SLOVENSKI STANDARD
SIST EN 4641-401:2024

01-december-2024

Aeronavtika - Kabli z optično prevleko premera 125 µm - 401. del: Tesna struktura, neobčutljiva na upogib 50 µm/125 µm GI vlakna, nominalni zunanji premer 1,8 mm - Standard izdelka

Aerospace series - Cables, optical 125 µm diameter cladding - Part 401: Tight structure bend insensitive 50 µm/125 µm GI fibre nominal, 1,8 mm outside diameter - Product standard

Luft- und Raumfahrt - Lichtwellenleiterkabel, Mantelaußendurchmesser 125 µm - Teil 401: Festaderaufbau 50 µm/125 µm GI-Faser, Kabelaußendurchmesser 1,8 mm - Produktnorm

Série Aérospatiale - Câbles, optiques, diamètre extérieur de la gaine optique 125 µm - Partie 401 : Câble à structure serrée, fibre à gradient d'indice 50 µm/125 µm insensible à la courbure, diamètre extérieur 1,8 mm - Norme de produit

Ta slovenski standard je istoveten z: **EN 4641-401:2024**

ICS:

33.180.10	(Optična) vlakna in kabli	Fibres and cables
49.090	Oprema in instrumenti v zračnih in vesoljskih plovilih	On-board equipment and instruments

SIST EN 4641-401:2024 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 4641-401

October 2024

ICS 49.090

English Version

Aerospace series - Cables, optical 125 µm diameter cladding - Part 401: Tight structure bend insensitive 50 µm/125 µm GI fibre nominal, 1,8 mm outside diameter - Product standard

Série Aérospatiale - Câbles, optiques, diamètre extérieur de la gaine optique 125 µm - Partie 401 : Câble à structure serrée, fibre à gradient d'indice 50 µm/125 µm insensible à la courbure, diamètre extérieur 1,8 mm - Norme de produit

Luft- und Raumfahrt - Lichtwellenleiterkabel, Mantelaußendurchmesser 125 µm - Teil 401: Festaderaufbau 50 µm/125 µm GI-Faser, Kabelaußendurchmesser 1,8 mm - Produktnorm

This European Standard was approved by CEN on 17 June 2024.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN 4641-401:2024 E

Contents

Page

European foreword ... 3
1 Scope ... 4
2 Normative references ... 4
3 Terms and definitions ... 6
4 Required characteristics ... 6
5 Cable construction ... 7
6 Materials ... 8
7 Test methods and performances ... 8
7.1 Tests in accordance with EN 3745-100 ... 8
7.1.1 Optical fibre ... 8
7.1.2 Fibre optic cable ... 9
7.2 Fluids test ... 16
8 Tooling ... 17
9 Quality assurance ... 17
10 Designation and marking ... 17
10.1 General principle of designation ... 17
10.2 Marking ... 17
10.3 Colours ... 18
11 Delivery conditions ... 18
11.1 Packaging ... 18
11.2 Labelling ... 18
11.3 Delivery lengths ... 18
12 Storage ... 18
13 Technical specification ... 18
Bibliography ... 19

European foreword

This document (EN 4641-401:2024) has been prepared by ASD-STAN.

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

This document shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2025, and conflicting national standards shall be withdrawn at the latest by April 2025.

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 document: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

1 Scope

This document specifies the general characteristics, conditions for qualification, acceptance and quality assurance for a fibre optic cable with a bend-insensitive, 50 µm/125 µm Graded Index fibre core, 1,8 mm outside diameter for non pull-proof contact designs.

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.

EN 2424, *Aerospace series — Marking of aerospace products*

EN 2812, *Aerospace series — Stripping of electric cables*

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

EN 3745-201, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 201: Visual examination*

EN 3745-202, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 202: Fibre dimensions*

EN 3745-203, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 203: Cable dimensions*

EN 3745-205, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 205: Cable longitudinal dimensional stability*

EN 3745-301, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 301: Attenuation*

EN 3745-302, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 302: Numerical aperture*

EN 3745-303, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 303: Bandwidth*

EN 3745-305, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 305: Immunity to ambient light coupling*

EN 3745-306,[1] *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 306: Variation of attenuation during temperature cycling*

EN 3745-401, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 401: Accelerated ageing*

[1] Published as ASD-STAN prEN at the date of publication of this document, available at: https://www.asd-stan.org/.

EN 3745-404, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 404: Thermal shock*

EN 3745-405, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 405: Low/High temperature bend test*

EN 3745-407, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 407: Flammability*

EN 3745-410, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 410: Thermal life*

EN 3745-411, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 411: Resistance to fluids*

EN 3745-412, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 412: Humidity resistance*

EN 3745-501, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 501: Optical fibre proof test*

EN 3745-503, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 503: Scrape abrasion*

EN 3745-504, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 504: Micro bending test*

EN 3745-505, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 505: Cable tensile strength*

EN 3745-506, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 506: Impact resistance*

EN 3745-507, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 507: Cut-through*

EN 3745-508, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 508: Torsion*

EN 3745-509, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 509: Kink test*

EN 3745-510, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 510: Bending test*

EN 3745-511, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 511: Cable to cable abrasion*

EN 3745-512, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 512: Flexure endurance*

EN 3745-513, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 513: Crush resistance*

EN 3745-517, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 517: Cable tie clamping test*

EN 3745-601, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 601: Smoke density*

EN 3745-602, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 602: Toxicity*

EN 3745-701, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 701: Strippability*

EN 3745-703, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 703: Durability of manufacturer's marking*

EN 3745-705, *Aerospace series — Fibres and cables, optical, aircraft use — Test methods — Part 705: Contrast measurement*

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

EN 3909, *Aerospace series — Test fluids and test methods for electrical and optical components and sub-assemblies*

EN 4641-001, *Aerospace series — Cables, optical, 125 µm diameter cladding — Part 001: Technical specification*

TR 6058,[2] Cable code identification list

3 Terms and definitions

For the purposes of this document, the definitions, symbols and abbreviations given in EN 3745-100 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp/

— IEC Electropedia: available at https://www.electropedia.org/

4 Required characteristics

The characteristics of the cables, tested according to the methods described hereafter shall comply with the values defined in this product standard.

[2] Published as ASD-STAN TR, available at: https://www.asd-stan.org/.

5 Cable construction

Key

1	Cladding	4	Strength member
2	Secondary buffer	5	Primary buffer
3	Cable jacket	6	Core

Figure 1 — Cable construction

Table 1 — Cable dimensional information

Property	Value
Core diameter	50 ± 2,5 µm
Cladding diameter	125 ± 1,0 µm
Core/cladding concentricity	≤ 1,5 µm
Core non circularity	≤ 5 %
Cladding non circularity	≤ 1 %
Primary buffer	Optional
Secondary buffer	900 ± 60 µm
Attenuation at 850 nm (+ 20 °C)	≤ 4,0 dB/km
Attenuation at 1 300 nm (+ 20 °C)	≤ 2,0 dB/km
Finished cable diameter	1,80 mm ± 0,10 mm
Cable mass	≤ 4,2 kg/km
Operating temperature	−65 °C to + 135 °C
Minimum bend radius (+ 20 °C)	Installation: 10 mm Long term: 10 mm Storage: 40 mm
Strength member weave pitch	p > 3 mm
Tensile strength	≥ 500 N

6 Materials

Materials shall conform to Table 2.

Table 2 — Cable materials

Element		Material
Fibre	Core	Silica
	Cladding	
Primary buffer		Polyacrylate
Secondary buffer		Fluoropolymer
Mechanical strength reinforcement		Aramid
Jacket		Fluoropolymer

7 Test methods and performances

7.1 Tests in accordance with EN 3745-100

7.1.1 Optical fibre

Optical fibre shall conform to Table 3.

Table 3 — Optical fibre performance requirements

Title	Test method — Part of the EN 3745 series	Test conditions and results
Fibre visual examination	EN 3745-201	Pass
Fibre core dimension	EN 3745-202	Method A: core diameter = 50 µm ± 2,5 µm
Optical fibre proof test	EN 3745-501	> 1 %
Fibre cladding dimension	EN 3745-202	Cladding diameter: 125 µm ± 1 µm Method A or B Sample shall be in accordance with test methods. Number of samples: 1
Primary buffer outside diameter	EN 3745-203	Not applicable
Fibre dimension core non circularity	EN 3745-202	Core non-circularity: ≤ 5 % (3 µm) Number of samples: 1
Fibre dimension cladding non circularity	EN 3745-202	Cladding non circularity: ≤ 1 % Number of samples: 1