INTERNATIONAL STANDARD

ISO 13044-2

Second edition
2021-01

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

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

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

Reference number
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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).

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).

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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.

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.

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.

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

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

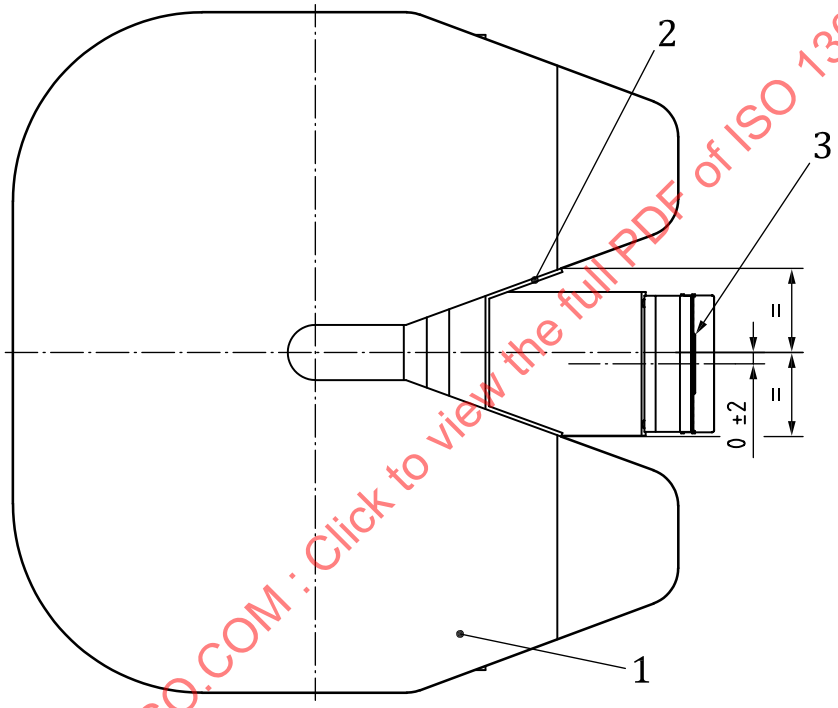
4.6.1 General

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 ± 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 ±2 mm, according to Figure 1.

Dimensions in millimetres

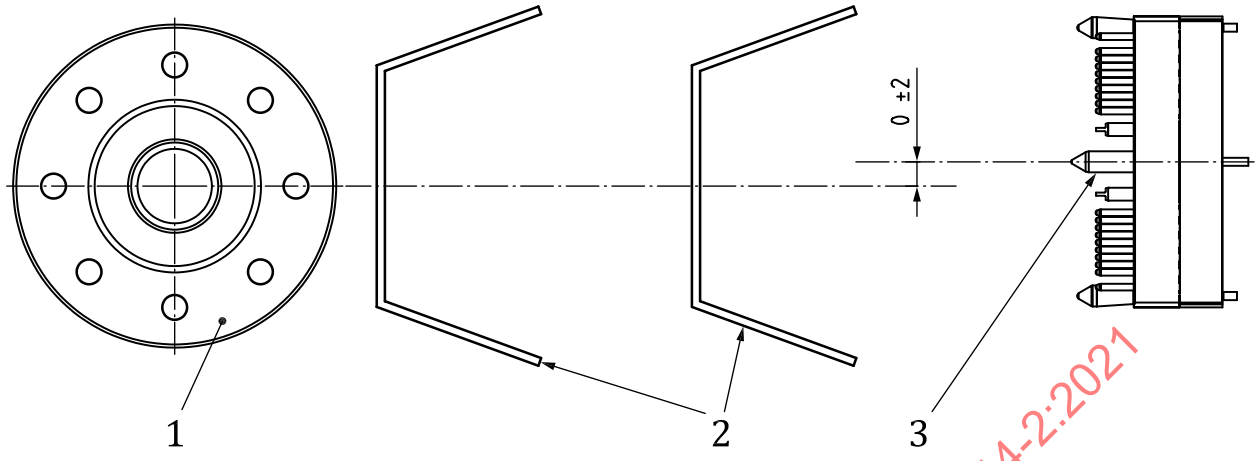


Key

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)

Dimensions in millimetres



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: ±2°.

4.6.3.5 Rotational degree of freedom around the lateral axis: ±2°.

4.6.3.6 Rotational degree of freedom around the vertical axis: ±100° around king pin axis, ±2° 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 ±0,5° 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 that the internal diameter of the EPI pneumatic plug, which is strongly recommended to have a minimum inner cross-section of 28 mm^2 (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;

— shall close completely in case there is no EPI socket module.

4.7.3 Gasket between plug and socket

In order to ensure a correct seal when connected, a gasket shall be installed between plug and socket on the contact surface of the EPI socket module.

See Figure A.1.

4.8 Automation of landing legs

Automated landing legs shall be power driven without necessarily being able to lift the semi-trailer.

The following parameters shall be applied when using electrical operation:

Nominal voltage: 24V;

Current limitation: 15A;

Polarity: contact L12 in Table B.1 is positive while running landing gear up;

Contact L13 in Table B.1 is positive while running landing gear down;

Operating time: minimum 20 s, maximum 90 s;

As the landing legs reach the end position, the current shall be cut off on the truck side within 2 s as long as 18 A are exceeded.

4.9 ISO 11992 cable length

ISO 11992-1 specifies the respective maximum lengths of the cables allocated to the towing vehicle, trailer and interface connection. In the case of a FACS equipped towing vehicle or trailer, the length associated with the interface cable is not appropriate therefore the length 7 m specified for this interface may be allocated to the FACS elements of the towing vehicle and trailer as described in this subclause. Figure 3 below defines the electrical installation associated with data communications for braking and is specified as follows:

— Towing vehicle: the combined length of a + b shall be a maximum of 21 m;

— Semi-trailer: the combined length of c + d shall be a maximum of 19 m.

IMPORTANT — Using the above cable lengths ensures that the overall length of cable available to connect from the tractors ABS/EBS ECU to the trailer ABS/EBS ECU, as specified in ISO 11992-1, is not exceeded.

NOTE For parameters a, b, c and d see Figure 3.

4.10 Mixed mode operation

For example provisions, see Annex C.

The design of this electrical circuit shall be configured in a way that a point-to-point connection is ensured as required by the ISO 11992 series.

5 Tests and specific requirements

5.1 General

Tests and requirements for EPI modules in accordance with this document are specified in Clause 5. The test sequence to be followed shall be as given in Table 1. The test sequence shall be carried out in

the order of the running numbers listed in Table 1 under the particular sample group. A test sequence shall be continued only if the sample meets the applicable requirements.

Table 1 — Test sequence

Sub-clause	Test title	Sample group					
		A	B	C	D	E	F
5.2	Visual examination	1, 5, 9	1, 11	1, 7, 12	1, 6	1, 7, 9	1, 8
5.3	Dimensional check	2					
5.4	Connection and disconnection	3	2	2		2	
5.5	Locking device operating test	4, 8	3, 10	3, 10			
5.6	Current carrying capacity				3		
5.7	Connection resistance		4, 7	4, 9	2, 5	6	2, 6
5.8	Current cycling				4		
5.9	Withstand voltage		5, 9	8			3, 7
5.10	Influence of water		8	11			
5.11	Protection against dust					5	
5.12	Endurance					4	
5.13	Vibration					3	4
5.14	Shock resistance	6					
5.15	Drop test	7					5
5.16	Temperature/humidity cycling		6				
5.17	Salt spray			5			
5.18	Chemical resistance			6			
5.19	Pneumatic connection leakage test					8	
5.20	Protection cover test	see 5.12					

5.2 Visual examination

Testing and requirements shall be in accordance with ISO 4091:2003, 5.1.

5.3 Dimensional check

Testing and requirements shall be in accordance with ISO 4091:2003, 5.2.

5.4 Connection and disconnection

All load-bearing mechanical components shall be able to withstand a minimum force of 1 500 N in the connecting direction.

All load-bearing mechanical components shall be able to withstand a minimum force of 1 500 N in the disconnecting direction.

In case the connector is assisted by an actuator, the force which acts on the connector shall be between 250 N and 500 N.

The peak force of the electrical female contact connecting with the corresponding electrical male contact in MMC (maximum material condition) [see Figure A.5 d)] shall be less than 5 N.

The peak force of the pneumatic female contact connecting with the corresponding pneumatic male contact in MMC [see Figure A.5 b)] shall be less than 20 N, the sliding force shall be less than 5 N. These measurements shall be done without pneumatic pressure.

5.5 Locking device operation

5.5.1 Application

The following applies to connectors not equipped with a distinct locking device, but secured by means of the interlock between the fifth wheel coupling and the king pin.

5.5.2 Requirements

In order to compensate for play and tolerances, the sum of the forces acting to hold the plug and socket together shall not be less than the sum of the maximum forces defined in 5.4 throughout the connector's entire range of motion and, if forces are created by air pressure, entire ranges of pressure.

Pressure ranges in operation are:

— supply line from 0,6 MPa to 1,2 MPa;

— control line from 0 MPa to 1,2 MPa.

5.6 Current carrying capacity

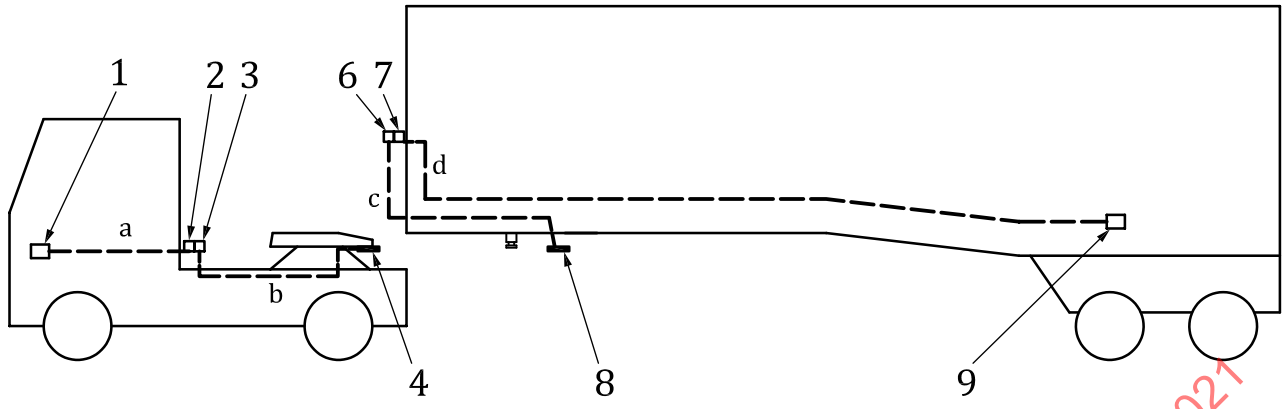
Testing and requirements shall be in accordance with ISO 4091:2003, 5.8.

5.7 Connection resistance (voltage drop), cable capacitance and pneumatics

Testing and requirements shall be in accordance with ISO 4091:2003, 5.9.

The total cable capacitance of the datalines (b + c) 7 m shall be a maximum of 350 pF, corresponding to an average capacitance of 50 pF/m (in accordance with ISO 4141-1:2019, 6.3), for the additional FACS harness.

NOTE The examples in Figures 5 and 6 for the pneumatic tubing are provided to illustrate the complete system configuration.

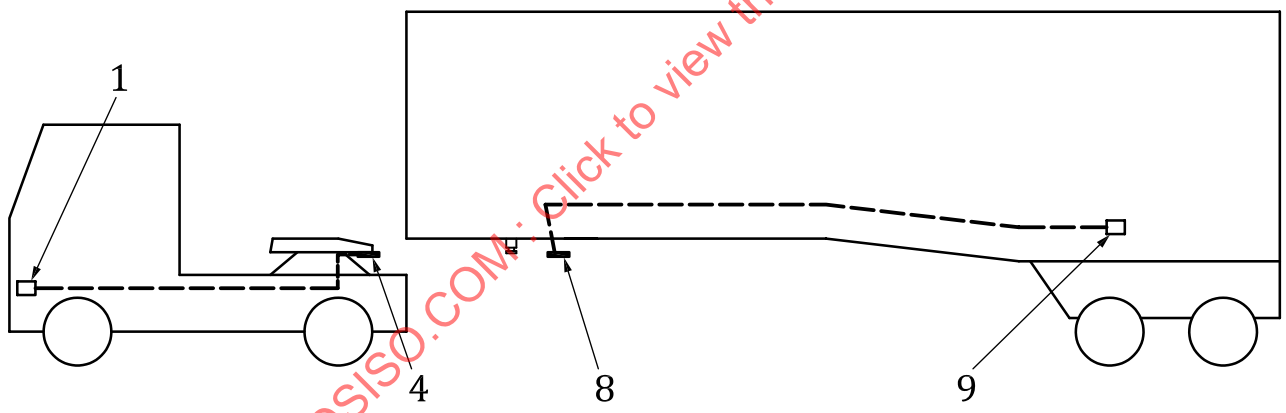


Key

1	ISO 11992-2 or ISO 11992-3 node in tractor, e.g. ECU ABS/EBS or databus device according to ISO 12098	a	Cable harness from 1 to 2.
4	EPI socket module	b	Cable harness from 3 to 4.
8	semi-trailer-sided EPI	c	Cable harness from 8 to 6.
9	ISO 11992-2 or ISO 11992-3 node in semi-trailer, e.g. ECU ABS/EBS or databus device according to ISO 12098	d	Cable harness from 7 to 9.

NOTE Connectors 2, 3, 6 and 7 enable either mixed mode or emergency operations.

Figure 3 — Example of an electrical wiring diagram of a tractor and semi-trailer, both equipped with FACS and for mixed mode operation



Key

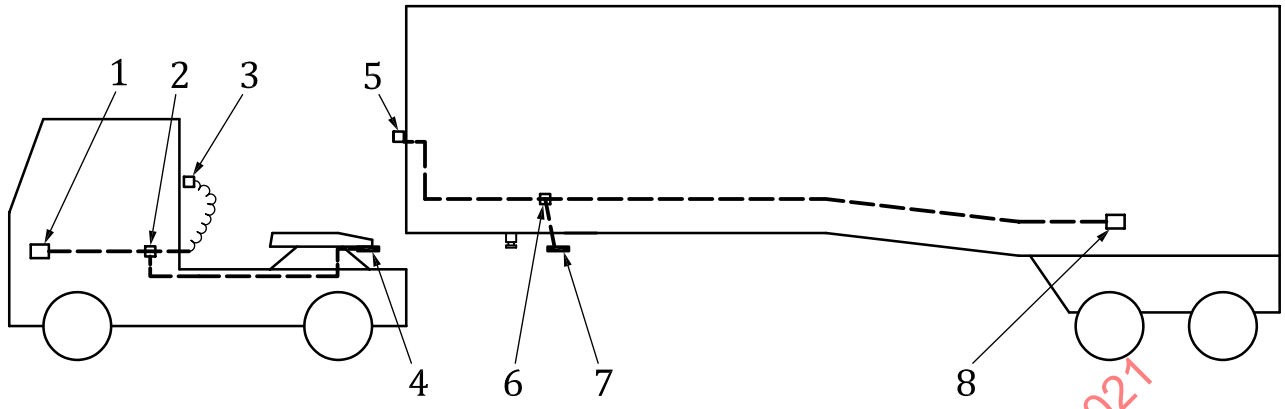
1 ISO 11992-2 or ISO 11992-3 node in tractor, e.g. ECU ABS/EBS or databus device according to ISO 12098

4 EPI socket module

8 semi-trailer-sided EPI

9 ISO 11992-2 or ISO 11992-3 node in semi-trailer, e.g. ECU ABS/EBS or databus device according to ISO 12098

Figure 4 — Example of electrical wiring diagram for a tractor and a semi-trailer, with FACS only

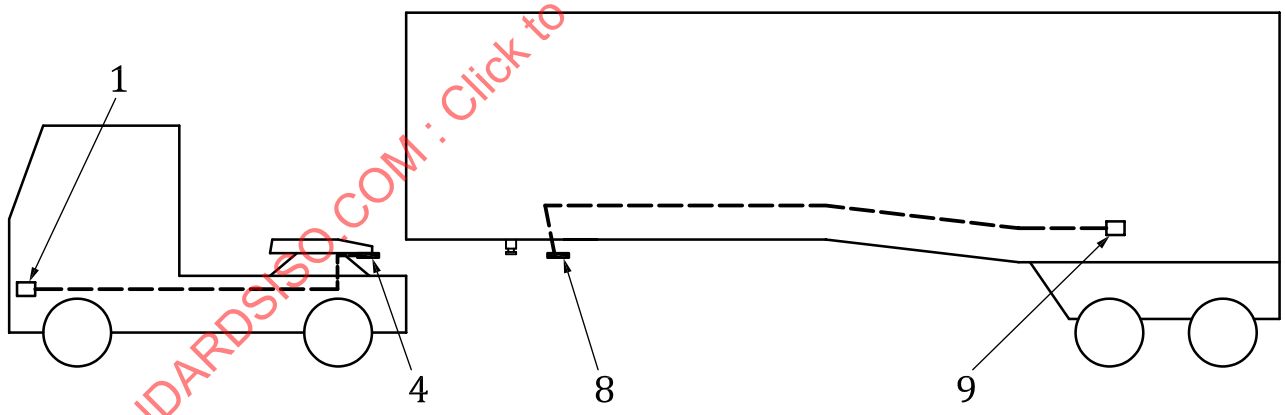


Key

1 semi-trailer control valve mounted on tractor
2 pneumatic distributor
3 pneumatic connector
4 tractor-sided EPI
5 pneumatic socket
6 pneumatic distribution valve
7 semi-trailer-sided EPI
8 semi-trailer regulating valve(s)

NOTE Connectors 2, 3, 6 and 7 enable either mixed mode or emergency operations.

Figure 5 — Example of pneumatic tubing diagram of a tractor and a semi-trailer, both equipped with FACS and for mixed mode operation



Key

1 ISO 11992-2 or ISO 11992-3 node in tractor, e.g. ECU ABS/EBS or databus device according to ISO 12098
4 EPI socket module
8 semi-trailer-sided EPI
9 ISO 11992-2 or ISO 11992-3 node in semi-trailer, e.g. ECU ABS/EBS or databus device according to ISO 12098

Figure 6 — Example of pneumatic tubing diagram for a tractor and a semi-trailer, both equipped with FACS only

5.8 Current cycling

Testing and requirements shall be in accordance with ISO 4091:2003, 5.10.

5.9 Withstand voltage

Testing and requirements shall be in accordance with ISO 4091:2003, 5.11.

5.10 Influence of water

Testing and requirements shall be in accordance with ISO 4091:2003, 5.12.

5.11 Protection against dust

Testing and requirements shall be in accordance with ISO 4091:2003, 5.14.

5.12 Endurance

EPI modules shall conform to the endurance test conditions specified in ISO 4091, except that for the number of test cycles the following 3-step approach shall be applied:

— 9 000 cycles at a speed of 0,2 m/s (±10 %);

— 500 cycles at a speed of 0,2 m/s (±10 %) under 80 % of the maximum allowed misalignment;

— 500 cycles at a speed of 0,6 m/s (±10 %). The test shall include the encapsulation and protection devices described in 4.6.

5.13 Vibration

Testing and requirements shall be in accordance with ISO 16750-3:2012, 4.1.2.7.

Vibrational tests shall be achieved in orientation of use. If not actuator-equipped pre-load according 4.6.2.1.1 shall be reduced to achieve S_1 5 mm; all other dimensions shall be nominal. The EPIs shall be tested while being mounted in their suspension assemblies, as shown in Figure 7. These suspensions shall include all the parts from tractor EPI to the elastic elements and axles needed to fulfil 4.6.2 respectively semi-trailer EPI and elastic elements and axles to fulfil 4.6.3.

The evaluation of vibration performance applies to the EPI modules and shall be carried out as specified in Table 1, columns E and F.

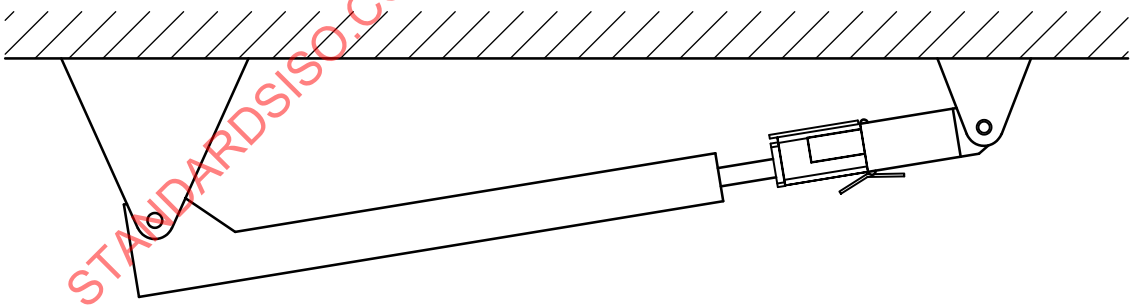


Figure 7 — Vibrational test

No specific evaluation criteria needed, other than those given by ISO 16750:

— “no brakeage”;

— “all functions of the device / system perform as designed after and during the test”.

5.14 Shock resistance

Testing and requirements shall be in accordance with ISO 16750-3:2012, 4.2.2.

5.15 Drop test

Testing and requirements shall be in accordance with ISO 16750-3:2012, 4.3.

5.16 Temperature/humidity cycling

Testing and requirements shall be in accordance with ISO 4091:2003, 5.18.

5.17 Salt spray

The following specifications shall be taken into account:

a) EPI modules disconnected, with flaps protection covers closed: test conditions according to ISO 4091 with 96 h test time;

b) EPI plug and socket module coupled: test conditions according to ISO 4091, however, with 300 h test time.

5.18 Chemical resistance

The following chemical agents shall be selected for testing:

— lubricating oil;

— diesel fuel;

— grease;

— alkaline cleaning agent;

— neutral cleaning agent;

— white spirit;

— acid cleaning agent.

For the composition of these chemical agents, see ISO 16750-5. Testing conditions, particularly the test temperatures and test duration, shall be in accordance with ISO 16750-5.

5.19 Leakage test of pneumatic connections

Testing shall be in accordance with ISO 6150:2018 series B. However, the number of test cycles shall be 10 000.

Leakage rates shall be determined after 5 000 and 10 000 cycles with performance according to ISO 6150:2018, 6.10.

5.20 Functional test of protection covers

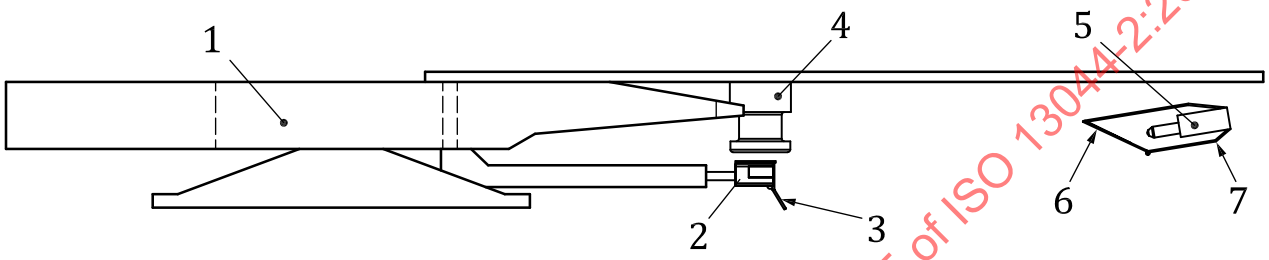
The testing of the protection cover functionality shall be included in the endurance test according to 5.12.

Annex A
(normative)

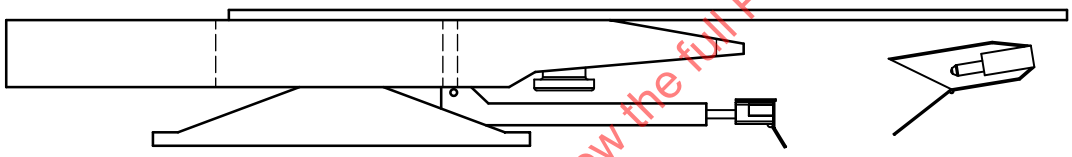
EPI module — Dimensional characteristics

A.1 Operation sequence

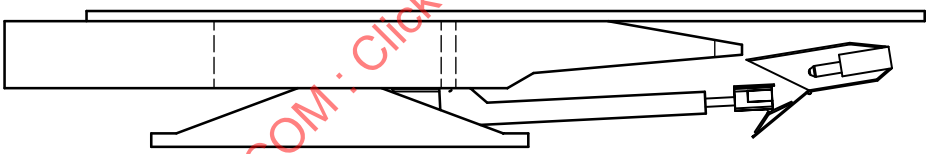
The operation sequence in FACS mode shall be as specified in Figure A.1



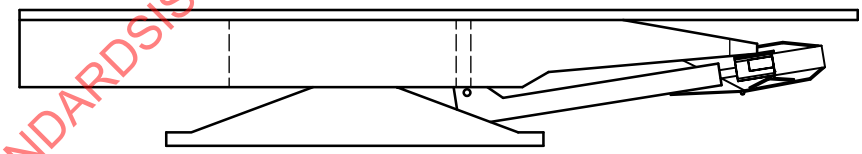
a) Main components before coupling manoeuvre



b) Tractor is moving rearwards, EPI socket module is approaching EPI plug module — EPI plug module protection cover opened



c) EPI socket module protection cover opened — EPI socket module is guided into EPI plug module



d) After final centring by alignment pins, all connections coupled (mechanical, electrical, pneumatic) — Coupling manoeuvre completed

Key

1 fifth wheel
2 EPI socket module
3 EPI socket module protection cover
4 king pin
5 EPI plug module
6 EPI plug module protection cover
7 EPI plug module housing

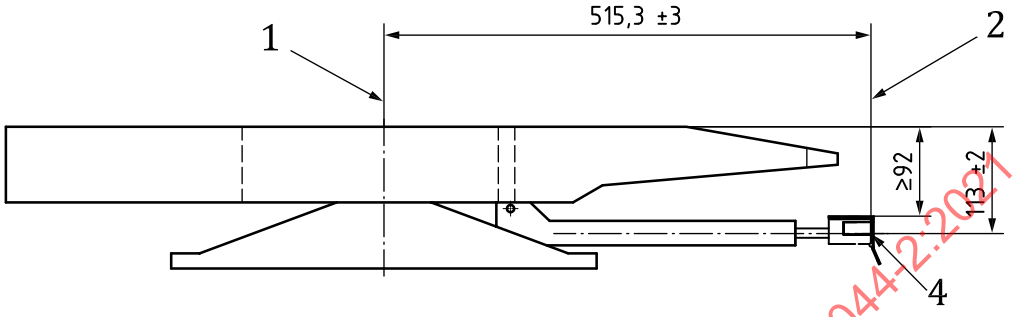
Figure A.1 — Operation sequence in FACS mode

A.2 EPI characteristics — Positions

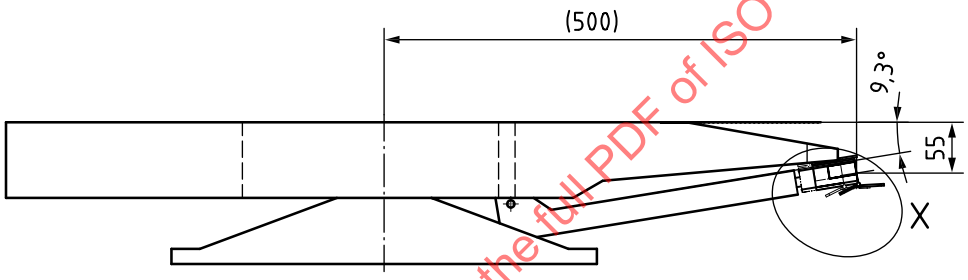
The position of the EPI socket module shall be as specified in Figure A.2

The position of the EPI plug module shall be as specified in Figure A.3

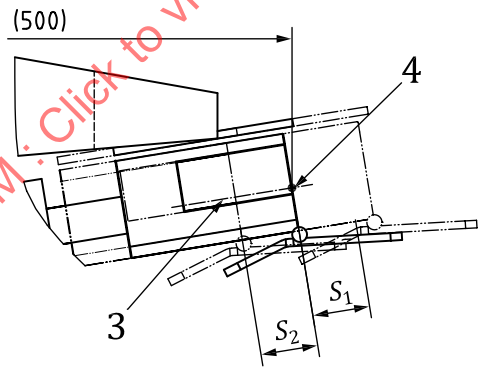
Dimensions in millimetres



a) Uncoupled position



b) Fifth wheel EPI components in nominal coupled position



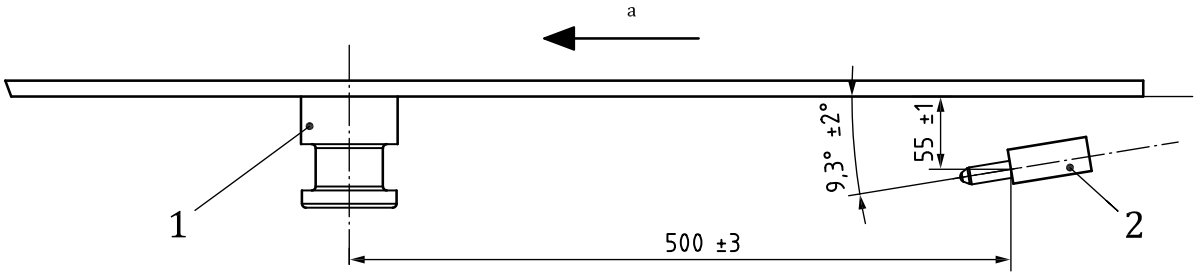
c) Detail X: possible EPI movement around nominal position

Key

1	axis of the fifth wheel (coincides with the axis of the king pin when coupled)	4	central EPI operating point: intersection of front face (2) and axis (3)
2	front face of the EPI socket module	S_1	15 mm
3	axis of central alignment pin socket boring	S_2	15 mm

Figure A.2 — Position of the EPI socket module on the fifth wheel

Dimensions in millimetres



Key

1 king pin

2 EPI semi-trailer

a Forward direction.

Figure A.3 — Position of the EPI plug module

A.3 EPI characteristics — Dimensions

The characteristic dimensions of the EPI socket module shall be as specified in Figure A.4

The characteristic dimensions of the socket module protection in closed position shall be as specified in Figures A.6 and A.8

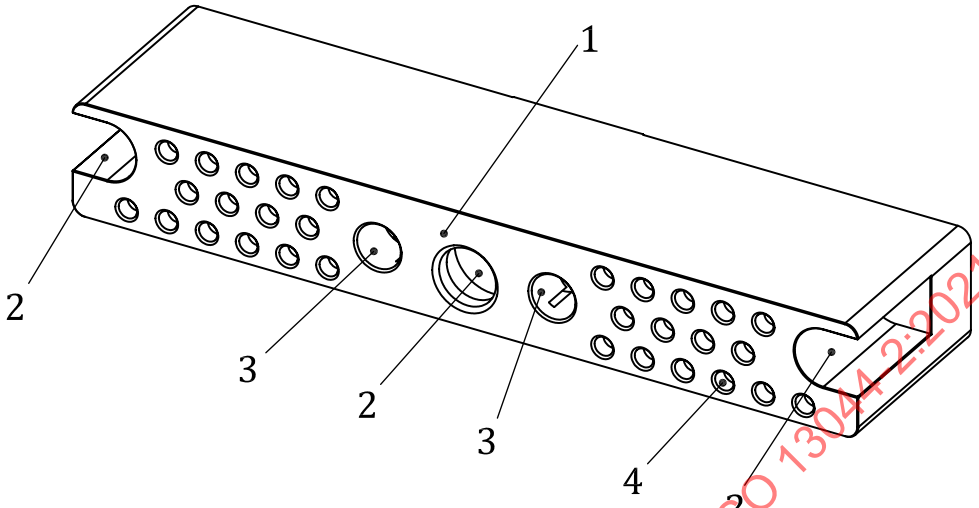
The characteristic dimensions of the socket module protection in open position shall be as specified in Figure A.7

The characteristic dimensions of the EPI plug module shall be as specified in Figure A.5

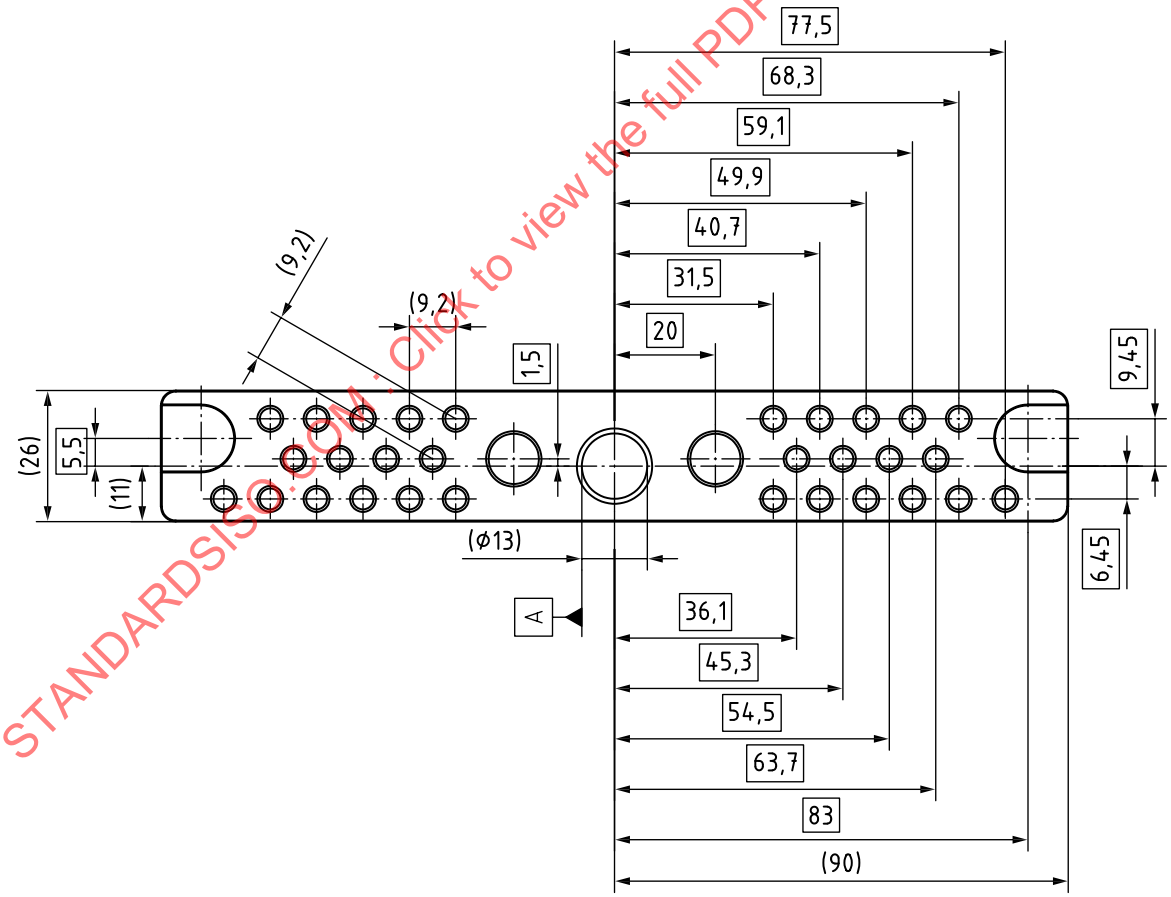
The characteristic dimensions of the plug module protection in open position shall be as specified in Figure A.9

A.3.1 EPI socket module

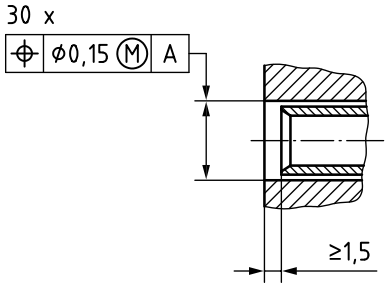
Dimensions in millimetres



a) Isometric view



b) Dimensions — Socket front view



c) Dimensions of female contacts (taken from ISO 7638-1)

Key

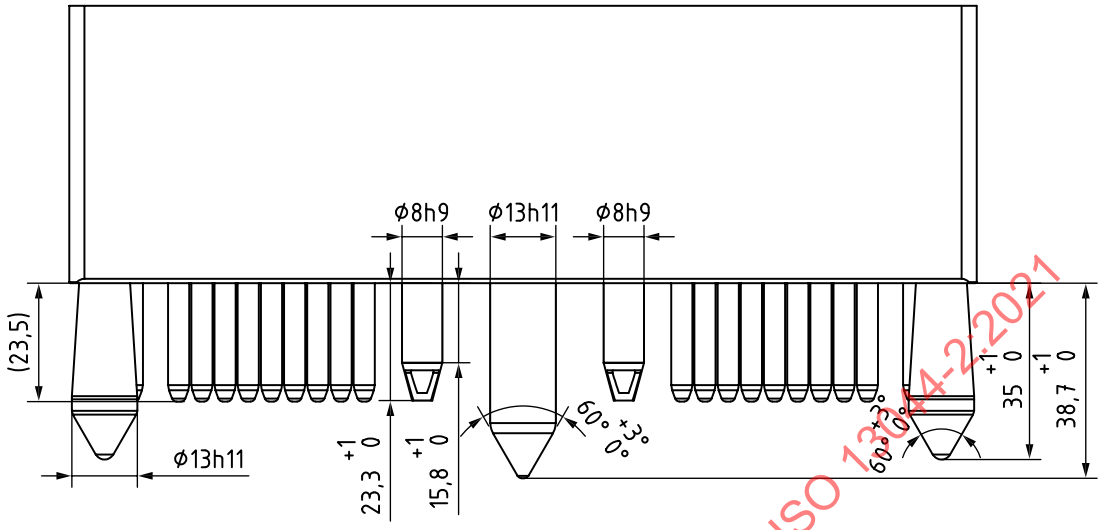
1 gasket
2 alignment socket
3 pneumatic socket
4 electric sockets (30x)

Figure A.4 — EPI socket module

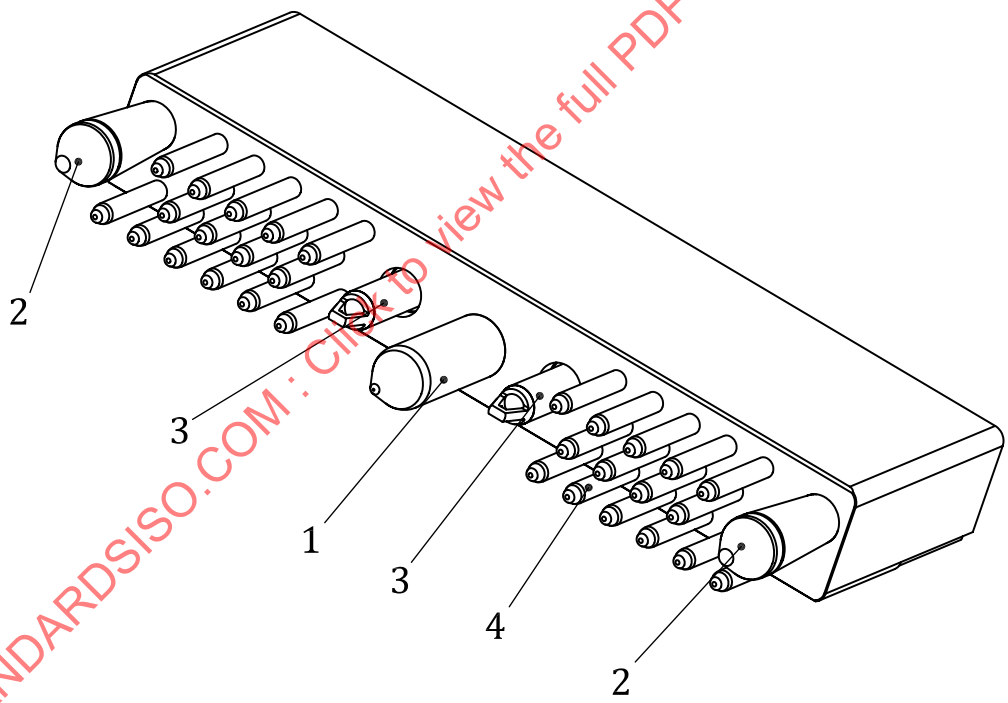
Dimensions and tolerances shall be valid for all 30 electric and 2 pneumatic female contacts. The alignment socket shall be in accordance with the requirements of 4.5 and 4.6.

A.3.2 EPI plug module

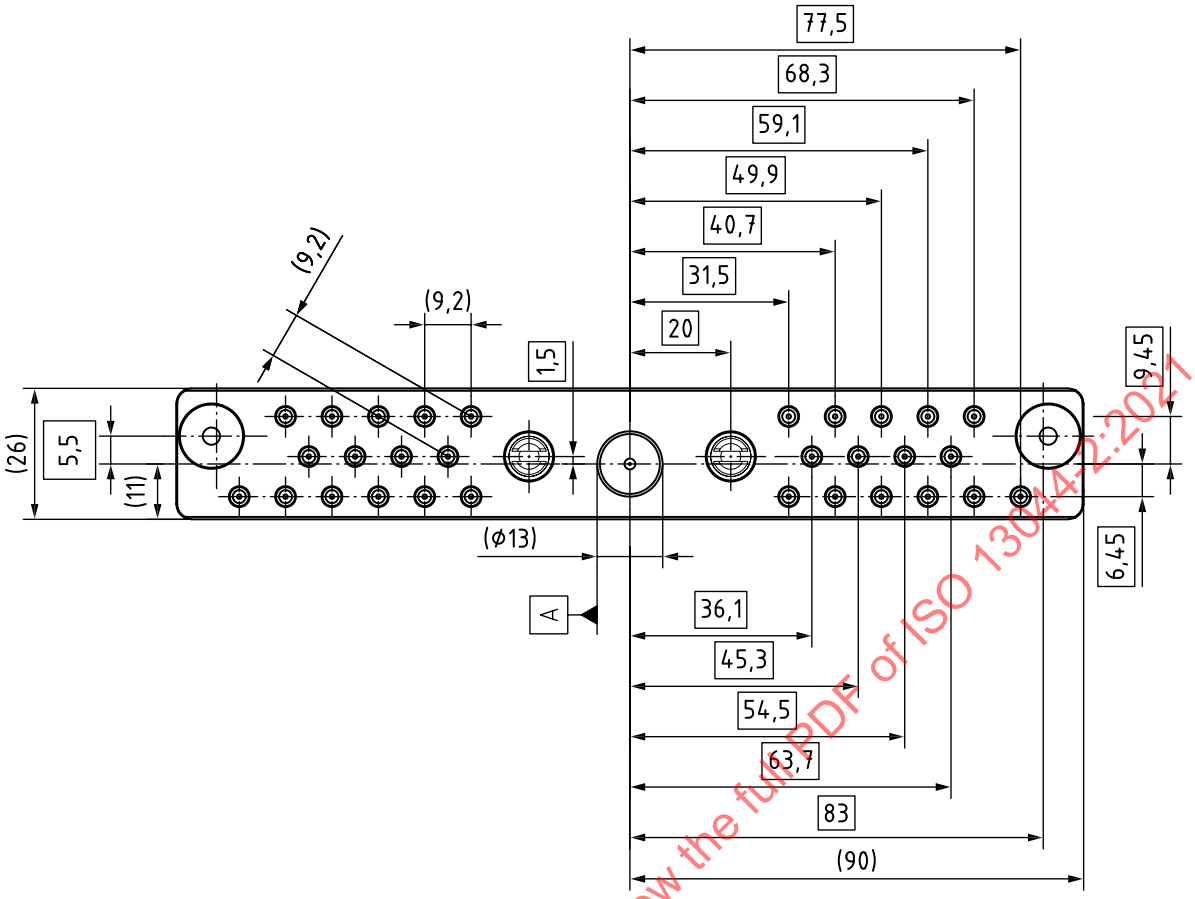
Dimensions in millimetres



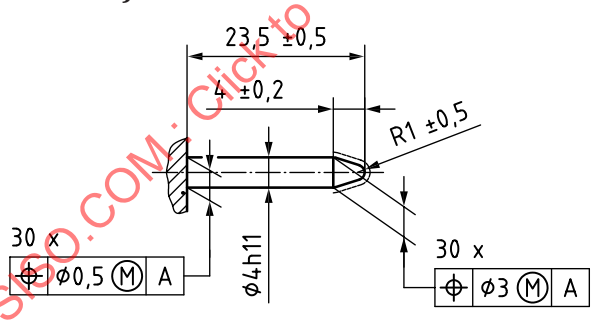
a) Isometric view



b) Dimensions — Top view



c) Dimensions — Front view



d) Dimensions of male contacts (taken from ISO 7638-1)

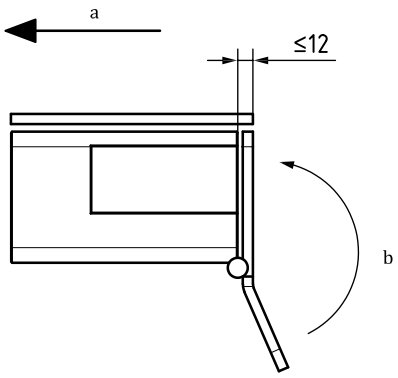
Key

1 central alignment pin, rigid
2 outer alignment pins, rigid (2x)
3 pneumatic male connections (2x)
4 electric male contacts (30x)

Figure A.5 — EPI plug module

Dimensions and tolerances shall be valid for all 30 electric and 2 pneumatic male contacts.

Dimensions in millimetres



a Driving direction.

b Shutting direction.

No value needed, since the main criteria is to ensure the sealing function of the flap. Different sealing concepts may require different closing forces.

Figure A.6 — EPI socket module protection — Closed position (left side view)

Dimensions in millimetres

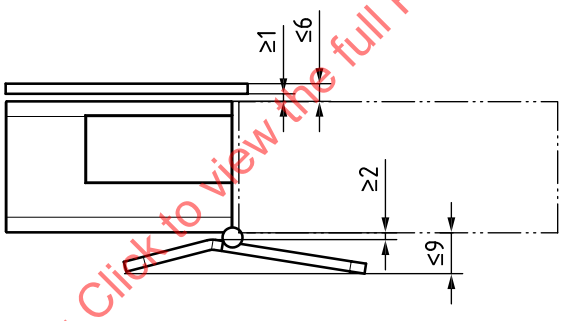


Figure A.7 — EPI socket module protection — Opened position

Dimensions in millimetres

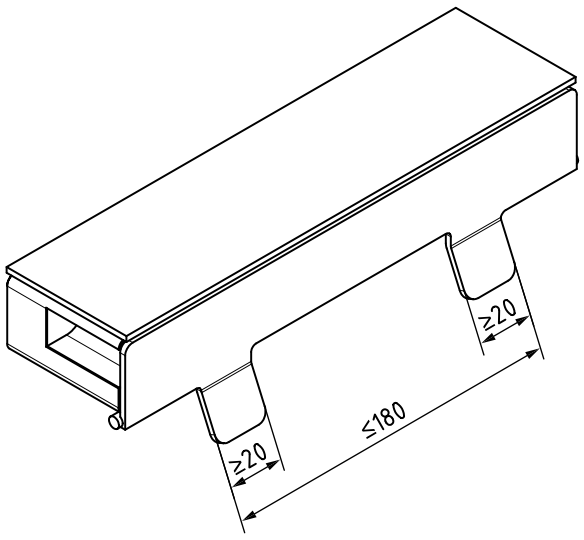
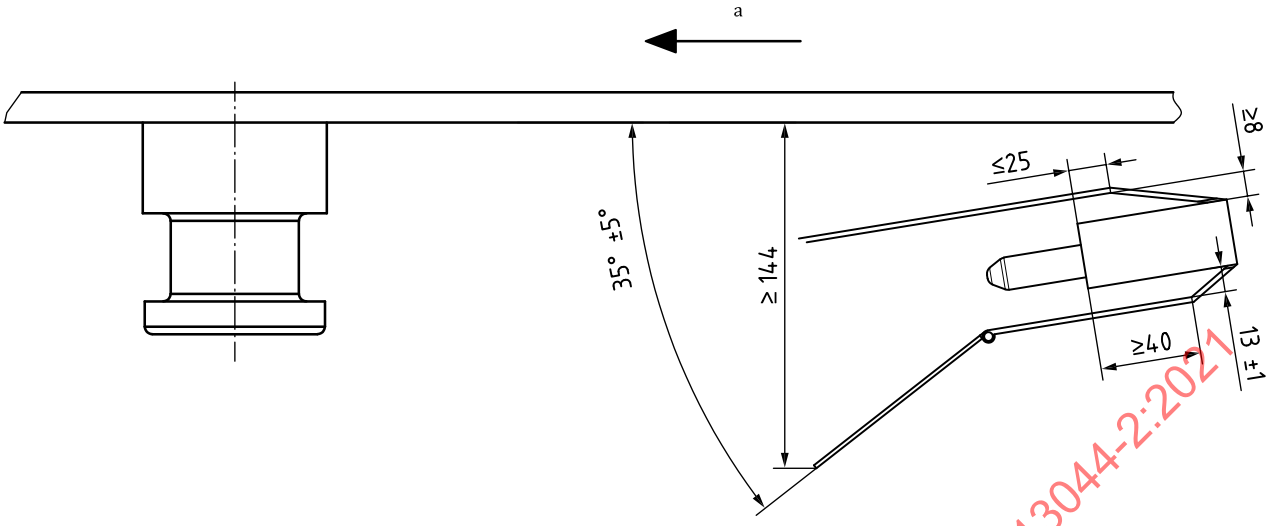


Figure A.8 — EPI socket module protection activation tabs — Socket front view

Dimensions in millimetres



a Driving direction.

Figure A.9 — EPI module protection — Opened position, dimensions