BS EN 3375-011:2017

BSI Standards Publication

Aerospace series — Cable, electrical for digital data transmission

Part 011: Single braid — Star Quad 100 ohms — Light weight — Type KL — Product standard

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National foreword

This British Standard is the UK implementation of EN 3375-011:2017. It supersedes BS EN 3375-011:2015 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ACE/6, Aerospace avionic electrical and fibre optic technology.

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English Version

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Luft- und Raumfahrt - Elektrische Leitungen für Digitaldatenübertragungen - Teil 011: Einfach geschirmt - Sternvierer 100 Ohm - Leichtbauweise - Typ KL - Produktnorm

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European foreword

This document (EN 3375-011:2017) 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of an identical text or by endorsement, at the latest by September 2017, and conflicting national standards shall be withdrawn at the latest by September 2017.

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1 Scope

This European Standard specifies the dimensions, tolerances, required characteristics and the mass of an AWG 24 shielded quad cable, type KL, intended for high speed (100 Mbit/s) full duplex Ethernet networks.

Linked to this particular application, the operating temperatures of the cable are between – 65 °C and 125 °C.

This cable is laser markable, this marking satisfies the requirements of EN 3838.

The characteristics impedance must be 100 Ω ± 15 Ω.

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 3375-001, *Aerospace series — Cable, electrical, for digital data transmission — Part 001: Technical specification — Product standard*

EN 3375-002, *Aerospace series — Cable, electrical, for digital data transmission — Part 002: General*

EN 3475-100 (all parts), *Aerospace series — Cable, electrical, aircraft use — Test methods — Part 100: General*

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

EN 9133, *Aerospace series — Quality Management Systems — Qualification Procedure for Aerospace Standard Products*

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

3 Terms and definitions

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

4 Required characteristics

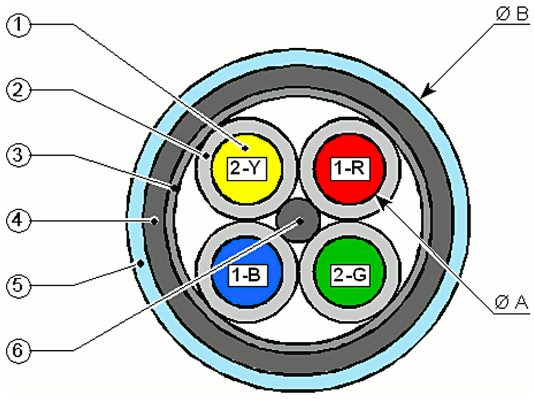
4.1 Configuration, dimensions, tolerances and mass

The configuration, dimensions and tolerances shall be in accordance with Figure 1 and Table 1.

Mass: ≤ 32 g/m.

1) Published as ASD-STAN Technical Report at the date of publication of this standard by AeroSpace and Defence industries Association of Europe - Standardization (ASD-STAN) (www.asd-stan.org)

Dimensions are in millimetres



NOTE No. of elements in accordance with Table 2

Figure 1 — Configuration, dimensions and tolerances

Table 1 — Dimensions, tolerances and general characteristics

Stranded conductor (∅*A*)	0,598 mm ≤ ∅ ≤ 0,656 mm [a]
Insulation diameter (single wire)	∅ ≤ 1,52 mm [a]
Braid, shield	Strand diameter: ≥ 0,08 mm
Outer diameter of cable (∅*B*)	4,10 < ∅ < 4,50 mm
Colour of the jacket ⑤	Light blue
Colour of components ①	Pair 1: Red (+), Blue (–) Pair 2: Yellow (+), Green (–)
Minimum bending radius for dynamic installation	10 × Max. outer diameter
Minimum bending radius in static	5 × Max. outer diameter
[a] Adapted tools are requested for stripping.	

4.2 Material

The material and surface treatment shall be in accordance with Table 2.

Table 2 — Material

No. of element	Element	Material
①	Stranded conductor	Silver plated copper
②	Insulation	Fluoropolymer
③	Protection tape	Synthetic or metallic
④	Braid	Silver plated copper
⑤	Jacket	Fluoropolymer
⑥	Filler	Fluoropolymer

4.3 General characteristics

General characteristics shall be in accordance with Table 1.

5 Test

Tests shall be in accordance with Table 3.

Maximum attenuation of the cable at 25 °C shall be in accordance with Table 4.

Minimum near end cross talk of the cable and contacts shall be in accordance with Table 5.

Transfer impedance shall be in accordance with Table 6.

Table 3 — Tests as per EN 3475

EN 3475-	Designation of the test	Carried out on / Requirement	
		Component (samples from finished cable)	**Cable**
100	General	Not applicable	Applicable
201	Visual examination	Applicable	Applicable
202	Mass	Not applicable	Applicable, see 4.1.
203	Dimensions	Applicable	Applicable, see Table 1.
301	Ohmic resistance per unit length	Not applicable	Applicable Maximum electrical loop resistance 192 Ω/km
302	Voltage proof test	Not applicable	Applicable Conductor/Conductor Conductors/Shield DC: 1 kV (1 min) or 2,5 kV (2 s) AC: 700 V (1 min) or 1,7 kV (2 s)
303	Insulation resistance	Not applicable	Applicable ≥ 1 500 MΩ.km at 20 °C
304	Surface resistance	Applicable 1 250 MΩ.mm	Applicable 1 250 MΩ.mm
305	Overload resistance	Not applicable	Not applicable
306	Continuity of conductors	Applicable	Applicable
307	Corona extinction voltage	Not applicable	Not applicable
401	Accelerated ageing	Not applicable	Applicable *T* °C = (155 ± 5) °C, 168 h Mandrel ∅ = 45 mm Load = 0,7 daN
402	Shrinkage and delamination	Applicable *T* °C = (125 ± 5) °C. Shrinking of the insulation = 0,8 mm max.	Applicable *T* °C = (125 ± 5) °C. Shrinking of the jacket = 5 mm max.
403	Delamination and blocking	Applicable *T* °C = (125 ± 5) °C. Mandrel ∅ = 20 mm	Applicable *T* °C = (125 ± 5) °C. Mandrel ∅ = 45 mm
404	Thermal shock	Applicable 30 min at (125 ± 5) °C 30 min at (– 65 ± 3) °C 30 min at (20 ± 3) °C Shrinking of the insulation = 0,8 mm max.	Applicable 30 min at (125 ± 5) °C 30 min at (– 65 ± 3) °C 30 min at (20 ± 3) °C Shrinking of the jacket = 5 mm max.
405	Bending at ambient temperature	Not applicable	Applicable Mandrel ∅ = 45 mm Load = 0,7 daN

EN 3475-	Designation of the test	Carried out on / Requirement	
		Component (samples from finished cable)	**Cable**
406	Cold bend test	Not applicable	Applicable T °C = (– 65 ± 3) °C Mandrel ∅ = 45 mm Load = 0,7 daN
407	Flammability	Not applicable	Applicable Load = 1 daN
408	Fire resistance	Not applicable	Not applicable
409	Air-excluded ageing	Not applicable	Not applicable
410	Thermal endurance	Not applicable	Not applicable
411	Resistance to fluids	Not applicable	Applicable
412	Humidity resistance	Not applicable	Not applicable
413	Wrap back test	Not applicable	Not applicable
414	Differential scanning calorimeter test (DSC test)	Not applicable	Not applicable
415	Rapid change of temperature	Not applicable	Not applicable
416	Thermal stability	Not applicable	Not applicable
417	Fire resistance of cables confined inside a harness	Not applicable	Not applicable
418	Thermal endurance for conductors	Not applicable	Not applicable
501	Dynamic cut-through	Not applicable	Applicable At (20 ± 5) °C: > 1 daN At operating temperature: ≥ 0,5 daN
502	Notch propagation	Not applicable	Applicable Notch depth = 0,05 mm Mandrel ∅ = 45 mm
503	Scrap abrasion	Not applicable	Applicable at (20 ± 5) °C F = 1 daN
504	Torsion	Not applicable	Not applicable
505	Tensile test on conductors and strands	Applicable Tensile strength ≥ 45 N and A % ≥ 10	On whole braid: Tensile strength ≥ 20 daN
506	Plating continuity	Applicable	Applicable
507	Adherence of plating	Applicable	Applicable
508	Plating thickness	Applicable [a]	Applicable [a]
509	Solderability	Not applicable	Not applicable
510	Tensile strength and elongation of extruded insulation, sheath and jacket materials	Not applicable	Not applicable
511	Cable-to-cable abrasion	Not applicable	Not applicable
512	Flexure endurance	Not applicable	Not applicable

EN 3475-	Designation of the test	Carried out on / Requirement	
		Component (samples from finished cable)	**Cable**
513	Deformation resistance (installation with plastic cable ties)	Not applicable	Applicable Cross-talk must be conform to Table 5 after test
514	Porosity of copper cladding on aluminium strands	Not applicable	Not applicable
515	Crush resistance	Not applicable	Not applicable
601	Smoke density	Not applicable	Applicable $T = 4$ min; $D_m = 200$
602	Toxicity	Not applicable	Applicable $T = 4$ min
603	Resistance to wet arc tracking	Not applicable	Not applicable
604	Resistance to dry arc propagation	Not applicable	Not applicable
605	Wet short circuit test	Not applicable	Not applicable
701	Strippability and adherence of insulation to the conductor	Applicable Method B 0,15 daN (see Table 1)	Applicable
702	Braid screen push back capability	Not applicable	Applicable
703	Permanence of manufacturer's marking	Not applicable	Applicable
704	Flexibility	Not applicable	Not applicable
705	Contrast measurement	Not applicable	K ≥ 50 %
706	Laser markability	Not applicable	Applicable
801	Capacitance per unit length	Not applicable	Applicable At 1 kHz 60 pF/m max.
802	Capacitance unbalance	Not applicable	Pair to ground: Applicable (20 ± 5) °C 330 pF max. per 100 m
803	Capacitance variation	Not applicable	Not applicable
804	Velocity of propagation	Not applicable	Applicable (C = 3 × 105 km/s) > 0,70 C at 31,25 MHz
805	Characteristic impedance	Not applicable	Applicable (100 ± 15) Ω from 1 MHz to 100 MHz
806	Attenuation	Not applicable	Applicable See Table 4.

EN 3475-	Designation of the test	Carried out on / Requirement	
		Component (samples from finished cable)	**Cable**
807	Transfer impedance	Not applicable	Applicable See Table 6.
808	Cross talk	Not applicable	Applicable See Table 5.
809	Resistance unbalance	Not applicable	Applicable ≤ 1,5 %
810	Structural return loss	Not applicable	Applicable 1 MHz ≤ f < 10 MHz: ≥ 20 + 5 log (f) 10 MHz ≤ f < 20 MHz: ≥ 25 dB 20 MHz ≤ f < 100 MHz: ≥ 25 – 7 log (f/20) in dB With f = frequency in MHz
811	Unbalance attenuation	Not applicable	Applicable LCL (min): from 1 MHz ≤ f < 100 MHz: ≥ 30 – 10 log (f/100) [b] LTCL (min): from 0,1 to < 1 MHz: ≥ 40 dB from 1 to < 10 MHz: ≥ 40 – 10 log (f) from 10 MHz to 100 MHz: ≥ 30 dB With f = frequency in MHz
812	Return loss (VSWR)	Not applicable	Not applicable
813	Power rating	Not applicable	Not applicable

[a] Plating thickness shall be at least 1,0 μm for silver.

[b] Calculations that result in LCL values greater than 40 dB can be revert to a requirement of 40 dB minimum.

Table 4 — Maximum attenuation of the cable at 25 °C

Frequency MHz	**Maximum attenuation of the cable** dB/100 m
1,00	2,1
4,00	4,4
10,00	6,9
16,00	8,8
20,00	9,9
31,25	12,5
62,50	18
100,00	23,3

The cable attenuation shall be also verified at temperatures – 55 °C, 70 °C, 125 °C and shall meet the requirements of the table above after adjusting for temperature.

The maximum attenuation must be adjusted using a factor of 0,2 % in dB per °C above 25 °C (only for temperature greater than 25 °C).

For example: at 31,25 MHz the maximum attenuation at 125 °C shall be:

12,5 + 0,2 % × (125 – 25) × 12,5 = 15 dB.

Table 5 — Minimum Near End Cross talk loss of the cable and contacts

Frequency MHz	**Next cable** dB/100 m
1,00	68
4,00	59
10,00	53
16,00	50
20,00	48
31,25	46
62,50	41
100,00	38

Table 6 — Transfer impedance

Frequency MHz	**Maximum transfer impedance** (Z_t max.) mΩ/m
DC	20
0,1	20
1,0	20
5,0	20
10,0	30
20,0	45
50,0	100
100,0	400

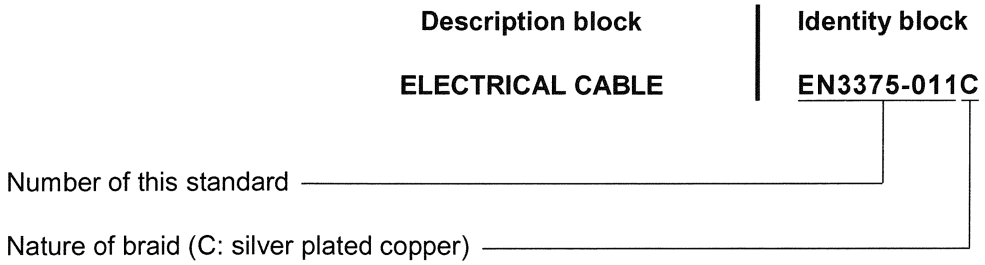
6 Quality assurance

See EN 9133.

7 Identification and marking (according to EN 3375-002 and TR 6058)

7.1 Designation

EXAMPLE



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

7.2 Short designation

According to TR 6058: **KL 24**

7.3 Marking on cable

In accordance with the design of the cable, there is only one way to use it for installation. The cable shall be marked with letter "A-B".

In order to differentiate the cables with new dimensional tolerances from this standard with the old version, a paving stone ■ will be added to manufacturing marking (see Figure 2).

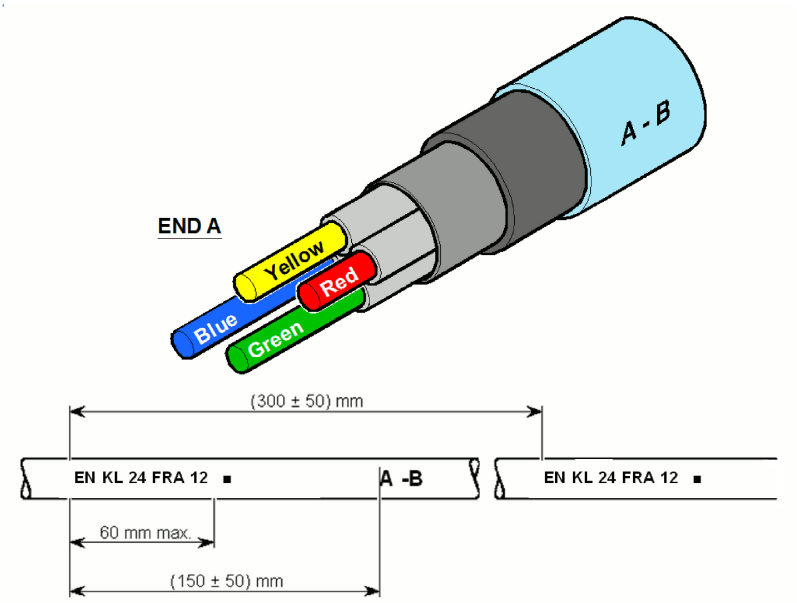


Figure 2 — Marking on cable

7.4 Colour of the marking on the jacket

Green (preferential) or black.

7.5 Colour of components

According to Table 1.

8 Packaging

See EN 3375-001.

9 Technical specification

See EN 3375-001.

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