



PRODUCT CATEGORY RULES (PCR)

For preparing an Environmental Product Declaration (EPD)
for the Product Category:

HAND DRYERS

VERSION 1 (JULY 13, 2016)

VALID THROUGH (JULY 13, 2021)

Product Category Rules for Hand Dryers, UL 10007

First Edition, Dated August 18, 2017

Summary of Topics

The edition of the Product Category Rules for Hand Dryers, UL 10007, has been issued.

Subject to these terms and conditions and those in any other agreements between you and UL Environment, Underwriters Laboratories Inc. (UL) and/or their representatives, you are hereby granted a limited, non-exclusive, non-transferable license to use the Product Category Rules (PCR) solely for your internal, non-commercial business purposes. The PCR is not being sold, and other than the limited license granted herein UL retains all rights, title and interest (including exclusive ownership) in the PCR and all copyright therein. UL reserves the right to regain possession of the PCR from you at any time. When no longer needed, you agree to destroy the PCR (if in hardcopy form) or delete and purge the PCR from your files (if in electronic form). No part of the PCR may be reproduced, modified, stored in a retrieval system, or transmitted in any form by any means, whether electronic, mechanical photocopying, recording, or otherwise without prior written permission of UL or UL Environment. You further agree not to create any derivative works from the PCR or remove or alter any copyright or other proprietary notices in the PCR. The limited license to use the standard shall automatically terminate upon your breach of any of the terms and conditions herein or any other agreement between you and UL, UL Environment and/or their representatives.

UL Environment provides this PCR “as is” without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will UL Environment, UL or any of their affiliates be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this PCR, even if UL Environment or UL or their authorized representative has been advised of the possibility of such damage. In no event shall UL Environment’s or UL’s liability for any damage ever exceed the price paid for the license to use this PCR, regardless of the form of the claim.

Users of the electronic versions of UL Environment’s Product Category Rules agree to defend, indemnify, and hold UL Environment, ULI, their affiliates and each of their respective trustees, officers, employees, agents and representatives harmless from and against any loss, expense, liability, damage, claim, or judgment (including reasonable attorney’s fees) resulting from any error or deviation introduced while purchaser is storing an electronic PCR on the purchaser’s computer system.

Contents

1.	General Information	4
1.1.	Committee Members	4
1.2.	Identification of Hand dryer Product.....	4
1.1.1.	UNSPSC Code	4
1.3.	Geographic Coverage	4
1.4.	Period of Validity.....	5
1.5.	Public Comment.....	5
1.6.	PCR Review Panel.....	5
1.7.	Public Commenters	5
1.8.	Other Hand Dryer Product Category Rules	5
1.9.	LCA Study References	5
1.10.	Definitions.....	6
2.	Goal and Scope	9
2.1.	System Function.....	9
2.2.	Functional unit	9
2.3.	System boundaries	10
3.	Requirements for the Underlying LCA	10
3.1.	Product Stage (A1, A2, and A3)	10
3.1.1.	Raw material supply (A1)	11
3.1.2.	Transport (A2).....	11
3.1.3.	Manufacturing (A3)	12
3.1.4.	Installation Stage (A4 and A5).....	12
3.2.	Use Stage (B1, B2, and B3)	12
3.2.1.	Reference Service Life and Estimated Service Life	12
3.2.2.	Maintenance (B2)	13
3.2.3.	Replacement (B3)	14
3.3.	End-of-life Stage (C1, C2, C3, and C4).....	14
3.3.1.	Removal (C1).....	14
3.3.2.	Transport (C2).....	14
3.3.3.	Waste processing (C3).....	14
3.3.4.	Disposal (C4)	14
3.4.	Cut-off rules	14



3.5.	Allocation rules	15
3.6.	Transportation	15
4.	Data Quality and Considerations.....	16
4.1.	Data sources.....	16
4.2.	Period under consideration.....	17
4.3.	Electricity Grid.....	17
4.4.	Transport.....	17
4.5.	Recycled waste streams	17
4.6.	Renewable energy	18
4.7.	Impact and inventory results	18
4.7.1.	Parameters Describing Resource Use.....	20
4.7.2.	Other Environmental Information Describing Different Waste Categories and Output Flows.....	21
4.8.	Units	21
5.	Content of the EPD	22
5.1.	General information to be declared	22
5.2.	Declaration of environmental aspects.....	23
6.	References.....	24
7.	Appendix I – Project documentation/report requirements	25
8.	Appendix II – Hand Dryer Testing Methods.....	28
8.1.	Dry Time Testing	28
8.1.1.	Dry Hands Panel.....	28
8.1.2.	Testing Equipment.....	28
8.1.3.	Test Procedure.....	30
8.2.	Energy Consumption Testing	33
8.3.	Reference Service Life Testing Procedure	34
9.	Appendix III – Relevant product safety standards	36
10.	Appendix IV – Hazardous Waste Classification by Region	37



1. General Information

The intended application of this Product Category Rules (PCR) document is to provide guidance for carrying out Environmental Product Declarations (EPDs) for hand dryers and to pinpoint the underlying requirements of the LCA pursuant to ISO standards that address appropriate environmental aspects of the hand dryer life cycle. The user of this PCR will be manufacturers of hand dryers and other interested parties and will enable EPDs that support comparable, informed, and objective sustainable purchasing of hand dryers.

1.1. Committee Members

- ◆ William Gagnon, Excel
- ◆ Denis Gagnon, Excel
- ◆ Tom Koetsch, Excel
- ◆ Peter Panaretos, Excel
- ◆ Dave Fisher, World Dryer
- ◆ Susan Fan, World Dryer
- ◆ Dan Storto, World Dryer
- ◆ Carol Wang, Hokwang
- ◆ I Chi Chen, Hokwang
- ◆ Lily Hsu, Hokwang
- ◆ Anna Nicholson, UL Environment
- ◆ Joel Hawk, UL

1.2. Identification of Hand dryer Product

Hand dryers are electric devices used to provide a hygienic method to dry hands in public washrooms. The product category included in this PCR includes both dryers with heat and without heating elements and hands-in and hand-under hand dryers.

These hand dryers are subject to the standards or technical approvals shown under Section 9.

1.1.1. UNSPSC Code

The following code covers the range of this rule: 47131707 - Restroom Supplies, Institutional Hand Dryers

1.3. Geographic Coverage

This PCR is global in scope and was developed in English.

Markets of applicability include:

- ◆ Africa
- ◆ Asia
- ◆ Caribbean
- ◆ Central America
- ◆ Europe
- ◆ Middle East
- ◆ North America
- ◆ Oceania
- ◆ South America

1.4. Period of Validity

This document is effective for five years from latest date of publication. If relevant changes in LCA methodology for the product category occur, the document will be revised. This PCR will be reviewed annually to determine whether revisions are necessary.

1.5. Public Comment

In accordance with the UL Environment General Program Instructions, this PCR is published for at least one calendar month and open to all public comments. Identifiable sources are addressed and responses will be posted.

1.6. PCR Review Panel

- ◆ Jon Dettling, Quantis (Chair)
- ◆ Jeremy Gregory, Independent Consultant
- ◆ Vincent Huang, ITRI

1.7. Public Commenters

- ◆ Dyson Ltd.
- ◆ NSF International
- ◆ SGS
- ◆ US Environmental Protection Agency

1.8. Other Hand Dryer Product Category Rules

At the time of publication, the committee is not aware of any existing published PCRs for hand dryers. The committee considered the NSF International Protocol P335, Hygienic Commercial Hand Dryers, in the creation of this PCR, as well as the Carbon Trust ETL Method for the Testing of High Speed Hand Air Dryers.

1.9. LCA Study References

In developing this PCR, the committee reviewed several LCA studies of hand dryers considered to be the most robust hand dryer LCAs conducted at the time of PCR publication:

Montalbo, T., Gregory, J., and Kirchain, R. "Life Cycle Assessment of Hand Drying Systems." Material Systems Laboratory. Commissioned by Dyson. 2011

Dettling, J. and Margni, M. "Comparative Environmental Life Cycle Assessment of Hand Drying Systems. Commissioned by Excel Dryer. 2009.

1.10. Definitions

For the purposes of this document, the following definitions apply:

Conventional Single-Point (Hands Under) Dryer

A hand dryer where hands are placed underneath the dryer exit nozzle for drying, having a predominantly single, unfocused direction air stream at the air exit plane and having average exit air velocity of less than 70 m/s (13,780 ft/min) when supplied with nominal supply voltage at 120V or 230V consistent with the product's certified electrical rating.

DU Declared Unit

Quantity of a product for use as a reference unit in an EPD, based on LCA, for the expression of environmental information based on one or more information modules.

Example: mass (kg); volume (m³) [modified from ISO 21930]

Dry Time

After washing the hands, the length of time required to dry one's hands to a dryness threshold equaling 0.25 grams residual moisture or less using a hand dryer.

Estimated Service Life

Total years of expected service based on the product's reference service life (RSL) and an average frequency of 200 uses per day (73,000 per year). The total duration of use and standby mode over the estimated service life (ESL) is based on the observed run time during operation and RSL for the specific model hand dryer. As a working example, a hand dryer with an established 12 second run time and demonstrated RSL of 500,000 cycles would have a corresponding expected service life (ESL) of 6.85 years. The total power consumed by the dryer during the use stage would be based on 1666.7 hours in use and 58,339.3 hours in standby mode and the respective power consumption (VA) in use and in standby mode.

Feedstock Energy

Heat of combustion of a raw material input that is not used as an energy source to a product system, expressed in terms of higher heating value or lower heating value [ISO 14044].

FU Functional Unit

Quantified properties of a hand dryer for use as a reference unit description in an EPD based on LCA [ISO 14040 and 14044]. In this PCR, a functional unit of 100,000 instances of hand drying is used.

High Speed Single-Point (Hands Under) Dryer

A hand dryer where hands are placed underneath the dryer exit nozzle for drying, having a predominantly single direction air stream focused for high velocity at the air exit plane and having average exit air velocity greater than or equal to 70 m/s (13,780 ft/min) when supplied with nominal supply voltage at 120V or 230V consistent with the product's certified electrical rating.

Information Module

Compilation of data to be used as a basis for a Type III Environmental Declaration, covering a unit process or a combination of unit processes that are part of the life cycle of a product [ISO 21930].

ISO

International Organization for Standardization

LCA Life Cycle Assessment

Calculation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle [ISO 14040].

LCI Life Cycle Inventory

Phase of life cycle assessment involving the compilation and quantification of inputs and outputs for a product throughout its life cycle [ISO 14040]

LCIA Life Cycle Impact Assessment

Phase of life cycle assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a product system throughout the life cycle of the product [ISO 14040]

LHV Lower Heating Value

The amount of heat released by combusting a specified quantity of fuel (initially at 25°C or another reference state) and returning the temperature of the combustion products to 150°C. The lower heating value (LHV) (net calorific value (NCV) or lower calorific value (LCV)) is determined by subtracting the heat of vaporization of the water vapor from the higher heating value. This treats any H₂O formed as a vapor. The energy required to vaporize the water therefore is not released as heat.

LHV calculations assume that the water component of a combustion process is in vapor state at the end of combustion, as opposed to the higher heating value (HHV) which assumes that all of the water in a combustion process is in a liquid state after a combustion process.

High Speed Multi-Point (Hands Under) Dryer

A hand dryer having exit air streams in at least two distinct independent air streams, intended for the left and right hands.

Process Energy

Energy input required for operating the process or equipment within a unit process, excluding energy inputs for production and delivery of the energy itself [ISO 14044].

Product Category

Group of products that can fulfill equivalent functions [ISO 14025].

RSL Reference Service Life

Service life of a product which is known to be expected under a particular set, i.e. a reference set, of in-use conditions and which may form the basis of estimating the service life under other in-use conditions.

Environment



The reference service life (RSL) of a hand dryer is expressed in cycles of hand drying instances attainable over the estimated service life (ESL) of the product.

Residual Moisture

The actual moisture remaining on one's hands after drying hands to a perceived level of dryness.

Run Time

The "dry time" of the dryer plus the "run-on time". The energy consumption during operation mode will be the total accumulated energy used during an operation cycle and is based on the "total run" time.

Run-On Time

Run-on dryer time is the time duration from when the hands are dry and removed from the dryer to when the dryer's controls stop dryer operation. Run-on time is complete when the dryer's supply current returns to normal levels in standby mode.

Specific data

Data representative of a product, product group or construction service, provided by one supplier.

Standby Mode

State of the hand dryer between instances of hand drying.

Trough Style (Hands In) Dryer

A hand dryer where the user places their hands into the drying cavity that has generally opposing air streams for drying the palm and back side of the hands concurrently

Type III Environmental Declaration, Environmental Product Declaration (EPD)

Providing quantified environmental data using predetermined parameters and, where relevant, additional environmental information [ISO 14025].

Unit Process

Smallest portion of a product system for which data are collected when performing a life cycle assessment.

VA Volt Ampere

The unit used for the apparent power in an electrical circuit, equal to the product of root-mean-square (RMS) voltage and RMS current. In direct current (DC) circuits, this product is equal to the real power (active power) in watts.

2. Goal and Scope

The intended application of this Product Category Rules (PCR) document is to give guidance for carrying out Environmental Product Declarations (EPD) for hand dryers and to pinpoint the underlying requirements of the LCA pursuant to ISO standards that address appropriate environmental aspects of these materials. The user of this PCR will be manufacturers of hand dryers and other interested parties.

This PCR addresses the cradle to end of life environmental impacts of hand dryers and complies with ISO 14025, Environmental labeling and declarations – Type III environmental declarations – Principles and procedures. Additional information as shown under Section 5 is permitted. No life cycle stages are excluded with the exception of capital such as manufacturing machinery, and personnel impacts.

An EPD prepared under this PCR will present data that has been aggregated over the following life cycle stages: raw material acquisition, production, use, maintenance and end of life.

Table 1. Hand dryer product EPD type

EPD type	Declared Unit or Functional Unit	Life Cycle Stages and modules	Reference Service Life (RSL)	Primary audience
Cradle to grave	Functional unit	Product stage (including raw material supply and manufacturing), Installation, Use, and End of Life	Required	Business to business (B to B) and/or Business to consumer (B to C)

Comparability of EPD of hand dryer products will be in accordance with the requirements for comparability as described in ISO 14025, Sections 4, 5.6, and 6.7.2.

2.1. System Function

The function of a hand dryer is to dry hands after washing in a public restroom. This PCR uses a cradle to grave scope and functional unit. Section 2.2 discusses these units and defines them for the hand dryer product category.

2.2. Functional unit

The functional unit of a product provides the basis for quantitative normalization when comparing products of equivalent function. Where there is an applicable standard contributing to calculating functional unit, that standard will be referenced per Section 9.

For declaration and reporting purposes only, it is acceptable to report the functional unit and LCA results in SI units as described in Section 4.8 of this PCR.

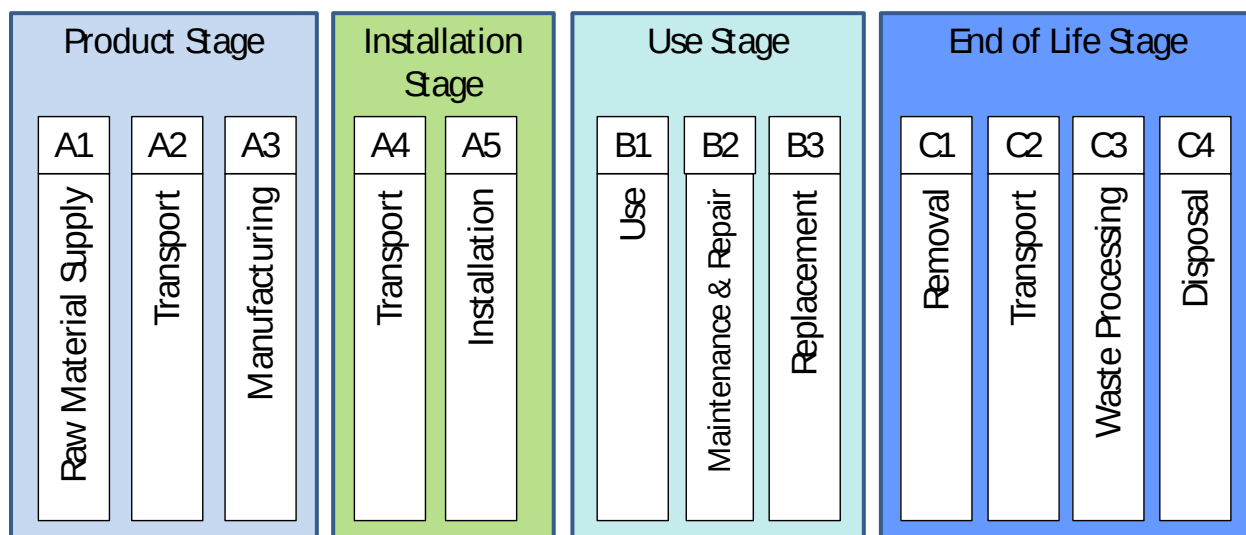
The functional unit is 100,000 instances of hand drying. See Section 8.1 - Dry Time Testing for the Drying Testing Method that shall be used to determine a hand drying instance.

2.3. System boundaries

This PCR follows the approach established by EN15804 for categorizing the various life cycle stages. This standard is designed to harmonize EPDs for products and services in the building and construction sector. Although EN15804 is designed for EPDs for building and construction products, the organization and reporting in that standard lends itself well to other products. Consistency with EN15804 will increase the utility of this PCR by allowing contextualization of the hand dryer results with building and construction products.

The hand dryer life cycle is broken into the various “information modules” shown in Figure 1. Each information module is described in more detail in the following sub-sections.

Figure 1. Hand dryer life cycle system boundaries



3. Requirements for the Underlying LCA

3.1. Product Stage (A1, A2, and A3)

The product stage is a set of information modules required to be included in all EPDs. Together, these represent the cradle-to-gate impacts of a hand dryer. As illustrated in Figure 1, it includes the information

modules A1 to A3. The system boundary with nature is set to include those processes that provide the material and energy inputs into the system and the following manufacturing and transport processes up to the factory gate as well as the processing of any waste arising from those processes.

In the case of input of secondary materials or energy recovered from secondary fuels, the system boundary between the system under study and the previous system (providing the secondary materials) is set where outputs of the previous system, e.g. materials, products, building elements or energy, reach the end-of-waste state.

Flows leaving the system at the end-of-waste boundary of the product stage (A1-A3) shall be allocated as co-products. As a general rule, such processes as collection and transport before the end-of-waste state are included as part of the waste processing of the system and additional processing is excluded. Loads and benefits from allocated co-products shall not be declared. If such a co-product allocation is not possible, other methods may be chosen and shall be justified. Therefore, as a general rule, potential loads or benefits from the product stage do not appear in life cycle calculations or reporting.

At the discretion of the LCA practitioner, modules A1, A2, and A3 may be summed together and reported as a group (i.e., A1-A3), rather than as distinct modules.

3.1.1. Raw material supply (A1)

The raw material supply module (A1) includes the provision of all raw materials and energy and includes waste processing or disposal of final residues during the material acquisition stage. It also includes all flows related to electricity generation of all processes in the product stage. However, production of capital goods, infrastructure, production of manufacturing equipment and personnel-related activities are not included.

The raw material supply stage will account for:

- ◆ Extraction and processing of raw materials (e.g., mining and refining processes) and biomass production and processing (e.g., agricultural or forestry operations);
- ◆ Reuse of products or materials from a previous product system;
- ◆ Processing of secondary materials used as input for manufacturing the product, but not including those processes that are part of the waste processing in the previous product system
- ◆ Generation of electricity, steam and heat from primary energy resources, also including their extraction, refining and transport;
- ◆ Energy recovery and other recovery processes from secondary fuels, but not including those processes that are part of waste processing in the previous product system;

3.1.2. Transport (A2)

The transport module (A2) includes the transportation of raw materials to manufacturing.