# Environmental Product Declaration

**Protect$^{IT}$ Feeder Terminal REF 541/543/545**


## Company Information

ABB Oy, Distribution Automation in Finland is part of ABB's automation technology sector. The company is in charge of design, manufacturing and marketing of protection and automation equipment and systems for electrical networks, including services and software products.

## Environmental management

The ISO 14001 environmental management system has been implemented and the Vaasa factory has been certified since 1997. Life cycle assessment (LCA) is continually applied to the products.

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## Application

The REF 541 / REF 543 / REF 545 feeder terminals are designed for the protection, control, measurement and supervision of medium voltage networks. The application area covers different types of networks, switchgear systems and medium-sized three-phase asynchronous motors. In addition, the terminals can be used for the protection and control of shunt capacitors banks.

## Function

The feeder terminals incorporate a wide range of functions:

- Protection functions
- Measurement functions
- Power quality measurements
- Control functions
- Condition monitoring

ENVIRONMENTAL PERFORMANCE

## Functional unit

The functional unit of our LCAs is an IED variant. The environmental impacts in the Life Cycle Assessment have been calculated for the most typically delivered variant of each product.

## Manufacturing of the product

The manufacturing at ABB consists of assembling components manufactured and delivered to ABB by subcontractors, and calibration, testing and packing. The only negative impacts of the manufacturing phase are waste generation and some energy consumption. The amount of waste produced is minimized by waste sorting and reusable packaging.

## Use of the product

The product can save equipment and resources when performing its function as a protection relay. The environmental impacts during the life cycle of the relays are caused by the electrical power consumption, not the operation itself.

## Recycling of the product

It is recommended that the product is recycled by a company specialized in recycling of electronic equipment. ABB aims at continuosly increasing the degree of recycling of the equipment manufactured. It is estimated that more than 70 weight percent can be recycled.

# ENVIRONMENTAL IMPACT

## Impact indicator values of a typical product variant of REF 54_

| Environmental impact categories | Manufacturing phase | Usage phase | Disposal phase | Total | Equivalent unit * |
|---|---|---|---|---|---|
| **Acidification** | 195.42 | 581.34 | -0.03 | **776.73** | **mol H+** |
| **Global warming** | 857.73 | 3828.59 | -0.64 | **4685.67** | **kg $CO_2$** |
| **Eutriphication** | 53.60 | 45.57 | 0.03 | **99.21** | **kg $O_2$** |
| **Ozone depletion** | 0.00 | 0.00 | 0.00 | **0.00** | **kg CFC-11** |
| **Photochemical oxidant formation** | 0.51 | 0.73 | 0.00 | **1.24** | **kg Ethylene** |

* In order to illustrate the numbers above we can note that 1118 kg $CO_2$ is the amount-related operation of equipment consuming 8 W annually during 25 years. 170 mol H+ also corresponds to the above mentioned power consumption and emissions of $SO_2$ and $NO_x$. The nutrification impact of 13 kg $O_2$ corresponds to the amount of phosphor needed to produce 50 kg grain using the fertilizer amount normal in the Nordic countries. The ozone depletion of 0.02 g is below 0.005% of the freon content of an old refrigerator. The photochemical oxidant formation can be compared to that of a medium-sized car used for approx. 1000 km.

## Resource utilization during the life cycle of a typical product variant of REF 54_

| Use of non-renewable resources | Manufacturing phase | Usage phase | Disposal phase | Equivalent unit |
|---|---|---|---|---|
| **Bauxite** | 3.66 | 0.30 | 0.00 | kg |
| **Copper** | 0.91 | 0.07 | 0.00 | kg |
| **Crude oil** | 62.58 | 162.40 | 0.07 | kg |
| **Hard coal** | 185.17 | 1604.25 | -2.41 | kg |
| **Iron in ore** | 7.33 | 11.00 | -4.54 | kg |
| **Lignite** | 144.10 | 20.88 | 0.01 | kg |
| **Limestone** | 5.54 | 23.45 | 0.00 | kg |
| **Natural gas** | 65.74 | 1.30 | 0.08 | kg |
| **Uranium in ore** | 0.02 | 0.03 | 0.00 | kg |
| **Use of renewable resources** | | | | |
| **Hydro energy** | 852.23 | 3963.86 | 0.39 | MJ |
| **Wood** | 1.40 | 52.78 | 0.00 | kg |

## Energy consumption during the life cycle of a typical product variant of REF 54_

| Energy form | Manufacturing phase | Usage phase | Disposal phase** | Unit |
|---|---|---|---|---|
| **World Electricity Mix** | 1290 | 6000 | 14 | kWh |
| **% of total** | 17.5 | 82.1 | 0.2 | % |

** In the assessment of the energy demanded for the disposal of the REF 54_ feeder terminal, only the energy required for handling the steel scrap was taken into account. The energy demand of 9.35 MJ/kg of steel scrap is based on the information from the Methodology Report of the International Iron and Steel Institute.

Electricity World 1998 ETH-EPD

Generation of electricity with different power generating systems in the world during 1998. The percentage share of the Electricity World: Electricity biomass & waste 1.09%, Electricity coal 39.36%, Electricity gas 15.27%, Electricity geothermal 0.31%, Electricity hydro 18.35%, Electricity nuclear 16.97%, Electricity oil 8.52%.
Data have been adapted to the demands of the EPD (Environmental Product Declaration) guidelines in Sweden.


## SUMMARY

The most significant environmental impact (Global Warming Potential indicator) is the power use during the product liftime (17-27W). The second biggest impact is coming from the production process of printed circuit boards.

## The five environmental impact values

### Acidification AP

Acidification originates from the emissions of sulphur dioxide and oxides of nitrogen. In the atmosphere, these oxides react with water vapour and form acids which subsequently fall down to the earth in form of rain or snow, or as dry depositions. Acidification potential translates the quantity of emission of substances into a common measure to compare their contributions to the capacity to release hydrogen ions.

### Eutrophication NP

Nutritients (mainly nitrogen and phosphorus) from sewage outfalls and fertilised farmland accelerate the growth of algae and other vegetation in water. The degradation of organic material consumes oxygen resulting in oxygen deficiency and fish kill.

### Global Warming Potential GWP

The index used to translate the level of emission of various gases into a common measure to compare their contributions to the absorption by the atmosphere of infrared radiation. GWPs are calculated as the absorption that would result from the emission of 1 kg of gas to that from the emission of 1 kg carbon dioxide over 100 years.

### Ozone depletion ODP

The index used to translate the level of emissions of various substances into a common measure to compare their contributions to the breakdown of the ozone layer. ODPs are calculated as the change that would result from the emission of 1 kg of a substance to that from the emission of 1 kg of CFC-aa ( a freon).

### Photochemical ozone creation POCP

The index used to translate the level of emissions of various gases into a common measure to compare their contributions to the change of the ground-level ozone concentration. POCPs are calculated as the change that would result from the emission of 1 kg of a gas to that from the emission of 1 kg of ethylene.

This product has been certified by ABB Group as **Industrial IT Enabled™ - Information Level.** All product information is supplied in interactive electronic format, based on ABB Aspect Object™ technology. The Industrial IT commitment from ABB ensures that every enterprise building block is equipped with the integral tools necessary to install, operate, and maintain it efficiently throughout the product lifecycle.

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