BS EN 4608-004:2015

BSI Standards Publication

Aerospace series — Cable, electrical, fire resistant — Single and twisted multicore assembly, screened (braided) and jacketed — Operating temperatures between — 65 °C and 260 °C

Part 004: DW family — Lightweight — UV Laser printable — Product standard

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National foreword

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

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Aerospace series - Cable, electrical, fire resistant - Single and twisted multicore assembly, screened (braided) and jacketed - Operating temperatures between - 65 °C and 260 °C - Part 004: DW family - Lightweight - UV Laser printable - Product standard

Série aérospatiale - Câbles électriques blindés résistant au feu - Simple et multifilaire blindé (tresse) gainé - Températures de fonctionnement comprises entre - 65 °C et 260 °C - Partie 004: Famille DW - Fil allégé - Marquable laser UV - Norme de produit

Luft- und Raumfahrt - Feuerbeständige elektrische Leitungen - Einzel- und mehradrig verdrillte Leitungen, geschirmt (Geflecht) und ummantelt - Betriebstemperaturen zwischen -65 °C und 260 °C - Teil 004: DW-Familie - Leichte Bauweise - UV-Laser bedruckbar - Produktnorm

This European Standard was approved by CEN on 21 June 2014.

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

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European foreword

This document (EN 4608-004:2015) 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 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of an identical text or by endorsement, at the latest by December 2015, and conflicting national standards shall be withdrawn at the latest by December 2015.

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1 Scope

This European Standard specifies the characteristics of lightweight fire proof, screened, electrical cables for use in the on-board electrical systems of aircraft at operating temperature between – 65 °C and 260 °C.

These cables are UV Laser printable in accordance with EN 3838.

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 2083, *Aerospace series — Copper or copper alloy conductors for electrical cables — Product standard*

EN 2346-005, *Aerospace series — Cable, electrical, fire resistant — Operating temperatures between − 65 °C and 260 °C — Part 005: DW family, single UV laser printable and multicore assembly — Light weight — Product standard*

EN 3475 (all parts), *Aerospace series — Cables, electrical, aircraft use — Test methods*

EN 3838, *Aerospace series — Requirements and tests on user-applied markings on aircraft electrical cables*

EN 4608-001, *Aerospace series — Cable, electrical, fire resistant — Single and twisted multicore assembly, screened (braided) and jacketed — Operating temperatures between − 65 °C and 260 °C — Part 001: Technical specification*

EN 4608-002, *Aerospace series — Cable, electrical, fire resistant — Single and twisted multicore assembly, screened (braided) and jacketed — Operating temperatures between − 65 °C and 260 °C — Part 002: General*

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

3 Terms and definitions

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

4 Materials and construction

4.1 Materials

These cables shall consist of the following:

— Cores according to EN 2346-005;

— Number of cores: 1 to 3.

2 and 3-core shall be twisted together according to EN 4608-001.

Screen:

— Nickel plated copper braid;

— See Table 1 for strand diameter;

— Material according to EN 2083, tests according to EN 3475-100;

— Construction according to EN 4608-001.

Outer jacket:

— Sintered wrapped PTFE UV laser printable.

4.2 Construction

See Table 1.

Table 1

No. of core	Code No.	Nominal cross section mm²	AWG [a]	Number of strands	Nominal diameter of strands mm	Conductive resistance at 20 °C max. Ohm/km	Nominal diameter of shield strands mm	External diameter max. mm	Mass max. g/m	Number of missing strands
1	002	0,2	24	19	0,12	131,00	0,10	2,61	14,15	0
	004	0,4	22	19	0,15	80,90	0,10	2,73	16,51	
	006	0,6	20	19	0,20	44,30	0,10	3,01	21,54	
	010	1,0	18	19	0,25	27,90	0,12	3,57	31,19	
	012	1,2	16	19	0,30	18,80	0,12	3,72	36,94	
	020	2,0	14	37	0,25	13,90	0,12	4,24	46,40	
	030	3,0	12	37	0,32	8,9	0,12	4,79	62,87	
2	002	For GPB 24, see EN 4608-005.								
	004	0,4	22	19	0,15	82,50	0,12	4,30	29,66	0
	006	0,6	20	19	0,20	45,20	0,12	4,90	40,51	
	010	1,0	18	19	0,25	28,50	0,12	5,90	56,25	
	012	1,2	16	19	0,30	19,20	0,12	6,20	65,71	
	020	2,0	14	37	0,25	14,20	0,12	7,20	85,98	
	030	3,0	12	37	0,32	9,1	0,12	8,30	118,48	
3	002	0,2	24	19	0,12	133,60	0,12	4,40	33,61	0
	004	0,4	22	19	0,15	82,50	0,12	4,50	39,15	
	006	0,6	20	19	0,20	45,20	0,12	5,20	54,46	
	010	1,0	18	19	0,25	28,50	0,12	6,20	77,01	
	012	1,2	16	19	0,30	19,20	0,12	6,60	90,47	
	020	2,0	14	37	0,25	14,20	0,15	7,80	125,75	
	030	3,0	12	37	0,32	9,1	0,15	9,00	174,02	

[a] Closest American Wire Gauge.

4.3 Colour code

See EN 4608-002.

5 Required characteristics

See EN 4608-001 and Table 2.

— Operating temperature: 260 °C max. continuous;

— Operating voltage: 600 V AC;

— Use frequency: 2 000 Hz max.

6 Tests

See Table 2.

Table 2 — Tests *(1 of 3)*

EN 3475-	Title	Details
201	Visual examination	Applicable. NOTE For qualification laser marked samples are also to be tested.
202	Mass	Applicable Table 1.
203	Dimensions	Applicable Table 1.
301	Ohmic resistance per unit length	Applicable Table 1.
302	Voltage proof test – Immersion test	Applicable.
302	Voltage proof test – Dry test	Applicable.
303	Insulation resistance	Applicable.
304	Surface resistance	Applicable.
305	Overload resistance	Not applicable.
306	Continuity of conductors	Applicable.
401	Accelerated ageing	Applicable. Temperature: (310 ± 5) °C. NOTE For qualification laser marked samples are also to be tested.
402	Shrinkage and delamination	Applicable. Temperature: (310 ± 5) °C. Maximum shrinkage at each end of the jacket: — 2 mm on AWG 24 to 18 — 3 mm on AWG 16 to 12 Core: according to EN 2346.
403	Delamination and blocking	Applicable. Temperature: (310 ± 5) °C.

Table 2 *(2 of 3)*

EN 3475-	Title	Details
404	Thermal shock	Applicable. Temperature (260 ± 5) °C. Maximum shrinkage at each end of the jacket: — 2 mm on AWG 24 to 18 — 3 mm on AWG 16 to 12 Core: according to EN 2346.
405	Bending at ambient temperature	Applicable. NOTE For qualification laser marked samples are also to be tested.
406	Cold bend test	Applicable. Temperature: (– 65 ± 2) °C.
407	Flammability – Method 1	Applicable. Extinction time: 3 s.
408	Fire resistance	Applicable. 15 min. Insulation resistance: 10 000 ohms. Load: 170 g for 004; 340 g for ≥ 006.
409	Air-excluded ageing	Not applicable.
410	Thermal endurance	Not applicable.
411	Resistance to fluids	Applicable. NOTE For qualification laser marked samples are also to be tested.
412	Humidity resistance	Not applicable.
413	Wrap back test	Not applicable.
414	Differential scanning calorimeter (DSC test)	Applicable (only if PTFE in the construction)
415	Rapid change of temperature	Not applicable.
416	Thermal stability	Not applicable.
417	Fire resistance of cables confined inside a harness	Not applicable.
501	Dynamic cut-through	Applicable to codes 004 to 020 included. Temperature 260 °C, 1 h. See Table 3.
502	Notch propagation	Applicable to codes 004 to 020 included. Depth notch: 0,10 mm.
503	Scrape abrasion	Applicable on single core screened jacketed only. Load, see Table 3.
504	Torsion	Not applicable.
505	Tensile test on conductors and strands	Applicable.
506	Plating continuity	Applicable.
507	Adherence of plating	Applicable.
508	Plating thickness	Applicable.
509	Solderability	Not applicable.

Table 2 *(3 of 3)*

EN 3475-	Title	Details
510	Tensile strength and elongation of extruded insulation, sheath and jacket material	Not applicable.
511	Cable-to-cable abrasion	Not applicable.
512	Flexure endurance	Not applicable.
513	Deformation resistance (Installation with plastic cable ties)	Not applicable.
601	Smoke density	Not applicable.
602	Toxicity	Not applicable.
603	Resistance to wet arc tracking	Not applicable.
604	Resistance to dry arc propagation	Not applicable.
605	Wet short circuit test	Not applicable.
701	Strippability and adherence of insulation to the conductor	Strippability: applicable. Adherence: not applicable.
702	Screen pushback capability	Applicable.
703	Permanence of manufacturer's marking	Applicable.
704	Flexibility	Not applicable.
705	Contrast measurement	Applicable $\geq$ 50 %.
706	Laser markability	Applicable.
EN 3838	Subclause 6.2 Permanence of markings Subclause 6.5 Exposure to light	Applicable.
807	Transfer impedance	Applicable. $Z_t \leq$ 60 mΩ/m for 1 core $Z_t \leq$ 40 mΩ/m for 2 cores $Z_t \leq$ 35 mΩ/m for 3 cores

Table 3

Code number	Nominal cross section	Test 501 Dynamic cut-through	Test 503 Scrape abrasion Load	
	mm^2	N	N	
			20 °C	260 °C
002	0,25	25	8	1,5
004	0,4	45	8	3
006	0,6	55	8	3,5
010	1,0	70	10	4
012	1,2	85	10	4
020	2,0	95	12	4
030	3,0	105	12	4

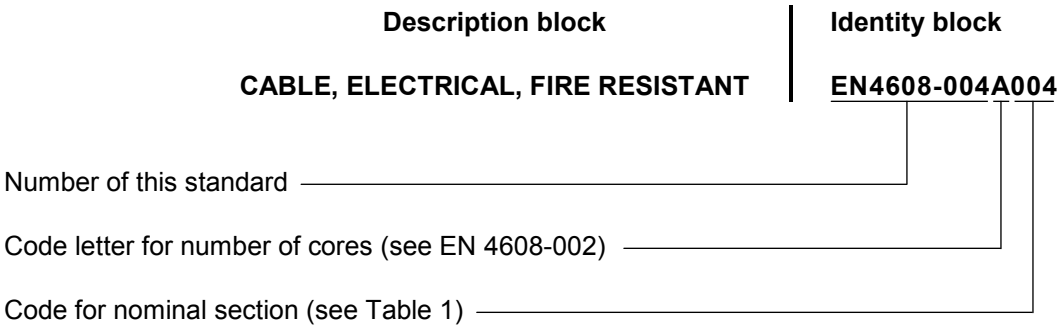
7 Quality assurance

See EN 9133.

8 Designation

8.1 Identification

EXAMPLE



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

8.2 Type code (for short designation)

	EN references	Code designation
Single core UV laser printable	EN4608-004A	GPA
2 cores	EN4608-004B	GPB
3 cores	EN4608-004C	GPC

9 Identification and marking

See EN 4608-002. (Excepted "EN" marking, which is used in case of ASD-CERT qualification only)

EXAMPLE On the outer jacket: GPB22 FRF03
Optional on cores: DWA 22 FRF03

10 Packaging, labelling and delivery lengths

See EN 4608-001.

11 Technical specification

See EN 4608-001.

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