

RIFENG CRIMP FITTINGS



THE INTERNATIONAL EPD® SYSTEM



ENVIRONMENTAL PRODUCT DECLARATION

Rifeng CRIMP Fittings

This EPD is representative of the weighted average crimp fittings (F1 and PF fittings) production, complied with ISO 14025:2006 and EN15804 2012+A1:2013

Geographical area of application of this EPD : China

Year taken as a reference for the data: 2017.7.1-2018.6.30

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FOR 50 YEARS





Future
Trends

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1. ENVIRONMENTAL PRODUCT DECLARATION DETAILS

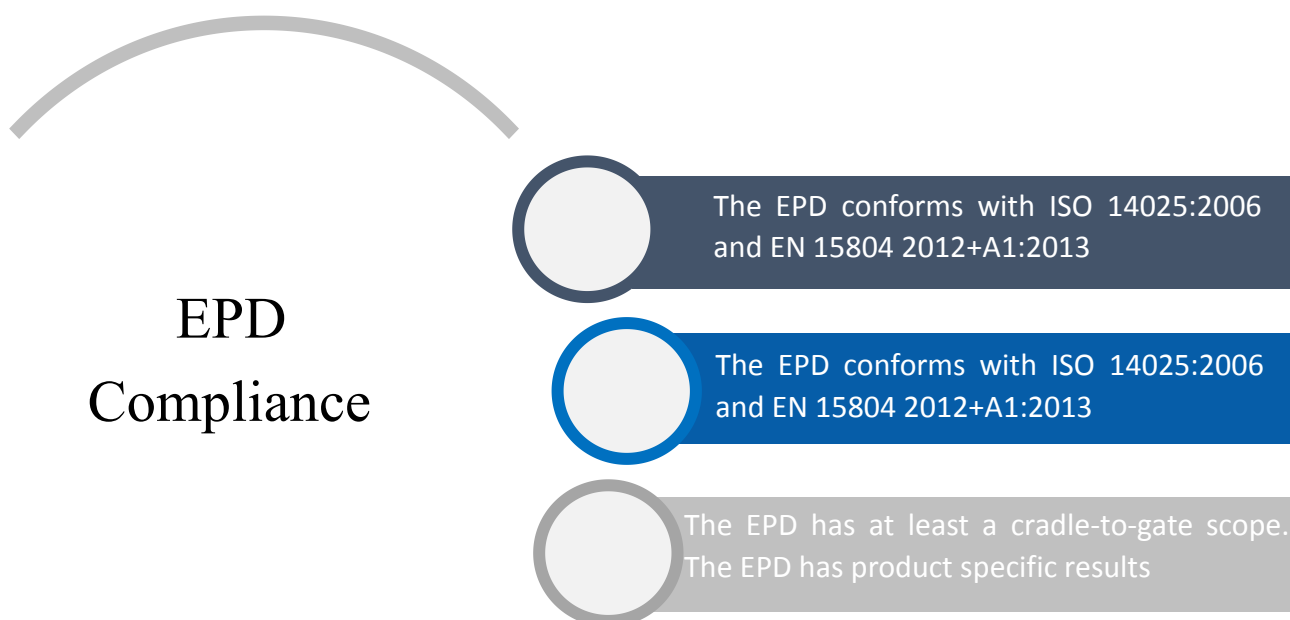
An Environmental Product Declaration, or EPD, is a standardised and verified way of quantifying the environmental impacts of a product based on a consistent set of rules known as a PCR (Product Category Rules).

Environmental product declarations within the same product category from different programmes may not be comparable. EPD of construction products may not be comparable if they do not comply with EN 15804 2012+A1:2013 .

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CEN STANDARD EN15804 2012+A1:2013 SERVED AS THE CORE PCR	
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Accredited /approved by	EPD International AB
Independent external verification of the declaration and data, according to ISO 14025:2006	<input type="checkbox"/> EPD process certification (Internal) <input checked="" type="checkbox"/> EPD verification (External)

2. EPD COMPLIANCE

The Rifeng CRIMP Fittings EPD results can also be used to represent Rifeng CRIMP Fittings products in Whole of Building Life Cycle Assessments. This EPD is complied with its requirement as below.





Rifeng Introduction

Rifeng Enterprise Group Co., Ltd., established in 1996, has been committed to developing high-quality and environmental - friendly piping products that cover the plumbing, indoor climate, drainage, electrical and gas fields with product systems ranging from multilayer pipes to PEX, PERT, PP-R, PVC, and brass hardware such as fittings, manifold and valves, under optional sizes from DN 09 to DN160 mm, to provide systematic solutions.

With over 5,000 employees and 6 manufacturing bases in China respectively located in Foshan, Shenyang, Tianjin, Shanxi, Hubei and Sichuan. It is only Foshan base has the business of export. Rifeng is increasingly taking an active role in the plastic piping markets and lays out a wide sales network over 67 countries.

Investments for international talents, accurate testing instruments and advanced hardware equipments are yearly increasing in R&D sector and it founded 2 research institutes, named National Technical Center and CNAS Certification Laboratory. With more technical improvement and product innovation, Rifeng is confident to provide customers with more hygienic and secure piping products all the time.

Rifeng piping system has more than 50 certificates, such as NSF, DVGW, AENOR, WRAS WaterMark, StandardsMark etc. These certificates worldwide underline our technical and quality know-how, and we can provide you with 25 years system warranty backed up by an international insurance company. Rifeng always implement the concept of customer value to satisfy different demands, and continuously provide customers with piping solutions and technical supports.

Rifeng CRIMP Fittings

Rifeng crimp fittings, the representative of fittings made up of brass, could be used together with Rifeng PEX/PE-RT and multilayer pipe as system mainly for hot and cold water installation, heating, gas or air conditioning application. There are certain fitting series such as F1, PF2, PF3, PF5. F1, known as compression fitting, consists of brass body, compression nut, O-ring, is used to connect with multilayer system for water, gas and air conditioning application, see below second picture. While PF series with components of brass body and brass press ring are applied PEX or PE-RT system for heating and water application, see below first picture.



When connecting with corresponding pipes, the fittings mainly use the ring to press the pipe to achieve tightness proof. The installation can be done manually by one person with the tools. Although the structure of F series and PF series fittings has a little bit different, they share the vast majority of similarity at the aspect of model type. Rifeng crimp fittings ranging from DN 12 to DN32 or 3/8" to 1", the bigger size can be developed as customer required.

3. RIFENG PIPING SYSTEM SOLUTIONS

Table 1 Product characteristics of Rifeng CRIMP fittings(Brass)

Product names	Rifeng CRIMP fittings(Brass) see table 9 for individual product codes
UN CPC Code	41516 Tubes, pipes and tube or pipe fittings, of copper
Brass material	DZR brass or Lead-free brass or other brass (up to market demand,material test refers to EN 12164:2016)
Nominal diameter	12mm~32mm or 3/8" to 1"

Note : No CPC code available for brass, therefore copper is used as an approximation.

Table 2 - Content Declaration

Material	Percentage Content	CAS No.
Brass	100%	63338-02-3
O-ring (if any)	<0.1%	EPDM Rubber (nothing hazardous)
Total	100%	

Rifeng crimp fittings do not contain any substances as such or in concentration exceeding legal limits, which can adversely affect human health and the environment in any stages of its entire life cycle.

General

The life cycle of a building product is divided into three process modules according to EN 15804 2012+A1:2013 and ISO 14025:2006, the Product Category Rules for Type III environment Declaration of Construction Products of International EPD Program. Table 3 shows the scope and system boundary of Rifeng crimp fittings assessment. The scope is “cradle to gate” as defined by EN 15804 2012+A1:2013.

This EPD intent is to cover all environmental impacts of significant concern over the product life cycle based on “cradle to gate” scope. Modules C1-C4 were deemed not relevant (of negligible impact) due to the fact that the pipes are left in the ground at end of life with negligible potential environmental impact. Other than module A1~A3, all other use stage modules were also deemed not relevant.

Table 3- System boundary and scope of assessment

Product stage			Construc tion stage		Use stage							End of life stage			
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
material supply	Transport	Manufacturing	Transport	Installation	Material emissions	Maintenance	Repair	Replacement	Refurbishment	Operational energy	Operational water	Deconstruction/Demolition	Transport	Waste processing	Disposal
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

X = module include in EPD

MND= module not declared (does not indicate zero impact result)

4. PRODUCT LIFE CYCLE OVERVIEW

4.1 LIFE CYCLE OF RIFENG CRIMP FITTINGS(BRASS)

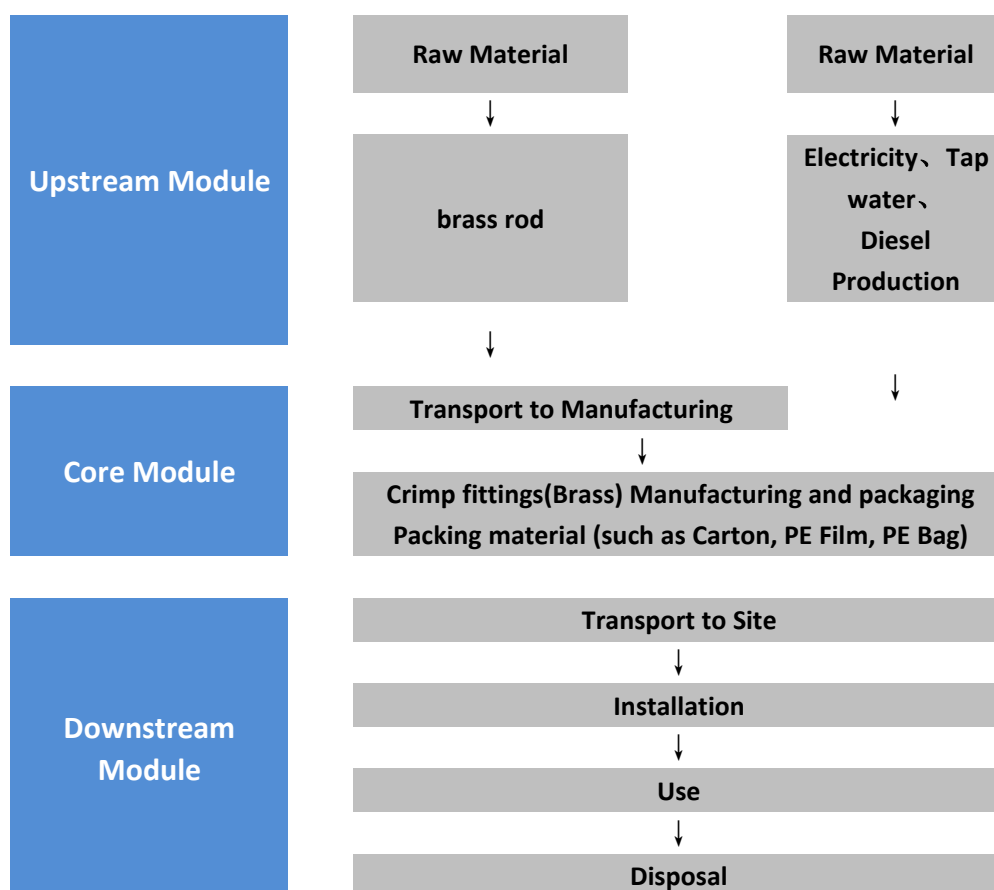


Figure 1 - life cycle diagram of crimp fitting production

System boundary in this EPD involves the upstream module and core module referring to A1~A3 stage in table 3. Downstream module (A4~A5,B1~B7,C1~C4) is out of the scope of study.

4. PRODUCT LIFE CYCLE OVERVIEW



4.2 MANUFACTURE STAGE

RIFENG

CRIMP FITTING MANUFACTURE



Raw material of crimp fittings would mainly be brass rod which is manufactured by mechanical process to cover all the workmanship before finished product.

Raw brass rod will be subjected to the mainly processes including cutting, hot forging, deflashing, machining and assembling. The in-process and finished inspection will be carry out to ensure product quality before shipping. Packing materials will be plastic bags and cartons. (Foshan base location of the map: F1-F14 No.1 Rifeng Road, Foshan, Guangdong, CHINA)

The results of this EPD are representative of the weighted average crimp fittings production, incorporating F1 fittings, PF fittings. It is based on 1kg product output to calculate the impact on environment in the phases of material supply, transport , manufacturing and packaging.

4. PRODUCT LIFE CYCLE OVERVIEW

In the A2 stage(Transport), the transport distances and means of transportation, as below.

- ✓ The raw material transportation is a truck, and the total transportation distance is 1.13E-01 km/per 1 kg of manufactured product.
- ✓ The packaging materials are transported as trucks with a total transport distance of 1.86E-04 km/per 1 kg of manufactured product.

In the manufacturing stage, there will be defective scrapping of the products, but these fittings can not be reused .It would be recycled to suppliers for manufacturing.

4.3 DISTRIBUTION STAGE

Rifeng has one crimp fittings ,for export,manufacturing facility in China and the vast majority of fittings distribution are crossing a long way by ship to foreign region in Asia, America, Australia and Europe.

4.4 INSTALLATION STAGE

Rifeng crimp fittings could be used together with Rifeng PEX/PE-RT and multilayer pipes as system mainly for hot and cold water installation, heating, gas or air conditioning application.

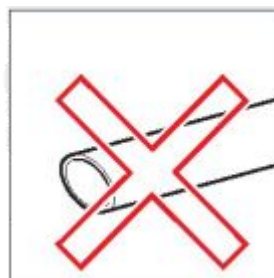
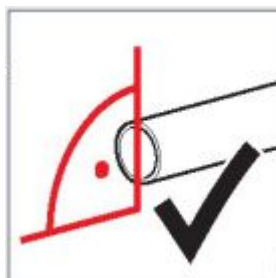
F1 fitting would simply use common span connecting to multilayer pipes by nut screwing up.PF series fittings connect with the pipes by tools refering to follow steps.



Figure 2- flaring tool

4. PRODUCT LIFE CYCLE OVERVIEW

Step 1 pipe cutting



Cut the pipe vertically by cutter.

Step 2 Tube Flaring



Choose the appropriate size of flared jaw to install in the tools. Insert the brass press ring into the pipe at the position which not affects the action of flaring.

Evenly flare the pipe end with jaw thoroughly inserting and rotate for $10^{\circ} \sim 45^{\circ}$. Pay attention that flared length shall be identical to the jaw insert length.

Step 3 Connection and tightening



Insert the fitting into the pipe by the flared length and slide the brass ring to pipe end so that to tighten the fitting body and brass ring.

4.5 USE STAGE

The brass crimp fittings are used together with pipes and would be buried under the ground or inside the wall, exposure sometimes, in a finished building. The failure rate is also extremely low and is consider to be inconsequential (not relevant) in this EPD. In case of fitting repairing, you only need to replaced by the new ones.when occurs fittings damage during usage stage, the whole piece of fitting would be discarding and landfilling.

4.6 END OF LIFE STAGE

The Rifeng crimp fittings which are installed under floor and inside wall are assumed to remain underground at the end of life. The brass fittings can be collected and recycled, but this is not compulsive. The recycled brass can be smelted into the initial raw brass rod by suppliers.

Based on the provisions of 「 CONSTRUCTION PRODUCTS AND CONSTRUCTION SERVICES PRODUCT CATEGORY RULES Chapter 7 GENERAL SYSTEM BOUNDARIES Table 2 」 , this announcement is "cradle-to-gate EPD", so Product Stage(A1 Raw material supply、 A2 Transport and A3 Manufacturing are Mandatory modules, but the remaining A4 ~ B7 are selective disclosure. Therefore, this EPD only discloses the necessary items for disclosure.

Chapter 4.3 to 4.6 are for reference only. They are not relevant in this EPD, so they are out of the study scope.

General

This section includes the main details of the LCA study as well as assumptions and methods of the assessment. A summary of the key life cycle assessment parameters is given in Table 4.

Table 4 - Details of LCA Study

Declared unit	1 kg of manufactured fitting
Geographical coverage	China
LCA scope	Cradle to gate

Life cycle thinking is a core concept in sustainable consumption and production for policy and business. Upstream and downstream consequences of decisions must be taken into account to help avoid the shifting of burdens from one type of environmental impact to another, from one political region to another, or from one stage to another in a product's life cycle from the cradle to the grave.

LCA is the compilation of the inputs, outputs and environmental impacts of a product system throughout its life cycle. It is a technique that enables industries to identify the resource flows and environmental impacts (such as greenhouse gas emissions, water and energy use) associated with the provision of products and services.

According to EN 15804 2012+A1:2013, EPDs of construction products may not be comparable if they do not comply with this standard, and EPDs might not be comparable, particularly if different functional units are used.

5.1 CORE DATA COLLECTION

Life cycle data has been sourced from material quantity data and production process data from:

- RIFENG reporting systems and staff
- RIFENG mix suppliers

Core manufacturing data was collected directly from RIFENG manufacturing sites.

- ✓ Electricity consumption was allocated to pipe via mass of pipe produced.
- ✓ Tap Water consumption was allocated to pipe via mass of pipe produced.
- ✓ Diesel consumption was allocated to pipe via mass of pipe produced.

5.2 BACKGROUND DATA

Generic background data was sourced for raw materials in the upstream module, and transport and manufacturing in the core module.

The LCA analysis method is adapted to Simapro 8.2.3 CML V3.02 (release by CML in April 2013 version 4.2) , and use the ecoinvent v3.0 database. For the EPD database, we used the 「Electricity, low voltage {CN}| market for | Alloc Def, S ; 1.17 KgCO₂e/kWh」. This general value means that when using 1 kWh electric power in China, there would be 1.17 Kg CO₂e generating and we can see the different used energy sources as below:

Non-renewable energy	
Energy, gross calorific value, in biomass	0.83%
Energy, gross calorific value, in biomass, primary forest	0.00%
Oil, crude	1.47%
Gas, mine, off-gas, process, coal mining/m3	0.52%
Coal, brown	0.09%
Coal, hard	90.58%
Gas, natural/m3	1.12%
Renewable energy	
Energy, kinetic (in wind), converted	0.13%
Energy, solar, converted	0.00%
Energy, geothermal, converted	0.00%
Energy, potential (in hydropower reservoir), converted	5.27%

Emission factor for calculate carbon emissions from electricity use. Almost all background data used for calculation of results are not older than 10 years. Exceptions (reference year not older than 2000) have only a minor impact on the overall results and can be considered representative for the period under review.

5.3 CUT OFF CRITERIA

Environmental impacts relating to personnel, infrastructure, and production equipment not directly consumed in the process are excluded from the system boundary. All other reported data were incorporated and modelled using the best available life cycle inventory data.

5.4 ALLOCATION

Allocation was carried out in accordance with the PCR, section 7.7. No allocation between co-products in the core module as there were no coproducts created during manufacturing.

5.5 VARIATION

The project report does not have tested a variation between different manufacturing locations, because RIFENG just has one site to produce RIFENG CRIMP fittings(Brass) product supplied to the market.

5.6 CRIMP FITTINGS ENVIRONMENTAL PERFORMANCE

The potential environmental impacts used in this EPD are explained in Table 5 and the results for RIFENG CRIMP fittings(Brass) are shown in Table 6. The use of energy and fresh water resources is shown in Table 7. The use of secondary material and secondary material used as energy resources is listed as 'INA' (indicator not assessed). Table 8 shows the generation of waste throughout the product life cycle.

5. LIFE CYCLE ASSESSMENT METHODOLOGY

Table 5 - Environmental indicators used in the EPD

Environmental Indicator		Unit	Description
ADPE (kgSb eq)	Abiotic Depletion Potential – Elements / minerals	Kg antimony equivalents	The extraction of non-living and nonrenewable elements and minerals. These resources are essential in our everyday lives and many are currently being extracted at an unsustainable rate.
ADPF (MJ)	Abiotic Depletion Potential – Fossil Fuels	MJ net calorific value	The extraction of non-living and nonrenewable fossil fuels. These resources are essential in our everyday lives and many are currently being extracted at an unsustainable rate.
GWP (kgCO ₂ eq)	Global Warming Potential	kg carbon dioxide equivalents	Increase in the Earth's average temperature, mostly through the release of greenhouse gases. A common outcome of this is an increase in natural disasters and sea level rise.
ODP (kgCFC11 eq)	Ozone Depletion Potential	kg CFC-11 equivalents	The decline in ozone in the Earth's stratosphere. The depletion of the ozone layer increases the amount of UVB that reaches the Earth's surface. UVB is generally accepted to be a contributing factor to skin cancer, cataracts and decreased crop yields.
POCP (kgC ₂ H ₄ eq)	Photochemical Ozone Creation Potential	kg ethylene equivalents	Ozone in the troposphere is a constituent of smog that is caused by a reaction between sunlight, nitrogen oxide and volatile organic compounds (VOCs). This is a known cause for respiratory health problems and damage to vegetation.
AP (kgSO ₂ eq)	Acidification Potential	kg sulphur dioxide equivalents	A process whereby pollutants are converted into acidic substances which degrade the natural environment. Common outcomes of this are acidified lakes and rivers, toxic metal leaching, forest damage and destruction of buildings.
EP (kgPO ₄ 3- eq)	Eutrophication Potential	Kg phosphate equivalents	An increase in the levels of nutrients released to the environment. A common outcome of this is high biological productivity that can lead to oxygen depletion, as well as significant impacts on water quality, affecting all forms of aquatic and plant life.

Life cycle impact assessment methods used: Simapro 8.2.3 CML V3.02 (release by CML in April 2013 version 4.2)

5. LIFE CYCLE ASSESSMENT METHODOLOGY

Table 6 - Potential environmental impacts per 1 kg of manufactured fittings(Brass)

	A1	A2	A3
ADPE (kgSb eq)	7.10E-03	1.80E-08	1.99E-06
ADPF (MJ)	1.26E+02	1.57E-01	3.20E+01
GWP (kgCO2 eq)	1.02E+01	9.13E-03	3.51E+00
ODP (kgCFC11 eq)	4.70E-06	1.81E-09	6.54E-08
POCP (kgC2H4 eq)	1.87E-02	1.55E-06	1.25E-03
AP (kgSO2 eq)	4.74E-01	2.74E-05	3.21E-02
EP (kgPO4 3- eq)	3.60E-01	6.20E-06	2.95E-03
ADPE = Abiotic Resource Depletion Potential – Elements, ADPF = Abiotic Resource Depletion Potential – Fossil Fuel, GWP = Global Warming Potential, ODP = Ozone Depletion Potential, POCP = Photochemical Oxidant Formation Potential, AP = Acidification Potential, EP = Eutrophication Potential			

Table 7 - Use of resources per 1 kg of manufactured fittings(Brass)

	A1	A2	A3
PERE (MJ)	1.28E+01	1.15E-03	2.26E+00
PERM (MJ)	0.00E+00	0.00E+00	0.00E+00
PERT (MJ)	1.28E+01	1.15E-03	2.26E+00
PENRE (MJ)	1.62E+02	1.52E-01	1.40E+01
PENRM (MJ)	0.00E+00	0.00E+00	0.00E+00
PENRT (MJ)	1.62E+02	1.52E-01	1.40E+01
SM (kg)	INA	INA	INA
RSF (MJ)	INA	INA	INA
NRSF (MJ)	INA	INA	INA
FW (m3)	1.05E+02	6.32E-03	3.17E-02
PERE = Use of renewable primary energy excluding raw materials, PERM = Use of renewable primary energy resources used as raw materials, PERT = Total use of renewable primary energy resources, PENRE = Use of non-renewable primary energy excluding raw materials, PENRM = Use of non-renewable primary energy resources used as raw materials, PENRT = Total use of non-renewable primary energy resources, SM = Use of secondary material, RSF = Use of renewable secondary fuels, NRSF = Use of non-renewable secondary fuels, FW = Use of net fresh water, INA = Indicator not accessed due to a limitation of the LCA tools and databases used to calculate the required resource flows. INA does not imply zero impact.			

Table 8 - Generation of waste per 1 kg of manufactured fittings(Brass)

	A1	A2	A3
HWD (kg)	2.35E-01	2.61E-02	0.00E+00
NHWD (kg)	5.48E-01	6.09E-02	8.50E-01
RWD (kg)	0.00E+00	0.00E+00	0.00E+00
HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed *=Limited by the number of decimal places, so it can only be displayed as zero.			

5.7 INTERPRETATION OF LCA RESULTS

The majority of environmental impact lies within the raw material supplied to RIFENG manufacturing site – comparatively little impact is caused by the CRIMP fittings(Brass) manufacturing at RIFENG site.

From the input materials, Brass is responsible for the majority of all environmental impacts and use of resources.

- ✓ Brass :
 - ✧ Approximately 99.68% of the environmental impact indicators of Abiotic depletion (fossil fuels).
 - ✧ Approximately 99.77% of the environmental impact indicators of Global warming (GWP100a).

From the manufacturing stage, Electricity is responsible for the majority of all environmental impacts (more than 98%).

6.1 PRODUCT SPECIFICATIONS

The product model declared by this EPD includes a total of products. After LCIA analysis, the difference does not exceed $\pm 10\%$ of the range (Because the functional units are set to be per kilogram of this type of product, so all of the following products are included in the inventory). Therefore, the LCA results announced by this EPD can be applied to the following products.

Table 9- The specification of Rifeng crimp fittings.

Application	Product code	Fitting type	Diameter (DN,mm)
Hot and cold water installation / Gas application / Air conditioning application	F1	Equal straight union	12, 14,16,18,20,25,32
		Reducer	12, 14,16,18,20,25,32
		Male straight union	12, 14,16,18,20,25,32
		Female straight union	12, 14,16,18,20,25,32
		Equal elbow	12, 14,16,18,20,25,32
		Unequal elbow	12, 14,16,18,20,25,32
		Male elbow	12, 14,16,18,20,25,32
		Female elbow	12, 14,16,18,20,25,32
		Equal tee	12, 14,16,18,20,25,32
		Unequal tee	12, 14,16,18,20,25,32
		Male tee	12, 14,16,18,20,25,32
		Female tee	12, 14,16,18,20,25,32
		Wall-plated female elbow	12, 14,16,18,20,25,32
		End cup	12, 14,16,18,20,25,32
		spigot adapter	12, 14,16,18,20,25,32
		Assembly double fittings	12, 14,16,18,20,25,32
		Assembly single fittings	12, 14,16,18,20,25,32
		Demountable female straight union	12, 14,16,18,20,25,32
		Double wall-plated female elbow	12, 14,16,18,20,25,32
		Brass linear manifold	12, 14,16,18,20,25,32
		Connector core	12, 14,16,18,20,25,32

6. PRODUCT INFORMATION

(table 9 continue)

Hot and cold water installation / Heating application	PF2	Equal straight union	16,20,25,32
		Reducer	16,20,25,32
		Male straight union	16,20,25,32
		Female straight union	16,20,25,32
		Equal elbow	16,20,25,32
		Male elbow	16,20,25,32
		Female elbow	16,20,25,32
		Equal tee	16,20,25,32
		Unequal tee	16,20,25,32
		Female tee	16,20,25,32
		Wall-plated female elbow	16,20,25,32
		brass sets	16,20,25,32
		Demountable female straight union	16,20,25,32
Hot and cold water installation / Heating application	PF3	Equal straight union	16,20,25,32
		Reducer	16,20,25,32
		Male straight union	16,20,25,32
		Female straight union	16,20,25,32
		Equal elbow	16,20,25,32
		Male elbow	16,20,25,32
		Female elbow	16,20,25,32
		Equal tee	16,20,25,32
		Unequal tee	16,20,25,32
		Female tee	16,20,25,32
		Wall-plated female elbow	16,20,25,32
		brass sets	16,20,25,32
		Demountable female straight union	16,20,25,32

6. PRODUCT INFORMATION

(table 9 continue)

Hot and cold water installation / Heating application	PF5	Equal straight union	3/8" ,1/2",5/8",3/4",1"
		Reducer	3/8" ,1/2",5/8",3/4",1"
		Male straight union	3/8" ,1/2",5/8",3/4",1"
		Female straight union	3/8" ,1/2",5/8",3/4",1"
		Equal elbow	3/8" ,1/2",5/8",3/4",1"
		Male elbow	3/8" ,1/2",5/8",3/4",1"
		Female elbow	3/8" ,1/2",5/8",3/4",1"
		Equal tee	3/8" ,1/2",5/8",3/4",1"
		Unequal tee	3/8" ,1/2",5/8",3/4",1"
		Female tee	3/8" ,1/2",5/8",3/4",1"
		Wall-plated female elbow	3/8" ,1/2",5/8",3/4",1"
		brass sets	3/8" ,1/2",5/8",3/4",1"
		Demountable female straight union	3/8" ,1/2",5/8",3/4",1"

6.2 OTHER TECHNICAL INFORMATION

For the full overview of the environmental benefits and product features of Rifeng crimp fittings please refer to Rifeng website: www.rifeng.com

7. REFERENCES

Simapro 8.2.3 CML V3.02 (release by CML in April 2013 version 4.2)

PRODUCT CATEGORY RULES, Construction Products and Construction Services, Version 2.3, 2018-11-15

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

ISO 21930:2017 Environmental declaration of building products

ISO 14025:2006 Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures

ISO 14040:2006 Environmental management -- Life cycle assessment -- Principles and framework

ISO 14044:2006 Environmental management -- Life cycle assessment -- Requirements and guidelines

ISO 7-1:1994 Threads where Pressure-Tight Joints are made on the Threads; Part 1: Dimensions, Tolerances and Designation

EN10226-1: 2004 Pipe threads where pressure tight joints are made on the threads
ASTM F1807-17: Metal Insert Fittings Utilizing a brass Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing

ISO21003:2008 Multilayer piping systems for hot and cold water installations inside buildings -- Part 3: Fittings

ISO 15875:2003 Plastics piping systems for hot and cold water installations — Crosslinked polyethylene (PE-X)-Part 3: Fittings

EN 12164:2016 Copper and copper alloys --Rod for free machining purposes

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