

Environmental Product Declaration

In accordance with ISO 14025 and EN50693

Objet Collection refrigerator (MF-B6**, F62*****B, M62*****2(S))



Owner of the declaration:
LG Electronics

Product name:
Objet Collection refrigerator

Declared unit:
A domestic refrigerator 1 ea, including related accessories and packaging

Product category /PCR:
EPDItaly007 – PCR for Electronic and Electrical Products and Systems, Rev. 2, 2020/01/20

Program holder and publisher:
The Norwegian EPD foundation

Declaration number:
NEPD-3952-2990-EN

Registration Number:
NEPD-3952-2990-EN

Issue date: 28.11.2022

Valid to: 28.11.2027

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General information

Product:

Objet Collection refrigerator

Program holder:

The Norwegian EPD Foundation
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Declaration number:

NEPD-3952-2990-EN

This declaration is based on Product Category Rules:

PCR: EPDItaly007 – PCR for Electronic and Electrical Products and Systems, Rev. 2, 2020/01/20.

Statements:

The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturer, life cycle assessment data and evidences.

Declared unit:

A domestic refrigerator 1 ea, including related accessories and packaging

Functional unit:

A domestic refrigerator 1 ea to store and protect food and beverages, internal temperature is cooled to below the room temperature during a service life of 7 years

Verification:

Independent verification of the declaration and data, according to ISO14025:2010

internal external


Noh-hyun Lim

Independent verifier approved by EPD Norway

Owner of the declaration:

LG Electronics

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Manufacturer:

LG Electronics

Place of production:

Smart Park1 (Changwon factory1), LG Electronics
170, Seongsanpaechong-ro, Seongsan-gu,
Changwon-si, Gyeongsangnam-do, Rep. of Korea

Management system:

ISO 14001, ISO 45001, ISO 50001, ISO 9001

Organisation no:

107-86-14075

Issue date:

2022-11-28

Valid to:

2027-11-28

Year of study:

2022

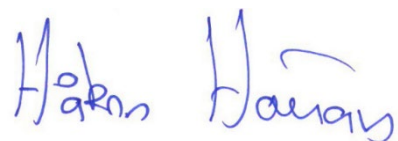
Comparability:

EPDs from other programmes than *The Norwegian EPD Foundation* may not be comparable.

The EPD has been worked out by:

Youngseok Lee and Yunyoung Hwang, Tres Works

Approved



CEO of EPD Norway

Product

Product description:

The Objet Collection refrigerator is used in home for protection and storage of food and beverages. The objet collection refrigerator is a new concept refrigerator that can change the color of the door panel. If the color of the door needs to be changed while the product is in use, the customer can freely select and change the color of the door.

Product specification:

The Objet Collection refrigerator is mostly composed of metal, plastic, glass, electronic components, and etc. Most of the metal is iron, aluminum, and copper, and the plastic is composed of ABS, PE, PP, PS, POM, and PU. The refrigerant is R600a.

Materials		kg	%
Metal	Ferrous (Gl, Steel)	3.86E+01	26.40%
	Nonferrous (Al, Cu)	4.53E+00	3.10%
Plastic and rubber (ABS, PE, PP, POM, PS, PU, rubber, etc.)		5.63E+01	38.54%
Glass		4.38E+01	30.00%
Electronic components		2.74E+00	1.88%
R600a (refrigerant)		7.60E-02	0.05%
Etc.		4.90E-02	0.03%

Technical data:

It's like window shopping in your fridge! LG InstaView™ Door-in-Door® refrigerators let you see inside without opening the door. Knock twice on the tinted glass panel and it will illuminate—letting you quickly browse your favorite foods & beverages while preventing cold air from escaping. Whether you're creating a shopping list or planning your next refrigerator raid—now you can see inside your fridge without even opening the door. LG InstaView™ Door-in-Door® refrigerators feature a mirrored glass panel that illuminates with two quick knocks, allowing you to peek inside without letting cold air escape.

Model name	WHD excluding the door - only cabinet (mm)	Door thickness	Color	LG InstaView™
F62****B	908 * 1726 * 610	Thin	veriaty	0
MF-B6**	908 * 1726 * 610	Thin	veriaty	0
M62****2(S)	908 * 1726 * 610	Thin	veriaty	0

Market:

Republic of Korea : Manufacturing

LCA: Calculation rules

Global: distribution, Use and end-of-life

Reference service life:

7 years (this is a theoretical period selected for calculation purposes only and it is not representative for the minimum, average, nor actual service life of the product)

Declared unit:

Objet Collection refrigerator 1 ea to store and protect food and beverages, internal temperature is cooled to below the room temperature during a service life of 7 years.

Cut-off criteria:

The PCR EPDItaly007 does not provide any details about cut-off criteria; it refers to chapter 4.2.3.3 in the standard EN 50693. According to EN 50693, the cut-off criteria can be set to a maximum of 5 % of the overall environmental impacts given by the LCIA results. In this study, production losses have been excluded as they are considered negligible to the overall environmental impacts. Thus, a conservative approach is adopted.

Allocation:

The electricity consumption of LGE's production plants are allocated to the production of one refrigerator by using allocation rules. Because refrigerator's production lines are focused on refrigerator production, the total electricity consumption for 2021 is divided by the total output and production time of refrigerators during the same year.

For the end-of-life allocation, the “polluter pays” principle is adopted according to what is defined in the CEN/TR 16970 standard, as required by the PCR EPDItaly007. This means, waste treatment processes are allocated to the product system that generates the waste until the end-of-waste state is reached.

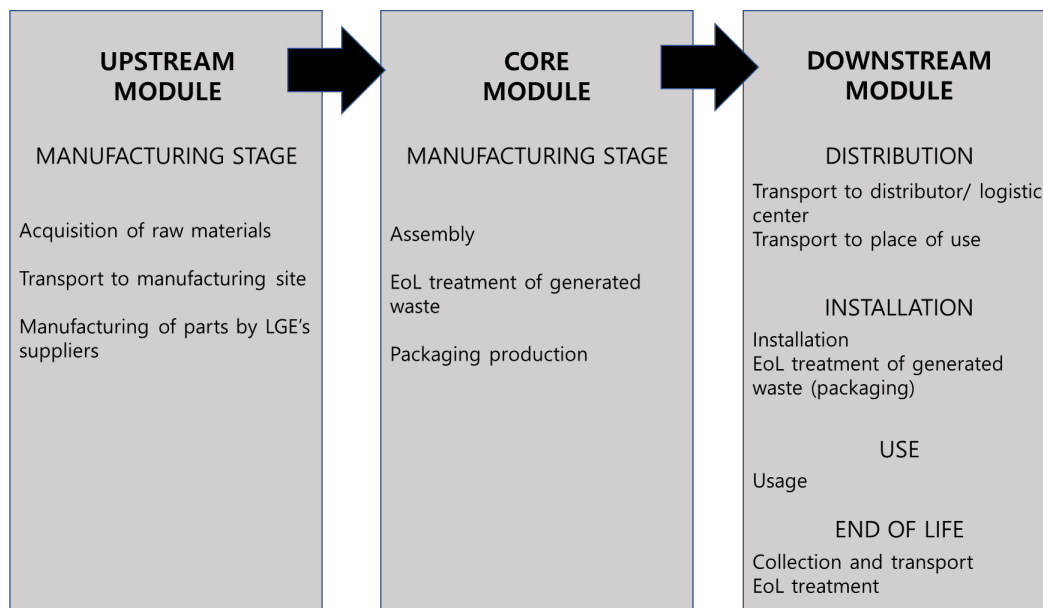
Data quality:

Both primary and secondary data are used. The main sources for primary data are the bill of materials as well as technical drawings and documents. Site specific foreground data have been provided by LG Electronics. For all processes for which primary are not available, generic data originating from Ecoinvent v3.8 and Sphera database, “allocation, cut-off by classification”, are used. The Ecoinvent and Gabi database(Sphera) is available in Gabi v10.6.2.9 which is the LCA software used for the calculations.

System boundary:

The life cycle analysis of the Objet Collection refrigerator is a “from cradle to grave” analysis and covers the following main life cycle stages according to EN 50693: Manufacturing stage, including the relevant upstream process (e.g. acquisition of raw material, preparation of semi-finished goods, etc.) and the main manufacturing and processing stage; distribution stage; installation stage, including the relevant stage for the preparation of the product for use; use stage; end-of-life stage, including the necessary stage until and for the final disposal or recovery of the product system.

The following figure shows the stages of the product life cycle and the information stages according to the PCR EPDItaly007 for the evaluation of electronic and electrical products and systems.



More specifically, the stages of the product life cycle and the information considered for the evaluation of the Objet Collection refrigerator is the following:

- The upstream manufacturing stage: This includes the acquisition of raw materials as well as production and transportation of semi-finished parts, components, and sub-assemblies from both direct and indirect suppliers to LG electronics.
- The core manufacturing stage: This includes the final assembling and testing at the local manufacturing sites in Korea. It also includes the production and use of packaging materials.
- The distribution stage: This includes all activities related to the distribution and transportation of the final product to the site of installation.
- The installation stage: This includes the end of life of the packaging materials.
- The use stage: This includes the power consumption throughout the reference service life of the product.
- The end-of-life stage: This includes all activities related to waste treatment and disposal of the product at the end of its service life.

Process	Manufacturing stage
Foaming	Forming an insulation layer of a refrigerator by injecting urethane undiluted solution into a product temporary assembled in urethane jig.
Refrigerant filling	Filling refrigerant in a vacuum refrigeration cycle
Assembly and inspection	Fastening process, welding process, insertion process, performance inspection process, etc
Packaging	Packaging the manufactured product and outer packaging the product

LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD.

Raw material supply (A1)

Material flow			Mass(kg)	%	Source
Product	Raw material	Ferrous (GI, Steel)	3.86E+01	26.40%	Bills of Material (LGE)
		Nonferrous (Al, Cu)	4.53E+00	3.10%	
		Plastic (ABS, PE, PP, POM, PS, PU, etc.)	5.63E+01	38.54%	
		Glass	4.38E+01	30.00%	
		Electronic components	2.74E+00	1.88%	
		R600a	7.60E-02	0.05%	
		Etc.	4.90E-02	0.03%	
Total		1.46E+02	100.00%		
Packaging	Raw material	Cardboard	5.32E-01	5.53%	
		Paper	6.78E+00	70.47%	
		Plastic	2.31E+00	24.01%	
	Total		9.62E+00	100.00%	

Based on the BOM(Bill of Materials) information of the refrigerator product of the manufacturer, the amount of raw material input per unit of product was applied.

Transport from raw material supply to manufacturer (A2)

Raw material supplier	Type	Type of vehicle	Mass(kg)	Distance(km)	value (ton.km)
Supplier A	Truck	transport, freight, lorry 7.5-16 metric ton, EURO6, RER	1.35E+01	4.80E+00	6.48E-02
Supplier B			1.09E+01	1.70E+00	1.86E-02
Supplier C			2.80E+00	1.70E+00	4.76E-03
Supplier D			2.67E+01	1.60E+01	4.27E-01
Supplier E			3.40E-02	2.50E+01	8.50E-04
Supplier F			1.83E+00	3.50E+01	6.41E-02
Supplier G			3.00E-02	3.50E+01	1.05E-03
Supplier H			3.60E-02	1.80E+01	6.48E-04
Supplier I			2.21E+00	2.80E+01	6.19E-02
Supplier J			1.95E+00	1.70E+01	3.32E-02
Supplier K			1.91E-01	2.40E+01	4.57E-03
Supplier L			6.96E+00	1.60E+01	1.11E-01
Supplier M			9.87E+00	2.30E+01	2.27E-01
Supplier N			6.43E+00	2.40E+01	1.54E-01
Supplier O			3.60E+00	2.60E+01	9.36E-02
Supplier P			4.25E+01	2.30E+01	9.77E-01
Supplier Q			1.05E+01	1.80E+00	1.90E-02
Supplier R			3.51E+00	1.80E+00	6.33E-03
Supplier S			5.00E-01	3.50E+01	1.75E-02
Supplier T			2.49E-01	1.80E+01	4.47E-03

Supplier U			1.32E-01	4.80E+00	6.34E-04
Supplier V			1.35E-02	1.70E+01	2.29E-04
Supplier W			1.55E+00	2.50E+01	3.87E-02
Supplier X			9.62E+00	6.40E+00	6.16E-02

The raw materials are delivered from each suppliers to manufacturer, LGE facility, and the most common type of transport is by road.

Manufacturing (A3)

	Unit	Value
Electricity consumption	kWh/unit	41.82

The product is manufactured at production facility in Korea. The manufacturer provided primary data for their annual production, production per hour and electricity consumption at the facility. The electricity consumption per unit production of the refrigerator was calculated by allocating the product production power consumption based on the information provided by the manufacturer.

Transport from production place to assembly/user (A4)

The refrigerators are in general delivered directly to the customer, and the most common type of transport is by road. A conservative approach is adopted, because the refrigerators produced in Korea are sold globally. In addition, more than 90% of these products are sold in Asia, and more than 70% are sold in Korea. There is no specific data are available, intracontinental transport in distribution 3500 km by lorry (85% payload) is applied, that is the transportation scenario of EN50693.

Assembly (A5)

The installation phase only implies manual activities, and no energy is consumed. Thus, in the LCA, this phase only includes the end-of-life of the packaging materials and manuals that are discarded after installation. Statistical data are adopted from Eurostat (2018) to create a scenario which is representative for Europe. A transport distance of 100 km is assumed because the actual location of disposal is unknown.

Use (B1)

	Unit	Value
Electricity grid mix	kWh/yr	458.4

The use phase considers the power consumption over the reference service life of 7 years as defined in the functional unit. This product is sold globally and is not limited to any specific country, the latest energy mix for the European Union is adopted as suggested by the standard EN 50693.

End of Life (C2,C3, C4)

	Unit	Value
Hazardous waste disposed	kg	0.00E+00
Collected as mixed construction waste	kg	0.00E+00
Reuse	kg	0.00E+00
Recycling(metal, plastic, glass, electronic components)	kg	6.90E+01
Energy recovery(plastic)	kg	2.45E+01
To landfill(metal, plastic, glass, electronic components)	kg	5.25E+01

The end-of-life stage is modelled according to the PCR EPDItaly007 and IEC/TR 62635. The percentages for end-of-life treatments of the product are adopted from IEC/TR 62635 (Annex

D, example 2), which is representative for Europe. The scenario is based on the rates given for materials that go through a separation process and thus, a conservative approach is adopted.

Transport to waste processing (C2)

A transport distance of 100 km is assumed because the distance to the actual location of disposal is unknown.

Additional technical information

The Objet Collection refrigerator is used in home for protection and storage of food and beverages. The Objet collection refrigerator is a new concept refrigerator that can change the color of the door panel. If the color of the door needs to be changed while the product is in use, the customer can freely select and change the color of the door.

LCA: Results

System boundaries (X=included, MID=module not declared, MIR=module not relevant)

Product stage			Assembly stage		Use stage							End of life stage			Beyond system boundaries	
Raw materials	Transport	Manufacturing	Transport	Assembly(Installation)	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	MIR	MIR	MIR	MIR	MIR	MIR	MIR	X	X	X	MIR

Environmental impact

Parameter	Unit	Product Stage			Assembly stage		Use stage	End of life stage		
		A1	A2	A3	A4	A5	B1	C2	C3	C4
GWP-total	kg CO ₂ - eq.	4.01E+02			9.15E+01		1.19E+03	8.14E+01		
GWP-fossil	kg CO ₂ - eq.	4.01E+02			8.62E+01		1.18E+03	8.13E+01		
GWP-biogenic	kg CO ₂ - eq.	2.24E-01			5.21E+00		1.07E+01	3.74E-02		
GWP-LULUC	kg CO ₂ - eq.	5.65E-02			2.14E-05		2.50E-01	6.92E-04		
ODP	kg CFC11-eq.	1.69E-07			5.50E-09		1.73E-08	5.15E-07		
AP	kg SO ₂ - eq.	1.68E+00			2.99E-02		2.60E+00	3.91E-02		
EP-freshwater	kg PO ₄ -eq.	4.75E-03			5.13E-05		3.45E-03	6.60E-04		
POCP	kg C ₂ H ₄ -eq.	9.62E-01			4.39E-02		1.58E+00	5.07E-02		
ADPM	kg Sb-eq.	6.51E-03			1.75E-07		3.23E-04	4.79E-06		
ADPE	MJ	7.56E+03			6.77E-01		2.15E+04	4.00E+01		
WDP	m ³	2.25E+02			9.63E-03		2.70E+02	3.87E+00		

GWP Global warming potential; ODP Depletion potential of the stratospheric ozone layer; POCP Formation potential of tropospheric photochemical oxidants; AP Acidification potential of land and water; EP Eutrophication potential; ADPM Abiotic depletion potential for non fossil resources; ADPE Abiotic depletion potential for fossil resources

Resource use

Parameter	Unit	Product Stage			Assembly stage		Use stage	End of life stage		
		A1	A2	A3	A4	A5	B1	C2	C3	C4
NRPE	MJ	1.66E+02			0.00E+00		5.64E+02	0.00E+00		
RPEE	MJ	6.61E-04			3.57E-04		2.44E-06	1.01E-02		
NRPM	MJ	0.00E+00			0.00E+00		0.00E+00	0.00E+00		
RPEM	MJ	0.00E+00			0.00E+00		0.00E+00	0.00E+00		
TRPE	MJ	1.66E+02			0.00E+00		5.64E+02	0.00E+00		
TPE	MJ	6.61E-04			3.57E-04		2.44E-06	1.01E-02		
RSF	MJ	0.00E+00			0.00E+00		0.00E+00	0.00E+00		
NRSF	MJ	0.00E+00			0.00E+00		0.00E+00	0.00E+00		
SM	kg	0.00E+00			0.00E+00		0.00E+00	0.00E+00		
W	m ³	2.40E+00			0.00E+00		9.68E-04	0.00E+00		

RPEE Renewable primary energy resources used as energy carrier; RPEM Renewable primary energy resources used as raw materials; TPE Total use of renewable primary energy resources; NRPE Non renewable primary energy resources used as energy carrier; NRPM Non renewable primary energy resources used as materials; TRPE Total use of non renewable primary energy resources; SM Use of secondary materials; RSF Use of renewable secondary fuels; NRSF Use of non renewable secondary fuels; W Use of net fresh water

End of life - Waste

Parameter	Unit	Product Stage			Assembly stage		Use stage	End of life stage		
		A1	A2	A3	A4	A5	B1	C2	C3	C4
HW	kg	2.32E-02			0.00E+00		1.86E-06	0.00E+00		
NHW	kg	0.00E+00			0.00E+00		0.00E+00	0.00E+00		
RW	kg	1.09E-01			0.00E+00		3.43E+00	0.00E+00		

HW Hazardous waste disposed; NHW Non hazardous waste disposed; RW Radioactive waste disposed

End of life – output flow

Parameter	Unit	Product Stage			Assembly stage		Use stage	End of life stage		
		A1	A2	A3	A4	A5	B1	C2	C3	C4
CR	kg	0.00E+00			0.00E+00		0.00E+00	0.00E+00		
MR	kg	0.00E+00			0.00E+00		0.00E+00	0.00E+00		
MER	kg	0.00E+00			0.00E+00		0.00E+00	0.00E+00		
EEE	MJ	0.00E+00			0.00E+00		0.00E+00	0.00E+00		
ETE	MJ	0.00E+00			0.00E+00		0.00E+00	0.00E+00		

CR Components for reuse; MR Materials for recycling; MER Materials for energy recovery; EEE Exported electric energy; ETE Exported thermal energy

Additional requirements

Greenhouse gas emission from the use of electricity in the manufacturing phase

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process(A3).

Electricity mix	Data source	Amount	Unit
Electricity grid mix, KR	Sphera	4.18E+01	kWh

Dangerous substances

LGE has established a step-by-step process and is committed to providing our customers with information about the chemicals in products, as required for compliance with REACH. For the first stage of the response, LGE requires all relevant supplier to (pre)-register substances and preparations used in industrial (including engineering) processes and will also monitor and support (pre)-registration by our suppliers.

LGE's obligation to provide SVHC information is only applicable if a substance included on the candidate list is present in an article in a concentration above 0.1% weight by weight(w/w), as per REACH. As soon as a SVHC appears on the "candidate list", suppliers of articles containing the SVHC must forward information on the listed SVHC contained in the article (above a concentration of 0.1% (w/w) to article recipients. An updated version of the "candidate list" can be found in the ECHA website: <http://echa.europa.eu>

There is detail contents below link :

<https://www.lg.com/global/management-of-hazardous-substances>

Indoor environment

No tests have been carried out on the product concerning indoor climate - not relevant.

Carbon footprint

Carbon footprint has been worked out for the product.

Parameter	Unit	Product Stage			Assembly stage		Use stage	End of life stage		
		A1	A2	A3	A4	A5	B1	C2	C3	C4
GWP-total	kg CO ₂ -eq.	4.01E+02			9.15E+01		1.19E+03	8.14E+01		

Bibliography

ISO 14025:2010	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 14044:2006	Environmental management - Life cycle assessment - Requirements and guidelines
EN 50693:2019 electronic	Product category rules for life cycle assessments of and electrical products and systems
EN 15804:2012+A2:2019 construction	Sustainability of construction works – Environmental product declarations – Core rules for the product category of products
PCR EPD Italy 007 2020	Electronic and electrical products and systems (rev.2), Oct.
GPI version 5:2019	General Programme Instructions for The Norwegian EPD Foundation/EPD-Norge (www.epd-norge.no)
PCR 013:2022	Korean Environmental Product Declaration PCR 013:2022 Refrigerator (using stage)
Ecoinvent, 2021.	Swiss Centre for Life Cycle Assessment, v3.8 (www.ecoinvent.ch)
Sphera, 2020.	Software GaBi version 9.5. (www.gabi.sphera.com)

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