ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	Aurubis Finland Oy
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-AUR-20160218-CBA1-EN
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Valid to	08/01/2023

Nordic Brown

Aurubis Finland Oy

Institut Bauen und Umwelt e.V.

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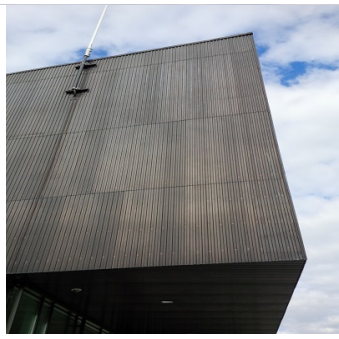

General Information

Aurubis Finland Oy	Nordic Brown
Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the Declaration** Aurubis Finland Oy P.O. Box 60 FI-28101 Pori, Finland
Declaration number EPD-AUR-20160218-CBA1-EN	**Declared product / Declared unit** 1 kg Nordic Brown
This Declaration is based on the Product Category Rules: Building metals, 07.2014 (PCR tested and approved by the SVR)	**Scope:** This Core environmental product declaration refers to copperstripes and copper sheets produced by Aurubis at Pori Oy site, Finland. Depending on the surface quality, the product is available in different qualities. This EPD refers to the product Nordic Brown. The Life Cycle Assessment is based on data from Aurubis Finland Oy in FI-28101 Pori. The plant is located in Pori, Finland. The data is based on the production year 2015.The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.
Issue date 09/01/2017	**Verification** The CEN Norm /EN 15804/ serves as the core PCR Independent verification of the declaration according to /ISO 14025/ ☐ internally ☒ externally
Valid to 08/01/2023	
Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)	
Dr. Burkhart Lehmann (Managing Director IBU)	Manfred Russ (Independent verifier appointed by SVR)

Product

Product description
The Nordic Brown product consists of 100% Cu-DHP according to /EN 1172/, i.e. oxygen-free phosphorus de-oxidised copper with limited residual phosphorus. Nordic Brown is pre-oxidised at Aurubis' factory to give straightaway the same oxidised brown surface that otherwise develops over time in the environment. The thickness of the oxide layer determines the colour: both Nordic Brown Light and the darker Nordic Brown versions are available. Nordic Brown is darker than Brown Light in the beginning due the thicker oxide layer. Colour of the Brown Light is light or medium brown and will change darker by time.

Nordic Brown is available in sheets or coils.

- Thickness range: 0.5 – 1.5 mm
- Maximum width: 1000 mm.

The oxide layer of the strips and sheets consists of Cu2O and CuO oxides.

This declaration is valid for the product Nordic Brown and Nordic Brown Light.

Application
Nordic products are used for facades, roofs , roof drainage systems and other architectural elements of all shapes, as well as interior applications, decorations, ceilings, wall claddings

Relevant standards are: /EN 1172/ in combination with /EN 1976/, /EN 1652/, /EN 504/, /EN 14783/.

Technical Data

Physical and mechanical properties

Name	Value	Unit
Coefficient of thermal expansion	17	$10^{-6}K^{-1}$
Tensile strength	220 - 300	N/mm^2
Melting point	1083	°C
Electrical conductivity at 20°C (min. 46)	46 - 52	$\Omega^{-1}m^{-1}$
Density	8940	kg/m^3
Thermal conductivity (at 20°C)	335	%W/Cm
Specific heat	385	J/kg K
Proof strength	min 140 / 250	N/mm^2
Elongation	min 8 / 33	%
Hardness	40 - 95	HV

Base materials / Ancillary materials
The Nordic Brown products consist of 100 % Cu-DHP according to /EN 1172/, i.e. oxygen-free phosphorus de-oxidised copper with limited residual phosphorus. The degree of purity is at least 99.90% copper in accordance with /EN 1976/ "Copper, semi-finished". The content of phosphorus is 0.015 – 0.040%. Mainly internal and external scrap (secondary material) is used in production (at least 97%). Max. 3% primary material is used within the production process. The oxide layer of the strips and sheets consists of Cu2O and CuO oxides.

Additives:

- Biodegradable rolling oil and emulsion which is used for cooling and lubrication during the rolling process
- Benzotriazole which is used as anticorrosive agent
- For the oxidation process, rolling oil and emulsion is removed from the surface layer. In a further process step, a thermo-chemical oxidation process takes place and the oxide layer is formed directly from the rolled copper surface.

Reference service life
Copper has a long service life and durability. The rates of copper elutriation under normal atmospheric weathering are between 0.7 g/m²*a and 1.5g/m²*a.

LCA: Calculation rules

Declared Unit
The declared unit is 1 kg of Nordic Brown.

Declared unit

Name	Value	Unit
Declared unit	1	kg
Conversion factor to 1 kg	1	-

System boundary
Type of the EPD: cradle-to-gate - with options. According to "System limits" outlined in section 5.5. of the PCR, Part A: “Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report” the following life cycle stages are considered:

- Production, upstream raw materials & energy (Module A1-A3)
- Waste processing for reuse, recovery or recycling (Module C3)
- Benefits and loads beyond the product system boundary (Module D)

Comparability
Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to /EN 15804/ and the building context, respectively the product-specific characteristics of performance, are taken into account. The used background database has to be mentioned.
For life cycle modelling of the considered products, the´/GaBi ts Software/, developed by thinkstep AG, has been used. All relevant background datasets are taken from
the /GaBi ts Software/ database. The datasets from the GaBi database are documented in the online documentation /GaBi ts Data/.

LCA: Scenarios and additional technical information

End of life (C1 - C4)

Name	Value	Unit
Collected separately	1	kg
Recycling	0.99	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Name	Value	Unit
Net scrap substituting primary material	0,0192	kg
Material loss	1	%

LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

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	MNR	MNR	MNR	MND	MND	MND	MND	X	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 kg Nordic Brown

Parameter	Unit	A1-A3	C3	D
Global warming potential	[kg CO_2-Eq.]	5.28E-1	0.00E+0	-4.04E-2
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	1.03E-11	0.00E+0	-1.98E-12
Acidification potential of land and water	[kg SO_2-Eq.]	1.61E-3	0.00E+0	-2.59E-4
Eutrophication potential	[kg $(PO_4)^{3-}$-Eq.]	1.30E-4	0.00E+0	-2.16E-5
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	1.43E-4	0.00E+0	-1.38E-5
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.27E-5	0.00E+0	-8.29E-6
Abiotic depletion potential for fossil resources	[MJ]	6.15E+0	0.00E+0	-2.84E-1

RESULTS OF THE LCA - RESOURCE USE: 1 kg Nordic Brown

Parameter	Unit	A1-A3	C3	D
Renewable primary energy as energy carrier	[MJ]	1.25E+0	IND	IND
Renewable primary energy resources as material utilization	[MJ]	0.00E+0	IND	IND
Total use of renewable primary energy resources	[MJ]	1.25E+0	0.00E+0	-7.09E-2
Non-renewable primary energy as energy carrier	[MJ]	7.93E+0	IND	IND
Non-renewable primary energy as material utilization	[MJ]	0.00E+0	IND	IND
Total use of non-renewable primary energy resources	[MJ]	7.93E+0	0.00E+0	-3.29E-1
Use of secondary material	[kg]	9.43E-1	0.00E+0	0.00E+0
Use of renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0
Use of non-renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0
Use of net fresh water	[m^3]	4.32E-3	0.00E+0	-6.54E-6

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 kg Nordic Brown

Parameter	Unit	A1-A3	C3	D
Hazardous waste disposed	[kg]	2.02E-6	0.00E+0	2.16E-7
Non-hazardous waste disposed	[kg]	3.06E-3	0.00E+0	-3.55E-4
Radioactive waste disposed	[kg]	7.20E-4	0.00E+0	-1.60E-5
Components for re-use	[kg]	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	[kg]	0.00E+0	1.91E-2	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	0.00E+0	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0	0.00E+0

References

Institut Bauen und Umwelt
Institut Bauen und Umwelt e.V., Berlin(pub.): Generation of Environmental Product Declarations (EPDs);
www.ibu-epd.de

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

EN 15804
EN 15804:2012-04+A1 2013: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

EN 1172
EN 1172:2011: Copper and copper alloys - Sheet and strip for building purposes

EN 1976
EN 1976:2012: Copper and copper alloys - Cast unwrought copper products

EN 1652
EN 1652:1997: Copper and copper alloys - Plate, sheet, strip and circles for general purposes

EN 504
EN 504:1999: Roofing products from metal sheet - Specification for fully supported roofing products from copper sheet;

EN 14783
EN 14783:2013: Fully supported metal sheet and strip for roofing, external cladding and internal lining - Product specification and requirements;

GaBi ts Data
GaBi 7.3 dataset documentation for the software-system and databases, LBP, University of Stuttgart and thinkstep AG, Leinfelden-Echterdingen, 2016 (http://www.gabi-software.com/international/databases/gabi-data-search/)

GaBi ts Software
Software and database for life cycle Engineering, LBP, University of Stuttgart and thinkstep AG, Leinfelden-Echterdingen, 2016

Publisher
Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Programme holder
Institut Bauen und Umwelt e.V.
Panoramastr 1
10178 Berlin
Germany

Tel +49 (0)30 - 3087748- 0
Fax +49 (0)30 – 3087748 - 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Author of the Life Cycle Assessment
thinkstep AG
Hauptstraße 111
70771 Leinfelden-Echterdingen
Germany

Tel +49 711 341817-0
Fax +49 711 341817-25
Mail info@thinkstep.com
Web **www.thinkstep.com**

Owner of the Declaration
Aurubis Finland Oy
P.O. Box60
28101 Pori
Finland

Tel +358 2 6266420
Fax +358 2 6266420
Mail info@aurubis.com
Web **www.aurubis.com**