

Product-Category Rules (PCR)

for preparing an environmental product declaration
(EPD) for

Ethernet Switches

PCR 2010:1.0

D-Link Corporation

Environment and Development Foundation

Version 1.0

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1. General Information

This document is to be used as the product category rules (PCR) for Ethernet Switches. The requirements specified in this PCR are intended to be used for EPDs certified in accordance with ISO 14025 standard. This document shall be valid until Aug 26, 2013.

This PCR was prepared by the D-Link Corporation¹. Representatives from major Taiwanese manufacturers of similar products and stakeholders were invited to the open consultation meeting on July 7, 2010, to participate in the discussion and review of this PCR. EDF then reviewed and approved this PCR on Aug 18, 2010.

For further information and processing of feedback comments concerning this PCR, please contact Mr. Arthur Lee (Tel: +886-2-66000123, ext. 2271; Fax: +886-2-87914794; email: arthur_lee@dlink.com.tw), Manager of the Quality Assurance Department, D-link Corporation.

2. Company and product description

The EPD shall include information about the manufacturing company/organization. The information may include manufacturing process related information, and environmental related information, such as the environmental management system information. The information may also include special issues which the company/organization would like to emphasize, such as the products meeting certain environmental criteria, or environmental safety and health related information.

This PCR covers the Ethernet switch products, including their packaging. This PCR is only applicable to communications between businesses and consumers (B to C), but it is not applicable for Wireless function.

2.1 Product group function

The Ethernet switch is a device with several data transmission ports which can provide different data transmission speeds and bandwidth. These ports are used to connect computers, printers, servers, routers, switches, hubs and other network devices. Ports with multiple transmission speeds can use a standard twisted line or multiple optical ports to interconnect regional Internet sub-networks or virtual LANs. Such independent Ethernet switches allow network to promote the transmission and use of large multimedia and imaging applications on the Internet, without causing bottlenecks in other users' applications, thus provide a fast broadband access networking environment.

¹ In 2009, D-link is the number one producer of Ethernet switches for small businesses with over 30% global market share, and the number 2 Ethernet switches producer for medium and large size businesses (20% market share) (Source: Gartner, Market Share, Worldwide, March 2010)

2.2 Product components

The main components of the Ethernet switches include at least the following:

- Main assembly (include the product case, printed circuit board and relevant electronic components);
- Power supply;
- Packaging;
- CD.

The data quality requirements for the main components are described in Section 9 on calculation rules and data quality requirements. The EPD shall also include the other components of the Ethernet switches, but their data quality requirements are different from those of the main components.

2.3 Product technical description

The product technical description part of the EPD shall include the following information:

1. LAN type, transmission speed, number of transmission ports
2. Management of firewall/bandwidth
3. Power consumption
4. Other information
5. Expected/design product life

3. List of parts and banned substances

The contents of the following parts and substances in the product shall be declared:

- All parts with weight ratio (part weight/product weight) $\geq 0.5\%$; this is the criterion used to determine if a part/component is considered main component;
- All banned substances regulated by legal and customer's environmental requirements;
- The following materials in the main components: flame retardants, lead content in solder, lead and flame retardant content in solder mask, and substances regulated by RoHS Directive (2002/95/EC)(the latest version).

The declaration of halogen-free flame retardants, lead-free solders and no RoHS²-regulated substances may only be made when appropriate evidences are available (for example, test reports from accredited laboratories/testing facilities). The following organizations may provide accreditation for testing facilities: Taiwan Accreditation Foundation (TAF), Asia Pacific Laboratory Accreditation Cooperation (APLAC), International Laboratory Accreditation Cooperation (ILAC) or ILAC Mutual Recognition Arrangement

² Restriction of the Use of Certain Hazardous Substances Directive

(ILAC MRA). For definitions of testing methodology and confirmations of regulated hazardous substances based on the accredited laboratories' product testing methods, please refer to IEC 62321 Standard.

4. Functional unit

The functional unit is defined as one unit of Ethernet switch, as the Ethernet switches are marketed and sold in such units.

5. System boundaries

The main system boundaries of the product system are business-to-consumer (B to C) in nature and are presented as follows:

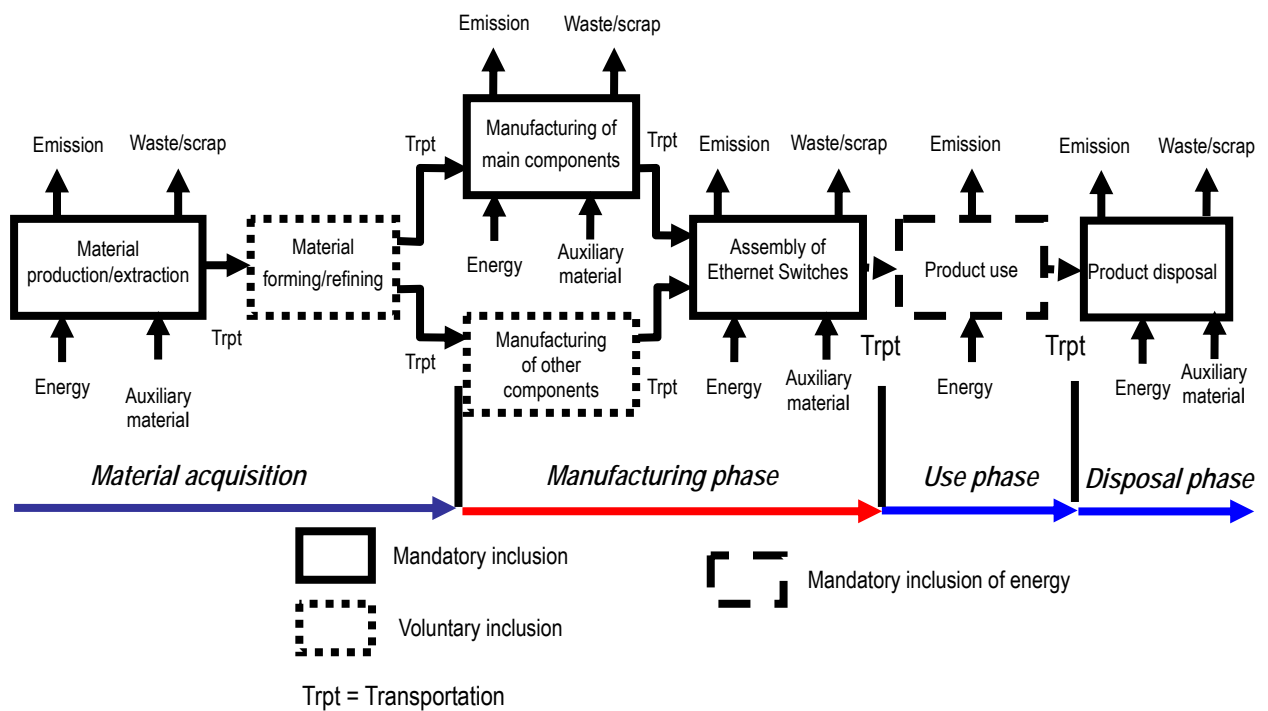


Figure 1 System boundary of the main product system

As described in Figure 1 above, the life cycle of an Ethernet switch covers all phases. Provision of recycling information is of mandatory inclusion nature.

Manufacturing Phase

The LCA shall include information for the following unit processes:

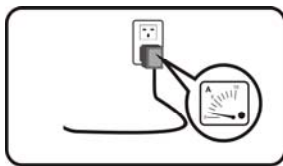
- Material extraction and manufacturing of main components and other small components;
- Manufacturing of main components;
- Product assembly;
- Transportation of main components to product assembly plants;
- Transportation of main components to product manufacturers.

The inclusion in the LCA the information on the material forming and refining and manufacturing of smaller parts is of the voluntary reporting nature. When voluntarily reported information is included, they shall be explained in the EPD.

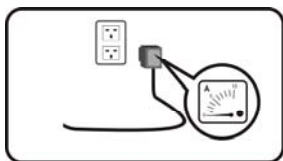
Use Phase

Common scenarios of product use are listed below::

- Power on Mode: Continuous use for 24 hours a day, 365 days in a year and lasting for 3 years;
- Off Mode (Switch off): 16-hour on and 8-hour off daily for three years (when the product is turned off, the power supply is still plugged in the wall outlet). Not applicable to equipment without a main switch;



- Off Mode (Unplugged): 16-hour on and 8-hour off daily for three years (when the product is turned off, the power supply is unplugged from the wall outlet).



- The final disclosed information for the scenarios are based on the electricity mix of one country in each continent with the greatest product sales.

Recycling/end of life

The reporting of recycling information (such as recycling and dis-assembly report and information on recycling channels) is mandatory in the EPD.

5.1 Specification of different boundary settings

Boundary in time

The validity period for the LCA results presented in the LCA report shall be defined.

Boundary towards nature

If the manufacturing processes are located within Taiwan, the waste categories as defined in Taiwan's Waste Disposal Act shall be adopted. If the processes are located in other countries, equivalent legal requirements shall be considered.

The natural boundary of the system shall describe the boundary where the materials and energy resources flow from nature into the system, and where the water and air emissions and waste are released out of the system.

Only the waste which is required to be disposed of needs to be considered; landfilling process does not need to be included. If the waste will be treated through water treatment or incineration, these processes need to be included.

Boundaries in the life cycle

The boundaries in the product life cycle are described in Figure 1. The construction of the site and infrastructure, as well as the production of manufacturing equipment and activities of the workers, do not need to be included.

Boundaries towards other technical systems

Boundaries towards other technical systems describe the inputs of material and other components towards other systems, as well as outputs of materials towards other systems. For the inputs of recycled materials and energy towards the product manufacturing phase, the transportation between the recycling process and use of recycled materials shall be included in the data set. For the production of recyclable products during the manufacturing phase, the transportation towards the recycling process shall be included.

(Note: Further explanations are provided in Section 7 on open-loop recycling)

Boundaries regarding geographical coverage

The manufacturing phase may cover manufacturing processes located on any sites around the world. For processes located in a specific region, the data used should be representative of the region. The data for the main components shall be the specific regional data for the region where the process takes place (see Section 9). For ease of comparison, no matter where the emissions are generated, the same parameters should be used for life cycle impact assessment (see Section 10).

6. Cut-off rules

For any impact category, if the sum of various impacts from a specific process/activity is less than 1% of the impact equivalent in that category, such a process/activity may be neglected during the inventory analysis.

If this PCR is to be used for product footprint declaration purpose, the cut-off rules should be consistent with the adopted carbon footprint standard or specifications.

Constituents and materials omitted from the LCA shall be documented.

(Note: This judgment for this “1% Rule” is based on the environment relevance assessment of material input to the system, and does not consider special and exceptional environmental impacts.)

7. Allocation rules

The main allocation rules shall be valid for the entire product system. For other secondary processes, other allocation rules may be defined; however, the use of these rules should be justified.

Product-specific information should be preferentially collected in order to avoid the need for allocation.

While selecting allocation rules, the following principles are recommended.

- Multi-output: The allocations are based on the changes in the resource consumption and pollutant emissions (for example, adopted quantity allocation for some main component, or surface allocation for some components), following the changes in the studied system’s output product or function or economical relationship.
- Multi-input: The allocation is based on actual relationship. For example, the manufacturing process’s emissions may be affected by the change in waste flow input.
- Open loop recycling: For the input of recycled materials or energy during the manufacturing phase of the product system, the transportation between the recycling process and the recycling to material use shall be included in the dataset. For the product which shall be recycled during the manufacturing phase, the transportation towards the recycling process shall be included.

Notes:

- *Allocation may be avoided through avoidance of dividing processes, for example as described in Section 6.3 of ISO/TR 14049; or through expansion of system boundary (for example as described in Section 6.4), so that the amended system shares the same product exchanges as the original system.*

8. Units

The base units and derived units of the International System of Units (SI, *Système International d'unités*) shall be used preferentially.

The following units shall be used:

- Power & Energy units:
 - Power unit: W
 - Energy unit: J

- Specification units:
 - Length unit: m
 - Capacity unit: m³
 - Area unit: m²
 - Weight unit: kg

- If necessary, prefixes may be used before the SI units.
 - 10⁹ = giga, symbol "G"
 - 10⁶ = mega, symbol "M"
 - 10³ = kilo, symbol "k"
 - 10⁻² = centi, symbol "c"
 - 10⁻³ = milli, symbol "m"
 - 10⁻⁶ = micro, symbol "μ"
 - 10⁻⁹ = nano, symbol "n"

9. Calculation rules and data quality requirements

- Primary data (for example, specific factory data or transportation data for a specific manufacturing process) shall be used for the main constituents. If other types of information are used, description of the information and rationale for using the information shall be provided.
- Secondary data may be used in the manufacturing process for the minor (not main) constituents of the products. Generic data may also be used for the production of bulk materials (see Appendix I for sources of generic data). For example, when bulk raw materials are purchased from the spot market or waste is processed during waste processing; when suppliers refuse to provide specific data; or when even if generic data are used in place of specific data, there is only minor impacts to the results.
- The data shall be representative for the average of a specific year.
- Primary data shall be used for the production of main components and main assembly.
- The electricity mix for the manufacturing phase should be primary data. If primary data cannot be obtained, the official electricity mix for the country where the site is located may be used as approximate value. The electricity mix should be documented.
- For the definition of hazardous waste, the definition as defined in Taiwan's Waste Disposal Act should be used for sites located in Taiwan. For sites located outside Taiwan, legal requirements for the host country shall be observed.
- As for the transportation of products, if the same products are delivered to different countries with the same selling mode, or to different users, the specific data in the country where the manufacturer is located can be used, or the average is calculated based on the sales volume in each country or based on the average distribution in the specific country.
- For the transportation of suppliers, the transportation modes and distances used by the suppliers shall be considered.

10. Parameters to be declared in the EPD

For the manufacturing phase, the following parameters shall be declared:

Energy Use MJ

Resource Use

- Use of non-renewable resources:
 - Without energy content
 - With energy content
- Use of renewable resources:
 - Without energy content
 - With energy content

Impact equivalents expressed as potential environmental impacts

- Global warming kg CO₂ equivalent
- Acidification kg SO₂ equivalent
- Ozone depletion kg CFC-11 equivalent
- Photochemical oxidant formation kg C₂H₄ equivalent
- Eutrophication kg PO₄³⁻ equivalent

Use Phase

- If the products are used by the users, the power consumption during On Mode and Off Mode shall be provided.
- If the product is equipped with a main switch, the power consumption from the power supply during the power off mode shall be considered.
- The following power and energy units shall be preferentially used: power units, kW or W; energy unit, kWh.

Additional information

- Recyclable materials (optional)
- Information on secondary materials (optional)
- Waste (classification):
 - Hazardous waste as defined in Taiwan's Waste Disposal Act. Follow host countries' laws for sites outside Taiwan.
 - Other waste.

11. Recycling information

The recycling information shall include information such as dis-assembly instructions, which parts/components are suitable for recycling (such as metal cases) or not suitable for recycling (for example, the information requirements for the final product manufacturers contained in the WEEE³ Directive may also be included in the Ethernet switch's EPD).

Information for the parts which can not be recycled and therefore should be disposed of properly during the end-of-life phase may also be included. When practical, this PCR encourages the inclusion of inventory and calculation data for the end-of-life phase.

12. Other environmental information (Optional)

The EPD may cover information including technology adopted, site of product manufacturing and assembly, as well as information on other working environment, health and risk-related aspects.

If this PCR is to be used for product carbon footprint declaration purpose, in the declaration, information regarding commitment on GHG reduction shall be included and shall ensure that the commitment is measurable, reportable and verifiable. The organization may also list environmental and energy management related information, such as awards, commendations and system certifications (e.g, QC08000 IECQ HSPM) etc.

³ Waste Electrical and Electronic Equipment Directive.

13. Information about the certification

The information on PCR review, EPD verification and verification organization shall be included.

EPD Certification is valid until 2013-__-__	
According to the Requirements for the international EPD system. General Programme Instructions, version 1 (2008) – www.environdec.com	
The PCR review for _____ (PCR 2010:) was administered by the Environment and Development Foundation and carried out by an LCA expert panel chaired by Dr. Ning Yu (ningyu@edf.org.tw)	
Independent verification of the declaration, according to ISO 14025:2006	
<input type="checkbox"/> Internal <input checked="" type="checkbox"/> External	
Third party verifier : Environment and Development Foundation in Taiwan.	
Accredited by :	
Name:	
Title:	
Organization:	Signature:_____
Name:	
Title:	
Organization:	Signature:_____
Name:	
Title:	
Organization:	Signature:_____
Environmental declarations from different programmes may not be comparable.	

14. References

The EPD shall make reference to the following documents:

- EPD General Program Instructions, Version 1.0 (2008-02-29), The International EPD Cooperation, downloadable from <http://www.gednet.org/>;
- Relevant PCR documents;
- The underlying LCA report.

When available, the following documents shall also be referenced:

- Other documents and recycling instructions which verify and complement the EPD.

Appendix I – Generic Data Sources to Refer to

For processes located within Taiwan, Taiwan generic data or the data published by the commercial, industrial and energy competent authorities of the Republic of China (ROC) government, may be used. However, for other regions (such as EU), if there are more relevant generic data available, these data should be used instead.

When data from the following generic databases are used, the most current and updated data should be used:

Material	Database	Published
LCA Database in Taiwan	DoITPro	2008
Steel	IISI (International Iron and Steel Institute)	1998
Copper	ICA (International Copper Association)	1998
Copper semi products	ICA (International Copper Association) + IME (Institut für Metallhüttenwesen und Elektrometallurg, Aachen)	1998 1995
Electricity	ETH (Eidgenössische Technische Hochschule) Data combined with IEA (International Energy Agency) statistics 1998	1996
Aluminum	EAA (European Aluminum Association)	2000
Plastics (and some chemicals)	APME (Association of Plastics Manufacturers in Europe)	1993-1998
Electronic components	EIME (Environmental Information and Management Explorer) EcoBilan	1998-2000
Energy	Boustead model 5.0	2007
Industrial processes	Ecoinvent 2nd edition	2007
Energy	ETH ESU 96	2004
Packaging materials, transport, waste treatments	BUwAL 250, 2nd edition	2004

Appendix II – Reporting Format for the EPD

This appendix provides guidance information for the titles of sections, types of data and required information to be reported in the mandatory reporting part of the EPD. As a generic reporting template, the following titles and sub-titles are recommended:

(Refer to the PCR manual for the section numbering, the information in Italics are the recommended data/information for inclusion)

Introductory part

Each EPD should have an introduction part on the top part of the EPD which includes the following information:

- *EPD system logo (LOGOTYPE)*
- *Company/organization name*
- *Product name*
- *EPD registration number*

Description of the company/organization and product/service

Company/Organization

- *Description of company/organization*
- *Description of overall working environment, existing quality system and environmental management system*

Product and services (see Section 2)

- *Product's main applications*
- *Description of product specification, manufacturing process, manufacturing sites (if there are several sites)*
- *For product's environmental performance aspects, characteristics which may improve the usefulness of product*
- *Other types of relevant information, for example, special manufacturing processes with special advantages to the environment*

List of materials and chemical substances

- *Content declaration (see Section 3)*

Presentation of the environmental performance

- *Outline of the LCA methodology, for example, period of LCA, functional units, system boundaries (graphical presentation), cut-off and allocation rules, and data sources.*

Manufacturing phase (see Section 10)

Use phase (see Section 10)

- *Geographical region for product delivery*
- *Transportation data*
- *End-of-life information*

Information about Company and Certification Organization

Recycling information (see Section 11)

Other environmental information (see Section 12)

Information regarding certification

- *Names of certification and verification organizations*
- *Validity of certification certificates*
- *Compliance with legal and relevant requirements*

References (see Section 13)

- *Relevant PCR documents*
- *EPD Requirements, MSR 1999:2*
- *Underlying LCA study*
- *Other supporting documents for LCA information*
- *Other relevant documents regarding company/organization's environmental activities*