curve with a radius of 45 m was successfully passed. The DAC is, therefore, also suitable for the use in narrow track curves.

4.37 What contribution does DAC make to the introduction of ERTMS?

The European rail traffic management system ERTMS has different technical development stages.

The current highest expansion stage provides for the elimination of track-side train detection systems, such as axle counters, for reasons of efficiency.

To do this, trains must be able to monitor their completeness – known as train integrity – and communicate this at regular intervals to the technical facilities of the railway infrastructure.

This requirement is not a problem for vehicles in rail passenger transport, as they are usually already equipped with a continuous data bus.

Rail freight transport, on the other hand, does not yet meet this requirement, as the freight wagons are only connected mechanically and pneumatically.

Only with the introduction of the DAC and the creation of a continuous data connection, train integrity can also be monitored in rail freight transport.

Freight trains will then be able to run on almost all lines equipped with ERTMS.

4.38 How does the data get from freight wagons to the locomotive, and what happens there?

Data is transmitted from freight wagons to the locomotive via Single Pair Ethernet. This is a two-wire network cable, which is duplicated for redundancy reasons and provides a bandwidth of 10 Mbit.

On the locomotive, the incoming data from the freight wagons are processed and displayed on a screen in the driver's cab, e.g. environmental data, operating data, fault codes, etc.).

The display also offers input options to the driver, allowing commands to be sent to the freight wagons, e.g. uncoupling or brake tests.

4.39 Is DAC the only way to determine train integrity, or are there other solutions for rail freight transport?

Tests are currently underway to determine train integrity by using a radio-based solution. However, the system is not yet available as a series solution.

DAC is a modular platform designed to provide a solution for various applications.

The aim is to use this platform to determine train integrity as well, so that separate control units do not have to be installed on freight wagons for each application.

4.40 Does the introduction of DAC have an impact on the speed of freight trains?

The decisive factor for the speed of freight trains is not the type of coupling, but the permissible maximum speed of the freight wagons used in the train and the infrastructural limitations of the line.

The DAC allows the absorption of high longitudinal compressive forces during braking. Therefore, heavy freight trains can be guided in more effective braking positions (e.g. P instead of G). On many sections of the route, the scheduled maximum speed can be increased.

An electro-pneumatic brake with effect on the chargeable braked weight can further increase the braking capacity of the freight wagons.

4.41 When will electro-pneumatic brakes be available for freight wagons?

The electro-pneumatic brake will be further investigated and specified in the second cycle of Europe's Rail, the continuation of the "FP5-TRANS4M-R" project. It is assumed that product development will not be finalised before 2029.

4.42 Does the DAC support the operation of longer and heavier trains?

The mechanical strength of the DAC is higher than that of the screw coupling and is based on specifications that have already been defined for the AK69, a European development based on the SA3.

They provide for higher operationally usable towing limits. In addition, targeted optimisation of the coupling joint can exert more than twice as much longitudinal pressure forces on the freight wagon.

This makes it possible to run trains with more effective braking positions.

4.43 What contribution can the DAC make to the capacity management of infrastructure managers?

The DAC enables longer and heavier freight trains, as well as simplified train dispatch in the train formation facilities.

More effective braking positions allow the trains to travel faster and thus "swim" better in the overall train traffic.

Experts expect that this should enable capacity increases of up to 15 % measured in tkm on existing infrastructure.

4.44 Does the DAC enable new train configurations?

Yes, new train configurations are possible with the DAC.

This means that a freight train, which consists of two independently movable parts, for example, is split at a certain station and the two train parts then continue in different directions.

In particular when used in conjunction with a Distributed Power System (DPS), it enables longer and heavier trains.

Analogously, it is possible to pick up / reunite train parts and then continue their journey to the destination station.

The formation of train with two locomotives ("double traction") and locomotives at the end of the train (”bank engine / helper engine”) are still possible.

4.45 What are the technical features of freight wagons compared to a wagon in rail passenger transport?

Compared to a passenger coach, a freight wagon is simpler in terms of its technical design.

It can be designed for different purposes (e.g. tank cars, flat cars, etc.).

It usually has no power and data connection.

It is usually not equipped with disc brakes and is therefore approved for lower speeds.

It is usually equipped with a screw coupling on each side of the wagon.

As a rule, it can run on the entire European standard gauge network without restrictions ("go everywhere").

4.46 Why do freight wagons usually have no power supply?

Freight wagons in Europe today usually have no power supply and no electrical components fed by a power line.

The established operational processes do not require any electrical components on the freight wagons. However, their potential for increasing efficiency is, therefore, severely limited (e.g. manual coupling and uncoupling, manual brake test, etc.).

Exceptions are special freight wagons with special requirements. For example, a number of freight wagons for the transportation of road vehicles are equipped with a manually plugged power line that supplies power to the lifting platform for loading and unloading the upper loading area. However, this requires that only appropriately equipped freight wagons are coupled in the train and that the power line is continuously connected.

The DAC is intended to introduce a standardised power supply for the first time in European rail freight transport. It allows all freight wagons to be supplied with electricity in any freight train. This requires that a large number of freight wagons are equipped accordingly during a short migration period.

4.47 Isn’t electricity on freight wagons dangerous?

Every rail vehicle used in passenger transport has electrical circuits with similar voltages. All necessary precautions are taken to minimise the risk of an electric shock.

4.48 What distinguishes freight wagons for dangerous goods compared to "normal" freight wagons?

Freight wagons for dangerous goods are very often transported in tank wagons and represent a special type of freight wagon.

They have special safety features (e.g. crash buffers, climbing protection), fittings and different tank designs.

Tank wagons for dangerous goods require a special authorisation and are subject to special test criteria.

4.49 What requirements must the DAC meet so that freight wagons equipped with it can also be used for dangerous goods?

The development of requirements for the use of freight wagons in potentially explosive environments has not yet been completed.

In principle, it is intended that in explosive areas the power supply will be switched off and all electrical components de-energized. In cases where this is not possible (for example, with the battery), explosion-proof designs must be used.

4.50 What distinguishes freight wagons for the transportation of military equipment or road vehicles compared to "normal" freight wagons?

Freight wagons for the transportation of military equipment are sometimes more robust than "normal" freight wagons and have higher axle loads as well as special security devices for military equipment.

Freight wagons for the transportation of road vehicles are mainly used to deliver brand-new passenger cars and vans. These represent comparatively light goods to transport.

In many cases, freight wagons for the transportation of military equipment or road vehicles have loading flaps at the front, which are required for loading and unloading the vehicles.

These loading flaps must not touch the electric coupling, which makes up the upper part of the DAC, when unfolded and driven on.

This was successfully demonstrated in early tests with further developments of the electric coupling and on the basis of some exemplary designs of freight wagons.

In addition, initial measurements during various tank loading operations have confirmed the implemented requirements for the height of the coupling and the maximum installation space of the coupling system.

4.51 Can refrigerated containers also be supplied with energy via the DAC?

The power requirement for a refrigerated container is several kilowatts. In contrast, the electrical components per freight wagon with DAC require less than 50 watts on average during operation. A single freight wagon with a refrigerated container requires around 100 times the power of a freight wagon without a refrigerated container.

In other words: A long DAC freight train with 50 freight wagons requires only about half the electrical power of a single freight wagon with a refrigerated container. If the electrical supply system were to be designed for this much higher power requirement, the costs would increase drastically.

A higher supply voltage would be required, the cable cross-sections would be larger, the contacts in the electrical part of the coupler and on the plug connectors would take up more installation space. And finally, the locomotives would have to provide the considerably higher power.

All in all, a considerable amount of additional effort would be required for development and deployment, so that a profitable cost-benefit ratio for the automation functions would no longer be given.

4.52 What are Pioneer DAC Trains?

Pioneer DAC Trains are freight trains that will be used to test the technological and operational robustness of DAC in Europe from mid-2027. For this purpose, automatic couplers will be installed in several locomotives and freight wagons and used in commercial operation.

Pioneer DAC Trains are to be equipped with the so-called “DAC Basic Package”. In addition to the automatic coupler, this includes several automation components. They can be used, for example, to carry out the automatic brake test or to recognise the train composition and wagon sequence.

The aim of Pioneer DAC Trains is to prove the benefits of DAC implementation and to minimise associated risks.

Pioneer DAC Trains are organised as an independent project. It operates under the labelling PioDAC and is co-funded by the Connecting Europe Facility (CEF).

4.53 Who participates in the Pioneer DAC Trains?

In September 2024, the European Climate, Infrastructure and Environment Executive Agency (CINEA) published a call for proposals for the Connecting Europe Facility (CEF). Interested companies were invited to submit applications for studies on DAC for rail freight transport – including validation of the system in commercial operations.

In July 2025, CINEA published the list of projects to be awarded funding under the 2024 CEF call for proposals, including the Pioneer DAC Trains (PioDAC) project submitted by Swedish infrastructure manager Trafikverket. The project is to receive around EUR 25 million in funding.

In October 2025, CINEA signed the grant agreement for the PioDAC project. The Swedish infrastructure manager Trafikverket is responsible for project management. The commercial freight trains will be operated by railway undertakings from Germany, Italy, Luxembourg, Norway, Austria, Sweden and Slovenia. They will be supported by DB AG, UIC and VPI European Rail Service.

Three commercial freight trains are to run on cross-border connections, and tests at marshalling yards are also planned. This will enable all the relevant criteria of the CEF call for proposals 2024 to be met.

PioDAC was launched on 01.11.2025 and will run for 36 months. The first commercial freight trains are scheduled to go into operation in mid-2027. By then, the specification for the "DAC Basic Package" must be finalised, the components must be procured and installed, and the approval process must be initiated and completed.

4.54 Who funds and finances the Pioneer DAC Trains?

Projects that are subsidised with funds from the Connecting Europe Facility (CEF) generally receive up to 50% of the eligible costs from the EU budget.

The other half must be covered by the participating companies. In order to reduce their own contribution, some project partners are currently seeking national co-funding.

4.55 Who organises the Pioneer DAC Trains?

The Pioneer DAC Trains are to be coordinated centrally by a consortium under the leadership of the Swedish infrastructure manager Trafikverket.

Companies from seven countries are involved in the consortium. The commercial freight trains are operated by railway undertakings from Germany, Italy, Luxembourg, Norway, Austria, Sweden and Slovenia. They are supported by DB AG, UIC and VPI European Rail Service.

The members of the consortium coordinate technical issues with the "FP5-TRANS4M-R" funding project. There is also regular exchange with Switzerland, where a comparable national project is planned.

If, in addition, nationally funded Pioneer DAC Trains are established, the respective railway undertakings will also be involved in coordinating the technical work and results.

4.56 What happens to the results of the Pioneer DAC Trains?

The results, experiences and conclusions from the operational testing of the Pioneer DAC Trains are continuously passed on to the manufacturers from the railway supply industry and all participating companies. They must also be published in accordance with the tender conditions of the Connecting Europe Facility (CEF).

This ensures that the findings from the Pioneer DAC Trains are fully available to the sector and that the final technical solution has the robustness required for a successful migration at the start of the DAC introduction in Europe.

4.57 Do Pioneer DAC Trains require an authorisation?

The train runnings with the Pioneer DAC Trains are to be carried out under commercial conditions. They are, therefore, not legally comparable with the demonstrator trains that have been running to date.

In some EU Member States (e.g. Germany), commercial test runs on national rail infrastructure may only be carried out with authorised vehicles. Therefore, all vehicles upgraded for the Pioneer DAC Trains must be reauthorised for operation on national rail infrastructure.

The procedure for these authorisations is currently being coordinated with the European authorising entity, the European Union Agency for Railways (ERA), taking into account the current legal situation. A generic risk analysis is being drawn up and the requirements and their verification are being jointly recorded.

The results should be applicable to all vehicle types and form the basis for a simplified authorisation procedure for migration.

If the modifications to the vehicle are not subject to authorisation in accordance with the relevant legal provisions, it is sufficient to notify the state authority of the test runs and obtain its approval. Responsibility for safe operation then lies with the respective railway undertaking or infrastructure manager.

4.58 Does the current European legal framework for authorisations support the commissioning of Pioneer DAC Trains?

No, the current European legal framework is only partially suitable for the commissioning of the Pioneer DAC Trains. At present, there is no harmonised authorisation procedure in Europe for test runs under commercial conditions.

Responsibility for this lies with the EU Member States, which have enacted individual regulations at national level.

From the perspective of rail freight transport, a harmonised Europe-wide regulation is needed to simplify the operation of test runs under commercial conditions. This applies to both national and cross-border transport.

In any case, safety must not be compromised.

5 Migration (31)

a. General

5.1 What are the main challenges for DAC migration?

One of the biggest challenges for DAC migration is operating with two different, incompatible coupling types during the transition phase:

1. Digital Automatic Coupling (DAC) and
2. Screw coupling (SC).

The current target picture of the European DAC Delivery Programme (EDDP) envisages a complete retrofit of the European freight fleet initially on the 1'435 mm network. Therefore, it forms the basis for the cost-benefit analysis (see section 6.b) and for migration planning. This framework condition requires precise preparation of the DAC migration.

The primary goal of migration planning is, therefore, to develop strategies that enable efficient production throughout the sector even in this phase to offer transport customers the best possible service during and beyond the system transition.

It is important to note that mixed operation of freight wagons that have already been upgraded with a DAC and those that have not yet been upgraded is not possible or practical. This applies to many different train systems, and in particular to single wagonload traffic operated by many European railway undertakings. The additional effort for sorting separately according to coupling systems cannot be mapped in terms of capacity, especially in large train formation facilities.

Another major challenge is to offer the necessary capacities in European workshops for the actual mechanical upgrading and the electrotechnical upgrade of freight wagons, i.e. in particular the development of the necessary personnel with the appropriate qualifications.

These and other points must be coordinated at European level so that cross-border traffic is possible without interruption. With its four migration strategies (see answer to question 5.2.), the migration method is designed precisely to meet these challenges.

5.2 What alternative scenarios for DAC migration have been considered or rejected to date?

There is a conflict between maintenance and operation in terms of the time required for the migration to DAC.

- From the point of view of today's maintenance processes and the existing workshop infrastructure with the existing capacities, it would be optimal to extend the migration phase over a long period of time and to upgrade freight wagons only when they come to the workshop for a revision. This procedure is called **serial migration**.
- From the point of view of efficient operations – i.e. production – in rail freight transport, all freight wagons should be upgraded at once so that there is full compatibility between all vehicles in the system at any time, as is the case today. This procedure is called **simultaneous migration**.

Given this trade-off, many different migration scenarios were examined. It has become apparent that operation of freight wagons with both coupling systems is not possible on a permanent basis in the European single wagonload networks.

- Mixed operation in shunting yards and other train formation facilities was examined: the expected capacity problems, operational bottlenecks and significantly increased management efforts led to the rejection of this option.
- In addition, to avoid mixed operation in train formation facilities, the division of the single wagonload network was analysed, in which the systems operate in screw coupling or DAC mode, depending on the daytime. This was also rejected, as separation daytime is only possible in a small network. In larger networks, the trains formed in this way would have entered facilities several hours later at a different daytime, where they would have been operated with the “wrong” coupling. Therefore, this option was rejected, too.
- The exclusive migration of new vehicles was also rejected because they are almost always coupled together with existing vehicles sooner or later. In addition, the useful life of a railway vehicle spans several decades. The migration would then also take that long for the last vehicle to be replaced by a new one.
- For reasons of weight and costs, the equipping of freight wagons with hybrid couplings in large numbers was also rejected.

For block and intermodal trains, however, the vehicles usually must only be able to couple with a limited number of other vehicles (exception: replacement of defective vehicles). In the case of train and wagon systems to which this applies, we speak of

separable transports. These can be gradually upgraded depending on the capacity of the workshops.

For non-separable transports, also known as “core wagonload system” transports, on the other hand, which focus on single wagonload traffic, a simultaneous migration with a quick transition in a short time is being sought. The following four migration methods are considered particularly promising:

1. Easy upgrading: During a stop in a workshop, the screw coupling is replaced by the DAC and all necessary work is carried out. As this method is very time-consuming, it is advisable for the serial upgrade of separable transports.
2. Pairing strategy: Regularly running pairs of freight wagons will temporarily be coupled with the DAC and marked with a separation ban. As a "pair", these wagons are from outside still fully compatible with wagons with a screw coupling. When migrating the core wagonload system, these wagons will be rearranged in such a way that the DACs are on the outside and the "pair" is compatible with wagons with DACs without any work effort. The screw couplings remaining in the middle of the wagon pair are then upgraded as quickly as possible afterwards.
3. "DACready": In a first step, the freight wagons will be prepared for the DAC in a phase lasting several years (e. g. equipping them with a DAC spring package), but they will keep the screw coupling and the side buffers. The installation of the head of the centre buffer coupling and removal of the side buffers is carried out in a second step in a quick transition in a short time (simultaneously). Overall, the two steps require slightly more time than a simple upgrade. However, the advantages outweigh this: peaks in workshops can be smoothened and simultaneous migration can take place as quickly as possible. See also answer to question 5.10.
4. Swap strategy: Here, wagons from separable transports and already fully retrofitted transports are exchanged with comparable wagons from the core wagonload system. The wagons, which are now running again with screw coupling in the separable transports, will be completely upgraded afterwards. This strategy is suitable for wagon types that are used both in the core wagonload system and in separable transports.

5.3 Why is the introduction of the DAC not limited to new vehicles only?

The objective of the DAC project, which is also the basis of the cost-benefit analysis (see section 6.b), assumes that the growth in rail freight transport can be fully developed only if the efficiency effects of the DAC and the additional components are achieved with as many vehicles as possible and are applied to the infrastructure used. However, new vehicles will only replace old vehicles to a limited extent (measured in terms of the total size of the fleet to be migrated). Usually, the life of a railway vehicle covers several decades. The migration would then also take that long until the last vehicle has been replaced by a new one.

Since the DAC is a major component for digitalisation, the entire fleet currently in use would be excluded from digitalisation. Investors would be forced to replace operational vehicles entirely with new vehicles if they wanted to keep up with intermodal competition in terms of technology. Even if the capital would be available on the market, the rail vehicle industry does not have enough capacity or skilled workers to replace the fleet quickly.

In rail freight transport, a large number of vehicles come into contact with other vehicles, e.g. when a rental contract ends and vehicles from a previously separable transport are distributed across Europe to new contracts. Therefore, the relatively few new vehicles with a DAC would be foreign objects in the train systems with screw couplings. However, the classic business model of vehicle rental companies relies on the completely flexible deployability of the vehicles. At least half of the freight wagons in Europe are owned by vehicle rental companies.

The introduction of DAC is, therefore, not limited to new vehicles, but covers the entire fleet.

5.4 Why can't the introduction of the DAC be limited to a few countries?

Rail freight transport is a strongly international business. The flow of goods, and thus increasingly also the network structures of the railway companies, are cross-border.

The entire sector has been working at full speed and at great financial expense for years to reduce technical and administrative obstacles at the borders and to achieve

full continuity of the traffic. The DAC migration must not counteract the successes already achieved in this field.

Trains not only run as a whole across national borders and return to their starting point in this formation. They are formed, in particular in single wagonload traffic, in one country and dissolved in another. Freight wagons are collected and distributed. This also takes place outside the single wagonload network in partly complex wagon group systems.

National unilateralism in migration or migration methods that provide for country-by-country upgrading would severely hinder or exclude efficient international transport and cause a backward modal shift.

5.5 Who will be responsible for carrying out the migration?

For the coordination and monitoring of a Europe-wide, regulated migration, the aim is to set up a so-called “Deployment Management Entity”.

It is to fulfil this task with its own staff and secured financing in a competition-neutral manner. The responsibility for the actual upgrading falls on the respective vehicle owner.

5.6 When should migration start in Europe?

In December 2024, the Supervisory Board of the European DAC Delivery Programme (EDDP) approved and published the schedule ("DAC General Master Plan"). It foresees the start of the introduction of the DAC from 2029 and expects completion in 2034.

Before that, the Pioneer DAC Trains (see section 4.f) will be tested on the open network in commercial operation for several months. They aim to test the technological and operational robustness of the solution and to minimise the risks for DAC implementation.

At the same time, the legal and financial framework for the DAC introduction in Europe and the Deployment Management Entity (see question 5.5) are to be created.

The schedule also takes into account the fact that the existing workshop capacities in Europe are limited or can only be expanded to a limited extent and that they are also needed for other projects (e.g. the introduction of ERTMS).

5.7 How should the migration of freight wagons take place?

How a freight wagon is migrated depends on how it is used.

Is there a need for it to be compatible with an undefined number of other vehicles at any time, or is it usually only used with a known group of other vehicles? The latter is particularly the case for block and intermodal trains. We call that separable transports.

In the case of separable transports, a serial migration takes place. This means that the wagon upgrading is carried out per traffic or train system. In this case, it makes sense for the wagons operating there to be upgraded to the DAC system directly in one step.

In the case of non-separable transports, which focuses on single wagonload traffic, we speak of the core wagonload system. To make sure that each wagon is compatible with every other wagon at any time, a simultaneous migration is being sought, in which all wagons are upgraded in a defined, very short period after a preparation phase of several years.

5.8 By when should the migration of freight wagons be completed?

The migration will start as soon as the technical legal framework has been defined, the funding and financing have been clarified and sufficient components are available for the start of the migration.

Migration planning envisages the so-called "4+2 scenario":

- Four years of preparation time until simultaneous conversion in the core wagonload system (e.g. single wagonload traffic).
- Parallel to the pre-installation, the complete upgrade of the wagons used in separable transports will begin. A total of six years is estimated for this serial approach (traffic per traffic), so that it will continue for another two years after the simultaneous conversion in the core wagonload system.

5.9 What does “DACable” mean?

“DACable” is a made-up word combining “DAC” and “able”: it describes vehicles that are suitable for installation of the DAC system without further structural modifications.

In the case of freight wagons, these are mainly (but not exclusively) vehicles that have been built in accordance with the specifications of UIC leaflet 530-1 or retrofitted accordingly.

These vehicles have the necessary installation space for the DAC spring package and the necessary frame stability. They can absorb the compressive forces transmitted via the coupling at the rear of this installation space. This is necessary because the compressive forces in the DAC system are no longer transmitted laterally at the side buffers.

In the “DACable” state, no components of the DAC system are installed yet, unlike in the “DACready” state. See also answer to question 5.10.

5.10 What does "DACready" mean?

The "DACready" strategy divides the upgrading of freight wagons into two steps:

1. The first step is to prepare the individual freight wagons for the quick migration to the DAC. This means that all components that do not affect operation with the screw coupling can be installed. This includes in particular replacing the pure draft gear of the screw coupling by the spring package of the DAC, to which the draw hook and the screw coupling are then reconnected. In addition, all installations should be carried out from underneath the vehicle wherever possible (e.g. fitting the pre-assembled cable ducts).
2. In a second step, the removal of draw hooks and side buffers and the installation of the DAC coupler head can be carried out as quickly as possible. The additional electrical components can then be installed in the positions of the present buffers at the standardised drill holes for the buffers. This is quick and easy to maintain.

After the first step, the vehicle is in “DACready” mode and can continue to be used as before with a screw coupling. While the first step must be carried out in regular workshops including lifting ramps or work pits, the requirements for the technical equipment of the workshops for the second step are much lower. So, this can also

be done outside regular workshops in so called "pop-up workshops" that have been temporarily set up for this purpose.

5.11 Do all freight wagons have to be upgraded?

No, there are currently no plans to make upgrading mandatory. However, it can be assumed that in the long term, the economic operation of non-upgraded transport will only make sense in very specific niche areas.

The objective of the DAC project, which is also the basis of the cost-benefit analysis (see section 6.b), assumes that the growth in rail freight transport can be fully developed only if the efficiency effects of the DAC and the additional components are achieved with as many vehicles as possible and are applied to the infrastructure used.

In the medium to long term, it can be assumed that all wagon owners will demand a switch to DAC, as the usability of wagons that have not been upgraded, will be highly restricted. This applies to international transport, and even in domestic transport, service partners (e.g. industrial railways, harbour railways, rail transport companies, wagon hire companies, workshops) will not maintain two systems. In addition, infrastructure restrictions for wagons with screw couplings cannot be excluded, e.g. due to a lack of train integrity monitoring.

On the other hand, freight wagons with only a short remaining service life can be used in the old system for isolated rail connections beyond the defined migration period.

5.12 What are so-called "coupling wagons"?

These are vehicles that have a screw coupling on the one side and a DAC on the other. These vehicles are connecting the two different coupling systems.

However, this configuration poses the challenge of correct alignment when coupling.

For this reason, adapter wagons are preferred, which are equipped with a hybrid coupling on both sides to enable the smooth connection between the different coupling systems.

Such wagons may be necessary for individual processes in the migration phase. However, for reasons of weight and cost, they are not a general solution to handle

a complex migration. The additional weight in particular is a disqualifying factor for numerous wagons used to transport weight-sensitive goods.

The developed migration methods aim to limit the need for the use of adapter wagons as much as possible.

5.13 Will there be freight wagons with hybrid couplings?

The DAC migration planning primarily strives to exclude the meeting of wagons with screw couplings and DAC as far as possible.

Nevertheless, due to special operational circumstances in specific migration phases, situations will arise in which freight wagons with screw couplings will have to be coupled with freight wagons with DAC.

In a few cases, adapter wagons with hybrid couplings are required for this purpose. The equipment on both sides with a hybrid coupling prevents these wagons from not being used due to incorrect alignment, as it is only possible to rotate the wagons at very few operating points.

5.14 What happens to existing freight wagons without sufficient installation space?

First, a fleet analysis is used to check which wagon types do not meet the requirements for the installation of the DAC.

These wagons are categorised, and design studies are carried out for the installation of a centre buffer coupling.

Once technical solutions have been identified and successfully tested, they are implemented. These wagons are then DACable.

5.15 What happens to existing freight wagons that cannot be upgraded?

In order to achieve the effect assumed in the cost-benefit analysis (see section 6.b) and to fully develop growth in rail freight transport, solutions must be sought for all existing vehicles as to how they can be retrofitted.

For many vehicles, the installation of the DAC is simple and easy. For others, the effort is higher, e.g. by increasing the strength of the vehicle frames by means of smaller stabilising measures. The number of vehicles for which this higher effort is required is currently being determined. It can be assumed that a DAC can be installed on all freight wagons. Preparing the vehicle for it is a question of cost.

If a keeper of a vehicle decides not to upgrade his vehicle anymore, then such freight wagons, for example, can still be used in separable transports. They would consist of wagons with screw couplings. A meeting with DAC wagons must be ruled out.

Difficulties arise when these freight wagons are used in single wagonload traffic and there is no specific use for them in separable transport. Transport in the single wagonload network, e.g. of freight wagons from separable transport to and from maintenance works, is also problematic.

In the future, it is to be expected that the use of non-upgraded vehicles on public infrastructure can be restricted as soon as the use of other DAC-related components becomes mandatory there, e.g. the "digital rear end signal" for ERTMS.

5.16 What happens to existing freight wagons where the strength of the wagon structure is not suitable for a DAC installation?

First, a fleet analysis is used to check which wagon types have a lack of strength in the wagon structure. Due to different purpose of use, each type of wagon has special characteristics. For this reason, not every type of wagon was automatically designed for power absorption via a centre buffer coupling.

These types of wagons are examined and categorised in great detail. Using 3D models and FEA simulations (finite element analysis), constructive solutions for the installation of a centre buffer coupling are designed. Simple design solutions have already been developed for individual vehicle types, e.g. a widely used intermodal double pocket wagon.

These constructions are evaluated iteratively and optimised. The positive simulation is followed by the practical test to enable safe operation.

5.17 What happens if documents on wagon types are no longer available?

During the migration, a database will be created in which all companies in the industry will enter their wagon data and documents. This database will be operated by a neutral institution.

By means of an open-source approach, every vehicle keeper is given the opportunity to obtain information from it and to provide missing documents.

5.18 Who decides which freight wagons are to be upgraded and which are not?

The respective vehicle owner is responsible for deciding whether or not to upgrade. Freight wagons are part of a comprehensive system. Coordination between the various partners involved in vehicle deployment (e.g. vehicle owners, railway undertakings, workshop operators, siding operators, etc.) is therefore essential.

With the aim of designing the migration for the sector as a whole, work is currently proceeding on an efficient regulatory coordination body. It will be centrally organised, must meet competition law requirements and support the sector in the upgrading process.

5.19 What type of DAC will be migrated and what is the “DAC Basic Package”?

The DAC type classifications sometimes used (e.g. Type 4, Type 5) refer to the respective functional level of the DAC in terms of its degree of automation, but they do not provide any information about specific, available functions.

Therefore, the EDDP Programme Board decided in November 2023 that the DAC – including the energy and data system – should be introduced with a so-called "DAC Basic Package".

This was most recently described by the EDDP Supervisory Board in September 2025 with the following definition:

- DAC coupler incl. energy/data system (incl. “prevent coupling” function)
    - Mechanical, electrical and pneumatic coupling

- Emergency manual coupling
- Power supply (400 V AC electrical power on train level and 48 V DC on wagon level)
- Single Pair Ethernet in train data communication

- Train composition/wagon order detection
- Automated brake test
- Train integrity and train length determination
- Automated uncoupling
  - automated uncoupling using train communication network
  - automated uncoupling locally triggered by a push-button.

This is also associated with the requirement that the DAC Basic Package must be modular, upgradable, and interchangeable.

5.20 When will brand-new freight wagons be delivered with the DAC?

It is essential that brand-new wagons used in the core wagonload system are equipped with the DAC as soon as the DAC migration has begun.

However, if these wagons are used in a separable transport, the operator of this traffic has to decide, by taking into account the characteristics of the respective traffic, when the new vehicles with DAC already installed will be ordered.

However, it is advisable to make sure already now that newly purchased wagons meet the DAC requirement, i.e. are DACable. See also answer to question 5.9.

5.21 Will the migration take into account the maintenance cycles of freight wagons?

Yes, the maintenance cycles of freight wagons are taken into account.

As part of the "DACready" strategy, it is advisable to make the appropriate preparations if the vehicle concerned is already scheduled for maintenance work or overhauls.

This avoids the need for an additional workshop visit.

5.22 Is there sufficient workshop capacity in Europe for the migration of freight wagons?

The existing workshop infrastructure is currently fully utilised 24/7. Therefore, an increase in capacities is possible through additional staff. An expansion of individual workshops for the DAC upgrading is also conceivable.

During the quick upgrade for the core wagonload system transports, capacities will have to be significantly expanded once again. Among others, the "pop-up workshops" will be set up for this purpose, which will provide the necessary capacity together with the regular workshops.

Further information on the approach of the "pop-up workshops" can be found here (German movie with English subtitles): https://www.dbcargo.com/rail-de-en/logistics-news/upgrading-made-easy-with-pop-up-workshops-8965890

5.23 Is there a sufficient number of employees in Europe with the right qualifications for the migration of freight wagons?

Currently, there is hardly any free personnel capacity in maintenance. Therefore, additional staff is needed to migrate across Europe. For example, they will be directly involved in the assembly of the DAC or support in logistics, e.g. forklift drives. This results in different requirement profiles for the staff, which can be considered when recruiting personnel.

The digital components require additional qualifications in the workshops that are classically hardly available today, such as mechatronics engineers or electricians.

In order to plan the migration realistically, the existing qualifications of the employees in the freight wagon workshops must also be considered. The so-called “design to retrofit” should make sure, among other things, that no extensive additional qualifications are required for the installation of the DAC and the additional components compared to those currently available.

5.24 Do wagon manufacturers have enough capacity to produce enough new freight wagons?

The objective of the DAC project, which is also the basis of the cost-benefit analysis (see section 6.b), assumes that the growth in rail freight transport can be fully

developed only if the efficiency effects of the DAC and the additional components are achieved with as many vehicles as possible and are applied to the infrastructure used. Therefore, DAC solutions should be developed primarily for the existing fleet.

Extensive additional capacities in the vehicle industry are not expected, as according to current estimates on the side of the vehicle keepers, the replacement of the existing fleet would not be funded. Therefore, the migration methods must be developed based on the existing fleet. However, it is possible to procure new freight wagons with DAC on schedule.

c. Locomotives

5.25 How should the migration of locomotives be carried out?

The locomotives used in European rail freight transport must remain operational for the duration of the migration, so that they can move all vehicles to be coupled with them. For locomotives, a quick change, therefore, would not make sense.

Thus, a technical solution must be found for the transitional period to be able to operate both coupling systems. The solution to this is the hybrid coupling.

A mechanism allows the Scharfenberg coupler head of the DAC to be folded up and then manually coupled with the draw hook of the screw coupling.

The technical solutions for individual series are under development.

5.26 Do all locomotives have to be upgraded?

The objective of the DAC project, which is also the basis of the cost-benefit analysis (see section 6.b), assumes that the growth in rail freight transport can be fully developed only if the efficiency effects of the DAC and the additional components are achieved with as many vehicles as possible and are applied to the infrastructure used.

This means that solutions are being sought for all existing vehicles on how they can be upgraded. Equipping rail freight locomotives with the DAC will become a prerequisite as soon as DAC is integrated into regular operations.

During the transition phase, hybrid couplings for locomotives will be used as far as possible and necessary for flexible application at all stages of migration.

In the long run, however, the goal is that all locomotives used in rail freight transport are equipped with a DAC.

5.27 What happens to locomotives that cannot be upgraded?

The objective of the DAC project, which is also the basis of the cost-benefit analysis (see section 6.b), assumes that the growth in rail freight transport can be fully developed only if the efficiency effects of the DAC and the additional components are achieved with as many vehicles as possible and are applied to the infrastructure used.

This means that solutions are being sought for all existing vehicles on how they can be upgraded.

This can also mean that "low-cost" alternatives for simple shunting operations in sidings and for industrial railway operations are used under simple conditions, e.g. coupling adapters.

5.28 When should brand-new locomotives be equipped with the DAC or hybrid couplings?

From the time of the system changeover, from which the DAC is the predominant coupling system, brand-new locomotives are to be equipped with the DAC or hybrid couplings.

However, new vehicles should already be "DACready" from the time of the implementation decision or at least be designed for it.

Vehicles that can be equipped with a hybrid coupling should also be equipped with it if this is necessary during the migration for its most flexible use.

d. Rail infrastructure

5.29 How should the migration of the yellow fleet be carried out?

The yellow fleet refers to all railway vehicles used for the construction and maintenance of the rail infrastructure.

Under certain conditions, the yellow fleet is a separable network. Therefore, migration methods can also be applied to this.

It is conceivable to upgrade the yellow fleet in two steps. First, the vehicles will be pre equipped for "DACready" status and, as a second step, after the transition of the core wagonload system transports, they will be fully upgraded.

This also relieves the workload of upgrading capacities.

5.30 How should the migration of the buffer stops be carried out?

Buffer stops that are not yet designed for central buffer couplings should be adapted if necessary, according to the specifications of the infrastructure managers.

5.31 How should the migration be carried out for last mile infrastructure?

Siding and industrial railways are affected by the changeover in the same way as railway undertakings, vehicle keepers and public rail infrastructure managers. Pure industrial railways are excepted as they do not have any interchange traffic with the public network.

When deciding on when and how freight wagons are to be upgraded, all parts of the transport chains in their area of operation must be taken into account. These are:

- the train run,
- handling and shunting tasks within the area of responsibility of the railway undertakings, and
- all handling, sorting, loading and unloading operations within the area of the siding and industrial railways.

For this purpose, a changeover plan must be drawn up using the four migration methods (see question 5.2), which takes into account the interests of the siding and industrial railways equally.

This is because vehicle flows that appear to be separable outside the siding and industrial railways (and could therefore be upgraded at different times) run together in the area of the siding and industrial railways. They must be moved together or at least with the same shunting vehicles and means.

The following measures can help with this changeover planning:

- coordinated changeover of all traffics that cannot be separated in the siding and industrial railway area, as well as
- equipping shunting vehicles and means with a hybrid coupling system (DAC, screw coupling, RK900) if necessary.

A particular challenge here is the wide variety of different shunting vehicles. Although most of them are quite old, in many cases it can be assumed that they will continue to be operated beyond the DAC migration.

On the one hand, their use for this purpose is often still economical, and on the other hand, some types were designed decades ago to absorb the force of a centre buffer coupling that was considered at the time. The latter simplifies the mechanical installation of the DAC and hybrid coupling systems.

Necessary adjustments to the infrastructure, e.g. regarding buffer stops, must be coordinated with the planned upgrading of the vehicles.

6 Overarching topics (29)

a. Legal aspects

6.1 Where will the DAC be legally embedded?

The DAC is to be embedded in the Technical Specification for Interoperability (TSI) of the "Freight Wagons" and "Locomotives and Passenger Wagons" subsystems.

It remains to be seen whether other TSIs are also affected. For example, the digital functions could be related to the TSI "Control, Command and Signalling".

When DAC is introduced, all requirements are to be recorded in the relevant TSIs so that specific national requirements can be avoided.

TSIs are adopted as a regulation and are, therefore, valid in all EU Member States from the date of entry into force.

The legal framework needed to organise migration, as well as to implement and endow the funding and financing scheme, has to be subject to a separate EU legal act.

6.2 Who decides on anchoring the DAC in EU law?

Technical specifications for interoperability (TSIs) are developed or formulated by representatives of the European railway sector and adopted by EU Member States on the basis of a proposal from the European Commission.

The body responsible for this is the so-called RISC, the Railway Interoperability and Safety Committee.

It is still unclear which EU legal act is needed for the organisation of migration as well as the implementation of the funding and financing scheme.

6.3 Does EU law still need to be implemented by EU Member States?

Technical Specifications for Interoperability (TSIs) are adopted as a regulation and will, therefore, apply in all EU Member States from the date of entry into force.

Since it is still unclear which EU legal act is needed for the organisation of migration as well as the implementation of the funding and financing scheme, it is not yet clear whether EU Member States will have to adapt their national law.

6.4 Will the DAC installation space be legally anchored again?

Until 2006, when the Technical Specification for Interoperability (TSI) of the freight wagon subsystem was introduced, the installation space was required in UIC leaflet 530-1, but never in the TSI. As of today, new freight wagons are therefore not required to have a DAC installation space.

The DAC installation space was intended for the subsequent equipping of the freight wagons with automatic couplings. With the introduction of the DAC in the context of the next TSI revision, such an obligation is not necessary. From today's perspective, the corresponding procedure is to be completed in 2027/28.

6.5 On what legal basis will DAC be introduced outside the EU Member States?

EU technical legislation will be adopted into national law by countries outside the European Union either:

- automatically (e.g. EEA Member States such as Norway),
- within the framework of autonomous enforcement (e.g. Switzerland) or
- on the basis of COTIF, the Intergovernmental Agreement for International Carriage by Rail,

It remains to be seen whether and, if so, how countries outside the European Union will participate in the organisation of migration as well as in the implementation of the funding and financing scheme.

6.6 For which European gauges is the specification very likely to be relevant?

The Technical Specifications for Interoperability (TSI) apply in principle to freight wagons and locomotives intended to operate on one or more of the following

standard gauges: 1’435 mm, 1’524 mm (Finland), 1’600 mm (Ireland) and 1’668 mm (Portugal, Spain).

The TSIs currently do not apply to freight wagons and locomotives operating mainly on 1’520°mm gauge (Baltic States) and occasionally on 1’524 mm gauge (Finland).

It can be assumed that there will be full or partial exceptions for track gauges beyond 1’435 mm.

6.7 Do freight wagons have to go through an authorisation process for the installation of a DAC spring package ("DAC ready")?

The aim is to ensure that the mere installation of a DAC spring package does not result in an authorisation process. This pre-equipping of freight wagons is referred to as "DAC ready". See also answer to question 5.10.

The same applies to the installation of electrical components (including sensors and cables), as there is no electrical connection to the locomotive and the components are therefore not active.

6.8 Do existing freight wagons which will be upgraded with a DAC have to go through an authorisation process?

From today's perspective, it is already clear that an authorisation process is required. Representatives of the sector are in dialogue with the European Union Agency for Railways (ERA) in order to be able to implement the process as simply and cost-effectively as possible.

The aim is to carry out the authorisation process generically and thus independently of the vehicle type.

6.9 Do upgraded locomotives have to go through an authorisation process?

From today's perspective, it is already clear that an authorisation process is required. Representatives of the sector are in dialogue with the European Union Agency for Railways (ERA) in order to be able to implement the process as simply and cost-effectively as possible.

The aim is to carry out the authorisation process generically and thus independently of the vehicle type.

6.10 What challenges are there in getting upgraded freight wagons authorised?

The authorisation of upgraded freight wagons is challenging in many respects. These are in particular:

- Before the introduction of the Technical Specifications for Interoperability (TSI), freight wagons could operate throughout Europe on the basis of the so-called RIV (Regolamento Internazionale Veicoli). This framework was replaced in 2006 by the AVV (General Contract for the Use of Freight Wagons). Unlike the RIV, the AVV does not contain any provisions on vehicle authorisation. They are laid down in the TSI for freight wagons. If a freight wagon operated on the basis of the RIV is upgraded and requiring reauthorisation, then according to the current interpretation of the European Union Agency for Railways (ERA), it may only operate in those Member States in which it was last operated. This restriction jeopardises the introduction of the DAC.
- Upgraded freight wagons must meet the TSI requirements. This applies exclusively to those parts that have been upgraded and to the TSI parameters affected by the modification (e.g. strength). Changes to the vehicle can only be assessed if the technical documentation of the vehicle is sufficient. However, this documentation is sometimes insufficient, especially in the case of older vehicles.
- Vehicle authorisations are always issued on the basis of a vehicle type authorisation. The more types are existing, the greater the effort required to authorise the fleet to be upgraded.
- Demonstrating compatibility with track-side train detection systems is currently very burdensome. It must be provided separately for each Member State. Until now, freight wagons did not have any electrical equipment and were therefore exempt from the relevant requirements. With the introduction of DAC, however, electrical components are now used on freight wagons, meaning that, like locomotives and passenger coaches, they must demonstrate electromagnetic compatibility. Work is currently underway at European level to simplify these regulations. The aim is to harmonise the provision of evidence across Europe.

6.11 What are the challenges involved in getting upgraded locomotives authorised?

Authorising upgraded locomotives is challenging in many ways. These are in particular:

- Vehicle authorisations are always issued based on a vehicle type authorisation. The more types there are, the greater the effort required to authorise the fleet to be upgraded.
- For existing locomotives, verification is particularly challenging due to the installation of the DAC. This applies above all to compliance with certain requirements:
    - Crash worthiness for locomotives must be verified in accordance with the current crash standard for an impact speed of 36 km/h. Initial analyses by locomotive manufacturers have shown that locomotives with DAC are not technically crash-safe for impact speeds of more than 20 km/h. For locomotives that were authorised before 2015 and did not have to meet any crash standards, DAC-retrofitting with energy absorption elements represents an improved crash safety. This upgrade can be accepted for the authorisation. For locomotives that were approved after 2015, the requirements of the standard have to be fulfilled.
    - Safety-relevant components such as wheel sets and car bodies are designed for maximum loads. The installation of additional mass – in particular due to the hybrid coupling – means that the mass-related authorisation requirements for an upgraded locomotive must be reassessed. Mass compensation or alternative verification methods, restrictions or conditions for use may be accepted as evidence in consultation with the assessment bodies and authorising entities.
    - The installation of the DAC may also exceed the permissible wheelset load for the railway infrastructure due to the increased total weight of the locomotive. This would mean that, in the absence of appropriate legal regulations, these locomotives would no longer be allowed to operate on certain parts of the infrastructure.
    - For the safety of shunting personnel, the so-called Bern rectangle must be verified for the operation of the screw coupling. This is the area between and below the side buffers and the screw couplings of two freight wagons or locomotives in contact with each other that

must be kept clear. It must be provided for shunting personnel to stand in during coupling and uncoupling. For the hybrid coupling, the Bern rectangle must therefore be verified when using the screw coupling. The current designs of hybrid couplings do not yet meet the requirements for the Bern rectangle.

- In order to brake safely, the brake pipe of a pneumatic brake must be vented within a specified time. According to current legal provisions, the installation of the DAC must be verified to ensure that this requirement is met. This requirement has been tightened in the latest revision of the relevant standard. This means that simple verification is not guaranteed, especially for older locomotives.

6.12 Which authority must carry out the authorisation process?

If railway vehicles are operated in more than one EU Member State, the authorisation process must be carried out by the European Union Agency for Railways (ERA).

Rail vehicles that are only used in one EU Member State can also be authorised by the competent national safety authority.

6.13 Does the current European legal framework for approval procedures support the introduction of innovations like DAC?

No, the current European legal framework is only partially suitable for the introduction of the DAC. It focuses on the vehicle type, which is why DAC must be assessed as a modification for each individual vehicle type.

This may be sufficient for individual vehicle types and minor adjustments, but it reaches its limits when the same modifications are made to many different vehicle types (‘massive retrofitting’).

The effort required to authorise the upgrades cannot be managed with the existing capacities of the competent authorities (e.g. testing facilities, assessment bodies, authorising authorities, etc.).

A significant simplification of the process for authorising ‘massive retrofitting’ is needed.

6.14 What should be considered when entering the vehicle register or the vehicle type register?

A distinction must be made between the ERATV (European Register of Authorised Types of Vehicle) and EVR (European Vehicle Register) registers.

ERATV: Registration of vehicle type authorisations with the parameters characterising a vehicle type.

- Here, the changes and / or parameters newly affected by the upgrade are documented for each vehicle type.
- The register entry is made by the responsible authority on the basis of templates completed by the holder of the vehicle type authorisation.

EVR: Registration of each individual vehicle with the individual vehicle number and reference to the type of vehicle to which the specific vehicle is compliant.

- Adjustment of vehicle data due to modification done by the keeper of the vehicle have to be documented in the EVR by the keeper for each of its affected vehicles.
- The register entry is made by the authority, at which the vehicle has been registered, or – in the future – by the European Union Agency for Railways (ERA).

b. Financing

6.15 How much does the introduction of the DAC cost?

The introduction of the DAC is to take place in two stages.

From mid-2027, the technology is to be tested in the so-called Pioneer DAC Trains throughout Europe. This project is estimated to cost around 50 million EUR. See also section 4.f.

After successful testing in commercial operation and assessment of the results, the Europe wide introduction of DAC will be gradually prepared. However, neither the final prices of the components nor the number of vehicles to be retrofitted are yet known.

A reliable value can, therefore, only be determined after completion of the development project, the results of the Pioneer DAC Trains and the availability of the migration plan.

6.16 Does the introduction of the DAC pay off?

As of today, the cost-benefit analysis carried out by the European Union Agency for Railways (ERA), a macro-economic assessment, comes to a positive conclusion. Numerous assumptions were made.

However, a significant part of the benefits does not remain with the keeper of the vehicles, but is attributable to other stakeholders, such as shippers, infrastructure managers, society and the environment.

From a business point of view, the DAC only pays off over a very long period of time. The high initial investments only lead to reflows of funds many years later through the corresponding additional sales and efficiency gains.

Financial contributions from third parties are, therefore, needed, e.g. subsidies from the public sector or financial support for those involved who benefit from the introduction of the DAC, but do not have to invest and thus finance themselves.

This support is also intended to help cover the high risks posed, inter alia, by the timing of the disparity between initial investments and reflows of funds.

6.17 Who benefits from the introduction of the DAC?

The railway undertakings, but also the shippers and the infrastructure managers benefit from the introduction of the DAC and, in the event of a corresponding modal shift, society and the environment to a large extent.

In addition, employees benefit from better working conditions. Through the production and maintenance of DAC by the rail supply industry, the project contributes to growth and jobs in Europe.

6.18 Who should finance the introduction of the DAC?

The keepers of the vehicles cannot finance the introduction of the DAC from their own funds. In the past, intra- and intermodal competition in freight transport did not allow the sector to build up corresponding reserves.

The complete financing from borrowed funds fails due to intra- and intermodal competition as well as the low benefits for the keepers of the vehicles.

In addition, all keepers of the vehicles must upgrade at the same time if possible, otherwise the possible benefits from the DAC will not occur or only to a limited extent.

The introduction of the DAC must, therefore, be supported to a large extent with subsidies. These will come from the EU budget or from funding pots of the EU Member States or third countries.

If the available subsidies do not fully cover the financing needs, solutions must be developed to help keepers of vehicles from private or public sources close this gap.

Any technical and financial risks must also be taken into account. These should be minimised as far as possible for vehicle keepers.

6.19 How can the use of public money for the introduction of DAC be justified?

The cost-benefit analysis carried out by the European Union Agency for Railways (ERA), a macro-economic assessment, assumes a positive result as of today. In other words, the expected benefits are greater than the expected costs over a period of 30 years.

The introduction of the DAC will not only provide benefits to the keepers of the vehicles, but also to society and the environment through the expected shift to rail.

In addition, a coordinated approach for the introduction of the DAC is needed in Europe. The benefit occurs only if all the companies concerned participate.

6.20 Why was the introduction of an automatic coupling in the USA achieved without public money?

The automatic coupling was introduced in the USA towards the end of the 19th century. It was mandatory from 1893 onwards. The aim was to reduce the number of manoeuvring accidents.

At that time, there was de facto no intermodal competition, so that the costs of technical progress and migration could be absorbed by the keepers of the vehicles through higher prices without any major problems.

6.21 Will there be scrapping premiums for freight wagons that cannot be upgraded?

The idea has been discussed, but not yet been deepened in terms of content.

6.22 Will there be scrapping premiums for locomotives that cannot be upgraded?

The idea has been discussed, but not yet been deepened in terms of content.

6.23 Will freight wagons become more expensive as a result of the DAC?

Yes, freight wagons will become more expensive as a result of the DAC, as they will be equipped with the DAC and the associated sensors. However, this allows the freight wagons to be used more efficiently and thus increases the productivity of rail freight transport.

c. Market

6.24 Which market segments of rail freight transport will benefit from the introduction of DAC?

All three market segments of rail freight transport (block train transport, intermodal transport, single wagonload transport) will benefit from the introduction of the DAC. According to the cost-benefit analysis of the European Union Agency for Railways (ERA), the benefit is greatest for single wagonload traffic (as of summer 2023).

However, block and intermodal trains also benefit from the sensor technology on the freight wagons, that are installed with the DAC, faster train dispatch in the departure stations and the possibility of higher speeds.

Trains in these two market segments are characterised by the fact that the wagon combination usually remains unchanged during the train journey. However, there

are also block and intermodal trains that have to be uncoupled or coupled in terminals and sidings.

This is due to, for example, different loading and unloading stations on a factory site or to track lengths in a terminal that are shorter than the usual or maximum train length in Europe.

In addition, driving on ERMTS lines of the highest technical level, where track-side train detection systems have been removed, will only be possible with the DAC. This is the only way to guarantee that the train is equipped with a continuous data bus and thus monitors the integrity of the train.

6.25 Does the introduction of the DAC also make sense for intermodal trains and block trains?

The introduction of the DAC also makes sense for intermodal trains and block trains. In these market segments, there is less coupling than in wagonload transport. However, DAC supports numerous processes in the operational handling of rail freight transport (e.g. train formation, train dispatch).

About half of the freight wagons used in Europe are used in more than one market segment. For these freight wagons, the migration time should be as short as possible. For all other freight wagons, longer transition periods or the waiving of retrofitting are possible.

The goal is that in the medium to long term, no more freight wagons will be equipped with screw couplings. In this way, the DAC leads to optimised processes in all transports and market segments and promotes the modal shift from road to rail.

6.26 Will the introduction of the DAC increase rental prices for customers?

From today's perspective, an answer to this question is not yet possible. It depends essentially on the development of the market for freight wagons and locomotives and the market for transport services in Europe.

Other influencing factors are how much own funds the vehicle keepers have to raise for the upgrading, how quickly the benefits of introducing DAC will be perceived, and whether the legal framework for road freight transport will be adapted.

If rail freight transport is to gain market share from road, the vehicle keepers' own funds must be as low as possible, the benefits of the introduction of DAC must be perceived as quickly as possible and the internalisation of external costs in road freight transport must be promoted.

d. Industrial policy

6.27 Which companies are involved in the development of the DAC and are they likely to produce it at a later date?

As part of "FP5-TRANS4M-R", four coupling manufacturers are participating in the DAC development: Dellner, Knorr Bremse, Voith and Wabtec.

Since the DAC specification is open, a later entry by other manufacturers is also possible.

6.28 Which parts of the DAC should be independent of manufacturers and, therefore, interchangeable?

The spring package must fit into the installation space provided for this purpose.

In addition, the specifications for the connection of the spring package to the coupler head (interface A) and those for the coupler head must be complied with.

This is to ensure the interchangeability of the spring package and the coupler head as well as the coupling as a whole.

6.29 Will the introduction of DAC also create new jobs? If so, in which countries are they likely to be?

Some coupling manufacturers are in the process of setting up production facilities for DAC in Eastern Europe (e.g. Dellner in Poland, Knorr Bremse in Hungary).

Jobs – some permanent, some temporary (e.g. for the upgrading phase) – will also be created in the workshops for freight wagons and locomotives.

7 Contacts (2)

7.1 Who are my contact persons for further questions?

If you have any questions about this, please contact

- Ajith Sureshkumar, Project coordinator DACFIT, Ajith.Sureshkumar@deutschebahn.com, or
- Aleksandra Sowada, Dissemination & Communication DACFIT, Aleksandra.Sowada@deutschebahn.com.

7.2 Where can I find further information about the DAC?

Further interesting information and links can be found under following link:

https://rail-research.europa.eu/

Thank you for your interest in the Q&A on the Digital Automatic Coupling (DAC).