The National Standard of
The People’s Republic of China

GB/T 20234.1-2011
To have replaced GB/T 20234-2006

Connection set of Conductive Charging for Electric Vehicles---
Part I: General Requirements

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Foreword

GB/T 20234 Connection set of conductive charging for electric vehicles consists of three parts:

-Part 1 General requirement
-Part II AC Charging coupler
-Part III DC Charging coupler

This is Part I of GB/T 20234.

This part is drafted in accordance with the rules prescribed in GB/T 1.1-2009.

This part has replaced GB/T20234-2006 General Requirements for Plugs, socket-outlets, vehicle couplers and vehicle inlets of conductive charging of electric vehicles

This part is formulated with reference to IEC 62196-1 Plugs, socket-outlets, vehicle couplers and vehicle inlets of conductive charging of electric vehicles (CDV) and in light of the actual situation of our country.

This part is under the jurisdiction of the Automotive Technical Committee of Standardization Administration of China (SAC/TC 114).

The leading drafting units of this part: China Automotive Technology & Research Center, China Electricity Council and China National Electric Apparatus Research Institute (CEI) Co., Ltd.


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Connection set of Conductive Charging for Electric Vehicles---
Part I: General Requirements

1. Scope
This part of GB/T 20234 specifies the definition, requirement, test methods and test rules of the connection set of conductive charging for electric vehicles.

This part applies to the connection set of conductive charging for electric vehicles.

– At a rated A. C. voltage not exceeding 690 V, frequency at 50 Hz and at a rated current not exceeding 250 A;

– At a rated D. C. voltage not exceeding 1000 V and at a rated current not exceeding 400 A.

If the plug and socket outlet of the connection set for electric charging has used the standard plug and socket-outlet meeting the standard requirement of GB2099.1, this part does not apply to these plugs and sockets.

Note: The vehicles referred to in this part refer to the external charging electric vehicles.

2. Normative references
The following standards are indispensible for the application of this standard. For dated references, only the dated editions apply. For undated references, the latest edition of the normative document (including its amendment and revision) applies to this standard.

GB 2099.1 Household and similar electric plug and socket-outlet Part I: Universal Requirement
GB/T 3956 Conductors of insulated cables
GB 4208 Degrees of protection provided by enclosure (IP code)
GB/T 5013 Rubber insulated cables (wires) with rated voltages up to and including 450/750v
GB/T5023 Polyvinyl chloride insulated cables (wires) with a rated voltage up to and including 450/750v
GB/T 11918-2001 Plugs, socket-outlets and couplers for industrial purpose
GB/T16916.1 Residual current operated circuit-breakers without integral over-current protection for household and similar uses (RCCB)—Part 1: General rules
GB/T16917.1 Residual current operated circuit-breakers with integral over-current protection for household and similar uses (RCCO)—Part 1: General rules
GB/T 18487.1 Electric vehicle conductive charging system-General requirements

3. Terms and definitions
Terms defined in GB/T 19596, GB/T 18487.1 and GB/T 11918-2001 and the following terms and definitions apply to this standard.

3.1 Connection set for charging
When an electric vehicle is being charged, the components connecting the electric vehicle with its power supply device may also include the plug and socket-outlet, vehicle coupler, in-cable control box, cap cover, in addition of the cables. See figure 1 for charging connection schematic diagram.
**Note:** See Appendix A for the charging modes and types of electric vehicle connection applicable to the charging connection set referred to in this part.

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Figure 1 Diagram showing the connection set for conductive charging of electric vehicles

3.2 Charging coupler

All the parts except cables and in-cable control boxes (if any) in the connection set for charging, including plugs & socket-outlets and vehicle couplers.

3.3 plug and socket-outlet

A means enabling the connection at will of a flexible cable to the electric vehicle power supply equipment. It consists of a socket-outlet and a plug.

3.3.1 socket-outlet

The part of a plug and a socket-outlet intended to be installed with the fixed wiring or incorporated in equipment device which is incorporated in the cable assembly and which performs control functions. It is the equivalent socket-outlet prescribed in GB/T 11918-2001.

3.3.2 Plug

The part of a plug and a socket-outlet integral with or intended to be attached to one flexible cable connected to the electric vehicle or to a vehicle connector. It is the equivalent plug prescribed in GB/T 11918-2001.

3.4 vehicle coupler (EV coupler)
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A means enabling the connection at will of a flexible cable to an electric vehicle. It consists of a vehicle connector and a vehicle inlet. It is the equivalent vehicle coupler prescribed in GB/T 11918-2001.

3.4.1 Vehicle inlet (EV inlet)

The part of a vehicle coupler incorporated in, or fixed to, the electric vehicle that connects with the on-board battery charger or the on-board power battery with a cable. It is the equivalent vehicle inlet prescribed in GB/T 11918-2001.

3.4.2 Vehicle connector (EV connector)

The part of a vehicle coupler integral with, or intended to be attached to, one flexible cable connected to the supply. It is the equivalent vehicle connector prescribed in GB/T 11918-2001.

3.5 in-cable control box

Device which is incorporated in the cable assembly and which performs control functions. It is located within the plug or the electric vehicle supply equipment with the function of at least of connection confirmation and leakage protection.

4. Symbols and abbreviations

A ............................................. amperes
V ............................................... Volts
Hz ................................................. hertz
~ or AC................................. Alternating current
== or DC............................... direct current
L, L1, L2, L3 the AC power phase line
NC Spare or in reserve
N neutral conductor

........................................ earthing contact

DC+ The positive pole of DC power source or battery
DC- The negative pole of DC power source or battery
CP Control confirmation
CC Connection confirmation for charging
S+ Charging communication 1
S- Charging communication 2
A+ Positive pole of the low-voltage auxiliary power source (such as 12V+, 24V+)
A- Negative pole of the low-voltage auxiliary power source (such as 12V-, 24V-)

IP XX (relevant digits) IP code (The protective degrees prescribed in GB 4208)

5. Rating of connection set for charging
5.1 Rated operating voltage (preferred value)
   - 250 V (AC)
   - 440 V (AC)
   - 690 V (AC)
   - 400 V (DC)
   - 750 V (DC)
   - 0 V–30 V (used for signal and control purposes or in low-voltage auxiliary power supply)

5.2 Rated operating current (preferred value)
   - 16 A (AC)
   - 32 A (AC)
   - 63 A (AC)
   - 125 A (AC)
   - 250 A (AC)
   - 125 A (DC)
   - 250 A (DC)
   - 400 A (DC)
   - 2 A (DC) (used only for signal or control purposes)
   - 20 A (DC) (used only in low-voltage auxiliary power supply)

6. General

6.1 General requirement

6.1.1 The connection set for charging shall be so designed and constructed that in normal use their performance is reliable and minimizes the risk of danger to the user or surroundings.

6.1.2 The ambient temperature for normal use of the connection set for charging is -30°C~+50°C.

6.1.3 Accessible surfaces of the connection set for charging shall be free from burrs, flashes and similar sharp edges.

6.1.4 Plugs, socket-outlets, vehicle connectors and vehicle connector enclosures shall be marked with such information as name or brand of the manufacturer, product types, rated voltage and rated current, etc.

6.1.5 The connection set for charging with an operating current exceeding 16 A (excluding 16A) shall be designed with an electronic pilot circuit, which in normal operation shall prevent the breaking on load of the connection set for charging.

6.1.6 The plug and socket-outlet and vehicle couplers shall be marked with visible symbols for distinction when type B connection is used.

6.2 Structure requirement

6.2.1 Plugs, socket-outlets, vehicle connectors and vehicle inlets shall be equipped with attached protective covers, which shall have attached parts (such as chains, ropes, etc.) that can act as connectors between the protective cover and the attached part and cannot be removed without use of tools.

6.2.2 Plugs, socket-outlets, vehicle connectors and vehicle inlets shall be provided with a protective earthing contact and earth conductors and they shall be directly and reliably connected to the earthing contacts. The earthing contact shall be the first to connect and the last to break in the course of connection and disconnection.
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6.2.3 The enclosure of the socket-outlet and the vehicle connector shall completely seal the terminals and the charging cable terminals.

6.2.4 The plugs and vehicle inlet (such as terminals, safety latches, enclosures, etc) can be securely fixed in such a way that they will not work loose in normal use. It shall not be possible to remove these parts from the plugs and vehicle inlet without the aid of a tool.

6.2.5 The charging coupler shall ensure that the user cannot alter the position of the earth conductor or the neutral conductor (if any).

6.2.6 There shall be one and only one relative position between the plug and the socket-outlet and between the vehicle connector and vehicle inlet for them to connect with each other so as to avoid the contact of pins of a plug with different functions with the live parts of a socket-outlet in case of a mis-mating.

6.2.7 Cable entries shall allow the introduction of the conduit or the protective covering of the cable to afford complete mechanical protection.

6.2.8 Insulating linings, barriers and the like shall have adequate mechanical strength. They shall be secured to the enclosure or body in such a way that
- they cannot be removed without being seriously damaged, or
- be so designed that they cannot be replaced in an incorrect position.

6.3 Interlock

6.3.1 The charging coupler shall have an interlock mechanism to prevent accidental disconnection in the course of charging.

6.3.2 In interlock status, the charging coupler cannot be disconnected with an external force of 200 N exerted on it and the interlock remains intact at the same time.

6.3.3 With respect to DC charging coupler, the interlock cannot be unlocked without special tools (mechanical or electronic tools).

6.4 The pull force

The forces used to insert the plug into and withdraw it from the socket-outlet and insert the vehicle connector into and withdraw it from the vehicle inlet shall all meet the following requirements:
- less than 100 N for AC charging couplers
- less than 140 N for DC charging couplers

The charging coupler may use power/force assisting devices. If the assisting device is used, the operating force in inserting and withdrawing shall meet the above-mentioned requirements.

6.5 Protection against electric shock

6.5.1 The protection against electric shock of the plugs, socket-outlets, vehicle connectors and vehicle inlets shall meet the requirements of Clause 9 of GB/T 11918-2001.

Note: The neutral conductors and control pilot conductors of vehicle connectors and vehicle inlets are deemed as live parts while the signal, data and earth conductors are deemed as non-live parts.

6.5.2 When inserting in the plug or the vehicle connector:
- The earth conductor shall be the first to connect
- The control pilot conductor shall be connected after the connection of the phase conductor and the neutral conductor.
6.5.3 When the plug or the vehicle connector is being withdrawn:
- The earth conductor shall be the last to disconnect
- The control pilot conductor shall be disconnected before the disconnection of the phase conductor and neutral conductor.

6.6 Earthing measures

6.6.1 The earthing contacts of the electric vehicle connection set for charging shall comply with the requirements of Clause 10 of GB/T 11918-2001.

6.6.2 The earthing contact of the electric vehicle connection set for charging shall withstand short-time large current test in accordance with Clause 7.6 hereof. The components in the earthing path shall not melt, crack or break.

6.3.3 The core connected to the earthing conductors shall be identified by the color combination of green/yellow. The nominal cross-sectional area of the earth conductor and of the neutral conductor, if any, shall be at least equal to that of the phase conductors, or as specified in Table 2.

6.7 Terminals

6.7.1 The terminals of charging couplers shall meet the requirements of Clause 11 of GB/T 11918-2001.

6.7.2 With respect to the terminals with rated current greater than 250A, non-rewireable methods shall be used.

6.8 Resistance to ageing of rubber and thermoplastic material

The resistance to ageing of rubber and thermoplastic material used in charging couplers of electric vehicles shall meet the requirements of Clause 13 of GB/T 11918-2001.

6.9 Degrees of protection

6.9.1 The Degrees of protection of the plugs, socket-outlets, vehicle connectors and vehicle inlets when their protective enclosures are connected with the earth shall respectively reach IP54.

6.9.2 The Degrees of protection of the plugs, socket-outlets, vehicle connectors and vehicle inlets when connected shall respectively reach IP55.

6.10 Insulation resistance and dielectric strength

The insulation resistance and dielectric strength of the charging coupler of electric vehicles shall meet the requirement of Clause 19 of GB/T 11918-2001.

6.11 Breaking capacity

6.11.1 The charging coupler with a control pilot wire that can avoid breaking under load in normal work shall have sufficient breaking capacity to interrupt the circuit in case of a fault without any indication of a fire or shock hazard when it is tested in accordance with Clause 7.11. After the test, the charging coupler is not required to keep its original function.

6.11.2 The charging coupler without a control pilot wire that cannot avoid breaking under load in normal work shall be tested in accordance with Clause 7.11. After the test, the samples shall show no damage impairing their further use.

6.12 Service life (Normal operation)

The plug, the socket-outlet, the vehicle connector and vehicle inlet shall be tested for service life in accordance with Clause 7.12. After the test, they shall meet the following requirement:
- No wear impairing the further use of the accessory or of its interlock, if any;
- No deterioration of enclosures or barriers;
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– No loosening of the insulating cap latch/pin
– No loosening of electrical or mechanical connections;
– No seepage of sealing compound;
– The continuity between mating signal and pilot conductors are maintained.
– The retest of dielectric strength shall meet the requirement of Clause 6.10.

6.13 Surface temperature and terminal temperature
The connection set for charging shall be tested in accordance with the test method prescribed in Clause 7.13, and shall meet the following requirements:

a) The maximum permissible temperature of the grasp and grip portion of the plug and the vehicle connector shall not exceed
-50°C for metal parts
-60°C for non-metal parts

b) The maximum permissible temperature of the non-grasp and non-grip portion of the plug and the vehicle connector shall not exceed
-60°C for metal parts
-85°C for non-metal parts

c) The terminal temperature rise shall not exceed 50 K.

6.14 Cables and their connection
The cables and their connections of the connection set for charging shall meet the requirements of Clause 23 of GB/T 11918-2001, GB/T 5013 and GB/T 5023. However, see Clause 7.14 for some of the test methods and the cable displacement requirement.

6.15 Mechanical strength
The mechanical strength of the cables and their connections of the connection set for charging shall meet the requirement of Clause 24 of GB/T 11918-2001.

6.16 Screws, live parts and connection
The screws, live parts and connections of the charging coupler shall meet the requirement of Clause 25 of GB/T 11918-2001.

6.17 Creepage distances, clearances and distances
The creepage distances, clearances and distances of sealing compound of the charging coupler shall meet the requirement of Clause 26 of GB/T 11918-2001.

6.18 Resistance to heat, fire and tracking
The resistance to heat, fire and tracking of the charging coupler shall meet the requirement of Clause 27 of GB/T 11918-2001.

6.19 Corrosion and resistance to rusting
The corrosion and resistance to rusting of the charging coupler shall meet the requirement of Clause 28 of GB/T 11918-2001.

6.20 Conditional short-circuit current withstand test
The conditional short-circuit current withstand test of the charging coupler shall meet the requirement of Clause 29 of GB/T 11918-2001.

6.21 Vehicle drive-over
The charging coupler and the vehicle connector shall not exhibit the following phenomena after they have gone through the vehicle drive-over test:
- Their degrees of protection cannot meet the requirement of Clause 6.9.
- Their creepage, clearances and distances of sealing compound cannot meet the requirement of Clause 6.17.
- Other possible damages resulting from additional fire or electric shocks
- They cannot meet the requirement of dielectric strength prescribed in Clause 6.10.

7. Test method
7.1 General
7.1.1 Unless otherwise specified, the samples are tested as delivered and under normal conditions of use, at an ambient temperature of (20 ± 5) °C.
7.1.2 All the test instruments and equipment shall have adequate accuracy. Their accuracy should be higher than the measured target precision of at least one order of magnitude and their error is less than one-third (1/3) of the allowed measured parameters.
7.1.3 Tests according to this standard are type tests. If a part of the connection set for charging has previously passed tests for a given degree of severity, the relevant type tests shall not be repeated if the severity is not greater.
7.1.4 The tests shall be carried out in the order of the clauses of this standard.
7.1.5 Three samples shall be subjected to all the tests. However, one new additional sample shall be tested in accordance with the requirement of Clause 7.19.
7.1.6 When the tests are carried out with conductor copper, the copper used shall be the copper provided by the manufacturer or the copper that can meet the requirement of GB/T 5023, GB/T 3955 and GB/T 5013.

7.2 Appearance inspection
Connection set for charging shall be inspected visually for its appearance.

7.3 Interlock device
The interlock mechanism of the vehicle connector and the vehicle inlet and the plug and socket-outlet shall be tested by connecting them and with an external force of 200 N exerted on them.

7.4 Pull force
Instruments (such as spring balances, balancing weights) shall be used to test and measure the pull force between plugs and socket-outlets and vehicle connectors and vehicle inlets.

7.5 Protection against electric shock
It shall be tested with reference to Clause 9 of GB/T 11918-2001.
Note: The type of the vehicle connectors and the vehicle inlets in this standard may be different from the type prescribed in GB/T 11918-2001.

7.6 Earthing measures
7.6.1 The earthing contacts shall be tested in accordance with Clause 10 of GB/T 11918-2001.
7.6.2 Short time resistance to heavy/large current shall be tested in the following steps:
   a) Simulate the actual use status and insert the plug into the socket-outlet and the vehicle connector into the vehicle inlet.
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b) Connect a wire/cable of not less than 0.6m long meeting the size requirement of Table 1 to the protective earth terminal of each device in accordance with the mounting and assembling requirement of the manufacturer. It is permissible to directly use the connected components of the minimum allowable size copper cable connecting the supply socket-outlets and the vehicle inlets and of the cable connecting the supply socket-outlet and the vehicle inlets and based on the ampere rating of the device.

c) The test shall be conducted using the current and the time indicated in Table 1.

d) When the test is over, an ohmmeter or similar instrument is used to check the connection continuity of the earth conductors.

Table 1 Test parameters of short-time resistance to heavy/large current of earth conductors

<table>
<thead>
<tr>
<th>Rated current of charging coupler/A</th>
<th>Minimum size of the earthing conductor (copper)/mm²</th>
<th>Time/S</th>
<th>Test current/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>4</td>
<td>4</td>
<td>470</td>
</tr>
<tr>
<td>32</td>
<td>6</td>
<td>4</td>
<td>750</td>
</tr>
<tr>
<td>63</td>
<td>10</td>
<td>4</td>
<td>1180</td>
</tr>
<tr>
<td>125</td>
<td>16</td>
<td>6</td>
<td>1530</td>
</tr>
<tr>
<td>250</td>
<td>25</td>
<td>6</td>
<td>2450</td>
</tr>
<tr>
<td>400</td>
<td>35</td>
<td>6</td>
<td>3100</td>
</tr>
</tbody>
</table>

7.2 Terminals

Terminals shall be tested in accordance with Clause 11 of GB/T 11918-2001. Table 3 of GB/T 11918-2001 shall be replaced with Table 2 of this standard.

Table 2 The cross-sectional areas of the line/cable which can be connected with the terminals

<table>
<thead>
<tr>
<th>Rated current of circuits/A</th>
<th>Cross-sectional areas of cables used with plugs, vehicle connectors and vehicle inlets/mm²</th>
<th>Cross-sectional areas of cables used with socket-outlet/mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-earthing cable</td>
<td>Earthing Cable</td>
</tr>
<tr>
<td>2</td>
<td>0.5</td>
<td>—</td>
</tr>
<tr>
<td>16~20</td>
<td>1.0~2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>32</td>
<td>2.5~6</td>
<td>6</td>
</tr>
<tr>
<td>63</td>
<td>6~16</td>
<td>16</td>
</tr>
<tr>
<td>125</td>
<td>16~50</td>
<td>16~25</td>
</tr>
<tr>
<td>250</td>
<td>70~150</td>
<td>25</td>
</tr>
<tr>
<td>400</td>
<td>240</td>
<td>70~120</td>
</tr>
</tbody>
</table>

7.8 Resistance to ageing of rubber and thermoplastic material
Resistance to ageing of rubber and thermoplastic material shall be tested in accordance with Clause 13 of GB/T 11918-2001.

7.9 Degrees of protection

Degrees of protection shall be tested in accordance with the requirements prescribed in GB 4208.

7.10 Insulation resistance and dielectric strength

Insulation resistance and dielectric strength shall be tested in accordance with the requirements of Clause 10 of GB/T 11918-2001. Table 5 on the dielectric strength test parameters of GB/T 11918-2001 shall be replaced with Table 3 of this standard.

<table>
<thead>
<tr>
<th>Rated voltage of charging coupler (V)</th>
<th>Test voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U ≤ 50</td>
<td>500</td>
</tr>
<tr>
<td>50 &lt; U ≤ 500</td>
<td>2000³</td>
</tr>
<tr>
<td>U &gt; 500</td>
<td>2 × U + 1000</td>
</tr>
</tbody>
</table>

³ This value is increased to 2500V for metal enclosures lined with insulating material.

Note 1: When insulation resistance and dielectric strength are being tested, neutral contact, the pilot contact, the communications contacts, and any other contacts for signal or control purposes, if any shall each be deemed as a pole.

Note 2: For the test objects indicated in Clauses 19.2.1 a) and 19.2.2 a) of GB/T 11918-2001, which are used in non-power circuits (control pilot circuit, communications circuits, etc), each circuit may be tested separately, using a test voltage based on the highest voltage in the circuit.

For the test objects indicated in 19.2.1 b) and 19.2.2 b) of GB/T 11918-2001, which are used in non-power circuits (control pilot circuit, communications circuits, etc.) the test voltage between these objects and the power circuits shall be based on the voltage of the power circuit.

7.11 Breaking capacity

Breaking capacity shall be tested in accordance with Clause 20 of GB/T 11918-2001. With respect to charging coupler with a control pilot circuit, it is necessary to keep the control pilot circuit in a non-working state. The breaking capacity shall be tested in accordance with the parameter of Table 4 of this standard, which has replaced Table 6 of GB/T 11918-2001. DC charging couplers shall be tested with AC current of equal value.

Table 4 Breaking capacity test parameters
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<table>
<thead>
<tr>
<th>Rated circuit current\ A</th>
<th>Test current/ A(AC)</th>
<th>Test Voltage/ V(AC)</th>
<th>cosφ</th>
<th>Number of cycles on load</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 (no control pilot circuit)</td>
<td>20</td>
<td>1.1× maximum rated</td>
<td>0.8</td>
<td>50</td>
</tr>
<tr>
<td>16</td>
<td>20</td>
<td>1.1× maximum rated</td>
<td>0.8</td>
<td>3</td>
</tr>
<tr>
<td>≥32</td>
<td>40</td>
<td>1.1× maximum rated</td>
<td>0.8</td>
<td>3</td>
</tr>
</tbody>
</table>

#### 7.12 Service life (normal operation)

The fixed parts (socket-outlet or vehicle inlet) shall be firmly mounted while the movable parts (plugs or vehicle connector) shall be made to move back and forth. Insert the plug into the socket-outlet and withdraw it from it and insert the vehicle connector into the vehicle inlet and withdraw it from it at the rated current and voltage under no load. Repeat the operation for 10,000 times. After the test, the dielectric strength shall be tested in accordance with the requirement of Clause 7.10. However, for accessories with rated voltage exceeding 50V, the test voltage shall be decreased by 500 V on the basis of Table 3.

Note: Test equipment, test sample installation and the insertion and withdrawal speed (rate), etc. are the same as those prescribed in Clause 7.11.

#### 7.13 Temperature rise

Temperature rise test shall be conducted in an ambient temperature of (25±5)°C. When it is tested, the plug and the vehicle connector are connected to the cables provided by the manufacturer and are tested in accordance with the method prescribed in Clause 22 of GB/T 11918-2001. AC current is used as the test current. See table 5 for specific current values. (Table 5 of this standard has replaced Table 8 of GB/T 11918-2001.) Read the temperature rise value when the temperature has reached a stable state.

Note: Thermal stability is considered to have occurred when three successive readings, taken at intervals of not less than 10 min, indicate no increase greater than 2 K.

### Table 5 Test current of temperature rise test

<table>
<thead>
<tr>
<th>Rated circuit current/ A</th>
<th>Test current (AC)/ A</th>
<th>Cross-sectional area of conductors/mm²</th>
<th>Vehicle connector, plug</th>
<th>Vehicle inlet, socket-outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>0.5</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>16~20</td>
<td>22</td>
<td>2.5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>42</td>
<td>6</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>63</td>
<td>Rated Current</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>125</td>
<td></td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>250</td>
<td></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>400</td>
<td></td>
<td>150</td>
<td></td>
</tr>
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<td>185</td>
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<td>250</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>300</td>
<td></td>
</tr>
</tbody>
</table>
7.14 Flexible cables and their connection

Flexible cables and their connection shall be tested in accordance with the method prescribed in Clause 23 of GB/T 11918-2001. Some of the contents are replaced with the following contents:

- For Non-rewireable plugs and vehicle connectors, accessories shall be provided with a suitable flexible cable appropriate for the rating of the accessory and as specified by the manufacturer. Non-rewireable plugs and vehicle connectors shall be tested as a cable assembly.

- See table 6 for the pulling force and torque values sustained and for the maximum allowable value for the cable displacement after the test. Table 6 of this standard has replaced Table 11 of GB/T 11918-2001.

<table>
<thead>
<tr>
<th>Rated current of circuits</th>
<th>Pulling force/ N</th>
<th>Torque/ N•m</th>
<th>Maximum displacement/ mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>160</td>
<td>0.6</td>
<td>2</td>
</tr>
<tr>
<td>32</td>
<td>200</td>
<td>0.7</td>
<td>2</td>
</tr>
<tr>
<td>63</td>
<td>240</td>
<td>1.2</td>
<td>2</td>
</tr>
<tr>
<td>125~400</td>
<td>500</td>
<td>11.0</td>
<td>5</td>
</tr>
</tbody>
</table>

7.15 Mechanical strength

The mechanical strength of the charging coupler shall be tested in accordance with the method prescribed in Clause 24 of GB/T 11918-2001. See Tables 7 and 8 for the specific values of parameters. Tables 7 and 8 of this standard have replaced Tables 12 and 13 of GB/T 11918-2001.

<table>
<thead>
<tr>
<th>Rating of charging coupler</th>
<th>Energy/ J</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vehicle inlet</td>
</tr>
<tr>
<td>≤32</td>
<td>1</td>
</tr>
<tr>
<td>&gt;32</td>
<td>2</td>
</tr>
</tbody>
</table>
7.16 Screws, current-carrying parts and connections

They shall be tested in accordance with the methods prescribed in Clause 25 of GB/T 11918-2001.

7.17 Creepage distances, clearances and distances between live parts and polarities through sealing compound

They shall be tested in accordance with the methods prescribed in Clause 26 of GB/T 11918-2001.
7.18 Resistance to heat, fire and tracking

They shall be tested in accordance with the methods prescribed in Clause 27 of GB/T 11918-2001.

7.19 Corrosion and resistance to rusting

They shall be tested in accordance with the methods prescribed in Clause 28 of GB/T 11918-2001.

7.20 Conditional short-circuit current withstand test

It shall be tested in accordance with the method prescribed in Clause 29 of GB/T 11918-2001.

7.21 Vehicle drive-over

Plugs and vehicle connectors wired with the minimum size cable of a type recommended by the manufacturer shall be placed on a concrete floor in any normal position of rest. A crushing force of (5 000 ± 250) N shall be applied by a conventional automotive tire, P225/75R15 or an equivalent tire suitable for the load, mounted on a steel rim and inflated to a pressure of (220 ± 10) kPa. The wheel is to be rolled over the vehicle connector or plug at a speed of (8 ± 2) km/h. The accessory is to be oriented in a natural resting position before applying the force in a different direction for each sample. The accessory under test shall be held or blocked in a fixed position so that it does not move substantially during the application of the applied force. In no case is the force to be applied to the projecting pins.

8. Test rules

Test samples are deemed to comply with this standard if no sample fails in the complete series of appropriate tests. If one sample fails in a test, that test and those preceding which may have influenced the test result are repeated on another set of three samples, all of which shall then pass the repeated tests.
Appendix A
(Informative)

Electric Vehicle Charging Mode and Types of Electric Vehicle Connection

A.1 Electric Vehicle Charging Modes
A.1.1 Mode 1 charging: connection of the electric vehicle to the A.C. supply network (mains) utilizing plugs and socket-outlets which comply with the requirements of GB2099.1 at the supply side, and utilizing phase(s), neutral and earthing contacts at the supply side. The use of mode 1 charging depends on the presence of a residual current device (RCD) on the supply side.

A.1.2 Mode 2 charging: connection of the electric vehicle to the A.C. supply network (mains) utilizing plugs and socket-outlets which comply with the requirements of GB2099.1 at the supply side, and utilizing phase(s), neutral, and earthing contacts at the supply side together with in-cable control box between the electric vehicle and the plug.

A.1.3 Mode 3 charging: direct connection of the electric vehicle to the A.C. supply network (mains) utilizing dedicated electric vehicle supply equipment where the control pilot conductor extends to equipment permanently connected to the A.C. supply network (mains).

A.1.4 Mode 4 charging: indirect connection of the electric vehicle to the A.C. supply network (mains) utilizing an off-board charger where the control pilot conductor extends to equipment permanently connected to the A.C. supply.

Note 1: A.C charging is recommended to use modes 2 and 3.
Note 2: All charging modes are required to install a residual current operated circuit-breaker with integral over-current protection on the supply side.

A.2 Types of electric vehicle Connection (Cases A, B, and C)

A.2.1 Case "A" connection: connection of an electric vehicle to the A.C. supply network (mains) utilizing a supply cable and plug permanently attached to the electric vehicle.

A. 2.2 Case "B" connection: connection of an electric vehicle to the A.C. supply network (mains) utilizing a detachable cable assembly with a vehicle connector and A.C. supply equipment.

A.2.3 Case "C" connection: connection of an electric vehicle to the A.C. supply network (mains) utilizing a supply cable and vehicle connector permanently attached to the supply equipment.