IEC TS 63236-1

Edition 1.0 2021-06

TECHNICAL SPECIFICATION

Direct current (DC) appliance couplers for information and communication technology (ICT) equipment installed in data centres and telecom central offices – Part 1: 2,6 kW system

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.120.01, 29.120.30

ISBN 978-2-8322-9927-2

Warning! Make sure that you obtained this publication from an authorized distributor.

® Registered trademark of the International Electrotechnical Commission

CONTENTS

FOREWORD 6
1 Scope 8
2 Normative references 9
3 Terms and definitions 10
4 General requirements 13
5 General notes on tests 14
5.1 General 14
5.2 Test samples 14
5.3 Failures 14
5.4 Routine tests 14
5.5 Test voltages 15
5.6 Grouping of samples 15
6 Standard ratings 15
7 Classification of appliance couplers 15
8 Marking 15
8.1 General 15
8.2 Additional markings 15
8.3 Symbols or alphanumeric notations 16
8.4 Legibility of markings 16
8.5 Terminal markings and wiring instructions 16
8.6 Durability 17
8.7 Test and inspection 17
9 Dimensions and compatibility 17
9.1 General 17
9.2 Single-pole connections 17
9.3 Compatibility 17
9.4 Dimensions for appliance couplers 17
10 Protection against electric shock 18
10.1 Accessibility of live parts 18
10.2 Protection against single pole connection 18
10.3 Protection against access to live parts 18
10.4 External parts 18
10.5 Shrouds 18
11 Provision for earthing 19
12 Terminals and terminations 19
12.1 General 19
12.2 Rewirable appliance couplers 19
12.3 Non-rewirable appliance couplers 19
13 Construction 20
13.1 Risk of accidental contact 20
13.2 Parts covering live parts 20
13.3 Pin construction 20
13.3.1 Prevention of rotation 20
13.3.2 Pin retention 20
13.3.3 Hollow pins 20

13.4 Contact pressure 21
13.5 Enclosure 21
13.5.1 General 21
13.5.2 Rewirable connectors 21
13.5.3 Non-rewirable connectors 21
13.6 Earth connection 22
13.7 Location of terminals and terminations 22
13.7.1 General 22
13.7.2 Free wire test for rewirable accessories 22
13.7.3 Free wire test for non-rewirable non-moulded-on accessories 23
13.7.4 Free wire verification for non-rewirable moulded-on accessories 23
14 Insulation resistance and electric strength 23
14.1 General 23
14.2 Insulation resistance 24
14.3 Dielectric strength 24
15 Forces necessary to insert and to withdraw the connector 24
15.1 General 24
15.2 Verification of the maximum withdrawal force 25
15.3 Verification of the minimum withdrawal force 26
16 Operation of contacts 26
17 Resistance to heating of appliance couplers 26
17.1 General 26
17.2 Heating test for connectors 26
17.3 Heating test for appliance inlets 27
18 Breaking capacity 27
19 Normal operation 29
20 Temperature rise 29
21 Cords and their connection 30
21.1 Cords for non-rewirable connectors 30
21.2 Cable anchorage 31
21.2.1 General 31
21.2.2 Additional requirements for rewirable connectors 31
21.2.3 Pull test for cable anchorage 31
21.3 Flexing test 33
22 Mechanical strength 35
22.1 General 35
22.2 Free fall test 35
22.3 Lateral pull test for contacts 36
22.4 Impact test 38
22.5 Pull tests for connectors with a separate front part 38
22.5.1 General 38
22.5.2 Straight pull test 38
22.5.3 Lateral pull test 38
23 Resistance to heat and ageing 39
23.1 Resistance to heat 39
23.2 Resistance to ageing 39
23.2.1 General 39
23.2.2 Ageing test for elastomeric materials 39

23.2.3 Ageing test for thermoplastic materials 40
23.2.4 Ageing test assessment 40
24 Screws, current-carrying parts and connections 40
24.1 General 40
24.2 Electrical connections 41
24.3 Securement of connections 41
24.4 Current-carrying parts 42
25 Creepage distances, clearances and distances through sealing compound 42
26 Resistance of insulating material to heat, fire and tracking 44
26.1 Resistance to heat and fire 44
26.1.1 General 44
26.1.2 Object of the test 44
26.1.3 General description of the test 44
26.1.4 Degree of severity 45
26.1.5 Evaluation of test results 45
26.2 Resistance to tracking 45
27 Resistance to rusting 45
28 Electromagnetic compatibility (EMC) requirements 46
28.1 General 46
28.2 Immunity – Accessories not incorporating electronic components 46
28.3 Emission – Accessories not incorporating electronic components 46
Annex A (normative) Safety-related routine tests for factory-wired accessories (protection against electric shock and correct polarity) 47
A.1 General remarks 47
A.2 Polarized systems, “+” and “−” : Correct connection 47
A.3 Earth continuity 48
A.4 Short-circuit/wrong connection and reduction of creepage distance and clearances between “+” and “−” to earth 48
A.4.1 Accessible surface safety check 48
A.4.2 Short-circuit/wrong connection 48
Annex B (normative) Test schedule 49
Annex C (informative) Alternative gripping tests 51
C.1 Gripping test C1 51
C.2 Gripping test C2 53
Annex D (normative) Standard sheets and gauges 54
D.1 Standard sheets 54
D.2 Gauges 58
D.2.1 Distance to the point of first contact 58
D.2.2 "GO" gauge for appliance inlets according to standard sheet 1 (Figure D.1) 59
D.2.3 "GO" gauge for connectors according to standard sheet 2 (Figure D.2) 60
D.2.4 Gauge for checking the maximum withdrawal force (see 15.2) 62
D.2.5 Gauges for checking the minimum withdrawal force (see 15.3) 63
D.2.6 Position of switch cam of optional micro switches 63
Bibliography 65

Figure 1 – Intended use of appliance couplers 10
Figure 2 – Apparatus for checking the withdrawal force 25

Figure 3 – Circuit diagram for breaking capacity and normal operation tests 28
Figure 4 – Apparatus for testing the cable anchorage 32
Figure 5 – Apparatus for the flexing test 34
Figure 6 – Example of apparatus for pull test 37
Figure C.1 – Reference gauge for gripping test 52
Figure C.2 – Example of the test apparatus for connector gripping test 53
Figure D.1 – Appliance inlet 56
Figure D.2 – Connector 57
Figure D.3 – Positioning of the “+” and “−” pins/connector-contacts 58
Figure D.4 – Gauges for checking point of first contact 59
Figure D.5 – "GO" gauge for appliance inlets according to standard sheet 1 (Figure D.1) 60
Figure D.6 – "GO" gauge for connectors according to standard sheet 2 (Figure D.2) 61
Figure D.7 – Gauge representing the counterpart inlet for checking the maximum withdrawal force 62
Figure D.8 – Gauge for checking the minimum withdrawal force for “+” and “-“ socket-contact 63
Figure D.9 – Gauge for checking the minimum withdrawal force for PE socket-contact 63
Figure D.10 – Area for positioning of actuator of optional micro switch 64
Figure D.11 – Minimum dimension of switch cam 64

Table 1 – Relationship between rated power and nominal cross-sectional areas or American Wire Gauge (AWG) size of copper conductors 19
Table 2 – Maximum diameters of the cords 24
Table 3 – Maximum and minimum withdrawal forces 25
Table 4 – Cords and conductors for the tests of Clause 16 30
Table 5 – Type and nominal cross-sectional area of cords 30
Table 6 – Types of cable for the rewirable connector test 32
Table 7 – Values for the lateral pulls applied 38
Table 8 – Values for torque and pull forces 39
Table 9 – Torque applied for the tightening and loosening test 41
Table 10 – Creepage distances, clearances and distances through insulating sealing compound 43
Table B.1 – Test schedule 49
Table D.1 – Dimension of contact gauge 59

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

DIRECT CURRENT (DC) APPLIANCE COUPLERS FOR INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) EQUIPMENT INSTALLED IN DATA CENTRES AND TELECOM CENTRAL OFFICES –

Part 1: 2,6 kW system

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC TS 63236-1 has been prepared by IEC technical committee 23: Electrical accessories. It is a Technical Specification.

IEC TS 63236-1 is to be used in conjunction with the other parts of the IEC 63236 series, if applicable.

The text of this Technical Specification is based on the following documents:

DTS	Report on voting
23/915/DTS	23/957A/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Specification is English

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

In this document, the following print types are used:

- requirements proper: in roman type;
- *test specifications: in italic type;*
- notes: in small roman type.

A list of all parts in the IEC 63236 series, published under the general title *Direct current (DC) appliance couplers for information and communication technology (ICT) equipment installed in data centres and telecom central offices*, 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 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.

DIRECT CURRENT (DC) APPLIANCE COUPLERS FOR INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) EQUIPMENT INSTALLED IN DATA CENTRES AND TELECOM CENTRAL OFFICES –

Part 1: 2,6 kW system

1 Scope

This part of IEC 63236, which is a Technical Specification, applies to DC appliance couplers for class I equipment with two active contacts plus an earthing contact, a rated power of 2,6 kW and a rated voltage range from 294 V to 400 V DC. They are intended to power DC information and communication technology equipment only, as specified in IEC 62368-1.

The accessories according to this document are intended to be used by ordinary persons in data centres only where the value of the DC voltage distribution system is defined as follows:

– 380 V with a tolerance of ±20 V for installations with no backup battery or with a voltage regulation system;
– 380 V with a voltage range of 294 V to 400 V for installations with a backup battery where voltage regulation is not guaranteed;
– the voltage value between each live conductor and earth does not exceed 200 V DC during normal operation;
– there are two abnormal voltage ranges (duration below 10 min):
  - 260 V up to 294 V, and
  - above 400 V to 410 V.

The maximum current of the appliance couplers is

– 6,5 A when the voltage between live contacts is 400 V DC,
– 8,8 A when the voltage between live contacts is 294 V DC,

and can rise up to 10 A when the voltage between live contacts decreases to 260 V DC for 10 min maximum.

The voltage between live conductors can fall down to 260 V DC when the voltage discharge value of the battery reaches the disconnecting level. The consequence is that the current increases accordingly.

The accessories according to this document do not require maintenance.

The accessories according to this document are intended for use in circuits where

– basic protection,
– an overcurrent protection (of 8,8 A or less for each socket-outlet or multiple socket-outlet),
– the fault protection (indirect contact protection), and
– additional protection

are already assured.

Appliance couplers complying with this document are suitable for normal use at ambient temperatures not normally exceeding +60 °C, with a lower limit of the ambient air temperature of –5 °C.

Appliance couplers are not suitable for use in place of plug and socket-outlet systems according to the IEC TS 62735 series.

Appliance couplers according to this document are not intended to be used in portable accessories covered by IEC TC 23.

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 60068-2-31, *Environmental testing – Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens*

IEC 60068-2-60, *Environmental testing – Part 2-60: Tests – Test Ke: Flowing mixed gas corrosion test*

IEC 60068-2-75, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

IEC 60112, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60227 (all parts), *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V*

IEC 60417, *Graphical symbols for use on equipment* (available at: http://www.graphicalsymbols.info/equipment*)*

IEC 60695-2-11, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products (GWEPT)*

IEC 60695-10-2, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test method*

IEC 60999-1, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm2 up to 35 mm2 (included)*

IEC 61032, *Protection of persons and equipment by enclosures – Probes for verification*

IEC 62368-1, *Audio/video, information and communication technology equipment – Part 1: Safety requirements*

IEC TS 63236-3, *Direct current (DC) appliance couplers for information and communication technology (ICT) equipment installed in data centres and telecom central offices – Part 3: AC/DC appliance inlet*

ISO/IEC GUIDE 51, *Safety aspects – Guidelines for their inclusion in standards*

ISO 1456, *Metallic coatings and other inorganic coatings – Electrodeposited coatings of nickel, nickel plus chromium, copper plus nickel and of copper plus nickel plus chromium*