Environmental Product Declaration
Force Measurement Products

ABB Automation Products and the Environment

To guarantee structured and effective environmental work within the company, ABB Automation Products (APR) has implemented the ISO 140001 environmental management system. The system in itself is not a goal; it only provides guidelines for how environmental work shall be carried out. To show the results of our environmental work and to present the environmental performance of our products, the division for force measurement products is introducing environmental product declarations for the product line.

At the division for force measurement products, our products' environmental performance levels and environmental characteristics are determined by:

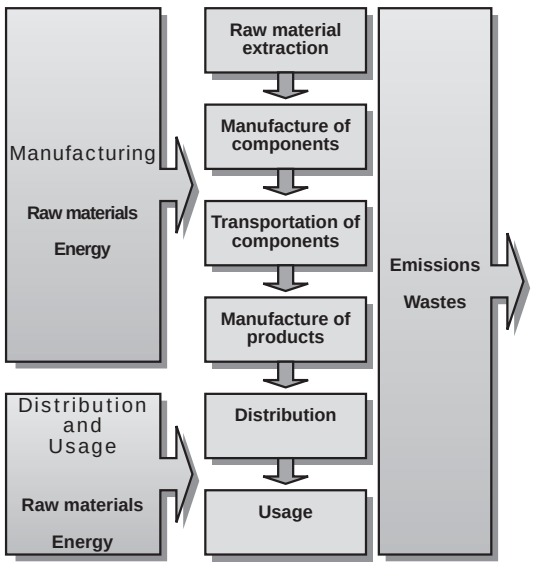

Figure 1. Studied life cycle for force measurement products.

- LCA (Life Cycle Assessment) - based on the ISO 14040-43, LCA international standards and their associated methods - have been used to provide a comprehensive picture of how our products affect the environment.
- Eco-efficient design primarily addresses the dismantling and recycling aspects that cannot be quantified with conventional LCAs. These environmental aspects have been evaluated by the concerned designers and product managers.

LCA and its general methodology

In accordance with the international standards, LCA is prepared with descriptions of goals and scopes, inventories, and environmental impact assessments.

System boundaries, among other things, are established when describing goals and scopes. These limits define the areas to be measured and studied for any given type of environmental impact. Figure 1 shows the various life cycle phases for force measurement products that are subject to environmental assessment. Based on the defined area of measurement, material and energy consumption, and waste and emission, amounts are inventoried and quantified.

In the following environmental impact assessment, information attained during inventorying is interpreted in terms that describe potential environmental impact.

Environmental impact assessments are prepared through classification and characterization, where inventory data during classification is grouped with respect to environmental impact. During the following characterization process, weighed appraisals are made of inventory data within the respective environmental impact categories. This is done because grouped inventory data influence the individual environmental impact categories to various extents.

Characterization results in inventory data within the respective environmental impact categories being converted into single numeric values, expressed as equivalents. In Figure 2, the various environmental impact categories considered for force measurement products are shown.

Table 1 presents the units used for the various environmental impact categories.

For additional information about life cycle assessments and the applied methodology, see ISO 14040-43.

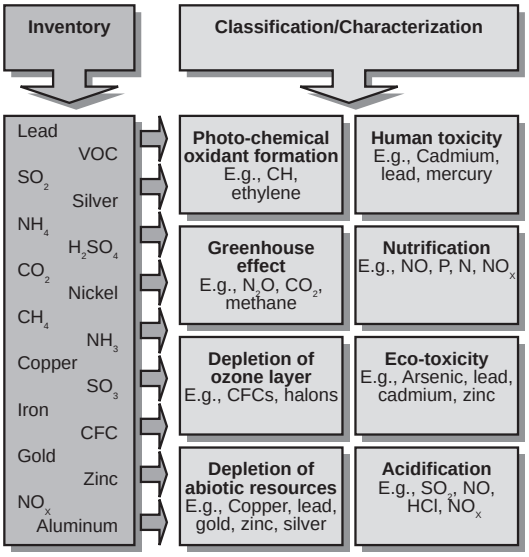

Figure 2. Classification and characterization of inventoried data.

Environmental impact category	Units (equivalents)
Greenhouse effect	kg carbon dioxide (GWP 100)
Acidification	kg sulfur dioxide (AP)
Abiotic depletion	kg silver
Nutrification	kg phosphate (NP)
Ozone depletion	kg CFC-11 (ODP)
Photo-chemical oxidant formation	kg ethylene (POCP)
Eco-toxicity (water)	m^3 water exposed to maximum acceptable limits (ECA)
Human toxicity (air)	kg of a human body exposed to the maximum acceptable limit for intake of air pollution (HCA)
Human toxicity (water)	kg of a human body exposed to the maximum acceptable limit for intake of water pollution (HCW)

Table 1. Units for environmental impact categories.

Manufacturing

In Table 2 below, environmental impact is shown for the manufacture of a typical system within the respective application areas for the division's products.

Distribution and Usage

In contrast to product manufacture, environmental impact from transportation to customers is dependent on where customer operations are situated. Usage is dependent on which energy sources are used for electrical production.

In the lower part of Table 2, environmental impact is shown for two means of distribution for the company's products (average values), as well as environmental impact for electricity production (average European values).

Environmental impact / Application area	Greenhouse effect	Acidification	Abiotic depletion	Nutrification	Ozone depletion	Photochemical oxidant formation	Eco-toxicity (water)	Human toxicity (air)	Human toxicity (water)
Manufacturing									
Flatness measurement and control	7177,3	30,6	35,4	1,95	1,5E-03	2,72	1,2E-01	50,9	5,4E-02
Web tension measurement	172,0	0,7	1,0	0,06	4,0E-05	0,09	1,9E-03	1,3	1,5E-03
Roll force measurement	769,7	3,1	5,0	0,27	7,1E-05	3,19	6,5E-03	17,4	2,3E-03
Weighing	457,3	1,3	2,2	0,10	3,5E-05	0,25	3,7E-03	2,7	1,3E-03
Strip tension measurement	1253,0	2,9	6,4	0,26	3,1E-05	0,29	4,3E-03	4,8	1,5E-03
Strip width measurement	1401,4	7,8	10,2	0,73	9,9E-05	0,66	3,8E-02	12,0	8,0E-03
Metal detection	1053,9	5,7	6,4	0,37	2,2E-04	0,37	1,8E-02	8,3	6,3E-03
Distribution and usage									
Truck (tonkm)	0,19	1,4E-03	1,4E-03	2,6E-04	-	6,0E-05	1,2E-07	1,9E-03	1,4E-09
Air (tonkm)	1,84	6,5E-03	1,3E-02	1,0E-03	-	3,5E-04	1,1E-06	8,8E-03	1,3E-08
Electrical power (MJ)	0,14	8,8E-04	4,9E-04	3,8E-05	8,7E-09	3,1E-05	3,1E-06	1,2E-03	1,3E-06

Table 2. Environmental impact for manufacturing, distribution and usage.

In Table 3, power consumption is presented for a typical configuration for the various application areas within force measurement.

Figure 3 shows how environmental impact is distributed over the studied life cycle phases for a force measurement system. This distribution is typical and representative for all application systems manufactured within the division.

Application area	Power (W)
Flatness measurement and control	1000
Web tension measurement	30
Roll force measurement	400
Weighing	70
Strip tension measurement	70
Strip width measurement	103
Metal detection	55

Table 3. Power consumption for force measurement products.

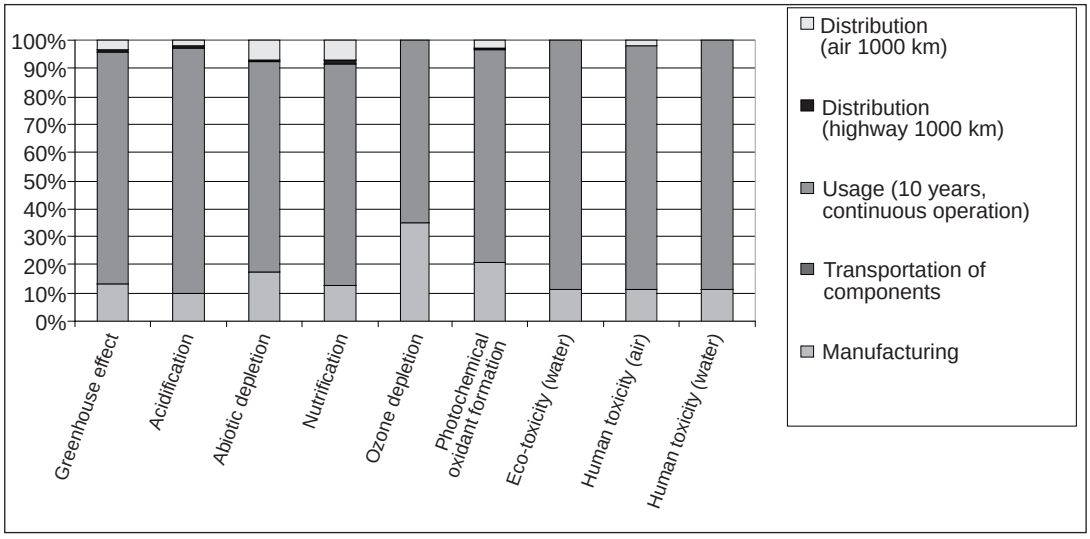

Figure 3. The relative environmental impact for force measurement products.[1]

[1] *The diagram is based on a system for flatness measurement and control.*

Eco-Efficient Design

	Environmental aspects	Yes	No	Comments
Electronics	Energy consumption			
	Energy-saving features.		X	
	Dismantling/recycling			
	Components containing hazardous materials are easily identified.	X		Materials are substances with known environmentally hazardous properties are used on circuit boards and certain wiring. These components, however, are not actively marked.
	Components containing hazardous materials are easily separate.	X		Circuit boards and wiring can be easily separated.
	Glued and/or welded joints are used.		X	
	Dismantling can be carried out using just a few basic standard tools.	X		A standard tool is defined as a tool that is commercially available.
	Fastening elements are easily accessible for dismantling products.	X		
	Employs fastening elements that enable non-destructive dismantling.	X		
Load cells	Dismantling/recycling			
	Components containing hazardous materials are easily identified.	(X)		Materials are substances with known environmentally hazardous properties are used on circuit boards and certain wiring. Does not apply to flatness measurement and control devices, which ave cadmium in their sensor wires.
	Components containing hazardous materials are easily separate.	(X)		Does not apply to flatness measurement and control devices, which have sensor wiring that is difficult to remove. For certain load cells included in weighing and tension measurement systems, circuit boards are relative difficult to remove.
	Glued and/or welded joints are used.	(X)		Glued joints occur in sensor cores and in load cell housings for certain load cells in the systems for weighing and tension measurement. Not applicable for strip width measurement.
	Dismantling can be carried out using just a few basic standard tools.	(X)		Not applicable to measurement roller for flatness measurement and control, certain systems for weighing and metal detection.
	Fastening elements are easily accessible for dismantling products.	(X)		Not applicable for detection coils for metal detection.
	Employs fastening elements that enable non-destructive dismantling.	(X)		Not applicable for detection coils for metal detectors and certain load cells within the systems for weighing and tension measurement.

Table 4. Environmental aspects for eco-efficient design.

In Table 4 on the previous page, environmental aspects are presented that cannot be examined (quantified) with a conventional LCA. As major similarities between application areas occur, information in the table has been generalized and classified into electronics and load cells. When differences for an environmental aspect occur between various application areas, comments have been provided.

Material Content

Of materials with known environmental hazards and which have been used in APR products, most are found on circuit boards. In Figure 4, the results are shown for an analysis of the most common circuit boards with the included materials expressed in g/kg circuit board.

Discarded Products

While force measurement products are primarily constructed of steel, circuit boards and wiring are also extensively used. These components contain materials of considerable value, from the environmental perspective. For this reason, worn-out products shall be sent to a recycling facility. At the recycling facility, materials that can be used as raw materials for new products are recycled, and hazardous materials are processed in an environmentally correct manner.

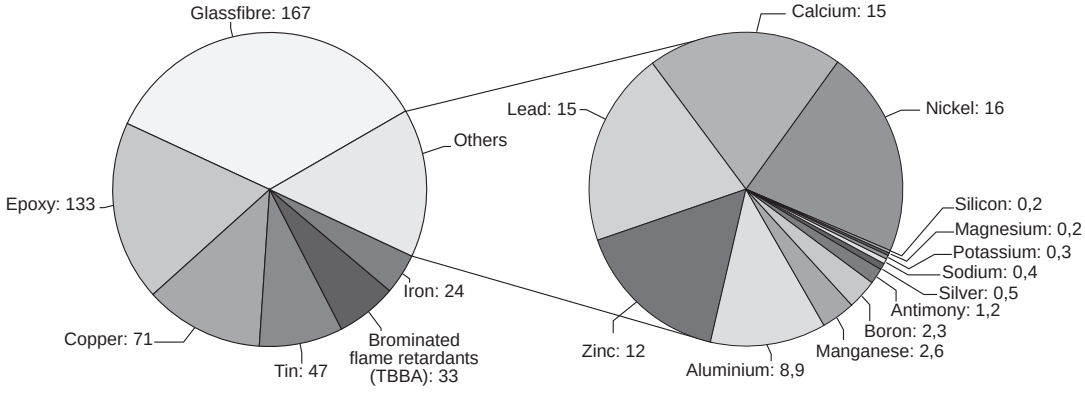

Figure 4. Material content for circuit boards[2].

[2] The detected substances shown in the diagram make up approximately 50% of the total circuit board weight. The remainder consists of organic materials, such as plastics, which could not be detected using the applied analysis method. Materials shown in the diagram represent more than 99.5% of the material that could be detected by the analysis, with the remaining 0.5% consisting of precious metals.

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