CORNING

Product Environmental Profile

Corning® Optical Fiber: EMEA

About Corning Incorporated

Corning Incorporated, of which Corning Optical Communications LLC is a wholly-owned subsidiary, is vital to progress in the industries we shape and in the world we share. We invent life-changing technologies using materials science. Our scientific and manufacturing expertise, boundless curiosity, and commitment to purposeful invention place us at the center of the way the world interacts, works, learns, and lives. Our sustained investment in research, development, and innovation means we're always ready to solve the toughest challenges alongside our customers.

Corning's businesses are ever-evolving to best serve our customers, industries, and consumers. Today, we accelerate and transform life sciences, mobile consumer electronics, optical communications, display, and automotive markets.

We are changing the world with trusted products that accelerate drug discovery, development, and delivery to save lives; damage-resistant cover glass to enhance the devices that keep us connected; optical fiber, wireless technologies, and connectivity solutions to carry information and ideas at the speed of life; precision glass for advanced displays to deliver richer experiences; and auto glass and ceramics to drive cleaner, safer, and smarter transportation.

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Registration Number: GLWO-00003-V01.01-EN	Drafting rules: PCR ed4-EN-2021 09 06 Supplemented by PSR-0001-ed4-EN-2022 11 16
Verifier accreditation No: VH08	Information and reference documents: www.pep-ecopassport.org
Date of Issue: 01-2025	Validity period: 5 years
Independent verification of the declaration and data in compliance with ISO 14025: 2006	
Internal: External: X	
The PCR review was conducted by a panel of experts chaired by Julie Orgelet (DDemain)	
PEPs are compliant with XP C08-100-1:2016 or EN 50693:2019 The components of the present PEP may not be compared with components from any other program.	
Document complies with ISO 14025:2006 "Environmental labels and declarations. Type III environmental declarations"	

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The products covered by this document include the following single-mode fibers compliant with ITU-T Recommendation G.652.D, colored and natural:

1. Corning® SMF-28® Ultra Optical Fibers
2. Corning® SMF-28e+® Optical Fibers
3. Corning® SMF-28® Contour Optical Fibers

Corning SMF-28 Ultra Optical Fibers
Corning SMF-28 Ultra single-mode optical fibers combine industry-leading attenuation, macrobend performance that exceeds ITU-T Recommendation G.657.A1, and a 9.2 µm mode field diameter. These fibers are designed for carrier (access, mobile, FTTH) and data center (indoors, DCI) applications and are fully backward compatible with the installed base of legacy single-mode fibers. With SMF-28 Ultra fibers, network operators have the freedom to deploy fiber-rich cables to increase capacity and address congestion. SMF-28 Ultra fiber is available in a traditional 242 µm diameter as well as a 200 µm diameter option with reduced coating for smaller, lighter, high-fiber-count cables.

Corning SMF-28e+ Optical Fibers
SMF-28e+ fiber is a reliable and widely deployed single-mode fiber for metro and access networks. It is ITU-T Recommendation G.652.D-compliant and fully compatible with legacy single-mode fibers. Options for compliance with ITU-T Recommendation G.657.A1 are also available.

Corning SMF-28 Contour Optical Fibers
The SMF-28 Contour optical fiber portfolio delivers on all the features needed to increase network efficiency for today and tomorrow. Combining a 190 µm outer diameter with improved bend resilience, these high-performance fibers enable smaller, lighter, more sustainable optical solutions. The wide spectrum fibers with low attenuation options have a 9.2 µm standard mode field diameter for compatibility with existing installed fibers and efficient splicing.

- SMF-28 Contour Pro fiber is an ITU-T Recommendation G.657.A2 compliant fiber that delivers superior bend performance for high density cables and connectivity and compatibility for installation efficiency.

- SMF-28 Contour Fit fiber is an ITU-T Recommendation G.657.A1 compliant fiber that is compatible with existing legacy fiber for network efficiency and has bend resilience suitable for high density optical solutions.

Table 1 shows the diameter of Corning's optical fiber covered by this document for SMF-28 Ultra Optical Fiber, SMF-28e+ Optical Fiber, and SMF-28 Contour Optical Fiber.

Diameter	190 µm	200 µm	242 µm
Product Name			
Corning SMF-28 Ultra Optical Fiber		x	x
Corning SMF-28e+ Optical Fiber		x	x
Corning SMF-28 Contour Optical Fiber	x		

Table 1. Diameter of Corning's optical fiber covered by this document for each product family.

Table 2 shows the product names and their relevant International Telecommunication Standard (ITU) specification standard covered by this document.

Product Family	Product Name	Standards
Corning SMF-28e+ Optical Fibers	SMF-28e+ fiber	ITU-T G.652.D
	SMF-28e+ fiber with A1 bend	ITU-T G.652.D and ITU-T G.657.A1
Corning SMF-28 Ultra Optical Fibers	SMF-28 Ultra fiber	ITU-T G.652.D and ITU-T G.657.A1
	SMF-28 Ultra 200 fiber	ITU-T G.652.D and ITU-T G.657.A1
Corning Contour Optical Fiber	SMF-28 Contour Pro fiber	ITU-T G.652.D and ITU-T G.657.A2
	SMF-28 Contour Fit fiber	ITU-T G.652.D and ITU-T G.657.A1

Table 2. Product names covered under Corning SMF-28 Ultra Optical Fibers, Corning SMF-28e+ Optical Fibers, & Corning SMF-28 Contour Optical Fibers and their relevant ITU specification standard.

Reference Product Description

Corning® SMF-28® Ultra Optical Fiber (242 µm):

This fiber combines industry-leading attenuation, macrobend performance that exceeds ITU-T Recommendation G.657.A1, and a 9.2 µm mode field diameter. This fiber is designed for carrier (access, mobile, FTTH) and data center (indoors, DCI) applications and is fully backward compatible with the installed base of legacy single-mode fibers. The traditional 242 µm diameter is the maximum diameter in the product family portfolio and has been chosen to be the reference product for the definition of the Life Cycle Impact Assessment Results.

Figure 1. Corning SMF-28 Ultra Optical Fiber

Functional Unit:
To transmit one communication signal over 1 m, at a wavelength of 1310 nm and 1550 nm, for 10 years and at a utilization rate of 100% in accordance with PSR-0001-ed4-EN 2022 11 16.

The duration and rate of use correspond to the "BUILDINGS" – Industrial (factories, warehouses) application, as defined in the table given in Appendix 6.1 of the specific rules for Wires, Cables. The duration and use rate do not relate to the expected lifetime of the product.

System Boundaries:
The boundaries are defined as sub-modules according to EN 15804:2012 +A2:2019 (see Figure 2).

Manufacturing (A1-A3):
This includes the inputs and outputs related to the production (extraction, treatment, transformation, etc.) and transportation of raw materials necessary to manufacture the optical fiber product. This includes the flows associated with the waste generated by the manufacturing of the materials and creation of the optical fiber product and packaging.

Distribution (A4):
This includes transportation of the packaged optical fiber product from the manufacturing plant to the distributor and from the distributor to the place of installation.

Installation (A5):
This includes the management of the waste generated during installation of the optical fiber product as a product component, the transportation of the waste generated, packaging, and end-of-life treatment.

Use (B1 & B6):
This includes only the inputs and outputs associated with the energy consumption over the reference service life (RSL) of the optical fiber product. No consumables are required for the use of the product, and it also requires no servicing or maintenance; these modules under the EN 15804 standard were not established in the system boundary of the study.

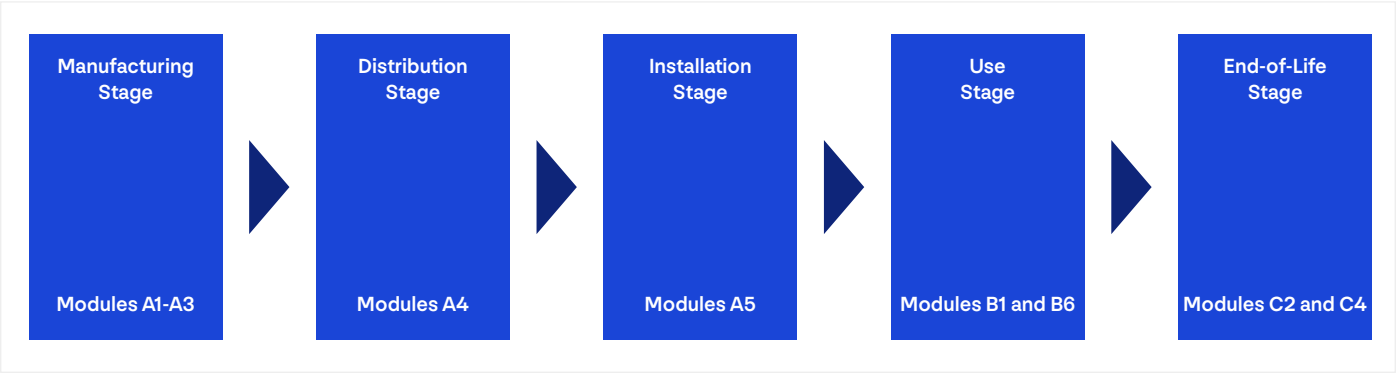

Figure 2. Life cycle boundaries of the reference product defined as sub-modules according to EN 15804:2012 +A2:2019

End-Of-Life (C2 & C4):
This includes inputs and outputs associated with the transportation required to collect the optical fiber product at the end-of-life, transportation from the installation site to the final end-of-life treatment site, and the associated inventory flow of the end-of-life scenario.

Manufacturing:

Optical Fiber:
Corning invented and uses the outside vapor deposition (OVD) process. Soot preforms are formed layer-by-layer by precise deposition of ultra-pure raw materials on a rotating cylindrical target rod. The soot preforms are transformed to solid transparent glass in a furnace and then drawn to optical fibers at high temperature. During the draw process, protective acrylate coatings are applied. The fiber is then spooled, measured, and ready for transportation (see Figure 3).

The product weight of the functional unit including its packaging is shown in Table 3 and the material composition is shown in Table 4.

Additional Environmental Information

REACH (1907/2006/EC) Compliance Statement:

Concerning the current Candidate List (List of substances of very high concern) under the REACH Regulation, dated 7 November 2024, the optical fiber products contain Diphenyl (2,4,6-trimethylbenzoyl) phosphine oxide (CAS No.: 75980-60-8) below 0.3% (by weight).

Concerning the current Restricted Substances List under the REACH Regulation Annex XVII, dated 10 October 2024, the optical fiber products contain no restricted substances.

Manufacturing:

Corning maintains a comprehensive environmental, health, and safety management system based on the principles of the global ISO 14001 standards. The manufacturing plants where this product is made are certified to the ISO 14001: 2015 and ISO 45001: 2018 standards. Where appropriate, we collaborate with suppliers to source materials locally to reduce transportation-related emissions.

Distribution:

The product is transported to optical fiber cable and connectivity manufacturers to be used as product component. Packaging and distribution are constantly being optimized to reduce impact.

Installation:

The product will be deployed as a raw material for optical fiber cables.

Use:

The product does not use parts that require periodic replacement or require special maintenance.

End-of-Life (EOL):

No special end-of-life treatment is required. The assumption made for the end-of-life scenario for the product is 100% landfill.

Figure 3. Process flow of the significant manufacturing stages of the optical fiber

Reference Product	Weight (kg/m)
Corning® SMF-28® Ultra Optical Fiber (242 µm)	1.16E-04

Table 3. Weight of the functional unit of the reference product including its packaging.

	Material Composition Weight (%)
Plastic	61.0%
Others	39.0%

Table 4. Material weight composition of the functional unit of the reference product including its packaging.

Life Cycle Assessment

Data sources:

The Bill of Materials (BOM) was used for all data related to each product including raw material weight, material type, supplier locations and secondary processing of materials. Primary data (waste, water, and electricity) of the manufacturing plant where the product configuration is produced was also collected. Other relevant manufacturing data, e.g., upstream processing of materials, was taken from the Sphera 2024 databases (Sphera Solutions GmbH, 2024) and represent state-of-the-art industrial processes. The Product Category Rule (PCR) provided information on the Use and End-Of-Life Phases of the products.

LCA Software:

LCA for Experts Software version 10.9.0.20 by Sphera (Sphera Solutions GmbH, 2024)

Impact Assessment:

This is the Impact Result of the optical fiber products and packaging within the established system boundary and functional unit according to EN 15804: 2012+A2:2019 as specified by the PEP ecopassport® PROGRAM (2021) and calculated using the LCA for Experts Software version 10.9.0.20 by (Sphera Solutions GmbH, 2024). These represent the potential environmental impacts estimated as environmental effects or pressure on the environment, resulting directly or indirectly from the elementary flows in the system boundary established for the optical fiber products. The environmental indicators for the Life Cycle Impact Result of the optical fiber products are categorized into Environmental Impact Indicators and Inventory Flow Indicators.

Reference Service Life (RSL):

10 years (as recommended by the Product Specific Rule)

Product Category:

Communication and data wires and cables

Use Scenario:

100% of the RSL (as recommended by the Product Specific Rule)

Geographical Representativeness:

All primary and secondary data were collected specific to the United States and Poland. Where country-specific or region-specific data were unavailable, proxy data were used. The data used is considered highly geographically representative and the Data Quality Assessment can be found in the report.

Technological Representativeness:

All primary and secondary data were modeled to be specific to the technologies or technology mixes under study. Where technology-specific data were unavailable, proxy data were used. The technological representativeness is high, and the Data Quality Assessment can be found in the report.

Energy Model Used:

Electricity Grid Mix (US) & Electricity Grid Mix (PL)

Final Assembly Location:

Mszczonów, Poland

Life Cycle Impact Assessment (LCIA) Results

The LCIA result of the functional unit shows the potential life cycle impact of the optical fiber product to transmit one communication signal over 1 m, at a wavelength of 1310 nm and 1550 nm, for 10 years and at a utilization rate of 100% in accordance with PSR-0001-ed4-EN 2022 11 16.

Table 5 shows the Life Cycle Impact result by environmental impact, resource use, output flows, and waste category indicators for the functional unit of the reference product Corning® SMF-28® Ultra Optical Fiber (242 µm).

Indicators: EN15804+A2 (EF 3.1)	Manufacturing (A1-A3)	Distribution (A4)	Installation (A5)	Use (B1&B6)	End-Of-Life (C2&C4)	Total
Environmental Impact Indicators						
Climate Change — total [kg CO2 eq.]	1.72E-03	1.06E-05	7.88E-05	3.63E-06	1.61E-06	1.82E-03
Climate Change, fossil [kg CO2 eq.]	1.73E-03	1.01E-05	6.06E-05	3.63E-06	1.61E-06	1.80E-03
Climate Change, biogenic [kg CO2 eq.]	-4.09E-06	4.30E-07	1.82E-05	7.09E-10	-4.18E-09	1.45E-05
Climate Change, land use and land use change [kg CO2 eq.]	5.35E-07	1.36E-09	1.64E-09	3.39E-10	7.52E-10	5.39E-07
Ozone depletion [kg CFC-11 eq.]	1.60E-14	1.32E-18	-6.42E-16	2.23E-17	3.86E-18	1.53E-14
Acidification [Mole of H+ eq.]	2.85E-06	1.22E-08	-2.51E-08	4.92E-09	9.59E-09	2.85E-06
Eutrophication, fresh water [kg P eq.]	2.23E-09	2.78E-12	-1.26E-10	2.19E-12	2.99E-12	2.11E-09
Eutrophication, marine [kg N eq.]	7.74E-07	4.55E-09	-1.19E-08	1.11E-09	2.39E-09	7.70E-07
Eutrophication, terrestrial [Mole of N eq.]	8.23E-06	5.14E-08	-7.63E-08	1.20E-08	2.62E-08	8.24E-06
Photochemical ozone formation, human health [kg NMVOC eq.]	2.33E-06	1.34E-08	-3.06E-08	3.25E-09	7.34E-09	2.33E-06
Resource use, mineral and metals [kg Sb eq.]	4.49E-09	2.83E-13	-4.90E-12	3.77E-13	1.66E-13	4.49E-09
Resource use, fossils [MJ]	3.92E-02	1.40E-04	-7.34E-04	6.15E-05	2.45E-05	3.86E-02
Water use [m³ world equiv.]	8.23E-05	2.65E-08	1.22E-05	8.34E-07	8.82E-08	9.54E-05
Resource Use Indicators						
Use of renewable primary energy (PERE) [MJ]	7.01E-03	1.03E-06	-3.08E-04	1.67E-05	3.02E-06	6.72E-03
Total use of renewable primary energy resources (PERT) [MJ]	7.01E-03	1.03E-06	-3.08E-04	1.67E-05	3.02E-06	6.72E-03
Use of nonrenewable primary energy (PENRE) [MJ]	3.92E-02	1.40E-04	-7.34E-04	6.15E-05	2.45E-05	3.86E-02
Total use of nonrenewable primary energy resources (PENRT) [MJ]	3.92E-02	1.40E-04	-7.34E-04	6.15E-05	2.45E-05	3.86E-02
Use of net fresh water (FW) [m3]	3.30E-06	1.12E-09	2.03E-07	2.55E-08	3.17E-09	3.53E-06
Output Flows and Waste Categories						
Hazardous waste disposed (HWD) [kg]	2.35E-10	5.11E-15	-7.15E-13	3.36E-14	6.03E-15	2.35E-10
Nonhazardous waste disposed (NHWD) [kg]	6.64E-05	1.46E-08	1.51E-05	2.09E-08	7.43E-05	1.56E-04
Radioactive waste disposed (RWD) [kg]	5.23E-06	2.24E-10	-2.75E-08	6.30E-09	2.59E-10	5.21E-06
Optional Indicators						
Particulate matter [Disease incidences]	3.30E-11	1.25E-13	-9.70E-14	4.50E-14	1.09E-13	3.32E-11
Ionizing radiation, human health [kBq U235 eq.]	4.47E-04	3.20E-08	-2.92E-06	5.20E-07	2.49E-08	4.45E-04
Ecotoxicity, fresh water [CTUe]	6.15E-03	1.05E-04	-9.04E-05	1.35E-05	1.16E-05	6.19E-03
Human toxicity, cancer [CTUh]	1.37E-12	1.92E-15	-6.65E-15	5.01E-16	2.67E-16	1.36E-12
Human toxicity, noncancer [CTUh]	1.38E-10	6.17E-14	-1.72E-13	8.26E-15	8.13E-15	1.38E-10
Land Use [Pt]	1.25E-02	1.03E-06	-1.95E-04	6.01E-06	2.22E-06	1.23E-02

Table 5. Life Cycle Impact Result for the functional unit of the reference product Corning® SMF-28® Ultra Optical Fiber (242 µm).

Extrapolation Ratios:

The LCIA of the optical fiber products covered by the document can be estimated using the LCIA results of the reference product and extrapolation ratios.

Example:

To estimate the Total Climate Change Impact for Corning® SMF-28® Ultra Optical Fiber with 200 µm diameter, the LCIA results of the reference product in Table 5 are multiplied by the extrapolation ratios for 200 µm diameter fibers in Table 10.

Environmental Impact Indicators: EN15804+A2 (EF 3.1)	Manufacturing (A1-A3)	Distribution (A4)	Installation (A5)	Use (B1&B6)	End-Of-Life (C2&C4)	Total
Climate Change — total [kg CO2 eq.]	1.72E-03	1.06E-05	7.88E-05	3.63E-06	1.61E-06	1.82E-03

Table 6. The total Climate Change Impact for the functional unit of the reference product Corning SMF-28 Ultra Optical Fiber (242 µm) extracted from Table 5.

Environmental Impact Indicators: EN15804+A2 (EF 3.1)	Manufacturing (A1-A3)	Distribution (A4)	Installation (A5)	Use (B1&B6)	End-Of-Life (C2&C4)	Total
Climate Change — total [kg CO2 eq.]	0.964	0.877	1.000	1.000	0.818	0.965

Table 7. Extrapolation ratios for the Life Cycle Impact result by environmental impact, resource use, output flows, and waste category indicators for fibers with 200 µm diameter from Table 10.

Table 8 shows the calculation of the total Climate Change Impact by multiplying the Life Cycle Impact result of the reference product Corning SMF-28 Ultra Optical Fiber (242 µm) from Table 6 and the extracted extrapolation ratios from Table 7.

Environmental Impact Indicators: EN15804+A2 (EF 3.1)	Manufacturing (A1-A3)	Distribution (A4)	Installation (A5)	Use (B1&B6)	End-Of-Life (C2&C4)	Total
Climate Change — total [kg CO2 eq.]	1.66E-03	9.28E-06	7.87E-05	3.63E-06	1.32E-06	1.75E-03

Table 8. Calculated Total Climate Change Impact for the functional unit of Corning SMF-28 Ultra Optical Fiber with 200 µm diameter.

The LCIA result of the reference product Corning SMF-28 Ultra Optical Fiber (242 µm) is the same for Corning® SMF-28e+® Optical Fiber (242 µm) and therefore requires no extrapolation ratio.

Table 9 shows the Corning Optical Fiber products with 200 µm diameter covered by the extrapolation ratios in Table 10.

Diameter	200 µm
Product Name	
Corning SMF-28 Ultra Optical Fiber	x
Corning SMF-28e+ Optical Fiber	x

Table 9. Corning's Optical Fiber products with 200 µm diameter covered by this document.

Table 10 shows the extrapolation ratios for the Life Cycle Impact result by environmental impact, resource use, output flows, and waste category indicators for the 200 µm options of Corning SMF-28 Ultra Optical Fiber and SMF-28e+ Optical Fiber.

Indicators: EN15804+A2 (EF 3.1)	Manufacturing (A1-A3)	Distribution (A4)	Installation (A5)	Use (B1&B6)	End-Of-Life (C2&C4)	Total
Environmental Impact Indicators						
Climate Change — total [kg CO2 eq.]	0.964	0.877	1.000	1.000	0.818	0.965
Climate Change, fossil [kg CO2 eq.]	0.964	0.877	1.000	1.000	0.818	0.965
Climate Change, biogenic [kg CO2 eq.]	1.089	0.877	1.000	1.000	0.818	0.971
Climate Change, land use and land use change [kg CO2 eq.]	0.985	0.877	0.958	1.000	0.818	0.984
Ozone depletion [kg CFC-11 eq.]	0.984	0.877	1.000	1.000	0.818	0.983
Acidification [Mole of H+ eq.]	0.952	0.877	1.003	1.000	0.818	0.951
Eutrophication, fresh water [kg P eq.]	0.957	0.877	1.000	1.000	0.818	0.954
Eutrophication, marine [kg N eq.]	0.965	0.877	1.002	1.000	0.818	0.964
Eutrophication, terrestrial [Mole of N eq.]	0.964	0.877	1.004	1.000	0.818	0.963
Photochemical ozone formation, human health [kg NMVOC eq.]	0.963	0.877	1.002	1.000	0.818	0.961
Resource use, mineral and metals [kg Sb eq.]	0.999	0.877	1.000	1.000	0.818	0.999
Resource use, fossils [MJ]	0.962	0.877	1.000	1.000	0.818	0.961
Water use [m³ world equiv.]	0.968	0.877	1.000	1.000	0.818	0.972
Resource Use Indicators						
Use of renewable primary energy (PERE) [MJ]	0.982	0.877	1.000	1.000	0.818	0.981
Total use of renewable primary energy resources (PERT) [MJ]	0.982	0.877	1.000	1.000	0.818	0.981
Use of nonrenewable primary energy (PENRE) [MJ]	0.962	0.877	1.000	1.000	0.818	0.961
Total use of nonrenewable primary energy resources (PENRT) [MJ]	0.962	0.877	1.000	1.000	0.818	0.961
Use of net fresh water (FW) [m3]	0.937	0.877	0.999	1.000	0.818	0.941
Output Flows and Waste Categories						
Hazardous waste disposed (HWD) [kg]	0.999	0.877	1.000	1.000	0.818	0.999
Nonhazardous waste disposed (NHWD) [kg]	0.973	0.877	0.955	1.000	0.818	0.897
Radioactive waste disposed (RWD) [kg]	0.998	0.877	1.000	1.000	0.818	0.998
Optional Indicators						
Particulate matter [Disease incidences]	0.971	0.877	1.012	1.000	0.818	0.970
Ionizing radiation, human health [kBq U235 eq.]	0.997	0.877	1.000	1.000	0.818	0.997
Ecotoxicity, fresh water [CTUe]	0.915	0.877	1.002	1.000	0.818	0.913
Human toxicity, cancer [CTUh]	0.989	0.877	1.001	1.000	0.818	0.989
Human toxicity, noncancer [CTUh]	0.995	0.877	1.001	1.000	0.818	0.995
Land Use [Pt]	0.993	0.877	1.000	1.000	0.818	0.993

Table 10. Extrapolation ratios for the Life Cycle Impact result by environmental impact, resource use, output flows, and waste category indicators for the 200 um options of Corning® SMF-28® Ultra Optical Fiber and SMF-28e+® Optical Fiber

Table 11 shows the Corning Optical Fiber products with 190 µm diameter covered by the extrapolation ratios in Table 12.

Table 12 shows the extrapolation ratios for the Life Cycle Impact result by environmental impact, resource use, output flows, and waste category indicators for the Corning® SMF-28® Contour Optical Fibers with 190 µm diameter.

Diameter	190 µm
Product Name	
Corning SMF-28 Contour Pro Optical Fiber	x
Corning SMF-28 Contour Fit Optical Fiber	x

Table 11. Corning's Optical Fiber products with 190 µm diameter covered by this document.

Indicators: EN15804+A2 (EF 3.1)	Manufacturing (A1-A3)	Distribution (A4)	Installation (A5)	Use (B1&B6)	End-Of-Life (C2&C4)	Total
Environmental Impact Indicators						
Climate Change — total [kg CO2 eq.]	0.956	0.851	1.000	1.000	0.779	0.957
Climate Change, fossil [kg CO2 eq.]	0.956	0.851	1.000	1.000	0.779	0.957
Climate Change, biogenic [kg CO2 eq.]	1.108	0.851	1.000	1.000	0.779	0.965
Climate Change, land use and land use change [kg CO2 eq.]	0.981	0.851	0.949	1.000	0.779	0.981
Ozone depletion [kg CFC-11 eq.]	0.981	0.851	1.000	1.000	0.779	0.980
Acidification [Mole of H+ eq.]	0.942	0.851	1.004	1.000	0.779	0.941
Eutrophication, fresh water [kg P eq.]	0.948	0.851	1.000	1.000	0.779	0.945
Eutrophication, marine [kg N eq.]	0.958	0.851	1.002	1.000	0.779	0.956
Eutrophication, terrestrial [Mole of N eq.]	0.956	0.851	1.004	1.000	0.779	0.955
Photochemical ozone formation, human health [kg NMVOC eq.]	0.955	0.851	1.003	1.000	0.779	0.953
Resource use, mineral and metals [kg Sb eq.]	0.999	0.851	1.000	1.000	0.779	0.999
Resource use, fossils [MJ]	0.954	0.851	1.000	1.000	0.779	0.952
Water use [m³ world equiv.]	0.961	0.851	0.999	1.000	0.779	0.966
Resource Use Indicators						
Use of renewable primary energy (PERE) [MJ]	0.979	0.851	1.000	1.000	0.779	0.978
Total use of renewable primary energy resources (PERT) [MJ]	0.979	0.851	1.000	1.000	0.779	0.978
Use of nonrenewable primary energy (PENRE) [MJ]	0.954	0.851	1.000	1.000	0.779	0.952
Total use of nonrenewable primary energy resources (PENRT) [MJ]	0.954	0.851	1.000	1.000	0.779	0.952
Use of net fresh water (FW) [m3]	0.924	0.851	0.999	1.000	0.779	0.928

Table 12. Extrapolation ratios for the Life Cycle Impact result by environmental impact, resource use, output flows, and waste category indicators for Corning SMF-28 Contour Optical Fibers with 190 µm diameter.

Table 12 Continued.

Indicators: EN15804+A2 (EF 3.1)	Manufacturing (A1-A3)	Distribution (A4)	Installation (A5)	Use (B1&B6)	End-Of-Life (C2&C4)	Total
Output Flows and Waste Categories						
Hazardous waste disposed (HWD) [kg]	0.998	0.851	1.000	1.000	0.779	0.998
Nonhazardous waste disposed (NHWD) [kg]	0.967	0.851	0.945	1.000	0.779	0.875
Radioactive waste disposed (RWD) [kg]	0.997	0.851	1.000	1.000	0.779	0.997
Optional Indicators						
Particulate matter [Disease incidences]	0.965	0.851	1.015	1.000	0.779	0.963
Ionizing radiation, human health [kBq U235 eq.]	0.997	0.851	1.000	1.000	0.779	0.997
Ecotoxicity, fresh water [CTUe]	0.897	0.851	1.002	1.000	0.779	0.895
Human toxicity, cancer [CTUh]	0.987	0.851	1.001	1.000	0.779	0.986
Human toxicity, noncancer [CTUh]	0.994	0.851	1.001	1.000	0.779	0.994
Land Use [Pt]	0.992	0.851	1.000	1.000	0.779	0.992

Table 12. Extrapolation ratios for the Life Cycle Impact result by environmental impact, resource use, output flows, and waste category indicators for Corning® SMF-28® Contour Optical Fibers with 190 µm diameter.

To estimate the Total Climate Change Impact or any other indicator for Corning SMF-28 Ultra 200 Optical Fiber with 200 µm diameter and Corning SMF-28 Contour Optical Fiber with 190 µm fiber, the LCIA results of the reference product in Table 5 are multiplied by the extrapolation ratios in Tables 10 and 12.

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