ENVIROMENTAL PRODUCT DECLARATION
as per ISO 14025 and EN 15804

Owner of the Declaration: Philips
Programme holder: Institut Bauen und Umwelt e.V. (IBU)
Publisher: Institut Bauen und Umwelt e.V. (IBU)
Declaration number: EPD-PHI-20140039-IBB1-EN
Issue date: 20/06/2014
Valid to: 19/06/2019

Ledline system
Philips

www.bau-umwelt.com / https://epd-online.com
1. General Information

Philips Ledline system

Programme holder
IBU - Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Declaration number
EPD-PHI-20140039-IBB1-EN

This Declaration is based on the Product Category Rules:
Luminaires, lamps and components for luminaires, 10-2013
(PCR tested and approved by the independent expert committee)

Issue date
20/06/2014

Valid to
19/06/2019

Scope:
1 Xitanium driver + 4 Fortimo LEDLines

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Verification
The CEN Norm EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025

Internally √
externally

Prof. Dr. Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)

Dr. Burkart Lehmann
(Managing Director IBU)

Prof. Dr. Birgit Grahl
(Independent tester appointed by SVA)

2. Product

2.1 Product description
The Fortimo LED Line system with rows of LEDs on the module has been designed to produce high efficiency, pure white light, for general lighting applications where diffuse lighting on the horizontal plane is the key. This range is ideal for incorporating into luminaires for use in general office lighting, where energy efficiency and glare control are of utmost importance. A set of LED lines incorporated in a luminaire by the OEM will ensure required light levels (lumen) and distribution. The set of LED lines will be driven by an electronic Xitanium driver; whose main function is controlling and securing the right currents are provided to the LED lines. The LEDline module is a leading product in relation to energy efficiency. With its lumen output of 140lm/W, it is 40% better than the most efficient Philips fluorescent lamp and the best currently available on the LED market.

2.2 Application
The designated application for the LEDline system is for general lighting applications mainly in offices and industries.

2.3 Technical Data
The system is a set of products (modules + driver) which are the key building blocks for a luminaire. A typical application contains the following technical features:
- 1 Xitanium driver
- 4 Fortimo LEDLines, containing 33 LEDs each (1 LED-line contains 3 rows of 11 LEDs).

Constructional data

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension driver</td>
<td>360 x 30 x 22</td>
<td>mm</td>
</tr>
<tr>
<td>Dimension LEDline</td>
<td>55 x 280</td>
<td>mm</td>
</tr>
<tr>
<td>Luminous flux</td>
<td>650</td>
<td>lm</td>
</tr>
<tr>
<td>Luminous efficiency</td>
<td>143</td>
<td>lm/W</td>
</tr>
<tr>
<td>Radiation angle</td>
<td>120</td>
<td>deg</td>
</tr>
<tr>
<td>Colour temperature</td>
<td>4000</td>
<td>K</td>
</tr>
</tbody>
</table>

2.4 Placing on the market / Application rules
The Fortimo LED Line family is ENEC approved and comply with CE regulations. ENEC (European Norms Electrical Certification) is the high quality European mark for electrical products that demonstrates compliance with European safety standards.
The relevant standards are summarized in the table below. To ensure luminaire approval, the conditions of acceptance need to be fulfilled. All luminaire manufacturers are advised to conform to the international standards of luminaire design (/IEC 60598/-Luminaires).

- Safety

**Philips Fortimo Led-line:**
/IEC/EN 62031/- LED modules for general lighting - safety specifications;
/IEC 62471/- Photobiological safety of lamps and lamp systems.

**Philips Xitanium driver:**
/IEC/EN 61347-1/- Lamp control gear.

- Electromagnetic compatibility

(tested with LED Lines, cables and Philips Xitanium driver)
/EN 55015/, /CISPR 55015/- Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment;
/IEC/EN 61000-3-2/- Limits for harmonic current emissions (equipment input current <16 A per phase);
/IEC/EN 61547/- Equipment for general lighting purposes - EMC immunity requirements (Electromagnetic compatibility).

2.5 Delivery status
Product weight: 195 + (4*48.6) = 389.4g

2.6 Base materials / Ancillary materials

Product’s materials and components are shown in the table below:

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver Printed circuit board</td>
<td>4.9</td>
<td>% Weight</td>
</tr>
<tr>
<td>Driver Electronic components</td>
<td>8.2</td>
<td>% Weight</td>
</tr>
<tr>
<td>Driver Steel</td>
<td>29.4</td>
<td>% Weight</td>
</tr>
<tr>
<td>4 LEDlines Printed circuit board</td>
<td>40.5</td>
<td>% Weight</td>
</tr>
<tr>
<td>4 LEDlines Electronic components</td>
<td>0.9</td>
<td>% Weight</td>
</tr>
<tr>
<td>4 LEDLines LEDs</td>
<td>1.0</td>
<td>% Weight</td>
</tr>
<tr>
<td>Packaging Cardboard</td>
<td>8.7</td>
<td>% Weight</td>
</tr>
<tr>
<td>Packaging Plastic (PE)</td>
<td>6.5</td>
<td>% Weight</td>
</tr>
</tbody>
</table>

2.7 Manufacture
The manufacturing of the product is partly made by Chinese suppliers for the Ledline and partly made by Philips Poland (in Pila) for the driver.

2.8 Environment and health during manufacturing
The manufacturing plants of Pila, Huizhou and Paju are all certified according to /ISO 14001/- (Environment)
In addition:
Pila is certified according to /OHSAS 18001/- (Health and Safety).
Huizhou is certified according to /ISO 9001/- (Quality).
Paju is certified according to /ISO 16949/- (Quality).

2.9 Product processing/Installation
LEDlines are incorporated into a ceiling luminaire.

2.10 Packaging
Packaging materials: Cardboard and Polyethylene (PE)
Packaging weight: 70g

2.11 Condition of use
Applications may apply dimming or lighting controls to allow further energy saving.

2.12 Environment and health during use

2.13 Reference service life
The RSL is established as 12.5 years, or 50,000 hours operation.

2.14 Extraordinary effects
Fire
Effects of fire can lead to emissions of PBDD/F (brominated compounds).

Water
No known impacts on the environment following unforeseeable influence of water, e.g. flooding.

Mechanical destruction
No known impacts on the environment following unforeseeable mechanical destruction.

2.15 Re-use phase
Luminaires are in scope of the WEEE directive. Efforts are done to improve collection, reuse and recycling of
the product. Possibilities of recycling concerns material utilization after dismantling of product: steel and precious metal recovery from electronic scrap.

2.16 Disposal
After use phase, product should primarily be intended for reused or recycled. If this is not possible, they should be used for energy generation instead of landfilling. Waste code according to European Waste Catalogue (EWC): 16 02 14 and 20 01 36.

2.17 Further information
Details of the product are published on: http://www.ecat.lighting.philips.com/l/oem/led-systems/led-module-system/fortimo-led-line-systems/929000862703_eu/

3. LCA: Calculation rules

3.1 Declared Unit
The declared unit is a system involving one driver and 4 ledlines, totaling a weight of 389.4 grams excluding packaging, providing a luminous flux of 650Lm each, including luminaire losses. This set, build-in in a luminaire, provides sufficient light for a typical office application, operated in a European office ceiling luminaire for 50,000 hours.

<table>
<thead>
<tr>
<th>Declared unit</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>piece</td>
</tr>
</tbody>
</table>

3.2 System boundary
Type of EPD: Cradle-to-grave. Modules A1-A3 include: raw material extraction, processing, energy and materials; manufacture of modules; assembly and packaging.

The following scenarios are also included:
- Transport to installation (A4);
- Disposal of packaging materials (A5);
- Operational energy use (B6);
- Transport to end-of-life (C2);
- Waste processing (C3);
- Final disposal for WEEE fraction not recycled (C4).
- Benefits and loads beyond system boundary - Recycling of steel and metals from PCBs (D)

3.3 Estimates and assumptions
The results of the LCA are based on following assumptions:

- Background data are used for suppliers’ specific processes.
- Foreground data are used for the assembly of the driver.
- No WEEE track record on luminaire collection and recycling were available at the time of study for the LEDlines system, as they were too recently brought to market. Data on collection and recycling have been based on readily available data taken from generic national statistics.

3.4 Cut-off criteria
Where no data was available, items that represented less than 1% of the total product weight were neglected. No excluded flows were of any known particular environmental concern.

3.5 Background data
Necessary background data are sourced from the /Ecoinvent/ database v2.2. (a science-based, industrial data provider of renown quality).

3.6 Data quality
Data is of good quality. Specific data used is less than 5 years old. Background data is geographically representative of the production location, and is less than 10 years old.

3.7 Period under review
The period under review is the year 2013 [year of the data collection in Pila and of the Bill of Material].

3.8 Allocation
In the aggregated module A1-A3, allocation of energy and auxiliaries used to process the assembly of the Xitanium driver in the factory of Pila, and allocation of product packaging according to weight were used.

3.9 Comparability
Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to /EN 15804/ and the building context, respectively the product-specific characteristics of performance, are taken into account.

4. LCA: Scenarios and additional technical information

<table>
<thead>
<tr>
<th>Transport to the building site (A4)</th>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport distance</td>
<td>107</td>
<td>km</td>
<td></td>
</tr>
<tr>
<td>Capacity utilisation (including empty runs)</td>
<td>90</td>
<td>%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Installation into the building (A5)</th>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaging driver</td>
<td>0.021</td>
<td>kg</td>
<td></td>
</tr>
<tr>
<td>Packaging LEDline</td>
<td>0.049</td>
<td>kg</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operational energy use (B6)</th>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity consumption</td>
<td>990</td>
<td>kWh</td>
<td></td>
</tr>
<tr>
<td>Equipment output</td>
<td>0.0198</td>
<td>kW</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>End of life (C1-C4)</th>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collected separately</td>
<td>0.331</td>
<td>kg</td>
<td></td>
</tr>
<tr>
<td>Recycling</td>
<td>0.251</td>
<td>kg</td>
<td></td>
</tr>
<tr>
<td>Incineration</td>
<td>0.138</td>
<td>kg</td>
<td></td>
</tr>
</tbody>
</table>
In the tables below are displayed the results of the life cycle assessment. For module B6, the RSL is defined as 50,000 hours or 12.5 years in operation.

### RESULTS OF THE LCA – RESOURCE USE: 1 Xitanium driver + 4 LEDlines

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>GWP</td>
<td>[kg CO₂-Eq.]</td>
<td>4.12E+1</td>
<td>1.31E-2</td>
<td>9.27E-3</td>
<td>5.88E+2</td>
<td>1.84E-3</td>
<td>1.06E-2</td>
<td>2.27E-1</td>
<td>-1.01E+0</td>
</tr>
<tr>
<td>ODP</td>
<td>[kg CFC11-Eq.]</td>
<td>2.96E-6</td>
<td>2.07E-9</td>
<td>4.11E-11</td>
<td>2.86E-5</td>
<td>2.60E-10</td>
<td>7.10E-10</td>
<td>2.93E-10</td>
<td>-7.82E-8</td>
</tr>
<tr>
<td>AP</td>
<td>[kg SO₂-Eq.]</td>
<td>2.96E-1</td>
<td>3.93E-5</td>
<td>2.83E-6</td>
<td>2.83E+0</td>
<td>5.34E-6</td>
<td>5.44E-6</td>
<td>3.79E-6</td>
<td>-1.19E-1</td>
</tr>
<tr>
<td>EP</td>
<td>[kg PO₄³⁻-Eq.]</td>
<td>5.86E-2</td>
<td>7.43E-8</td>
<td>6.77E-7</td>
<td>3.71E-1</td>
<td>9.93E-7</td>
<td>8.15E-6</td>
<td>1.15E-5</td>
<td>-1.16E-2</td>
</tr>
<tr>
<td>POCP</td>
<td>[kg Ethen-Eq.]</td>
<td>1.26E-2</td>
<td>1.59E-6</td>
<td>1.01E-7</td>
<td>1.13E-1</td>
<td>2.33E-7</td>
<td>2.19E-6</td>
<td>9.36E-7</td>
<td>-4.76E-3</td>
</tr>
<tr>
<td>ADPE</td>
<td>[kg Beq.]</td>
<td>2.68E-3</td>
<td>3.56E-6</td>
<td>8.61E-10</td>
<td>9.14E-4</td>
<td>7.65E-9</td>
<td>3.82E-8</td>
<td>4.50E-9</td>
<td>-2.00E-3</td>
</tr>
<tr>
<td>ADPF</td>
<td>[MJ]</td>
<td>6.15E+2</td>
<td>1.02E-1</td>
<td>4.48E-3</td>
<td>8.00E-3</td>
<td>2.96E-2</td>
<td>1.61E-3</td>
<td>3.08E-2</td>
<td>-1.67E+1</td>
</tr>
</tbody>
</table>

**Caption**
- GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non fossil resources; ADPF = Abiotic depletion potential for fossil resources.

### RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 Xitanium driver + 4 LEDlines

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>HWD</td>
<td>[kg]</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
</tr>
<tr>
<td>NHWD</td>
<td>[kg]</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
</tr>
<tr>
<td>RWD</td>
<td>[kg]</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
</tr>
<tr>
<td>CRU</td>
<td>[kg]</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
</tr>
<tr>
<td>MFR</td>
<td>[kg]</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>3.19E-1</td>
</tr>
<tr>
<td>MDD</td>
<td>[kg]</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>8.46E-2</td>
</tr>
<tr>
<td>EEE</td>
<td>[MJ]</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
</tr>
<tr>
<td>EET</td>
<td>[MJ]</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
</tr>
</tbody>
</table>

**Caption**
- 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; EEE = Exported electrical energy; EEE = Exported thermal energy.
6. **LCA: Interpretation**

The dominance analysis of the Life Cycle assessment is illustrated on the figure below:

For all impact categories except the Abiotic Depletion Potential (ADPE, non-fossil), the dominant phase is module B6, the use phase, associated with electricity consumption (and its related electricity generation).

In particular, the contribution to global warming (GWP) is for 93% associated with the use phase and 7% with the production phase.

The production phase (aggregated module A1-A3) has a minor contribution to the overall environmental impacts, but is nevertheless the main contributor to the ADPE, especially by the raw material supply (A1) arising from the extraction of virgin material. Indeed, contribution to ADPE comes mainly from the gold used to make electronic components.

Recycling the Ledline system (module D) provides benefits. It especially induces significant reduction in ADPE category, by the recovery of precious metals - mainly gold - contained in electronic components.

7. **Requisite evidence**

The measurements are based on documentation and bill of materials of the product.

8. **References**

**Institut Bauen und Umwelt**
Institut Bauen und Umwelt e.V., Berlin (pub.): Generation of Environmental Product Declarations (EPDs);

**General principles**
for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2013-04
www.bau­umwelt.de

**PCR Part A**
Institut Bauen und Umwelt e.V., Königswinter (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A; Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report. April 2013
www.bau­umwelt.de

**ISO 14025**
DIN EN ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

**EN 15804**
EN 15804:2012-04: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

**PCR 2013, Part B**
Institut Bauen und Umwelt e.V., Königswinter (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part B Requirements on the EPD for Luminaires, lamps and components for luminaires. October 2013
www.bau­umwelt.de

**Ecoinvent**
Ecoinvent Centre www.ecoinvent.org

**ISO 14044-44**

**ISO 14001**
DIN EN ISO 14001:2004: Environmental management systems - Requirements with guidance for use

**OHSAS 18001**
BS OHSAS 18001:2007: Occupational health and safety management

**ISO 9001**
DIN EN ISO 9001:2008: Quality management systems - Requirements

ISO 16949

IEC 60598
IEC 60598:2008: Luminaires - Part 1: General requirements and tests

IEC/EN 62031

IEC 62471
IEC 62471:2002: Photobiological safety of lamps and lamp systems

IEC/EN 61347-1
IEC/EN 61347-1:2012: Lamp controlgear - Part 1: General and safety requirements

EN 55015
EN 55015:2013: Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment

IEC/EN 61000-3-2
IEC/EN 61000-3-2:2006: Electromagnetic compatibility (EMC) — Part 3 – 2: Limits — Limits for harmonic current emissions (equipment input current ≤16 A per phase)

IEC/EN 61547
IEC/EN 61547:2009: Equipment for general lighting purposes - EMC immunity requirements
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Web www.philips.com

<table>
<thead>
<tr>
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<th>Straße, Nr.</th>
<th>PLZ, Ort</th>
<th>Land</th>
<th>Tel</th>
<th>Fax</th>
<th>Mail</th>
<th>Web</th>
</tr>
</thead>
<tbody>
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<th>Straße, Nr.</th>
<th>PLZ, Ort</th>
<th>Land</th>
<th>Tel</th>
<th>Fax</th>
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