

METRA SPA



ENVIRONMENTAL PRODUCT DECLARATION

Product: name:

METRA CURTAIN WALLS SYSTEMS

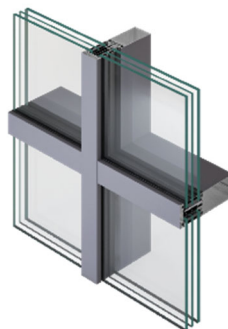
[POLIEDRA SKY TECH 50, POLIEDRA SKY TECH
60, POLIEDRA SKY 35 LUX]

Site Plant:


Rodengo Saiano - Brescia – Italy

in compliance with ISO 14025 and EN 15804:2012+A2:2019

Program Operator	EPDItaly
Publisher	EPDItaly
Declaration Number	CURTAINWALLS
Registration Number	EPDITALY0227
Issue Date	19/01/2022
Valid to	19/01/2027



GENERAL INFORMATION

EPD OWNER:	METRA SpA - via Stacca, 1 25050 Rodengo Saiano - Brescia - Italy
PLANTS INVOLVED in the declaration:	METRA SpA - via Stacca, 1 25050 Rodengo Saiano - Brescia - Italy
SCOPE OF APPLICATION:	This Environmental Product Declaration (EPD) is valid for POLIEDRA SKY TECH 50, POLIEDRA SKY TECH 60, POLIEDRA SKY 35 LUX curtain walls. The production facility is located in Rodengo Saiano, Brescia (IT). The life cycle assessment is representative for the product introduced in the declaration for the given system boundaries.
PROGRAM OPERATOR:	EPDITALY, via Gaetano De Castillia 10, 20124 Milano, Italia.
INDIPENDENT CHECK:	<p>This declaration has been developed referring to EPDItaly, following the General Program Instruction; further information and the document are available at: www.epditaly.it. This EPD document is valid within the following geographical area: worldwide according to sales market conditions.</p> <p>CEN standard EN 15804:2012+A2:2019 served as the core PCR (PCR ICMQ-001/15 rev 3.0). PCR review was conducted by Daniele Pace. Contact via info@epditaly.it</p> <p>Independent verification of the declaration and data, according to EN ISO 14025:2010.</p> <p>Third party verifier: ICMQ SpA, via De Castillia, 10 20124 Milano (www.icmq.it)</p> <p><input type="checkbox"/> EPD process certification (Internal) <input checked="" type="checkbox"/> EPD verification (External)</p> <p>Accredited by: Accredia</p>
CPC CODE:	42120 "Doors, windows and their frames and thresholds for doors, of iron, steel or aluminium"
CORPORATE CONTACT:	Andrea Mafezzoni a.mafezzoni@metrabuilding.com
TECHNICAL SUPPORT:	Sphera https://www.sphera.com 
COMPARABILITY:	Environmental statements published within the same product category, but from different programs, may not be comparable. In particular, EPDs of construction products may not be comparable if they do not comply with EN 15804:2012+A2:2019.
ACCOUNTABILITY:	METRA SpA relieves EPDItaly from any non-compliance with environmental legislation. The holder of the declaration will be responsible for the information and supporting evidence; EPDItaly declines all responsibility for the manufacturer's information, data and results of the life cycle assessment.

**REFERENCE
DOCUMENT:**

This declaration has been developed following the General Program Instruction document of EPDItaly, available at www.epditaly.it.

**PRODUCT CATEGORY
RULES (PCR):**

PCR ICMQ-001/15 rev 3.0
EN 15804:2012+A2:2019 is the framework reference for PCRs.

Scope and Type of EPD

The type of EPD is “cradle to gate with options” and it’s specific EPD for the POLIEDRA SKY TECH 50, POLIEDRA SKY TECH 60, POLIEDRA SKY 35 LUX produced in the METRA plant located in Rodengo Saiano, Brescia (IT) and sold worldwide. All data refer to the 2020 production.

Database: GaBi Database 2021.2 (2021)

Software: GaBi 10

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	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	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

According to the PCR ICMQ-001/15 rev. 3 the LCA study it’s “cradle to gate with options”. Modules included are A1, A2, A3, C and D. All manufacturing activities and packaging/auxiliary’s production are in module A3, while energy production and input materials are in A1. Distribution to distributors/installers (A3) is included together with end of life scenarios (credits included). “MND” indicates “Module not declared”.

The declaration is 1a (specific product from a specific manufacturer) according to /REGOLAMENTO EPDITALY V.5/.

The production facility is located in Rodengo Saiano, Brescia (IT). The market range is worldwide.

Product description

Declared unit

The declared unit is 1 m² of curtain wall (POLIEDRA SKY TECH 50, POLIEDRA SKY TECH 60, POLIEDRA SKY 35 LUX).

Name	Declared unit [m ²]	Conversion factor to 1 kg [m ² /kg]	Transparent area [%]
POLIEDRA SKY TECH 50	1	0.0181	80
POLIEDRA SKY TECH 60	1	0.0179	80
POLIEDRA SKY 35 LUX	1	0.01811	88

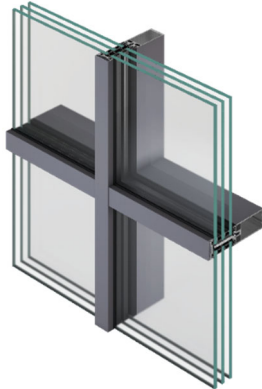
Product

The composition is as following:

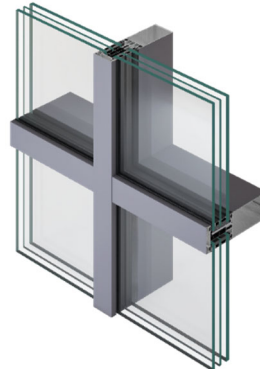
Name	Glass [%]	Alluminium [%]	Plastic [%]	Other metals [%]	EPDM [%]	Other [%]	Total [%]
POLIEDRA SKY TECH 50	77.65	19.60	0.46	0.23	1.64	0.42	100
POLIEDRA SKY TECH 60	76.62	20.66	0.45	0.23	1.61	0.44	100
POLIEDRA SKY 35 LUX	79.76	17.52	0.46	0.23	1.61	0.42	100

The product does not contain any substances included in the "Candidate List of Substances of Very High Concern for Authorization" compliant with /REACH/.

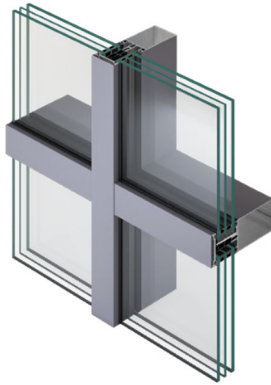
Poliedra SKY35 LUX



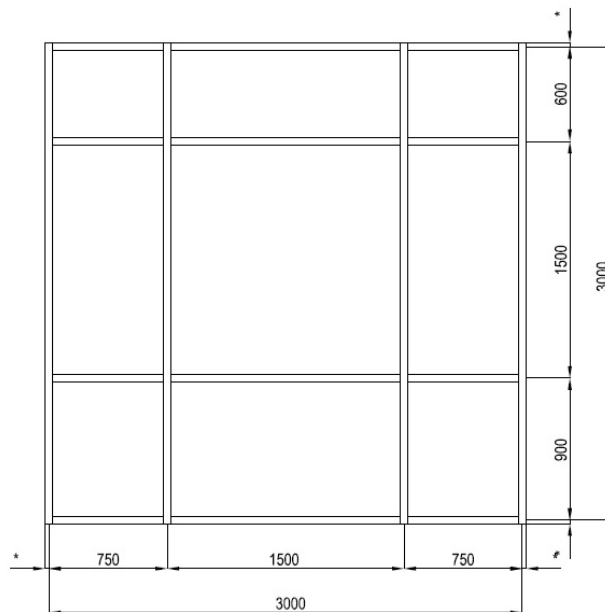
Poliedra SKY TECH 50



Poliedra SKY TECH 60

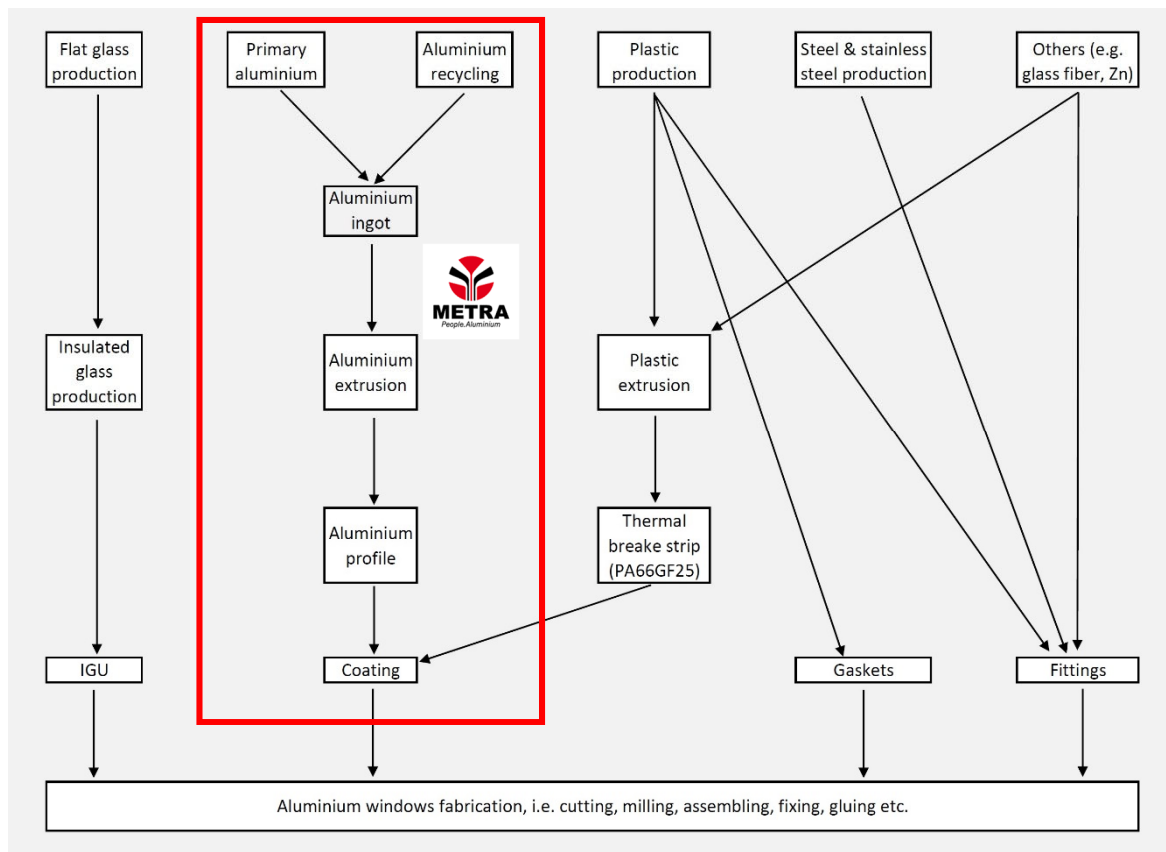


Product design



- * POLIEDRA SKY TECH 50 - 25 mm
- * POLIEDRA SKY TECH 60 - 30 mm
- * POLIEDRA SKY 35 LUX - 17,5 mm

Production processes



Processes within the red box are the ones within Metra gate primary data were then available for. All processes outside that boundary have been taken into account as necessary for the complete curtain wall's production, but secondary data have been used to estimate the impact production. Processes included in the study by using primary data (as directly connected to Metra activities) are then: aluminum billet production (using both primary and secondary aluminum), billets extrusion, painting, addition of polyamide to the profile, cutting of the profile and finally packaging for the delivery to the assembler/distributor. All other components are provided by Metra to the assembler while the glass is delivered directly from the glass producer to the assembler. The gate the EPD refers to is not the Metra gate, but the gate of the final assembler where the curtain walls start from as assembled product ready for the installation phase.

Technical data

Category	Description & Value	Standards
Thermal Insulation - frame (Heat transfer coefficient of frame (Uf) depending on the frame/vent combination)	down to: 0.83 W/m ² K for POLIEDRA SKY TECH 50, 0.82 W/m ² K for POLIEDRA SKY TECH 60, 1.0 W/m ² K for POLIEDRA SKY 35 LUX	EN ISO 10077-2
Thermal insulation - facade	Ucw 0.89 W/m ² K POLIEDRA SKY TECH 50, Ucw 0.9 W/m ² K for POLIEDRA SKY TECH 60, Ucw 0.88 W/m ² K for POLIEDRA SKY 35 LUX	EN ISO 12631
Air permeability	Class A4	EN 12152
Watertightness	Class RE1200	EN 12154
Wind load resistance	POLIEDRA SKY TECH 50 and POLIEDRA SKY TECH 60 ±2000Pa/±3000Pa POLIEDRA SKY 35 LUX ±1600Pa/±2400Pa	EN 13116
Sound insulation	Up to 50 dB	EN ISO 140-3

Technical properties	
Size	POLIEDRA SKY TECH 50 3000x3000 mm (wheelbase to wheelbase) 3050x3050 mm (actual size) POLIEDRA SKY TECH 60 3000x3000 mm (wheelbase to wheelbase) 3060x3060 mm (actual size) POLIEDRA SKY 35 LUX 3000x3000 mm (wheelbase to wheelbase) 3035x3035 mm (actual size)
Profile depth	125 mm
Profile width	POLIEDRA SKY TECH 50 – 50 mm POLIEDRA SKY TECH 60 – 60 mm POLIEDRA SKY 35 LUX – 35 mm
Glazing unit	6/12/4/12/8
Fitting	MA6772
Conversion factor to 1 curtain wall	POLIEDRA SKY TECH 50 – 9.30 m ² POLIEDRA SKY TECH 60 – 9.36 m ² POLIEDRA SKY 35 LUX – 9.21 m ²
Declared unit	1 m ² of curtain walls

Condition of delivery

The curtain walls are supplied in customised dimensions with appropriate protection and transport equipment. Such packaging only refers to the distribution to the installer, any other packaging the distributor uses for the whole curtain wall delivery to the building site is not included in the study. The packaging consists of wooden pallets (44%), aluminium angle brackets (48%), polyethylene film (6%) and 1% of polypropylene wrapper and tape. The total packaging weight for the given product is 22.34 kg.

Detailed product description

The curtain walls are manufactured with METRA POLIEDRA SKY TECH 50, POLIEDRA SKY TECH 60 and POLIEDRA SKY 35 LUX systems. The mullion and transom profiles are made of aluminium alloy EN AW 6060 (EN 573-3 and EN 755-2) with temper designation T6 according to EN 515, extruded in compliance with the tolerances according to EN 12020-2. The structure is of the mullion and transom type with the load-bearing profiles arranged on the inside. The architectural section of the profiles on the inside and outside is 50 mm for the model POLIEDRA SKY TECH 50, 60 mm for the model POLIEDRA SKY TECH 60 and only 35 mm for the model POLIEDRA SKY 35 LUX. These systems are suitable for the realisation of vertical curtain walls, inward and outward sloping facades, sloping roofs, tunnels, polygonal constructions, bow windows, pyramids and verandas.

The profiles are coated with polyester powder paint. The connection of the transoms to the uprights is made by means of stainless-steel screws and spring bolts. The transom-mullion joints are able to absorb horizontal expansion caused by temperature variations. All brackets anchoring the curtain wall to the building structure are made of extruded aluminium and must allow for adjustments in the three orthogonal directions.

The curtain wall must be equipped with a drainage and ventilation system. Any seepage water or water that forms due to condensation inside the profiles is collected and conveyed to the outside with a controlled evacuation system. At the same time, the system ensures ventilation of the glazed infills. The joint between the transom and mullion is made by cutting the transom and overlapping the water collection grooves between the transoms and mullions. All gaskets are made of EPDM. The internal glazing gaskets of the transoms must mask the 6.5 mm water gap with the mullion. The internal glazing gasket of the transom has the same aesthetic appearance (same height) as the mullion gasket. The internal and



external glazing gaskets must allow compensation for any differences in thickness, which are unavoidable in double-glazed and/or laminated glass panes, while guaranteeing correct perimeter working pressure. The curtain wall systems allow the insertion of glazing from a minimum of 8 mm to a maximum of 72 mm thick. Thermal insulation between the internal structural part and the external covers is achieved by interposing an extruded strip of thermally insulating synthetic material.

Company



Since 1962 Made in Metra has been the philosophy that brings solutions to Italian and International companies that start from the supply of aluminum and turn into a flexible partnership that is always focused on innovation.

Dynamism and continual research, experience and approach to the relationship are the bearing points of a path that led Metra to qualify as a point of reference for the textile industry, with an annual production of over 90,000 tons of aluminum bars.

Thanks to a structure that is organized and efficient, but at the same time streamlined and flexible, Metra responds precisely to the most complete design needs with the versatility of a service designed to measure the needs of the client.

Today the Metra Group has extensive coverage of Italy and a strong presence in Europe and the world.

Under the guidance of the Brescia office, are 3 production establishments in Italy, 2 logistical centers and a lot of points of sale, among dealers and retailers. In Europe and the world Metra is currently present across a commercial and distributive network to be able to supply the international market through the sites located in Canada (production and finishing) high standard of quality and service. The expansion continues, with internationalization both at a production level and distribution level and a consistent search for growth in the network of partners, dealers and distributors outside Europe.



LCA results – Environmental impact per functional or declared unit

Additional environmental impact indicators have been calculated and included in the project report, but are not declared according to EN 15804:2012+A2:2019 chapter 7.2.3.2.

LCA results – Environmental impact per functional or declared unit

POLIEDRA SKY TECH 50

Environmental Impact for 1 m ²									
Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
GWP - total	[kg CO2 eq.]	1.15E02	7.27E-01	3.18E01	9.52E-01	1.65E00	3.02E00	4.69E-01	-4.20E01
GWP - fossil	[kg CO2 eq.]	1.14E02	7.19E-01	2.97E01	9.51E-01	1.63E00	3.02E00	4.66E-01	-4.19E01
GWP - biogenic	[kg CO2 eq.]	3.44E-01	2.16E-03	2.13E00	1.23E-03	4.90E-03	2.43E-04	1.50E-03	-9.49E-02
GWP - luluc	[kg CO2 eq.]	5.14E-02	5.89E-03	3.62E-02	1.77E-04	1.34E-02	8.26E-05	1.36E-03	-1.70E-02
ODP	[kg CFC-11 eq.]	3.80E-13	1.42E-16	2.30E-12	1.62E-14	3.23E-16	6.95E-16	1.81E-15	1.03E-12
AP	[Mole of H+ eq.]	6.69E-01	2.16E-03	8.55E-02	9.02E-04	1.65E-03	3.70E-04	3.31E-03	-2.24E-01
EP - freshwater	[kg P eq.]	7.29E-05	2.14E-06	5.12E-05	3.87E-07	4.86E-06	1.58E-07	1.54E-06	-2.09E-05
EP - marine	[kg N eq.]	1.56E-01	9.79E-04	2.04E-02	2.96E-04	4.99E-04	9.61E-05	8.57E-04	-3.50E-02
EP - terrestrial	[Mole of N eq.]	1.80E00	1.09E-02	2.22E-01	3.21E-03	6.07E-03	1.73E-03	9.42E-03	-4.03E-01
POCP	[kg NMVOC eq.]	3.87E-01	1.95E-03	5.89E-02	8.85E-04	1.40E-03	2.70E-04	2.60E-03	-9.63E-02
ADPE	[kg Sb eq.]	2.01E-05	6.38E-08	3.55E-06	1.68E-07	1.45E-07	9.85E-09	4.39E-08	-3.61E-06
ADPF	[MJ]	1.64E03	9.59E00	3.41E02	1.44E01	2.18E01	7.81E-01	6.19E00	-5.10E02
WDP	[m ³ world equiv.]	1.05E01	6.68E-03	5.93E00	1.00E-01	1.52E-02	2.87E-01	4.96E-02	-5.55E00

Caption: GWP - total = global warming potential; GWP - fossil = global warming potential (fossil fuel only); GWP - biogenic = global warming potential (biogenic); GWP - luluc = global warming potential (land use only); ODP = ozone depletion; AP = acidification terrestrial and freshwater; EP - freshwater = eutrophication potential (freshwater); EP - marine = eutrophication potential (marine); EP - terrestrial = eutrophication potential (terrestrial); POCP = photochemical ozone formation; ADPE = abiotic depletion potential (element), ADPF = abiotic depletion potential (fossil) WDP = water scarcity.

POLIEDRA SKY TECH 60

Environmental Impact for 1 m ²									
Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
GWP - total	[kg CO2 eq.]	1.18E02	7.33E-01	3.29E01	9.64E-01	1.67E00	3.02E00	4.70E-01	-4.41E01
GWP - fossil	[kg CO2 eq.]	1.18E02	7.25E-01	3.07E01	9.63E-01	1.65E00	3.02E00	4.67E-01	-4.40E01
GWP - biogenic	[kg CO2 eq.]	3.52E-01	2.18E-03	2.15E00	1.25E-03	4.96E-03	2.47E-04	1.51E-03	-1.00E-01
GWP - luluc	[kg CO2 eq.]	5.26E-02	5.94E-03	3.71E-02	1.80E-04	1.35E-02	8.34E-05	1.36E-03	-1.77E-02
ODP	[kg CFC-11 eq.]	3.90E-13	1.43E-16	2.34E-12	1.64E-14	3.27E-16	7.00E-16	1.81E-15	1.10E-12
AP	[Mole of H+ eq.]	6.85E-01	2.18E-03	8.74E-02	9.13E-04	1.67E-03	3.70E-04	3.31E-03	-2.35E-01
EP - freshwater	[kg P eq.]	7.45E-05	2.16E-06	5.33E-05	3.92E-07	4.92E-06	1.60E-07	1.54E-06	-2.17E-05
EP - marine	[kg N eq.]	1.58E-01	9.87E-04	2.12E-02	2.99E-04	5.06E-04	9.65E-05	8.59E-04	-3.64E-02
EP - terrestrial	[Mole of N eq.]	1.82E00	1.10E-02	2.30E-01	3.25E-03	6.15E-03	1.73E-03	9.43E-03	-4.18E-01
POCP	[kg NMVOC eq.]	3.94E-01	1.96E-03	6.10E-02	8.96E-04	1.41E-03	2.71E-04	2.60E-03	-1.01E-01
ADPE	[kg Sb eq.]	2.05E-05	6.44E-08	3.69E-06	1.71E-07	1.47E-07	9.91E-09	4.40E-08	-3.81E-06
ADPF	[MJ]	1.70E03	9.68E00	3.51E02	1.45E01	2.21E01	7.84E-01	6.20E00	-5.36E02
WDP	[m ³ world equiv.]	1.12E01	6.74E-03	6.27E00	1.02E-01	1.54E-02	2.87E-01	4.96E-02	-5.88E00

Caption: GWP - total = global warming potential; GWP - fossil = global warming potential (fossil fuel only); GWP - biogenic = global warming potential (biogenic); GWP - luluc = global warming potential (land use only); ODP = ozone depletion; AP = acidification terrestrial and freshwater; EP - freshwater = eutrophication potential (freshwater); EP - marine = eutrophication potential (marine); EP- terrestrial = eutrophication potential (terrestrial); POCP = photochemical ozone formation; ADPE = abiotic depletion potential (element), ADPF = abiotic depletion potential (fossil) WDP = water scarcity.

POLIEDRA SKY 35 LUX

Environmental Impact for 1 m ²									
Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
GWP - total	[kg CO2 eq.]	1.11E02	7.29E-01	3.09E01	9.52E-01	1.65E00	2.98E00	4.81E-01	-3.91E01
GWP - fossil	[kg CO2 eq.]	1.11E02	7.21E-01	2.87E01	9.50E-01	1.63E00	2.98E00	4.78E-01	-3.90E01
GWP - biogenic	[kg CO2 eq.]	3.36E-01	2.16E-03	2.11E00	1.23E-03	4.90E-03	2.41E-04	1.54E-03	-8.74E-02
GWP - luluc	[kg CO2 eq.]	5.05E-02	5.90E-03	3.56E-02	1.77E-04	1.34E-02	8.21E-05	1.39E-03	-1.61E-02
ODP	[kg CFC-11 eq.]	3.61E-13	1.43E-16	2.29E-12	1.62E-14	3.23E-16	6.90E-16	1.85E-15	9.21E-13
AP	[Mole of H+ eq.]	6.58E-01	2.17E-03	8.38E-02	9.01E-04	1.65E-03	3.65E-04	3.39E-03	-2.09E-01
EP - freshwater	[kg P eq.]	7.19E-05	2.15E-06	4.95E-05	3.86E-07	4.86E-06	1.56E-07	1.55E-06	-2.00E-05
EP - marine	[kg N eq.]	1.56E-01	9.81E-04	1.97E-02	2.96E-04	4.99E-04	9.50E-05	8.78E-04	-3.33E-02
EP - terrestrial	[Mole of N eq.]	1.80E00	1.10E-02	2.14E-01	3.21E-03	6.07E-03	1.71E-03	9.65E-03	-3.85E-01
POCP	[kg NMVOC eq.]	3.85E-01	1.95E-03	5.71E-02	8.85E-04	1.40E-03	2.67E-04	2.66E-03	-9.07E-02
ADPE	[kg Sb eq.]	1.99E-05	6.40E-08	3.46E-06	1.68E-07	1.45E-07	9.77E-09	4.50E-08	-3.33E-06
ADPF	[MJ]	1.59E03	9.62E00	3.36E02	1.44E01	2.18E01	7.73E-01	6.34E00	-4.74E02
WDP	[m ³ world equiv.]	9.79E00	6.70E-03	5.24E00	1.00E-01	1.52E-02	2.83E-01	5.08E-02	-5.08E00

Caption: GWP - total = global warming potential; GWP - fossil = global warming potential (fossil fuel only); GWP - biogenic = global warming potential (biogenic); GWP - luluc = global warming potential (land use only); ODP = ozone depletion; AP = acidification terrestrial and freshwater; EP - freshwater = eutrophication potential (freshwater); EP - marine = eutrophication potential (marine); EP- terrestrial = eutrophication potential (terrestrial); POCP = photochemical ozone formation; ADPE = abiotic depletion potential (element), ADPF = abiotic depletion potential (fossil) WDP = water scarcity.

LCA results – Resource use per functional or declared unit

LCA results – Resource use per functional or declared unit

POLIEDRA SKY TECH 50

Resource use for 1 m²

Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
PERE	[MJ]	3.35E02	5.52E-01	8.39E01	2.36E00	1.25E00	1.90E-01	8.30E-01	-1.96E02
PERM	[MJ]	0	0	1.87E01	0	0	0	0	0
PERT	[MJ]	3.35E02	5.52E-01	1.03E02	2.36E00	1.25E00	1.90E-01	8.30E-01	-1.96E02
PENRE	[MJ]	1.59E03	9.63E00	3.34E02	1.44E01	2.19E01	7.81E-01	6.20E00	-5.10E02
PENRM	[MJ]	5.18E01	0	7.76E00	0	0	0	0	0
PENRT	[MJ]	1.64E03	9.63E00	3.42E02	1.44E01	2.19E01	7.81E-01	6.20E00	-5.10E02
SM	[kg]	5.73E00	0	8.79E-02	0	0	0	0	0
RSF	[MJ]	1.23E-24	0	2.31E-22	0	0	0	0	-1.34E-20
RNSF	[MJ]	1.45E-23	0	2.72E-21	0	0	0	0	-1.57E-19
FW	[m ³]	8.70E-01	6.32E-04	2.58E-01	2.66E-03	1.44E-03	6.78E-03	1.51E-03	-5.02E-01

PERE= Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM= Use of renewable primary energy resources used as raw materials; PERT=Total use of renewable primary energy resources; PENRE= Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials; PENRM= Use of non renewable primary energy resources used as raw materials; PENRT=Total use of non renewable primary energy resources; SM= Use of secondary material; RSF=Use of renewable secondary fuel; RNSF=Use of non renewable secondary fuel s; FW= Use of net fresh water

POLIEDRA SKY TECH 60

Resource use for 1 m ²									
Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
PERE	[MJ]	3.54E02	5.57E-01	8.55E01	2.39E00	1.27E00	1.91E-01	8.31E-01	-2.08E02
PERM	[MJ]	0	0	1.87E01	0	0	0	0	0
PERT	[MJ]	3.54E02	5.57E-01	1.04E02	2.39E00	1.27E00	1.91E-01	8.31E-01	-2.08E02
PENRE	[MJ]	1.65E03	9.71E00	3.44E02	1.45E01	2.22E01	7.85E-01	6.20E00	-5.36E02
PENRM	[MJ]	5.15E01	0	7.76E00	0	0	0	0	0
PENRT	[MJ]	1.70E03	9.71E00	3.51E02	1.45E01	2.22E01	7.85E-01	6.20E00	-5.36E02
SM	[kg]	6.14E00	0	9.33E-02	0	0	0	0	0
RSF	[MJ]	1.23E-24	0	2.45E-22	0	0	0	0	-1.34E-20
RNSF	[MJ]	1.45E-23	0	2.87E-21	0	0	0	0	-1.57E-19
FW	[m ³]	9.20E-01	6.38E-04	2.66E-01	2.69E-03	1.45E-03	6.78E-03	1.52E-03	-5.35E-01

PERE= Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM= Use of renewable primary energy resources used as raw materials; PERT=Total use of renewable primary energy resources; PENRE= Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials; PENRM= Use of non renewable primary energy resources used as raw materials; PENRT=Total use of non renewable primary energy resources; SM= Use of secondary material; RSF=Use of renewable secondary fuel; RNSF=Use of non renewable secondary fuel s; FW= Use of net fresh water

POLIEDRA SKY 35 LUX

Resource use for 1 m ²									
Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
PERE	[MJ]	3.09E02	5.53E-01	8.22E01	2.35E00	1.25E00	1.88E-01	8.50E-01	-1.77E02
PERM	[MJ]	0	0	1.87E01	0	0	0	0	0
PERT	[MJ]	3.09E02	5.53E-01	1.01E02	2.35E00	1.25E00	1.88E-01	8.50E-01	-1.77E02
PENRE	[MJ]	1.54E03	9.65E00	3.29E02	1.44E01	2.19E01	7.74E-01	6.34E00	-4.74E02
PENRM	[MJ]	5.10E01	0	7.76E00	0	0	0	0	0
PENRT	[MJ]	1.59E03	9.65E00	3.37E02	1.44E01	2.19E01	7.74E-01	6.34E00	-4.74E02
SM	[kg]	5.08E00	0	8.48E-02	0	0	0	0	0
RSF	[MJ]	3.88E-25	0	2.30E-22	0	0	0	0	-1.37E-20
NRSF	[MJ]	4.55E-24	0	2.70E-21	0	0	0	0	-1.61E-19
FW	[m ³]	8.05E-01	6.34E-04	2.42E-01	2.66E-03	1.44E-03	6.69E-03	1.55E-03	-4.55E-01

PERE= Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM= Use of renewable primary energy resources used as raw materials; PERT=Total use of renewable primary energy resources; PENRE= Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials; PENRM= Use of non renewable primary energy resources used as raw materials; PENRT=Total use of non renewable primary energy resources; SM= Use of secondary material; RSF=Use of renewable secondary fuel; RNSF=Use of non renewable secondary fuel s; FW= Use of net fresh water

LCA results – Output flows and waste categories per declared unit

LCA results – Output flows and waste categories per functional or declared unit

POLIEDRA SKY TECH 50

Wastes input/output flows for 1 m²

Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
HWD	[kg]	4.00E-07	5.07E-10	1.26E-07	3.80E-09	1.15E-09	1.56E-10	6.62E-10	-2.61E-07
NHWD	[kg]	1.75E01	1.51E-03	9.86E00	3.69E-03	3.43E-03	1.52E-01	3.07E01	-1.21E01
RWD	[kg]	4.94E-02	1.75E-05	1.14E-02	5.90E-04	3.97E-05	3.22E-05	6.50E-05	-2.64E-02
CRU	[kg]	0	0	0	0	0	0	0	0
MER	[kg]	0	0	0	0	0	0	0	0
MFR	[kg]	0	0	1.81E-02	0	0	1.39E01	0	0
EEE	[MJ]	0	0	0	0	0	4.96E00	0	0
EET	[MJ]	0	0	0	0	0	8.98E00	0	0

HWD = Hazardous waste disposed; NHWD = Non hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; ; EEE = Exported electrical energy; EET = Exported Thermal Energy

POLIEDRA SKY TECH 60

Wastes input/output flows for 1 m ²									
Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
HWD	[kg]	4.06E-07	5.12E-10	1.30E-07	3.85E-09	1.17E-09	1.57E-10	6.63E-10	-2.62E-07
NHWD	[kg]	1.85E01	1.52E-03	1.02E01	3.73E-03	3.48E-03	1.52E-01	3.07E01	-1.27E01
RWD	[kg]	5.20E-02	1.76E-05	1.16E-02	5.97E-04	4.02E-05	3.22E-05	6.51E-05	-2.80E-02
CRU	[kg]	0	0	0	0	0	0	0	0
MER	[kg]	0	0	0	0	0	0	0	0
MFR	[kg]	0	0	1.81E-02	0	0	1.40E01	0	0
EEE	[MJ]	0	0	0	0	0	4.95E00	0	0
EET	[MJ]	0	0	0	0	0	8.93E00	0	0

HWD = Hazardous waste disposed; NHWD = Non hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; ; EEE = Exported electrical energy; EET = Exported Thermal Energy

POLIEDRA SKY 35 LUX

Wastes input/output flows for 1 m ²									
Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
HWD	[kg]	3.96E-07	5.09E-10	1.25E-07	3.80E-09	1.15E-09	1.55E-10	6.78E-10	-2.67E-07
NHWD	[kg]	1.63E01	1.51E-03	9.58E00	3.69E-03	3.43E-03	1.51E-01	3.14E01	-1.12E01
RWD	[kg]	4.60E-02	1.75E-05	1.12E-02	5.89E-04	3.97E-05	3.18E-05	6.65E-05	-2.41E-02
CRU	[kg]	0	0	0	0	0	0	0	0
MER	[kg]	0	0	0	0	0	0	0	0
MFR	[kg]	0	0	1.81E-02	0	0	1.42E01	0	0
EEE	[MJ]	0	0	0	0	0	4.90E00	0	0
EET	[MJ]	0	0	0	0	0	8.86E00	0	0

HWD = Hazardous waste disposed; NHWD = Non hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; ; EEE = Exported electrical energy; EET = Exported Thermal Energy

LCA results – Biogenic carbon content of product and packaging for 1m²

LCA results - Biogenic carbon content of product and packaging for 1 m²

POLIEDRA SKY TECH 50

Biogenic carbon content of product and packaging for 1 m²

Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
Biog. C in product	[kg]	0	0	0	0	0	0	0	0
Biog. C in packaging	[kg]	0	0	0.39	0	0	0	0	0

Caption: Biog. C in packaging = Biogenic carbon content in packaging; Biog. C in product = Biogenic carbon content in product

POLIEDRA SKY TECH 60

Biogenic carbon content of product and packaging for 1 m²

Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
Biog. C in product	[kg]	0	0	0	0	0	0	0	0
Biog. C in packaging	[kg]	0	0	0.39	0	0	0	0	0

Caption: Biog. C in packaging = Biogenic carbon content in packaging; Biog. C in product = Biogenic carbon content in product



POLIEDRA SKY 35 LUX



Biogenic carbon content of product and packaging for 1 m²

Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
Biog. C in product	[kg]	0	0	0	0	0	0	0	0
Biog. C in packaging	[kg]	0	0	0.39	0	0	0	0	0

Caption: Biog. C in packaging = Biogenic carbon content in packaging; Biog. C in product = Biogenic carbon content in product

Calculation rules

Calculation rules

Declared unit

The calculation refers to the declared unit of 1 m² of curtain wall (POLIEDRA SKY TECH 50, POLIEDRA SKY TECH 60, POLIEDRA SKY 35 LUX).

Assumptions

Where possible, a conservative approach has been adopted, overestimating burdens to prove irrelevance. In other cases, proxy data were selected based on scientific experience, in order to improve the accuracy of the model. Where it was not possible to know the precise composition of materials in the supply chain (due to commercial or industrial confidential suppliers' reasons or due to missing datasets), these have been approximated with LCIs of similar materials, estimated by the combination of available dataset or reconstructed with literature data.

1. In particular for a few components a detailed technical sheet was not available and then assumption have been made:
 - STAG10 (detaching oil in the extrusion process): a fatty acid-based lubricant has been chosen as a proxy.
 - BONDERITE G34/A and BONDERITE 1095 used in the painting plant: the composition of similar Bonderite additives has been used (BONDERITE C-AK 415 ALKALINE and BONDERITE C-IC W-1 AERO ACID DEOXIDIZER known as TURCO WO #1).
2. In general, where not a defined value of emissions, but a range of values is provided as conservative assumption the maximum value is considered.
3. In the billets production PCDD-PCDF emission is declared as a unique emission. This has been modelled as an equal division between polychlorinated dibenzo-p-dioxins and polychlorinated dibenzo-p-furans.
4. As no specific data were available for the production of the 6060 alloy, a general aluminium billet production has been modelled.
5. Paint on profiles is considered to follow same trend as the weight of profiles
6. In case of PA with glass fibre with no available proportion, a 75(PA)/25 (GF) ratio is used
7. In case of components mixtures with no available proportion between components, an equal distribution is considered
8. For double glass manufacturing, as in GaBi database only one size is available (4-16-4), in order to model the missing weight of thicker layers a float glass dataset is used and it is summed up to the given double glass so to reach the real double glass weight
9. For glass suppliers, a conservative distance of 200 km is considered
10. The PCR /EN 17213:2020/(used as useful reference for the declared unit, type of transport means and distances for distribution to retailers and end of life scenarios) is related to windows and doors.

As we assume that other products (facades, doors, shutters) may be similar with relation to such aspects, scenarios from the given PCR are the also used for the other products impacts calculations.

Cut off rules

EN 15804:2012+A2:2019 requires that where there are data gaps or insufficient input data for a unit process the cut-off criteria shall be 1% of renewable and non-renewable primary energy usage and 1% of the total mass of this unit process. The total neglected flows from a product stage must be no more than 5% of product inputs by mass or 5% of primary energy contribution.

The only flows that have been omitted in the study are the flows related to glass spacers. The mass of these inputs are far below 1% of the total inputs to the production process. Moreover the transport from the glass producer to the final assembler and the assembly consumption at the assembler place have been neglected as widely <1%.

Data quality

The data quality can be considered as good. The LCA models have been checked and most relevant flows are considered. Technological, geographical and temporal representativeness is appropriate.

Allocation – upstream data

For all refinery products, allocation by mass and net calorific value has been applied. The specific manufacturing route of every refinery product is modelled and so the impacts associated with the production of these products are calculated individually. Two allocation rules are applied: 1. the raw material (crude oil) consumption of the respective stages, which is necessary for the production of a product or an intermediate product, is allocated by energy (mass of the product * calorific value of the product); and 2. the energy consumption (thermal energy, steam, electricity) of a process, e.g. atmospheric distillation, being required by a product or an intermediate product, are charged on the product according to the share of the throughput of the stage (mass allocation).

Materials and chemicals needed used in the manufacturing process are modelled using the allocation rule most suitable for the respective product. For further information on a specific product, see documentation gabi-software.com.

In addition to the above mentioned allocation methods for refinery products and materials, inventories for electricity and thermal energy generation also include allocation by economic value for some by-products (e.g. gypsum, boiler ash and fly ash). In case of plants for the co-generation of heat and power, allocation by exergy is applied.

Allocation – foreground data

The overall production of METRA comprises further products beside the product considered in this study. Data for thermal and electrical energy as well as auxiliary material refer to the declared product. During data collection the allocation is done via mass, area, pieces or time spent in the machine.

Scenarios and additional technical information

METRA SpA's environmental management system is in compliance with the standard ISO 14001:2015 for activities related to manufacture of aluminium alloy extruded sections by means of extrusion, mechanical processing, and heat treatment phases (Certificate n. EMS- 8598/S).

- Module A1 refers to all raw materials' impacts production with packaging included and all types of energy inputs
- Module A2 includes the raw materials (also auxiliary's and packaging) transports to factory gate
- Module A3 comprises all production activities and wastes treatment and process emissions (both to air and to water).
- Module C1-C2 comprise dismantling activities and transport to end of life treatments
- Module C3-C4 comprise all production activities and wastes treatment and process emissions (both to air and to water). Such activities refer both to Metra direct activities primary data have been used for (such as billets production, extrusion, painting, polyamide addition, cutting and packaging to the assembler) and processes not directly carried out by Metra, but included in the study as necessary for the curtain wall's production (secondary data used in that case). It also includes the impacts linked to transport from the factory gate to the distributor/ manufacturer that is also assembling the curtain wall.
- Module D comprises all the declared benefits and loads from net flows leaving the product system that have not been allocated as co-products (which is the case for flows from A1-A3) and that have passed the end-of waste state (processing up to the end-of waste state or disposal of final residues during the product stage) it's been included in module D. The arising recycling potential for the generated power and thermal energy from incineration at EoL and for the material credits due to recycling process are considered in module D. The benefits and loads beyond the product boundary are covered in module D, relating to the benefits from reuse, recovery and/or recycling potentials of the product, and are included in the analysis of the study as well.

METRA Spa provided the distribution percentage to different types of user, but the transport details used are the ones suggested by the /EN 17213:2020/ (used as useful reference for the declared unit, type of transport means and distances for distribution to retailers and end of life scenarios)

Scenario	GaBi truck	Description	METRA %
Small direct sales	batches GLO: Truck-trailer, Euro 6, up to 28t gross weight / 12,4t payload capacity ts <u-so>	7,5 t truck, 20 % payload, 50 km one way and 50 km return empty. Total 100 km.	16.20
Small through manufacturers	batches local GLO: Truck-trailer, Euro 6, up to 28t gross weight / 12,4t payload capacity ts <u-so>	7,5 t truck, full capacity 50 km and 7,5 t 20% payload, 50 km one way and 100 km return empty. Total 200 km.	25.98
Small through distributors	batches GLO: Truck-trailer, Euro 6, 50 - 60t gross weight / 40,6t payload capacity ts <u-so>	40t truck, full capacity 150 km and 150 km return empty.	55.59
		GLO: Truck-trailer, Euro 6, up to 28t gross weight / 12,4t payload capacity ts <u-so>	
		7,5 t 20% payload, 50 km one way and 50 km return empty. Total 400 km.	
Large-scale project	batches GLO: Truck-trailer, Euro 6, 50 - 60t gross weight / 40,6t payload capacity ts <u-so>	40t truck, full capacity 150 km and 150 km return empty.	2.23

	Composition of the packaging [kg/m ²]
Aluminium spacers	1.195
PE film	0.156
PP fibers	0.020
PVC Tape	0.011
Wooden pallets	1.100
Total kg/m²	2.482

Module A5 has not been included, but the following materials production for the packaging added by Metra have been taken into account for 1 m² of curtain walls (only the production materials' impact has been considered). The packaging added by the local manufacturer/distributor has not been included.

- Module B is not considered: for B1 only energy-related emissions would be relevant but such impact shall be calculated at the building level as there are no power operated devices in the product under study. From B2 to B6 module no standard scenarios are available.
- Modules C1 (dismantling) and C2 (transport to end of life treatment) are considered. 100 km has been assumed as transport distance
- Modules C3 (recycling and incineration with energy recovery) and C4 (landfilling) consider the end of life scenarios of the product, considering all components of the curtain walls. The percentages to the given scenarios has been suggested by the /EN 17213:2020/ (used as useful reference for the declared unit, type of transport means and distances for distribution to retailers and end of life scenarios) for the different materials shown in the table below:

Material	EoL treatment
Glass	70% landfilling and 30% recycling
Non glass-metals	5% landfilling and 95% recycling
Non glass-plastic	5% landfilling and 95% incineration with energy recovery

- Module D deriving from the end of life scenarios.

References

EN ISO 14044:2006 Environmental Management – Life Cycle Assessment – Requirements and Guidelines.

EN ISO 14025:2011-10, Environmental labels and declarations - Type III environmental declarations - Principles and procedures.

EN 15804:2012+A2:2019: Sustainability of construction works -Environmental Product Declarations - Core rules for the product category of construction products

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