SURFACE VEHICLE STANDARD

J1962™	SEP2015
Issued 1992-06 Revised 2015-09 Superseding J1962 JUL2012	

Diagnostic Connector

RATIONALE

This document is being revised by the SAE J1962 Task Force in response to a request from the California Air Resources Board (CARB) to SAE for clarification regarding the access area to the vehicle diagnostic connector that is intended to provide proper clearance for the mating of the scan tool connector to the vehicle.

As a result of the CARB request, the SAE Vehicle E/E System Diagnostic Standards Committee approved the task of reviewing and revising for clarification this SAE J1962 Specification.

As this document and ISO 15031-3 are technically equivalent, there is no need to reference an individual ISO version in the title of this document and it has been removed.

FOREWORD

This document supersedes SAE J1962 200204, and is technically equivalent to ISO/DIS 15031-3, except for minor reorganization of Paragraphs 1 and 2.

On-Board Diagnostic (OBD) regulations require passenger cars, and light and medium duty trucks, to be equipped with a standardized connector for purposes of access to on-board diagnostic information by “generic” test equipment. This document describes the requirements for the physical connection and associated pin usage to allow for standard access to the OBD data.

SAE J1962 was originally developed to meet U.S. OBD requirements for 1996 and later model year vehicles. ISO 15031-3 was based on SAE J1962 and was intended to meet European OBD requirements for 2000 and later model year vehicles, and added a modified connector type to accommodate vehicles with a 24 V system. This document is technically equivalent to ISO 15031-3 with U.S. specific requirements identified.

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1. SCOPE

1.1 Purpose

This document supersedes SAE J1962 200204, and is technically equivalent to ISO/DIS 15031-3: December 14, 2001.

This document is intended to satisfy the requirements of an OBD connector as required by U.S. On-Board Diagnostic (OBD) regulations. The diagnostic connection specified in this document consists of two mating connectors, the vehicle connector and the external test equipment connector.

This document specifies:

a. The functional requirements for the vehicle connector. These functional requirements are separated into four principal areas: connector location/access, connector design, connector contact allocation, and electrical requirements for connector and related electrical circuits,

b. The functional requirements for the external test equipment connector. These functional requirements are separated into three principal areas: connector design, connector contact allocation, and electrical requirements for connector and related electrical circuits.

1.2 Differences from ISO Document

The ISO 15031-3 document is intended to satisfy the OBD requirements in countries other than the U.S., and includes functionality not required or not allowed in the U.S.

Notable exceptions are:

a. U.S. OBD regulations specify a connector location that may be more restrictive than specified in this document or the ISO 15031-3 document.

b. U.S. OBD regulations do not allow greater than 20 V at the SAE J1962 connector. Only the Type A connector as defined in this document is allowable.

NOTE: A comma is used as a decimal marker for numeric values shown within the figures of this document.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J1850 Class B Data Communication Network Interface

SAE J1978 OBD II Scan Tool – Equivalent to ISO/DIS 15031-4

2.1.2 ISO Publications

Copies of these documents are available online at http://webstore.ansi.org/

ISO 8092-2:2000	Road Vehicles - Connections for On-Board Electrical Wiring Harnesses - Part 2: Definitions, Test Methods and General Performance Requirements
ISO 9141-2:1994	Road Vehicles - Diagnostic Systems - Part 2: CARB Requirements for Interchange of Digital Information
ISO 9141-2:1994/Amd.1:1996	Road Vehicles - Diagnostic systems - Part 2: CARB Requirements for Interchange of Digital Information - Amendment 1
ISO 14230-4:2000	Road Vehicles - Keyword Protocol 2000 for Diagnostic Systems - Part 4: Requirements for Emission-Related Systems
ISO/DIS 15031-3: December 14, 2001	Road vehicles - Communication between Vehicle and External Test Equipment for Emissions-Related Diagnostics - Part 3: Diagnostic Connector and Related Electrical Circuits, Specification and Use
ISO/DIS 15765-4:2001	Road vehicles - Diagnostics on Controller Area Network (CAN) - Part 4: Requirements for Emissions-Related Systems
ISO 16750-2	Road vehicles - Environmental Conditions and Testing for Electrical and Electronical Equipment - Part 2: Electrical Load

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J1930	Electrical/Electronic Systems Diagnostic Terms, Definitions, Abbreviations, and Acronyms – Equivalent to ISO/TR 15031-2
SAE J1979	E/E Diagnostic Test Modes – Equivalent to ISO/DIS 15031-5
SAE J2012	Diagnostic Trouble Code Definitions – Equivalent to ISO/DIS 15031-6

2.2.2 ISO Publications

Copies of these documents are available online at http://webstore.ansi.org/

ISO 6722-3:1993 Road Vehicles - Unscreened Low-Tension Cables - Part 3: Conductor Sizes and Dimensions for Thick-Wall Insulated Cables

ISO 6722-4:1993 Road Vehicles - Unscreened Low-Tension Cables - Part 4: Conductor Sizes and Dimensions for Thin-Wall Insulated Cables

ISO 8092-3:1996 Road Vehicles - Connections for On-Board Electrical Wiring Harnesses - Part 3: Tabs for Multi-Pole Connections; Dimensions and Specific Requirements

ISO 15031-1:2001 Road Vehicles - Communication between Vehicle and External Test Equipment for Emissions-Related Diagnostics - Part 1: General information

3. TERMS AND DEFINITIONS

3.1 CONNECTION

Two mated connectors or contacts.

3.2 CONNECTOR

Assembly of contact and housing which terminates conductors for the purpose of providing connection and disconnection to a suitable mating connector. Diagnostic Link Connector, abbreviated DLC, is used interchangeably in this document.

3.3 CONTACT

Conductive element in a connector (including means for cable attachment) which mates with a corresponding element to provide an electrical path.

3.4 FEMALE CONTACT

Electrical contact (including means for cable attachment) intended to make electrical engagement on its inner surface and to accept entry of a male contact thus forming an electrical connection. Examples: receptacle, sleeve.

3.5 MALE CONTACT

Electrical contact (including means for cable attachment) intended to make electrical engagement on its outer surface and to enter a female contact thus forming an electrical connection. Examples: tab, pin, blade.

4. VEHICLE CONNECTOR LOCATION/ACCESS

4.1 Consistency of Location

NOTE: Jurisdictional OBD regulations may specify a connector location that is more restrictive than specified in this document or the ISO 15031-3 document. They may also prohibit the use of covers which conceal the connector. Applicability of those regulations should be verified by the user of this document to ensure vehicle compliance.

The vehicle coordinate system is designed as follows: positive x points toward the front of the vehicle, positive y points toward the left side of the vehicle, and positive z points up. See Figure 1 below.

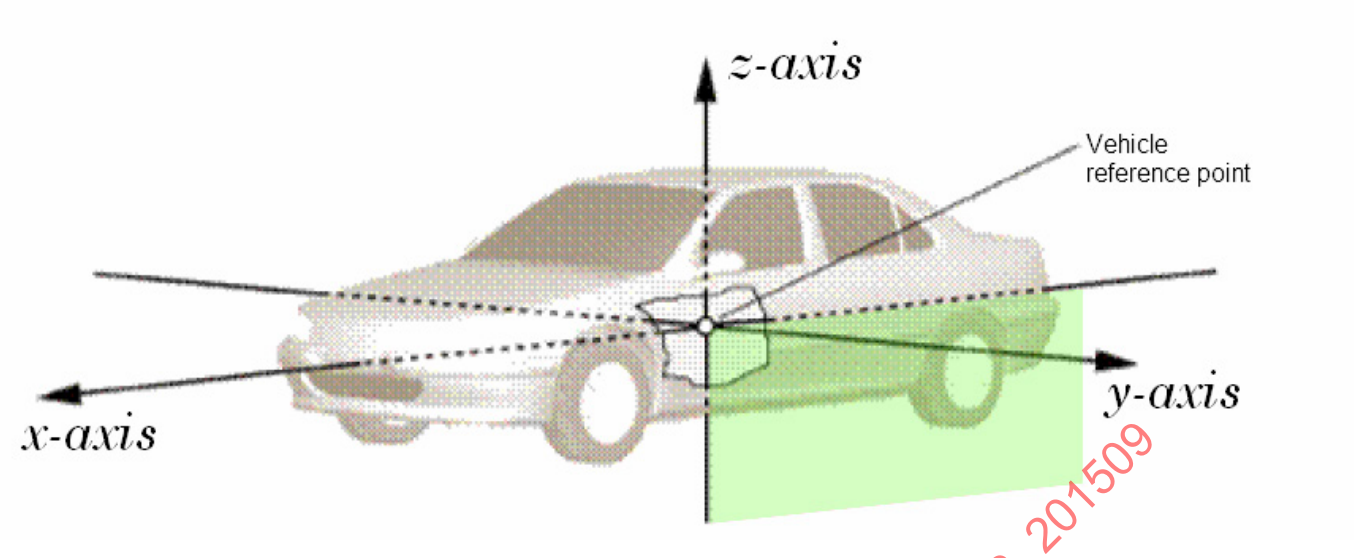


Figure 1 - Vehicle coordinate system

4.1.1 Location and Position of Vehicle Connector Type A

If the vehicle connector type A is used, the connector shall be located in the driver's side foot-well region of the vehicle interior, no higher than the bottom of the point where the steering column exits the instrument panel when at the lowest adjustable position. For left hand drive vehicles, the entire connector profile shall be located to the left of the left edge (+y direction) of the brake pedal (or clutch pedal, if equipped). The vehicle connector shall be securely mounted to the vehicle in order to facilitate mating and un-mating.

The connector shall be mounted such that the face of the vehicle connector is pointing downward (90° from horizontal, the –z direction) or toward the rear of the vehicle (0° from horizontal, the –x direction), or any angle in between. See Figure 2 below. Tolerance: ± 5°

The connector may be mounted vertically or horizontally, as shown in Figure 2, but may not be oriented in any other angles. Additionally, the orientation of the connector must follow the drawing in Figure 2. For vertically mounted connectors, the long side must be to the left (+y direction). For horizontally mounted connectors, the long side must be on top (or rearward if the connector is pointing down). Tolerance: ± 5°

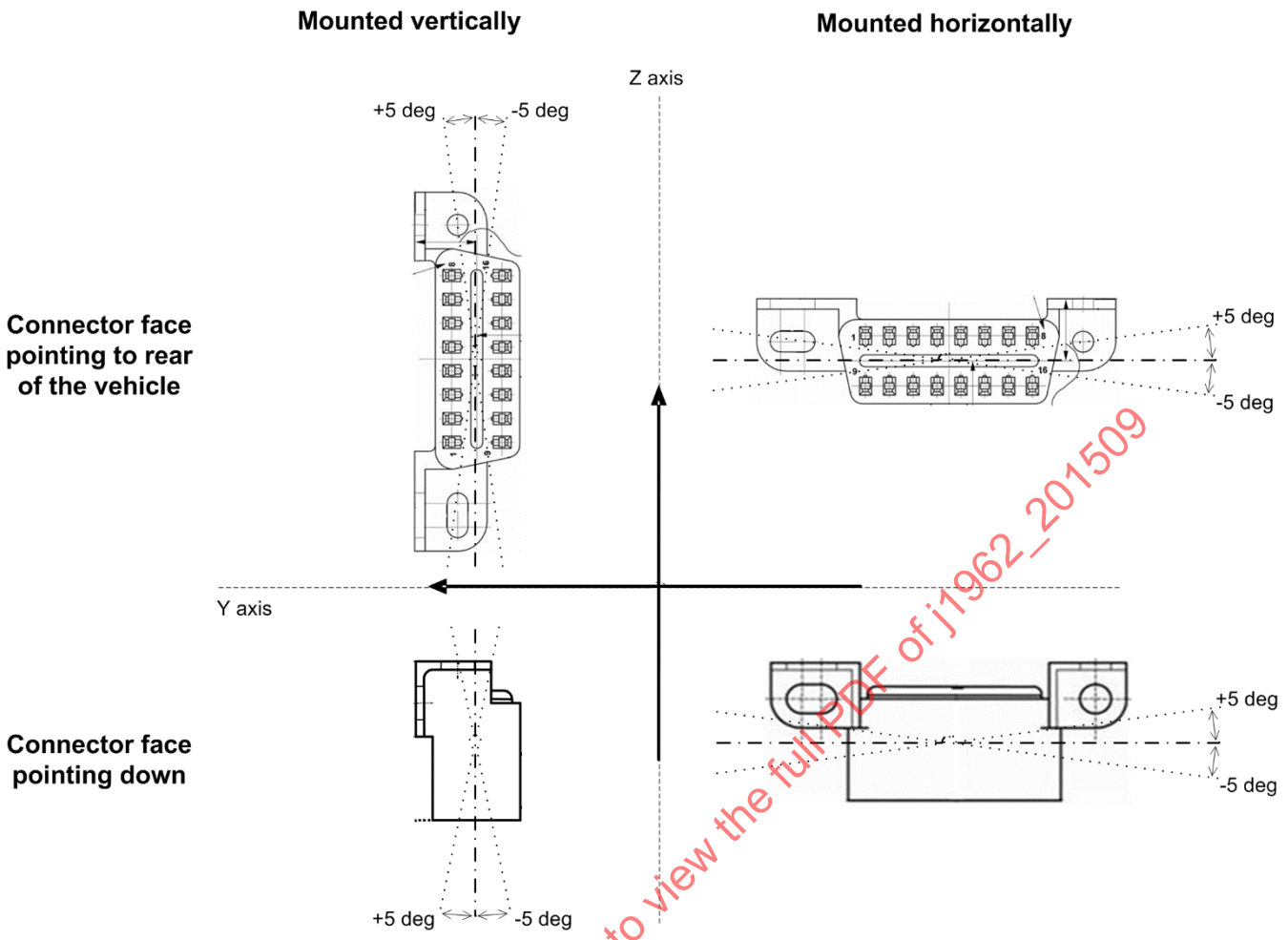


Figure 2 - Connector orientation (mounting limits)

4.1.2 Location of Vehicle Connector Type B

If the vehicle connector type B is used, the connector shall be located in the passenger or driver's compartment in the area bounded by the driver's end of the instrument panel, including the outer side, and an imagined line 750 mm beyond the vehicle centerline. It shall be attached to the instrument panel and easy to access from the driver's seat *or* from the co-driver's seat *or* from the outside. The vehicle connector shall be mounted to facilitate mating and un-mating.

4.2 Ease of Access

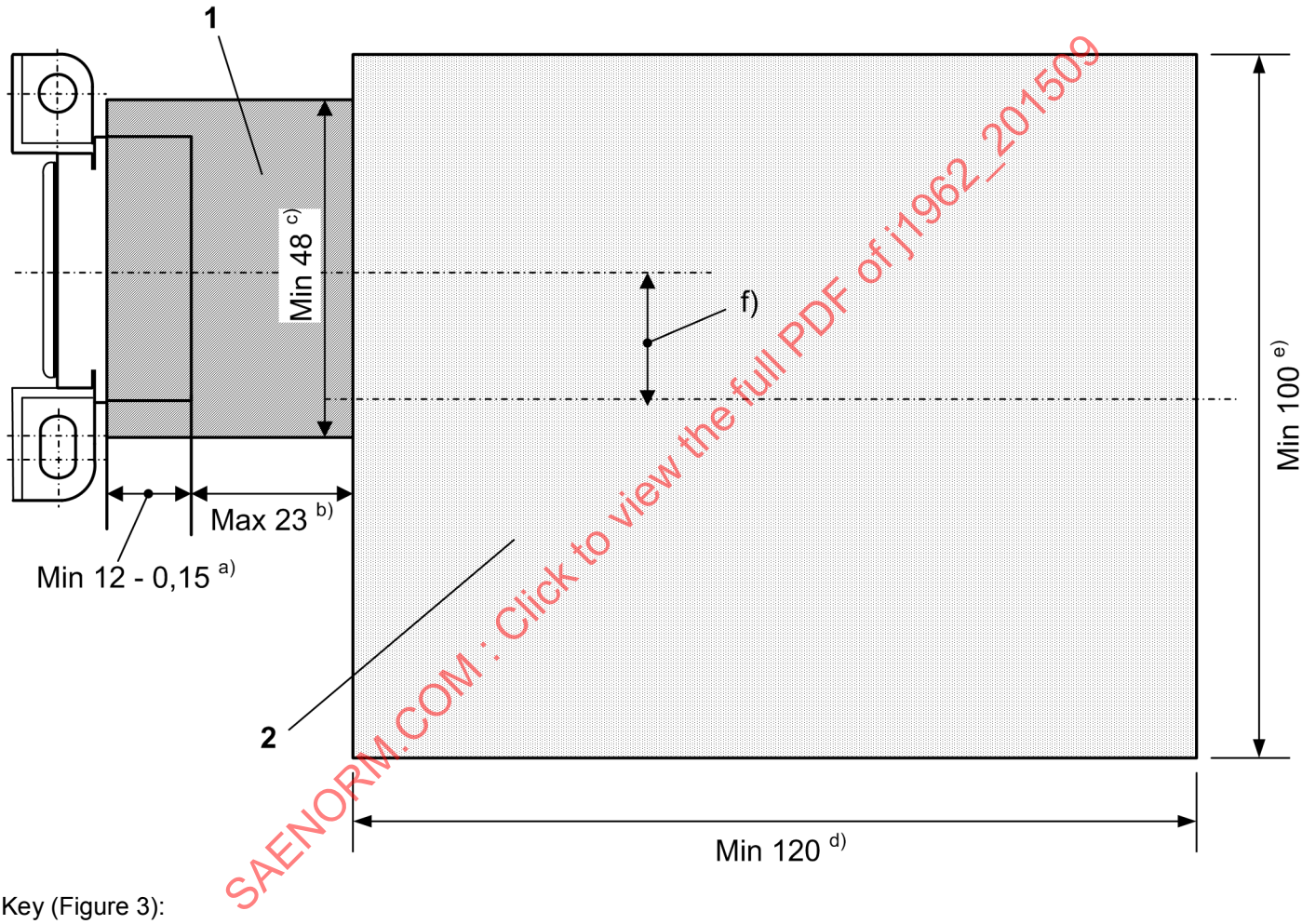
Access to the vehicle connector shall not require a tool for the removal of a connector cover, or any barriers. The vehicle connector shall be fastened and located so as to permit a one-handed/blind insertion of the mating external test equipment connector. If a cover (lid) is used, it has to fulfill the following requirements:

- Clearly designated with the letters OBD.
- Easy to remove without any tools.
- Shall remain attached to the vehicle (hinged, tethered, etc.) while open to avoid being lost, but must be able to be pushed out of the "Keep Clear" areas.

NOTE: Jurisdictional OBD regulations may prohibit the use of covers which conceal the connector. Applicability of those regulations should be verified by the user of this document to ensure vehicle compliance.

There must be two “Keep Clear” areas for access to the vehicle connector. These “Keep Clear” areas shall have the same orientation as the connector. The “DLC Clearance Area” (W 48 x H 25 x D 35 mm) for connector mating, and the “Technician Access Area” (W 100 x H 80 x D 120 mm) for technician work space. For the Technician Access Area, offsets for width and height from the connector’s centerline are allowed to enable connector positions next to obstructions, edges, or panels. Maximum values for these offsets are ± 26 mm for width and between +25.5 mm and –29.5 mm for height. No offset from the connector centerline is allowed for the DLC Clearance Area. See Figures 3 and 4 below.

Dimensions in millimeters!
Not true to scale!
Mounting features shown are for guidance only!
All dimensions refer to access areas!



Key (Figure 3):

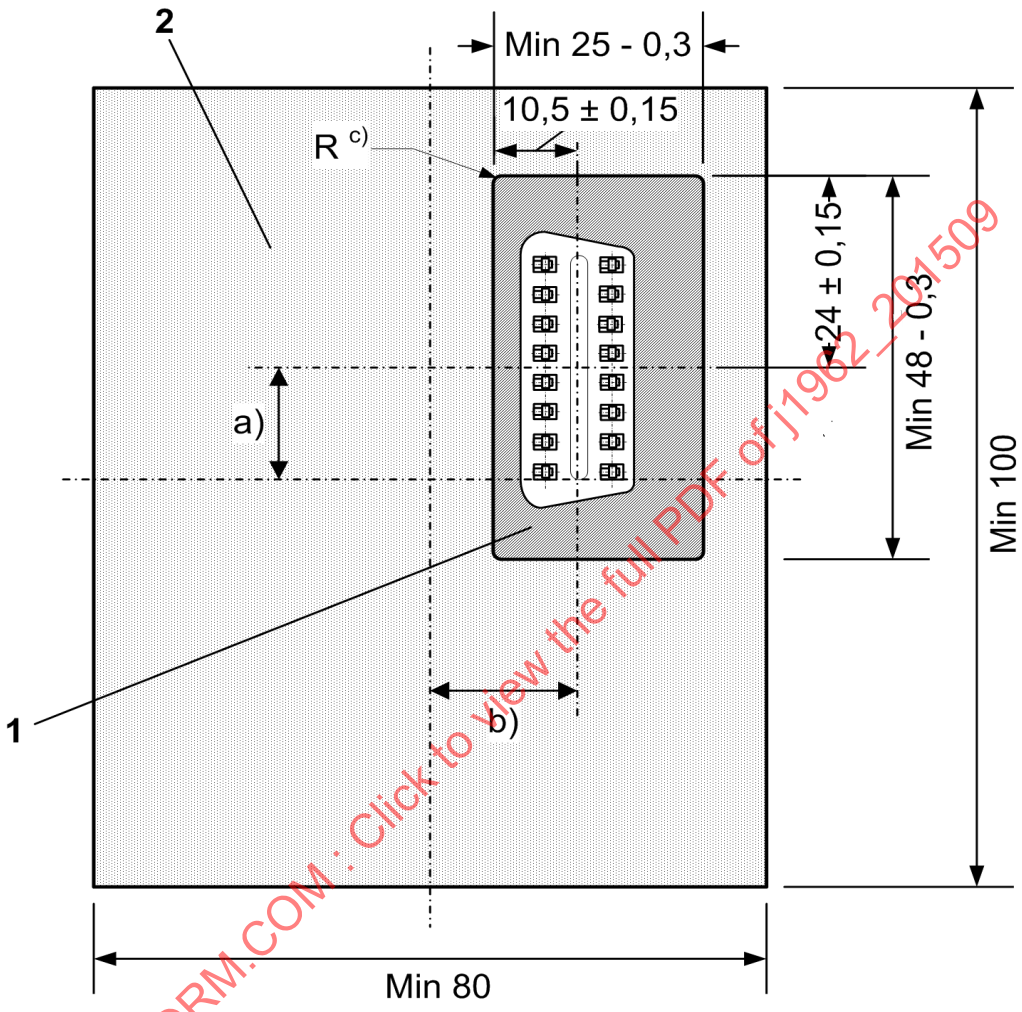
1 DLC Clearance Area Dimensions: W 48 x H 25 x D 35 mm
2 Technician Access Area Minimum Dimensions: W 100 x H 80 x D 120 mm

Footnotes (Figure 3):

a) This portion of the DLC Clearance Area (12 mm) is the overlap distance with the mating connector.
b) Additional clearance of up to 23 mm maximum accommodates vehicle connectors with recessed mounting.
c) Width dimension of DLC Clearance Area.
d) Depth dimension of Technician Access Area (to provide ample work space for the technician).
e) Width dimension of Technician Access Area.
f) Maximum offset of Technician Access Area centerline relative to connector centerline in width direction (+ and – direction from connector centerline).

Figure 3 - Connector access area dimensions - viewed from above / side

Dimensions in millimeters!
Not true to scale!
All dimensions refer to access areas!



Key (Figure 4):
1 DLC Clearance Area
2 Technician Access Area

Footnotes (Figure 4):

a) Offset of Technician Access Area centerline relative to connector centerline in width direction (+ and – direction from connector centerline). Maximum value is ± 26 mm.
b) Offset of Technician Access Area centerline relative to connector centerline in height direction. Maximum values are +25,5 mm or –29,5 mm from centerline.
c) This radius (1 mm) shall only be a tolerance for testing purposes of DLC Clearance Area and has no effect on panel designs, etc.

Figure 4 - Connector access area dimensions - viewed from front

4.3 Visibility

The vehicle connector shall be out of the occupant's (front and rear seat) normal line of sight but easily visible to a "crouched" technician.

4.4 Vehicle Operation

Attachment of external test equipment as well as any external prolonged data collection equipment (e.g. vehicle data recorders and loggers) shall not result in a physical obstruction or impediment to an individual attempting normal vehicle operation.

5. VEHICLE AND EXTERNAL TEST EQUIPMENT CONNECTOR DESIGN

5.1 Dimensions

For basic spring clip and blade dimensions of the vehicle/external test equipment connectors see Figures 5 and 6. For the physical dimensions of the connector type A see Figures A1 and A2 and for the connector type B see Figures B1 and B2.

The connector type B of the external test equipment connector shall have the ability to mate with the connector type A and type B of the vehicle connector and the compliance of the electrical, mechanical, and climatic performances of the connection shall be guaranteed. The connector type A of the external test equipment connector shall have the ability to mate with the connector type A of the vehicle connector and the compliance of the electrical, mechanical, and climatic performances of the connection shall be guaranteed.

5.2 Number of Contacts

The vehicle and external test equipment connectors shall each be capable of accommodating 16 contacts.

5.3 Contact Requirements

5.3.1 Contact Types

The vehicle connector shall consist of female contacts that will mate with the male blade contacts of the external test equipment connector.

5.3.2 Contact Spacing

Contact spacing is shown in Figures A2, and B2.

5.4 Connector Mating

The external test equipment connector contact mating shall be designed so that the signal ground and the chassis ground contacts of the external test equipment connector will make electrical contact prior to any other test equipment connector contacts making electrical contact. On the disconnect cycle, these same two contacts will not lose electrical contact until all of the other contacts have been disconnected.

5.5 Connector Shape/Features

The mating portions of both connectors shall be isosceles trapezoid shaped with each corner having a radius. The face of the vehicle side connector must have straight lines for the four sides of the trapezoid (e.g., no cut-outs, extra holes, or ears allowed). Except for the holes for the 16 contacts and the slot/slots in the center, the face of the vehicle side connector must be solid (no other holes). The entire perimeter of the face of the vehicle side connector must lie in one plane (i.e., no tapered edges). The connectors shall have easily discernible polarization features to allow for easy connection in a one-handed / blind operation.

The vehicle connector and the external test equipment connector shall have latching features that assure the external test equipment connector will remain mated when properly connected. The latching feature shall be designed to provide a positive feel when the external test equipment connector is fully seated. The latching feature shall not require the activation of any levers on either connector to mate or un-mate. Pulling on the external test equipment connector in the disconnecting direction to separate the two mated connectors shall not result in any damage to either connector.

5.6 Spring Clip

An optional spring clip (as specified in Figure 5) may be used on the external test equipment connector.

5.7 Temperature Class

The minimum temperature range for the selected material shall be in accordance with the class 2 of the environmental temperature range specified in table 3 of ISO 8092-2 (–40 °C to +85 °C).

5.8 External Test Equipment Connector Cycle Life

The external test equipment manufacturer shall specify the minimum number of mating cycles the external test equipment connector is capable of while meeting the requirements.

5.9 Strain Relief

The external test equipment connector shall have strain relief features for the cable connected to it.

5.10 Contact and Connector Parameters and Performance Requirements

5.10.1 Preconditioning

Take unused samples and perform 200 mating cycles before the test in 5.10.5 and the requirements in 5.10.3 and 5.10.4.

5.10.2 Functional Parameters for Contacts

a. Blade size for external test equipment connector: Shall conform to the dimensions shown in Figure 6.

b. Minimum Current - carrying capacity for contacts: 10 A DC at 20 °C

c. Temperature range according to class 2 of the environmental temperature range in table 3 of ISO 8092-2 (–40 °C to +85 °C).

d. Voltage range in accordance with ISO 16750-2.

e. The contact system shall accept cross-sectional area of cable conductors of up to: 0.75 mm^2 and 18 AWG.

5.10.3 Performance Requirements for Contacts

The contact system (i.e., mated contact pairs) shall meet the performance requirements in a) and b) below following each of the environmental exposures listed in the 5.10.5. Tests of connection resistance are to be taken as specified in 4.8.1.1 of ISO 8092-2.

a. Resistance interface (initial with no preconditioning, measured at 1 A): 3 mΩ maximum

b. Recommended resistance cable to cable per contact pair: 10 mΩ at initial mating when tested with a constant current source of 1 A according to ISO 8092-2, clause 4.8.1.3.

c. Recommended connection resistance at low current: 100 mΩ at initial mating when tested with a constant current source of 100 µA according to ISO 8092-2, clause 4.8.1.2.

5.10.4 Connector System Performance Requirements

The connector system shall meet the performance requirements outlined in a) through d) below following each of the environmental exposures listed in 5.10.5. Measurements shall be taken at room temperature (23 °C ± 5 °C).

a. Insulation resistance between adjacent contacts tested as in 4.12 of ISO 8092-2: 20 MΩ minimum.

b. Contact retention in housing tested as in 4.7.1 of ISO 8092-2: 80 N minimum.

c. Connection and disconnection force tested as in 4.3.1 of ISO 8092-2 fully equipped with 16 contact pairs:

    1. without spring clip: 110 N maximum,

    2. with spring clip: 142 N maximum (see Figure 5).

d. Polarization feature shall prevent mis-mating of connectors when a force of 220 N is applied.

e. Mounting Feature: The vehicle connector mounting feature shall withstand a force of 220 N applied to the connector mating area in the direction of the connecting and disconnecting process without mechanical and electrical failure. It shall also withstand a force of 220 N applied in all other axial directions without mechanical failure.

5.10.5 Accelerated Environmental Exposures for the Vehicle Connector

Accelerated environmental testing shall be conducted for the vehicle connector while not being mated to the external test equipment connector. Perform each environmental exposure a) through d) with separate sample groups. After exposure, the vehicle connector shall be mated to original external test equipment connector for the performance tests in 5.10.3 and 5.10.4.

a. Thermal Cycling: Subject the sample to 1000 cycles as follows (see 4.22 of ISO 8092-2):

    — 30 min at a temperature of –40 °C ± 2 °C;
    — 10 s max. transition time;
    — 30 min at a temperature of 110 °C ± 2 °C;
    — 10 s max. transition time.

b. Temperature/humidity cycling: Subject the sample to 15 cycles as follows (see 4.10 of ISO 8092-2):

    — Hold the chamber temperature at tc = 23 °C ± 5 °C and at 45 to 75% RH (relative humidity) for 4 h;
    — Raise tc to 55 °C ± 2 °C at 95 to 99 % RH within 0.5 h;
    — Hold tc at 55 °C ± 2 °C at 95 to 99 % RH for 10 h;
    — Lower tc to –40 °C ± 2 °C within 2.5 h (During these periods the relative humidity is uncontrolled.);
    — Hold tc at –40 °C ± 2 °C for 2 h (During these periods the relative humidity is uncontrolled.);
    — Raise tc to 85 °C ± 2 °C within 1.5 h from –40 °C ± 2 °C (During these periods the relative humidity is uncontrolled.);
    — Hold tc at 85 °C ± 2 °C for 2 h (During these periods the relative humidity is uncontrolled.);
    — Allow to return to room temperature of 23 °C ± 5 °C within 1.5 h (During these periods the relative humidity is uncontrolled.).

Alternative test for temperature/humidity cycling - 15 cycles of the following:

    — 16 hours at 95 % RH and 40 ºC,
    — 2 hours at –40 °C,
    — 2 hours at +85 °C,
    — 4 hours at room temperature.

c. Mechanical Shock: 3 shocks at 50 g in each of the 3 mutually perpendicular axes of the connector.

d. Vibration: Sinusoidal 1.5 mm ± 0.15 mm amplitude by 15 g for 2 hours in each of the 3 mutually perpendicular axes at room temperature.

6. CONTACT ALLOCATION AND SPECIFICATIONS FOR RELATED ELECTRICAL CIRCUITS

6.1 Vehicle and External Test Equipment Connector Contact Designation

See Figure 7 and Table 1 for vehicle connector/external test equipment connector contact designations.

6.2 General Contact Allocation

See Table 1 for a summary of contact allocations.

6.3 Vehicle Connector Contact Allocation

6.3.1 Vehicle Connector Contacts 1, 3, 8, 9, 11, 12, and 13

Allocation of vehicle connector contacts 1, 3, 8, 9, 11, 12, and 13 is left to the discretion of the vehicle manufacturer.

6.3.2 Vehicle Connector Contact 2

If SAE J1850 10.4 Kbps VPW (Variable Pulse Width) is used in a vehicle to supply OBD required communication services, then contact 2 of the vehicle connector shall be the SAE J1850 10.4 Kbps VPW (Variable Pulse Width) signal connection.

If SAE J1850 41.6 Kbps PWM (Pulse Width Modulation) is used in a vehicle to supply OBD required communication services, then contact 2 of the vehicle connector shall be the bus positive signal of the SAE J1850 41.6 Kbps PWM (Pulse Width Modulation) connection.

If neither SAE J1850 10.4 Kbps VPW (Variable Pulse Width) nor SAE J1850 41.6 Kbps PWM (Pulse Width Modulation) is used in a vehicle to supply OBD (on-board diagnosis) required communication services, then assignment of this contact is left to the discretion of the vehicle manufacturer, provided this assignment does not interfere with the operation of, nor cause damage to, tools conforming to SAE J1978.

6.3.3 Vehicle Connector Contact 4

Vehicle connector contact 4 is designated chassis ground and shall be connected electrically to the vehicle chassis in such a way as to provide power ground for external test equipment taking current as in SAE J1978.

NOTE: Section 6.5.3 External Test Equipment Connector Contact 4 specifies the use of this contact.

6.3.4 Vehicle Connector Contact 5

Vehicle connector contact 5 is designated signal ground and shall be implemented in the vehicle connector in such a way as to provide a ground reference for the communication transceivers in external test equipment and as a possible power ground for test equipment taking current as in SAE J1978.

Its implementation in the vehicle shall take into consideration noise contributions and node-to-node voltage offset limitations of the OBD communication interface used in the vehicle. The use of a battery minus (–), common vehicle clean signal ground, «clean», «logic», or other connection points within a vehicle that minimize node-to-node voltage offsets and noise is recommended.

NOTE: Section 6.5.4 External Test Equipment Connector Contact 5 specifies the use of this contact.

6.3.5 Vehicle Connector Contact 6

If ISO 15765-4 CAN is used in a vehicle to supply OBD required communication services, then contact 6 of the vehicle connector shall be the CAN-High bus signal connection.

If ISO 15765-4 is not used in a vehicle to supply OBD required communication services, then assignment of this contact is left to the discretion of the vehicle manufacturer, provided this assignment does not interfere with the operation of, nor cause damage to, tools conforming to SAE J1978.

6.3.6 Vehicle Connector Contact 7

If a two wire or a one wire ISO 9141-2 or ISO 14230-4 interface is used in a vehicle to supply OBD required communication services, then contact 7 of the vehicle connector shall be the K line of the ISO 9141-2 or ISO 14230-4 interface.

If neither a two wire nor a one wire ISO 9141-2 or ISO 14230-4 interface is used in a vehicle to supply OBD required communication services, then assignment of this contact is left to the discretion of the vehicle manufacturer, provided this assignment does not interfere with the operation of, nor cause damage to, tools conforming to SAE J1978.

6.3.7 Vehicle Connector Contact 10

If an SAE J1850 41.6 Kbps PWM (Pulse Width Modulation) interface is used in a vehicle to supply OBD required communication services, then contact 10 of the vehicle connector shall be the bus negative signal of the SAE J1850 41.6 Kbps PWM (Pulse Width Modulation) interface.

If an SAE J1850 41.6 Kbps PWM (Pulse Width Modulation) interface is not used in a vehicle to supply OBD required communication services, then assignment of this contact is left to the discretion of the vehicle manufacturer, provided this assignment does not interfere with the operation of, nor cause damage to, tools conforming to SAE J1978.

6.3.8 Vehicle Connector Contact 14

If ISO 15765-4 CAN is used in a vehicle to supply OBD required communication services, then contact 14 of the vehicle connector shall be the CAN-Low bus signal connection.

If ISO 15765-4 is not used in a vehicle to supply OBD required communication services, then assignment of this contact is left to the discretion of the vehicle manufacturer, provided this assignment does not interfere with the operation of, nor cause damage to, tools conforming to SAE J1978.

6.3.9 Vehicle Connector Contact 15

If a two wire ISO 9141-2 or ISO 14230-4 interface is used in a vehicle to supply OBD required communication services, then contact 15 of the vehicle connector shall be the L line of the ISO 9141-2 or ISO 14230-4 interface.

If a two wire ISO 9141-2 or ISO 14230-4 interface is not used in a vehicle to supply OBD required communication services, then assignment of this contact is left to the discretion of the vehicle manufacturer, provided this assignment does not interfere with the operation of, nor cause damage to, tools conforming to SAE J1978.

6.3.10 Vehicle Connector Contact 16

Vehicle connector contact 16 is designated to provide permanent positive voltage for the external test equipment, both for power and also as a reference for K-Line communications. It is recommended that this connection is protected by the use of a fuse or other circuit protection element. This circuit may be grouped with other circuits, but it must remain energized during both key-off and key-on (engine off or engine running) and during engine cranking.

The following shall apply:

a. For the usage of connector type A according to Appendix A the nominal supply voltage at contact 16 shall be 12 V DC and the current supply supported shall be at a minimum of 4.0 A,

b. For the usage of connector type B according to Appendix B the nominal supply voltage at contact 16 shall be 24 V DC and the current supply supported shall be at a minimum of 2.0 A.

6.4 Vehicle Connector Contact Protection

It is recommended that the vehicle manufacturer provides circuit protection in the event that the contacts of the vehicle connector are shorted together. This protection is limited to the ranges of voltages present at the vehicle connector before the external test equipment connector is mated to it.

6.5 External Test Equipment Connector Contact Allocations and Requirements for Related Circuits

6.5.1 External Test Equipment Connector Contacts 1, 3, 8, 9, 11, 12, and 13

The use of external test equipment connector contacts 1, 3, 8, 9, 11, 12, and 13 is left to the discretion of the test equipment manufacturer.

The external test equipment connector contacts, seen from the point of connection to the vehicle, shall normally be in a high impedance state, that is at greater than 500 kΩ impedance relative to signal ground and at greater than 500 kΩ impedance relative to chassis ground.

Before the condition of these external test equipment connector contacts is changed from this high impedance state, the external test equipment user and/or the external test equipment shall verify the proper usage of these vehicle connector contacts.

6.5.2 External Test Equipment Connector Contacts 2, 6, 7, 10, 14, and 15

Assignment and use of external test equipment connector contacts 2, 6, 7, 10, 14, and 15 shall be compatible with the assignment and use of their mating contact in the vehicle connector (see paragraph 6.3).

6.5.3 External Test Equipment Connector Contact 4

External test equipment connector contact 4 is designated chassis ground. This contact may be used by the external test equipment as a power ground. Implementation of this contact in the external test equipment connector is optional.

6.5.4 External Test Equipment Connector Contact 5

External test equipment connector contact 5 is designated signal ground. This contact shall be used by the SAE J1978 external test equipment as the signal ground reference for vehicle communication transceivers.

External test equipment shall not draw more than 1.5 A through this contact.

NOTE: The 1.5 A limit refers to the use of the external test equipment covered by this document (e.g., support of the requirements of SAE J1978)

Support of other uses of the SAE J1962 connectors (e.g., shorting a manufacturer discretionary contact to ground) is not covered by this limitation.

6.5.5 External Test Equipment Connector Contact 16

External test equipment connector contact 16 is designated as permanent positive voltage and is available to supply operating power and a reference voltage to the external test equipment.

6.6 External Test Equipment Connector Contact Protection

It is recommended that all circuits connected to the contacts of the external test equipment connector be protected to the extent that no damage will come to these circuits if any contact of the external test equipment connector:

a. Is connected to vehicle connector contact 16 - as permanent positive voltage for up to 10 A;

b. Is connected to vehicle connector contact 4 - vehicle chassis ground, or

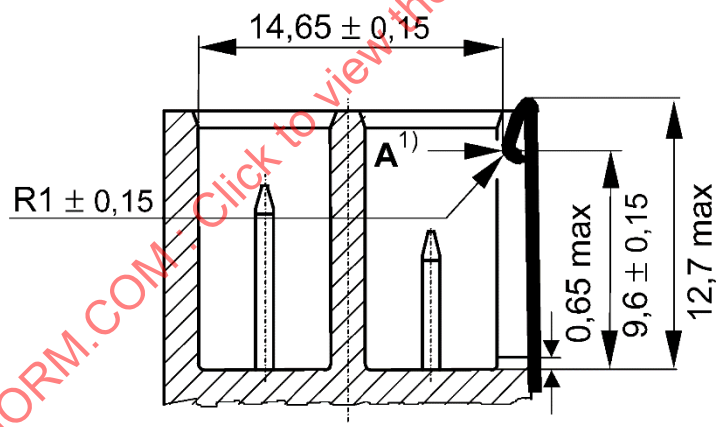
c. Is connected to vehicle connector contact 5 - vehicle signal ground.

6.7 Minimum Impedance between External Test Equipment Connector Contacts 4, 5, and the External Surface of External Test Equipment

The minimum impedance shall be 1 MΩ between each of the following:

— External test equipment connector contacts 4 and 5,
— External test equipment connector contact 4 and the external surface of the external test equipment,
— External test equipment connector contact 5 and the external surface of the external test equipment.

Dimensions in millimetres

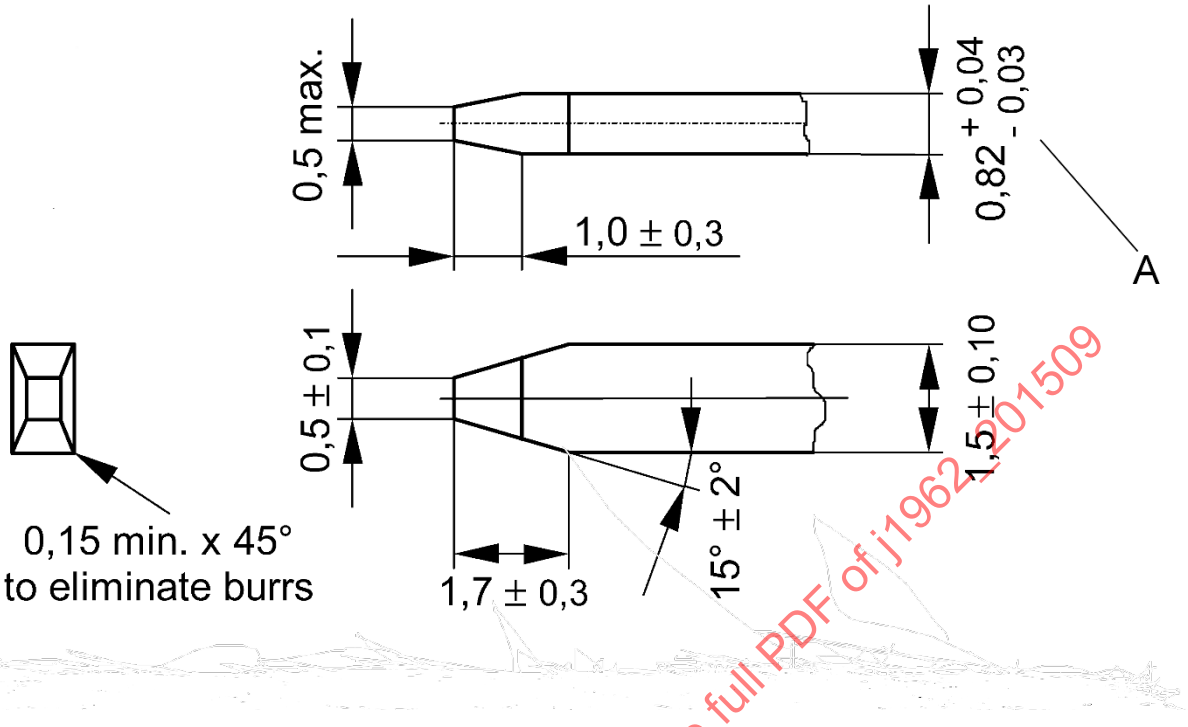


Key (Figure 5):

1) A force applied as shown by arrow “A” shall deflect clip outward for a distance of 2,5 ± 0,15, clip shall recover to original position. Connector shall meet specifications in 5.10.4.c) with spring clip in place.

Figure 5 - Spring clip detail (optional)

Dimensions in millimetres



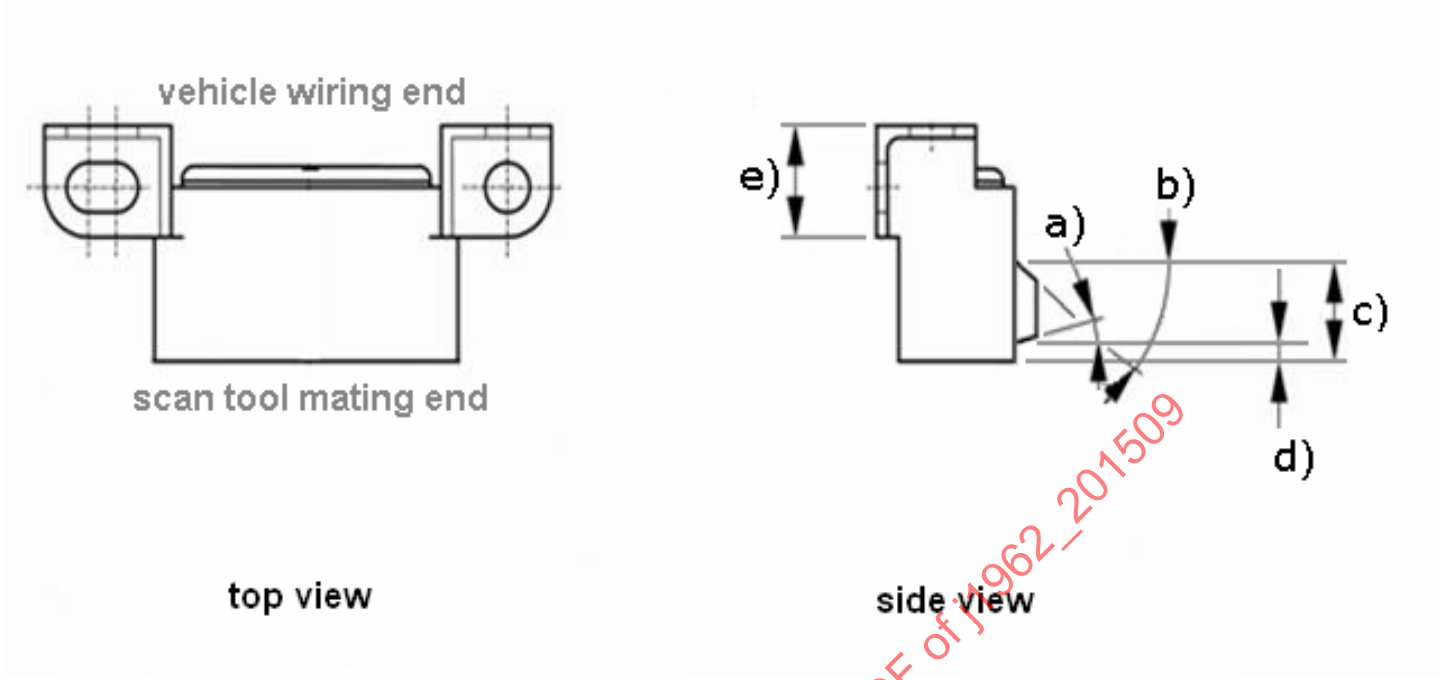
Key (Figure 6)

A – Dimensions of the 1,5 x 0,8 blade according to ISO 8092-3 are also acceptable.

Figure 6 - Blade detail

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

Figure 7 - Contact designation for vehicle connector mating end view



Key (Figure 8):

a) 20° minimum, 45° maximum. Tolerance: ± 2°

b) 45° or 60°. Tolerance: ± 2°

c) 9,5 mm if angle b is 45°. 9,5 mm minimum and 11,3 mm maximum if angle b is 60°. Tolerance: ± 0,15 mm

d) 1,5 mm minimum, 4,5 mm maximum. Tolerance: ± 0,15 mm

e) Mounting features are optional—the features shown are for guidance only.

NOTE: See Figures 3 and 4 for clearance dimensions for connecting external test equipment.

Figure 8 - Retaining tab details