BS EN 2267-011:2015

BSI Standards Publication

Aerospace series — Cables, electrical, for general purpose — Operating temperatures between -55 °C and 260 °C

Part 011: DZA family, single and multicore assembly for use in low pressure atmosphere — Product standard

National foreword

This British Standard is the UK implementation of EN 2267-011:2015.

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A list of organizations represented on this committee can be obtained on request to its secretary.

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Luft- und Raumfahrt - Leitungen, elektrisch, für allgemeine Verwendung - Betriebstemperaturen zwischen -55 °C und 260 °C - Teil 011: DZA-Familie, ein- und mehradrige Leitungen zur Anwendung bei niedrigem Luftdruck - Produktnorm

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

European foreword

This document (EN 2267-011:2015) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this European Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2016, and conflicting national standards shall be withdrawn at the latest by January 2016.

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1 Scope

This European Standard specifies the characteristics of electrical wires **DZA** family for use in the on board:

— 115 V (phase to neutral) or 200 V (phase to phase) electrical network of aircraft.

— 230 V (phase to neutral) or 400 V (phase to phase) electrical network of aircraft and particularly use in non-pressurized areas.

This cable family is used at operating temperature between −65 °C and 260 °C. These cables are demonstrated to be arc resistant for both networks (115 V and 230 V).

2 Normative references

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

EN 2084, *Aerospace series — Cables, electric, general purpose, with conductors in copper alloy — Technical specification*

EN 2235, *Aerospace series — Single and multicore electrical cables, screened and jacketed — Technical specification*

EN 2267-002, *Aerospace series — Cables, electrical, for general purpose — Operating temperatures between −55 °C and 260 °C — Part 002: General*

EN 3475-100, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 100: General*

EN 3475-201, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 201: Visual examination*

EN 3475-202, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 202: Mass*

EN 3475-203, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 203: Dimensions*

EN 3475-301, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 301: Ohmic resistance per unit length*

EN 3475-302, *Aerospace series — Cable, electrical, aircraft use — Test methods — Part 302: Voltage proof test*

EN 3475-303, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 303: Insulation resistance*

EN 3475-304, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 304: Surface resistance*

EN 3475-305, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 304: Surface resistance*

EN 3475-306, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 306: Continuity of conductors*

EN 3475-307, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 307: Corona extinction voltage*

EN 3475-401, *Aerospace series — Cables, electrical, aircraft use — Test Methods — Part 401: Accelerated ageing*

EN 3475-402, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 402: Shrinkage and delamination*

EN 3475-403, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 403: Delamination and blocking*

EN 3475-404, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 404: Thermal shock*

EN 3475-405, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 405: Bending at ambient temperature*

EN 3475-406, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 406: Cold bend test*

EN 3475-407, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 407 : Flammability*

EN 3475-410, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 410: Thermal endurance*

EN 3475-411, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 411: Resistance to fluids*

EN 3475-412, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 412: Humidity resistance*

EN 3475-413, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 413: Wrap back test*

EN 3475-414, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 414: Differential scanning calorimeter (DSC test)*

EN 3475-501, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 501: Dynamic cut-through*

EN 3475-502, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 502: Notch propagation*

EN 3475-503, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 503: Scrape abrasion*

EN 3475-504, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 504: Torsion*

EN 3475-505, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 505: Tensile test on conductors and strands*

EN 3475-506, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 506: Plating continuity*

EN 3475-507, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 507: Adherence of plating*

EN 3475-508, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 508: Plating thickness*

EN 3475-601, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 601: Smoke density*

EN 3475-602, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 602: Toxicity*

EN 3475-604, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 604: Resistance to dry arc propagation*

EN 3475-605, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 605: Wet short circuit test*

EN 3475-701, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 701: Strippability and adherence of insulation to the conductor*

EN 3475-703, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 703: Permanence of manufacturer's marking*

EN 3475-704, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 704: Flexibility*

EN 4434, *Aerospace series — Copper and copper alloy lightweight conductors for electrical cables — Product Standard (Normal and tight tolerances)*

EN 9133, *Aerospace series — Quality management systems — Qualification procedure for aerospace standard parts*

TR 6058 [1)], *Aerospace series — Cable code identification list*

3 Terms, definitions and symbols

For the purposes of this document, the terms, definitions and symbols given in EN 3475-100 apply.

4 Materials and construction

4.1 Materials

4.1.1 Conductor

These cable conductors shall be made of copper or copper alloy and nickel plated (code D) according to EN 4434 Table 2 (tight tolerances) for 001 to 140 section codes.

4.1.2 Insulation

All size codes shall be defined to satisfy all required characteristics of Clause 5.

The use of foamed insulation material is forbidden.

To minimize partial discharges effect:

— size and number of cavities (gas trap) inside the insulation shall be as low as possible

— at minimum bend radius there shall be no wrinkles outside the insulation (EN 3475-405).

Minimum bend radius shall be in accordance with bending diameter given in Table 4 of the technical specification EN 2084.

1) Published as ASD-STAN Technical Report at the date of publication of this European Standard (http://www.asd-stan.org/).

4.2 Construction

See EN 4434, and Table 1.

Table 1

Code for nominal section	Nominal section	AWG [a]	Linear resistance at 20 °C	External diameter		Mass
	mm^2		Ω/km	mm	mm	kg/km
			max.	min.	max.	max.
012	1,2	16	14,5	2,38	2,70	23
030	3	12	6,8	3,23	3,61	41
051	5	10	4,1	3,68	4,21	62

[a] AWG = closest American Wire Gage

4.3 Number of cores

See EN 2267-002.
See EN 2235, 4.3.2 for cabling.

4.4 Colour coding of cores

See EN 2267-002.

5 Required characteristics

According to EN 2084 and EN 3475-100.

See Table 2.

Table 2 *(1 to 3)*

EN 3475-	Test	Details
201	Visual examination	Applicable
202	Mass	Applicable; see Table 1
203	Dimensions	Applicable; see 4.2 and Table 1
301	Electrical resistance per unit length	Applicable; see Table 1
302	Voltage proof test	Applicable with − immersion test 2,5 kV r.m.s. (non delivered samples) − dry spark test 2,5 kV r.m.s. − dry impulse test 4,0 kV r.m.s.
303	Insulation resistance	Applicable
304	Surface resistance	Applicable
305	Overload resistance	Applicable T_1 = (310 ± 5) °C; T_2 = (450 ± 5) °C
306	Continuity of conductors	Applicable
307	Corona extinction voltage	Applicable prior to each delivery − Method B at 45.000 feet (145 mbar) and 150 °C PDIV ≥ 566 V r.m.s. (800 V peak), PDEV ≥ 509 V r.m.s. (720 V peak)
401	Accelerated ageing	Applicable Temperature (310 ± 5) °C
402	Shrinkage and delamination	Applicable Temperature (290 ± 5) °C Maximum shrinkage at each end of cable: — 1,00 mm^2 to 1,20 mm^2: 1,00 mm — 2,00 mm^2 to 5,00 mm^2: 1,20 mm
403	Delamination and blocking	Applicable temperature (310 ± 5) °C
404	Thermal shock	Applicable but (−65 ± 2) °C instead of (−55 ± 2) °C Temperature (260 ± 5) °C Maximum shrinkage at each end of cable: — 1,00 mm^2 to 1,20 mm^2: 1,00 mm — 2,00 mm^2 to 5,00 mm^2: 1,20 mm
405	Bending at ambient temperature	Applicable prior to each delivery In addition and before voltage proof test, remove the wounded cable from the mandrel and examine the outer surface with a magnification of 3: there shall be no wrinkles outside the insulation.

Table 2 *(2 to 3)*

<table>
<tr><th>EN 3475-</th><th>Test</th><th>Details</th></tr>
<tr><td>406</td><td>Cold bend</td><td>Applicable
Temperature (−65 ± 2) °C</td></tr>
<tr><td>407</td><td>Flammability</td><td>Applicable
Extinguishing time: 3 s max.</td></tr>
<tr><td>408</td><td>Fire resistance</td><td>Not applicable</td></tr>
<tr><td>409</td><td>Air excluded ageing</td><td>Not applicable</td></tr>
<tr><td>410</td><td>Thermal endurance</td><td>Applicable
10 000 h at 260 °C with curve extrapolation
100 000 h at 200 °C with curve reading</td></tr>
<tr><td>411</td><td>Resistance to fluids</td><td>Applicable</td></tr>
<tr><td>412</td><td>Humidity resistance</td><td>Applicable
Method B - Temperature (95 ± 5) °C
Duration 360 h</td></tr>
<tr><td>413</td><td>Wrap back test</td><td>Applicable</td></tr>
<tr><td>414</td><td>Differential scanning calorimeter test</td><td>Applicable (only if PTFE in the construction)</td></tr>
<tr><td>415</td><td>Rapid change of temperature</td><td>Not applicable</td></tr>
<tr><td>416</td><td>Thermal stability</td><td>Not applicable</td></tr>
<tr><td>417</td><td>Fire resistance of cables confined inside a harness</td><td>Not applicable</td></tr>
<tr><td>418</td><td>Thermal endurance for conductors</td><td>Not applicable</td></tr>
<tr><td>501</td><td>Dynamic cut-through</td><td>Applicable for sections up to 14 mm^2
Temperatures (20 ± 3) °C and (260 ± 5) °C
<table>
<tr><th rowspan="2">Nominal section
mm^2</th><th colspan="2">Cut-through force</th></tr>
<tr><th>20 °C
N</th><th>260 °C
N</th></tr>
<tr><td>1,20</td><td>150</td><td>85</td></tr>
<tr><td>3,00</td><td>165</td><td>105</td></tr>
<tr><td>5,00</td><td>180</td><td>120</td></tr>
</table></td></tr>
<tr><td>502</td><td>Notch propagation</td><td>Applicable notch depth: 40 μm</td></tr>
<tr><td>503</td><td>Scrape abrasion</td><td>Applicable
Test force on needle for cables:
— 1,00 mm^2 to 1,20 mm^2 = 10 N
— 2,00 mm^2 to 9,00 mm^2 = 12 N</td></tr>
<tr><td>504</td><td>Torsion</td><td>Applicable
T_3 = (260 ± 5) °C; T_4 = (310 ± 5) °C</td></tr>
<tr><td>505</td><td>Tensile test on conductors and strands</td><td>Applicable</td></tr>
<tr><td>506</td><td>Plating continuity</td><td>Applicable</td></tr>
</table>

Table 2 *(3 to 3)*

EN 3475-	Test	Details
507	Adherence of plating	Applicable
508	Plating thickness	Applicable
509	Solderability	Not applicable
510	Tensile strength and elongation	Not applicable
511	Cable to cable abrasion	Not applicable
512	Flexure endurance	Not applicable
513	Deformation resistance	Not applicable
514	Porosity of copper cladding on aluminium strands	Not applicable
515	Crush resistance	Not applicable
601	Smoke density	Applicable
602	Toxicity	Applicable
603	Resistance to wet arc tracking	Not applicable owing to the absence of size 006
604	Resistance to dry arc propagation	Applicable 230 V ac Wire damage ≤ 70 mm – no tracking effect
605	Wet short circuit test	Applicable 230 V ac Wire damage ≤ 70 mm – no tracking effect
701	Strippability and adherence of insulation to the conductor	Applicable
702	Braid screen pushback capability	Not applicable
703	Permanence of manufacturer's marking	Applicable
704	Flexibility	Applicable code 030 to code 051 Maximum force - 3,00 mm^2: 8 N - 5,00 mm^2: 9 N
705	Contrast measurement	Not applicable
706	Laser markability	Not applicable

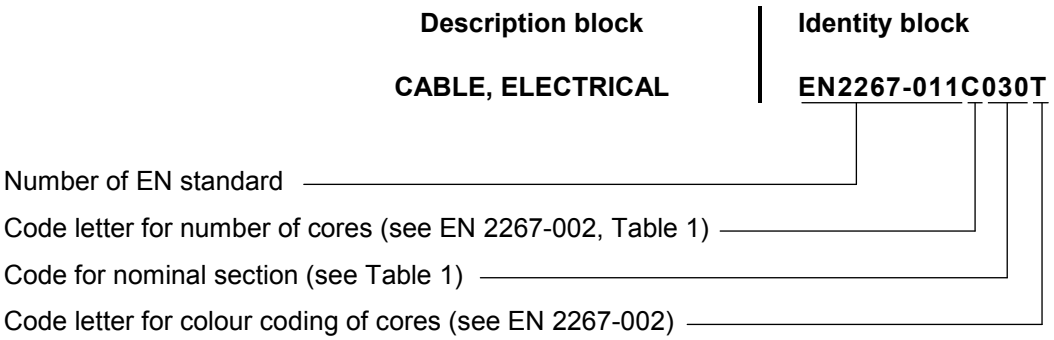
6 Quality assurance

See EN 9133.

7 Designation

7.1 Identification

EXAMPLE:



NOTE If necessary, the code I9005 shall be placed between the description block and the identity block.

7.2 Type code (for short designation)

Code designation in accordance with TR 6058, see Table 3.

Table 3

	EN reference	Code designation
Single core	EN 2267-011A	DZA
Multicore		
– 2 cores	EN 2267-011B	DZB
– 3 cores	EN 2267-011C	DZC

8 Identification and marking

See EN 2267-002.

9 Packaging, labelling and delivery lengths

See EN 2084.

10 Technical specification

See EN 2084 and EN 2235, except the qualification cable size shall be 030.

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