
**Road vehicles — Connectors for the
electrical connection of towing and
towed vehicles — Connectors for
electronically monitored charging
systems with 12 V or 24 V nominal
supply voltage**

*Véhicules routiers — Connecteurs pour liaisons électriques entre
véhicules tracteurs et véhicules tractés — Raccords pour systèmes de
charge contrôlés électroniquement à tension d'alimentation nominale
de 12 V ou 24 V*





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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).

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.

This document was prepared by Technical Committee, ISO/TC 22 *Road vehicles*, Subcommittee SC 32, *Electrical and electronic components and general system aspects*.

This second edition cancels and replaces the first edition (ISO 25981:2008), which has been technically revised. It also incorporates the Technical Corrigendum ISO 25981:2008/Cor 1:2008.

The main changes compared to the previous edition are as follows:

- references to ISO 4009 removed;
- corrections to [Figure 2](#) socket.

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.

Road vehicles — Connectors for the electrical connection of towing and towed vehicles — Connectors for electronically monitored charging systems with 12 V or 24 V nominal supply voltage

1 Scope

This document specifies dimensional characteristics, contact allocation, tests and requirements of 7-pole connectors for electrical connections of electronically monitored charging systems of towing and towed vehicles. The electronic monitoring system is designed to detect 12 V and 24 V nominal supply voltage and to limit the current to 50 A, and this is a connector without any braking capacity.

This electrical connection is intended for use with separable truck-trailer combinations in order to connect an additional battery pack of the trailer with the generator of the truck using an electronically monitored charging system. Additional battery packs in trailers are basically used with tailgate lifts, electrical forklifts or other technical equipment with high current consumption.

This document further specifies a park socket used to receive and store the plug when it is disconnected.

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 4141 (all parts), *Road vehicles — Multi-core connecting cables*

ISO 4091, *Road vehicles — Connectors for the electrical connection of towing and towed vehicles — Definitions, tests and requirements*

ISO 7638-1, *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 7638-2, *Road vehicles — Connectors for the electrical connection of towing and towed vehicles — Part 2: Connectors for braking systems and running gear of vehicles with 12 V nominal supply voltage*

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

IEC 60512-13-5, *Connectors for electronic equipment — Tests and measurements — Part 13-5: Mechanical operation tests — Test 13e: Polarizing and keying method*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4091 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/>

4 Dimensional

4.1 General

Details not specified are at the manufacturer's discretion.

The contacts shall be floating and shall align to the datum position when plug and socket are engaged.

4.2 Plug

Dimensions of the plug shall be in accordance with [Figure 1](#).

The locking lever design shall take into consideration the space required for screws used to fasten the socket (see section B-B in [Figure 2](#)).

4.3 Socket

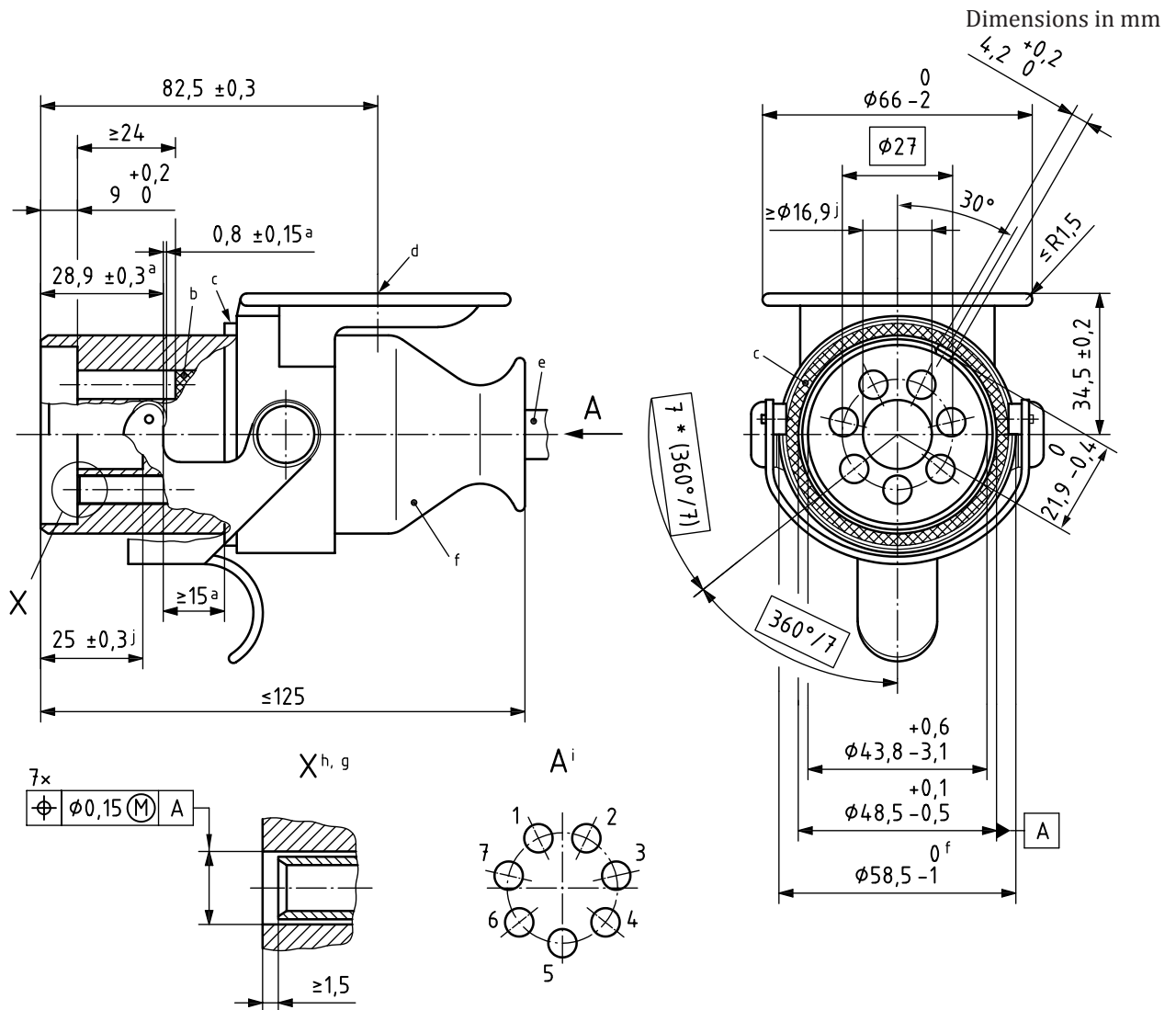
Dimensions of the socket shall be in accordance with [Figure 2](#).

The cover is shown in the open position. It shall close automatically when the plug is disconnected.

4.4 Park socket

Dimensions of the park socket shall be in accordance with [Figure 3](#).

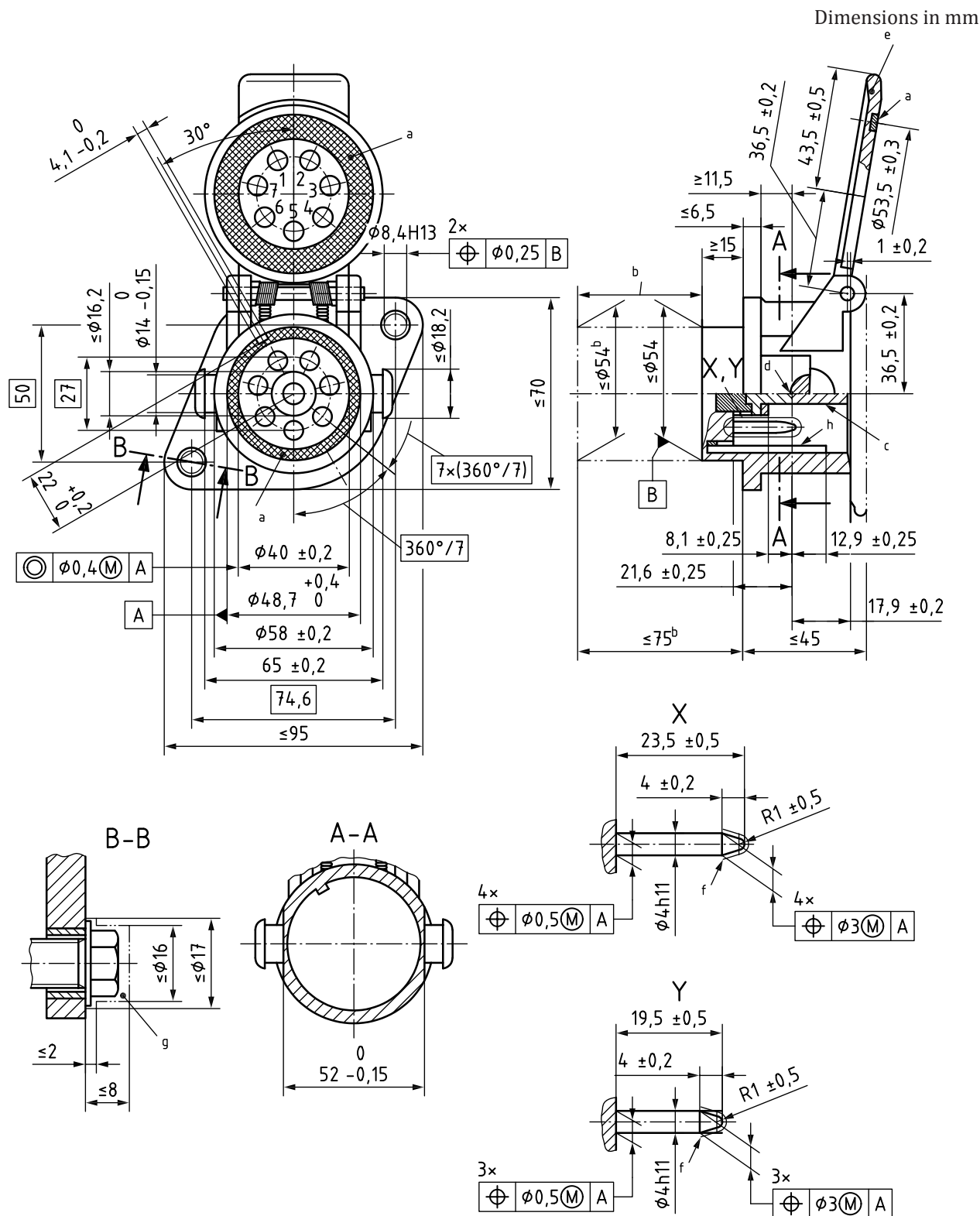
The cover is shown in the open position. It shall close automatically when the plug is disconnected.



Key

- a Dimension refers to the locking lever in its locked position.
- b Plug housing with 7 bushings and coding.
- c The sealing ring shall be mounted such that it cannot become detached under normal use.
- d Centre of cover rest.
- e See ISO 4141-3 for correct sealing.
- f Other housing designs are permitted in compliance with the maximum distance of 58 mm for the locking lever.
- g Contact bushing with $6,0 \text{ mm}^2$ terminal for contacts 1 to 4 and $1,0 \text{ mm}^2$ terminal for contacts 5 to 7.
- h Spring tube.
- i Contact numbers.
- j Minimum space required for the ejection from the socket.

Figure 1 — Plug



Key

X contacts 1 to 4 with $6,0 \text{ mm}^2$ terminal and $23,5 \text{ mm}$ length

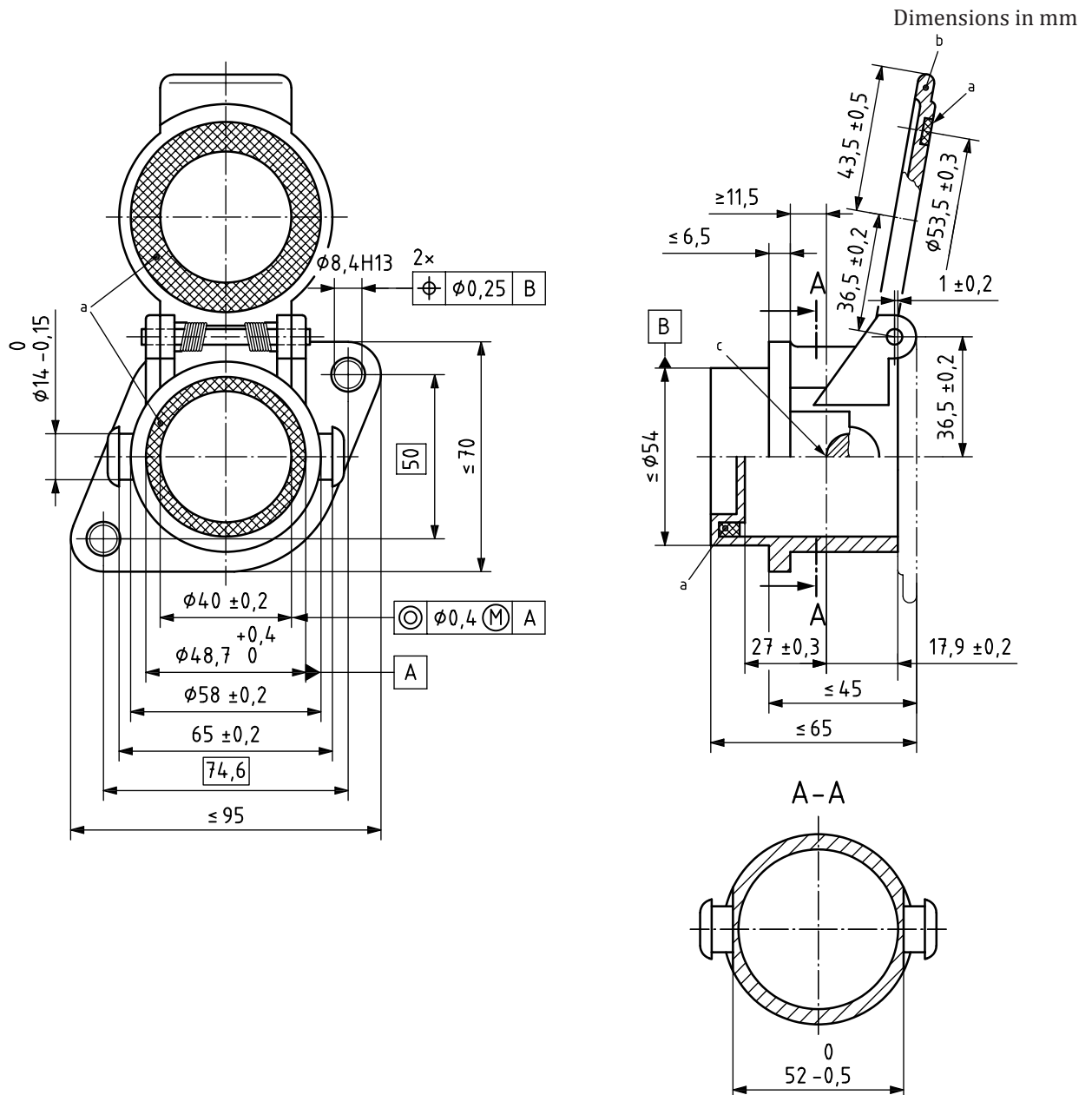
Y contacts 5 to 7 with $1,0 \text{ mm}^2$ terminal and $19,5 \text{ mm}$ length

a The sealing ring shall be mounted such that it cannot become detached under normal use.

b For existing products for which the cable outlet is mounted from the rear, the outside diameter of the outlet may be larger with the vehicle manufacturer's agreement. However, to ensure socket exchangeability, it is recommended to allow for future applications that the maximum outside diameter be 54 mm over a maximum length of 75 mm . See ISO 4141-3 for correct sealing.

- | | |
|---|--|
| c | Spring loaded ejector optional. |
| d | Reference point for engaged locking lever. |
| e | Opening angle of cover 120° min. |
| f | This area shall be smooth and burr free. |
| g | Minimum space required for screws used to fasten the socket. |
| h | Coding is shown 150° rotated to indicate depth of coding. |

Figure 2 — Socket



Key

- a The sealing ring shall be mounted such that it cannot become detached under normal use.
- b Opening angle 120° min.
- c Reference point for engaged locking lever.

Figure 3 — Park socket

5 Application of the connector

5.1 General

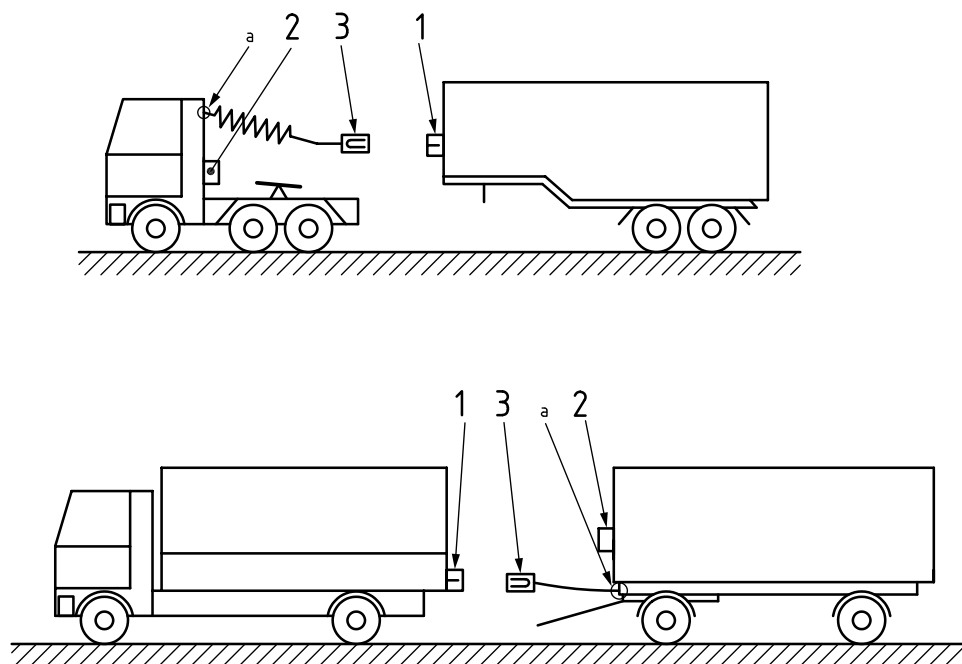
The connection shall be used only for those road vehicles that are equipped with an electronic monitoring device which recognises the system voltage, and which is able to prevent damages caused by wrong system voltage.

The minimum functionality of the electronic monitoring device shall be as specified in [Annex A](#).

If this connector is used, the optional 7-pin N connector (see ISO 1185) shall be replaced by the 15-pin connector conforming to ISO 12098.

Coiled cable assemblies shall be fitted to:

- the tractor, in the case of an articulated vehicle (the coiled cable may be connected to the electrical on-board network of the towing vehicle, with or without the connection; see [Figure 4](#));
- the trailer, in the case of a drawbar-trailer combination [therefore, the trailer towing vehicle (drawbar tractor) shall be fitted with a socket mounted at the rear of the vehicle; see [Figure 4](#)].



Key

- 1 socket
- 2 park socket
- 3 plug
- a See [5.1](#).

Figure 4 — Electrical connection positions

5.2 Contact allocation

The contact allocation shall be in accordance with [Table 1](#).

Table 1 — Contact allocation

Contact No.	Function
1	Plus charging current; switched on electronically
2	Plus charging current; switched on electronically
3	Minus charging current
4	Minus charging current
5	Switched on minus, if platform is closed (control pin for switching on charging current and feedback signal for systems following quiescent current principle)
6	Switched on minus, if platform is opened (control pin for switching on charging current and feedback signal for systems following operating current principle)
7	Switched on minus for feedback signal, if tailgate lift of trailer is opened

5.3 Contact designation

The contact designation numbers shall be permanently marked on the inside of the socket cover, and on the terminal faces of both plug and socket.

The character size shall not be less than 2 mm. However, where limited space is available, a smaller size may be used on the terminal face.

5.4 Terminals

The terminals at the rear side of the pins and tubes shall be capable of accepting cables with the following nominal cross-sectional areas.

- Contacts 1, 2, 3, and 4: 6 mm²
- Contacts 5, 6 and 7: 1 mm²

Terminals accepting cables of a different cross-sectional area shall be as agreed between manufacturer and user.

5.5 Connecting cable

The connecting cable shall meet the requirements of the applicable parts of the ISO 4141 series.

5.6 Colouring of plug and socket

As a minimum requirement, the cover of the socket and the insert of the plug shall be coloured light grey.

6 Tests and specific requirements

6.1 General

Connectors conforming to this document shall be tested as specified in ISO 4091 and shall fulfil the requirements of ISO 4091 unless otherwise specified in subclauses [6.2](#) to [6.5](#).

6.2 Mismatching

6.2.1 Purpose

It shall be impossible to make contact between any tube or pin of the plugs and sockets conforming to this document and the pins and tubes of connectors conforming to ISO 7638-1, ISO 7638-2 and ISO 12098 without excessive force.

6.2.2 Test procedure

The mismatching test shall be applied in accordance with IEC 60512-13-5.

6.2.3 Requirement

No pins shall come into contact up to the minimum allowable force of 1 000 N.

6.3 Connection and disconnection

The connection and disconnection forces shall not exceed 35 N when tested in accordance with ISO 4091.

6.4 Endurance

Carry out the endurance test as specified in ISO 4091, but with 10 000 cycles.

6.5 Mechanical strength of mounting features

The mounting features shall be able to withstand a minimum mounting torque of 15 Nm for fastening the socket.

Annex A

(normative)

Minimum functionality of the monitoring device

A.1 General

The described connector shall be used in combination with an additional electronic monitoring device in order to protect the complete charging system against damage by overvoltage, misuse and electrical arcing.

A.2 Minimum functionalities

The minimum functionalities are as described below.

- Two control pins (pin 5 and 6) are provided to signalize the electronic monitoring device whether a trailer cable is connected or not. For a correct charging function, one of these wires shall be connected to minus (e.g. in the battery box of the trailer). This coded connection shall not only result in a turn-on signal for charging of the additional battery pack but, in addition, the feedback system of the platform at the trailer is determined (see [Table 1](#)). With a hybrid operation (i.e. the towing vehicle and trailer have tailgate lifts from different tailgate manufacturers with different feedback systems), the correct coding of pin 5 or 6 shall result in a correct switching principle of the feedback signal in the driver's cabin. In this way, it is possible to combine trailers with different minus feedbacks from all tailgate manufacturers with a towing vehicle that is equipped with a comparable electronic monitoring device (with trucks, the feedback signal is always minus operating current principle).
- The electronic monitoring device shall be able to diagnose initially the systems voltage of each of the battery packs that are to be connected. In the case of different system voltages (12V/24V), no coupling of the battery packs shall take place.
- When the plug is engaged, the electronic monitoring device shall connect the battery packs after a time delay in order to prevent electrical arcing at the contacts.
- When the plug is separated, the shorter pins of the plug initially disconnect the ground signal; in this way, the electronic monitoring device shall shut off the charging current within milliseconds before the contacts of the charging current pins are disconnected, in order to prevent electrical arcing at the contacts.
- The electronic monitoring device shall disconnect the charging system if the charging current exceeds 50 A. If a short-circuit occurs, the electronic monitoring device shall also disconnect the charging system if the current exceeds 100 A for a duration of 0,05 s.

Bibliography

- [1] ISO 1185, *Road vehicles — Connectors for the electrical connection of towing and towed vehicles — 7-pole connector type 24 N (normal) for vehicles with 24 V nominal supply voltage*
- [2] ISO 3731, *Road vehicles — Connectors for the electrical connection of towing and towed vehicles — 7-pole connector type 24 S (supplementary) for vehicles with 24 V nominal supply voltage*
- [3] ISO 11992-1, *Road vehicles — Interchange of digital information on electrical connections between towing and towed vehicles — Part 1: Physical and data-link layers*
- [4] ISO 11992-3, *Road vehicles — Interchange of digital information on electrical connections between towing and towed vehicles — Part 3: Application layer for equipment other than brakes and running gear*

