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GB/T 20234.1-2015

Replacing GB/T 20234.1-2011

**Connection set for conductive charging of electric
vehicles - Part 1: General requirements**

电动汽车传导充电用连接装置

第 1 部分：通用要求

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Foreword

GB/T 20234 “Connection Set of Conductive Charging for Electric Vehicles” consists of 3 parts:

- Part 1: General Requirements;
- Part 2: AC charging coupler;
- Part 3: DC charging coupler.

This Part is Part 1 of GB/T 20234.

This Part was drafted in accordance with the rules given in GB/T 1.1-2009.

This Part replaces GB/T 20234.1-2011 “Connection set of conductive charging for electric vehicles - Part 1: General requirements”. Compared with GB/T 20234.1-2011, the main technical changes are as follows:

- Add 1000V (DC) in rated working voltage (preferred value), 10A (AC), 80A (DC) and 200A (DC) in rated working current (preferred value). Modify the corresponding clauses (see Clause 5 and Clause 7);
- Delete the requirement that connection set for charging of which the rated working current exceeds 16A (not including 16A) shall be equipped with control pilot circuit (see 6.1.5 in Edition 2011);
- Modify the protection requirements of power interface and vehicle interface (see 6.2.1 and 6.9.1);
- Make it clear that electronic locking device shall be installed on vehicle plug of DC charging interface (see 6.3.3);
- Delete the requirement that the terminal of which the rated current exceeds 250A shall use non-rewirable way (see 6.7.2 of Edition 2011);
- Modify some test parameters of test methods (see Table 2, Table 3, Table 4, Table 5, Table 6 and Table 7).

This Part is formulated by reference to IEC 62196-1:2014 “Plugs, socket-outlets, vehicle connectors and vehicle inlets - Conductive charging of electric vehicles - Part 1: General requirements”. And it is based on the domestic situations.

This Part was proposed by the Ministry of Industry and Information Technology of the People's Republic of China.

This Part shall be under the jurisdiction of National Technical Committee of Auto Standardization (SAC/TC 114).

Main drafting organizations of this Part: China Automotive Technology and Research Center, China Electricity Council and China National Electrical Apparatus Research Institute Co., Ltd.

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This Part replaces the following previous standards:

- GB/T 20234-2006, GB/T 20234.1-2011.

Connection set for conductive charging of electric vehicles - Part 1 :General requirements

1 Scope

This Part of GB/T 20234 specifies the definition, requirements, testing methods and testing specifications for connection set of conductive charging for electric vehicles.

This Part applies to connection set of conductive charging for electric vehicles, with:

- The rated AC Voltage is not greater than 690 V, frequency of 50 Hz, rated current is not greater than 250 A;
- The rated DC voltage is not greater than 1 000 V, the rated current is not greater than 400 A.

If the power supply coupler of connection set of conductive charging USES the standardized plugs and sockets which meets the requirements of GB 2099.1 and GB 1002, then this Part does not apply for these plugs and sockets.

Note: Vehicle in this Part refers to the electric vehicle which can be charged externally.

2 Normative references

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

GB 1002 Single phase plugs and socket-outlets for household and similar purposes

GB 2099.1 Plugs and socket - Outlets for household and similar purposes - Part 1: General requirements

GB/T 3956 Conductors of insulated cables

GB 4208 Degrees of protection provided by enclosure (IP code)

GB/T 5013.4 Rubber insulated cables of rated voltages up to and including 450/750V - Part 4: Cords and flexible cables

GB/T 5023 (All parts) Polyvinyl chloride insulated cables of rated voltages up to and

including 450/750V

GB/T 11918.1-2014 Plugs, socket - outlets and couplers for industrial purposes - Part 1: General requirements

GB/T 18487.1 Electric vehicle conductive charging system - Part 1: General requirements

GB/T 19596 Terminology of electric vehicles

3 Terms and definitions

The following terms and definitions AND the terms defined in GB/T 19596, GB/T 18487.1, GB/T 11918.1-2014 apply to this document.

3.1 Connection set for charging

When the electric vehicle is charged, the COMPONENTS connecting the electric vehicle and the power supply equipment of electric vehicle, except the cables, MAY INCLUDE power supply coupler, vehicle coupler, in-cable control box, and in-cable lid, etc. Diagram of charging connection set is shown in Figure 1.

Note: The suitable charging mode and the connecting method of the connection set for charging may refer to Appendix A.

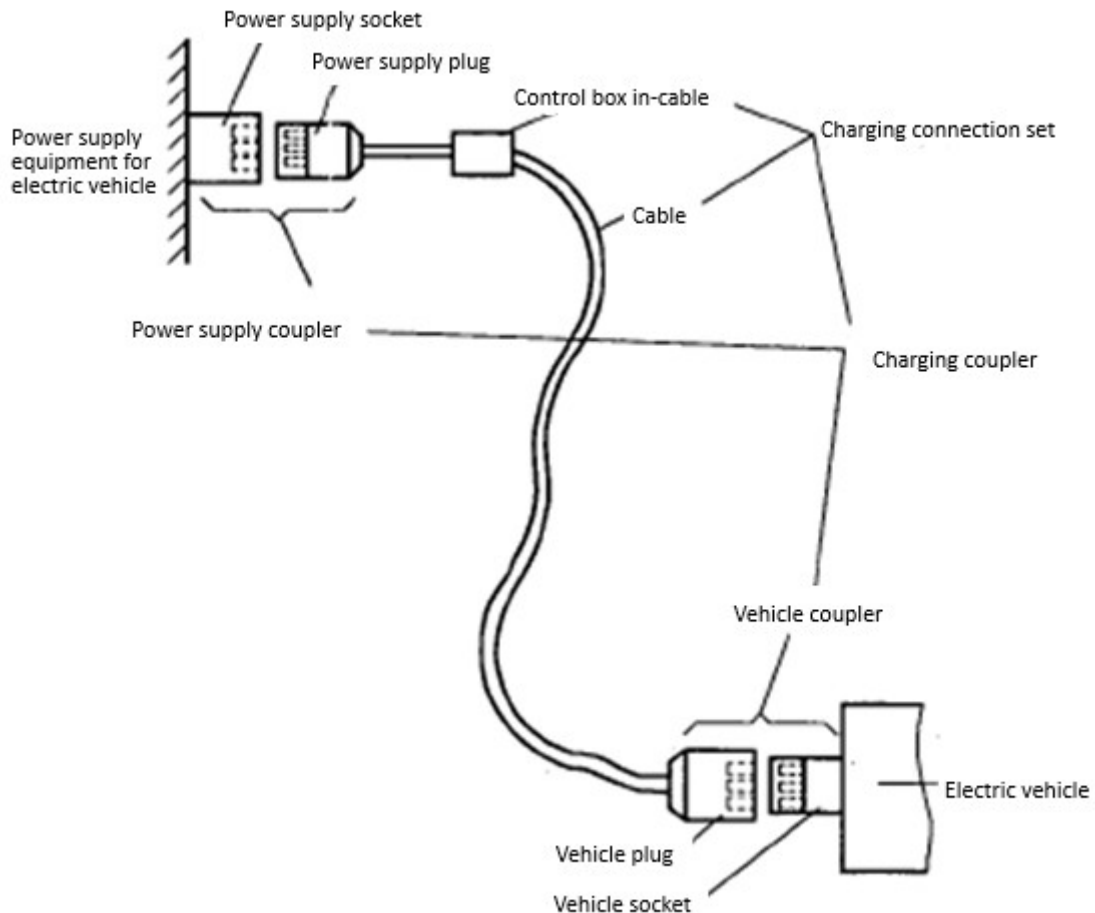


Figure 1 Diagram of connection set of conductive charging for electric vehicles

3.2 Charging coupler

In connection set for charging – except the cables and cable control box (if any) - it includes power supply coupler and vehicle coupler.

3.3 Plug and socket-outlet

The component which can connect the cables to the power sources or the power supply equipment of electric vehicles. It is consisted of supply plug and supply socket. It is corresponding to the plug and socket in GB/T 11918.1-2014.

3.3.1 Socket-outlet

The fixed part which is connected with power supply cable or power supply equipment, in power supply coupler. It is corresponding to the socket-outlet in GB/T 11918.1-2014.

3.3.2 Plug

The movable part which is connected with charging cable, in power supply coupler. It is corresponding to the plug in GB/T 11918.1-2014.

3.4 Vehicle coupler

The component which connects cable to electric vehicle. It is consisted of vehicle plug and vehicle socket. It is corresponding to apparatus coupler in GB/T 11918.1-2014.

3.4.1 Vehicle inlet

The part of vehicle coupler which is fixed on the vehicle. And it connects with the cables, and on-board charger or on-board power battery. It is corresponding to the apparatus inlet in GB/T 11918.1-2014.

3.4.2 Vehicle connector

The movable part of vehicle coupler which connects to charging cable. It is corresponding to the connector in GB/T 11918.1-2014.



3.5 In-cable control and protection device; IC-CPD


The device which is integrated in cable module of charging mode 2, with control function and safety function.

Note: In-cable control and protection device is located in the demountable cable module or in the plug of non-fixed mounting part.

4 Symbols and abbreviations

The following symbols and abbreviations apply to this document.

A	ampere
V	voltage
Hz	hertz
 or AC	alternative current
 or DC	directive current
L1, L2, L3	AC phase line
N	Neutral line

	protection and grounding connection
DC+	DC positive or battery positive side
DC-	DC power negative or battery negative
CP	control confirmation
CC	charging connection confirmation
S+	charging communication 1
S-	charging communication 2
A+	low voltage auxiliary power, positive (such as 12 V+)
A-	low voltage auxiliary power, negative (such as 12 V-)
IPXX (related numbers)	IP Code (the protection level specified in GB 4208)

5 Rated value of connection set for charging

5.1 Rated working voltage (preferred value)

250 V (AC)

440 V (AC)

690 V (AC)

400 V (DC)

750 V (DC)

1000 V (DC)

0 V~30 V(DC) (used for signal, control or low auxiliary power)

5.2 Rated working current (preferred value)

10 A (AC)

16 A (AC)

32 A (AC)

63 A (AC)

125 A (AC)

250 A (AC)

80 A (DC)

125 A (DC)

200 A (DC)

250 A (DC)

400 A (DC)

2 A (DC) (only used for signal or control)

20 A (DC) (only used for low voltage auxiliary power supply)

6 Requirements

6.1 General requirements

6.1.1 Performance of connection set for charging shall be reliable in normal use. And it shall have no harm to the users and environment.

6.1.2 Temperature requirement for connection set for charging is $-30^{\circ}\text{C} \sim +50^{\circ}\text{C}$.

6.1.3 The easy-touchable surface of the connection set for charging shall not have the burrs as well as the sharp angles.

6.1.4 Supply plug, socket, vehicle plug, and vehicle socket's outer shells shall be marked with information such as the name or brand of the manufacturer, product specification, rated voltage, and rated current.

6.1.5 When connection method B is adopted, clear and different identifiers shall be available for power supply coupler and vehicle coupler for distinguishing.

6.2 Structure requirements

6.2.1 For supply plug, supply socket, vehicle plug and vehicle socket, there shall have related protection devices, so as to ensure that plug and socket meet requirements in 6.9 when they are not connected. This protection device can be an independent protection cover; it may also be integrated together with power supply equipment or with electric vehicle.

6.2.2 Supply plug, supply socket, vehicle plug and vehicle socket shall have the grounding terminals and contacts. During connection and disconnection, grounding

contact shall be the first one to connect and the last one to disconnect.

6.2.3 External housing of the supply plug and vehicle socket shall cover all the terminals and the end of charging cables.

6.2.4 Supply plug and vehicle socket components (such as terminals, bolts, and housing etc.) shall be fixed and reliable. And it cannot be loose or dropped off during normal use. Without using tools, it cannot be dismounted from the supply plug and vehicle socket.

6.2.5 Charging coupler shall ensure that the user cannot change the position of the grounding contacts or neutral contact (if available).

6.2.6 There is only 1 unique inserting position between supply plug and supply socket, and between vehicle plug and vehicle socket, so as to prevent contacting of the screws with different functions in plugs and sockets and the conductive parts in sockets, caused by plugging in mistakenly.

6.2.7 Cable inlet of supply plug and vehicle plug shall be easy for the entrance of the cable duct guide or cable protection layers. And it can provide a good mechanical protection to the cable.

6.2.8 Insulating gaskets, insulation layers and the similar components shall have enough mechanical strength. And it shall be fixed onto the shell or vehicle body. And it shall be:

- If it is not severely damaged, it is impossible to be dismounted, or:
- It is designed in such way that it is impossible to be positioned wrongly.

6.3 Locking devices

6.3.1 Charging coupler shall have the locking function to prevent the accidental disconnections during charging process.

6.3.2 In locking state, when applying 200 N force to pull out, the connection shall not be disconnected, and the locking device shall not be damaged.

6.3.3 For vehicle coupler of DC charging, electronic locking device shall be installed on vehicle plug, so as to prevent that the vehicle coupler is disconnected while being loaded.

6.4 Pull and push force

During the whole process, the force of supply plug inserting and pulling out of the sockets, vehicle plug inserting and pulling out socket shall all satisfy:

- AC charging coupler: less than 100 N;

- DC charging coupler: less than 140 N.

The force assistance device can be adopted for charging coupler. If the assistance devices are used, when the inserting and pulling out operations is needed, the operating force of the assistance device shall meet the above conditions.

6.5 Protection against electric shock

6.5.1 Electric shock protection for supply plug, supply socket, vehicle plug and vehicle socket shall meet the requirements in Clause 9 in GB/T 11918.1-2014.

Note: Neutral terminal and control guide terminal on vehicle plug and vehicle socket are deemed as charged parts. The signal transmission contacts and grounding terminals are not deemed as charged parts.

6.5.2 When plug in supply plugs or vehicle sockets:

- Grounding terminal shall be connected firstly;
- Control guide terminals shall be connected later than the connection of phase terminal and neutral terminal.

6.5.3 When plug off supply plug or vehicle socket:

- Grounding terminals shall be disconnected the last;
- Control guide terminals shall be disconnected earlier than the phase terminals and neutral terminals.

6.6 Grounding measures

6.6.1 Grounding protection of connection set for charging of the vehicles shall meet requirements of Clause 10 in GB/T 11918.1-2014.

6.6.2 Grounding protection of connection set for charging of the vehicles shall be tested according to 7.6 to perform short-time high-current withstanding test. The parts in grounding circuit shall not be melt, broken or damaged.

6.6.3 Grounding terminals connecting wires shall be indicated with green-yellow color. The section area of grounding line and neutral line (if available) shall be the same as the section area of phase line at least, or meet requirements in Table 2.

6.7 Terminals

Terminals for charging coupler of electric vehicle shall meet requirements in Clause 11 in GB/T 11918.1-2014.

6.8 Durability of rubber and thermoplastic material

Durability performance of rubber and thermoplastic material adopted for charging coupler of the vehicles shall meet requirements of Clause 13 in GB/T 11918.1-2014.

6.9 Protection level

6.9.1 When connected with the attached protection device, the protection level of supply plug and supply socket, vehicles plug and vehicle socket shall reach IP54 respectively.

6.9.2 When supply plug and supply socket, vehicles plug and vehicle socket are coupled respectively, the protection level shall reach IP55.

6.10 Insulation resistance and dielectric strength

Insulation resistance and dielectric strength of vehicle charging coupler shall meet requirements of Clause 19 in GB/T 11918.1-2014.

6.11 Breaking capacity

6.11.1 For the charging coupler which has control guide and which can avoid load-breaking under normal work, when the test is conducted according to 7.11, the hazard of catching fire or electricity shock must not be occurred. When test is finished, the original function of the charging coupler is not required to maintain.

6.11.2 For the connection set for charging which has no control guide function or the control guide circuit cannot avoid the load-break, It shall conduct the test according to 7.11. When the test is finished, the test samples shall not have the damage which may affect the further usage.

6.12 Life of use (normal operation)

Durability test for supply plug and supply socket, vehicle plug and vehicle socket shall be according to 7.12. When test is finished, the following requirements shall be met:

- Accessories or locking devices can be used as normal;
- External housing or insulation plate is not worsen;
- Insulation nuts on screws are still tight;
- Electrical and mechanical connections are tight;
- Without leakage of sealant;
- Continuity of the signal transmission is maintained among the contacts;
- Re-test for performance of dielectric strength shall meet the related

requirements in 6.10.

6.13 Surface temperature and terminal temperature rise

Connection set for charging shall be tested according to 7.13. And it shall meet the following requirements:

- a) For the grip-zone of supply plug and vehicle plug, the highest temperature shall not be above:
 - Metal parts 50°C;
 - Non-metal parts 60°C.
- b) For non grip-zone of supply plug and vehicle plug, the highest temperature shall not be above:
 - Metal parts 60°C;
 - Non-metal parts 85°C.
- C) Temperature rise for terminals shall not be over 50 K.

6.14 Cables and connections

Cable and the other connections of connection set for charging shall meet the requirements in Clause 23 in GB/T 11918.1-2014. Some testing methods and displacement requirements are shown in 7.14.

6.15 Mechanical strength

Mechanical strength of charging connection device shall meet requirements in Clause 24 in GB/T 11918.1-2014.

6.16 Rivets, current-carrying parts and connection

Rivets, current-carrying parts and connections of charging coupler shall meet requirements of Clause 25 in GB/T 11918.1-2014.

6.17 Creepage distance, electrical clearance and distance through the sealant

Creepage distance, electrical clearance and distance through the sealant shall meet requirements in Clause 26 in GB/T 11918.1-2014.

6.18 Thermal tolerance, fire resistance and tracking resistance

Thermal tolerance, fire resistance and tracking resistance shall meet requirements in Clause 2 in GB/T 11918.1-2014.

6.19 Corrosive and rust protection

Corrosive and rust protection requirements for charging coupler shall meet requirements in Clause 28 in GB/T 11918.1-2014.

6.20 Short circuit current withstand ability test

Short circuit current withstand ability test for charging coupler shall meet requirements of Clause 29 in GB/T 11918.1-2014.

6.21 Vehicle rolling

Vehicle rolling test for supply plug and vehicle socket shall be conducted according to 7.21. And the followings shall not occur.

- Protection level cannot meet requirements in 6.9;
- Creepage distance, electrical clearance and distance through the sealant cannot meet requirements in 6.17;
- Other damage symptoms which may cause fire or electric shock;
- Dielectric strength cannot meet requirements in 6.10.

7 Test methods

7.1 General provisions

7.1.1 Unless it is specified otherwise, the sample test shall be conducted under the environmental temperature of $(20\pm5)^{\circ}\text{C}$. And it is tested according to the delivery condition.

7.1.2 All testing instruments and equipment shall be precise enough. And the precision shall be at least 1 quantity-level higher than the tested indication precision, or the tolerance shall be less than 1/3 of the allowable tolerance.

7.1.3 The tests in this Part are all type test. If a part of connection set for charging has been tested as qualified under a certain severity test, and the related severity level of type test is not over the test which has been done, then the relevant type test is exempted.

7.1.4 Tests shall be conducted according to the test sequence in this Part.

7.1.5 All the tests shall be conducted with 3 samples. When necessary, it shall use additional sample to conduct 7.19 test.

7.1.6 When conductive wire is required in test, the wire shall be from the manufacturer,

or the copper wire that meets requirements in GB/T 5023 (all parts), GB/T 3956 or GB/T 5013.

7.2 Appearance check

Check the appearance and structure of the connection set for charging by visual and hand test.

7.3 Locking devices

Install supply plug and supply socket, vehicle plug and vehicle socket, and apply 200N pulling force to check the function of the locking device.

7.4 Inserting-pulling force

Test the inserting-pulling force, with an instrument (such as spring scale, weight etc.), between vehicle plug and vehicle socket, power plug and power socket.

7.5 Electric shock protection

Refer to Clause 9 in GB/T 11918.1-2014.

Note: In this Part, the type of screws of vehicle plug and the inserting set of vehicle socket can be different from that in GB/T 11918.1-2014.

7.6 Grounding measures

7.6.1 Conduct the tests according to instructions of Clause 10 in GB/T 11918.1-2014.

7.6.2 Conduct the short-time high-current withstand test according to the following procedure:

- a) Simulate the actual usage state. Install the supply plug, supply socket and vehicle plug and vehicle socket;
- b) According to the manufacturer's fastening specification, connect the conductive wire, that is over 0.6m in length and can meet requirements in Table 1, to protective grounding terminal. Supply socket and vehicle socket are connected to the permissible minimum size copper conductive cable. Supply plug and vehicle plug are connected to the permissible minimum size copper conductive cable. It is allowed to directly use those components that has been connected.
- c) Conduct the test according to the current and duration in Table 1.
- d) When test is finished, check the continuity among the grounding conductors, with ohmmeter or similar devices.

Table 1 Short-time high-current withstand test parameters for grounding

terminals

Rated current for Charging coupler / A	Minimum size of grounding conductor (copper) mm ²	Time / s	Test current / A
10	2.5	4	300
16, 20	4	4	470
32	6	4	750
63	10	4	1180
80	10	4	1180
125	16	6	1530
200	16	6	1530
250	25	6	2450
400	35	6	3100

7.7 Terminals

Conduct the test according to Clause 11 in GB/T 11918.1-2014. In which, the Table 3 in GB/T 11918.1-2014 shall be replaced by Table 2 in this Part.

Table 2 Wire cross section area of the terminal connection

Rated current value of contacts A	Cable cross section area of supply plug, vehicle plug and socket /mm ²		Cable cross section area of supply socket /mm ²	
	Non-grounding cable	grounding cable	on-grounding cable	grounding cable
2	0.5	—	0.5	—
10	1.0 ~1.5	2.5	1.0 ~1.5	2.5
16, 20	1.0 ~2.5	2.5	1.5 ~4	4
32	2.5~6	6	2.5 ~10	10
63	6~16	16	6~25	25
80	10~25	25	16~35	25
125	25~70	25	35 ~95	50
200	70~150	25	70~185	95
250	70~150	25	70~185	95
400	240	120	300	150

7.8 Rubber and thermoplastic material durability

Conduct the test according to Clause 13 in GB/T 11918.1-2014.

7.9 Protection level

Conduct protection level tests according to GB 4208.

7.10 Insulation resistance and dielectric strength

Test shall be conducted according to Clause 19 in GB/T 11918.1-2014.

7.11 Breaking capability

Conduct the Breaking capability test according to Clause 20 in GB/T 11918.1-2014. For the charging coupler with control guide circuit, the control guide circuit shall not operate. And conduct breaking capability test according to parameters in Table 3 (replace Table 9 in GB/T 11918.1-2014). DC coupler shall adopt the equivalent AC for test.

Table 3 Test parameters of breaking capability

Rated current of contact A	Test current A(AC)	Test voltage V(AC)	$\cos\Phi\pm 0.05$	Cycling times
16, 20	20	1.1× rated value	0.8	3
32	40	1.1× rated value	0.8	3
63	70	1.1× rated value	0.8	1
> 63 (DC)	Rated current	1.1× rated value	0.8	1

7.12 Usage lifespan (normal operation)

Fasten the fixed parts (supply socket or vehicle socket). Make the movable parts (supply plug or vehicle plug) to move forth and back. Perform pull-push test for 10000 cycles under the condition of no-load and power-on (rated voltage, no current). When the test is finished, conduct dielectric strength test according to 7.10. However, for accessories of which the rated voltage is over 50 V, the test voltage shall be reduced by 500V based on Table 8 in GB/T 11918.1-2014.

Note: Test equipment, installation method and pull-push speed etc. are same as 7.11.

7.13 Temperature rise

Temperature rise test shall be conducted in environment temperature of $(25 \pm 5)^{\circ}\text{C}$. Conduct the test according to Clause 22 in GB/T 11918.1-2014. Test current shall be AC. The detail current values are shown in Table 4 (replace Table 11 in GB/T 11918.1-2014). When the test is conducted, it is recommended to use the charging connection device with cable that is provided by the manufacturer. If the manufacturer does not provide cable, then use the cable of which the cross-sectional area is specified in Table 5. When testing, it shall read the temperature-rise value, after it reaches the

temperature stable state.

Note: When the temperature-rise value is lower than 2K for 3 consecutive readings in the interval of not less than 10 minutes, then it is deemed as the temperature is stable.

Table 4 Test current of temperature rise

Contact rated current / A	Test current(AC) / A	Wire cross-section area / mm ²	
		Vehicle plug, supply plug	Vehicle socket, supply socket
2	2	0.5	0.5
10	13	1.5	2.5
16, 20	22	2.5	4
32	42	6	10

Table 4 (continued)

Contact rated current / A	Test current(AC) / A	Wire cross-section area / mm ²	
		Vehicle plug, supply plug	Vehicle socket, supply socket
63	Rated current	16	25
80		25	35
125		50	70
200		150	150
250		150	185
400		240	300

7.14 Cable and connection

Test according to the rules in Clause 23 of GB/T 11918.1-2014. In which, part of the content shall be replaced with below content.

- For dismountable supply plug, supply socket, vehicle plug and vehicle socket, it shall be equipped with electric cables of which the rated working values meet the manufacturer's requirements. And it shall be tested as cable components;
- The tolerable pulling force value, torque value, and the maximum permissible displacement value for the cables after the test are shown in Table 5 (replace Table 14 in GB/T 11918.1-2014). Cable shall withstand the tensile test for 100 times; apply tension for 1s each time. Then make the cable withstand the torque test for 1min.

Table 5 Pulling force, torque and maximum permissible displacement value for cable fasteners

Rated current of contact / A	Pulling force / N	Torque N • m	Maximum displacement /mm
10-20	160	0.6	2
32	200	0.7	2
63	240	1.2	2
80	240	1.2	2
125	240	1.5	2
200	250	2.3	2
250	500	11.0	5
400	500	11.0	5

7.15 Mechanical strength

Charging coupler shall be tested according to Clause 24 in GB/T 11918.1-2014. In which, the detail parameters such as pendulum ball impact energy, the force exerted by the heavy-weight in bending test are shown in Table 6 and Table 7 respectively (replace Table 15 and Table 16 respectively in GB/T 11918.1-2014).

Table 6 Impact energy of pendulum ball test

Rated current value of charging coupler (I) A	Energy / J	
	Vehicle socket	Supply socket
$I \leq 32$	1	1
$32 < I \leq 100$	2	2
$100 < I \leq 150$	3	3
$150 < I \leq 400$	4	4

Table 7 Force exerted by heavy-weight in bending test

Rated current (I) A	Force / N
$I \leq 20$	20
$20 < I \leq 32$	25
$32 < I \leq 70$	50
$70 < I \leq 250$	75
$250 < I \leq 400$	100

7.16 Screws, current-carrying parts and connection

Test according to the rules in Clause 25 of GB/T 11918.1-2014.

7.17 Creepage distances, clearances, and penetrating sealant distance

Test according to the rules in Clause 26 of GB/T 11918.1-2014.

7.18 Heat resistance, flame resistance and resistance to tracking

Test according to the rules in Clause 27 of GB/T 11918.1-2014.

7.19 Corrosion and rust resistance

Test according to the rules in Clause 28 of GB/T 11918.1-2014.

7.20 Short circuit withstand limiting test

Test according to the rules in Clause 29 of GB/T 11918.1-2014.

7.21 Vehicle rolling

PLACE the supply plug and vehicle plug of the cable recommended by the manufacturer ONTO the concrete ground randomly. USE P225/75R15 or traditional tyre (inflation pressure (220 ± 10) kPa) with equivalent load, to roll over the supply plug or vehicle plug with force of (5000 ± 250) N and at speed of (8 ± 2) km/h. Before the sample is rolled over, each sample shall be placed on the ground randomly in normal condition. The testing sample shall not have obvious movement. The tested sample shall not be placed on the protruded object.

8 Inspection rules

If all test samples are tested as qualified in all tests, the samples are deemed as complying with the requirements of this Part. If there is 1 sample that is unqualified in one of the test items, then this item and the previous item or previous few items of which the test results may be affected shall be re-conducted on another group of 3 samples. When repeating test, all the 3 samples shall be qualified.

Appendix A

(Informative)

Electric vehicle charging mode and connection mode

A.1 Electric vehicle charging mode

A.1.1 Charging Mode 1: When connecting electric vehicle to AC network (power supply), the plug and socket-outlet at power supply side shall comply with requirements of GB 2099.1 and GB 1002. Phase line, neutral line and protective earth conductor shall be used at power supply side.

A.1.2 Charging Mode 2: When connecting electric vehicle to AC network (power supply), the plug and socket-outlet at power supply side shall comply with requirements of GB 2099.1 and GB 1002. Phase line, neutral line and protective earth conductor shall be used at power supply side. And In-cable control and protection device (IC-CPD) is installed in the charging connection cable.

A.1.3 Charging Mode 3: When connecting electric vehicle to AC network (power supply), USE special power supply equipment; directly CONNECT the electric vehicle with AC network. And INSTALL the control guide device on the special power supply equipment.

A.1.4 Charging mode 4: When connecting electric vehicle to AC network or DC network, USE DC power supply equipment that has control guide function.

A.2 Electric vehicle connection mode

A.2.1 Connection mode A: When connecting electric vehicle to AC network, USE the charging cables and supply plug which are connected with the vehicle permanently.

A.2.2 Connection mode B: When connecting electric vehicle to AC network, USE the independent movable cable module that has vehicle plug and supply plug.

A.2.3 Connection mode C: When connecting electric vehicle to AC network, USE the charging cable and vehicle plug that are permanently connected to the power supply.

END