Blu-Core® G5 Filling

This Environmental Product Declaration (EPD) discloses potential environmental outcomes compliant with ISO 14025 for business to business communication. The declared product Blu-Core G5 Filling was made by Chevron Crushtech in South Africa in 2017 for sale for applications in industrial sectors.

Chevron Crushtech is a supplier of post- consumer recycled filling and building sand to the construction industry.

They get their material input from broken bricks, excavated soil and building rubble from the local Gauteng area.

The material gets crushed and the particle size defines whether it gets sold as Building Sand, G5, G6 or G7 Filling.

G5 Filling has a higher stone to fines ratio, which gives it a higher load bearing strength.

The G7 Filling has the lower stone to fines ratio and has therefore the lowest load bearing strength of the 3 filling products.

Chevron Crushtech is a financial supporter of PEER Africa.

The company is starting up a social program to educate the local community how to dispose of rubbish correctly.

The aim is to avoid as well as clean-up illegal rubble dumping.

Figure 1 Input for Blu-Core G5 Filling

Blu-Core® G5 Filling

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Different program EPDs may not be comparable as e.g. Australian transport is more than elsewhere. **Further explanatory information is found at** http://www.globalgreentag.com/ or contact: certification1@globalgreentag.com

Blu-Core® G5 Filling

1. Details of This Declaration

Program Operator	GreenTag Global Pty Ltd hereafter called Global GreenTag noted at www.globalgreentag.com
EPD Number	CHC-002-2018
Date issue	2 July 2018
Validity	2 July 2021
Reference PCR	Compliant with PCR UCM: 2016 Unreinforced Concrete Mixtures
Time	Made in and sold from 2017 for 60 years use
Geography	Made in South Africa. Uses are assumed as for South Africa.
Application	Construction Sector
Functional unit	Blu-Core® G5 Filling /kg 60 year use cradle to fate

2. Product Characterisation

Definition	Blu-Core G5 Filling by Chevron Crushtech for use as filler in e.g. bricks, hot mix asphalt and bulk mix concrete in the construction sector.
Standard	ASTM D1883-16 Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils

3. Verification of this Declaration

This EPD was approved on 2 July 2018 according to requirements of ISO14025 8.1.3b.

Role	Name	Position	Signature
PCR Review Chair	Murray Jones	Ecquate Pty Ltd CEO	02-07-2018
LCBA Developer	Delwyn Jones	The Evah Institute	02 07 2018
LCI Developer	Mathilde Vlieg	Vlieg LCA Consultant	16 07 2018
LCARate, LCIA & EPD Developer	Mathilde Vlieg	Global GreenTag Researcher	
3rd Party LCI Verifier	Shloka Ashar	Global GreenTag Lead Auditor LCI Verifier	16/07/2018
Internal EPD Audit	David Baggs	Global GreenTag CEO & Program Director	

4. Sustainability Assessment Scores

Table 1 lists Global GreenTag Sustainability Assessment Criteria (SAC) scores prior to weighting and then used to determine the GreenTag EcoPOINT[1].

Table 1 Normalised GreenTag EcoPOINT & SAC Scores

Category Potential	Results (-1 to +1)
Building Synergy	1.00
Health & Ecotoxicity	0.00
Biodiversity	-0.50
LCA Score	0.71
Greenhouse Gas Emissions CO_{2eq}[2]	0.21
Social Responsibility	-0.25
GreenTag EcoPOINT	0.11

SAC scores are normalised against business as usual (BAU) product performing comparable functions under the same category rules. Lower scores show better environmental and social benefits with fewer impacts and damages. Considering sustainability:

- worst case BAU results = 1.0,
- neutral = 0.0 and
- net positive benefit = -1.0

5. Type 1 Ecolabel

The declared product Type 1 Ecolabel achieved

Global GreenTag^{CertTM}	Platinum Streamlined

6. Base Material Origin and Detail

Table 2 lists key components by function, type, key operation as well as source and % mass amount.

Table 2 Base Material

Function	Component	Production	Origin	%
Filler	Broken Brick	Acquire, Sort, Crush, Sieve, Wash, Haul	South Africa	>5<15
Filler	Concrete	Acquire, Sort, Crush, Sieve, Wash, Haul	South Africa	>35 <50
Filler	Excavated Soil	Acquire, Sort, Sieve, Grind, Haul	South Africa	>40<60

[1] http://www.ecospecifier.com.au/knowledge-green/glossary.aspx#greentagecopoint
[2] Stocker et al (eds.) Climate Change 2013: The Physical Science Basis, CH8, IPCC AR5, Cambridge U Press, UK.

7. Life Cycle Inventory Results

Table 3 lists resource use per functional unit, with transport as defined in Figure 2, across phases:

- cradle to gate including supply, manufacture and upstream;
- design and construction from delivery to site and installation;
- use and operation including maintenance, repair, replacement refurbishment and
- end-of-life from deconstruction, reuse, demolition, recycling and disposal.

Cradle to Gate includes resource acquisition, manufacture and delivery to the new site. Cradle to Grave results are from modelling the aggregate usage for 32MPa concrete building slab to end of life fate.

Table 3 Inventory Results / Functional Unit

Total Input use of	Unit	Cradle to Gate	Cradle to Grave
Product Mass	kg	1.00	1.00
Embodied Water	kl	0.07	0.12
Recycled Material	kg	1.00	1.00
Fuel + Feedstock	MJ	0.33	0.41

8. Life Cycle Impact Results

Table 4 shows Life Cycle Assessment (LCA) Eco-Indicator 99 results for product use.

Table 4 Potential Impact Results / Functional Unit

Evaluation Category	Unit	Cradle to Gate	Cradle to Grave
EcoIndicator 99	ecopoint	0.016	0.0083
Carbon Dioxide Equivalent Emissions	kg CO_{2e}	0.019	0.021
Ecosystem Quality Damages	PDF*m^2*yr	7.2E-07	2.6E-07
Human Health Damages	DALY	5.0E-05	2.4E-05
Ozone Depletion	kg $R11_e$	1.8E-14	3.1E-14
Acidification	kg SO_{2e}	0.0036	0.0012
Fossil Fuel Depletion	$MJ_{surplus}$	0.025	0.030
Mineral Resource	$MJ_{surplus}$	1.2E-04	1.2E-04

9. Whole of life Performance

Health Protection	The product does not contain levels of carcinogenic, toxic or hazardous substances that warrant ecological or human health concern cradle to grave. It passed the Ecospecifier Cautionary Assessment Process (ESCAP) and no issues or red light concerns existed for product human or ecological toxicity.
Effluent	The LCI results and ESCAP raised no red light concerns in emissions to water[3].
Waste	Cradle to grave waste to landfill was non-hazardous.
Environmental Protection	The maker avoids waste, toxics, and pollution by recycling clean building rubble. Their policy and practice is to employ modern European equipment that meets environmental regulations for dust and effluent emissions.
Environmental Health Effects	No other potential in-use impacts on environment or health are known.

3 According with national standards in ANZECC Guideline For Fresh & Marine Water Quality (2000)

10. Installation, Use & Disposal

Service life	Residential and commercial builds vary but 60 year life is assumed typical.
Health Safety & Environment	Apart from compliance to occupational and workplace health safety and environmental laws no additional personal protection is considered essential.
Residual Scrap	Installation scrap of 5% is assumed with fate to recycling.
Maintenance	Recommended maintenance raises no ecosystem or human health concerns.
Recycling	Home mill, fabrication and installation scrap is reworked into new product.
Re-use	This study assumes 60% product is serviceable for reuse over 40 more years.
Disposal	It assumes 30% is recycled and 70% landfilled after this current lifetime of use.

11. Life Cycle Benefit Potential

Manufacturer's details confirm the product comprises 100% post consumer scrap for each declared unit. This product's use has the following types of benefits and positive outcomes.

Urban space, social and human health and safety benefits arise from reclaiming material.

Benefits of Avoided Waste by Reclaiming Scrap

Resource Supply Security	Extends access to existing aggregates for urban and industrial development
	Material, time and money saved in reuse not squandered delivering to or in landfill
	Retains resources of aggregates now depleted for many capital cities worldwide
Land Use	Saves natural land use otherwise lost to larger quarries for getting natural aggregates
	Saves landfill space by using scrap as value-added fill instead of lowest-value waste
	Brakes climate change via carbon sequestered & retained in natural unquarried land
Social Benefits	Alternatives easing pressures on pricing as well as availability, scheduling and access
	Less price and supply pressure for illegal aggregate mining linked violence and murder

Biodiversity, climate and agricultural security benefits flow from avoided worst illegal aggregate mining.

Benefits from avoided worst case illegal aggregate mining

Secure Biodiversity	Retains extensive natural foraging land 0.032 hectares per year/kg product
	Retains plants for foraging animals, herds and biodiversity @ 5.17kg/kg product
Climate Security	Strongest brake on climate change is carbon sequestrated in biodiverse land use
	Protects wet biomass on natural land sequestering @13.6kg CO_{2e}/kg product
Agricultural Security	Retains natural forage of wet biomass for grazing livestock @ 5.17kg/kg product
	Retains foraging plants for microbes, birds, bees, insects & herds @ 5.17kg/kg product

Local as well as global benefits flow from fewer fossil fuel emissions for shortest distance freight.

Benefits of Avoiding Fossil Fuel Emissions in Transport

Urban Space & Security	Road traffic flow and safety without disposal and landfill associated congestion and risk
	Drivers and vehicles nearer to site not away to larger and or more distant quarries
Human Health & Safety	Safer occupational, workplace and environmental health without disposal or landfill
	Safer health, lower risk and better traffic flow without disposal and landfill activity
Environmental Health	Freedom from photochemical smog from vehicle exhausts
	Free from inhalable dust, volatile organics and carcinogenic compounds from vehicles
Global Built & Environmental Health	Climate security without greenhouse gas from longer distance freight
	Repairing Stratospheric Ozone Layer without longer distance fossil fuel emissions
	Safer waterways for aquatic and marine wildlife and air for buildings without acid rain

12. Life Cycle Assessment Method

LCA Author	The Evah Institute as described at *www.evah.com.au*
Study Period	Factory data was collected from 2015 to 2018
LCA Method	Compliant with ISO 14040 and ISO 14044 Standards
LCIA method	EcoIndicator 99 Life Cycle Impact (LCIA) Assessment
Scope	Cradle to Fate including all supply chain phases and stages depicted in Figure 2.
Phases	The LCA covered all known flows in all known stages cradle to end of life fate.
Assumptions	Use is to typical Australian Facility Management professional practice.
Scenarios	Use, cleaning, maintenance plus disposal and re-use were scenario-based using Facility Management Association denoted and published typical operations.
System Boundaries	The LCA covers all operations in the system boundary depicted in Figure 3.
Processes	All known processes are included from resource acquisition, water, fuel & energy use, power generation & distribution, freight, refining, intermediates, manufacture, scrap re-use, packing and dispatch, installation, use, maintenance and landfill. All significant waste and emission flows from all supply chain operations involved to make, pack and install the product are included.

Life Cycle Stages	Product			Construct-ion		Use stage related to the building Fabric					Operation		End of Life				Beyond system Boundary
Modules	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Unit Operations	Raw material supply	Transport	Manufacture	Transport	Construction	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy use	Operational Water use	Demolition	Transport	Waste Processing	Disposal	Potential Reuse Recovery and Recycling load &benefit
Modeling	Actual			Scenarios													
Cradle to Gate	M	M	M														
Cradle to Gate +options	M	M	M	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Cradle to Grave	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	O

Figure 3 Phases and Stages Cradle to Grave

Evah industry databases cover all known domestic and global scope 1 and 2 operations. They exclude scope 3 burdens from capital facilities, equipment churn, noise and dehydration as well as incidental activities and employee commuting. The databases exist in top zones of commercial global modelling and calculating engines. Quality control methods are applied to ensure:

- Coverage of place in time with all information[4] for each dataset noted, checked and updated;
- Consistency to Evah guidelines[5] for all process technology, transport and energy demand;
- Completeness of modeling based on in-house reports, literature and industry reviews;
- Plausibility in 2 way checks of LCI input and output flows of data checked for validity, plus
- Mathematical correctness of all calculations in mass and energy balance cross checks.

Electricity supply models in active databases are updated annually. As each project is modelled and new data is available the databases are updated and audited by external Type 1 ecolabel certifiers.

[4] Jones D G (2004) LCI Database for Commercial Building Report 2001-006-B-15 Icon.net, Australia
[5] Evah Tools, Databases and Methodology Queensland, Australia at http://www.evah.com.au/tools.html

13. Data Sources Representativeness and Quality

Primary data used for modelling the state of art of each operation includes all known process for:

- Technology sequences;
- Energy and water use;
- Landfill and effluent plus
- Reliance on raw and recycled material;
- High and reduced process emissions;
- Freight and distribution systems.

Primary data is sourced from clients, Annual Reports and their publications on corporate locations, logistics, technology use, market share, management systems, standards and commitment to improved environmental performance. Information on operations is also sourced from client:

- Supply chain mills, their technical manuals, corporate annual reports and sector experts, and
- Manufacturing specifications websites and factory site development license applications.

Background data is sourced from the International Energy Agency, IBISWorld, USGS Minerals, Franklin Associates, Boustead 6, Plastics Europe, CML2, Simapro 8, EcoInvent 3 and NREL USLCI model databases. Information on operations is also sourced from:

- Library, document, NPI and web searches, review papers, building manuals and
- Global Industry Association and Government reports on Best Available Technology (BAT).

For benchmarking, comparison and integrity checks inventory data is developed to represent BAT, business as usual and worst practice options with operations covering industry sector supply and infrastructure in Australia and overseas.

Such technology, performance and license conditions were modelled and evaluated across mining, farming, forestry, freight, infrastructure and manufacturing and building industry sectors since 1995.

As most sources do not provide estimates of accuracy, a pedigree matrix of uncertainty estimates to 95% confidence levels of Geometric Standard Deviation[2] (σ_g) is used to define quality as in Table 5[6]. No data set with >±30% uncertainty is used.

Table 5 Data Quality Uncertainty (U) for 2017-18

Metric σ_g	U ±0.01	U ±0.05	U ±0.10	U ±0.20	U ±0.30
Temporal	Post 2015	Post 2010	Post 2005	Post 2000	Pre 2000
Duration	>3yr	3yr	2yr	1yr	<1yr
Data Source	Process	Line	Plant	Corporate	Sector
Technology	Actual	Comparable	Within Class	Conventional	Within Sector
Reliability on	Site Audit	Expert verify	Region Report	Sector Report	Academic
Precision to	Process	Line	Plant	Company	Industry
Geography	Process	Line	Plant	Nation	Continent
True of the	Process	Mill	Company	Group	Industry
Sites cover of	>50%	>25%	>10%	>5%	<5%
Sample size	>66% trend	>25% trend	>10% batch	>5% batch	Academic
Cut-off mass	0.01%	0.05%	0.1%	0.5%	1%
Consistent to	±0.01	<±0.05	<±0.10	<±0.20	<±0.30
Reproducible	>98% confidence	>95%	>90%	>80%	<70%
Certainty	Very High	High	Typical	Poor	>±0.30 unused

[6] Evah Institute data quality control system accords with UNEP SETAC Global LCI Database Quality 2010 Guidelines

14. Supply Chain Modelling Assumptions

Australian building sector rules and Evah assumptions applied are defined in Table 6.

Table 6 Scope Boundaries Assumptions and Metadata

Quality/Domain	National including Import and Export
Process Model	Typical industry practice with currently most common or best (BAT) technology
Resource flows	Regional data for resource mapping, fuels, energy, electricity and logistics
Temporal	Project data was collated from 2015 to 2017
Geography	Designated client, site, regional, national, Pacific Rim then European jurisdiction
Representation	Designated client, their suppliers and energy supply chains back to the cradle
Consistency	Model all operations by known given operations with closest proximity
Technology	Pacific Rim Industry Supply Chain Technology typical of 2015 to 2018
Functional Unit	Typical product usage with cleaning& disposal/m^2 over the set year service life
System Control	
Primary Sources	Clients and suppliers mills, publications, websites, specifications & manuals
Other Sources	IEA 2018, GGT 2018, Boustead 2013, Simapro 2016, IBIS 2018, EcoInvent 2018
Data mix	Power grid and renewable shares updated to latest IEA 2018 reports
Operational	Company data for process performance, product share, waste and emissions
Logistics	Local data is used for power, fuel mix, water supply, logistics share & capacity
New Data Entry	VliegLCA, Evah Institute 2018; Global Green Tag Researchers 2018
Data Generator	Manufacturers, Evah Institute 2018; GGT 2018; Meta: IBIS 2018, Other pre 2018
Data Publisher	The Evah Institute Pty Ltd to Global GreenTag and designated client only
Persons input	All contributors cited in Evah & Global GreenTag records or websites
Data Flow & Mix	
System Boundary	Earth's cradle of all resource & emission flows to end of use, fitout or build life
System flows	All known from and to air, land, water and community sources & sinks
Capital inclusions	Natural stocksΔ, industry stockpilesΔ, capital wear Δ, system losses and use
Arid Practice	Dry technology adopted, Water use is factored by 0.1 as for e.g. Mining
Transportation	Distance >20% than EU; >20% fuel efficient larger vehicles, load & distance
Industrial	Company or industry sector data for manufacturing and minerals involved
Mining	All raw material extraction is based on Australian or Pacific Rim technology
Imported fuel	Mix is from nearest sources is e.g. UAE, SE Asia, Canada or New Zealand
Finishes	Processing inputs with finishing burdens are factored in. If not that is denoted
Validation	
Accuracy	10^{th} generation study is ± 5 to 15% uncertain due to some background data
Completeness	All significant operations are tracked and documented from the cradle to grave
Precision	Tracking of >90% flows applies a 90:10 rule sequentially to 99.9% and beyond
Allocation	%100 to co products on reaction stoichiometry by energetic or mass fraction
Burdens	All resource use from & emissions to community air land, water are included
Plausibility	Results are checked and benchmarked against BAT, BAU & worst practice
Sensitivity	Calculated U is reported & compared to libraries of Bath U RICE & EcoInvent 3.2
Validity Checks	Are made versus Plastics Europe, Ecobilan, GaBi & or Industry LCA Literature

15. References for this LCA & EPD

Australian & New Zealand (ANZECC) Guidelines For Fresh & Marine Water Quality (2000) http://www.environment.gov.au/water/quality/national-water-quality-management-strategy

Basel Convention (2011) Control of Transboundary Movement of Hazardous Waste & Disposal http://www.basel.int/portals/4/basel%20convention/docs/text/baselconventiontext-e.pdf

Boustead (2014) Model 6 LCI database http://www.boustead-consulting.co.uk/publicat.htm USA & UK

EcoInvent (2016) LCI Model 3 database http://www.ecoinvent.ch/ EcoInvent, Switzerland

Evah (2016) LCA Tools, Databases & Methodology at http://www.evah.com.au/tools.html

Franklin Associates (2016) US LCI Database http://www.fal.com/index.html Eastern Research Group US

GreenTag™ Certification (2016) http://www2.ecospecifier.org/services_offered/greentag_certification

GreenTag™ (2016) Product Category Rules http://www.globalgreentag.com/greentag-epd-program

Jones D., Mitchell. P. & Watson P. (2004) LCI Database for Australian Commercial Building Material: Report 2001-006-B-15, Sustainable Built Assets, CRC for Construction Innovation

Jones D.G et al. (2009) Chapter 3: Material Environmental LCA in Newton P et al., (eds) Technology, Design & Process Innovation in the Built Environment, Taylor & Francis, UK

IBISWorld (2014) Market Research, http://www.ibisworld.com.au/ IBISWorld Australia

International Energy Agency (2016) Energy Statistics http://www.iea.org/countries/membercountries/

ISO 9001:2008 Quality Management Systems Requirements

ISO 14001:2004 Environmental management systems: Requirements with guidance for use

ISO 14004:2004 EMS: General guidelines on principles, systems & support techniques

ISO 14015:2001 EMS: Environmental assessment of sites & organizations (EASO)

ISO 14020:2000 Environmental labels & declarations — General principles

ISO 14024:2009 Environmental labels & declarations -- Type I Principles & procedures

ISO 14025:2006 Environmental labelling & declarations Type III EPDs Principles & procedures

ISO 14031:1999 EM: Environmental performance evaluation: Guidelines

ISO 14040:2006 EM: Life cycle assessment (LCA): Principles & framework

ISO 14044:2006 EM: LCA: Requirement & guideline for data review: LCI; LCIA, Interpretation results

ISO 14064:2006 EM: Greenhouse Gases: Organisation & Project reporting, Validation & verification

ISO 15392:2008 Sustainability in building construction General principles

ISO 15686-1:2011 Buildings & constructed assets Service life planning Part 1: General principles

ISO 15686-2:2012 Buildings & constructed assets Service life (SL) planning Part 2: prediction

ISO 15686-8:2008 Buildings & constructed assets SL planning Part 8: Reference & estimation

ISO 21929-1:2011 Sustainability in building construction Sustainability indicators Part 1: Framework

ISO 21930:2007 Building construction: Sustainability, Environmental declaration of building products

ISO/TS 21931-1:2010 Sustainability in building construction: Framework for assessment, Part 1:

ISO 21932:2013 Sustainability in buildings and civil engineering works -- A review of terminology

Plastics Europe (2016) Portal http://www.plasticseurope.org/plastics-sustainability/eco-profiles.aspx

Pre (2016) SimaPro 8 Software, The Netherlands http://www.pre-sustainability.com/simapro-manuals

Myhre et al, 2013, Anthropogenic and Natural Radiative Forcing Chapter 8 in Stocker et al (eds.) Climate Change 2013, AR5 of the IPCC, Cambridge U Press UK. http://www.ipcc.ch/report/ar5/wg1/

Roache S. K. (2012) IMF Report WP/12/115 China's Impact on World Commodity Markets http://www.imf.org/external/pubs/ft/wp/2012/wp12115.pdf International Monetary Fund

UNEP (2016) Persistent Organic Pollutants http://www.chem.unep.ch/pops/ The UN

USLCI (2016) Life-Cycle Inventory Database https://www.lcacommons.gov/nrel/search, USA

U.S. Geological Survey National Minerals (2016) http://minerals.usgs.gov/minerals/pubs/country/ USA

US EPA (2016) Database of Sources of Environmental Releases of Dioxin like Compounds in U.S http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=20797 p 1-38, 6-9, USA

16. Reviewers Report Conclusions

The independent LCA reviewer's report confirmed that the LCA project report and addition information addressed the EPD. The verifier, Shloka Ashar, was not involved in developing the LCA or EPD and has no conflict of interests from their organisational position. While the report is confidential its conclusions confirmed that documentation according to set ISO Standard requirements was provided including evidence from the:

The Evah Institute, the LCA developer:

a) Recipes of input and output data of unit processes used for LCA calculations √

b) Datasheets of measures, calculations, estimates and emails with sources as in Table 6 √

e) References to literature and databases from which data was extracted as noted in Table 6 √

g) Notes on supply chain processes and scenarios satisfying requirements of this Standard √

i) Embodied Energy shares as used for sensitivity analyses re ISO 14044:2006, 4.5.3.3 √

j) Proof percentages or figures in calculations in the end of life scenario √

k) Notes on proof of % and allocation calculations √

o) All operations covered Vs criteria and substantiation used to determine system boundaries √

Product Manufacturer in:

c) Specifications used to create the manufacturer's product √

d) Citations, references, specifications or regulations & data showing completeness √

f) Specification demonstrating that the building product can fulfil the intended use √

The Certifier Global GreenTag on:

l) Notes and calculation of averages of different locations yielding generic data √

m) Substantiating additional environmental information ISO 14025:2006, 7.2.4 √

n) Procedures for data collection, questionnaires, instructions, confidentiality deeds √

Requiring No Evidence:

As the EPD is cradle to grave as well as PCR compliant the independent reviewer did not need to:

h) Substantiate a few stages as all stages were substantiated √

p) Substantiate alternatives when no other choices and assumptions were applied √

q) Demonstrate consistency for few stages as the same rules in Tables 5 and 6 applied to all. √

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Further and explanatory information is found at

http://www.globalgreentag.com/

or contact:

certification1@globalgreentag.com

Global GreenTagCertTM EPD Program

Environmental Product Declaration

Compliant to ISO 14025