

Product-Category Rules (PCR)  
for Preparing an Environmental Product  
Declaration (EPD) for  
Forged Parts for Motor Vehicles

PCR 2016:1.0

**King Duan Industrial Co., Ltd.**

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# 1. General information

This document is intended to be used as the product category rules (PCR) for the manufacturing of forged parts for motor vehicles (“product”), including raw parts, globally. This PCR covers products with the Harmonized System (HS) Code of 870899 (Other parts & accessories for the motor vehicles of 8701-8705). The requirements specified in this PCR are intended to be used for EPDs certified in accordance with the ISO 14025 standard. This document shall be valid until December 31, 2019.

This PCR was first drafted by King Duan Industrial Co., Ltd. Representatives from major Taiwanese manufacturers of similar products and stakeholders were invited by King Duan Industrial Co., Ltd to the open consultation meeting held on September 30, 2016, to participate in the discussion and review of the draft PCR. The Environment and Development Foundation (EDF) subsequently reviewed and approved this PCR.

For further information and comments concerning this PCR, please contact: King Duan Industrial Co., Ltd., Manager Toby Lu (Tel: +886-2-24925366 Ext.301; Fax: +886-2-24925353; email: [toby.lu@kingduan.com.tw](mailto:toby.lu@kingduan.com.tw)).

## 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 management 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, environmental safety and health related information.

This PCR covers the whole life stages of forged parts for motor vehicles, and is applicable to the Business-to-Business (B2B) communications. During the inventory of product related environmental impacts, the scope of inventory shall cover both the accessories and packaging materials.

### 2.1 Product group functions

Forged parts for motor vehicles (“product”) are usually used in the suspension, chassis, or steering components/assemblies of the motor vehicles, and can provide multiple functions including transmission, linkage, steering or exterior decoration.

### 2.2 Product components/composition

The product’s components/composition may include but not limited to the following main, secondary, auxiliary and packaging materials:

- **Main materials:** Materials which formed the body of the forged parts, including steel and aluminum alloy.

- **Secondary materials:** Selective materials used during the post-treatment processes, such as heat treatment, surface treatment (film processing, electroplating, hot dip galvanizing or baking), and computer numerically controlled machining (CNC).
- **Auxiliary material:** Materials used during the forging process, which are in contact with the product, but will not appear in the final product, for example, release agent, machining oil (cutting oil), antirust oil, and high-pressure air.
- **Packaging materials:** For example, paper, wood or plastic boxes, partitions, buffer materials, anti-rust materials, bags and labels.

### 2.3 Product technical description

The product technical description part of the EPD may include but not limited to the following information:

- Product weight
- Product material: e.g., steel, aluminum and various added alloys.
- Product number: Refer to customer number.
- Product function: e.g., transmission, linkage, steering, and appearance decoration.

## 3. List of materials and chemical substances

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

- All materials of the product (excluding packaging material) with weight ratio (material weight/product weight (excluding packaging))  $\geq 1\%$ ;
- All materials of the packaging with weight ratio (material weight/packaging weight)  $\geq 1\%$ ;
- All substances/materials in the product restricted/regulated by legal and customer requirements, including those regulated by radiation contamination regulations or EU's RoHS Directive (e.g., cadmium, lead, mercury, hexavalent chromium, polybrominated biphenyls, and polybrominated diphenyl ethers), and other harmful substances.

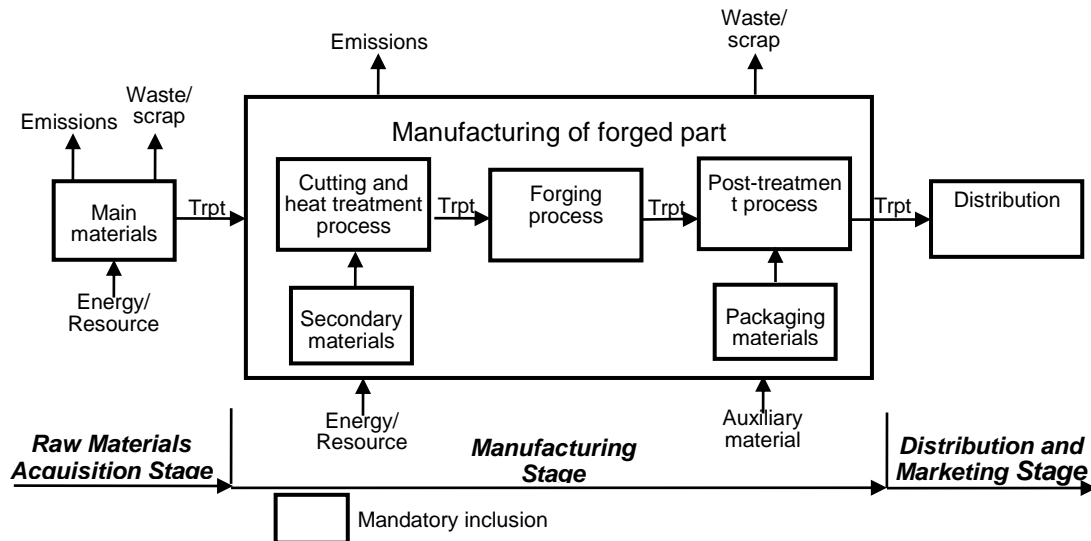
Declaration of no regulated substances may only be made when appropriate evidences are available (for example, test reports from accredited laboratories/testing facilities). The following organizations may provide accreditation for testing facilities: Taiwan Accreditation Foundation (TAF), (Asia Pacific Laboratory Accreditation Cooperation (APLAC), International Laboratory Accreditation Cooperation (ILAC) or ILAC Mutual Recognition Arrangement (ILAC MRA). For definitions of testing methodology and confirmations of regulated hazardous substances, please refer to respective accredited laboratories' product testing methods.

## 4. Declared unit

The declared unit is one (1) unit of forged part for motor vehicles ("product"), with the indication of its main material, function and weight. For example, forged carbon steel control arm, weight 3.19 kg. The reason for adopting this unit is that the product is sold and marketed in this unit on the market.

## 5. System boundaries

The main system boundaries for the declared product system are presented as follows:



**Figure 1 System boundary of the product system**

As noted in **Figure 1** above, the life cycle of the forged parts for motor vehicle (“product”) covers three life cycle stages: raw material acquisition, product manufacturing, and distribution and marketing. The data quality requirements for the life cycle inventory of main and secondary components are described in Section 9 on calculation rules and data quality requirements. Without violating the Cut-off Rules described in Section 6, the declaration of other information is optional (voluntary).

### Raw Materials Acquisition Stage

The LCA shall include information for the following unit processes:

- Processes involved and quantities consumed related to main materials, secondary materials, auxiliary materials and packaging materials.

### Manufacturing Stage

The LCA shall include information for the following unit processes:

- Processes related to inputs of energy and resources during the manufacturing processes. Post-treatment processes shall include heat treatment and machining.
- Environmental impacts related to pollution emissions, waste and scrap materials generated during the manufacturing processes.
- Transportation between different processes within the site of the plant.

### Distribution and Marketing Stage

- Transportation of products to customers designated sites.

## **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 solid 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 quantity of the disposed waste needs to be considered; the landfilling process does not need to be considered. If the waste is generated through wastewater treatment or incineration process, such waste should be included into the wastewater treatment or incineration process.

### **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 site operators 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 stage, 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 stage, 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 stage 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 constituents 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 environmental impact parameters should be used for life cycle impact assessment (see Section 10).

## 6. Cut-off rules

With the exception of environmental impacts resulting from energy use, 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. Nonetheless, the accumulated impact of neglected process/activity may not exceed 5%. Components 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 stage 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 stage, 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.

### Power & energy units:

- power unit: W
- energy unit: J

### **Specification units:**

- length unit: m
- capacity unit: m<sup>3</sup>
- area unit: m<sup>2</sup>
- weight unit: kg

### **If necessary, prefixes may be used before the SI units:**

- 10<sup>9</sup> = giga, symbol “G”
- 10<sup>6</sup> = mega, symbol “M”
- 10<sup>3</sup> = kilo, symbol “k”
- 10<sup>-2</sup> = centi, symbol “c”
- 10<sup>-3</sup> = milli, symbol “m”
- 10<sup>-6</sup> = micro, symbol “μ”
- 10<sup>-9</sup> = nano, symbol “n”

## **9. Calculation rules and data quality requirements**

### **Data quality requirements for the raw material acquisition**

- Generic data may be used for the extraction, production, forming and refining of raw materials used for components and assemblies of the products. Please refer to Appendix I for the common sources of generic data.

### **Data quality requirements for the manufacturing stage**

- Site-specific data (for example, specific data for manufacturing plant or transportation) shall be used for the manufacturing of products. If other types of information are used, description of the information and rationale for using such information shall be provided. For site-specific data of the main components/assemblies manufacturing processes, specific data from a plant representative of such sites may be used.
- Generic data may be used when suppliers refuse to provide specific data, or when even if generic data are used in place of specific data, there is only minor impact to the results. The general rule is that if generic data are used in place of specific data, their combined contribution for all life cycle stages shall not be greater than 20% of total impacts for each impact category. However, there may be certain exception to specific products, and such exceptions shall be explained.
- When generic data are used, the equivalence between the chemical and/or physical process or at least the same technical range of referred systems shall be considered. Moreover, it is also recommended to consider the date or geographic aspects of the data quality when feasible. The year of the generic data used cannot be older than 1990.
- The data shall be representative for the average of a specific year. If the average data for a specific year cannot be obtained, average data for a specific period may be used. However, the selected specific period should be representative, and the reason for using such data shall be provided.
- The electricity mix for the manufacturing stage should be site-specific data. If site specific 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 shall be used for sites located in Taiwan. For sites located outside Taiwan, legal requirements for the host country shall be observed.
- For the transportation between different processes within the manufacturing plant, the actual transportation modes used and distance traveled shall be considered.

Note: For the purpose of inventory and declaration of product carbon footprint, where the organization implementing this PCR does not contribute 10% or more to the upstream GHG emissions of the product or input prior to its provision to another organization or the end-user, the primary activity data requirement shall apply to the emissions arising from those processes owned, operated or controlled by the first upstream supplier that does contribute 10% or more to the upstream GHG emissions of the product or input.

### **Data quality requirements for the distribution and marketing stage**

- For transportation of products to the customer designated sites, the actual mode of transportation and the distance traveled shall be considered.

## **10. Parameters to be declared in the EPD**

The following parameters shall be declared in the EPD:

### **Energy consumption**

- Consumption of energy (e.g., electricity or other energy) shall be declared for all stages of the product life cycle. For use of products at the user side, the quantities of consumed electricity shall also be declared.

### **Resource use**

The declaration of resource use shall include the following:

- non-renewable resources
  - ◆ materials resources
  - ◆ energy resources (used for energy conversion purposes)
- renewable resources
  - ◆ material resources
  - ◆ energy resources (used for energy conversion purposes)
- secondary resources
  - ◆ material resources (pre-consumer or post-consumer recycling and reuse)
  - ◆ energy resources (used for energy conversion purposes)

- recovered energy flows (such as thermal energy) expressed in MJ
- water resource use indicators shall also be calculated from the life cycle inventory. These indicators do not constitute a “water footprint” as potential environmental impacts due to the water use in different geographical locations is not captured. The minimum indicators for water resource use in the EPD shall be:
  - ◆ total amount of water (consider make-up water for in-plant recycling and reuse)
  - ◆ direct amount of water used by the core process
- The following requirements for the water resource use indicators apply (in part adopted from water footprint inventory in ISO 14046 Environmental management - Water footprint - Principles, requirements and guidelines):
  - ◆ water use includes evaporation, transpiration, product integration, release into different drainage basins or the sea, displacement of water from one water resource type to another water resource type within a drainage basin (e.g. from groundwater to surface water). In-stream water use is not included.
  - ◆ for water used in closed loop processes (such as cooling system) and in power generation only the net water consumption (such as reintegrations of water losses) should be considered.
  - ◆ sea water shall not be included in the indicator.
  - ◆ tap water or treated water (e.g. from a water treatment plant), or waste water that is not directly released in the environment (e.g. sent to a wastewater treatment plant) are not elementary water flows, but intermediate flows from a process within the technosphere.
  - ◆ additional transparency in terms of geographical location, type of water resource (e.g. groundwater, surface water).

**The following requirements on the resource declaration shall also apply:**

- all parameters for resource consumption shall be expressed in mass, with the exception of renewable energy; resources used for the generation of hydroelectric, wind electricity and solar energy, which shall be expressed in MJ;
- all parameters shall not be aggregated but reported separately. Resources which contribute for less than 5% in each category shall be included in the resources list as “other”;
- nuclear power shall be reported among the non-renewable energy resources as kg of uranium calculated by converting the thermal energy (MJ) considering a reactor of III generation with an efficiency of 33%;
- the PCR can define other resources (for example rare materials originating from the LCI data) which may be listed and detailed in the EPD for each specific product category;
- the energy content of some products (such as paper or plastic based products) is useful information for the end of life management. For this reason, the “energy content of product” shall be declared in MJ: its estimation shall be made considering the gross calorific value of the product. Only the energy that is suitable for an eventual energy recovery at the end of life shall be considered (energy content of steel due to its carbon content, for example, shall not be considered since it is not practically recoverable);
- energy content of biomass used for feed or food purposes shall not be considered.

## Impact equivalents expressed as potential environmental impacts

### Impact categories for mandatory declaration

- Emission of greenhouse gases (expressed as the sum of global warming potential, GWP, 100 years, in CO<sub>2</sub> equivalents).
- Emission of acidifying gases (expressed as the sum of acidifying potential in sulphur dioxide (SO<sub>2</sub>) equivalents).
- Emission of gases that contribute to the creation of ground-level ozone (expressed as the sum of ozone-creating potential, ethene-equivalents).
- Emission of substances to water contributing to oxygen depletion (expressed as phosphate (PO<sub>4</sub><sup>3-</sup>) equivalents).

### Impact categories for optional declaration

Declaration for other impact categories which are considered important is optional (voluntary).

### Waste

- hazardous waste (as defined in Taiwan's Waste Disposal Act, or follow host countries' laws for sites outside Taiwan).
- non-hazardous waste
  - ◆ Plastic parts marking: Where technologically possible, plastic parts of the vehicle weighing  $\geq 25$  g shall be marked in accordance with the ISO 11469 and ISO 1043 Part 1/2/3/4, SPI or other international standard label to facilitate their identification and recovery at the end of life.
  - ◆ Plastic packaging material marking: The Plastic packaging materials shall be labeled on the parts with SPI or other international standards for ease of sorting.

Note: For characterization factors of each impact category, please refer to *General Programme Instructions For The International EPD System, Version 2.5 (2015-5-11)*.

## 11. Recycling information

The recycling information shall include information such as dis-assembly instructions and which parts/components are suitable for recycling (such as metal cases) or not suitable for recycling. The information provided by the final product may also be included in the declaration information for products.

If practical, information for the parts which cannot be incinerated and/or recycled and reused, and therefore should be disposed of properly during the end-of-life stage may also be included.

## **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 intended to be used for product carbon footprint declaration purpose, in the declaration, information regarding commitment on GHG reduction should 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., ISO 14001, ISO 14064-1, and IECQ HSPM).

### 13. Information about the certification

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

This EPD Certification is valid until 20\_\_ - \_\_ - \_\_.

It is in accordance with the Requirements for the International EPD System, General Programme Instructions, version 2.5 (2015-05-11) – [www.environdec.com](http://www.environdec.com)

The PCR review for \_\_\_\_\_ (PCR 2016 : ) was administered by the Environment and Development Foundation and carried out by an LCA Expert Panel chaired by Dr. Wen-Ching Chen ([wencc@edf.org.tw](mailto:wencc@edf.org.tw)).

Independent verification of the declaration, is based on ISO 14025 : 2006

Internal     External

Third party verifier : Environment and Development Foundation in Taiwan.

LCA Expert Panel:

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 established in accordance with this PCR shall refer to the following documents:**

- GENERAL PROGRAMME INSTRUCTIONS FOR THE INTERNATIONAL EPD® SYSTEM, Version 2.5 (2015-05-11), downloadable from: <http://www.environdec.com/en/The-International-EPD-System/General-Programme-Instructions/>
- The underlying LCA report
- ISO 14040, “Environmental management — Life cycle assessment — Principles and framework”, second edition, 2006-07-01.
- ISO 14044, “Environmental management — Life cycle assessment — Requirements and guidelines”, first edition, 2006-07-01.
- PCR documents of relevance to the EPD.

**When available, the following documents shall also be referenced:**

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

**Reference for this PCR:**

- HS code: 7323.91 to 7323.99 (Cast iron, iron or steel: table, kitchen and other household articles and parts).

## 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. Data from the following generic databases are recommended for use.

Material	Database	Published
Industrial processes	ecoinvent 3.1	2014
Packing materials, transport, Waste treatments	BUWAL 250, 2 <sup>nd</sup> edition	2004
Steel, Primary copper, Copper products, Electricity, Fuels, Aluminum, Chemicals, Transports, Waste management	ecoinvent 3.1	2014
	PE-GaBi 14	2014
	ELCD version 3.2	1995-2014
	The Boustead Model 5.0	2013
	EIME (Environmental Information and Management Explorer) EcoBilan	1999-2014
Plastics	PE Plastics Europe (Association of Plastics Manufacturers in Europe)	1993-1998
	PE-GaBi 14	2014
	ELCD version 3.2	1995-2014
	ecoinvent 3.1	2014
	The Boustead Model 5.0	2013
	EIME (Environmental Information and Management Explorer) EcoBilan	1999-2014
Electronic components	PE-GaBi 14	2014
	ELCD version 3.2	1995-2014
	ecoinvent 3.1	2014
	The Boustead Model 5.0	2013
	EIME (Environmental Information and Management Explorer) EcoBilan	1999-2014
LCA Database in Taiwan	Carbon factor database from EPA, ROC.	2013
	DoITPro	2014

## 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:

- *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, declared units, system boundaries (graphical presentation), cut-off and allocation rules, and data sources.*

#### ***Raw Materials acquisition stage (see Section 10)***

#### ***Manufacturing stage (see Section 10)***



***Distribution, Use and End-of-Life stage*** (see Section 10)

## **Information about Company and Certification Organization**

***Recycling information*** (see Section 11)

***Other environmental information*** (see Section 12)

***Information regarding certification*** (see Section 13)

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

***References*** (see Section 14)

- *relevant PCR documents*
- *General Programme Instructions for the International EPD® System, Version 2.5 (2015-05-11)*
- *underlying LCA study*
- *other supporting documents for LCA information*
- *other relevant documents regarding company/organization's environmental activities*

## Appendix III Abbreviations

Acronyms	Common Name
APLAC	Asia Laboratory Accreditation Cooperation
CFP	Carbon Footprint of Product
WFP	Water Footprint of Product
EPD	Environmental Product Declaration
ErP	Energy Related Product
ILAC	International Laboratory Accreditation Cooperation
ILAC MAR	International Laboratory Accreditation Cooperation Mutual Recognition Arrangement
ISO	International Organization for Standardization
LCA	Life Cycle Assessment
PCR	Product Category Rule
RoHS	The Restriction of the use of certain Hazardous Substances in electrical and electronic equipment
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals
CPSC	Consumer Product Safety Commission
SPI	Society of the Plastics Industry
TAF	Taiwan Accreditation Foundation
RSL	Restricted Substance List
TEC	Typical Energy Consumption
Trpt	Transportation
WEEE	The Waste Electrical and Electronic Equipment Directive