

---

---

**Road vehicles — Fully automatic  
coupling systems 24 V (FACS)  
for heavy commercial vehicle  
combinations —**

Part 2:

**Electrical and pneumatic interface for  
50 mm fifth wheel couplings**

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

*Véhicules routiers — Dispositifs d'attelage entièrement automatiques  
(FACS) à 24 V pour ensembles routiers lourds —*

<https://standards.iteh.org/catalogue/standards/sist/96061-15-0511-450d-be35-d9ced006e5ec/iso-13044-2-2021>

*Partie 2: Interface électrique et pneumatique pour sellettes d'attelage  
de 50 mm*



**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

ISO 13044-2:2021

<https://standards.iteh.ai/catalog/standards/sist/960f61d5-0511-450d-be35-d9ced906e5ec/iso-13044-2-2021>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

	Page
<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>2</b>
<b>4 Requirements</b> .....	<b>2</b>
4.1 General.....	2
4.2 Tractor and semi-trailer.....	3
4.3 Mechanical interface, Manual operation.....	3
4.4 EPI module.....	3
4.5 Mating of the two EPI parts.....	3
4.6 Guiding and alignment.....	4
4.6.1 General.....	4
4.6.2 Installation requirements of EPI socket module.....	5
4.6.3 Installation requirements of semi-trailer-mounted EPI module.....	5
4.6.4 Perpendicular degree of freedom of contacts.....	6
4.6.5 Pneumatic valves in EPI socket module.....	6
4.7 Encapsulation and protection.....	6
4.7.1 General.....	6
4.7.2 EPI plug module protection cover actuation.....	6
4.7.3 Gasket between plug and socket.....	7
4.8 Automation of landing legs.....	7
4.9 ISO 11992 cable length.....	7
4.10 Mixed mode operation.....	7
<b>5 Tests and specific requirements</b> .....	<b>7</b>
5.1 General.....	7
5.2 Visual examination.....	8
5.3 Dimensional check.....	8
5.4 Connection and disconnection.....	8
5.5 Locking device operation.....	9
5.5.1 Application.....	9
5.5.2 Requirements.....	9
5.6 Current carrying capacity.....	9
5.7 Connection resistance (voltage drop), cable capacitance and pneumatics.....	9
5.8 Current cycling.....	11
5.9 Withstand voltage.....	12
5.10 Influence of water.....	12
5.11 Protection against dust.....	12
5.12 Endurance.....	12
5.13 Vibration.....	12
5.14 Shock resistance.....	12
5.15 Drop test.....	13
5.16 Temperature/humidity cycling.....	13
5.17 Salt spray.....	13
5.18 Chemical resistance.....	13
5.19 Leakage test of pneumatic connections.....	13
5.20 Functional test of protection covers.....	13
<b>Annex A (normative) EPI module — Dimensional characteristics</b> .....	<b>14</b>
<b>Annex B (normative) EPI module — Contact allocation</b> .....	<b>23</b>
<b>Annex C (informative) Mixed mode operation</b> .....	<b>25</b>
<b>Bibliography</b> .....	<b>29</b>

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 40, *Specific aspects for light and heavy commercial vehicles, busses and trailers*.

This second edition cancels and replaces the first edition (ISO 13044-2:2013), which has been technically revised. The main changes compared to the previous edition are as follows:

- changes to the normative references.

A list of all the parts in the ISO 13044 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

This document specifies the integrated electrical and pneumatic connections of an automated fifth wheel coupling system for articulated vehicles and related components.

Fully automated coupling systems improve safety for the driver and for the vehicle combinations. They also improve the work conditions for the driver and reduce cost for the end user.

- a) Higher safety standard is achieved for example by:
  - a reduction of operational accidents,
  - less injured drivers because there is no need for drivers to stay in the dangerous zone between the towing and the towed vehicle while uncoupling.
- b) Higher comfort level is achieved for example by:
  - elimination of necessity to access the coupling, landing gears and supply lines,
  - reduction of physical demands when operating the coupling and the landing gears or when climbing on or descending from chassis to manually connect or disconnect the supply lines.
- c) Cost reduction for end user is achieved for example by:
  - less repair and maintenance of cables and pipes,
  - less inactive periods for the vehicle combination due to less damage and repair,
  - new components create space for future extensions and potentials.

[ISO 13044-2:2021](https://standards.iteh.ai/catalog/standards/sist/960f61d5-0511-450d-be35-d9ced906e5ec/iso-13044-2-2021)

<https://standards.iteh.ai/catalog/standards/sist/960f61d5-0511-450d-be35-d9ced906e5ec/iso-13044-2-2021>

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

ISO 13044-2:2021

<https://standards.iteh.ai/catalog/standards/sist/960f61d5-0511-450d-be35-d9ced906e5ec/iso-13044-2-2021>

# Road vehicles — Fully automatic coupling systems 24 V (FACS) for heavy commercial vehicle combinations —

## Part 2: Electrical and pneumatic interface for 50 mm fifth wheel couplings

### 1 Scope

This document specifies the mechanical, electrical/electronic and pneumatic characteristics of a fully automated fifth wheel coupling system to ensure interchangeability between a towing vehicle and a coupled semi-trailer(s) with 24 V nominal supply voltage. The two vehicles together constitute an articulated vehicle or are part of a vehicle combination.

This document also supports the step-by-step introduction of fully automated fifth wheel coupling systems in the market. It specifies features necessary for mixed mode operation, i.e. the combination of a fully automated coupling system (FACS) equipped towing vehicle with a conventional semi-trailer, and vice versa, the combination of a conventional towing vehicle with a FACS-equipped semi-trailer.

### 2 Normative references (standards.iteh.ai)

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 337, *Road vehicles — 50 semi-trailer fifth wheel coupling pin — Basic and mounting/interchangeability dimensions*

ISO 1726-1, *Road vehicles — Mechanical coupling between tractors and semi-trailers — Part 1: Interchangeability between tractors and semi-trailers for general cargo*

ISO 1726-2, *Road vehicles — Mechanical couplings between tractors and semi-trailers — Part 2: Interchangeability between low-coupling tractors and high-volume semi-trailers*

ISO 3842, *Road vehicles — Fifth wheels — Interchangeability*

ISO 6150:2018, *Pneumatic fluid power — Cylindrical quick-action couplings for maximum working pressures of 1 MPa, 1,6 MPa, and 2,5 MPa (10 bar, 16 bar and 25 bar) — Plug connecting dimensions, specifications, application guidelines and testing*

ISO 7638-1:2018, *Road vehicles — Connectors for the electrical connection of towing and towed vehicles — Part 1: Connectors for braking systems and running gear of vehicles with 24 V nominal supply voltage*

ISO 11992 (all parts), *Road vehicles — Interchange of digital information on electrical connections between towing and towed vehicles*

ISO 12098:2020, *Road vehicles — Connectors for the electrical connection of towing and towed vehicles — 15-pole connector for vehicles with 24 V nominal supply voltage*

ISO 13044-1, *Road vehicles — 24 V fully automatic coupling systems (FACS) for heavy commercial vehicle combinations — Part 1: General requirements and definitions*

ISO 16750-3:2012, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 3: Mechanical loads*

ISO 16750-5, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 5: Chemical loads*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13044-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

#### 3.1 fully automated coupling system FACS

coupling and uncoupling system where all operations, i.e. mechanical, electrical, pneumatic and applicable auxiliary functions, are performed automatically, enabling the coupling and uncoupling process to be completed without direct manual intervention

[SOURCE: ISO 13044-1:2012, 3.3.1.3]

#### 3.2 electrical/electronic-pneumatic interface module EPI module

component, combining all electrical/electronic and pneumatic connections in one mating unit, consisting of two complementary parts, the *EPI plug module* (3.2.1) and the *EPI socket module* (3.2.2)

##### 3.2.1 EPI plug module

part of the *EPI module* (3.2) containing the electric male contacts, pneumatic male connections and the alignment pins, it is permanently attached to the king pin side mounted on the *semi-trailer* (3.2.3)

##### 3.2.2 EPI socket module

part of the *EPI module* (3.2) containing the electric female contacts, pneumatic female connections and the alignment sockets, it is permanently attached to the fifth wheel which is mounted to the tractor vehicle

##### 3.2.3 semi-trailer

towed vehicle which is designed to be coupled to either a towing vehicle or to a dolly, and to impose a substantial vertical load either on the towing vehicle or on the dolly

##### 3.2.4 alignment device

device placed on the trailer-side, which makes contact to the fifth wheel throat during the coupling process and centres the EPI plug relative to the EPI socket

### 4 Requirements

#### 4.1 General

In order to guarantee the best functionality, comfort and safety, the use of FACS is recommended in combination with spring-brake equipped semi-trailers only. FACS does not exonerate the driver from ensuring the semi-trailer is correctly parked before coupling or uncoupling.

In order to guarantee best functionality, comfort and safety, the use of FACS is recommended for towing vehicles with height adjustable air-suspension at least on the rear axle.

In the case of coupling systems that are not fully automatic, but utilize an automatic electro-pneumatic interface, this interface shall conform with the requirements specified within this document.

## 4.2 Tractor and semi-trailer

In order to ensure interchangeability between tractor vehicles and semi-trailers, the requirements of ISO 3842 and ISO 1726-1 or ISO 1726-2 shall be met for vehicles to be equipped with FACS.

## 4.3 Mechanical interface, Manual operation

Fifth wheels installed on FACS-equipped tractor vehicles shall conform with the requirements of ISO 3842. Fifth wheel coupling pins (king pins) installed on FACS-equipped semi-trailers shall conform with the requirements of ISO 337. In the event of a failure of the remote control it shall be possible, in an emergency, to open the coupling in at least one other way. If this requires the use of a tool, then this shall be included in the vehicle's tool kit. Any manual operation shall not lead to any damages or malfunction of the system components.

**NOTE** For fifth wheel versions with a throat angle other than 40° (e.g. 52°) optional versions can be allowed under the condition that the alignment device ([Figure 2](#), key 2 or [Figure 1](#), key 2) uses a corresponding angle. In this case the interchangeability will only be ensured within the individual version.

## 4.4 EPI module

**4.4.1** EPI plug modules and EPI socket modules in accordance with this document shall provide the following electrical connections with 24 V nominal supply voltage:

- 7 poles for the electrical connection of the braking systems and running gear (incl. 2 poles for the CAN based communication conformant to ISO 11992-1 and ISO 11992-2);
- 23 poles for the electrical connection of equipment other than braking systems and running gear (incl. 2 poles for the CAN-based communication conformant to ISO 11992-1 and ISO 11992-3).

The dimensional characteristics and location of the EPI module shall be in accordance with the specifications of [Annex A](#). Number, location and functionality shall be in accordance with the specifications of [Annex B](#). Electrical contacts shall only be used as specified.

**CAUTION** — Using the electrical contacts for non-specified purposes (including ground) may cause damage to equipment. Any deviation from the contact allocation specified in [Table 1](#) is not allowed. However, depending on legislation and customer demand, only some of the 30 electrical contacts may be required.

**4.4.2** EPI plug modules and EPI socket modules in accordance with this document shall provide connections for the following two pneumatic braking lines:

- one control line;
- one supply line.

The dimensional characteristics of the pneumatic connections shall be in accordance with the specifications of [Annex A](#).

## 4.5 Mating of the two EPI parts

The mating of the EPI plug module and the EPI socket module shall take place automatically during the coupling process as illustrated in [Figure A.1](#).

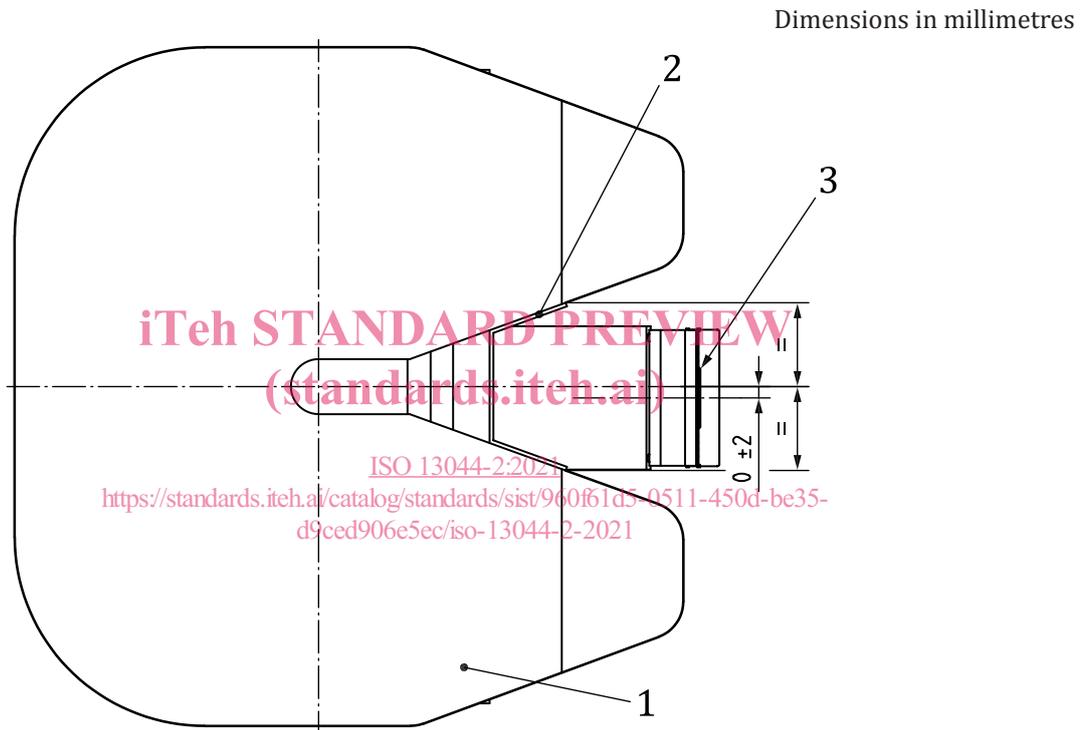
4.6 Guiding and alignment

4.6.1 General

The guiding and alignment of the EPI module shall be made by a rigid alignment pin in the middle plus two outer pins, which are preferably “self-aligning” designed to provide low forces during EPI mating; see [Figure A.5](#).

The central alignment pin shall have the ability to align both EPI parts within a range  $\pm 5$  mm in both horizontal and vertical directions. The two outer pins shall ensure the parallel orientation of both EPI parts for connection alignment.

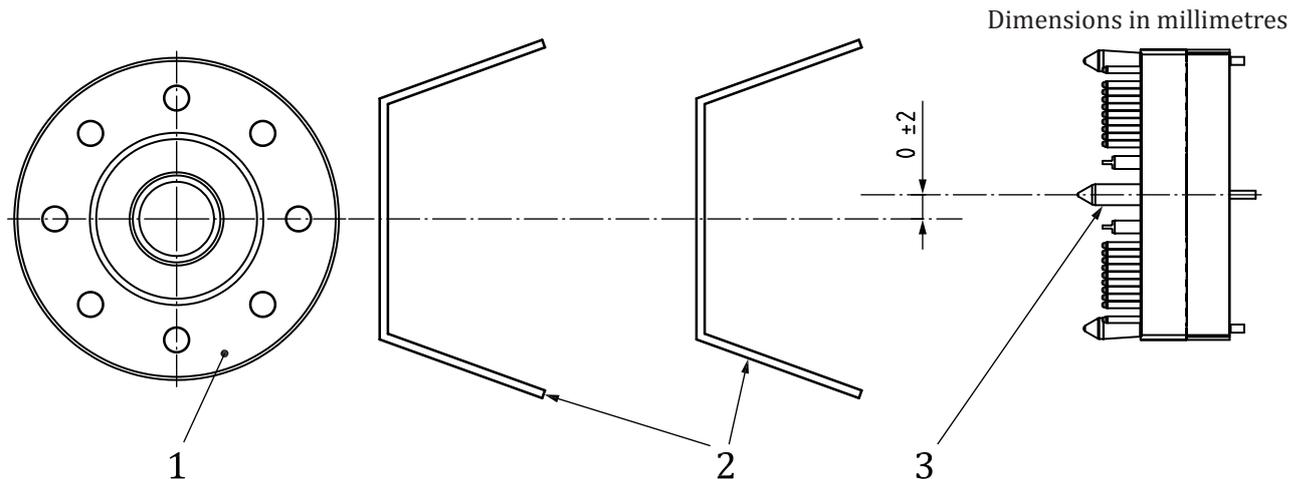
The positional tolerance between the contact surface of the alignment device and the fifth wheel shall be a maximum of  $\pm 2$  mm, according to [Figure 1](#).



Key

- 1 fifth wheel
- 2 alignment device (movable in length direction, shown in contact position, see [Figure 2](#))
- 3 EPI central alignment socket

Figure 1 — EPI female module positioning tolerance (displaced shown)

**Key**

- 1 king pin
- 2 alignment device (movable in length direction, shown in two positions)
- 3 EPI central alignment pin

**Figure 2 — EPI male module positioning tolerance (displaced shown)**

#### 4.6.2 Installation requirements of EPI socket module

##### 4.6.2.1 Translational degree of freedom in the longitudinal direction of alignment pin:

**4.6.2.1.1 No actuator:** Displaceable from 0 mm to a minimum of 30 mm [ $S_2$ , as shown in [Figure A.2 c\)](#)], preloaded with a force between 250 N to 500 N (as both pneumatic lines are under pressure) when uncoupled, achieved by means of either elastic elements or other stored energy. With the FACS coupled the EPI socket module will be pushed forward by  $S_1 = 15$  mm [see [Figure A.2 b\)](#)] which is the nominal position. In the coupled position, a movement as described above shall be possible, without the EPI modules being disconnected or damaged.

**4.6.2.1.2 With actuator:** The actuator shall move the EPI socket by at least the range described in [4.6.2.1.1](#).

**4.6.2.2** Translational degree of freedom in the lateral direction: essentially fixed.

**4.6.2.3** Translational degree of freedom in the vertical direction: essentially fixed.

**4.6.2.4** Rotational degree of freedom around the longitudinal axis of EPI tractor alignment socket: essentially fixed.

**4.6.2.5** Rotational degree of freedom around the lateral articulation axis: from horizontal to a minimum of 12° [EPI module upwards, see [Figure A.2 b\)](#)].

**4.6.2.6** Rotational degree of freedom around the vertical axis: essentially fixed.

#### 4.6.3 Installation requirements of semi-trailer-mounted EPI module

**4.6.3.1** Translational degree of freedom in the longitudinal direction of the alignment pin: fixed.

4.6.3.2 Translational degree of freedom in the lateral direction: essentially fixed.

4.6.3.3 Translational degree of freedom in the vertical direction: essentially fixed.

4.6.3.4 Rotational degree of freedom around the longitudinal axis of the truck alignment pin:  $\pm 2^\circ$ .

4.6.3.5 Rotational degree of freedom around the lateral axis:  $\pm 2^\circ$ .

4.6.3.6 Rotational degree of freedom around the vertical axis:  $\pm 100^\circ$  around king pin axis,  $\pm 2^\circ$  around vertical axis through EPI module.

#### 4.6.4 Perpendicular degree of freedom of contacts

Each electric male contact shall be floating and shall align to the datum position when an EPI plug and socket are engaged according to ISO 12098:2020, 4.1 and ISO 7638-1:2018, 4.1.

Each pneumatic male contact shall be floating to allow a degree of freedom of a minimum of 0,5 mm perpendicular to the main alignment pin axis and with a minimum of  $\pm 0,5^\circ$  axis deviation.

#### 4.6.5 Pneumatic valves in EPI socket module

Both pneumatic sockets shall be airtight when disconnected. These sockets shall be opened by the pneumatic plugs [see [Figure A.5 a\)](#)]. The sockets shall be fully open a minimum of 3 mm before EPI modules are mated. To compensate tolerances, the sockets shall stay fully open a minimum of 3 mm after the EPI modules are mated.

The minimum flow cross-section of the pneumatic socket when fully open shall not be less than the internal diameter of the EPI pneumatic plug, which is strongly recommended to have a minimum inner cross-section of 28 mm<sup>2</sup> (see NOTE below).

NOTE Reductions in the internal diameter can increase the response time when tested in accordance with the procedure defined in regulations like, e.g. Annex 6 to ECE Regulation 13.

### 4.7 Encapsulation and protection

#### 4.7.1 General

In order to guarantee interchangeability, protection covers of the EPI modules shall be in defined positions having devices and activation points which are determined as follows.

##### 4.7.1.1 Protection cover on the EPI socket module

See [Figures A.6](#) to [A.8](#).

##### 4.7.1.2 Protection cover on the EPI plug module

See [Figure A.9](#).

#### 4.7.2 EPI plug module protection cover actuation

The protection cover on the EPI plug module:

- shall open early enough to lift the EPI socket module during the coupling process;
- shall try to close before the king pin reaches the coupled position;
- shall not cause damage to any part while trying to close;