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Edition 1.0 2020-05

INTERNATIONAL STANDARD

Charging cables for electric vehicles of rated voltages up to and including 0,6/1 kV –
Part 4-1: Cables for DC charging according to mode 4 of IEC 61851-1 –
DC charging without use of a thermal management system

IEC 62893-4-1:2020-05(en)

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CONTENTS

FOREWORD 3
1 Scope 5
2 Normative references 5
3 Terms and definitions 6
4 General purpose cables – Heavy duty flexible cables 6
4.1 Code designation 6
4.2 Rated voltage 6
4.3 Construction 6
4.3.1 Sizes of cable 6
4.3.2 Insulation 7
4.3.3 Screen(s) (optional) 7
4.3.4 Core identification 7
4.3.5 Assembly 7
4.3.6 Sheath 7
4.3.7 Marking 8
4.3.8 Inductance between power cores 8
4.4 Requirements 8
5 Guidance on use of cables 8
Annex A (normative) Tests for completed cables 10
Annex B (normative) Tables for cable dimensions and insulation resistance 12
Annex C (normative) Bending test 14
Annex D (normative) Screen 16
Annex E (informative) Cable inductance between DC+ and DC− 17
Bibliography 18

Figure C.1 – Apparatus for cyclic bending 15

Table 1 – Intended use of charging cables for EV (environmental conditions) 9
Table 2 – Recommended use of charging cables for EV 9
Table A.1 – Tests for cable types 62893 IEC 126, 127 and 128 10
Table B.1 – General data for type 126 (EVM-1) 12
Table B.2 – General data for type 127 (EVM-2) and type 128 (EVM-3) 13

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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CHARGING CABLES FOR ELECTRIC VEHICLES OF RATED VOLTAGES UP TO AND INCLUDING 0,6/1 kV –

Part 4-1: Cables for DC charging according to mode 4 of IEC 61851-1 – DC charging without use of a thermal management system

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International Standard IEC 62893-4-1 has been prepared by IEC technical committee 20: Electric cables.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
20/1908/FDIS	20/1911/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

This document is to be read in conjunction with IEC 62893-1:2017 and IEC 62893-2:2017.

A list of all parts in the IEC 62893 series, published under the general title *Charging cables for electric vehicles of rated voltages up to and including 0,6/1 kV*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

CHARGING CABLES FOR ELECTRIC VEHICLES OF RATED VOLTAGES UP TO AND INCLUDING 0,6/1 kV –

Part 4-1: Cables for DC charging according to mode 4 of IEC 61851-1 – DC charging without use of a thermal management system

1 Scope

This part of IEC 62893 applies to cables for DC charging according to mode 4 of IEC 61851-1. These cables are not intended to be used with a thermal management system such as that specified in IEC 61851-23.

Charging cables specified in IEC 62893 (all parts) are intended to be used for electrical appliances of class II equipment.

The maximum conductor operating temperature for the cables in this document is 90 °C.

The test methods specified are given in IEC 62893-2, IEC 60245-2, IEC 60332-1-2, IEC 62821-1:2015, Annex B and in the relevant parts of IEC 60811.

IEC 62440 is intended to be used as guidance on the safe use of cables in this document together with Clause 5 of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC 60227-2:1997, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 2: Test methods*

IEC 60245-2:1994, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 2: Test methods*

IEC 60332-1-2, *Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame*

IEC 60364-5-54, *Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors*

IEC 60811-401:2012, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 401: Miscellaneous tests – Thermal ageing methods – Ageing in an air oven*
IEC 60811-401:2012/AMD1:2017

IEC 61851-1, *Electric vehicle conductive charging system – Part 1: General requirements*

IEC 61851-23, *Electric vehicle conductive charging system – Part 23: DC electric vehicle charging station*

IEC 62440:2008, *Electrical cables with a rated voltage not exceeding 450/750 V – Guide to use*

IEC 62821-1:2015, *Electric cables – Halogen-free, low smoke, thermoplastic insulated and sheathed cables of rated voltages up to and including 450/750 V – Part 1: General requirements*

IEC 62893-1:2017, *Charging cables for electric vehicles of rated voltages up to and including 0,6/1 kV – Part 1: General requirements*

IEC 62893-2:2017, *Charging cables for electric vehicles of rated voltages up to and including 0,6/1 kV – Part 2: Test methods*

3 Terms and definitions

For the purposes of this document the terms and definitions given in IEC 62893-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
auxiliary power core
core in the cable that is used to provide auxiliary power to operate on-vehicle electrical devices during the charging process without using battery power (e.g. climate control)

3.2
temperature sensor core
core in the cable that is used to provide temperature signals to operate an EVSE

4 General purpose cables – Heavy duty flexible cables

4.1 Code designation

The code designation is 62893 IEC 126 for halogen free cables with sheath compound EVM-1 and 62893 IEC 127 for halogen free cables with sheath compound EVM-2.

The code designation is 62893 IEC 128 for cables with sheath compound EVM-3.

4.2 Rated voltage

0,6/1 kV AC up to and including 1,5 kV DC.

4.3 Construction

4.3.1 Sizes of cable

The sizes of cable shall be:

- Power cores:

  4 mm^2 to 150 mm^2 – two or more cores.
- Control or pilot cores:

  Number not specified, for size see 8.2 d) of IEC 62893-1:2017.
- Optional PE conductor – one core:

Minimum size of PE or PEM conductor shall be in accordance with Annex B, Table B.1 or Table B.2 or, in the case where there is agreement between manufacturer and customer about the short-circuit requirements, the nominal cross-section of the PE or PEM conductor shall comply with the calculations specified in IEC 60364-5-54 or with IEC 61851-23.

- Auxiliary power cores (optional):

  2,5 mm^2 to 6 mm^2 – two cores.

- Temperature sensor cores (optional):

  Number not specified, for size see 8.2 d) of IEC 62893-1:2017.

4.3.2 Insulation

The insulation for power cores shall be a compound of type EVI-2 according to IEC 62893-1.

The insulation for pilot, auxiliary power, control or temperature sensor cores shall be a compound of type EVI-1 or EVI-2 specified in IEC 62893-1.

For auxiliary power cores the nominal wall thickness shall not be less than 0,8 mm.

4.3.3 Screen(s) (optional)

The screen over a core or an assembly of cores (such as pairs or quads) shall consist of a copper braid with minimum 80 % optical coverage, as specified in Annex D.

4.3.4 Core identification

Identification of the power cores of a cable shall be achieved by the use of coloured insulation or by a coloured surface. Each power core of a cable shall have only one colour, except the core identified by a combination of the colours green-and-yellow.

The colour of control (CC), pilot (CP), temperature sensor or any other core shall be clearly identified and different from the power cores.

Core identification using numbers could be applied if the insulation of the cores is of the same colour and numbered sequentially, starting by number 1. The numerals shall be legible and durable.

4.3.5 Assembly

The cores shall be twisted together.

A centre filler may be used. A centre-core is not permitted.

A separator (e.g. tape) and/or filler may be applied around the core assembly before application of the sheath.

A screen according to 8.6 of IEC 62893-1:2017 may be applied over the core assembly.

4.3.6 Sheath

The sheath shall be a compound of type EVM-1, as specified in IEC 62893-1 for cable type 62893 IEC 126, EVM-2, as specified in IEC 62893-1 for cable type 62893 IEC 127 and EVM-3, as specified in IEC 62893-1 for cable type 62893 IEC 128.

The application of the sheath shall give the finished cable a practically circular shape.

4.3.7 Marking

The cable shall be marked with the corresponding code designation in accordance with 4.1.

Each cable shall have its full code designation according to the requirements in this document, marked continuously (Clause 6 of IEC 62893-1:2017) on the sheath and in addition:

– rated voltage;
– number and nominal cross section of power cores and PE conductor, if any.

Additional markings, for example the year of manufacture, are permitted, but are not required by this document. If an additional marking is applied, it shall neither conflict nor interfere with the required markings.

4.3.8 Inductance between power cores

See Annex E.

4.4 Requirements

Each cable shall comply with the appropriate requirements given in IEC 62893-1, and the particular requirements of this document.

Testing shall be in accordance with Annex A, and the relevant tests indicated in columns 6 and 7 of Table A.1.

a) The thicknesses of insulation and sheath shall conform to Table B.1 for Type 126 and Table B.2 for Types 127 and 128.
b) The insulation thickness of auxiliary cores should be 0,8 mm. For CP, PP and any other cores up to and including 0,75 mm^2, see 8.3.3 of IEC 62893-1:2017.
c) The requirements for the compatibility test shall be as given in Annex A of IEC 62893-1:2017.
d) The test conditions and requirements for the cold impact test shall be as given in 5.8 of IEC 62893-2:2017.
e) The test conditions and requirements for the crush resistance test shall be as given in 5.7 of IEC 62893-2:2017.
f) The bending test (8.1 of Table A.1) shall be in accordance with Annex C.

5 Guidance on use of cables

General guidance given in IEC 62440 shall be used. In addition, the specific information from Table 1 and Table 2 shall be taken into account for the products specified in this document.

Table 1 – Intended use of charging cables for EV (environmental conditions)

1 Code designation Shape of cable Conductor construction	2 62893 IEC 126, 127 and 128 Round Class 5
1 Duty [a] 1.1 Heavy	 +
2 Presence of water 2.1 Condition AD 7 [b]	 +
3 Corrosive of polluting substances 3.1 Condition AF 3 [b]	 +
4 Impact 4.1 Condition AG 2 [b]	 +
5 Vibrations 5.1 Condition AH 3 [b]	 +
6 Flora 6.1 Condition AK 2 [b]	 –
7 Fauna 7.1 Condition AL 2 [b]	 –
8 Outdoor use 8.1 Condition AN 3 [b] 8.2 Permanent [c]	 + +
9 Frequent flexing	+
10 Frequent torsion	+
Key "+" = acceptable "–" = not suitable [a] See Annex C of IEC 62440:2008 for definitions. [b] See Annex A of IEC 62440:2008 for definitions. [c] See Annex B of IEC 62440:2008 for definitions.	

Table 2 – Recommended use of charging cables for EV

1	2	3
Code designation	**Recommended use**	**Comments**
62893 IEC 126 and 127	Intended for use for charging mode 4 of IEC 61851-1.	Max. storage temperature: +45 °C Min. temperature for installation and handling: −25 °C They are intended for indoor and outdoor use.
62893 IEC 128	Intended for use for charging mode 4 of IEC 61851-1. Only for outdoor use (due to halogen content in the case of fire)	Max. storage temperature: +45 °C Min. temperature for installation and handling: −25 °C They are intended for outdoor use.