

## Environmental Product Declaration

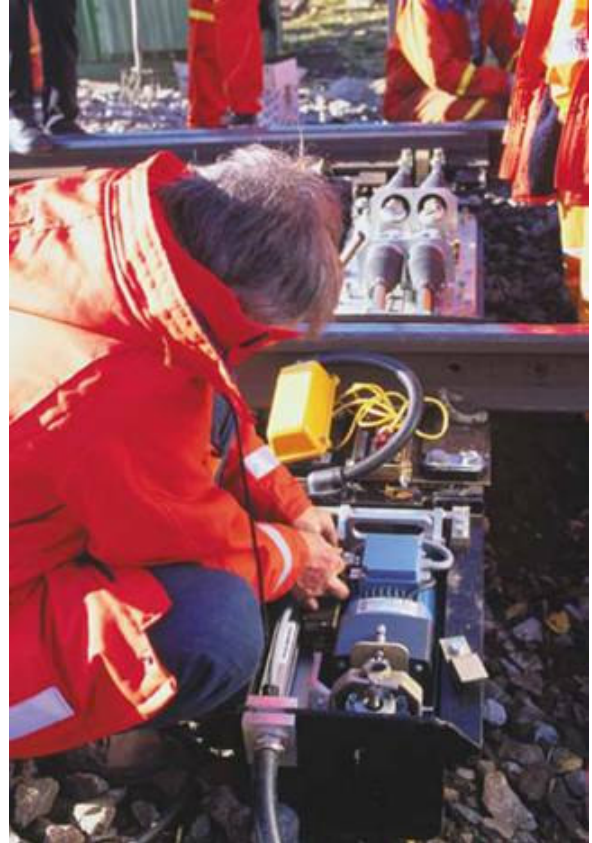
### *EBI Switch 2000*

#### *Product description*

*EBI\** Switch 2000 is a sleeper integrated point machine designed to increase safety and availability, reduce traffic delays and minimise life cycle cost. This efficient system includes locking and detection for both the closed and open switch rail.

*EBI* Switch 2000 is designed for optimal integration in the track and is fully integrated in a steel sleeper which has the same function as an ordinary sleeper. This design eliminates the need for mechanical parts between sleepers, such as connection rods and external locks. It also enables machine based maintenance such as ballast tamping, filling of ballast and snow clearance without manual work throughout the complete turnout. The machine can easily be pre-installed at a switch manufacturer or installed in an existing track. All parts are carefully designed to reduce the maintenance need and to increase the performance of the switch.

The modular structure enables a fast unit replacement if needed, which reduces the on-site time and traffic disturbance. To enable maximum flexibility for different turnouts, stroke, operation time, tractive force and start delay are adjustable and can be individually set on all machines. This flexibility also reduces the spare part stock and simplifies logistics. The *EBI* Switch 2000 does not contain hydraulic equipment or equivalent fluids that can cause any leakage out to the surrounding ground and environment.



Manufacturing materials (kg)	Total per <i>EBI</i> Switch	The Weight [%]	Recyclability [%]
Steel	572	97,6	99
Polymers	5,3	0,9	100
Aluminium	4,7	0,8	100
Copper	1,3	0,2	100
Other materials	2,7	0,5	26
<b>Total</b>	<b>586</b>	<b>100</b>	<b>99</b>

Materials in need of special treatment at End-of-life are 2,5 kg.

#### *System boundaries*

The Life Cycle Assessment (LCA) overleaf is based on the *EBI* Switch 2000. It covers environmental aspects for extraction and production of the raw materials used, transports of major parts to assembly plant and the energy consumption for final assembly (83 kWh). It also covers the end-of-life activities. Materials used during maintenance and the replacement of certain components have been included in the study. The calculated energy consumption during use phase for one *EBI* Switch in service for 20 years is 243 kWh.

#### *End-of-life*

Recyclability calculations are based on existing recycling processes that are commercially available and technically possible today. Energy recovery is included in the recyclability rate that is estimated to be 99 %.

**Environmental Profile – Results from LCA according to ISO 14040**

The functional unit is one *EBI* Switch in service for 20 years.

**Resource utilisation**

Primary energy resources (kWh)	Manufacturing	Use	End-of-life	Total life cycle
<b>Non Renewable</b>				
Nuclear	38	113	0	151
Oil	1,7	5,0	0	6,7
Coal	1,7	4,8	0	6,5
Gas	0,2	0,7	0	0,9
<b>Renewable</b>				
Hydropower	39	114	0	153
Biomass	1,6	4,7	0	6,4
Wind power	0,2	0,5	0	0,7

Material (kg) Resources	Manufacturing	Use	End-of-life	Total life cycle
Steel	572	25,2	-597	0,06
Polymers	5,3	2,0	-7,30	0
Aluminium	4,7	2,4	-7,10	0
Copper	1,3	1,0	-2,30	0
Other material	2,7	4,8	-1,95	5,55
<b>Total</b>	<b>586</b>	<b>35,4</b>	<b>-616</b>	<b>5,61</b>

**Impact categories to which all the emissions are grouped:**

Environmental impact categories	Unit	Manufacturing	Use	End-of-life	Total life cycle
Global warming potential (GWP)	kg CO <sub>2</sub> equiv.	1198	114	-967	344
Ozone Depletion Potential (ODP)	kg CFC 11 equiv.	0,000030	0,000009	-0,000003	0,000036
Acidification (AP)	mol H+ equiv.	99	17	-58	58
Eutrophication (NP)	kg O <sub>2</sub> equiv.	11,0	1,4	-5,9	6,5
Photochemical Oxidant formation (POCP)	kg Ethene equiv.	0,06	0,03	-0,09	0

The **material resources** cover the materials used for manufacturing and maintenance of the *EBI* Switch.

The **energy resources** cover energy needed during manufacturing of the *EBI* Switch. A Swedish electricity mix, including a variety of energy resources, has been used in the calculations.

The **materials in need of special treatment** are identified according to knowledge of existing recycling processes that are commercially available and technically possible today.

**Manufacture** covers the materials and energy needed for assembly of the *EBI* Switch.

**Use** covers the predicted and estimated processes during the use phase.

**End-of-life** covers recycling, incineration with energy recovery and landfill. Credit for recyclability of metals and polymers is achieved by deducting the impact of production of the same virgin material or energy.

**Total** sums up the manufacture, use and end-of-life phase.

**Included in the LCA:**

- Data for raw materials used throughout the life cycle
- Transportation of main components to final assembly
- Energy consumption during assembly and use

**Not included:**

- Manufacturing processes at suppliers
- The raw material waste produced in the manufacturing process
- Effects of possible accidents
- Energy and emissions for the end-of-life treatment

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This EPD is performed according to ISO 14021

For further details regarding the LCA, see 3EST 7-3122 Life Cycle Assessments of RCS products ver 1.0