EPD

Environmental Product Declaration

FLEXITEST SWITCH – 10 POSITION (FT-1)

Production site: Pinetops, United States

DOCUMENT KIND Environmental Product Declaration	IN COMPLIANCE WITH ISO 14025 and EN 50693			
PROGRAM OPERATOR The Norwegian EPD Foundation	PUBLISHER The Norwegian EPD Foundation			
REGISTRATION NUMBER OF THE PROGRAM OPERATOR NEPD-8619-8182-EN	ISSUE DATE 2024-12-31			
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OWNING ORGANIZATION ABB Switzerland Ltd, Group Technology Management	ABB DOCUMENT ID 1VAL200301-EPD	REV. A	LANG. EN	PAGE 1/18

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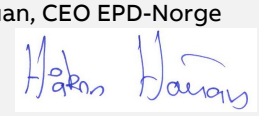
EPD Owner	ABB Switzerland Ltd, Group Technology Management
Organization No.	CHE-101.538.426
Manufacturer name and address	ABB Pinetops 3022 NC-43, Pinetops, NC 27864, United States
Company contact	Joemoan Xavier – joemoan.i.xavier@us.abb.com Product Manager
Program operator	The Norwegian EPD Foundation Post Box 5250 Majorstuen, 0303 Oslo, Norway phone: +47 23 08 80 00, email: post@epd-norge.no
Declared product	FT-1 Switches
Product description	FT-1 switches are used at every level of the power distribution process, from generation to distribution, to perform tests on switchboard relays, meters, and instruments. This product allows for these tests to be conducted without taking relays out of service or accessing the relay wiring.
Functional unit	To test relays connected to Current Transformers, Potential Transformers and Control Circuits , with negligible internal resistance and no power consumption through the United States with a lifetime of 20 years.
Reference flow	An average FT-1 switch, including related accessories and packaging.
Independent verification	Independent verification of the declaration and data, according to ISO 14025:2010 ☐ INTERNAL ☒ EXTERNAL Independent verifier approved by EPD-Norge: Elisabet Amat Signature: 
Approved by	Håkon Hauan, CEO EPD-Norge Signature: 
Reference PCR	EN 50693:2019 – Product Category Rules for Life Cycle Assessments of Electronic and Electrical Products and Systems. EPDItaly007 – Electronic and Electrical Products and Systems, Rev. 3.0, 2023/01/13.
Program instructions	The Norwegian EPD Foundation/EPD-Norge, General Programme Instructions 2019, Version 3.0, 2019/04/24.
LCA study	This EPD is based on the LCA study described in the LCA report 1VAL200301-LCA.
EPD type	Average product
EPD scope	Cradle-to-grave
Product RSL	20 years
Geographical representativeness	Manufacturing (suppliers): Global Manufacturing (ABB): United States Downstream: United States
Reference year	2023
LCA software	SimaPro 9.5 (2023)
LCI database	Ecoinvent v3.9.1 (2022)
Comparability	EPDs published within the same product category, though originating from different programs, may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible.
Liability	The owner of the declaration shall be liable for the underlying information and evidence. EPD-Norge shall not be liable with respect to manufacturer, life cycle assessment data, and evidence.
Markets of Applicability	Global: Manufacturing United States: Distribution and End-of-Life

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Sustainability at ABB

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At ABB, we actively contribute to a more sustainable world, leading by example in our own operations and partnering with customers and suppliers to enable a low-carbon society, preserve resources, and promote social progress.

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General Information

This Environmental Product Declaration is an “average EPD” which declares an average product as the reference product. According to the General Program Instructions of EPD-Norge, the total environmental impacts do not vary more than ± 10 % between the declared products; however, variations may be greater for the other impact categories. The EPD covers the following devices of the FT-1 Switch Family, including related accessories and packaging:

- 129A501G01 (FT1-001)
- 129A514G01 (FT1-014)
- 498A020G01 (FT1-073)
- 9682A75G01 (FT1-890)

The results associated to an additional device of the FT-1 Switch Family can be extrapolated according to the provided extrapolation rules. The extrapolation rules cover the following devices of the FT-1 Switch Family, including related accessories and packaging:

- 991A15KG01 (FT1-15K)
- S129A518G01 (FT1-S018)

FT-1 switches are used at every level of the power distribution process, from generation to distribution, to perform tests on switchboard relays, meters, and instruments. This product allows for these tests to be conducted without taking relays out of service or accessing the relay wiring.
General technical information of the products is presented below.

	Description	FT1-001	FT1-014	FT-073	FT1-890
Config.	**FT-1 Test Switch**	129A501G01	129A514G01	498A020G01	9682A75G01
Size	**Length**	.16 m	.16 m	.16 m	.16 m
	Width	.070 m	070 m	.070 m	.070 m
	Height	.06 m	.06 m	.06 m	.06 m
	Weight	.79 kg	.83 kg	.85 kg	.90 kg
Ratings	**Rated voltage [kV]**	.60 kV	.60 kV	.60 kV	.60 kV
	Rated current [A]	30 A	30 A	30 A	30 A
	Rated continuous current for 1 sec.[kA]	.5 kA	.5 kA	.5 kA	.5 kA

The products are manufactured by ABB US located in Pinetops, NC. The manufacturing site is certified according to the following standards:

- ISO/IEC 17025:2017 – Electrical Testing
- ISO 9001:2015 – Quality Management System

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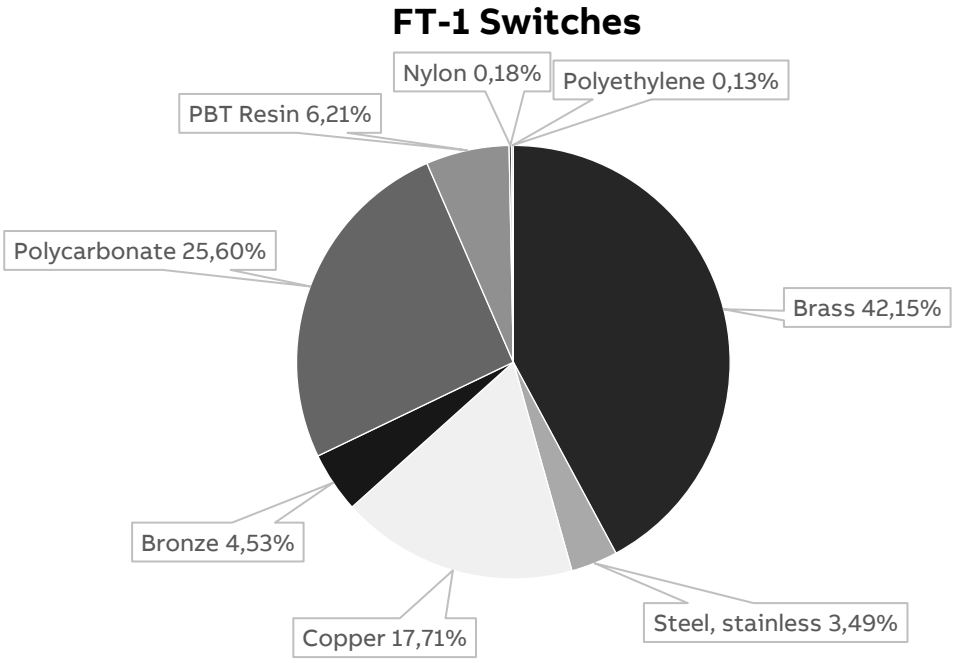
Constituent Materials

The constituent materials of the average FT-1 Switch are presented below.

Type	Material	Weight [kg]	Weight %
Metals	Brass	0.26	42.15%
	Steel, stainless	0.03	3.49%
	Copper	0.11	17.71%
	Bronze	0.02	4.53%
Plastics	Polycarbonate	0.20	25.60%
	Polyethylene	0.001	0.13%
	PBT Resin	0.04	6.21%
	Nylon	0.001	0.18%
Total		**0.77**	**100%**



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The constituent materials of the packaging and accessories are presented below.

	Description	Material	Weight [kg]	Weight %
Unit (1st)	Packaging box	Cardboard	0.09	94%
	Box insert	Cardstock	0.004	4.5%
	Staple	Steel	0.001	1.5%
	Total		**0.09**	**100%**

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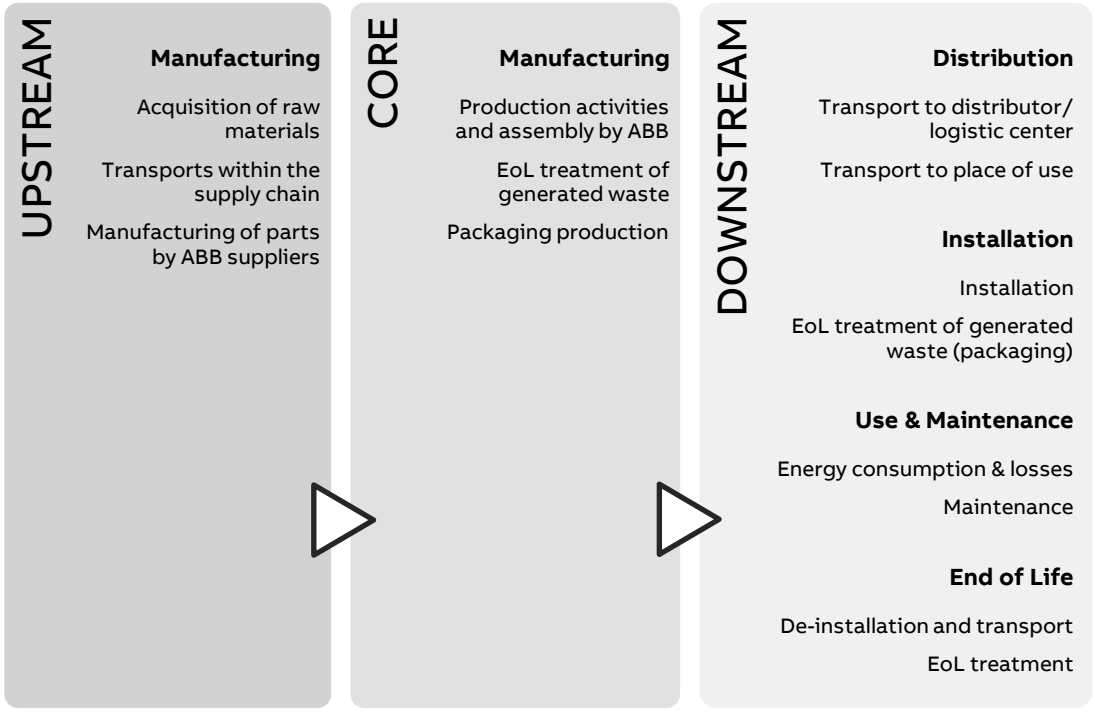
LCA Background Information

Functional Unit

To test relays connected to Current Transformers, Potential Transformers and Control Circuits, with negligible internal resistance and no power consumption through the United States with a lifetime of 20 years. The reference flow is an average FT-1 switch, including related accessories and packaging. Note, the reference service life (RSL) of 20 years is a theoretical period selected for calculation purposes only – this is not representative for the minimum, average, nor actual service life of the product.

System Boundaries

The life cycle assessment is a “cradle-to-grave” analysis, and the system boundaries are defined according to EN 50693, as required by the PCR. For transparency reasons, the manufacturing stage is further divided into an upstream and core stage.



Data quality

Both primary and secondary data are used. The main sources for primary data are the bill of materials (BOM), CAD-files, and technical drawings and site-specific foreground data are provided by ABB.

For all processes for which primary data are not available, generic background data originating from the Ecoinvent v3.9.1 database, with system model “allocation, cut-off by classification”, are used. The LCA software used for the calculations is SimaPro 9.5.

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Allocation rules

The utility consumption and waste generation by ABB, in the core manufacturing stage, is allocated to the production of one reference product according to applicable rules. For the end-of-life allocation, the “Polluter Pays” principle is adopted according to what is defined in the CEN/TR 16970 standard. However, the potential benefits and avoided loads from recovery and recycling processes are not considered because it is not required by the PCR.

Cut-off criteria

According to PCR EPDItaly007, the cut-off criteria can be set to a maximum of 5 % of the overall environmental impacts. In this LCA, stickers have been excluded as their weights are negligible.

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Inventory Analysis

Manufacturing Stage (upstream)

The life cycle inventory in the upstream manufacturing stage is based on the primary data available from ABB. Datasets are applied accordingly, to the best of our knowledge, to represent each material, manufacturing process, and surface treatment.

Additionally, supply chain transports are added as far as data is available between ABB, the suppliers, and sub-suppliers. Only primary suppliers are considered. The rest of the transports are assumed to already be included in Ecoinvent's "market for"-processes.

Manufacturing Stage (core)

In the core manufacturing stage, utility consumption and waste generation at the ABB manufacturing site are accounted for. The packaging materials and accessories associated with the product are also considered.

Distribution

The transport distance from ABB manufacturing site to site of installation varies depending on the location of the customer. It is assumed to be 300 km over land, as suggested by Sub-PCR EPDItaly012.

	Dataset	Amount	Unit	Represent.
Transport	*Transport, freight, lorry 16-32 metric ton, EURO4 {RoW}*	300	km	Assumption

Installation

The installation phase only implies manual activities, and no energy is consumed. Therefore, this phase only considers the end-of-life of the packaging materials used.

	Scenario	Transport	Representation
Packaging End-of-Life	*Advancing Sustainable Material Management United States Environmental Protection Agency (EPA) (2020)*	100 km by lorry (assumption)	US

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Use

The use stage considers the reference power consumption/power losses/SF6 losses/other over the reference service life as defined in the functional unit. For the FT-1 Switch, there is no power consumption as it is a testing apparatus for relays. Any power loss during testing is nominal.

End of life

Decommissioning of the product only implies manual activities, and no energy is consumed. Therefore, this phase only considers the end-of-life of the product.

	Scenario	Transport	Representation
Product End-of-Life	Advancing Sustainable Material Management United States Environmental Protection Agency (EPA) (2020)	100 km by lorry (assumption)	US

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Environmental Indicators

In accordance with the PCR EPDItaly007, the environmental impact indicators are determined by using the characterization factors and impact assessment methods specified in EN 15804:2012+A2:2019.

FT-1 Average Switch

			Cradle-to-gate		Cradle-to-grave			
			UPSTREAM	CORE	DOWNSTREAM			
Impact category	Unit	Total	Manufacturing		Distribution	Installation	Use and maintenance	End-of-life
GWP – total	kg CO_2 eq.	6.98E+00	6.51E+00	1.56E-01	4.41E-02	1.14E-01	0.00E+00	1.56E-01
GWP – fossil	kg CO_2 eq.	6.91E+00	6.41E+00	2.03E-01	4.41E-02	1.03E-01	0.00E+00	1.55E-01
GWP – biogenic	kg CO_2 eq.	5.39E-02	8.99E-02	-4.74E-02	1.54E-05	1.07E-02	0.00E+00	7.53E-04
GWP – luluc	kg CO_2 eq.	9.85E-03	8.64E-03	1.04E-03	2.30E-05	5.39E-05	0.00E+00	9.19E-05
ODP	kg CFC-11 eq.	9.06E-08	8.29E-08	4.53E-09	6.98E-10	1.63E-09	0.00E+00	8.12E-10
AP	mol H+ eq.	2.41E-01	2.39E-01	9.07E-04	1.94E-04	4.53E-04	0.00E+00	3.40E-04
EP – freshwater	kg P eq.	1.82E-02	1.80E-02	9.83E-05	3.58E-06	8.41E-06	0.00E+00	2.18E-05
EP – marine	kg N eq.	1.74E-02	1.59E-02	7.31E-04	7.11E-05	1.77E-04	0.00E+00	5.08E-04
EP – terrestrial	mol N eq.	2.09E-01	2.03E-01	2.34E-03	7.60E-04	1.78E-03	0.00E+00	9.25E-04
POCP	kg NMVOC eq.	6.23E-02	6.03E-02	7.82E-04	2.61E-04	6.12E-04	0.00E+00	2.91E-04
ADP – minerals and metals	kg Sb eq.	3.00E-03	3.00E-03	8.81E-07	1.42E-07	3.32E-07	0.00E+00	4.19E-07
ADP – fossil	MJ, net calorific value	9.77E+01	9.08E+01	3.92E+00	6.24E-01	1.46E+00	0.00E+00	8.81E-01
WDP	m^3 eq.	1.26E+00	4.27E+00	3.04E+00	2.75E-03	6.51E-03	0.00E+00	1.62E-02

GWP-fossil: Global Warming Potential fossil; GWP-biogenic: Global Warming Potential biogenic; GWP-luluc: Global Warming Potential land use and land use change; ODP: Depletion potential of the stratospheric ozone layer; AP: Acidification potential; EP-freshwater: Eutrophication potential-freshwater compartment; EP-marine: Eutrophication potential-marine compartment; EP-terrestrial: Eutrophication potential-accumulated exceedance; POCP: Formation potential of tropospheric ozone; ADP-minerals & metals: Abiotic Depletion for non-fossil resources potential; ADP-fossil: Abiotic Depletion for fossil resources potential; WDP: Water deprivation potential.

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Resource use parameters	Unit	Total	Cradle-to-gate		Cradle-to-grave			
			UPSTREAM	CORE	DOWNSTREAM			
			Manufacturing		Distribution	Installation	Use and maintenance	End-of-life
PENRE	MJ, low cal. value	8.89E+01	8.20E+01	3.92E+00	6.24E-01	1.46E+00	0.00E+00	8.81E-01
PERE	MJ, low cal. value	1.31E+01	1.29E+01	1.75E-01	7.94E-03	1.87E-02	0.00E+00	7.09E-02
PENRM	MJ, low cal. value	8.82E+00	8.82E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERM	MJ, low cal. value	1.16E+00	0.00E+00	1.16E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ, low cal. value	9.77E+01	9.08E+01	3.92E+00	6.24E-01	1.46E+00	0.00E+00	8.81E-01
PERT	MJ, low cal. value	1.43E+01	1.29E+01	1.33E+00	7.94E-03	1.87E-02	0.00E+00	7.09E-02
FW	m^3	3.83E-02	1.08E-01	-7.03E-02	8.89E-05	2.10E-04	0.00E+00	5.30E-04
MS	kg	1.70E-01	9.95E-02	7.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

PENRE: Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material; PERE: Use of renewable primary energy excluding renewable primary energy resources used as raw material; PENRM: Use of non-renewable primary energy resources used as raw material; PERM: Use of renewable primary energy resources used as raw material; PENRT: Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials); PERT: Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials); FW: Net use of fresh water; MS: Use of secondary materials; RFS: Use of renewable secondary fuels; NRSF: Use of non-renewable secondary fuels.

System output indicators	Unit	Total	Cradle-to-gate		Cradle-to-grave			
			UPSTREAM	CORE	DOWNSTREAM			
			Manufacturing		Distribution	Installation	Use and maintenance	End-of-life
HWD	kg	1.17E-03	1.14E-03	1.13E-05	4.03E-06	9.41E-06	0.00E+00	3.16E-06
NHWD	kg	3.68E+00	2.95E+00	5.18E-02	3.03E-02	7.60E-02	0.00E+00	5.72E-01
RWD	kg	1.52E-04	1.26E-04	2.42E-05	1.26E-07	2.97E-07	0.00E+00	1.35E-06
MER	kg	9.22E-02	0.00E+00	4.99E-04	0.00E+00	1.30E-03	0.00E+00	9.04E-02
MFR	kg	2.82E-01	8.83E-02	8.46E-03	0.00E+00	8.45E-02	0.00E+00	1.01E-01
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ETE	MJ	3.25E-01	0.00E+00	0.00E+00	0.00E+00	5.28E-03	0.00E+00	3.19E-01
EEE	MJ	1.80E-01	0.00E+00	0.00E+00	0.00E+00	2.93E-03	0.00E+00	1.77E-01

HWD: hazardous waste disposed; NHWD: non-hazardous waste disposed; RWD: radioactive waste disposed; MER: materials for energy recovery; MFR: material for recycling; CRU: components for reuse; ETE: exported thermal energy; EEE: exported electricity energy.

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Extrapolation rules

Extrapolation Rules

Due to the large variations in environmental impacts present within the series, extrapolation rules are established according to EN 50693 for the test switches. The extrapolation rules have been verified with other product configurations to ensure an accuracy within ± 10% of the total environmental impacts.

Average FT-1 Impact with FT1-15K and FT1-S018 configuration:

The conversion factors, shown in the table below, are calculated by dividing the environmental impact of the selected FT-1 switches by the related FT-1 Average values.
The environmental impact values of other FT-1 Switch configurations are then obtained by multiplying the reference flow by the correspondent conversion factor:

$$\text{Value}_{(FT1)} = \text{Value}_{(FT\text{-}1\ Average)} * \text{Conversion Factor}$$

Where:

- Value $_{(FT\text{-}1\ Average)}$ can be found in the tables in the chapter titled “Environmental Indicators” of the LCA.
- Conversion Factor are constants, and they can be found in the following tables.

Impact Category	Unit	Total	UPSTREAM	CORE	DOWNSTREAM			
			Manufacturing		Distribution	Installation	Use and maintenance	End-of-life
GWP – total	kg CO_2 eq.	2.85	3.15	1.00	2.28	1.00	N/A	1.55
GWP – fossil	kg CO_2 eq.	2.80	3.13	1.00	2.28	1.00	N/A	1.54
GWP – biogenic	kg CO_2 eq.	-2.38	6.71	1.00	2.28	1.00	N/A	5.08
GWP – luluc	kg CO_2 eq.	3.78	5.86	1.00	2.28	1.00	N/A	2.56
ODP	kg CFC-11 eq.	2.80	3.25	1.00	2.28	1.00	N/A	2.12
AP	mol H+ eq.	11.40	12.23	1.00	2.28	1.00	N/A	2.37
EP – freshwater	kg P eq.	13.14	14.25	1.00	2.28	1.00	N/A	2.48
EP – marine	kg N eq.	4.87	7.01	1.00	2.28	1.00	N/A	1.34
EP – terrestrial	mol N eq.	6.97	8.07	1.00	2.28	1.00	N/A	2.28
POCP	kg NMVOC eq.	5.90	6.75	1.00	2.28	1.00	N/A	2.27
ADP – minerals and metals	kg Sb eq.	17.44	17.58	1.00	2.28	1.00	N/A	2.55
ADP – fossil	MJ, net calorific value	2.47	2.70	1.00	2.28	1.00	N/A	2.38
WDP	m^3 eq.	-0.60	4.94	1.00	2.28	1.00	N/A	1.88

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Impact Category	Unit	Total	UPSTREAM	CORE	DOWNSTREAM			
			Manufacturing		Distribution	Installation	Use and maintenance	End-of-life
GWP – total	kg CO_2 eq.	1.04	1.05	1.00	1.08	1.00	N/A	1.00
GWP – fossil	kg CO_2 eq.	1.04	1.05	1.00	1.08	1.00	N/A	1.00
GWP – biogenic	kg CO_2 eq.	1.02	1.01	1.00	1.08	1.00	N/A	1.03
GWP – luluc	kg CO_2 eq.	0.99	0.99	1.00	1.08	1.00	N/A	1.00
ODP	kg CFC-11 eq.	1.06	1.07	1.00	1.08	1.00	N/A	1.00
AP	mol H+ eq.	0.94	0.94	1.00	1.08	1.00	N/A	1.00
EP – freshwater	kg P eq.	0.93	0.93	1.00	1.08	1.00	N/A	1.00
EP – marine	kg N eq.	1.00	1.00	1.00	1.08	1.00	N/A	1.00
EP – terrestrial	mol N eq.	0.99	0.99	1.00	1.08	1.00	N/A	1.00
POCP	kg NMVOC eq.	1.00	1.00	1.00	1.08	1.00	N/A	1.00
ADP – minerals and metals	kg Sb eq.	0.92	0.92	1.00	1.08	1.00	N/A	1.00
ADP – fossil	MJ, net calorific value	1.04	1.05	1.00	1.08	1.00	N/A	1.00
WDP	m^3 eq.	0.87	0.96	1.00	1.08	1.00	N/A	1.00

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Additional Environmental Information

Circularity Values

The recyclability potential of the product (excluding packaging) is calculated by dividing "MFR: material for recycling" in the end-of-life stage by the total weight of the product. As a result, the average recyclability potential of the FT-1 switches is 13% as presented in table 17. The recyclability potential of the packaging is 12%. The results are representative for United States according to EPA Advancing Sustainable Material Management (2018).

Recyclability Potential	
FT-001	13%
FT-014	13%
FT-073	14%
FT-890	13 %
Average	13.25%

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

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

Energy mix	Source	Percentage	Amount	Unit
Nuclear	Ecoinvent v3.9.1	51.6%	0.38	kg CO_2-eq/kWh
Gas (CT)	Ecoinvent v3.9.1	38.04%		
Coal	Ecoinvent v3.9.1	8.71%		
Unbundled Renewable Energy	Ecoinvent v3.9.1	1.44%		
Fuel Oil	Ecoinvent v3.9.1	.21%		

Dangerous substances

The product complies with REACH and RoHS directive requirements and does not contain any of the listed materials more than the authorized proportions. For further information about REACH and RoHS, please visit the ABB webpage: https://new.abb.com/contact/form.

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Indoor environment

The product meets the requirements for low emissions.

Carbon footprint

Carbon footprint has not been worked out for the product.

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Program Operator and publisher		
The Norwegian EPD Foundation	Ph.	+47 23 08 80 00
Post Box 5250 Majorstuen,	email	post@epd-norge.no
0303 Oslo, Norway	web	www.epd-norge.no

Owner of the declaration		
ABB Switzerland Ltd, Group Technology Management		
Brown Boveri Straße 6, 5400 Baden, Switzerland	web	www.abb.com

Author		
Kamar Brown	Ph.	+1 252-827-1001
ABB Pinetops	email	kamar.brown@us.abb.com
3022 NC-43, Pinetops, NC 27864	web	www.abb.com

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