BS EN 4604-005:2015

BSI Standards Publication

Aerospace series — Cable, electrical, for signal transmission

Part 005: Cable, coaxial, 75 ohmx, 200 °C, type WL — Product standard

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 4604-005:2015.

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

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 87669 1

ICS 49.060

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 July 2015.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 4604-005

July 2015

ICS 49.060

English Version

Aerospace series - Cable, electrical, for signal transmission - Part 005: Cable, coaxial, 75 ohmx, 200 °C, type WL - Product standard

Série aérospatiale - Câbles électriques pour transmission de signaux - Partie 005: Câble, coaxial, 75 ohms, 200 °C, type WL - Norme de produit

Luft- und Raumfahrt - Elektrische Leitungen für Signalübertragungen - Teil 005: Koaxialkabel, 75 Ohm, 200 °C, Typ WL - Produktnorm

This European Standard was approved by CEN on 29 November 2014.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

European foreword

This document (EN 4604-005:2015) 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 January 2016, and conflicting national standards shall be withdrawn at the latest by January 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This standard specifies the required characteristics of a coaxial cable, 75 Ω, type WL, for use in aircraft electrical systems at operating temperature between – 55 °C and 200 °C and specially for high frequency up to 3 GHz.

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

EN 4604-001*, Aerospace series — Cable, electrical, for signal transmission — Part 001: Technical specification*

EN 4604-002*, Aerospace series — Cable, electrical, for signal transmission — Part 002: General*

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

ASTM-B298-12, *Standard specification for silver-coated soft or annealed copper wire* [2)]

IEC 60096-0-1:2012, *Radio frequency cables — Part 0-1: Guide to the design of detail specifications — Coaxial cables*

3 Terms and definitions

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

3.1

Epsilon (ε)
value of dielectric constant

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

2) Published by: ASTM National (US) American Society for Testing and Materials.(http://www.astm.org/)

4 Required characteristics

4.1 Material, construction, dimensions and mass

4.1.1 Material

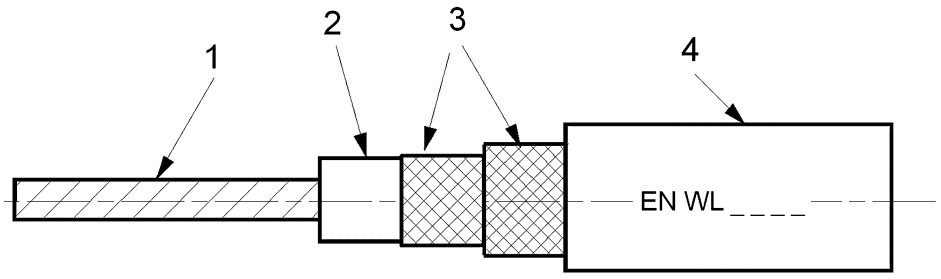
See Table 1.

Table 1 — Material

	Material	Finish	Colour
Conductor	Multi-stranded high-strength copper alloy	1 µm silver plated	—
Dielectric	Fluorocarbon	—	—
Shield	Double-braid per ASTM-B298-12	1 µm silver plated	—
Jacket	Fluorocarbon	—	Medium blue

4.1.2 Construction, dimensions and mass

See Figure 1 and Table 2.



Key

1 Conductor
2 Dielectric
3 Shield
4 Jacket

Figure 1 — Construction

Table 2 — Dimensions and mass

Diameter mm					Mass g/m
Conductor	Dielectric	Shield		Cable	
	max.	min.	max.		max.
0,30 ± 0,025 (7 × 0,10) mm	1,30	1,75	1,95	2,35	12,5

Strand diameter for shield = 0,08 mm

4.2 General characteristics

a) Operating temperature: −55 °C to 200 °C;

b) Minimum bend radius:

1) in static use: 15 mm;

2) in dynamic use: 25 mm;

c) Performances are guaranteed up to 3 GHz.

4.3 Electrical characteristics

— Characteristic impedance: $Z_c = (75 \pm 5)\ \Omega$;

— Capacitance per unit length: $C_p = 60$ pF/m max.;

— Transfer impedance up to 100 MHz: 30 mΩ/m max., see Figure 3;

— Operating voltage: 500 V RMS max.;

— Maximum power handling (at sea level): see Table 3 and Figure 4;

— Attenuation versus frequency: see Table 3 and Figure 2;

— Velocity of propagation: 0,74 c min.

Table 3 — Frequency, attenuation and power handling

Frequency MHz	10	50	100	200	300	400	1 000	3 000
Attenuation dB/100 m	10	23	30	43	53	63	102	176
Power handling W	500	430	300	210	170	150	93	52
NOTE Power handling values are defined by calculation. The formula is coming from IEC 60096-0-1:2012.								

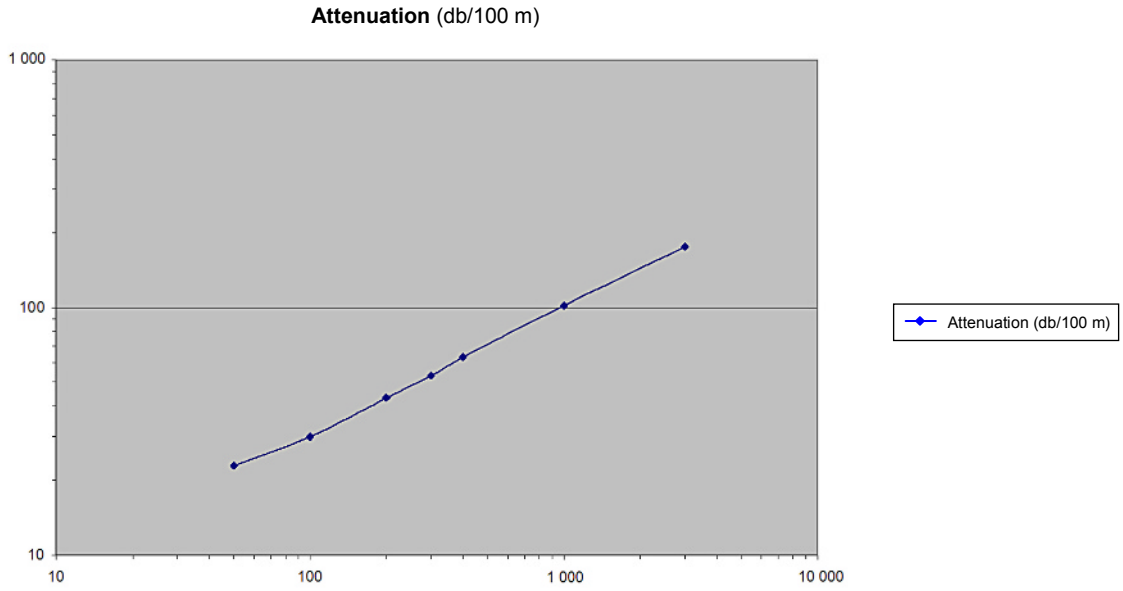


Figure 2 — Maximum attenuation curve

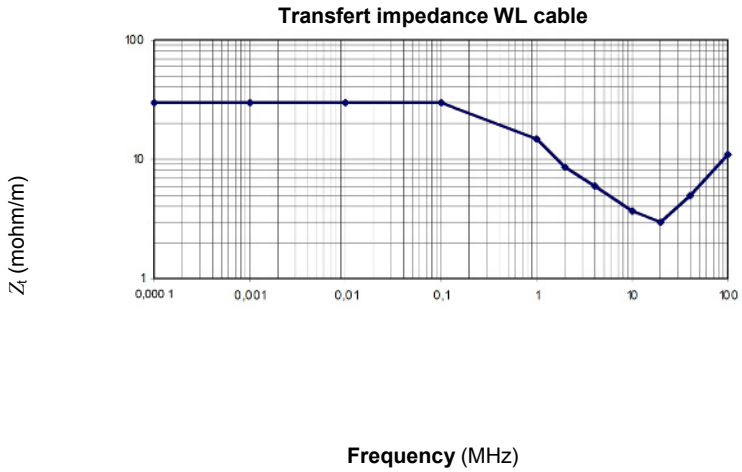


Figure 3 — Transfer Impedance

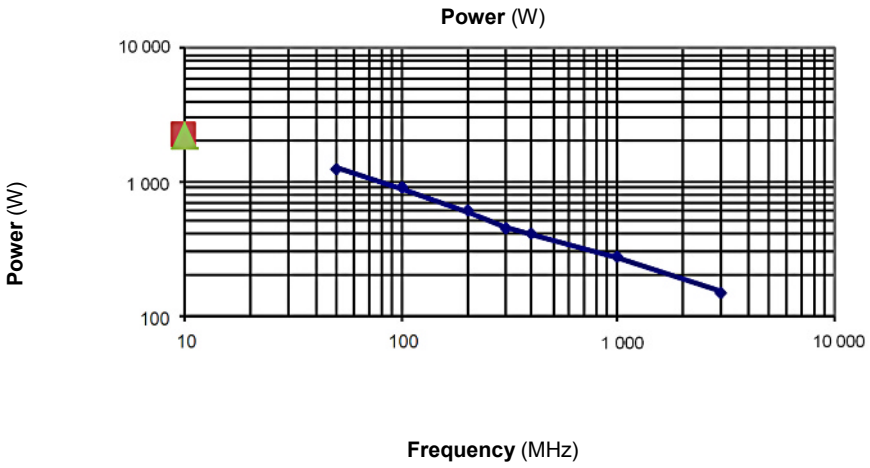


Figure 4 — Power curve

4.4 Tests

See Table 4.

Table 4 — Tests *(1 of 3)*

EN 3475-	Designation of the test	Remarks
201	Visual examination	Applicable
202	Mass	Applicable
203	Dimensions	Applicable See 4.1.2 – Table 2.
301	Ohmic resistance per unit length	Applicable 0,384 Ω/km max.
302	Voltage proof test	Applicable Dielectric: Dry test: 2 000 VAC Jacket: Dry impulse: 5 000 V
303	Insulation resistance	Applicable > 5 000 MΩ between shield and conductor
304	Surface resistance	Not applicable
305	Overload resistance	Not applicable
306	Continuity of conductors	Applicable
307	Corona extinction voltage	Not applicable
401	Accelerated ageing	Not applicable
402	Shrinkage and delamination	Not applicable
403	Delamination and blocking	Not applicable
404	Thermal shock	Not applicable
405	Bending at ambient temperature	Not applicable
406	Cold bend test	Not applicable
407	Flammability	Applicable Load = 10 N Extinction time < 3 s
408	Fire resistance	Not applicable
409	Air-excluded ageing	Not applicable
410	Thermal endurance	Not applicable
411	Resistance to fluids	Applicable
412	Humidity resistance	Not applicable
413	Wrap back test	Not applicable
414	Differential scanning calorimeter (DSC test)	Not applicable

Table 4 — Tests *(2 of 3)*

EN 3475-	Designation of the test	Remarks
415	Rapid change of temperature	Applicable Variation of capacitance: 5 % max. Increase of attenuation: 5 % max. Shrinkage: 1,5 mm max. 1st specimen length (C, α): 15 m
416	Thermal stability	Applicable Heat exposure temperature: 200 °C. Variation of capacitance: 5 % max. Increase of attenuation: 5 % max. Variation of impedance: 3 % max. Shrinkage: 1,5 mm max. 3rd specimen length (C, α): 15 m Mandrel diameter: 28 mm
417	Fire resistance of cables confined inside a harness	Not applicable
418	Thermal endurance for conductors	Not applicable
501	Dynamic cut-through	Not applicable
502	Notch propagation	Applicable Cut depth: 0,05 mm
503	Scrape abrasion	Applicable On external sheath 10 000 cycles Load: 6 N
504	Torsion	Not applicable
505	Tensile test on conductors and strands	Applicable Elongation ≥ 2,5 % Tensile strength ≥ 25 N for the whole conductor.
506	Plating continuity	Applicable
507	Adherence of plating	Applicable
508	Plating thickness	Applicable ≥ 1 µm
509	Solderability	Not applicable
510	Tensile strength and elongation of extruded insulation, sheath and jacket materials	Not applicable
511	Cable to cable abrasion	Not applicable
512	Flexure endurance	Applicable Load: 3 daN – 1 000 cycles minimum Mandrel diameter: 28 mm

Table 4 — Tests *(3 of 3)*

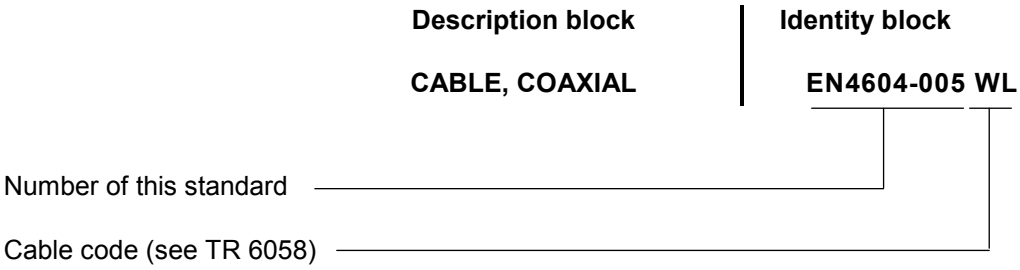
EN 3475-	Designation of the test	Remarks
513	Deformation resistance (Installation with plastic cable ties)	Applicable Application force: 70 N ± 5 % For Method A
514	Porosity of copper cladding on aluminium strands	Not applicable
515	Crush resistance	Not applicable
601	Smoke density	Applicable
602	Toxicity	Applicable
603	Resistance to wet arc tracking	Not applicable
604	Resistance to dry arc propagation	Not applicable
605	Wet short circuit test	Not applicable
701	Strippability and adherence of insulation to the conductor	Applicable 2,5 N to 12 N
702	Screen pushback capability	Applicable
703	Permanence of manufacturer's marking	Applicable
704	Flexibility	Not applicable
705	Contrast measurement	Not applicable
706	Laser markability	Not applicable
801	Capacitance per unit length	Applicable C = 60 pF/m maximum
802	Capacitance unbalance	Not applicable
803	Capacitance variation	Not applicable
804	Velocity of propagation	Applicable $v \geq$ 222 000 km/s
805	Characteristics impedance	Applicable Z_c = (75 ± 5) Ω at 200 MHz
806	Attenuation	Applicable See 4.3, Table 3, Figure 2.
807	Transfer impedance	Z_t applicable (see Figure 3).
808	Cross-talk	Not applicable
809	Resistance unbalance	Not applicable
810	Structural return loss	Not applicable
811	Unbalance attenuation	Not applicable
812	Return loss (VSWR)	Not applicable

5 Quality assurance

See EN 4604-001.

6 Designation

EXAMPLE



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

7 Identification and marking

See EN 4604-002.

Colour of the marking shall be black.

8 Packaging, labelling and delivery lengths

8.1 Packaging and labelling

See EN 4604-001.

8.2 Delivery lengths

Delivery on cable drums (about 200 m).

Minimum length of each piece: 50 m.

9 Technical specification

See EN 4604-001.

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™