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Motorcycles and mopeds — Communication between vehicle and external equipment for diagnostics — Diagnostic connector and related electrical circuits, specification and use

Motos et vélomoteurs — Communication entre véhicule et équipement externe pour les diagnostics — Raccord de disgnostic et circuits électriques relatifs, spécifications et utilisation

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Foreword

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The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 38, *Motorcycles and mopeds*.

Introduction

This International Standard specifies on-board diagnostic connector for motorcycles and mopeds.

Motorcycles and mopeds — Communication between vehicle and external equipment for diagnostics — Diagnostic connector and related electrical circuits, specification and use

1 Scope

This International Standard specifies a minimum set of requirements for a diagnostic connector used in communication between motorcycles and mopeds, and external equipment for diagnostics. Its aim is to promote the use of a common diagnostic connector throughout the motorcycle industry. The diagnostic connection consists of two mating connectors, the vehicle connector and the external test equipment connector. Applicable to all types of motorcycles and mopeds, the connector specified is sealed with positive locking feature and is intended for short-term diagnostic connection only.

This International Standard specifies functional requirements for

a) the vehicle connector, separated into the four principal areas of
   - connector location,
   - connector design,
   - connector contact allocation, and
   - electrical requirements for connector and related electrical circuits, and

b) the external test equipment connector, separated into the three principal areas of
   - connector design,
   - connector contact allocation, and
   - electrical requirements for connector and related electrical circuits.

The dimensional requirements of the vehicle connector are given as a minimum specification, to allow design freedom.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8092-2:2005, *Road vehicles — Connections for on-board electrical wiring harnesses — Part 2: Definitions, test methods and general performance requirements*

ISO 16750-2, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 2: Electrical loads*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
connection
two mated connectors or contacts

[SOURCE: ISO 15031-3:2004, 3.1]

3.2
connector
assembly of contact and housing which terminates conductors for the purpose of providing connection and disconnection to a suitable mating connector

[SOURCE: ISO 15031-3:2004, 3.2]

3.3
contact
conductive element in a connector (including means for cable attachment) which mates with a corresponding element to provide an electrical path

[SOURCE: ISO 15031-3:2004, 3.3]

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

EXAMPLE Receptacle, sleeve.

[SOURCE: ISO 15031-3:2004, 3.4]

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

EXAMPLE Tab, pin, blade.

[SOURCE: ISO 15031-3:2004, 3.5]

4 Vehicle connector location

4.1 General

It should be recognized that country or regional governments could mandate a connector location which supersedes these provisions.

4.2 Recommended location

The vehicle connector shall be located in easily access. The preferred location is under the seating position.

4.3 Vehicle operation

Attachment of any external test equipment to the vehicle connector shall not preclude normal physical and electrical operation of the vehicle.

See ISO 15031-3:2004, 4.5.

5 Vehicle and external test equipment connector design

5.1 Dimensions

For the dimensions of the external test equipment connector, see Annex A.

The external test equipment connector shall be mateable with the vehicle connector; compliance of the electrical, mechanical and climatic performances of the connection shall be guaranteed.

5.2 Number of contacts

The vehicle connector and the external test equipment connector shall be capable of accommodating 6 contacts.

5.3 Contact requirements

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

See ISO 15031-3:2004, 5.3.1.

5.4 Connector colour/features

The vehicle connector shall be red coloured.

The vehicle connector and the external test equipment connector shall have latching features to ensure that 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 vehicle connector shall have the latch mechanism that can be released when disconnect latched connectors.

5.5 Temperature class

The minimum temperature range for the selected material shall be Class 2, in accordance with the environmental temperature range specified in ISO 8092-2:2000, Table 3, i.e. −40 °C to +85 °C.

See ISO 15031-3:2004, 5.7.

5.6 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.

See ISO 15031-3:2004, 5.8.

5.7 Contact and connector parameters and performance requirements

5.7.1 Preconditioning

Take unused samples and perform 200 mating cycles before applying the test given in 5.7.5 and the requirements given in 5.7.3 and 5.7.4.

5.7.2 Functional parameters for contacts

The functional parameters for the contacts are as follows:

a) the blade size for the external test equipment connector shall be in accordance with Annex A;

b) the current-carrying capacity for contacts more than 3,5 A d.c. (full circuits test)/7,5 A d.c. (single circuit test) at 20 °C;

c) the temperature range shall be −40 °C to +85 °C (Class 2 of the environmental temperature range according to ISO 8092-2:2005, Table 3);

d) the voltage range shall be in accordance with ISO 16750-2;

e) the contact system shall accept a cross-sectional area of cable conductors of up to 0,50 mm^2 and 20 AWG.

5.7.3 Performance requirements for contacts

The contact system (i.e. mated contact pairs) shall meet the performance requirements given under point a) of this subclause, following performance of each of the environmental exposures according to 5.7.5. Tests of connection resistance shall be in accordance with ISO 8092-2:2005, 4.8.1.1.

a) Resistance cable-to-cable per contact pair: 30 mΩ at initial mating when tested with a constant current source of 1 A in accordance with ISO 8092-2:2005, 4.8.1.3.

b) Recommended connection resistance at low current: 100 mΩ at initial mating when tested with a constant current source of 100 µA in accordance with ISO 8092-2:2005, 4.8.1.2.

5.7.4 Connector system performance requirements

The connector system shall meet the performance requirements given under points a) to e) of this subclause, following performance of each of the environmental exposures according to 5.7.5. Measurements shall be taken at room temperature (23°C ± 5°C).

a) Insulation resistance between adjacent contacts tested in accordance with ISO 8092-2:2005, 4.12: ≥100 MΩ.

b) Contact retention in housing tested in accordance with ISO 8092-2:2005, 4.7: ≥60 N.

c) Connection (with lock) and disconnection (without lock) force tested in accordance with ISO 8092-2:2005, 4.3.1, fully equipped with 6 contact pairs: ≤75 N.

d) Polarization features shall prevent mismating of connectors when a force of 150 N is applied.

e) Water tightness test in accordance with ISO 8092-2:2005, 4.9.1.1.2 (leakage current ≤50 µA at 48 V) and 4.9.1.1.3.

5.7.5 Accelerated environmental exposures for the vehicle connector

Accelerated environmental testing shall be conducted for the vehicle connector when not mated to the external test equipment connector. However, the suitable cover according to 5.7.4 e) shall be attached on the vehicle connector. Perform each environmental exposure, a) to d), as follows, with separate sample groups. After exposure, the vehicle connector shall be mated to the original external test equipment connector for the performance tests given in 5.7.3 and 5.7.4.

a) Thermal cycling

Perform the test in accordance with ISO 8092-2:2005, 4.22.1 with the following modifications.

— cycles: 1 000 times

— transition time: 5 min max.

b) Temperature/humidity cycling

Perform the test in accordance with ISO 8092-2:2005, 4.10.1 with the following modifications.

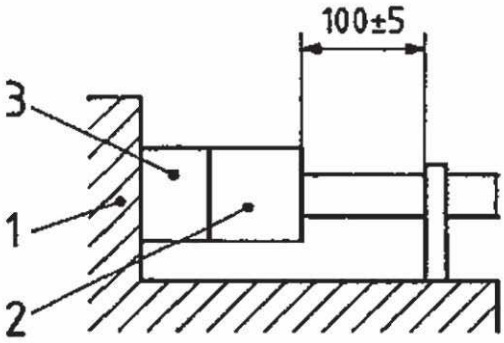
— cycles: 15 times

c) Mechanical shock

Apply three shocks at 50 g in each of the three mutually perpendicular axes of the connector.

See ISO 15031-3:2004, 5.10.5 c).

The test method refers to the Figure 1.



Key

1 test bench
2 test sample
3 fixed connector

Figure 1 — Test method 1

d) Vibration

Sinusoidal (1,5 ± 0,15) mm amplitude by 15 g for 2 h in each of the three mutually perpendicular axes at room temperature.

See ISO 15031-3:2004, 5.10.5 d).

The test method refers to the Figure 1.

e) Chemical fluids

This subclause is in accordance with ISO 8092-2:2005, 4.23.1 and 4.23.2

6 Contact allocation and specifications for related electrical circuits

6.1 Vehicle and external test equipment connector contact designation and general allocation

See Figure 2 and Table 1 for vehicle connector and external test equipment contact designations.

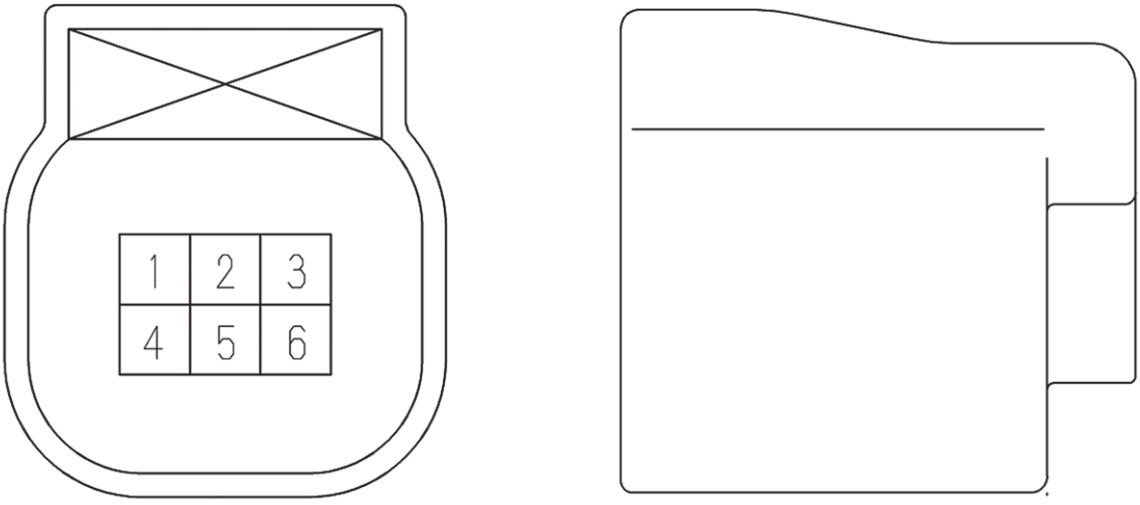


Figure 2 — Contact designation for vehicle connector mating end view

6.2 General contact allocation

See Table 1 for a summary of contact allocations.

Table 1 — General contact allocation

Contact	General allocation
1	Discretionary[a]
2	CAN_ H line of ISO 15765-4[b]
3	Ground
4	Permanent positive voltage/ Switched vehicle battery voltage (ignition on/off)
5	CAN _L line of ISO 15765-4[b]
6	K line according to ISO 9141-2 and ISO 14230-4[b]

[a] Assignment of Contact 1 in the vehicle connector is left at the discretion of the vehicle manufacturer.

[b] For Contacts2,5 and 6, the related diagnostic communication assignments are shown. These contacts can also be used for alternate assignments in the vehicle connector .See 6.3 and 6.5 for further information.

6.3 Vehicle connector contact allocation

6.3.1 Vehicle connector contact 1

Allocation of Contact 1 of the vehicle connector is left at the discretion of the vehicle manufacturer.

6.3.2 Vehicle connector contact 2

If ISO 15765-4 CAN is used in a vehicle to supply OBD required communication services, then Contact 2 of the vehicle connector shall be the CAN-High bus signal connection.

However, if ISO 15765-4 is not used for that purpose, then assignment of the contact is left at the discretion of the vehicle manufacturer, provided the assignment does not interfere with the operation of, nor cause damage to, the tools conforming to ISO 15031-4.

See ISO 15031-3:2004, 6.3.5.

6.3.3 Vehicle connector contact 3

Contact 3 of the vehicle connector is designated ground.

6.3.4 Vehicle connector contact 4

Contact 4 of the vehicle connector is designated to provide permanent positive voltage or switched vehicle battery voltage (ignition on/off) for the external test equipment, both for power and also as a reference for K-line communications. This connection should be protected by the use of a fuse or other circuit protection element. This circuit may be grouped with other circuits.

See ISO 15031-3:2004, 6.3.10.

6.3.5 Vehicle connector contact 5

If ISO 15765-4 CAN is used in a vehicle to supply OBD required communication services, then Contact 5 of the vehicle connector shall be the CAN-Low bus signal connection.

However, if ISO 15765-4 is not used for that purpose, then assignment of the contact is left at the discretion of the vehicle manufacturer, provided the assignment does not interfere with the operation of, nor cause damage to, tools conforming to ISO 15031-4.

See ISO 15031-3:2004, 6.3.8.

6.3.6 Vehicle connector contact 6

If a two-wire or one-wire ISO 9141-2 or ISO 14230-4 interface is used in a vehicle to supply OBD required communication services, then Contact 6 of the vehicle connector shall be the K line of the interface.

However, if neither interface is used for that purpose, then assignment of the contact is left at the discretion of the vehicle manufacturer, provided the assignment does not interfere with the operation of, nor cause damage to, tools conforming to ISO 15031-4.

See ISO 15031-3:2004, 6.3.6.

6.4 Vehicle connector contact protection

The vehicle manufacturer should provide 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.

See ISO 15031-3:2004, 6.4.

6.5 External test equipment connector contact allocations and requirements for related circuits

6.5.1 External test equipment connector contact 1

Contact 1 shall not be used by external test equipment.

6.5.2 External test equipment connector contacts 2, 5 and 6

Assignment and use of external test equipment connector contacts 2, 5 and 6 shall be compatible with the assignment and use of their mating contact in the vehicle connector (see 6.3).

See ISO 15031-3:2004, 6.5.2.

6.5.3 External test equipment connector contact 3

Contact 3 of the external test equipment connector is designated ground. This contact shall be used by the ISO 15031-4 external test equipment as the signal ground reference for vehicle communication transceivers. This contact may be used by the external test equipment as a power ground.

6.5.4 External test equipment connector contact 4

Contact 4 of the external test equipment connector is designated as permanent positive voltage or switched vehicle battery voltage (Ignition on/off) and is available to supply operating power and a reference voltage to the external test equipment.

6.6 External test equipment connector contact protection

All circuits connected to the contacts of the external test equipment connector should be protected to the extent that no damage to these circuits will occur if any contact of the external test equipment connector.

— is connected to contact 4 of the vehicle connector, as permanent positive voltage or switched vehicle battery voltage (Ignition on/off) for a current up to 7,5A,

— is connected to contact 3 of the vehicle connector, vehicle ground.

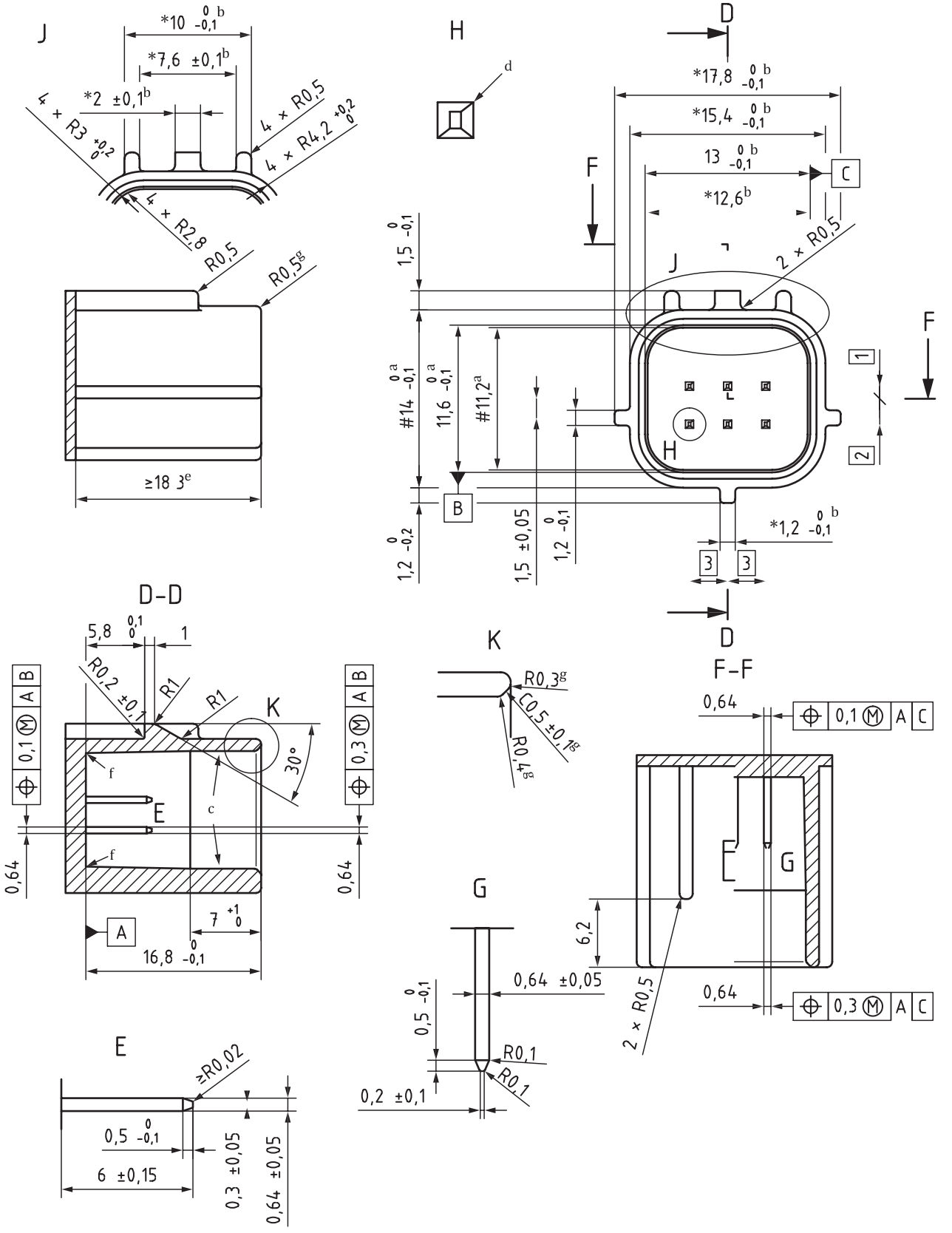
6.7 Minimum impedance between external test equipment connector contact 3 and external surface of external test equipment

The minimum impedance shall be 1 MΩ.

Annex A
(normative)

Diagnostic connection

Dimensions in millimetres



Key

General

Unspecified R shall be R0,3 +0,15/-0,15.

General tolerance is as mentioned below.

+0,15 / -0,15 at 10 max., +0,2/-0,2 at 50 max., eccent :0,1.

a Dimension marked # shall be divided evenly by centre line of 11,6 +0/-0,1.

b Dimension marked * shall be divided evenly by centre line of 13 +0/-0,1.

c No parting line on the sealing surface.
Surface in tool polished with RA: 1,6 µm.

d No burr and no flaw on the contact.
C0,05 at max. on all egde of the contact is allowed.
No mating section and no broken-out section at the contact surface of the contact.
Contact material shall be copper alloy.
Sn plating shall be applied after underplating.
Thickness of Sn plating shall be between 0,8 µm to 4,0 µm.
Plating area shall be whole surface of the contact.

e Length shall be 18,3 at min. for mating vehicle connector.

f R0,2 at max. is allowed.

g Dimension marked g shall be applicable all around

Figure A.1 — External test equipment connector

Bibliography

[1] ISO 6722-1, *Road vehicles — 60 V and 600 V single-core cables — Part 1: Dimensions, test methods and requirements for copper conductor cables*

[2] ISO 9141-2, *Road vehicles — Diagnostic systems — Part 2: CARB requirements for interchange of digital information*

[3] ISO 14230-4, *Road vehicles — Diagnostic systems — Keyword Protocol 2000 — Part 4: Requirements for emission-related systems*

[4] ISO 15031-2, *Road vehicles — Communication between vehicle and external equipment for emissions-related diagnostics — Part 2: Guidance on terms, definitions, abbreviations and acronyms*

[5] ISO 15031-3:2004, *Road vehicles — Communication between vehicle and external equipment for emissions-related diagnostics — Part 3: Diagnostic connector and related electrical circuits, specification and use*

[6] ISO 15031-4, *Road vehicles — Communication between vehicle and external equipment for emissions-related diagnostics — Part 4: External test equipment*

[7] ISO 15765-4, *Road vehicles — Diagnostics on Controller Area Networks (CAN) — Part 4: Requirements for emissions-related systems*

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