ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025 and EN 15804

Declaration holder	**Hilti Aktiengesellschaft**
Publisher	Institut Bauen und Umwelt e.V. (IBU)
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HAC anchor channel system

Hilti Aktiengesellschaft

Institut Bauen und Umwelt e.V.

www.bau-umwelt.com / https://epd-online.com

1. General information

HILTI	HAC anchor channel system
Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin GERMANY	**Holder of the Declaration** HILTI Aktiengesellschaft Feldkircher Strasse 100 FL 9494 Schaan LIECHTENSTEIN
Declaration number EPD-HIL-20130069-IBA1-EN	**Declared product/unit** HILTI HAC 30 - 70 anchor channels depicted using the example of HAC 50 HILTI HAC 50 anchor channel with special HBC screw The declared unit is one running metre [running metre]. 3 M16x50 mm HBC-C screws are assumed per running metre channel. Packaging is not taken into consideration on account of the cut-off criterion.
This Declaration is based on the Product Category Rules: Thin-walled profiles and profiled panels made of metal, 02-2013 (PCR tested and approved by the independent Expert Committee (SVA))	**Area of validity:** This document refers to the HILTI HAC anchor channel system and corresponding HBC screws. Specific data from the HILTI production facility in Kaufering was recorded for the LCA. It is based on data from 2012. The holder of the Declaration is liable for the basic data and evidence; liability on the part of IBU with relation to manufacturer information, LCA data and evidence is excluded.
Issue date 12.07.2013	
Valid until 11.07.2018	
Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)	**Verification** The CEN EN 15804 standard serves as the core PCR. Verification of the EPD by an independent third party in accordance with ISO 14025 ☐ internally ☒ externally
Prof. Dr.-Ing. Hans-Wolf Reinhardt (Chairman of the SVA)	Dr. Daniela Kölsch (Independent auditor appointed by the SVA)

2. Product

2.1 Product description

The HILTI anchor channel system comprises HAC-50 anchor channels and the corresponding HBC hook head screws. The anchor channel comprises a V-shaped steel rail which is filled with LDPE foam. The foamed body features a tear-out strip which facilitates removal of the foam. The front of the anchor channel features sealing end caps preventing entry of concrete slurry during casting. The HAC 30-70 anchor channels differ in terms of mass in relation to running metres.

This document covers the following anchor channels:

Product name:

- HAC-30
- HAC-40
- HAC-50
- HAC-60
- HAC-70

Conversion is via the product weight.

2.2 Application

Anchor channels are cast in concrete. Prior to the casting process, they are positioned in the component and typically fastened by nailing to the formwork. Anchor channels serve towards subsequent fastening of fixtures. Typical areas of application include curtain wall façades, fastening elevator installations in shafts, applications in the area of finished parts and in the area of installation technology.

2.3 Technical data

Technical construction data

As resistance values in concrete are subject to a wide variety of factors, only channel parameters and basic geometric data per ETA 11/0006 dated 28 February 2012 are indicated below. Please refer to the ETA for a detailed design of the anchor point and other data.

Table 1: Technical construction data

Description	Value	Unit
Steel failure, anchor N(Rk,s,a)	33	kN
Steel failure, channel-anchor connection N(Rk,s,c)	33	kN
Bending by the channel lips, traction N(Rk,s,l)	35	kN
Channel bending resistance M(Rk,s,flex)	1389	Nm
Bending by the channel lips, transverse pull V(Rk,s,l)	51	kN
Minimum anchoring depth h(ef)	91	mm
Minimum clearance c(min)	75	mm
Anchor channel width b(ch)	41.9	mm
Anchor channel height h(ch)	31.0	mm
Profile thickness t(nom)	2.75	mm

2.4 Placing on the market / Application rules

Anchor channel systems are designed in accordance with CEN-TS 1992-4 "Design of fastenings for use in concrete" and the European Technical Approval ETA - 11/0006 "Hilti Anchor channels - HAC with special HBC screw".

2.5 Delivery status

Channels and screws are packed separately and can also be ordered separately
(further information available in section 2.10).

2.6 Base materials / Auxiliaries

Table 2: HAC 50 material distribution

Description	Value	Unit
Steel, coil (anchor channel)	2467.9	g
Steel, billet (hook head screws)	342.0	g
PP (end caps)	22.0	g
PET (tear-out strip)	7.1	g
PE-E (foam)	25.9	g
Polyester resin (tear-out strip)	1.1	g
Total	2866.0	g

2.7 Production

The raw material for the anchor channel comes from Linz (Austria) and is cold-rolled in a special process at Welser (Austria). The channel is galvanised after the rolling process.

The foam is produced in Eynatten (Belgium). The tear-out strip is manufactured in Affalterbach (Germany). The anchor channel end caps are produced in an injection-moulding process in Ulm (Germany). This is followed by transport to final manufacturing in Kaufering. All transports reviewed are by truck.

The hook head screws are produced in Taiwan and transported by ship to Europe. All other transports are by truck.
The power mixes for the production processes are reviewed for each specific country.

The following flow chart depicts the production process on which this is based.

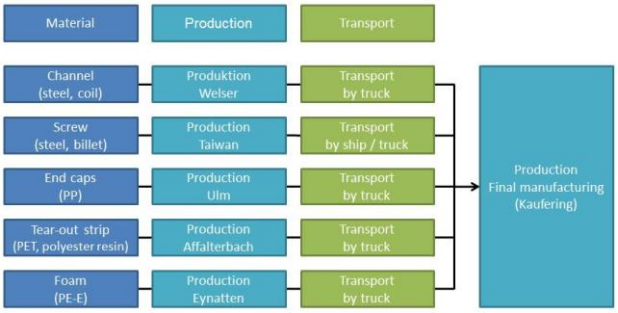

Fig. 1: Flow chart for the various life stages

2.8 Environment and health during production

HILTI AG, Feldkircherstr. 100, FL-9494 Schaan is certified in accordance with DIN EN ISO 14001 Environmental Management Systems (Swiss Association for Quality and Management Systems SQS under certificate registration no. 12455). The environmental aspects are assessed across the entire value-added chain - from basic research, through product development and manufacturing processes to sales. The Hilti production facility – Hilti GmbH Industriegesellschaft für Befestigungstechnik, Hiltistr. 6, D-86916 Kaufering – is also certified in accordance with DIN EN ISO 50001 Energy Management Systems (SQS under certificate registration no. 39590). By means of a continuous improvement process, projects are realised with the goal of better energy efficiency in infrastructure and in the process flows.

The Kaufering facility procures its entire thermal heat from a municipal biomass power station built in the immediate vicinity.

The office premises and production facilities in plant 6 have been cooled with groundwater for the past 3 years.

In terms of Environment Management, waste separation represents an essential component of the disposal concept at the site. Daily implementation and the re-use of materials are in close collaboration with a specialist disposal company. Within the framework of comprehensive health management in the plant, workplaces are designed in accordance with ergonomic aspects and are also subject to on-going further development.

2.9 Product processing/installation

The plant for manufacturing the HAC channels complies with the state of the art, the requirements on the physical features of work equipment in accordance with § 7 of the Industrial Safety Regulation and the relevant provisions, specifications and guidelines of the authorities, professional liability associations and trade associations. The channels are processed on a rectilinear system. The punching and crimping drive is controlled hydraulically. The channel is inscribed on the inside and outside using an ink-jet printer. The following EC Directives are taken into consideration during production:

- Machinery Directive 98/37/EC
- Low Voltage Directive 73/23/EEC
- Basic Pressure Equipment Directive 2009/105/EC
- Pressure Equipment Directive 1999/36/EC
- Atex Directive 94/9/EC where at least parts of the system are designated for use in potentially explosive areas

- Noise Directive 2003/10/EC
Where necessary, all doors and flaps are secured with safety switches. Low-wear design was considered when designing the noise protection measures (e.g. covered sound insulation mats in the case of strong mechanical loads). The possibility of persons being locked inside the system is excluded. Switch cabinets feature double-bit locks.

The system is capable of switching to "economy mode" within 5 minutes in the event of a system shutdown. And this means: deactivation of belts, air nozzles, hydraulics etc. where possible by the process.

2.10 Packaging
Up to a length of 1.30 metres, the channels are delivered on Euro pallets with wooden folding frames. Anchor channels of longer lengths are delivered packed and strapped in bundles as long goods. Depending on the size and length, screws are packed in packing units of 50 or 100, in some cases in packaging units of 25, in cardboard boxes.

2.11 Condition of use
After installation and casting, the foam is usually removed using the tear-out strip and disposed of. When used as designated, the characteristics of the anchor channel system remain unchanged.

2.12 Environment and health during use
When used as designated, there is no impact on the environment or health.

2.13 Reference service life
The anchor channel system is designed in accordance with CEN TS 1992-4 which is integrated in the Eurocode generation of standards. Accordingly, a useful life of 50 years is anticipated in line with the safety concept outlined in the Eurocode.

2.14 Extraordinary effects

Fire
The Hilti anchor channel system is also approved for the effects of fire in accordance with ETA-11/0006 and is not allocated to any building material class.

Water
The anchor channel system largely comprises hot-dip galvanised steel. The end caps are made of polypropylene (PP). Thanks to the materials used, there are no environmental risks attributable to the effects of water.

Mechanical destruction
In the event of unintentional mechanical destruction, there is no risk for users or the environment if the product has been installed correctly.

2.15 Re-use phase
Cast anchor channels can not be re-used but material recycling is possible.

2.16 Disposal
Anchor channels and special screws are made of galvanised steel and can be recycled accordingly. The LDPE foam body removed during installation remains essentially intact and can be easily disposed of in one piece
(EWC key: 191001)

2.17 Further information
www.hilti.com

3. LCA: Calculation rules

3.1 Declared unit
The declared unit is defined as a HAC-50 anchor channel manufactured by HILTI AG without packaging. On account of its low mass percentage (less than 5%), the packaging is not included in the calculation and falls below the cut-off criteria. The weight relates to the anchor channel in running metres. Three average M16x50 mm HBC hook head screws are defined as fixing points. The following table depicts the data concerning the declared unit.

Table 3: Declared unit data

Description	Value	Unit
Conversion factor to 1 kg	0.349	-
HAC 50 anchor channel	2.524	kg / running metre
Hook head screws (3x 0.114 kg)	0.342	kg / running metre
Declared unit	2.866	kg / running metre

In order to derive an estimate of the environmental impacts and indicators for other products, the following conversion factors can be used.
Product name / Conversion factor:

The conversion factors for calculating the results of the Life Cycle Assessment arise on the basis of the relationships between the various product masses.

- HAC-30 / 0.71
- HAC-40 / 0.81
- HAC-50 / 1.00
- HAC-60 / 1.47
- HAC-70 / 2.02

Calculation sample:
GWP HAC-50 x 2.02 = GWP HAC-70

3.2 System boundary
Type of EPD: cradle to gate – with options. The following information modules are defined in this study as the system boundary:

A1- A3 Product stage:
- A1, Raw material supply,
- A2, Transport,
- A3, Production

Benefits and loads are also considered in Information module D.

3.3 Estimates and assumptions
The power mixes and other background data for the production processes are calculated for each specific country.

Japanese data was taken as a basis for the background data relating to the production process for hook head screws (steel, billets) in Taiwan as background data for Taiwan is not available in the GaBi 6 data base. This assumption can be made as the data is practically identical (Life Cycle Inventories of Electricity Mixes and Grid).

On account of an assumed collection rate of 85% (see Worldsteel Association) for the product under review, the following assumptions are made in Information module D: 85% of materials are recycled; the remaining 15% of product mass is landfilled.

3.4 Cut-off criteria

All of the information modules considered have therefore been included in detail in the calculation with the result that all requirements of the EN 15804 are complied with.

This product requires individual packaging design as the anchor channels are of varying length depending on the customer's requests. Calculation of the product without packaging permits better comprehension of the results as the declared unit is clearly defined. Furthermore, the packaging accounts for less than 5% of the mass percentage of the product as a whole and therefore falls short of the cut-off criteria.

3.5 Background data

The data base for the background data in the GaBi 6.0 data bases is documented in the following link and to which this study also refers: PE International.

3.6 Data quality

Specific data from the Hilti production facility in Kaufering for 2012 was recorded for the LCA. The background data used from the GaBi 6 data base originates from 2012 and therefore of high topicality. The data on the provision of materials for the HAC-50 anchor channel originates from a de-construction analysis commissioned by Hilti AG. As the mass of the steel coil has been established with an accuracy of 0.1g, a high degree of quality can be assumed for the results of the Life Cycle Assessment.

3.7 Period under review

Data from 2012 is taken as a basis.

3.8 Allocation

Products and co-products are not allocated in the information modules A1- A3 reviewed.

3.9 Comparability

As a general rule, EPD data can only be compared or evaluated if all of the data to be compared has been generated in accordance with EN 15804 and the building context and/or product-specific characteristics are taken into consideration.

4. LCA: Scenarios and further technical information

The following scenario assumptions were taken as a basis for the LCA calculation:

Re-use, recovery and recycling potential (D)
On account of the assumed collection rate (see section 3.3), the product mass is allocated to the corresponding material flows in the following table.

Table 4: Collection rate

Description	Value	Unit
Material recycling	2436.1	g
Landfilling	429.9	g
Total	2866.0	g

Material recycling gives rise to material credits which are depicted in the results of the LCA. Steel runs through two processes. The first process involves melting in the electric arc furnace which incurs environmental pollution. The second process involves credits in terms of blast furnace steel. Only this difference is indicated in the results of information module D.

The background data on landfilling takes consideration of the composition of the waste in question. Landfilling does not give rise to any energy credits.

5. LCA: Results

SYSTEM BOUNDARIES (X = INCLUDED IN THE LCA; MND = MODULE NOT DECLARED)

Product stage			Construction process stage		Use stage							End-of-life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Production	Transport	Assembly	Use / Application	Maintenance	Repairs	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction	Transport	Waste treatment	Landfilling	Re-use, recovery and recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X

LCA RESULTS - ENVIRONMENTAL IMPACT: HILTI HAC 50 [running metre]

Parameter	Unit	A1 - A3	D
Global Warming Potential	[kg CO_2 equiv.]	8.67	-2.38
Ozone Depletion Potential	[kg CFC11 equiv.]	9.84E-08	2.78E-10
Acidification Potential	[kg SO_2 equiv.]	0.0278	-0.0133
Eutrification Potential	[kg $(PO_4)^{3-}$ equiv.]	0.00213	-0.00052
Photochemical Ozone Creation Potential	[kg ethene equiv.]	0.00455	-0.00186
Abiotic Depletion Potential non-Fossil Resources	[kg Sb equiv.]	4.82E-05	-9.09E-08
Abiotic Depletion Potential Fossil Fuels	[MJ]	102	-30.6

LCA RESULTS - USE OF RESOURCES: HILTI HAC 50 [running metre]

Parameter	Unit	A1 - A3	D
Renewable primary energy as energy carrier	[MJ]	2.85	0
Renewable primary energy as material utilisation	[MJ]	0	0
Total use of renewable primary energy sources	[MJ]	2.85	0.561
Non-renewable primary energy as energy carrier	[MJ]	99.6	0
Non-renewable primary energy as material utilisation	[MJ]	2.4	0
Total use of non-renewable primary energy sources	[MJ]	102	-30.6
Use of secondary materials	[kg]	0	0
Renewable secondary fuels	[MJ]	0.000236	0.0434
Non-renewable secondary fuels	[MJ]	0.00247	0.454
Net use of fresh water	[m^3]	---	

LCA RESULTS - OUTPUT FLOWS AND WASTE CATEGORIES: HILTI HAC 50 [running metre]

Parameter	Unit	A1 - A3	D
Hazardous waste for disposal	[kg]	---	---
Disposed of, non-hazardous waste	[kg]	22.4	-20.2
Disposed of, radioactive waste	[kg]	0.00246	0.000842
Components for re-use	[kg]	0	0
Materials for recycling	[kg]	0	2.396
Materials for energy recovery	[kg]	0	0
Exported electrical energy	[MJ]	0	0
Exported thermal energy	[MJ]	0	0

All indicators established in accordance with EN 15804. The estimated impact of environmental pollution is calculated in accordance with CML 2001 Nov. 2010.

The Hazardous waste for disposal (HWD) and Net use of fresh water (FW) indicators are not depicted owing to the unavailability of this information in the background data. This is permissible according to a decision by the Expert Committee (SVA) on 7 January 2013.

These values apply for the HAC-50 anchor channel; if you wish to derive the estimated environmental impacts and indicators for other products, please refer to the conversion factors in section 3.1.

6. LCA: Interpretation

The dominance analysis indicates that the main causes of environmental impacts and indicators can be found in information module A1. The product mass is the decisive variable. In terms of information module A1, 86.4% of the GWP, 84.5% of the PED (lower calorific value), 79.4% of the POCP and 99.8% of the ADPE is incurred by provision of the material for the steel coils for anchor channels. In recent years, cold-rolling structural steel has proved to be an excellent alternative to conventional hot-rolling processes and makes an essential contribution towards reducing the environmental impacts of a product system (see Brütsch/Rüegger AG).
As the mass of the steel coil has been established with an accuracy of 0.1g by means of a de-construction study, a high degree of quality can be assumed for the results of the Life Cycle Assessment.

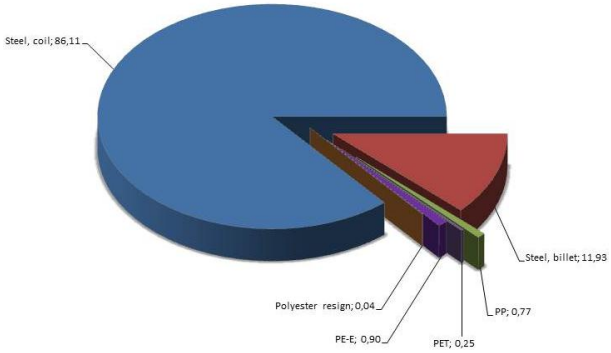

Fig. 2: Material distribution as a [%] of the product

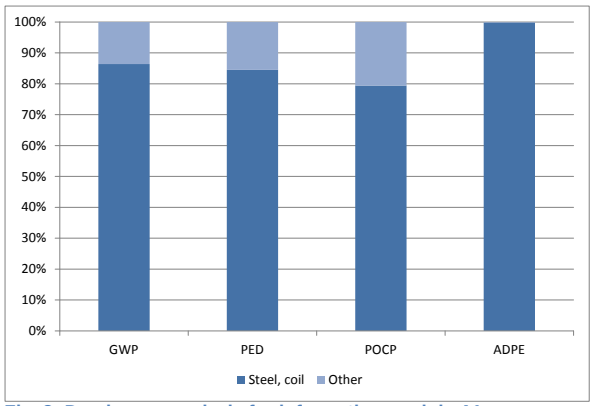

Fig. 3: Dominance analysis for information module A1

Dominance analysis for information module A1

In order to use the results of the Life Cycle Assessment for the declared product to derive estimates for other products in this class, the product mass ratio is applied as a conversion factor. As indicated in the dominance analysis, all processes in the "cradle to gate" approach are primarily dependent on the mass which makes such a procedure possible (see section 3.1).

7. Requisite evidence

No evidence is required.

8. References

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EN 15804
DIN EN 15804:2012-04, Sustainability of construction works – Environmental Product Declarations – Core rules for the product category of construction products; German version EN 15804:2012

ISO 14001
DIN EN ISO 14001:2009-11, Environment management systems – Requirements with guidance for use (ISO 14001:2004 + Cor. 1:2009); German and English versions EN ISO 14001:2004 + AC:2009

ISO 50001
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Indicators of environmental impacts
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EN 1993-1-3
DIN EN 1993-1-3:2010-12, Design of steel structures – Parts 1-3: General rules – Supplementary rules for cold-formed members and sheeting; German version EN 1993-1-3:2006 + AC:2009

Machinery Directive 98/37/EC
Directive 98/37/EC of the European Parliament and Council dated 22 June 1998 on the approximation of the laws of the Member States relating to machinery

Low Voltage Directive 73/23/EEC
Directive 2006/95/EC the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to Electrical Equipment designed for use within certain voltage limits

Basic Pressure Equipment Directive 2009/105/EC
Directive 2009/105/EC of the European Parliament and Council of 16 September 2009 relating the simple pressure vessels

Pressure Equipment Directive 1999/36/EC
Council Directive 1999/36/EC of the European Parliament and Council of 29 April 1999 on transportable pressure equipment

Atex Directive 94/9/EC
Directive 94/9/EC of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres (where at least parts of the systems are designated for use in potentially explosive areas)

Noise Directive 2003/10/EC
Directive 2003/10/EC of the European Parliament and Council dated 6 February 2003 on the minimum health and safety requirements regarding the exposure of workers to the reisks arising from physical agents (noise)

ETA 11/0006
Approval ETA-110006 dated: 28.02.2012 Hilti anchor channel - HAC with special screw - HBC Concreted anchor channel

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