

**Optical fibre cables - Part 3-60: Outdoor cables -
Family specification for drinking water pipe cables
and subducts for installation by blowing and/or
pulling/dragging/floating in drinking water pipes**

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 60794-3-60:2009 sisaldab Euroopa standardi EN 60794-3-60:2008 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 19.01.2009 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 03.12.2009.

Standard on kättesaadav Eesti standardiorganisatsioonist.

This Estonian standard EVS-EN 60794-3-60:2009 consists of the English text of the European standard EN 60794-3-60:2008.

This standard is ratified with the order of Estonian Centre for Standardisation dated 19.01.2009 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

Date of Availability of the European standard text 03.12.2009.

The standard is available from Estonian standardisation organisation.

ICS 33.180.10

Võtmesõnad:

Standardite reprodutseerimis- ja levitamisoigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonilisse süsteemi või edastamine ükskõik millises vormis või millisel teel on keelatud ilma Eesti Standardikeskuse poolt antud kirjaliku loata.

Kui Teil on küsimusi standardite autorikaitse kohta, palun võtke ühendust Eesti Standardikeskusega:
Aru 10 Tallinn 10317 Eesti; www.evs.ee; Telefon: 605 5050; E-post: info@evs.ee

**Optical fibre cables -
Part 3-60: Outdoor cables -
Family specification for drinking water pipe cables and subducts
for installation by blowing and/or pulling/dragging/floating
in drinking water pipes
(IEC 60794-3-60:2008)**

Câbles à fibres optiques -
Partie 3-60: Câbles extérieurs -
Spécification de famille
relative aux câbles et sous-conduits
cheminant dans les conduites d'eau
potable destinés à être
installés par soufflage et/ou
par tirage/appareillage trainant/flottage
dans les conduites d'eau potable
(CEI 60794-3-60:2008)

Lichtwellenleiterkabel -
Teil 3-60: Außenkabel -
Familienspezifikation
für Kabel in Trinkwasserleitungen
und Schächten für die Verlegung
durch Einblasen und/oder
Einschieben/Einziehen/Eingleiten
in Trinkwasserleitungen
(IEC 60794-3-60:2008)

This European Standard was approved by CENELEC on 2008-11-01. CENELEC 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 Central Secretariat or to any CENELEC 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 CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 86A/1232/FDIS, future edition 1 of IEC 60794-3-60, prepared by SC 86A, Fibres and cables, of IEC TC 86, Fibre optics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60794-3-60 on 2008-11-01.

This standard is to be used in conjunction with EN 60794-1-1, EN 60794-1-2 and EN 60794-3.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2009-08-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2011-11-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60794-3-60:2008 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60304	1982	Standard colours for insulation for low-frequency cables and wires	HD 402 S2	1984
IEC 60793-1-20	- ¹⁾	Optical fibres - Part 1-20: Measurement methods and test procedures - Fibre geometry	EN 60793-1-20	2002 ²⁾
IEC 60793-1-40 (mod)	- ¹⁾	Optical fibres - Part 1-40: Measurement methods and test procedures - Attenuation	EN 60793-1-40	2003 ²⁾
IEC 60793-1-44	- ¹⁾	Optical fibres - Part 1-44: Measurement methods and test procedures - Cut-off wavelength	EN 60793-1-44	2002 ²⁾
IEC 60793-2	- ¹⁾	Optical fibres - Part 2: Product specifications - General	EN 60793-2	2008 ²⁾
IEC 60793-2-50	- ¹⁾	Optical fibres - Part 2-50: Product specifications - Sectional specification for class B single-mode fibres	EN 60793-2-50	2008 ²⁾
IEC 60794-1-1	- ¹⁾	Optical fibre cables - Part 1-1: Generic specification - General	EN 60794-1-1	2002 ²⁾
IEC 60794-1-2	- ¹⁾	Optical fibre cables - Part 1-2: Generic specification - Basic optical cable test procedures	EN 60794-1-2	2003 ²⁾
IEC 60794-3	- ¹⁾	Optical fibre cables - Part 3: Sectional specification - Outdoor cables	EN 60794-3	2002 ²⁾
IEC 60794-3-10 (mod)	- ¹⁾	Optical fibre cables - Part 3-10: Outdoor cables - Family specification for duct and directly buried optical telecommunication cables	EN 60794-3-10	2002 ²⁾
IEC 60811-1-1	1993	Insulating and sheathing materials of electric and optical cables - Common test methods - Part 1-1: General application - Measurement of thickness and overall dimensions - Tests for determining the mechanical properties	EN 60811-1-1	1995

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60811-5-1 (mod)	1990	Insulating and sheathing materials of electric and optical cables - Common test methods - Part 5-1: Methods specific to filling compounds - Drop point - Separation of oil - Lower temperature brittleness - Total acid number - Absence of corrosive components - Permittivity at 23 °C - D.C. resistivity at 23 °C and 100 °C	EN 60811-5-1	1999
IEC 62305-1	- ¹⁾	Protection against lightning - Part 1: General principles	EN 62305-1 + corr. November	2006 ²⁾ 2006

CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references	6
3 Symbols and abbreviations.....	7
4 Family specification for drinking water pipe cables and subducts for installation by blowing and/or pulling/dragging/floating in drinking water pipes (blank detail specification and minimum requirements).....	8
4.1 Construction.....	8
4.1.1 General	8
4.1.2 Subducts	8
4.1.3 Drinking water pipe cables.....	8
4.2 Optical fibres.....	9
4.2.1 Single-mode dispersion unshifted (B1.1) optical fibre	9
4.2.2 Single-mode dispersion shifted (B2) optical fibre	9
4.2.3 Single-mode non-zero dispersion (B4) optical fibre.....	10
4.2.4 Single-mode (B6) optical fibre	10
4.2.5 Multimode fibres	10
4.3 Drinking water pipe cable constructions.....	11
4.3.1 Cable for installation within subducts (previously installed within the drinking water pipe)	11
4.3.2 Cable for direct installation into the drinking water pipes	12
4.3.3 Subduct construction	13
4.4 Installation and operating conditions	13
4.4.1 Tests applicable to cables/cable elements	13
4.4.2 Installation conditions	13
4.5 Mechanical and environmental tests	14
4.5.1 Subducts	14
4.5.2 Cable for installation within subducts (previously installed into the drinking water pipes)	17
4.5.3 Cables for direct installation into the drinking water pipe	21
Annex A (informative) Blank detail specification.....	25
Annex B (informative) OF cables for drinking water pipes	28
Annex C (informative) Examples of subducts and drinking water pipe cables.....	29
Annex D (informative) Example for installation schemes of optical fibre cables in drinking water pipes (fibre in drinking water pipes).....	31
Figure C.1 – Examples of constructions of cables for installation in subducts within drinking water pipes.....	29
Figure C.2 – Examples of constructions for drinking water pipe cables	30
Figure D.1 – Schematic drawing – I/O-port for OF cables into drinking water lines.....	31
Figure D.2 – Schematic drawing – Installation of OF cables in drinking water lines	32
Figure D.3 – Installation of I/O-ports on high pressure PE drinking water pipe	32
Table 1 – Single-mode dispersion unshifted (B1.1) optical fibre	9
Table 2 – Single-mode dispersion shifted (B2) optical fibre	9
Table 3 – Single-mode non-zero dispersion (B4) optical fibre.....	10

Table 4 – Single-mode (B6) optical fibre	10
Table 5 – Characteristics – Cable for installation within subducts	11
Table 6 – Characteristics – Cable for direct installation within the high pressure gas pipe	12
Table 7 – Characteristics – Subduct construction.....	13
Table 8 – Tests applicable to cables/cable elements.....	13
Table 9 – Subducts tests applicable.....	14
Table 10 – Tests applicable to the cable for installation within subducts	17
Table 11 – Tests applicable to the cables for direct installation into the drinking water pipe	21
Table A.1 – Cable for installation within subducts	25
Table A.2 – Cables for direct installation into the drinking water pipes	26
Table A.3 – Subduct description	27
Table B.1 – OF cables for drinking water pipes	28

This document is a preview generated by EVS

OPTICAL FIBRE CABLES –

Part 3-60: Outdoor cables – Family specification for drinking water pipe cables and subducts for installation by blowing and/or pulling/dragging/floating in drinking water pipes

1 Scope

This part of IEC 60794 is a family specification that covers drinking water pipe cables and subducts for installation by blowing and/or pulling/dragging/floating in drinking water pipes. Systems built with components covered by this standard are subject to the requirements of sectional specification IEC 60794-3.

Drinking water pipe cable and subduct constructions have to meet the different requirements of the drinking water companies and/or associations regarding chemical, environmental, operational interactions and in general maintenance conditions.

A table of preferential applications, describing drinking water pipe cable characteristics versus methods of installation is reported in Annex A for drinking water pipe cables.

Clause 4 describes a blank detail specification for drinking water pipe cables and subducts for installation by blowing and/or pulling/dragging/floating in drinking water pipes. It incorporates some minimum requirements.

Detail specifications may be prepared on the basis of this family specification.

The parameters specified in this standard may be affected by measurement uncertainty arising either from measurement errors or calibration errors due to lack of suitable standards. Acceptance criteria should be interpreted with respect to this consideration.

The number of fibres tested is representative of the drinking water line cable and should be agreed between the customer and the supplier.

2 Normative references

The following referenced documents are indispensable for the application 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.

IEC 60304, 1982: *Standard colours for insulation for low-frequency cables and wires*

IEC 60793-1-20, *Optical fibres – Part 1-20: Measurement methods and test procedures – Fibre geometry*

IEC 60793-1-40, *Optical fibres – Part 1-40: Measurement methods and test procedures – Attenuation*

IEC 60793-1-44, *Optical fibres – Part 1-44: Measurement methods and test procedures – Cut-off wavelength*

IEC 60793-2, *Optical fibres – Part 2: Product specifications – General*

IEC 60793-2-50, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

IEC 60794-1-1, *Optical fibre cables – Part 1-1: Generic specification – General*

IEC 60794-1-2, *Optical fibre cables – Part 1-2: Generic specification – Basic optical cable test procedures*

IEC 60794-3, *Optical fibre cables – Part 3: Sectional specification – Outdoor cables*

IEC 60794-3-10, *Optical fibre cables – Part 3-10: Outdoor cables – Family specification for duct and directly buried optical telecommunication cables*

IEC 60811-1-1, 1993: *Common test methods for insulating and sheathing materials of electric cables and optical cables – Part 1-1: Methods for general application – Measurement of thickness and overall dimensions – Tests for determining the mechanical properties*

IEC 60811-5-1, 1990: *Insulating and sheathing materials of electric and optical cables – Common test methods – Part 5-1: Methods specific to filling compounds – Drop-point – Separation of oil – Lower temperature brittleness – Total acid number – Absence of corrosive components – Permittivity at 23 °C – DC resistivity at 23 °C and 100 °C*

IEC 62305-1, *Protection against lightning – Part 1: General principles*

3 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

λ_{CC}	cabled fibre cut-off wavelength
d	nominal outer diameter of the cable
d_c	nominal outer diameter of the subduct
DS	detail specification
T_O	threshold tensile load below which no attenuation and/or fibre strain increase should occur in the tensile performance test
T_M	the acceptable amount of short-term tensile load that can be applied to the cable without permanent degradation of the characteristics of the fibres in the tensile performance test
T_{A1}	temperature cycling test low-temperature limit according to IEC 60794-1-2, method F1
T_{A2}	temperature cycling test low-temperature limit according to IEC 60794-1-2, method F1
T_{B1}	temperature cycling test high-temperature limit according to IEC 60794-1-2, method F1
T_{B2}	temperature cycling test high-temperature limit according to IEC 60794-1-2, method F1
t_1	temperature cycling dwell time
$n \times d$	a value times cable outer diameter used for bends, mandrels, etc.
PE	polyethylene
I/O-port	input/output port for launching OF cables into and out of the gas pipe
APL	aluminium/polyethylene laminate
SPL	steel/polyethylene laminate