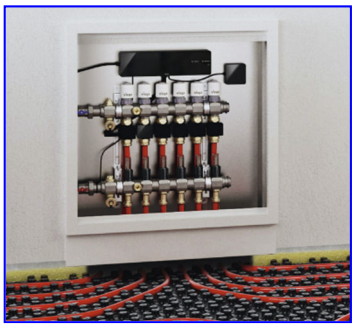
Environmental Product Declaration (EPD)

Declaration code EPD-VFT-GB-67.0



Viega GmbH & Co. KG

surface temperature control

Fonterra Surface temperature control

Basis:

DIN EN ISO 14025
EN 15804 + A2

Company EPD
Environmental
Product **D**eclaration

Publication date:
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Environmental Product Declaration (EPD)

Declaration code EPD-VFT-GB-67.0

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Declaration holder	Viega GmbH & Co. KG Viega Platz 1 57439 Attendorn, Germany www.viega.de
Declaration code	EPD-VFT-GB-67.0
Designation of declared product	Fonterra Surface temperature control
Scope	Fonterra surface temperature control systems for heating and cooling rooms.
Basis	This EPD was prepared on the basis of EN ISO 14025:2011 and DIN EN 15804:2012+A2:2019. In addition, the "Allgemeiner Leitfaden zur Erstellung von Typ III Umweltproduktdeklarationen" (General guideline for preparation of Type III Environmental Product Declarations) applies. The Declaration is based on the PCR Documents "PCR Part A" PCR-A-1.0:2023 and "Surface temperature control" PCR-FT-1.0:2023
Validity	Publication date: 01.10.2024 / Last revision: 19.11.2024 / Valid until: 01.10.2029 This verified Company Environmental Product Declaration (company EPD) applies solely to the specified products and is valid for a period of five years from the date of publication in accordance with DIN EN 15804.
LCA Basis	The LCA was prepared in accordance with DIN EN ISO 14040 and DIN EN ISO 14044. The base data includes the data collected at production plant of company Viega GmbH & Co. KG, and the generic data derived from the Ecoinvent 3 data base (v3.10.1, 28.11.2023) and Ecoinvent EN 15804. LCA calculations were carried out for the included “cradle to grave” including all upstream chains (e.g. raw material extraction, etc.).
Notes	The ift-Guidance Sheet “Conditions and Guidance for the Use of ift Test Documents” applies. The declaration holder assumes full liability for the underlying data, certificates and verifications.

Christoph Seehauser Deputy Head for Sustainability	Dr. Torsten Mielecke Chairman of Expert Committee ift-EPD and PCR	Prof. Dr. Eric Brehm External verifier

1 General Product Information

Product definition

The EPD relates to the product group “surface temperature control” and applies to:

1 m² Fonterra panel, 1 m Fonterra panel, 1 Fonterra control system and 1 pc Fonterra accessories of company Viega GmbH & Co. KG

These are divided into the following product groups:

Product group (PG)		Weight[1]
PG1	Fonterra panel	0.375 kg/m² - 26.433 kg/m²
PG2	Fonterra pipe	0.044 kg/m - 0.180 kg/m
PG3	Fonterra control system	0.014 kg/pc - 0.840 kg/pc
PG4	Fonterra accessories	0.001 kg/pc - 25.000 kg/pc

[1] The relevant weights [g/piece], [kg/m²] and [g/m] are specified in the conversion table of Annex B in accordance with PCR Part B.

Table 1 Product groups

The declared unit is obtained by summing up:

PG	Assessed product[2]	Weight[2]	Declared unit
PG1	Fonterra panel	22.73	1 m²
PG2	Fonterra pipe	0.26	1 m
PG3	Fonterra control system	1.04	1 pc
PG4	Fonterra accessories	10.05	1 pc

[2] Representative average products were determined for each product group across several associated products.

Table 2 Functional unit per reference product

Averaging is explained in the background report.

The average unit is declared as follows:
Directly used material flows are determined by means of manufactured masses (kg) and allocated to the declared unit. All other inputs and outputs in the production were scaled to the declared unit in their entirety since there is no typical functional unit due to the high number of variants. The reference period is the year 2023.

The validity of the EPD is limited to the systems named in Table 1 (associated products in Annex B.)

Product description

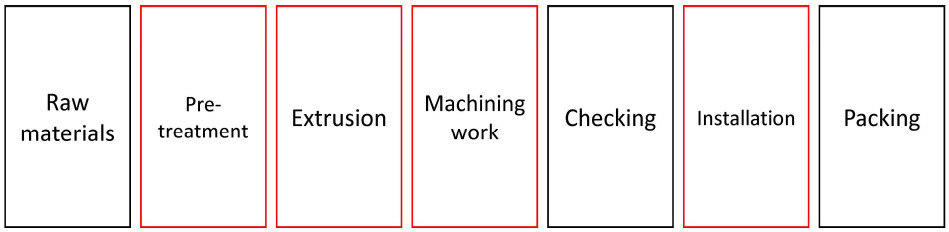
Fonterra panels
The panels serve as the basis for surface temperature control systems and are available in various designs. A basic distinction can be made between staple boards, studded boards and plasterboards.

Fonterra pipe systems
Multi-layer composite piping and solid plastic pipes in pipe dimensions d12-25 including the appropriate connection technology. The pipe system is divided into PB pipes, PE-Xc pipes, solid plastic pipes and PE-RT/Al/PE-RT pipes.

Fonterra control system
The Fonterra control system includes all the elements required to regulate the Fonterra surface temperature control. This product group contains electronic components including their own power consumption.

Fonterra accessories
Fonterra accessories include various components that are relevant for the installation of surface temperature control.
For a detailed product description refer to the manufacturer specifications or the product specifications of the respective offer/quotation.

Product manufacture



Application

Fonterra surface temperature control systems for new buildings and renovations are used for heating and cooling of private or commercial premises. A wide range of construction elements with installation and fastening options in floor, wall and ceiling constructions create scope for creative and economical use - without disruptive radiators.

Management systems

The following management systems are held:

- Quality management system as per DIN EN ISO 9001:2015
- Energy management system as per DIN EN ISO 50001:2018
- Environmental management system as per DIN EN ISO 14001:2015
- Occupational health and safety management system as per DIN EN ISO 45001:2018

Additional information

For additional verifications of applicability or conformity refer to the CE marking and the documents accompanying the product, if applicable.

2 Materials used

Primary materials

The raw materials used can be found in Section 6.2 Inventory analysis (Inputs).

Declarable substances

It may contain substances according to the REACH candidate list.
Further information on listed substances and the corresponding SCIP number are available on request from the manufacturer.

All relevant safety data sheets are available from Viega GmbH & Co. KG.

3 Construction process stage

Processing recommendations, installation

Observe the instructions for assembly/installation, operation, maintenance and disassembly, provided by the manufacturer. For this, see www.viega.de

4 Use stage

Emissions to the environment

No emissions to indoor air, water and soil are known. There may be VOC emissions.

Reference service life (RSL)

The RSL information was provided by the manufacturer. The RSL must be established under specified reference conditions of use and relate to the declared technical and functional performance of the product within the building. It must be determined according to all specific rules given in European product standards or, if none are available, according to a c-PCR. It must also take into account ISO 15686-1, -2, -7 and -8. If there is guidance on deriving RSLs from European Product Standards or a c-PCR, then such guidance must take precedence.
If it is not possible to determine the service life as the RSL in accordance with ISO 15686, the BBSR table “Nutzungsdauer von Bauteilen zur Lebenszyklusanalyse nach BNB” (service life of building components for life cycle assessment in accordance with the sustainable construction evaluation system) can be used. For further information and explanations refer to www.nachhaltigesbauen.de.

For this EPD the following applies:
For a "cradle to grave" EPD and Module D (A + B + C + D), a reference service life (RSL) must be specified.
The service life for Fonterra Surface temperature control of company Viega GmbH & Co. KG is specified as 50 years according to the manufacturer / BBSR table / ISO 15686.

The service life is dependent on the characteristics of the product and in-use conditions.

The service life solely applies to the characteristics specified in this EPD or the corresponding references.
The RSL does not reflect the actual life time, which is usually determined by the service life and the redevelopment of a building. It does not give any information on the useful life, warranty referring to performance characteristics or guarantees.

5 End-of-life stage

Possible end-of-life stages

Fonterra Surface temperature control is fed to central collection points. There the products are usually shredded and sorted into their constituents. The end-of-life stage depends on the site where the products are used and is therefore subject to the local regulations. Observe the locally applicable regulatory requirements.

In this EPD, the modules of after-use are presented according to the market situation.
Specific components of metals, plastics and electrical components are recycled. Residual fractions of plastics are thermally recycled. Other residual fractions are sent to landfill.

Disposal routes

The LCA includes the average disposal routes.

All life cycle scenarios are detailed in the Annex.

6 Life Cycle Assessment (LCA)

Environmental product declarations are based on life cycle assessments (LCAs) which use material and energy flows for the calculation and subsequent representation of environmental impacts.

As a basis for this, life cycle assessments were prepared for Fonterra Surface temperature control. The LCAs are in conformity with the requirements set out in DIN EN 15804 and the international standards DIN EN ISO 14040, DIN EN ISO 14044 and EN ISO 14025 as well as based on ISO 21930.

The LCA is representative of the products presented in the Declaration and the specified reference period.

6.1 Definition of goal and scope

Aim

The goal of the LCA is to demonstrate the environmental impacts of the products. In accordance with DIN EN 15804, the environmental impacts covered by this Environmental Product Declaration are presented for the entire product life cycle in the form of basic information. No other additional environmental impacts are specified.

Data quality, data availability and geographical and time-related system boundaries

The specific data originate exclusively from the 2023 fiscal year. They were collected on-site at the plants located in Niederwinkling and Ennest and originate in parts from company records and partly from values directly obtained by measurement. Primary data was collected for energy, water and packaging costs, as well as for auxiliary materials, waste and offcuts from the company's own data management system. Secondary data from literature sources was used for waste recycling (routes).
The generic data originate from the Ecoinvent 3 data base in current version (v3.10.1, 28.11.2023). Ecoinvent EN 15804 was used as a supplement for the LCIA indicators. The data was last updated in 2023. The data is not older than 1 year, as indicated in the ILCD field. No other generic data were used for the calculation.

Generic data are selected as accurately as possible in terms of geographic reference. If no country-specific data sets are available or if the regional reference cannot be determined, European or globally valid data sets are used.

Data gaps were either filled with comparable data or conservative assumptions, or the data were cut off in compliance with the 1% rule.

The software system "Umberto 11" (version 11.12.1) was used to model the life cycle.

The data quality complies with the requirements of prEN 15941:2022.

Scope / system boundaries

The system boundaries refer to the supply of raw materials and purchased parts, manufacture/production, use and end-of-life stage of the Fonterra Surface temperature control.
No additional data from pre-suppliers/subcontractors or other sites were taken into consideration.

Cut-off criteria

All company data collected, i.e. all commodities/input and raw materials used, the thermal energy and electricity consumption, were taken into consideration.

The boundaries cover only the product-relevant data. Gebäude- bzw. Anlagenteile. die nicht für die Produktherstellung relevant sind. wurden ausgeschlossen.

The transport distances of the pre-products used were taken into consideration as a function of 100% of the mass of the products.
Prevista pre-wall/flushing technology is transported exclusively by a >32 t truck / semitrailer, EURO 6, diesel, 53% capacity utilization.

Other transportation routes were not taken into account as they are either marginal, have no relevant impact on the balance sheets or were not recorded.

The transportation routes of the waste materials to the recycling site are not taken into account.

The criteria for the exclusion of inputs and outputs as set out in DIN EN 15804 are fulfilled. From the data analysis it can be assumed that the total of negligible processes per life cycle stage does not exceed 1% of the mass/primary energy. In der Summe werden für die vernachlässigten Prozesse 5 % des Energie- und Masseeinsatzes eingehalten. The life cycle calculation also includes material and energy flows that account for less than 1%.

6.2 Inventory analysis

Aim

All material and energy flows are described below. The processes covered are presented as input and output parameters and refer to the declared units.

Life cycle stages

The complete life cycle of Fonterra Surface temperature control is shown in the annex. The product stage "A1 – A3", construction process stage "A4 – A5", use stage "B1 – B7", end-of-life stage "C1 – C4" and the benefits and loads beyond the system boundaries "D" are considered.

Benefits

The below benefits have been defined as per DIN EN 15804:

- Benefits from recycling
- Benefits (thermal and electrical) from incineration

Allocation of co-products

Allocations occur during production.
Allocation was based on the masses (kg) of products produced.

Allocations for re-use, recycling and recovery

If the products are reused/recycled and recovered during the product stage (rejects), the elements are shredded, if necessary and then sorted into their constituents. This is done by various process plants, e.g. magnetic separators.
The system boundaries were set following their disposal, reaching the end-of-waste status.

Allocations beyond life cycle boundaries

The use of recycled materials in the manufacturing process was based on the current market-specific situation. In parallel to this, a recycling potential was taken into consideration that reflects the economic value of the product after recycling (recyclate).
The system boundary set for the recycled material refers to collection.

Secondary material

The use of secondary material in module A3 by Viega GmbH & Co. KG was considered. Secondary material is not used.

Inputs

The following manufacturing-related inputs were included in the LCA:

Energy
The electricity mix is based on “electricity, high voltage (DE, production mix).” "Compressed air, 1,000 kPa gauge, RoW, production" was assumed for the electricity consumption of compressed air and "coovling energy, GLO, market" for the electricity consumption of the cooling system.

A portion of the process heat is used for space heating. This can, however, not be quantified, hence a “worst case” figure was taken into account for the product.

Water
There is no water consumption in the individual process steps for production.

Raw material/Pre-products
The charts below show the share of raw materials/pre-products in percent.

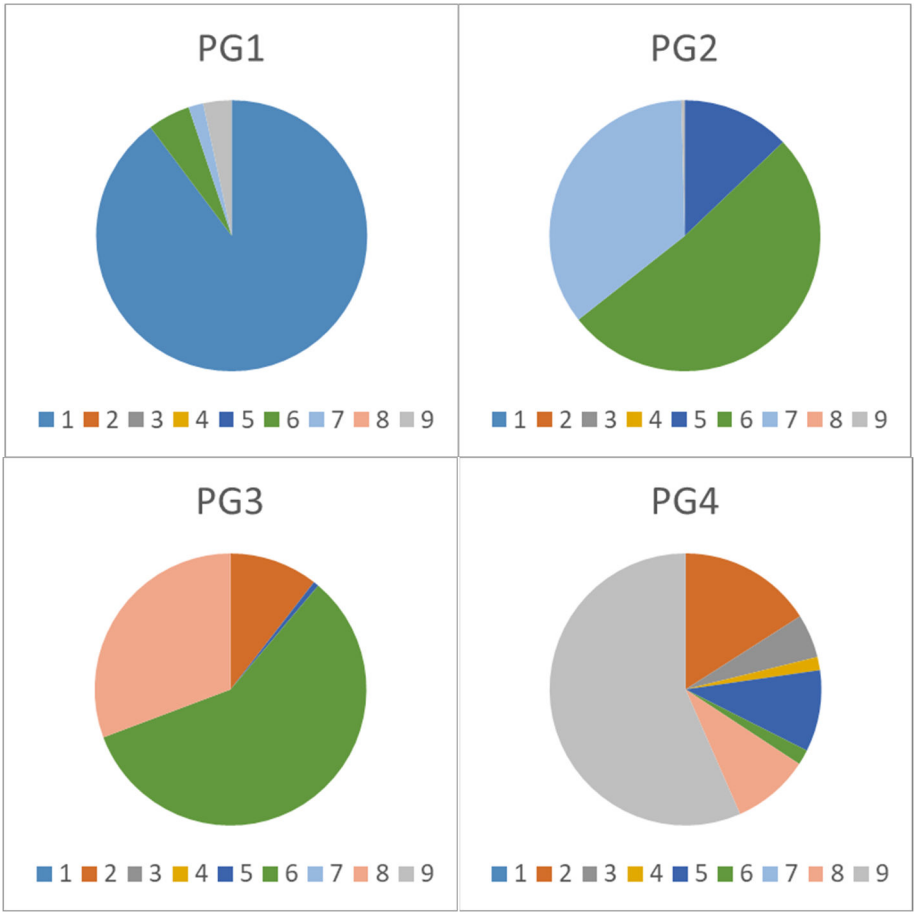


Illustration 1 Percentage of individual materials per declared unit

No.	Material	Mass in %			
		PG1	PG2	PG3	PG4
1	Gypsum fibre	89.77	-	-	-
2	Steel	-	-	10.53	15.97
3	Stainless steel	-	-	-	5.19
4	Gunmetal	-	-	-	1.58
5	Other metals	-	12.88	0.64	9.68
6	Plastics	5.08	51.50	58.11	1.81
7	Lead	1.77	35.19	-	-
8	Electronics	-	-	30.72	9.19
9	Various	3.39	0.43	-	56.58

Table 3 Percentage of individual materials per declared unit

Ancillary materials and consumables
There are no significant quantities of ancillary materials and consumables.

Product packaging
The amounts used for product packaging are as follows:

No.	Material	Mass in kg			
		PG1	PG2	PG3	PG4
1	Cardboard	0.212	0.007	0.076	0.187
2	PE	0.016	0.001	0.014	0.047
3	Wood	0.113	0.022	-	-
4	Paper	-	-	0.017	0.058

Table 4 Weight in kg of packaging per declared unit

Biogenic carbon content
According to EN 16449, the following amounts of biogenic carbon are generated:

Product group		Content in kg C per pc	
		In product	In the corresponding packaging
1	Fonterra panels	0.00	0.325
2	Fonterra pipes	0.00	0.029
3	Fonterra control system	0.00	0.092
4	Fonterra accessories	0.00	0.245

Table 5 Biogenic carbon content in product and packaging at the factory gate

Outputs

The following manufacturing-related outputs were included in the LCA:

Waste
Secondary raw materials were included in the benefits.
See Section 6.3 Impact assessment.

Waste water
No waste water is produced during the manufacturing process.

6.3 Impact assessment

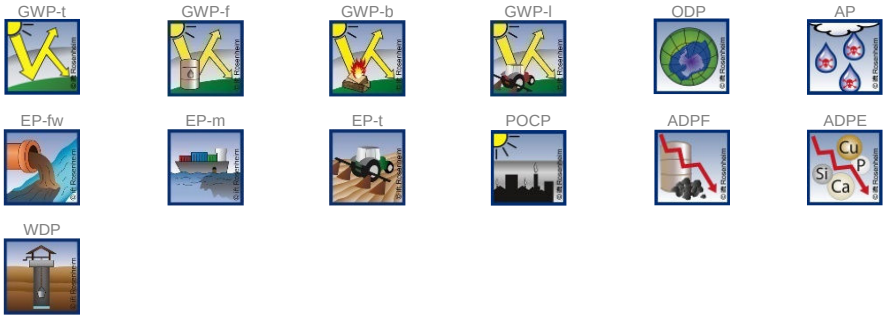
Aim

The impact assessment covers both inputs and outputs. The impact categories applied are stated below:

Core indicators

The models for impact assessment were applied as described in DIN EN 15804+A2.
The impact categories presented as core indicators in the EPD are as follows:

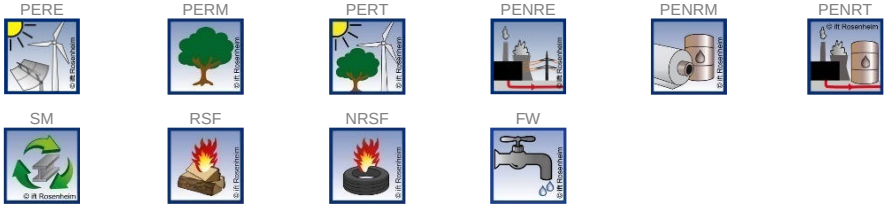
- Climate change - total (GWP-t)
- Climate change - fossil (GWP-f)
- Climate change - biogenic (GWP-b)
- Climate change - land use & land use change (GWP-l)
- Ozone depletion (ODP)
- Acidification (AP)
- Eutrophication freshwater (EP-fw)
- Eutrophication salt water (EP-m)
- Eutrophication land (EP-t)
- Photochemical ozone creation (POCP)
- Depletion of abiotic resources - fossil fuels (ADPF)
- Depletion of abiotic resources - minerals and metals (ADPE)
- Water use (WDP)



Resource management

The models for impact assessment were applied as described in DIN EN 15804-A2.
The following resource use indicators are presented in the EPD:

- Renewable primary energy as energy source (PERE)
- Renewable primary energy for material use (PERM)
- Total use of renewable primary energy (PERT)
- Non-renewable primary energy as energy source (PENRE)
- Renewable primary energy for material use (PENRM)
- Total use of non-renewable primary energy (PENRT)
- Use of secondary materials (SM)
- Use of renewable secondary fuels (RSF)
- Use of non-renewable secondary fuels (NRSF)
- Net use of freshwater resources (FW)

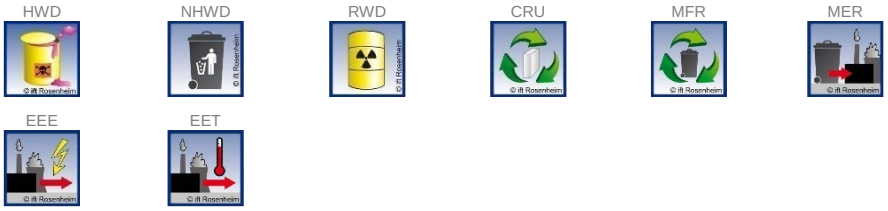


Waste

The waste generated during the production of surface temperature control is evaluated and shown separately for the fractions trade wastes, special wastes and radioactive wastes. Since waste handling is modelled within the system boundaries, the amounts shown refer to the deposited wastes. A portion of the waste indicated is generated during the manufacture of the pre-products.

The models for impact assessment were applied as described in DIN EN 15804-A2.
The waste categories and indicators for output material flows presented in the EPD are as follows:

- Disposed hazardous waste (HWD)
- Non-hazardous waste disposed (NHWD)
- Radioactive waste disposed (RWD)
- Components for re-use (CRU)
- Materials for recycling (MFR)
- Materials for energy recovery (MER)
- Exported electrical energy (EEE)
- Exported thermal energy (EET)



Additional environmental impact indicators

The models for impact assessment were applied as described in DIN EN 15804-A2.
The additional impact categories presented in the EPD are as follows:

- Particulate matter emissions (PM)
- Ionizing radiation, human health (IRP)
- Ecotoxicity – freshwater (ETP-fw)
- Human toxicity, carcinogenic effects (HTP-c)
- Human toxicity, non-carcinogenic effects (HTP-nc)
- Impacts associated with land use/soil quality (SQP)

	Results per 1 m² Fonterra panel														
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Core indicators																
GWP-t	kg CO_2 equivalent	14.40	1.57	0.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.13	0.11	15.20	-7.35
GWP-f	kg CO_2 equivalent	14.90	1.57	1.65E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.23E-02	0.13	6.35E-02	1.03	-7.34
GWP-b	kg CO_2 equivalent	-0.50	6.17E-05	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	4.10E-06	4.45E-02	14.10	1.55E-03
GWP-l	kg CO_2 equivalent	1.63E-02	6.54E-04	1.61E-06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.45E-06	5.20E-05	1.41E-04	2.91E-04	-4.36E-03
ODP	kg CFC-11-eq.	2.17E-07	2.51E-08	1.09E-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.24E-11	2.00E-09	7.60E-10	6.95E-09	-1.58E-07
AP	mol H^+-eq.	7.99E-02	3.98E-03	1.88E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.13E-05	5.33E-04	4.22E-04	3.49E-03	-2.60E-02
EP-fw	kg P-eq.	3.32E-03	1.27E-04	7.00E-06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.84E-05	1.01E-05	1.36E-05	1.55E-03	-1.67E-03
EP-m	kg N-eq.	1.55E-02	1.01E-03	4.16E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.45E-04	1.94E-04	1.66E-04	2.92E-02	-5.20E-03
EP-t	mol N-eq.	0.16	1.09E-02	9.09E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.28E-04	2.12E-03	1.48E-03	1.08E-02	-5.39E-02
POCP	kg NMVOC-eq.	6.40E-02	6.00E-03	4.84E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.12E-05	7.74E-04	4.73E-04	6.85E-03	-2.81E-02
ADPF*²	MJ	7.15E-04	4.56E-06	2.64E-08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.70E-09	3.59E-07	5.41E-07	7.34E-07	-6.69E-05
ADPE*²	kg Sb equivalent	252.00	23.60	8.67E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.77E-02	1.87	0.75	6.56	-156.00
WDP*²	m^3 world-eq. deprived	3.39	0.11	3.45E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.20E-04	8.97E-03	6.79E-03	6.92E-02	-1.60
Resource management																
PERE	MJ	20.70	0.31	6.19E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.41E-03	2.45E-02	3.47E-02	0.20	-5.23
PERM	MJ	20.70	0.31	6.19E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.41E-03	2.45E-02	3.47E-02	0.20	-5.23
PERT	MJ	20.70	0.31	6.19E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.41E-03	2.45E-02	3.47E-02	0.20	-5.23
PENRE	MJ	253.00	23.60	8.67E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.77E-02	1.87	0.75	6.56	-156.00
PENRM	MJ	253.00	23.60	8.67E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.77E-02	1.87	0.75	6.56	-156.00
PENRT	MJ	253.00	23.60	8.67E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.77E-02	1.87	0.75	6.56	-156.00
SM	kg	3.34	1.00E-02	3.63E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.55E-05	7.94E-04	6.58E-04	2.15E-03	-0.19
RSF	MJ	8.17E-03	1.27E-04	4.35E-07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.41E-07	1.01E-05	2.89E-05	3.72E-05	-3.12E-04
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m^3	8.36E-02	3.45E-03	4.67E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-9.11E-04	2.75E-04	1.77E-04	-7.69E-02	-4.11E-02
Categories of waste																
HWD	kg	0.82	3.99E-02	7.19E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.14E-04	3.17E-03	3.17E-03	1.81E-02	-0.43
NHWD	kg	27.80	0.74	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.24	5.88E-02	9.70E-02	105.00	-20.30
RWD	kg	1.33E-04	5.07E-06	4.62E-08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.70E-08	4.04E-07	3.96E-07	3.97E-06	-9.03E-05
Output material flows																
CRU	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	8.03E-03	1.76E-04	3.60E-06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.51E-06	1.40E-05	1.03	1.28E-04	-1.64E-03
MER	kg	1.87E-04	1.08E-06	3.91E-09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.24E-09	8.30E-08	7.91E-08	4.42E-07	-1.64E-05
EE	MJ	0.52	4.26E-03	1.46E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.68E-05	3.41E-04	3.14E-04	2.26E-03	-5.25E-02

Key:
GWP-t – global warming potential - total **GWP-f** – global warming potential fossil fuels **GWP-b** – global warming potential - biogenic **GWP-l** – global warming potential - land use and land use change **ODP** – ozone depletion potential **AP** - acidification potential **EP-fw** - eutrophication potential - aquatic freshwater **EP-m** - eutrophication potential - aquatic marine **EP-t** - eutrophication potential - terrestrial **POCP** - photochemical ozone formation potential **ADPF*²** - abiotic depletion potential – fossil resources **ADPE*²** - abiotic depletion potential – minerals&metals **WDP*²** – Water (user) deprivation potential **PERE** - Use of renewable primary energy **PERM** - use of renewable primary energy resources **PERT** - total use of renewable primary energy resources **PENRE** - use of non-renewable primary energy **PENRM** - use of non-renewable primary energy resources **PENRT** - total use of non-renewable primary energy resources **SM** - use of secondary material **RSF** - use of renewable secondary fuels **NRSF** - use of non-renewable secondary fuels **FW** - net use of fresh water **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 **EE** - exported energy

	Results per 1 m² Fonterra panel														
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Additional environmental impact indicators																
PM	Disease incidence	1.19E-06	1.52E-07	4.35E-08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.55E-10	1.31E-08	1.89E-08	4.69E-08	-2.75E-07
IRP*[1]	kBq U235-eq.	0.54	2.07E-02	2.11E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.92E-04	1.65E-03	1.62E-03	1.62E-02	-0.37
ETP-fw*[2]	CTUe	78.10	5.69	2.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.42	0.45	1.01	204.00	-40.70
HTP-c*[2]	CTUh	4.52E-08	8.04E-09	6.42E-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.51E-11	6.40E-10	5.76E-10	2.12E-09	-1.77E-08
HTP-nc*[2]	CTUh	1.06E-07	1.54E-08	6.56E-08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.15E-09	1.24E-09	1.56E-09	9.69E-08	-4.63E-08
SQP*[2]	dimensionless	136.00	23.20	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	1.88	1.34	12.20	-17.00

Key:
PM – particulate matter emissions potential **IRP*[1]** – ionizing radiation potential – human health **ETP-fw*[2]** - Eco-toxicity potential – freshwater **HTP-c*[2]** - Human toxicity potential – cancer effects **HTP-nc*[2]** - Human toxicity potential – non-cancer effects **SQP*[2]** – soil quality potential

Disclaimers:

*1 This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionising radiation from the soil, from radon and from some building materials is also not measured by this indicator.

*2 The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

	Results per 1 m Fonterra pipe															
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Core indicators																
GWP-t	kg CO_2 equivalent	0.41	1.68E-02	2.77E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.72E-03	1.23E-03	2.57E-03	2.71E-03	-0.59
GWP-f	kg CO_2 equivalent	1.13	1.68E-02	6.62E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.18E-04	1.23E-03	1.51E-03	1.85E-04	-0.59
GWP-b	kg CO_2 equivalent	-0.72	6.60E-07	2.70E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.61E-03	3.93E-08	1.06E-03	2.53E-03	1.77E-04
GWP-l	kg CO_2 equivalent	1.47E-03	7.00E-06	4.86E-08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.31E-08	4.99E-07	3.35E-06	5.22E-08	-3.55E-04
ODP	kg CFC-11-eq.	1.72E-08	2.69E-10	2.13E-12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.91E-13	1.92E-11	1.81E-11	1.24E-12	-1.29E-08
AP	mol H^+-eq.	5.56E-03	4.26E-05	6.02E-06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.97E-07	5.12E-06	1.00E-05	6.24E-07	-2.03E-03
EP-fw	kg P-eq.	2.77E-04	1.36E-06	2.12E-07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.77E-07	9.67E-08	3.24E-07	2.78E-07	-1.35E-04
EP-m	kg N-eq.	1.05E-03	1.08E-05	1.40E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.32E-06	1.86E-06	3.95E-06	5.22E-06	-4.05E-04
EP-t	mol N-eq.	1.11E-02	1.17E-04	3.04E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.23E-06	2.03E-05	3.53E-05	1.94E-06	-4.19E-03
POCP	kg NMVOC-eq.	5.39E-03	6.42E-05	1.59E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.79E-07	7.43E-06	1.13E-05	1.23E-06	-2.26E-03
ADPF*²	MJ	6.90E-06	4.89E-08	4.00E-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.35E-11	3.45E-09	1.29E-08	1.31E-10	-2.80E-06
ADPE*²	kg Sb equivalent	23.50	0.25	1.84E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.47E-04	1.79E-02	1.79E-02	1.17E-03	-12.70
WDP*²	m^3 world-eq. deprived	0.28	1.20E-03	1.12E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.87E-06	8.61E-05	1.62E-04	1.24E-05	-0.13
Resource management																
PERE	MJ	12.90	3.31E-03	2.96E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.32E-05	2.36E-04	8.25E-04	3.64E-05	-0.41
PERM	MJ	12.90	3.31E-03	2.96E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.32E-05	2.36E-04	8.25E-04	3.64E-05	-0.41
PERT	MJ	12.90	3.31E-03	2.96E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.32E-05	2.36E-04	8.25E-04	3.64E-05	-0.41
PENRE	MJ	23.50	0.25	1.84E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.47E-04	1.80E-02	1.79E-02	1.17E-03	-12.70
PENRM	MJ	23.50	0.25	1.84E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.47E-04	1.80E-02	1.79E-02	1.17E-03	-12.70
PENRT	MJ	23.50	0.25	1.84E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.47E-04	1.80E-02	1.79E-02	1.17E-03	-12.70
SM	kg	3.63E-02	1.07E-04	1.04E-06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.45E-07	7.63E-06	1.56E-05	3.86E-07	-2.00E-03
RSF	MJ	0.24	1.36E-06	1.40E-08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.23E-09	9.71E-08	6.88E-07	6.66E-09	-1.61E-05
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m^3	7.31E-03	3.69E-05	1.45E-06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-8.75E-06	2.64E-06	4.20E-06	-1.38E-05	-3.30E-03
Categories of waste																
HWD	kg	7.39E-02	4.28E-04	2.28E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.06E-06	3.04E-05	7.54E-05	3.24E-06	-3.50E-02
NHWD	kg	2.65	7.94E-03	7.87E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.19E-02	5.65E-04	2.31E-03	1.87E-02	-1.67
RWD	kg	1.47E-05	5.43E-08	4.31E-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.52E-10	3.88E-09	9.43E-09	7.11E-10	-7.32E-06
Output material flows																
CRU	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	1.60E-03	1.88E-06	1.38E-08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.45E-08	1.34E-07	2.46E-02	2.28E-08	-2.11E-04
MER	kg	9.05E-07	1.16E-08	1.18E-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.03E-11	7.97E-10	1.88E-09	7.92E-11	-6.50E-07
EE	MJ	1.07E-02	4.56E-05	4.33E-07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.57E-07	3.27E-06	7.47E-06	4.05E-07	-2.74E-03

Key:
GWP-t – global warming potential - total **GWP-f** – global warming potential fossil fuels **GWP-b** – global warming potential - biogenic **GWP-l** – global warming potential - land use and land use change **ODP** – ozone depletion potential **AP** - acidification potential **EP-fw** - eutrophication potential - aquatic freshwater **EP-m** - eutrophication potential - aquatic marine **EP-t** - eutrophication potential - terrestrial **POCP** - photochemical ozone formation potential **ADPF*²** - abiotic depletion potential – fossil resources **ADPE*²** - abiotic depletion potential – minerals&metals **WDP*²** – Water (user) deprivation potential **PERE** - Use of renewable primary energy **PERM** - use of renewable primary energy resources **PERT** - total use of renewable primary energy resources **PENRE** - use of non-renewable primary energy **PENRM** - use of non-renewable primary energy resources **PENRT** - total use of non-renewable primary energy resources **SM** - use of secondary material **RSF** - use of renewable secondary fuels **NRSF** - use of non-renewable secondary fuels **FW** - net use of fresh water **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 **EE** - exported energy

	Results per 1 m Fonterra pipe														
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Additional environmental impact indicators																
PM	Disease incidence	8.09E-08	1.62E-09	1.51E-09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.33E-12	1.26E-10	4.50E-10	8.39E-12	-2.08E-08
IRP*[1]	kBq U235-eq.	5.61E-02	2.22E-04	1.74E-06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.85E-06	1.58E-05	3.86E-05	2.91E-06	-3.00E-02
ETP-fw*[2]	CTUe	5.96	6.09E-02	6.67E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.32E-02	4.32E-03	2.40E-02	3.65E-02	-3.32
HTP-c*[2]	CTUh	6.17E-09	8.60E-11	2.14E-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.41E-13	6.15E-12	1.37E-11	3.79E-13	-1.42E-09
HTP-nc*[2]	CTUh	8.28E-09	1.65E-10	2.12E-09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.10E-11	1.19E-11	3.70E-11	1.73E-11	-3.72E-09
SQP*[2]	dimensionless	68.30	0.25	5.08E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.39E-03	1.81E-02	3.18E-02	2.19E-03	-1.26

Key:
PM – particulate matter emissions potential **IRP*[1]** – ionizing radiation potential – human health **ETP-fw*[2]** - Eco-toxicity potential – freshwater **HTP-c*[2]** - Human toxicity potential – cancer effects **HTP-nc*[2]** - Human toxicity potential – non-cancer effects **SQP*[2]** – soil quality potential

Disclaimers:

*1 This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionising radiation from the soil, from radon and from some building materials is also not measured by this indicator.

*2 The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

	Results per 1 Fonterra control system														
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Core indicators																
GWP-t	kg CO_2 equivalent	115.00	6.71E-02	0.38	0.00	0.00	0.00	0.00	0.00	69.90	0.00	6.97E-03	4.97E-03	1.92E-02	6.50E-02	-18.70
GWP-f	kg CO_2 equivalent	115.00	6.71E-02	1.08E-02	0.00	0.00	0.00	0.00	0.00	67.30	0.00	4.76E-04	4.97E-03	1.84E-02	4.44E-03	-18.70
GWP-b	kg CO_2 equivalent	0.23	2.63E-06	0.36	0.00	0.00	0.00	0.00	0.00	2.37	0.00	6.50E-03	1.59E-07	8.52E-04	6.06E-02	1.36E-04
GWP-l	kg CO_2 equivalent	0.15	2.79E-05	6.77E-07	0.00	0.00	0.00	0.00	0.00	0.21	0.00	1.34E-07	2.02E-06	2.70E-05	1.25E-06	-2.28E-02
ODP	kg CFC-11-eq.	6.31E-06	1.07E-09	2.97E-11	0.00	0.00	0.00	0.00	0.00	1.24E-06	0.00	3.20E-12	7.75E-11	1.50E-10	2.98E-11	-4.85E-07
AP	mol H^+-eq.	0.79	1.70E-04	8.37E-05	0.00	0.00	0.00	0.00	0.00	0.40	0.00	1.60E-06	2.07E-05	1.13E-04	1.50E-05	-0.19
EP-fw	kg P-eq.	0.17	5.42E-06	2.86E-06	0.00	0.00	0.00	0.00	0.00	6.26E-02	0.00	7.14E-07	3.91E-07	7.86E-06	6.66E-06	-2.63E-02
EP-m	kg N-eq.	0.17	4.29E-05	1.95E-04	0.00	0.00	0.00	0.00	0.00	6.21E-02	0.00	1.34E-05	7.54E-06	2.49E-05	1.25E-04	-2.97E-02
EP-t	mol N-eq.	1.82	4.65E-04	4.23E-04	0.00	0.00	0.00	0.00	0.00	0.56	0.00	4.99E-06	8.21E-05	2.64E-04	4.65E-05	-0.33
POCP	kg NMVOC-eq.	0.52	2.56E-04	2.19E-04	3.10E-06	0.00	0.00	0.00	0.00	0.18	0.00	3.15E-06	3.01E-05	7.76E-05	2.94E-05	-0.13
ADPF*[2]	MJ	4.97E-02	1.95E-07	5.57E-09	0.00	0.00	0.00	0.00	0.00	9.08E-04	0.00	3.38E-10	1.40E-08	2.65E-07	3.15E-09	-8.35E-03
ADPE*[2]	kg Sb equivalent	1,500.00	1.01	2.56E-02	0.00	0.00	0.00	0.00	0.00	1570.00	0.00	3.02E-03	7.26E-02	0.23	2.81E-02	-261.00
WDP*[2]	m^3 world-eq. deprived	36.90	4.80E-03	1.58E-03	0.00	0.00	0.00	0.00	0.00	42.60	0.00	3.18E-05	3.48E-04	3.63E-03	2.97E-04	-6.01
Resource management																
PERE	MJ	162.00	1.32E-02	4.13E-04	0.00	0.00	0.00	0.00	0.00	429.00	0.00	9.36E-05	9.53E-04	2.81E-02	8.73E-04	-26.10
PERM	MJ	162.00	1.32E-02	4.13E-04	0.00	0.00	0.00	0.00	0.00	429.00	0.00	9.36E-05	9.53E-04	2.81E-02	8.73E-04	-26.10
PERT	MJ	162.00	1.32E-02	4.13E-04	0.00	0.00	0.00	0.00	0.00	429.00	0.00	9.36E-05	9.53E-04	2.81E-02	8.73E-04	-26.10
PENRE	MJ	1,500.00	1.01	2.56E-02	0.00	0.00	0.00	0.00	0.00	1570.00	0.00	3.02E-03	7.26E-02	0.23	2.82E-02	-261.00
PENRM	MJ	1,500.00	1.01	2.56E-02	0.00	0.00	0.00	0.00	0.00	1570.00	0.00	3.02E-03	7.26E-02	0.23	2.82E-02	-261.00
PENRT	MJ	1,500.00	1.01	2.56E-02	0.00	0.00	0.00	0.00	0.00	1570.00	0.00	3.02E-03	7.26E-02	0.23	2.82E-02	-261.00
SM	kg	0.31	4.27E-04	1.45E-05	0.00	0.00	0.00	0.00	0.00	0.26	0.00	9.91E-07	3.08E-05	9.97E-05	9.24E-06	-0.15
RSF	MJ	1.30E-02	5.42E-06	1.97E-07	0.00	0.00	0.00	0.00	0.00	2.07E-03	0.00	1.71E-08	3.93E-07	9.69E-06	1.60E-07	-1.74E-03
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m^3	0.98	1.47E-04	2.05E-05	0.00	0.00	0.00	0.00	0.00	1.35	0.00	-3.54E-05	1.07E-05	1.04E-04	-3.30E-04	-0.17
Categories of waste																
HWD	kg	9.94	1.70E-03	3.22E-04	0.00	0.00	0.00	0.00	0.00	3.96	0.00	8.33E-06	1.23E-04	1.55E-03	7.77E-05	-2.00
NHWD	kg	359.00	3.17E-02	0.11	0.00	0.00	0.00	0.00	0.00	306.00	0.00	4.81E-02	2.28E-03	3.88E-02	0.45	-105.00
RWD	kg	3.20E-03	2.16E-07	6.01E-09	0.00	0.00	0.00	0.00	0.00	1.11E-02	0.00	1.83E-09	1.57E-08	4.75E-07	1.70E-08	-4.61E-04
Output material flows																
CRU	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	5.86E-02	7.50E-06	1.92E-07	0.00	0.00	0.00	0.00	0.00	0.16	0.00	5.87E-08	5.42E-07	9.99E-02	5.47E-07	-1.40E-02
MER	kg	3.37E-04	4.61E-08	1.64E-09	0.00	0.00	0.00	0.00	0.00	2.19E-05	0.00	2.03E-10	3.22E-09	1.96E-08	1.90E-09	-2.89E-05
EE	MJ	1.56	1.82E-04	6.05E-06	0.00	0.00	0.00	0.00	0.00	7.24	0.00	1.04E-06	1.32E-05	2.03E-04	9.70E-06	-0.21

Key:
GWP-t – global warming potential - total **GWP-f** – global warming potential fossil fuels **GWP-b** – global warming potential - biogenic **GWP-l** – global warming potential - land use and land use change **ODP** – ozone depletion potential **AP** - acidification potential **EP-fw** - eutrophication potential - aquatic freshwater **EP-m** - eutrophication potential - aquatic marine **EP-t** - eutrophication potential - terrestrial **POCP** - photochemical ozone formation potential **ADPF*[2]** - abiotic depletion potential – fossil resources **ADPE*[2]** - abiotic depletion potential – minerals&metals **WDP*[2]** – Water (user) deprivation potential **PERE** - Use of renewable primary energy **PERM** - use of renewable primary energy resources **PERT** - total use of renewable primary energy resources **PENRE** - use of non-renewable primary energy **PENRM** - use of non-renewable primary energy resources **PENRT** - total use of non-renewable primary energy resources **SM** - use of secondary material **RSF** - use of renewable secondary fuels **NRSF** - use of non-renewable secondary fuels **FW** - net use of fresh water **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 **EE** - exported energy

	Results per 1 Fonterra control system														
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Additional environmental impact indicators																
PM	Disease incidence	6.49E-06	6.47E-09	2.14E-08	0.00	0.00	0.00	0.00	0.00	1.41E-06	0.00	2.16E-11	5.09E-10	1.53E-09	2.01E-10	-1.22E-06
IRP*[1]	kBq U235-eq.	13.00	8.84E-04	2.43E-05	0.00	0.00	0.00	0.00	0.00	43.20	0.00	7.47E-06	6.41E-05	1.94E-03	6.97E-05	-1.87
ETP-fw*[2]	CTUe	3,730.00	0.24	0.92	2.53E-05	0.00	0.00	0.00	0.00	280.00	0.00	9.38E-02	1.75E-02	0.10	0.88	-634.00
HTP-c*[2]	CTUh	2.82E-07	3.43E-10	2.96E-10	0.00	0.00	0.00	0.00	0.00	1.60E-07	0.00	9.74E-13	2.49E-11	6.93E-11	9.08E-12	-7.03E-08
HTP-nc*[2]	CTUh	4.06E-06	6.58E-10	2.87E-08	6.73E-13	0.00	0.00	0.00	0.00	1.18E-06	0.00	4.46E-11	4.80E-11	5.71E-10	4.16E-10	-6.85E-07
SQP*[2]	dimensionless	580.00	0.99	7.07E-02	0.00	0.00	0.00	0.00	0.00	348.00	0.00	5.63E-03	7.31E-02	0.14	5.25E-02	-143.00

Key:
PM – particulate matter emissions potential **IRP*[1]** – ionizing radiation potential – human health **ETP-fw*[2]** - Eco-toxicity potential – freshwater **HTP-c*[2]** - Human toxicity potential – cancer effects **HTP-nc*[2]** - Human toxicity potential – non-cancer effects **SQP*[2]** – soil quality potential

Disclaimers:

*1 This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionising radiation from the soil, from radon and from some building materials is also not measured by this indicator.

*2 The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

	Results per 1 Fonterra accessories															
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Core indicators																
GWP-t	kg CO_2 equivalent	149.00	1.29	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.11	0.34	9.27	-113.00
GWP-f	kg CO_2 equivalent	149.00	1.29	3.42E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.01E-02	0.11	0.28	0.63	-112.00
GWP-b	kg CO_2 equivalent	-0.24	5.07E-05	0.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	3.36E-06	6.03E-02	8.64	-1.38E-02
GWP-l	kg CO_2 equivalent	0.18	5.38E-04	1.85E-06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.84E-06	4.27E-05	4.43E-04	1.78E-04	-0.14
ODP	kg CFC-11-eq.	3.50E-06	2.07E-08	8.14E-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.77E-11	1.64E-09	2.84E-09	4.25E-09	-2.85E-06
AP	mol H^+-eq.	2.01	3.27E-03	2.29E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.39E-05	4.38E-04	2.06E-03	2.13E-03	-1.30
EP-fw	kg P-eq.	0.24	1.04E-04	7.59E-06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.51E-05	8.27E-06	1.07E-04	9.49E-04	-0.17
EP-m	kg N-eq.	0.25	8.27E-04	5.33E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.84E-04	1.59E-04	5.57E-04	1.78E-02	-0.19
EP-t	mol N-eq.	2.89	8.95E-03	1.16E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.05E-04	1.74E-03	5.67E-03	6.63E-03	-2.12
POCP	kg NMVOC-eq.	1.05	4.93E-03	5.91E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.67E-05	6.36E-04	1.72E-03	4.19E-03	-0.79
ADPF*²	MJ	6.83E-02	3.75E-06	1.53E-08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.14E-09	2.95E-07	6.69E-06	4.49E-07	-5.31E-02
ADPE*²	kg Sb equivalent	1,950.00	19.40	7.00E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.39E-02	1.54	3.39	4.01	-1510.00
WDP*²	m^3 world-eq. deprived	53.90	9.24E-02	4.37E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.73E-04	7.37E-03	4.50E-02	4.23E-02	-38.80
Resource management																
PERE	MJ	241.00	0.25	1.13E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.98E-03	2.02E-02	0.36	0.12	-164.00
PERM	MJ	241.00	0.25	1.13E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.98E-03	2.02E-02	0.36	0.12	-164.00
PERT	MJ	241.00	0.25	1.13E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.98E-03	2.02E-02	0.36	0.12	-164.00
PENRE	MJ	1,950.00	19.40	7.00E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.39E-02	1.54	3.39	4.01	-1510.00
PENRM	MJ	1,950.00	19.40	7.00E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.39E-02	1.54	3.39	4.01	-1510.00
PENRT	MJ	1,950.00	19.40	7.00E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.39E-02	1.54	3.39	4.01	-1510.00
SM	kg	2.25	8.22E-03	3.95E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.10E-05	6.53E-04	2.53E-03	1.32E-03	-3.18
RSF	MJ	2.02E-02	1.04E-04	5.43E-07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.62E-07	8.30E-06	1.43E-04	2.28E-05	-1.17E-02
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m^3	1.56	2.83E-03	5.70E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-7.48E-04	2.26E-04	1.26E-03	-4.70E-02	-0.99
Categories of waste																
HWD	kg	24.90	3.28E-02	8.96E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.76E-04	2.60E-03	2.04E-02	1.11E-02	-13.50
NHWD	kg	932.00	0.61	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.02	4.83E-02	0.56	63.90	-719.00
RWD	kg	3.61E-03	4.17E-06	1.65E-08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.86E-08	3.32E-07	4.44E-06	2.43E-06	-2.81E-03
Output material flows																
CRU	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	0.12	1.44E-04	5.24E-07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.24E-06	1.15E-05	4.64	7.80E-05	-8.90E-02
MER	kg	3.64E-04	8.89E-07	4.51E-09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.30E-09	6.82E-08	3.75E-07	2.70E-07	-1.83E-04
EE	MJ	1.93	3.50E-03	1.66E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.20E-05	2.80E-04	2.23E-03	1.38E-03	-1.29

Key:
GWP-t – global warming potential - total **GWP-f** – global warming potential fossil fuels **GWP-b** – global warming potential - biogenic **GWP-l** – global warming potential - land use and land use change **ODP** – ozone depletion potential **AP** - acidification potential **EP-fw** - eutrophication potential - aquatic freshwater **EP-m** - eutrophication potential - aquatic marine **EP-t** - eutrophication potential - terrestrial **POCP** - photochemical ozone formation potential **ADPF*²** - abiotic depletion potential – fossil resources **ADPE*²** - abiotic depletion potential – minerals&metals **WDP*²** – Water (user) deprivation potential **PERE** - Use of renewable primary energy **PERM** - use of renewable primary energy resources **PERT** - total use of renewable primary energy resources **PENRE** - use of non-renewable primary energy **PENRM** - use of non-renewable primary energy resources **PENRT** - total use of non-renewable primary energy resources **SM** - use of secondary material **RSF** - use of renewable secondary fuels **NRSF** - use of non-renewable secondary fuels **FW** - net use of fresh water **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 **EE** - exported energy

	Results per 1 Fonterra accessories														
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Additional environmental impact indicators																
PM	Disease incidence	1.10E-05	1.25E-07	5.98E-08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.56E-10	1.08E-08	4.53E-08	2.87E-08	-7.93E-06
IRP*[1]	kBq U235-eq.	14.60	1.70E-02	6.66E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.58E-04	1.36E-03	1.80E-02	9.93E-03	-11.40
ETP-fw*[2]	CTUe	5,840.00	4.68	2.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.98	0.37	2.63	125.00	-4070.00
HTP-c*[2]	CTUh	2.34E-06	6.60E-09	8.06E-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.06E-11	5.26E-10	1.78E-09	1.30E-09	-5.39E-07
HTP-nc*[2]	CTUh	1.14E-05	1.27E-08	7.60E-08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.43E-10	1.01E-09	9.36E-09	5.93E-08	-5.79E-06
SQP*[2]	dimensionless	1,330.00	19.10	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	1.55	4.32	7.48	-912.00

Key:
PM – particulate matter emissions potential **IRP*[1]** – ionizing radiation potential – human health **ETP-fw*[2]** - Eco-toxicity potential – freshwater **HTP-c*[2]** - Human toxicity potential – cancer effects **HTP-nc*[2]** - Human toxicity potential – non-cancer effects **SQP*[2]** – soil quality potential

Disclaimers:

*1 This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionising radiation from the soil, from radon and from some building materials is also not measured by this indicator.

*2 The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

6.4 Interpretation, LCA presentation and critical review

Evaluation

The environmental impacts of

- Fonterra panels
- Fonterra pipes
- Fonterra control systems
- Fonterra accessories

differ considerably from each other. The differences in the environmental impact of the products lie in the various pre-products and raw materials used and in the mass of the pre-products and raw materials used in each case. The LCA covers the complete life cycle.

The product groups Fonterra panels, Fonterra pipes and Fonterra accessories have no emissions in the utilisation phase. The value here is therefore 0.00. As Fonterra control system involves contact with the room air, B1 (VOC mixing calculation) is also taken into account. In addition, components of the Fonterra control system have a power consumption, which is estimated/calculated for B6 as part of the worst-case approach.

When analyzing the results, it should be noted that different functional units were used for the clusters:

- Fonterra panels: m^2
- Fonterra pipes: m
- Fonterra control system: pc
- Fonterra accessories: pc

One difference is that the product groups Fonterra panels and Fonterra control system have a higher proportion of biogenic C in the packaging.

For the product group Fonterra panels, a maximum product made of gypsum was identified as the worst case during the pre-test. According to the literature, the recycling rate here is low and, accordingly, the proportion of Module D in Fonterra panels is also comparatively low.

The absolute values of the product groups Fonterra control system and Fonterra accessories are significantly higher compared to Fonterra panels and pipes. This is due to the proportion of electronic components in the two product groups (control system and accessories).

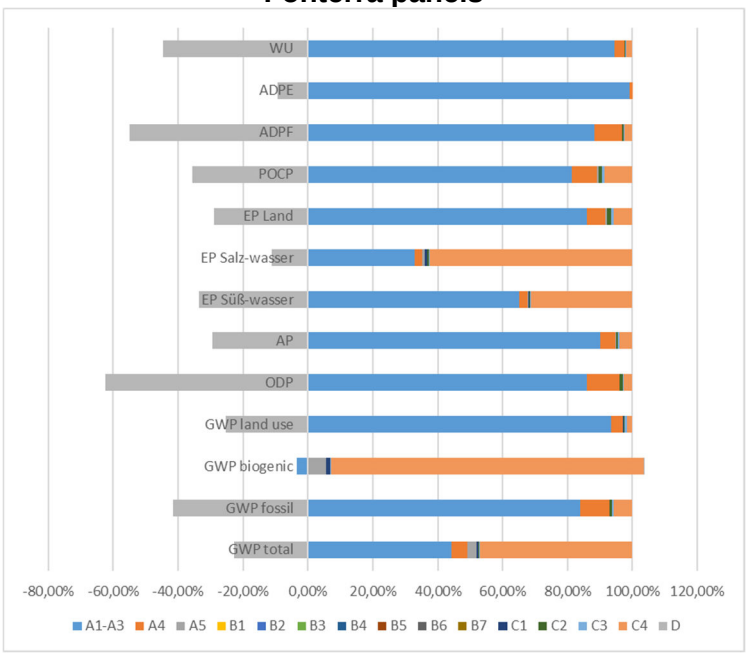
The product group Fonterra control system is the only one with energy consumption in the utilisation phase, which is very significant due to the conservative estimate (B6).

The charts below show the allocation of the main environmental impacts.

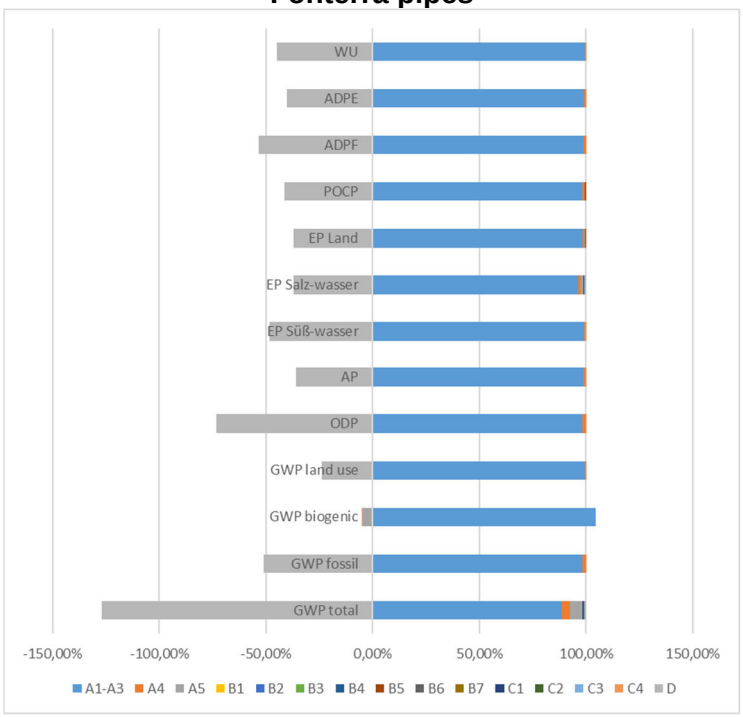
The values obtained from the LCA calculation are suitable for the certification of buildings.

Diagrams
The listed diagram(s) below show the B modules with reference to the specified RSL within the building service life of 50 years.

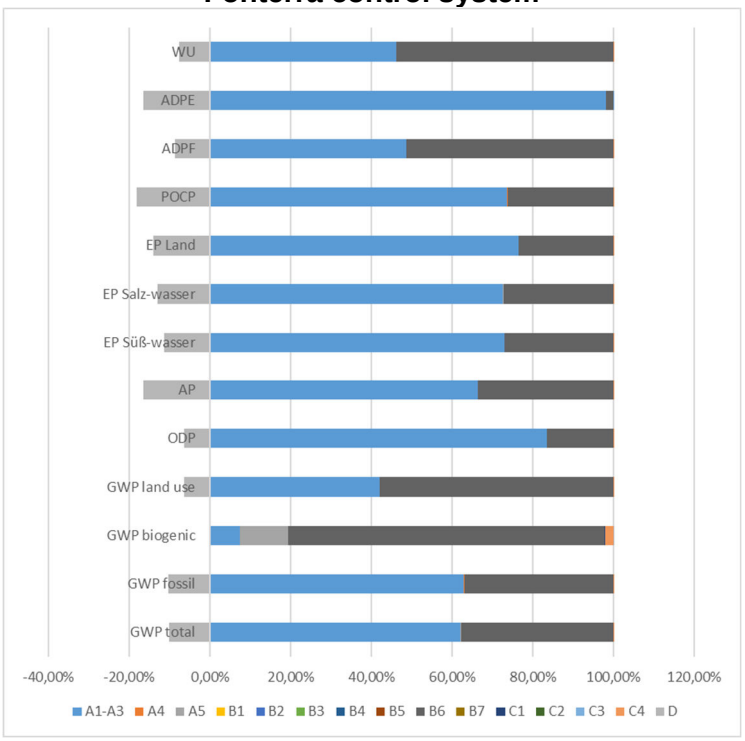
Fonterra panels



Fonterra pipes



Fonterra control system



Fonterra accessories

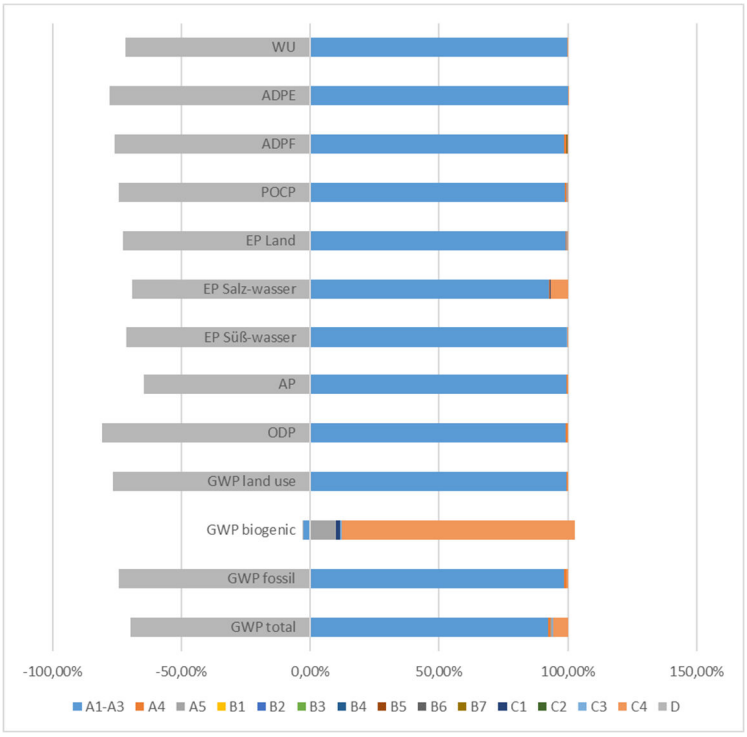


Illustration 2 Percentage of the modules in selected environmental impact indicators

Report

The LCA report underlying this EPD was developed according to the requirements of DIN EN ISO 14040 and DIN EN ISO 14044 as well as DIN EN 15804 and DIN EN ISO 14025. It is deposited with ift Rosenheim. The results and conclusions reported to the target group are complete, correct, without bias and transparent. The results of the study are not designed to be used for comparative statements intended for publication.

Critical review

The critical review of the LCA and of the report took place in the course of verification of the EPD and was carried out by the external auditor Prof. Dr. Eric Brehm.

7 General information regarding the EPD

Comparability

This EPD was prepared according to DIN EN 15804 and is therefore only comparable to those EPDs that also comply with the requirements set out in DIN EN 15804.
Any comparison must refer to the building context and the same boundary conditions of the various life cycle stages.
For comparing EPDs of construction products, the rules set out in DIN EN 15804, Clause 5.3, apply.

The detailed individual results of the products were summarised on the basis of conservative assumptions and differ from the average results. Identification of the product groups and the resulting variations are documented in the background report.

Communication

The communications format of this EPD meets the requirements of EN 15942:2012 and is therefore the basis for B2B communication. Only the nomenclature has been changed according to DIN EN 15804.

Verification

Verification of the Environmental Product Declaration is documented in accordance with the ift "Richtlinie zur Erstellung von Typ III Umweltproduktdeklarationen" (Guidance on preparing Type III Environmental Product Declarations) in accordance with the requirements set out in DIN EN ISO 14025.

This declaration is based on the PCR documents "PCR Part A" PCR-A-1.0:2023 and "Surface temperature control" PCR-FT-1.0:2023.

The European standard EN 15804 serves as the core PCR [a)]
Independent verification of the declaration and statement according to EN ISO 14025:2010
Independent third party verifier: [b)] Eric Brehm
[a)] Product category rules [b)] Optional for business-to-business communication Mandatory for business-to-consumer communication (see EN ISO 14025:2010. 9.4).

Revisions of this document

No.	Date	Note	Person in charge	Testing personnel
1	01.10.2024	External verification	Dumproff	Brehm
2	19.11.2024	Correction expiration date	Dumproff	

8 Bibliography

1. **Research project.** *"EPDs für transparente Bauelemente" (EPDs for transparent building components) - Final report.* Rosenheim: ift Rosenheim GmbH, 2011. SF-10.08.18.7-09.21/II 3-F20-09-1-067.
2. **ift-Guideline NA-01/4.** *General guideline for preparation of Type III Environmental Product Declarations* Rosenheim: ift Rosenheim GmbH, 2023.
3. **ift Rosenheim GmbH.** *Conditions and Guidance for the Use of ift Test Documents.* Rosenheim: s.n., 2016.
4. **DIN EN ISO 12457 Part 1-4.** *Characterization of waste - Leaching; Compliance test for leaching of granular waste materials and sludges - Part 1-4:* Berlin: Beuth Verlag GmbH, 2003.
5. **IKP Universität Stuttgart and PE Europe GmbH.** *GaBi 10: Software and database for LCA.* Leinfelden-Echterdingen: s.n., 2020.
6. **Chemikaliengesetz – ChemG (Chemicals Act).** *Law on protection against hazardous substances - Subdivided into Chemicals Law and a series of regulations; of relevance here: Law on protection against hazardous substances.* Berlin: BGBI. (Federal Gazette) I S. 1146, 2017.
7. **Bundesimmissionsschutzgesetz - BImSchG. (Federal Immission Law).** *Gesetz zum Schutz vor schädlichen Umwelteinwirkungen durch Luftverunreinigungen, Geräusche, Erschütterungen und ähnlichen Vorgängen (Law on harmful environmental impacts by air contamination, noise, vibrations and similar processes).* Berlin: BGBI. (Federal Gazette) I S. 3830, 2017.
8. **ISO 21930:2017-07.** *Sustainability in building construction - Environmental declaration of building products.* Berlin: Beuth Verlag, 2017.
9. **ISO 15686-1:2011-05.** *Buildings and constructed assets - Service life planning - Part 1: General principles and framework.* s.l. : Beuth Verlag GmbH, 2011.
10. **ISO 15686-2:2012-05.** *Buildings and constructed assets - Service life planning - Part 2: Service life prediction procedures.* s.l. : Beuth Verlag GmbH, 2012.
11. **ISO 15686-7:2017-04.** *Buildings and constructed assets - Service life planning - Part 7: Performance evaluation for feedback of service life data from practice.* s.l. : Beuth Verlag GmbH, 2017.
12. **ISO 15686-8:2008-06.** *Buildings and constructed assets - Service life planning - Part 8: Reference service life and service-life estimation.* s.l. : Beuth Verlag GmbH, 2008.
13. **DIN EN ISO 16000 Parts 6, 9 11.** *Indoor air: Determination of the emission of volatile organic compounds from building products and furnishing.* Berlin: Beuth Verlag GmbH, 2012, 2008, 2006.
14. **DIN EN 13501-1:2010-01.** *Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.* Berlin: Beuth Verlag GmbH, 2010.
15. **Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety).** *Leitfaden Nachhaltiges Bauen (Guidance on Sustainable Building).* Berlin: s.n., 2016.
16. **DIN EN 15804:2012+A2:2019+AC:2021.** *Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products:* Berlin: Beuth Verlag GmbH, 2022.
17. **EN 17672:2022.** *Sustainability of construction works - Environmental product declarations - Horizontal rules for business-to-consumer communication.* Berlin: Beuth Verlag GmbH, 2022.
18. **EN 15942:2012-01.** *Sustainability of construction works - Environmental product declarations - Communication format business-to-business.* Berlin: Beuth Verlag GmbH, 2012.
19. **OENORM S 5200:2009-04-01.** *Radioactivity in construction materials.* Berlin: Beuth Verlag GmbH, 2009.
20. **EN ISO 14025:2011-10.** *Environmental labels and declarations - Type III environmental declarations - Principles and procedures.* Berlin: Beuth Verlag GmbH, 2011.
21. **DIN EN ISO 14044:2006-10.** *Environmental management - Life cycle assessment - Requirements and guidelines.* Berlin: Beuth Verlag GmbH, 2006.
22. **DIN EN ISO 14040:2018-05.** *Environmental management - Life cycle assessment - Principles and framework.* Berlin: Beuth Verlag GmbH, 2018.
23. **Chemikalien-Verbotsverordnung - ChemVerbotsV. (Chemicals Prohibition Regulation).** *Verordnung über Verbote und Beschränkungen des Inverkehrbringens gefährlicher Stoffe, Zubereitungen und Erzeugnisse Chemikaliengesetz (Regulation on bans and restrictions of the placing on the market of hazardous substances, formulations and products covered by the Chemicals Law).* Berlin: BGBI. (Federal Gazette) I S. 1328, 2017.
24. **Gefahrstoffverordnung - GefStoffV. (Hazardous substances regulation).** *Verordnung zum Schutz vor Gefahrstoffen (Regulation on protection against hazardous substances).* Berlin: BGBI. (Federal Gazette) I S. 3758, 2017.
25. **Eyerer, P. und Reinhardt, H.-W.** *Ökologische Bilanzierung von Baustoffen und Gebäuden - Wege zu einer ganzheitlichen Bilanzierung. (LCA of building materials and buildings - Routes to integrated LCA).* Basel: Birkhäuser Verlag, 2000.
26. **Klöpffer, W und Grahl, B.** *Ökobilanzen (LCA).* Weinheim: Wiley-VCH-Verlag, 2009.
27. **PCR Part A.** *Product category rules for environmental product declarations as per EN ISO 14025 and EN 15804.* Rosenheim : ift Rosenheim, 2023.
28. **PCR Part B - Surface temperature control.** *Product category rules for Environmental Product Declarations as per EN ISO 14025 and 15804.* Rosenheim: ift Rosenheim, 2023.

9 Annex

Description of life cycle scenarios for Fonterra Surface temperature control

Product stage			Con-struction process stage		Use stage*							End-of-life stage				Benefits and loads beyond system boundaries
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	production	Transport	Construction/installation process	Use	maintenance	Repair	replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/demolition	Transport	Waste processing	Disposal	Reuse Recovery Recycling potential
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

* For declared B-modules, the calculation of the results is performed taking into account the specified RSL related to one year

Table 6 Overview of applied life cycle stages

The scenarios were calculated taking into account the defined RSL (see Point 4 Use stage).

The scenarios were furthermore based on the research project “EPDs for transparent building components”. (1)

Note: The standard scenarios selected are presented in bold type. They were also used for calculating the indicators in the summary table.

✓ Included in the LCA
— Not included in the LCA

A4 Transport

No.	Scenario	Description
A4.1	**National**	**Transport mix 35-53% capacity used[1], approx. 600 km**
A4.2	International/EU country	Transport mix 35-53% capacity used[1], approx. 2,000 km
A4.3	International/Non-EU	Transport mix 35-53% capacity used[1], approx. 19,000 km

[1] Capacity used: utilized loading capacity of the truck

The transport distances shown represent a transport average with the following transport mix. The scenarios include the return transport, if applicable.

Shipping method	Network fleet structure	Share in %		
		A4.1	A4.2	A4.3
Parcel service provider (CEP - Courier-Express- Parcel service)	Van 7.5 - 16 t (Euro 6), diesel, 35% capacity utilization	2	0	0.5
Forwarding agency and own truck fleet	> 32 t truck/semitrailer (Euro 6), diesel, 53 % capacity utilization	98	90	85
Air freights	Cargo and passenger aircrafts, kerosene	0	9	11
Seagoing vessels/containers	See-/Containerschiff zum Empfangshafen. Schweröl	0	1	3.5

A4 Transport to construction site	Transport weight [kg] per declared unit	Density [kg/m³]	Capacity load factor[2]
PG1 - Fonterra panels	24.292	A4.1: 900 kg/m³ A4.2: 900 kg/m³ A4.3: 0.12 kg/m³	<1
PG2 - Fonterra pipes	0.260		
PG3 - Fonterra control system	1.036		
PG4 - Fonterra accessories	19.965		

[2] Capacity load factor:
= 1 Product completely fills the packaging (without air inclusion)
<1 Packaging contains unused volume (e.g.: air, filling material)
> 1 Product is packed in compressed form

A4 Transport to construction site	Unit	A4.1	A4.2	A4.3
Core indicators				
GWP-t	kg CO_2 equivalent	6.27E-05	3.33E-04	2.81E-03
GWP-f	kg CO_2 equivalent	6.26E-05	3.33E-04	2.81E-03
GWP-b	kg CO_2 equivalent	2.18E-08	8.84E-08	7.09E-07
GWP-l	kg CO_2 equivalent	3.21E-08	1.06E-07	7.96E-07
ODP	kg CFC-11-eq.	1.06E-12	5.45E-12	4.58E-11
AP	mol H^+-eq.	1.71E-07	1.16E-06	1.03E-05
EP-fw	kg P-eq.	5.24E-09	1.74E-08	1.31E-07
EP-m	kg N-eq.	4.47E-08	3.98E-07	3.63E-06
EP-t	mol N-eq.	2.45E-07	1.62E-06	1.42E-05
POCP	kg NMVOC-eq.	4.62E-07	4.21E-06	3.85E-05
ADPF	MJ	9.49E-04	4.78E-03	4.00E-02
ADPE	kg Sb equivalent	1.81E-10	5.55E-10	4.09E-09
WDP	m³ world-eq. deprived	4.74E-06	1.66E-05	1.27E-04
Resource management				
PERE	MJ	1.19E-05	4.13E-05	3.15E-04
PERM	MJ	0.00	0.00	0.00
PERT	MJ	1.19E-05	4.13E-05	3.15E-04
PENRE	MJ	9.49E-04	4.78E-03	4.00E-02
PENRM	MJ	0.00	0.00	0.00
PENRT	MJ	9.49E-04	4.78E-03	4.00E-02
SM	kg	3.98E-07	1.33E-06	1.00E-05
RSF	MJ	0.00	0.00	0.00

NRSF	MJ	0.00	0.00	0.00
FW	m³	1.30E-07	4.63E-07	3.54E-06
Categories of waste				
HWD	kg	6.96E-07	2.36E-06	1.78E-05
NHWD	kg	2.23E-05	7.40E-05	5.57E-04
RWD	kg	2.05E-10	7.39E-10	5.69E-09
Output material flows				
CRU	kg	0.00	0.00	0.00
MFR	kg	7.38E-09	2.84E-08	2.27E-07
MER	kg	4.16E-11	1.35E-10	1.02E-09
EE	MJ	1.68E-07	5.81E-07	4.41E-06
Additional environmental impact indicators				
PM	Disease incidence	6.08E-12	1.94E-11	1.43E-10
IRP	kBq U235-eq.	8.61E-07	3.15E-06	2.44E-05
ETPfw	CTUe	5.01E-04	2.44E-03	2.02E-02
HTPc	CTUh	2.78E-14	9.74E-14	7.45E-13
HTPnc	CTUh	6.85E-13	3.61E-12	3.04E-11
SQP	dimensionless	9.33E-04	2.92E-03	2.12E-02

A5 Construction/installation process

No.	Scenario	Description
A5.1	**Manual**	**According to the manufacturer, some products require holes to be drilled in the wall. Assumption: Bohrmaschine 600 W. Bohrdauer 10 s. Stromverbrauch 1.67E-03 kWh / Bohrloch.**

In case of deviating consumption during installation/assembly of the products which forms part of the site management, they are covered at the building level.

The following power consumption occurs during installation:

Product group	Number of drill holes required	Power consumption [kWh]
PG1 - Fonterra panels	20	0.0034
PG2 - Fonterra pipes	6	0
PG3 - Fonterra control system	4	0
PG4 - Fonterra accessories	0	0

The following quantities of waste materials are generated by packaging during installation:

Product group	Waste materials in kg	of which quantities collected for waste recycling (output materials) in kg
PG1 - Fonterra panels	0.2276	0
PG2 - Fonterra pipes	0.0077	0
PG3 - Fonterra control system	0.1067	0
PG4 - Fonterra accessories	0.2914	0

Ancillary materials, consumables, use of water, use of other resources, material losses as well as direct emissions during installation are negligible.

It is assumed that the packaging material in the Module construction / installation is sent to waste handling. Waste is only thermally recycled in line with the conservative approach. Benefits from A5 are specified in Module D. Electricity replaces electricity mix (GLO, high voltage, market group); thermal energy replaces thermal energy from natural gas (district or industrial, natural gas, RoW).

Transport to the recycling plants is included.

Since this is a single scenario, the results are shown in the relevant summary table.

B1 Use

Only in the case of Fonterra control systems is there partial contact with the indoor air, which is why a VOC measurement was carried out on a representative mixed sample. The product groups Fonterra panels, Fonterra pipes and Fonterra accessories have no contact with the indoor air.

Test reports are available for the evaluation of emissions of volatile organic compounds according to ISO 16000. The following additional information is part of the life cycle assessment. The values result from a test over 28 days and were determined on the basis of a mixed sample using the worst-case approach.

No.	Scenario	Description
B1	Normal intended use	**Release of substances into the indoor air.** **1.0 mg/m³ over 28 days;** **13.04 mg/m³ per year corresponds to an annual emission of 1.304*10^{-5} kg TVOC**

Emissions to soil and water cannot be quantified. See EN 15804 Clause 5.4.4 and Clause 6.3.5.4.2. There are no horizontal standards with harmonized test methods.

Since this is a single scenario, the results are shown in the summary table. There, the results were related to one year, taking into account the reference service life.

B2 Cleaning, maintenance and repair (not relevant)

No cleaning or maintenance is required.

Hilfs-/Betriebsstoffe. Energie-/Wassereinsatz. Materialverluste und Abfallstoffe sowie Transportwege während der Reinigung können vernachlässigt werden.

Since this is a single scenario, the results are shown in the relevant summary table.

B3 Repair (not relevant)

No repair of the components of the building part is required.

For updated information refer to the respective instructions for assembly/installation, operation and maintenance from Viega GmbH & Co. KG.

Hilfs-/Betriebsstoffe. Energie-/Wassereinsatz. Abfallstoffe. Materialverluste und Transportwege während der Reparatur können vernachlässigt werden.

Since this is a single scenario, the results are shown in the relevant summary table.

B4 Replacement (not relevant)

No.	Scenario	Description
B4.1	No replacement	According to manufacturer, a replacement is not planned.

*Assumptions for evaluation of possible environmental impacts; statements made do not constitute any guaranty or warranty of performance.

The statements made in this EPD are only informative to allow evaluation at the building level.

It is assumed that no replacement will be necessary during the 50-year reference service life and the 50-year building service life.

For updated information refer to the respective instructions for assembly/installation, operation and maintenance from Viega GmbH & Co. KG.

Hilfs-/Betriebsstoffe. Energie-/Wassereinsatz. Materialverluste. Abfallstoffe sowie Transportwege während des Ersatzes können vernachlässigt werden.

Since this is a single scenario, the results are shown in the relevant summary table.

B5 Modification/refurbishment (not relevant)

According to the manufacturer, the elements are not included in the improvement / modernisation activities for buildings.

For updated information refer to the respective instructions for assembly/installation, operation and maintenance from Viega GmbH & Co. KG.

Hilfs-/Betriebsstoffe. Energie-/Wassereinsatz. Materialverluste. Abfallstoffe sowie Transportwege während des Ersatzes können vernachlässigt werden.

Since this is a single scenario, the results are shown in the relevant summary table.

B6 Operational energy use

No.	Scenario	Description
B6.1	No energy consumption	No energy consumed when used
B6.2	Energy consumption normal use	Distribution control station with 35 W continuous output Consumption of 203.3 kWh per year (242 days of use)

Fonterra control systems are partly electrically operated. For the other products, there is no energy consumption during standard use. The products are operated manually.
There is no transport consumption for energy use in buildings. Ancillary materials, consumables and water, waste materials and other scenarios are negligible.

Since only one scenario is used, the results based on one year are shown in the relevant summary table.

B7 Operational water use (not relevant)

No water consumption when used as intended. The water flow is not a component that determines the functionality of the products. Water consumption for cleaning is specified in Module B2.1.

There is no transport consumption for water use in buildings. Ancillary materials, consumables, waste materials and other scenarios are negligible.

Since this is a single scenario, the results are shown in the relevant summary table.

C1 Deconstruction, demolition

No.	Scenario	Description
C1	Deconstruction	**According to the manufacturer: 99% deconstruction Further deconstruction rates are possible, give adequate reasons.**

No relevant inputs or outputs apply to the scenario selected. The energy consumed for deconstruction is negligible. Any arising consumption is marginal.

Since this is a single scenario, the results are shown in the relevant summary table.

In case of deviating consumption the removal of the products forms part of site management and is covered at the building level.

C2 Transport

No.	Scenario	Description
C2	Transport	**Transport to collection point with >32 t truck (Euro 4), diesel, 29.96 t payload, 53% capacity used, 50 km**

Since this is a single scenario, the results are shown in the relevant summary table.

C3 Waste management

No.	Scenario	Description
C3	Current market situation	**Share for recirculation of materials:** • **Stainless steel 98% in melt (UBA, 2017)** • **Remaining metals (SiBr, brass, gunmetal, nickel) 97% in melt (UBA, 2017)** • **Aluminium 95% in melt (GDA, 2018)** • **Plastics 60 % thermal recycling in incineration plants (Zukunft Bauen, 2017)** • **Plastics 40 % recycled (Zukunft Bauen, 2017)** • **Electronics 87% recycled (based on waste electrical and electronic equipment, UBA, 2018)** • **Gypsum 5 % recycled (BMUV, 2017)** • **Remainder to landfill/disposal**

As the products are placed on the European market, the disposal scenario is based on average European data sets.

The below table presents the disposal processes and their percentage by mass/weight. The calculation is based on the above mentioned shares in percent related to the declared unit of the product system.

C3 Disposal	Unit	Fonterra			
		Panels	Pipes	Control system	Accessories
Collection process, collected separately	kg	2.37E+01	2.28E-01	9.20E-01	1.95E+01
Collection process, collected as mixed construction waste	kg	2.40E-01	2.30E-03	9.30E-03	1.97E-01
Recovery system, for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovery system, for recycling	kg	3.53E+00	2.26E-01	8.78E-01	7.19E+00
Recovery system, for energy recovery	kg	1.46E+00	1.21E-01	3.09E-01	5.46E-01
Disposal	kg	2.02E+01	1.33E-03	4.18E-02	1.23E+01

Since this is a single scenario, the results are shown in the summary table.

C4 Disposal

No.	Scenario	Description
C4	**Disposal**	**The non-measurable quantities and losses of the reuse/recycling chain (C1 and C3) are modelled as “inert waste (Europe without Switzerland, treatment of inert waste, sanitary landfill.”**

The consumption in scenario C4 results from physical pre-treatment, waste recycling and management of the disposal site. The benefits obtained here from the substitution of primary material production are allocated to Module D, e.g. electricity and heat from waste incineration.

Since this is a single scenario, the results are shown in the summary table.

D Benefits and loads from beyond the system boundaries

No.	Scenario	Description
D	**Recycling potential**	**Stainless steel scrap from A5 and C3 excluding the scrap used in A3 replaces 100% of chrome steel (RoW); Silicon bronze scrap from A5 and C3 excluding the scrap used in A3 replaces 100% of bronze (RoW); Gunmetal scrap from C3 excluding the scrap used in A3 replaces 100% of gunmetal; Brass scrap from C3 excluding the scrap used in A3 replaces 100% of brass; Aluminium scrap from C3 excluding the scrap used in A3 replaces 100% of aluminum, sheet metal rolls (RoW); Nickel scrap from C3 excluding the scrap used in A3 replaces 100% of nickel (GLO); Electronics scrap from C3 excluding the scrap used in A3 replaces 100% of electronic components (GLO);**

		Plastic recyclate from C3 excluding the plastics used in A3 replaces 60% of polyethylene, high density, RoW Gypsum recyclate from C3 minus the plastics used in A3 replace 5% of "market for gypsum fiberboard GLO" Benefits from incineration plant: Electricity replaces electricity mix (GLO), thermal energy replaces thermal energy from natural gas (RoW).

The values in Module D result from recycling of the packaging material in Module A5 and from deconstruction at the end of service life.

Since this is a single scenario, the results are shown in the summary table.

Annex B

Fonterra panels

Material no.	System	Material short text GER	Material short text ENG	Model no.	Dimensions	Item no.	Functional unit	Weight in g	Conversion factor
625201	Fonterra panels	Falt-Tackerplatte	1260 folding clipplate 35-2F 5 C 9	1260	35 - 2F	776015	m2	438	-
625221	Fonterra panels	Rollen-Tackerplatte	1261 reel-stapler plate 25-2WLG04Y Z 9	1261	25-2 WLG 045	727765	m2	430	-
625301	Fonterra panels	Falt-Tackerplatte	1260 folding clipplate 25-2F 5 C 9	1260	25 - 2 F	609351	m2	473	-
625371	Fonterra panels	Rollen-Tackerplatte	1261 reel-stapler plate 35-3R 5 C 9	1261	35 - 3 R	609412	m2	534	-
625471	Fonterra panels	Noppenplatte	1224 knob panel 12-1530-2 5TA 9	1224	12-15 30-2	664442	m2	1,582	-
625481	Fonterra panels	Noppenplatte	1225 knob panel 12-15ND11 5TA 9	1225	12-15 ND11	664459	m2	1,298	-
625491	Fonterra panels	Noppenplatte	1226 knob panel 12-15smart 5TA 9	1226	12-15 SMART	664466	m2	1,000	-
625511	Fonterra panels	Noppenplatte	1227 knob panel 15-1730-2 5TA 9	1227	15-17 30-2	664473	m2	1,608	-
625521	Fonterra panels	Noppenplatte	1228 knob panel 15-17ND11 5TA 9	1228	15-17 ND11	664480	m2	1,194	-
625531	Fonterra panels	Noppenplatte	1229 knob panel 15-17smart 5TA 9	1229	15-17 SMART	664497	m2	1,130	-
625541	Fonterra panels	Verteiler-Tür-Set	12241 manifold/door set 12-1530-2 5TA 9	12241	12-15 30-2	664503	m2	1,130	-
625571	Fonterra panels	Verteiler-Tür-Set	12251 manifold/door set 12-15ND11 5TA 9	12251	12-15 ND11	664510	m2	985	-
625581	Fonterra panels	Verteiler-Tür-Set	12261 manifold/door set 12-15smart5TA 9	12261	12-15 SMART	664527	m2	898	-
625591	Fonterra panels	Verteiler-Tür-Set	12271 manifold/door set 15-1730-2 5TA 9	12271	15-17 30-2	664534	m2	1,346	-
625621	Fonterra panels	Verteiler-Tür-Set	12281 manifold/door set 15-17ND11 5TA 9	12281	15-17 ND11	664541	m2	1,000	-
625631	Fonterra panels	Verteiler-Tür-Set	12291 manifold/door set 15-17smart 5TA 9	12291	15-17 SMART	664558	m2	898	-
626301	Fonterra panels	EPS-Wärmedämmplatte	1282 EPS-Thermal insulation plate S B 9	1282	20	609214	m2	375	-

624441	Fonterra panels	Kühldeckenplatte	12201 ceiling cooling panel 310x20G Z 9	12201	310 X 2000	636746	m2	13,330	1.61
626020	Fonterra panels	Verteilerplatte	123812 manifold panel 620x930 G R 9	123812	620 X 930	673154	m2	10,400	1.73
626421	Fonterra panels	Reno-Kopfplatte	123811 Reno-head plate 310x620 G R 9	123811	310 X 620	657420	m2	3,360	5.20
626431	Fonterra panels	Reno-Grundplatte	123810 RENO-Base plate 620x1000 G R 9	123810	620 X 1000	657437	m2	13,000	1.61
628171	Fonterra panels	Gipsfaserplatte	12382 staff plate 620x1000 G R 9	12382	620 X 1000	615567	m2	14,733	1.61
628241	Fonterra panels	Wandheizplatte	1237 panel heating plate 620x2000 G R 9	1237	620 X 2000	615635	m2	25,060	1.61
628261	Fonterra panels	Wandheizplatte	12371 panel heating plate 620x1000 G R 9	12371	620 X 1000 (70%)	615659	m2	12,567	1.61
628281	Fonterra panels	Gipsfaserplatte	12372 staff plate 620x2000 G R 9	12372	620 X 2000	615673	m2	26,433	1.61
626311	Fonterra panels	EPS-Wärmedämmplatte	1282 EPS-Thermal insulation plate S B 9	1282	30	609221	m2	687	-
625321	Fonterra panels	Falt-Tackerplatte	1260 folding clipplate 30-3F 5 C 9	1260	30 - 3 F	609375	m2	521	-
625311	Fonterra panels	Falt-Tackerplatte	1260 folding clipplate 30-2F 5 C 9	1260	30 - 2 F	609368	m2	506	-
625381	Fonterra panels	Rollen-Tackerplatte	1261 reel-stapler plate 30-2R 5 C 9	1261	30 - 2 R	613433	m2	512	-
625361	Fonterra panels	Rollen-Tackerplatte	1261 reel-stapler plate 30-3R 5 C 9	1261	30 - 3 R	609405	m2	518	-

Fonterra pipes

Material no.	System	Material short text GER	Material short text ENG	Model no.	Dimensions	Item no.	Functional unit	Weight in g	Conversion factor
625250	Fonterra pipes	PB-Rohr	1405 PB-pipe 12x1.3x650m 5DL 9	1405	12 X 1.3 X 650M	616502	m	46	-
625910	Fonterra pipes	PE-Xc-Rohr	1401 PE-XC pipe 17x2.0x240m 5GE 9	1401	17 X 2.0 X 240M	609627	m	103	-
625950	Fonterra pipes	PB-Rohr	1203 PB-pipe 12x21x120m 5DA 9	1203	12 X 21 X 120M	609658	m	101	-
628380	Fonterra pipes	PE-Xc-Rohr	1401 PE-XC pipe 25x2.3x240m 5GE 9	1401	25 X 2.3 X 240M	626952	m	170	-
638831	Fonterra pipes	PE-RT-Rohr	1403 PE-RT-pipe 25x2.3x480m 5IE 9	1403	25 X 2.3 X 480M	657376	m	173	-
638910	Fonterra pipes	PE-RT-Rohr	1403 PE-RT-pipe 16x2.0x240m 5IZ 9	1403	16 X 2.0 X 240M	678975	m	97	-
646270	Fonterra pipes	MV-Rohr	1406 MV-pipe 16x2.0x240m 5JB 9	1406	16 X 2.0 X 240M	692391	m	109	-
696600	Fonterra pipes	PB-Rohr	1405 PB-pipe 25x2.3x240m 5DZ 9	1405	25 X 2.3 X 240M	703585	m	163	-
699560	Fonterra pipes	PB-Rohr	14053 PB-pipe 15x1.5x2500M 5DL 9	14053	15 X 1.5 X 2500M	692728	m	64	-
626220	Fonterra pipes	PB-Rohr	14057 PB-pipe 12x1.3x1000 5DL 9	14057	12 X 1.3 X 1000	635305	m	47	-
645045	Fonterra pipes	PB-Rohr	14057 PB-pipe 17x2.0x1000 5DL 9	14057	17 X 2.0 X 1000	712259	m	100	-
624910	Fonterra pipes	PE-Xc-Rohr	1401 PE-XC pipe 20x2.0x240m 5GE 9	1401	20 X 2.0 X 240M	613631	m	127	-
624961	Fonterra pipes	PE-Xc-Rohr	1401 PE-XC pipe 20x2.0x480m 5GE 9	1401	20 X 2.0 X 480M	664435	m	127	-
625260	Fonterra pipes	PB-Rohr	1405 PB-pipe 15x1.5x240m 5DL 9	1405	15 X 1.5 X 240M	616519	m	64	-
625270	Fonterra pipes	PB-Rohr	1405 PB-pipe 15x1.5x650m 5DL 9	1405	15 X 1.5 X 650M	616526	m	62	-
625930	Fonterra pipes	PE-Xc-Rohr	1401 PE-XC pipe 17x2.0x650m 5GE 9	1401	17 X 2.0 X 650M	609641	m	106	-
628295	Fonterra pipes	PB-Rohr	1405 PB-pipe 12x1.3x240m 5DL 9	1405	12 X 1.3 X 240M	615680	m	45	-
637870	Fonterra pipes	PE-RT-Rohr	1403 PE-RT-pipe 17x2.0x240m 5IE 9	1403	17 X 2.0 X 240M	638313	m	99	-
637880	Fonterra pipes	PE-RT-Rohr	1403 PE-RT-pipe 17x2.0x650m 5IE 9	1403	17 X 2.0 X 650M	638320	m	98	-

638801	Fonterra pipes	PE-RT-Rohr	1403 5IE 9	PE-RT-pipe 20x2.0x240m	1403	20 X 2.0 X 240M	657345	m	126	-
638811	Fonterra pipes	PE-RT-Rohr	1403 5IE 9	PE-RT-pipe 20x2.0x480m	1403	20 X 2.0 X 480M	657352	m	126	-
638821	Fonterra pipes	PE-RT-Rohr	1403 5IE 9	PE-RT-pipe 25x2.3x240m	1403	25 X 2.3 X 240M	657369	m	180	-
638920	Fonterra pipes	PE-RT-Rohr	1403 5IZ 9	PE-RT-pipe 16x2.0x650m	1403	16 X 2.0 X 650M	678982	m	95	-
645270	Fonterra pipes	PB-Rohr	1405 5DL 9	PB-pipe 17x2.0x240m	1405	17 X 2.0 X 240M	697600	m	100	-
645280	Fonterra pipes	PB-Rohr	1405 5DL 9	PB-pipe 17x2.0x650m	1405	17 X 2.0 X 650M	697617	m	100	-
645570	Fonterra pipes	PB-Rohr	1405 5DZ 9	PB-pipe 17x2.0x400m	1405	17 X 2.0 X 400M	750022	m	100	-
696540	Fonterra pipes	PB-Rohr	1405 5DZ 9	PB-pipe 20x2.0x240m	1405	20 X 2.0 X 240M	703561	m	120	-
696560	Fonterra pipes	PB-Rohr	1405 5DZ 9	PB-pipe 12x1.3x120m	1405	12 X 1.3 X 120M	707712	m	44	-

Fonterra control system

Material no.	System	Material short text GER	Material short text ENG	Model no.	Dimensions	Item no.	Functional unit	Weight in g	Conversion factor
616141	Fonterra control system	Stellantrieb	1249 actuating drive 230V 5 Z 9	1249	230 V	696214	pc	113	0.1091
627010	Fonterra control system	Basiseinheit	1246 base unit 230V 5 Z 9	1246	230 V	759001	pc	455	0.4392
627020	Fonterra control system	Basiseinheit	12461 base unit 230V 5 Z 9	12461	230 V	759018	pc	475	0.4585
627030	Fonterra control system	Raumthermostat	1244 thermostat 230V 5 Z 9	1244	230 V	759025	pc	115	0.1110
627083	Fonterra control system	Raumthermostat	12303 thermostat 230V 5 B 9	12303	230 V	816643	pc	63	0.0609
627261	Fonterra control system	Stellantrieb	12491 actuating drive 24V 5 Z 9	12491	24 V	708887	pc	113	0.1086
631403	Fonterra control system	Basiseinheit	1250 base unit - 5 DS9	1250	-	804695	pc	840	0.8108
631433	Fonterra control system	Relais	125027 relay - S Z 9	125027	-	804725	pc	159	0.1537
636140	Fonterra control system	Raumthermostat	12505 thermostat - 5 A 9	12505	-	734022	pc	221	0.2133
636180	Fonterra control system	Stellantrieb	125015 actuating drive - 5 C 9	125015	-	734466	pc	89	0.0859
636190	Fonterra control system	WLAN-Modul	125016 WLAN-module - 5 A 9	125016	-	734473	pc	70	0.0676
636200	Fonterra control system	Funkverstärker	125020 radio amplifier - 5 A 9	125020	-	734480	pc	120	0.1158
636550	Fonterra control system	Netzteil	125022 power supply 230/5.9V 5 A 9	125022	230/5.9V	734503	pc	140	0.1351
636560	Fonterra control system	Sensor	125025 sensor - 5 A 9	125025	-	734510	pc	41	0.0396
636640	Fonterra control system	Aktormodul	125011 Actuator module - 5 BA9	125011	-	805609	pc	53	0.0512
636950	Fonterra control system	Kabel	125023 cable - 5 C 9	125023	-	741136	pc	14	0.0136
636970	Fonterra control system	Flachbandkabel	125028 ribbon cable 850 5 A 9	125028	850	741204	pc	24	0.0227
637020	Fonterra control system	Sensor	125030 sensor - 5 A 9	125030	-	741211	pc	15	0.0145
637120	Fonterra control system	Netzteil	12475 power supply 230V/24V S Z 9	12475	230 V / 24 V	616731	pc	720	0.6950

637180	Fonterra control system	Sicherheits-temperaturbegr	12196 safety temperatur limiter – 5 Z 9	12196	-	616892	pc	190	0.1834
638203	Fonterra control system	Basiseinheit	12511 base unit - S A 9	12511	-	813475	pc	809	0.7809
638213	Fonterra control system	Stellantrieb	12512 actuating drive - S C 9	12512	-	813482	pc	105	0.1014
638223	Fonterra control system	Sensor	12513 sensor - S Z 9	12513	-	813499	pc	28	0.0265
638253	Fonterra control system	Raumthermostat	12305 thermostat 85x81x44.5 S CH9	12305	85X81X44.5	813512	pc	114	0.1100
639270	Fonterra control system	Flachbandkabel	125028 ribbon cable 5000 5 A 9	125028	5000	794064	pc	128	0.1236
639283	Fonterra control system	Raumthermostat	12302 thermostat 24V 5 B 9	12302	24 V	804770	pc	51	0.0497
768931	Fonterra control system	Netzteil	224563 power supply 230-6.5V 5 8Z9	224563	230-6.5V	734862	pc	55	0.0533

Fonterra accessories

Material no.	System	Material short text GER	Material short text ENG	Model no.	Dimensions	Item no.	Functional unit	Weight in g	Conversion factor
111731	Fonterra accessories	Kugelhahn-Set	1041 ball valve set 3/4 0 1 9	1041	45385	606275	pc	455	0.0452
113213	Fonterra accessories	Erweiterungsset	10102 extension set DN25 E 1 9	10102	DN25	786939	pc	625	0.0622
300130	Fonterra accessories	Fixierhaken	1482 fixing hook - 5 A 9	1482	-	759322	pc	3	0.0003
300161	Fonterra accessories	Rohrhaspel	1452 pipe coiler 12-20 7 H 9	1452	44166	562359	pc	9,155	0.9109
300201	Fonterra accessories	Estrichzusatzmittel	1454 additive for floor pavement S Z 9	1454	10 kg	562724	pc	10,630	1.0577
300244	Fonterra accessories	Rohrhaspel	14522 pipe coiler - 7 H 9	14522	-	754761	pc	11,582	1.1524
300310	Fonterra accessories	Rohrführung	14521 transition pipe - 7 H 9	14521	-	759940	pc	1,032	0.1027
300901	Fonterra accessories	Tellerdübel	1480 plate dowel 35x25x5 5 S 9	1480	35 X 25 X 5	569037	pc	2	0.0002
300911	Fonterra accessories	Haltenadel	1481 staple 20x50 5 S 9	1481	20 X 50	569044	pc	1	0.0001
300962	Fonterra accessories	Messstelle	1490 assembly unit - 5 2A9	1490	-	569082	pc	40	0.004
545700	Fonterra accessories	Regel-/Verteilerstation	12542 distributor station - 0 Z 9	12542	-	704896	pc	4,840	0.4816
558630	Fonterra accessories	Tackernadeln	12606 stapler needle 57 5 A 9	12606	57	707392	pc	2	0.0002
558650	Fonterra accessories	Tackergerät	12607 stapler - 7 Z 9	12607	-	707408	pc	2,475	0.2463
616161	Fonterra accessories	Tackergerät	14453 stapler - 7 Z 9	14453	-	696238	pc	2,454	0.2442

616231	Fonterra accessories	Tackernadeln	12451 stapler needle - 5 A 9	12451	-	696245	pc	2	0.0002
624371	Fonterra accessories	Kupplung mit SC	1223 coupling with SC 25x2,3 2 1 9	1223	25 X 2.3	636586	pc	116	0.0115
624524	Fonterra accessories	Übergangsstück mit SC	12135 Adapter piece w.sc 3/4x25 2 4 9	12135	3/4 X 25	636814	pc	120	0.0119
624661	Fonterra accessories	Einsteckstück mit SC	1213 plug piece with SC 15x12 2 1 9	1213	15 X 12	637002	pc	36	0.0035
624671	Fonterra accessories	Rohrführungsbogen	1272 guide tube bow 25 5 A 9	1272	25	637019	pc	110	0.0109
625010	Fonterra accessories	Schelle	12331 clamp - 7 Z 9	12331	-	775964	pc	18	0.0018
625050	Fonterra accessories	Montagehilfe	12333 mounting aid - S Z 9	12333	-	775988	pc	114	0.0113
625070	Fonterra accessories	Schneidwerkzeug	12332 Cutting tool - 5 Z 9	12332	-	775995	pc	675	0.0672
625100	Fonterra accessories	Klebeband	12334 adhesive tape 3500x100x2 S Z 9	12334	3500 X 100 X 2	776008	pc	78	0.0078
625394	Fonterra accessories	Tackernadeln	1245 stapler needle 15-20 5 4A9	1245	15 - 20	656966	pc	2	0.0002
625441	Fonterra accessories	Tackergerät	14452 stapler - 7 Z 9	14452	-	659165	pc	2,390	0.2378
625601	Fonterra accessories	Rohrführungsbogen	1272 guide tube bow 12 5 A 9	1272	12	609498	pc	23	0.0022
625641	Fonterra accessories	Diagonalhalter	1290 diagonal bracket 15-17 5 A 9	1290	15 - 17	664565	pc	12	0.0011
626010	Fonterra accessories	Klebeband	1279 adhesive tape 50x66m S Z 9	1279	50 X 66M	609672	pc	160	0.0159
626101	Fonterra accessories	Abrollgerät	1280 wire dispenser - 7 Z 9	1280	-	609702	pc	623	0.062
626251	Fonterra accessories	Estrichzusatzmittel	1455 additive for floor pavement S Z 9	1455	10 kg	609207	pc	10,568	1.0515

626353	Fonterra accessories	Dübel	12811 dowel 90 5 Z 9	12811	90	827144	pc	8	0.0008
626611	Fonterra accessories	Grundierung	123523 primer 1L S Z 9	123523	1 L	668914	pc	1,128	0.1122
626651	Fonterra accessories	Zonenventilset	1286 zone valve set - 0 1 9	1286	-	610005	pc	1,025	0.102
626681	Fonterra accessories	Anschlussset	1288 connection set HM 0 4 9	1288	HM	610074	pc	1,061	0.1056
626691	Fonterra accessories	Anschlussset	12881 connection set HM 0 4 9	12881	HM	610081	pc	1,730	0.1721
627301	Fonterra accessories	Rohrführungsbogen	12336 guide tube bow 15-17 5 Z 9	12336	15 - 17	778095	pc	24	0.0024
627381	Fonterra accessories	Kleinflächenregelstation	1256 mix.stat. for small surf.areE 1 9	1256	50 X 54 X 12	684112	pc	9,200	0.9154
627391	Fonterra accessories	Türelement	12561 door element 482x444x20 7 CH9	12561	482 X 444 X 20	684129	pc	2,360	0.2348
627541	Fonterra accessories	Anschlussset	12551 connection set - S Z 9	12551	-	685171	pc	833	0.0829
627671	Fonterra accessories	Montageset	1299 assembly set 11/2 7 H 9	1299	1.5	613082	pc	2,150	0.2139
627701	Fonterra accessories	T-Stück	12183 tee 32x17x32 2G1 9	12183	32 X 17 X 32	656386	pc	244	0.0243
627731	Fonterra accessories	T-Stück	12183 tee 40x20x40 2G1 9	12183	40 X 20 X 40	656416	pc	413	0.0411
627991	Fonterra accessories	Vergussmasse	12376 sealing compound 25KG S Z 9	12376	25 kg	664428	pc	25,000	2.4876
628181	Fonterra accessories	Schnellbauschraube	1259 dry wall screw 25x3.9 7 A 9	1259	25 X 3.9	615574	pc	1	0.0001
628201	Fonterra accessories	Schlagdübel	12392 nail dowel 35x6 5 C 9	12392	35 X 6	615598	pc	3	0.0003
628225	Fonterra accessories	Schelle	12394 clamp - 5 C 9	12394	-	615611	pc	3	0.0002

628350	Fonterra accessories	Fugenkleber	12373 joint adhesive 310G S Z 9	12373	310 G	624897	pc	550	0.0547
628351	Fonterra accessories	Doppelanschlussstück	12559 double connection piece 3/4 0 4 9	12559	45385	625450	pc	160	0.0159
628360	Fonterra accessories	Estrichkleber	12374 screed adhesive 1000G S Z 9	12374	1000 G	624903	pc	1,130	0.1124
628370	Fonterra accessories	Temperaturfolie	12375 temperature foil 150x70 5 Z 9	12375	150 X 70	624910	pc	12	0.0012
636170	Fonterra accessories	Temperaturmessstelle	125010 temperature measuring statio 5 A 9	125010	-	734459	pc	130	0.0129
636472	Fonterra accessories	Aufsteller	12506 display - 5 DS9	12506	-	789831	pc	77	0.0077
636770	Fonterra accessories	Schnellbauschraube	1259 dry wall screw 45x3.9 7 A 9	1259	45 X 3.9	625184	pc	2	0.0002
636780	Fonterra accessories	Fensterbauschraube	12591 window building screw 22x4, 27 Z 9	12591	22 X 4.2	625191	pc	1	0.0001
636811	Fonterra accessories	Verschraubung	1037 union 3/4x12 0 4 9	1037	3/4 X 12	614508	pc	66	0.0065
636861	Fonterra accessories	Verschraubung	1037 union 3/4x20 0 4 9	1037	3/4 X 20	614553	pc	68	0.0068
636871	Fonterra accessories	Verschraubung mit SC	1236 union with SC 3/4x12 2 4 9	1236	3/4 X 12	614584	pc	69	0.0068
636921	Fonterra accessories	Verschraubung mit SC	1236 union with SC 3/4x20 2 4 9	1236	3/4 X 20	614638	pc	103	0.0102
636931	Fonterra accessories	Kupplung mit SC	1223 coupling with SC 12x1.3 2 1 9	1223	12 X 1.3	614676	pc	26	0.0026
636991	Fonterra accessories	Verschraubung	1021 union 3/4x20 0 4 9	1,021	3/4 X 20	614645	pc	119	0.0119
637011	Fonterra accessories	Kupplung	10305 coupling 12x1.3 0 1 9	10305	12 X 1.3	614669	pc	120	0.012
637451	Fonterra accessories	Kupplung	10305 coupling 20x2 0 1 9	10305	20 X 2	619824	pc	170	0.0169

637491	Fonterra accessories	Winkel 90°	12143 elbow 90°15x1.5 2 1 9	12143	15 X 1.5	619862	pc	102	0.0101
638034	Fonterra accessories	Übergangsstück mit SC	12135 Adapter piece w.sc 1/2x12 2 4 9	12135	1/2 X 12	636166	pc	46	0.0046
638083	Fonterra accessories	Deckendurchführung	12727 ceiling lead-in 20 5 C 9	12727	20	637095	pc	241	0.024
638240	Fonterra accessories	Befestigungsband	126241 mounting tape 200 5 E 9	126241	200	638344	pc	1	0.0001
646381	Fonterra accessories	Kugelhahn-Set	10412 ball valve set 11/2 0 1 9	10412	1.5	696085	pc	2,485	0.2473
699140	Fonterra accessories	Estrichzusatzmittel	14531 additive for floor pavement S Z 9	14531	20 kg	703998	pc	20,200	2.01
723731	Fonterra accessories	Schnellentlüfter	10281 air vent 1/2 0 1 9	10281	45323	610685	pc	183	0.0182
739040	Fonterra accessories	Estrichzusatzmittel	1456 additive for floor pavement S Z 9	1456	12 kg	704513	pc	12,125	1.2065
770320	Fonterra accessories	Differenzdruckreglerset	1289 differential pressure regula 0 Z 9	1289	-	719562	pc	2,279	0.2267
111134	Fonterra accessories	Adapter	10215 adapter 1/2x3/4 0 4 9	10215	1/2 X 3/4	639877	pc	46	0.0046
113103	Fonterra accessories	Heizkreisverteiler	1010 heating distributor DN25-2 E 1 9	1010	DN25-2	786823	pc	1,711	0.1702
113143	Fonterra accessories	Heizkreisverteiler	1010 heating distributor DN25-6 E 1 9	1010	DN25-6	786861	pc	2,776	0.2762
113203	Fonterra accessories	Heizkreisverteiler	1010 heating distributor DN25-12 E 1 9	1010	DN25-12	786922	pc	4,669	0.4645
690131	Fonterra accessories	Industrieverteiler	1007 industrial manifold 6-fold E 1 9	1007	6-fold	620820	pc	7,200	0.7164
690171	Fonterra accessories	Industrieverteiler	1007 industrial manifold 10-fold E 1 9	1007	10-fold	621964	pc	11,050	1.0995
690231	Fonterra accessories	Industrieverteiler	1007 industrial manifold 16-fold E 1 9	1007	16-fold	622022	pc	16,705	1.6622

626901	Fonterra accessories	Unterputz-Verteilerschr.	1294 concealed distribution box 47 CH9	1294	460	610272	pc	9,395	0.9348
626951	Fonterra accessories	Unterputz-Verteilerschr.	1294 concealed distribution box 17 CH9	1294	1200	610319	pc	18,000	1.791
626961	Fonterra accessories	Aufputz-Verteilerschrank	12941 on-wall distribution box 4607 CH9	12941	460	610326	pc	8,900	0.8856
627001	Fonterra accessories	Aufputz-Verteilerschrank	12941 on-wall distribution box 1207 CH9	12941	1200	610371	pc	16,500	1.6418
626401	Fonterra accessories	Trennfolie	1284 separating sheet 0.1 5 Z 9	1284	0.1	609887	pc	97	0.0097

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Notes
This EPD is mainly based on the work and findings of the Institut für Fenstertechnik e.V., Rosenheim (ift Rosenheim) and specifically on the ift-Richtlinie NA-01/4 Allgemeiner Leitfaden zur Erstellung von Typ III Umweltproduktdeklarationen. (ift-Guideline NA-01/4 - Guidance on preparing Type III Environmental Product Declarations)

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