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**Road vehicles — Electrical connectors  
for braking systems —**

**Part 2:**

**Connectors for 12 V nominal supply voltage**

*Véhicules routiers — Connecteurs électriques pour dispositifs  
de freinage —*

*Partie 2: Connecteurs pour systèmes à tension nominale de 12 V*



## 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 7638-2 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

Together with ISO 7638-1, it cancels and replaces ISO 7638:1975, of which it constitutes a major technical revision.

ISO 7638 consists of the following parts, under the general title *Road vehicles — Electrical connectors for braking systems*:

- *Part 1: Connectors for 24 V nominal supply voltage*
- *Part 2: Connectors for 12 V nominal supply voltage*

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# Road vehicles — Electrical connectors for braking systems —

## Part 2:

## Connectors for 12 V nominal supply voltage

### 1 Scope

This part of ISO 7638 specifies the electrical connectors for braking systems and their contact allocation for the electrical connections between towing and towed vehicles equipped with 12 V nominal supply voltage systems.

This part of ISO 7638 further specifies a park socket used to receive and store the plug when it is disconnected.

### 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 7638. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 7638 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 4009:1989, *Towing vehicles — Mounting of electrical connections on rear cross-members.*

ISO 4091:1992, *Road vehicles — Connectors for electrical connections between towing vehicles and trailers — Test methods and performance requirements.*

ISO 4091:1992/Amd.1:1997, *Road vehicles — Connectors for electrical connections between towing vehicles and trailers — Test methods and performance requirements. Amendment 1.*

ISO 4141-1:—<sup>1)</sup>, *Road vehicles — Multi-core connecting cables — Part 1: Test methods and requirements of basic performance sheathed cables.*

ISO 4141-2:—<sup>1)</sup>, *Road vehicles — Multi-core connecting cables — Part 2: Test methods and requirements of high performance sheathed cables.*

ISO 4141-3:—<sup>1)</sup>, *Road vehicles — Multi-core connecting cables — Part 3: Construction, dimensions and marking of unscreened sheathed low-tension cables.*

ISO 7638-1:1997, *Road vehicles — Electrical connectors for braking systems — Part 1: Connectors for 24 V nominal supply voltage.*

1) To be published. (Revision of ISO 4141:1988)

ISO 11992-1:—<sup>2)</sup>, *Commercial road vehicles — Electrical connections between towing and towed vehicles — Interchange of digital information — Part 1: Physical layer and data link layer.*

ISO 11992-2:—<sup>2)</sup>, *Commercial road vehicles — Electrical connections between towing and towed vehicles — Interchange of digital information — Part 2: Application layer for braking equipment.*

ISO 12098:1994, *Commercial vehicles with 24 V systems — 15-pole connectors between towing vehicles and trailers — Dimensions and contact allocation.*

IEC 529:1989, *Degrees of protection provided by enclosures (IP code).*

### 3 Definitions

For the purposes of this part of ISO 7638, the following definitions apply.

**3.1 park socket:** A socket to store the plug when it is disconnected.

**3.2 ejector:** A part of the socket (but not of the park socket) provided to disengage the plug automatically, if the locking device is not operative.

### 4 Dimensional characteristics

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.

Terminals of contacts 1 and 4 may be connected to more than one single core.

#### 4.1 Plug

Dimensional characteristics shall be as in 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.

#### 4.2 Socket

Dimensional characteristics shall be as in figure 2.

The cover is shown in the open position. It shall close automatically when the plug is disconnected. Its opening angle shall be 120° min.

#### 4.3 Park socket

Dimensional characteristics shall be as in figure 3.

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

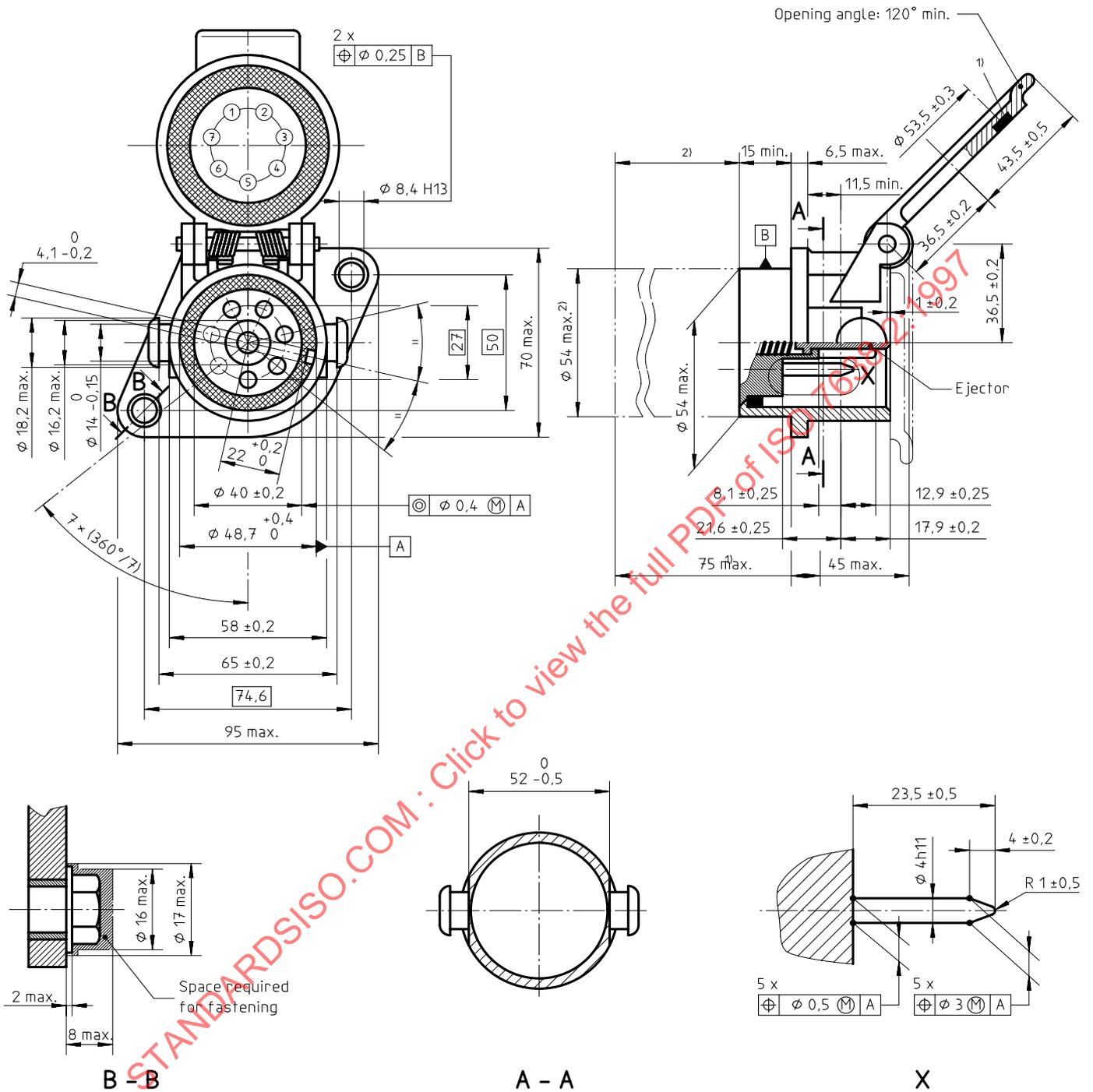
Opening angle: see figure 3.

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2) To be published.



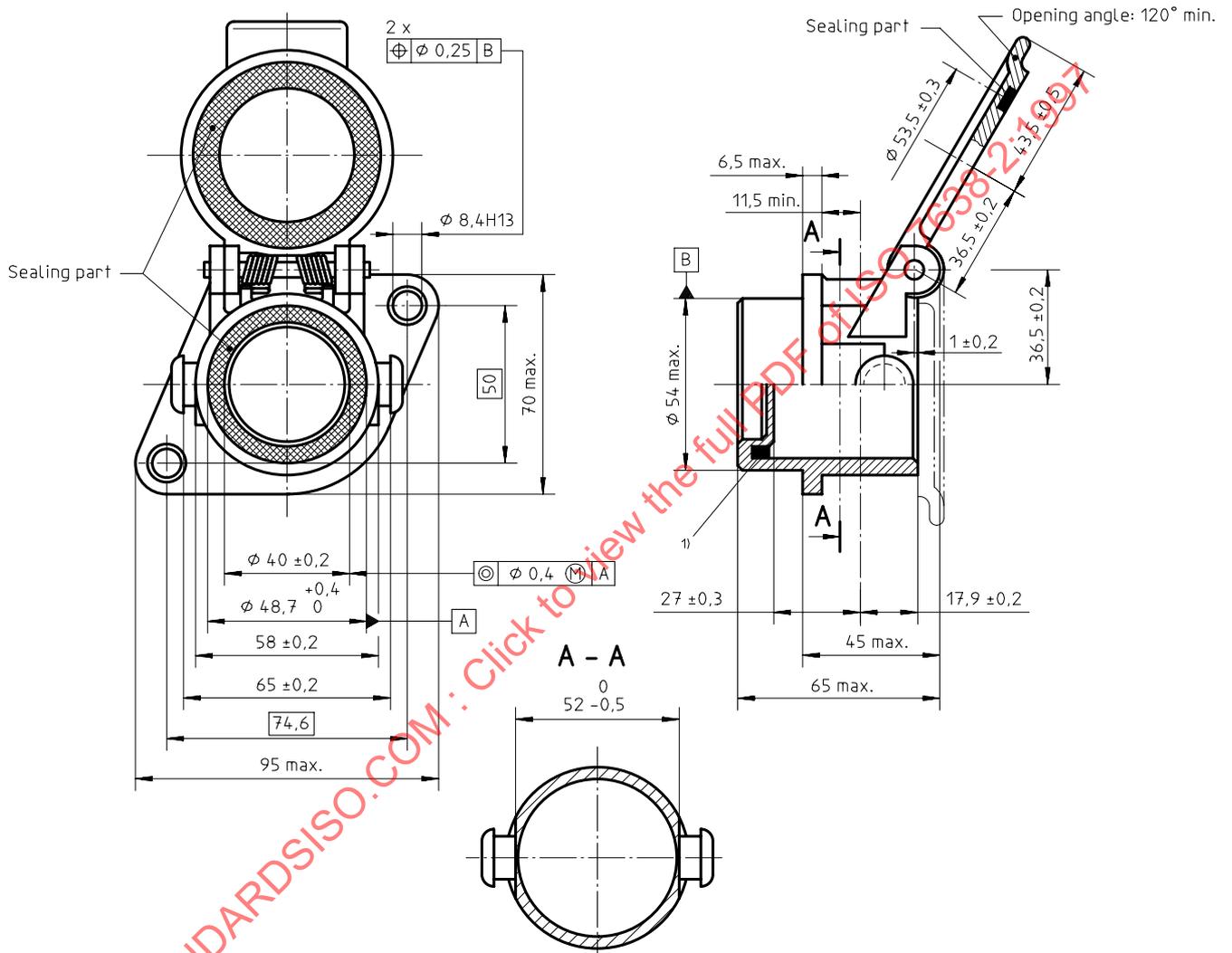
Dimensions in millimetres



- 1) The gasket shall be mounted such that it cannot become detached under normal use.
- 2) For existing products for which the cable outlet is mounted from the rear, the outside diameter of the outlet may be larger, with the agreement of the vehicle manufacturer. However, to ensure socket exchangeability it is recommended to allow, for future applications, that the max. outside diameter be 54 mm over a max. length of 75 mm.

Figure 2 — Socket

Dimensions in millimetres



1) The gasket shall be mounted such that it cannot become detached under normal use.

Figure 3 — Park socket

## 5 Application of the connector

### 5.1 Socket and plug positions

The coiled cable assembly is fitted to the semi-trailer towing vehicle (fifth wheel tractor). The coiled cable assembly may be connected to the electrical on-board network of the towing vehicle with or without the connection (see figure 4). If a connector is used, an additional mechanical fixation of the coiled cable assembly to the towing vehicle is recommended.

The uncoiled cable assembly is fitted to the drawbar trailer. Therefore, the trailer towing vehicle (drawbar tractor) shall be fitted with a socket mounted at the rear of the vehicle (see figure 4).

The position of the connector installed on the towing vehicle shall comply with ISO 4009.

### 5.2 Free space around the connection

The minimum free space around the connection is specified in figure 5.

### 5.3 Contact allocation

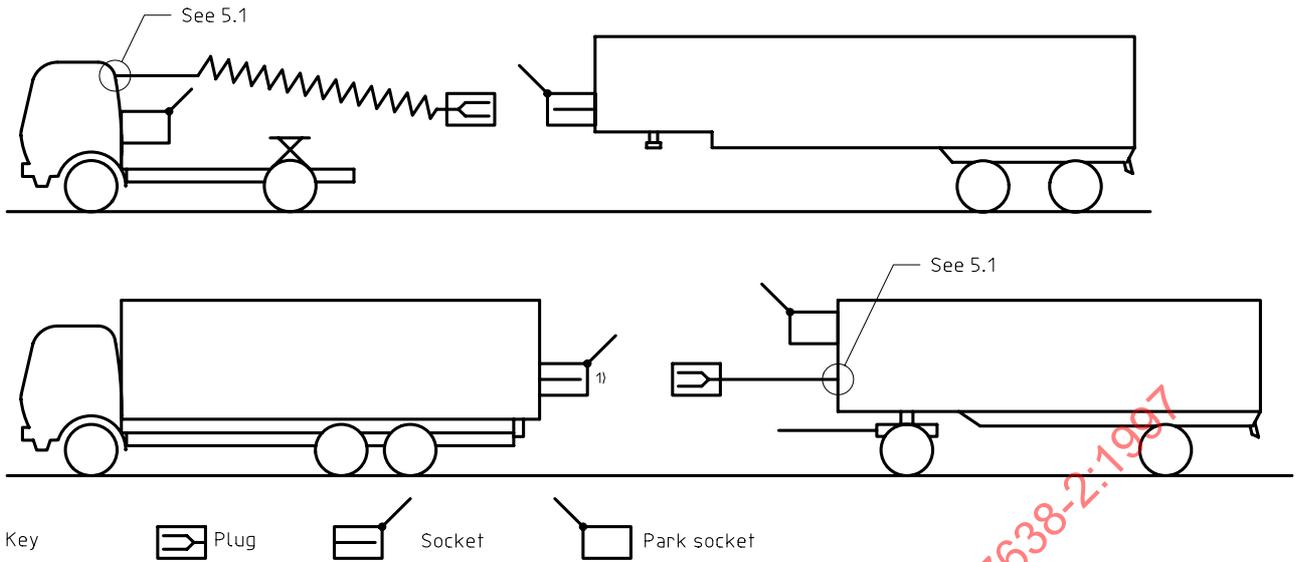
The contact allocation of the connectors shall be as in table 1.

**Table 1 — Contact allocation**

Contact No.	Function
1	plus electrovalve
2	plus electronics
3	minus electronics
4	minus electrovalve
5	warning device <sup>1)</sup>
6	CANH <sup>2)</sup>
7	CANL <sup>2)</sup>

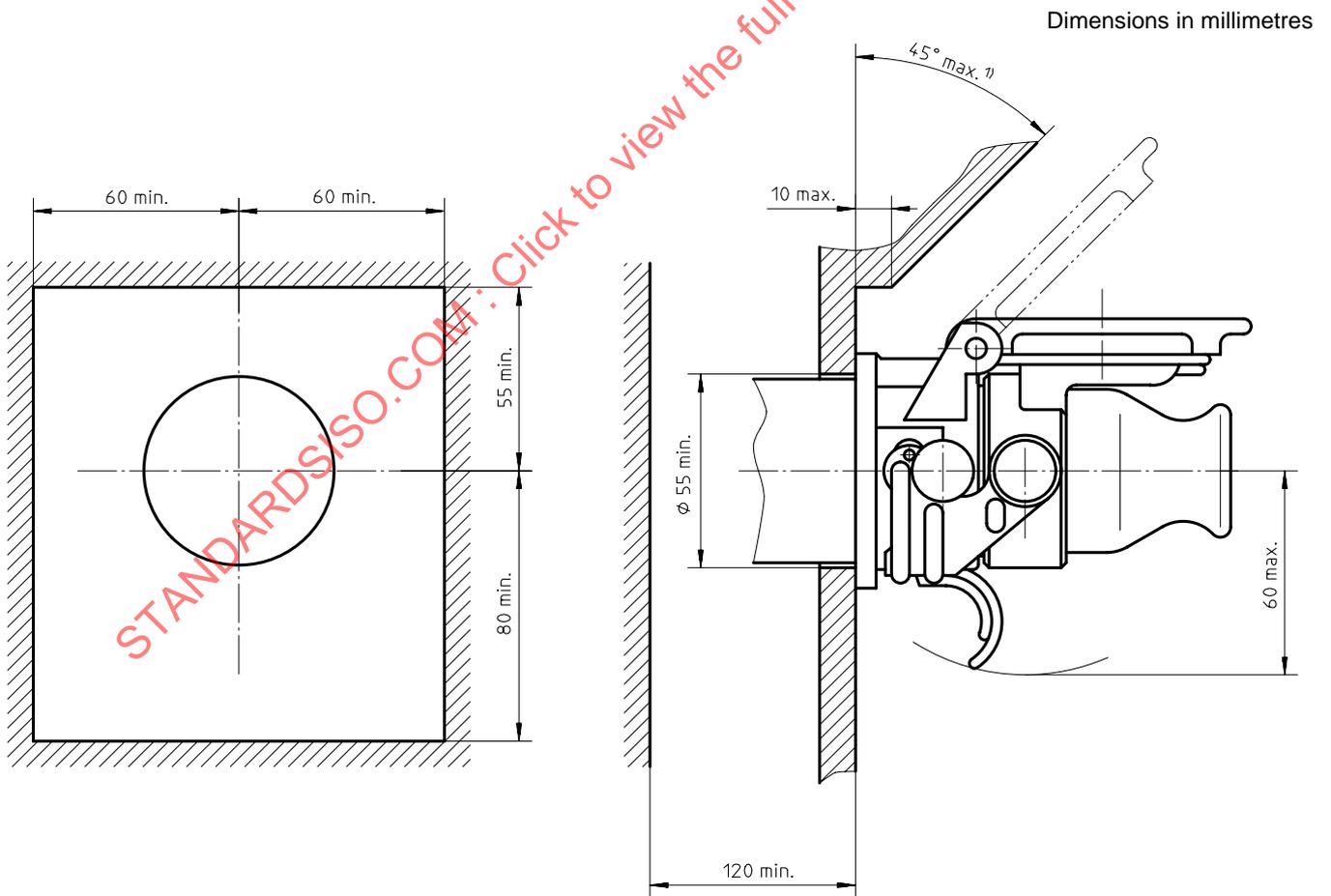
1) The warning device is controlled through contact 5. This contact has open circuit during normal operation, see figure 6.

2) According to ISO 11992-1 and ISO 11992-2.



1) According to ISO 4009.

Figure 4 — Electrical connection positions



1) The angle of max. 45° shall extend across the full horizontal space.

Figure 5 — Free space around the connection

**5.4 Contact numbers and terminals**

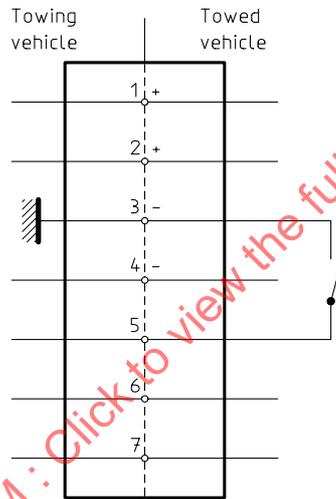
The contact designation numbers shall be permanently marked on the inside of the socket cover and on the terminal faces of plug and socket.

The character size shall not be less than 2 mm. Reduced space available may require application of a smaller size on the terminal face.

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 and 4: 4 mm<sup>2</sup> or 6 mm<sup>2</sup>; 3)
- Contacts 2, 3, 5, 6 and 7: 1,5 mm<sup>2</sup>.

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



**Figure 6 — Warning device**

**5.5 Connecting cable**

The connecting cable shall meet the requirements of ISO 4141-1, ISO 4141-2 and ISO 4141-3.

**6 Test methods**

The test methods and sequences shall be as specified in ISO 4091 and ISO/DAM 4091.

**6.1 Ejector force**

Measure the force of the ejector in the socket along its moving direction over the full travel range with a suitable device.

3) It is intended to delete the 6 mm<sup>2</sup> at the next periodical review of this part of ISO 7638.

## 6.2 Endurance

Carry out the test with plug and socket equipped with the necessary contacts but without the cable.

The test consists of 10 000 mechanical cycles without electrical load. One cycle is defined by the following operations:

- a) opening of the cover;
- b) insertion of the plug into the socket;
- c) latching and unlatching the locking device;
- d) withdrawal of the plug;
- e) closing of the socket cover.

Insert and withdraw the plug at a velocity of  $(500 \pm 100)$  mm/min.

Carry out 4 cycles per minute.

## 7 Performance requirements

It shall be impossible to make contact between any tube or pin of the plugs and sockets according to this part of ISO 7638 and the pins and tubes of connectors according to ISO 12098 and ISO 7638-1.

Connectors according to this part of ISO 7638 shall meet the performance requirements of ISO 4091 as specified in the following requirements.

### 7.1 Ejector force

The ejector shall produce a force within the range of 35 N to 75 N, including any force variation over the ejector spring travel (see test procedure in 6.1).

### 7.2 Endurance

After the endurance test as in 6.2, the requirements of 7.17 and 7.18 shall be checked successively.

The insertion and withdrawal forces specified in 7.6 shall then be rechecked; the values shall not vary by more than 50 % from those measured initially.

The voltage drop between the terminal of each pin and its tube shall not vary by more than 50 % from that measured initially.

### 7.3 Dimensional check

The dimensional check shall be carried out according to ISO 4091:1992, subclause 4.2.

All of the dimensions shall be within the tolerances quoted in the particular specification of the connector. Failure of any of these dimensions to comply with these requirements entails the failure of the sample.

### 7.4 Static load

No cracks or permanent deformations shall be visible after the test specified in ISO 4091:1992, subclause 3.3.1.

### 7.5 Locking device and cable retention strength

No cracks or permanent deformations shall be visible after the test specified in ISO 4091:1992, subclause 3.3.2.

After the test, the test rod shall not have moved more than 2 mm, measured on the PVC surface.

### 7.6 Insertion and withdrawal forces

The insertion and withdrawal forces of the connection shall be 35 N max.

The ejector shall be disabled for this test.

### 7.7 Lateral strength at low temperature

No cracks or permanent deformation shall be visible after the test specified in ISO 4091:1992, subclause 3.3.9.

### 7.8 Operational force of the locking lever

The forces measured in the test specified in ISO 4091:1992, subclause 3.3.4.1 shall not exceed 120 N.

### 7.9 Current carrying capacity

The measured increase of contact temperature shall not exceed the appropriate temperature rise as specified in table 2.

Table 2 — Current carrying capacity

Nominal cable cross-sectional area admissible at contact mm <sup>2</sup>	Test cable nominal cross-sectional area mm <sup>2</sup>	Test current ± 0,5 A	Temperature rise max. °C
6 1)	6 1)	30	20
4	4	30	25
1,5	1,5	16	30

1) It is intended to delete the 6 mm<sup>2</sup> at the next periodical review of this part of ISO 7638.

### 7.10 Voltage drop

Each individual contact in the connector tested as in ISO 4091:1992, subclause 3.5.2 shall show a maximum voltage drop of 40 mV.

### 7.11 Flash resistance

No flashover shall occur during the test specified in ISO 4091:1992, subclause 3.5.3.

### 7.12 Temperature/humidity stability

No cracks or deformations shall be visible after the test specified in ISO 4091:1992, subclause 3.3.8.