ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	HALFEN GmbH
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-HAL-20160244-IBC1-EN
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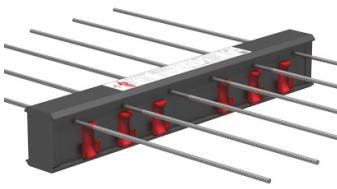
Valid to	13.02.2022

HALFEN Iso-ElemenT HIT-HP MVX-0805-20-100

HALFEN GmbH

Institut Bauen und Umwelt e.V.

www.ibu-epd.com / https://epd-online.com



1. General Information

HALFEN GmbH	HALFEN Iso-ElemenT HIT-HP MVX
Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the Declaration** HALFEN GmbH Liebigstraße 14 40764 Langenfeld Germany Europe
Declaration number EPD-HAL-20160244-IBC1-EN	**Declared product / Declared unit** The declared unit is one metre length of the element. HALFEN Iso-ElemenT HIT-HP MVX depicted using the example of HALFEN Iso-ElemenT Type HIT-HP MVX-0805-20-100-cc.
This Declaration is based on the Product Category Rules: Load-bearing thermal insulation elements, 07/2014 (PCR tested and approved by the SVR)	**Scope:** This EPD refers to the specific load-bearing thermal insulated connection element HALFEN Iso-ElemenT type HIT-HP MVX-0805-20-100-cc (18.64 kg) manufactured by HALFEN. The stainless steel component of the tension bar is produced at HALFEN plant Artern / Germany. Other components tension bars, Compression-Shear-Bearings (CSB), processed casing boxes and assembled module units are produced at HALFEN plant Nowe Skalmierzyce / Poland. The final assembling of all module units is done at HALFEN plant Artern / Germany or at HALFEN plant Nowe Skalmierzyce / Poland. Specific data from the HALFEN production facility in Artern / Germany and Nowe Skalmierzyce / Poland was recorded for the LCA. The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.
Issue date 14.02.2017	
Valid to 13.02.2022	**Verification** The CEN Norm /EN 15804/ serves as the core PCR Independent verification of the declaration according to /ISO 14025/ ☐ internally ☒ externally
Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)	
Dr. Burkhart Lehmann (Managing Director IBU)	Matthias Klingler (Independent verifier appointed by SVR)

2. Product

2.1 Product description

The HALFEN Iso-ElemenT HIT-HP MVX is a load bearing insulated connection element for thermal separation of cantilevered reinforced concrete components such as balcony and ceiling slabs. It is used to prevent mold, to ensure increased building physical requirements and to avoid cracking due to temperature expansions. It consists of a sturdy casing box made of plastic, which is filled with mineral rock wool. In addition to the insulating effect, the mineral rock wool is used as fireproofing material so that all versions of the insulated connection element HIT-HP are by default classified in the fire resistance class REI 120 according to /EN 13501-2/.

The tension bars and the Compression-Shear-Bearings (CSB) form the statically bearing components of the system. They are arranged into the casing box in such a way that a shift in all three spatial directions can be excluded, so that the system has a high assembly security.
The tension bars are made of a welded connection of stainless steel and rebars. The Compression-Shear-Bearings consist of a fiber-reinforced high-performance mortar and are adapted with regard to the usage area, as well as mechanical and structural properties.

The HALFEN Iso-ElemenT HIT-HP MVX is available in the following variants:

- joint widths: HP = 80 mm

- The number of tension bars and Compression-Shear-Bearings define the load bearing capacity level of each HIT element
- Element height: h = 16 cm to 35 cm
- Element length: l = 25 cm, 50 cm, 100 cm
- Concrete cover: cc = 30 mm, 35 mm, 50 mm
- The respective variant of HALFEN Iso-Element HIT is integrated in the product name and so clearly defined.

The declared product HIT-HP MVX-0805-20-100-cc in the EPD is thus characterized by:

- joint widths: HP = 80 mm
- Number of tension bars: 8
- Number of Compression-Shear-Bearings: 5
- Element height: h = 20 cm
- Element length: l = 100 cm
- Concrete cover: cc = 30 mm, 35 mm, 50 mm

Detailed information about HALFEN Iso-ElemenT HIT-HP MVX-0805-20-100-cc is included in the table in section 2.3.

All variants of the above mentioned product HALFEN Iso-ElemenT HIT-HP MVX have respective to the declared product HIT-HP MVX-0805-20-100-cc identical components which are manufactured by the same production processes. Thus, the EPD results for the production of HALFEN Iso-ElemenT HIT-HP MVX-0805-20-100-cc are applicable to other element types (load bearing capacities) by considering the respective calculation rules within this EPD.

All used materials are recyclable and made in a significant ratio from recycled materials. Therefore, the HALFEN Iso-ElemenT can be classified as environmentally friendly.

2.2 Application

The HALFEN Iso-ElemenT type HIT-HP MVX is used for static transfer of bending moments as well as positive and negative shear forces. It is placed between the outer and inner reinforced concrete construction such that the heat flow is locally minimized and the thermal bridges is reduced.

2.3 Technical Data

Constructional data HIT-HP MVX-0805-20-100-cc

Name	Value	Unit
Insulation thickness type HP	80	mm
Concrete covering (cc) according national and international standards	30 - 50	mm
Height of the element	200	mm
Length of the element	1000	mm
Fire resistance class according /EN 13501-2/	REI 120	-
Thermal conductivity of the insulation material	0.035	W/(mK)
number of tension bars (diameter 12 mm)	8	pieces / m
number of Compression-Shear-Bearing	5	pieces / m

2.4 Application rules

For the placing on the market in the EU/EFTA (with the exception of Switzerland) the Regulation (EU) No 305/2011 applies. The products need a Declaration of Performance taking into consideration / ETA 13/0546/ and the CE marking.

The HALFEN Iso-ElemenTs HIT-HP MVX are designed in accordance with:

- /ETA-13/0546/ European Technical Approval of the Austrian Institute for Structural Engineering (OIB) or
- /ICC-ES ESR-3799/ Report from the ICC-ES or
- /Z-15.7-293/ National technical building approval by the German Institute for Building Technology (DIBt)

2.5 Delivery status

The declared product HALFEN Iso-ElemenT HIT-HP MVX-0805-20-100-cc is manufactured to a length of 100 cm and a height of 20 cm (further Information available in section 2.10).

2.6 Base materials / Ancillary materials

Name	Value	Unit
Tension Bars: reinforcing steel B500	47.4	%
Tension Bars: stainless steel	8.9	%
CSB: High Performance Mortar	15.4	%
CSB: End Caps – Polymers (PP)	1.6	%
Thermal insulation and fire protection material (mineral rock wool)	7.6	%
Casing box - Polymers (PVC-R, PVC)	19.1	%

The product weight with respect to the declared unit HIT-HP MVX-0805-20-100-cc is 18.64 kg.

2.7 Manufacture

The materials needed for the final assembly of the HALFEN Insulated connections HIT-HP are manufactured in-house or purchased from qualified verndors.

The Halfen insulated connection HIT-HP with tension bars and Compression-Shear-Bearings is built from a modular system of plastic casings with integrated thermally insulating fire protection material. In order to be protected from moisture, the thermally insulating fire protection material is enclosed in the casing box from all sides.
The welded connections of the tension bars are made with the flash butt welding method. The tension bars are arranged in the upper casings and secured in their positions, together they form an assembly unit. The Compression-Shear-Bearings made of high performance mortar are arranged with CSB end-caps in a casing box and secured in their positions. They form an assembly unit. In the built-in state, the upper

casings are connected with the lower casings.

The stainless steel component of the tension bar is produced at HALFEN plant Artern / Germany. The components: tension bars, Compression-Shear-Bearings, processed casing boxes and assembled module units are produced at HALFEN plant Nowe Skalmierzyce / Poland.

The final assembling of all module units is done at HALFEN plant Artern / Germany or HALFEN plant Nowe Skalmierzyce / Poland.

2.8 Environment and health during manufacturing

The criteria for environmental and energy management and the requirements for the Health and Safety at work follow all statutory requirements and HALFEN standards.

HALFEN was certified according to /DIN EN ISO 50001/ on the 15th April 2016 for all its 18 locations inside Europe, the United States of America and China by the SWEDAC Certification Institute International GmbH.

Since 1994 all HALFEN locations are certified according to /ISO 9001/ (ISO 9001:2015) by DNV GL.

The continuous production and product quality according the product specifications and approval specifications of HALFEN Iso-ElemenT HIT-HP are ensured by an in-process quality control by HALFEN and by regularly third party quality inspections by /MPA NRW/, /KIWA/, /ITB/ and /IAS/ certified bodies.

All types of waste such as stainless steel, reinforcing steel, mineral rock wool, plastics, wood (wood pallets and wood trimmings) and packaging materials (cardboard) that are incurred in the production of the product or remain as excess material will be separated according to type and recycled.

2.9 Product processing/Installation

The HALFEN Iso-ElemenT HIT-HP MVX is supplied as a ready to install insulated connection element. If required, the element can be cut to the required length by using of a conventional hand saw. The HALFEN Iso-ElemenT HIT is positioned in the building shell or in the precast concrete plant during or alternatively after the reinforcement installation without the use of lifting equipment. HALFEN Iso-ElemenT HIT-HP MVX is positioned in a linear arrangement between the balcony and floor ceiling. The Iso-Element has to be secured in position e.g. with existing site reinforcement and secured against slippage during subsequent concreting. No special environmental protection measures need to be taken while processing HALFEN Iso-ElemenT HIT.

2.10 Packaging

The HALFEN Iso-ElemenT HIT is delivered by default stacked on wooden pallets with lateral wooden slats, secured in position with packing tape. Any use of protective foil is omitted by default. This is used only on customer request. The individual packaging materials should be separated according to their type and recycled.

2.11 Condition of use

All supplied materials are protected in the installed condition against external influences and designed for the service life of the respective construction. No risks can arise to water, air and soil if the products are used as designated.

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

A service life of at least 50 years confirmed by approval test scenarios and approval procedures is applicable for HALFEN Iso-ElemenT HIT-HP MVX which are in line with the safety concepts outlined in the Eurocode or ACI. The practical service life can however be considerably longer. A further condition for the service life is that the HALFEN Iso-ElemenT HIT is used in accordance with the designed application. This service life refers to static design approach and not to reference service life according to /ISO 15686/.

2.14 Extraordinary effects

Fire

All versions of HALFEN insulated connections HIT-HP are classified as standard according to various approvals with a fire resistance duration of 120 minutes and are classified in accordance with /EN 13501/ in the fire resistance class REI120. Halfen Iso-ElemenTs HIT-HP are not allocated to any building material class.

Water

By regulation-conforming use of stainless steel with the corresponding bond length in the connected concrete structures and in accordance with the designed concrete cover of the tension bars the risk of corrosion of steel materials for the HALFEN Insulated connections HIT is ruled out. 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

HALFEN Iso-Element HIT-HP can not be re-used but material recycling is possible.
All components of the described product can be returned and recycled into the material cycle. In view of an efficient recycling process it should be ensured that a separation of materials during decommissioning is possible.

2.16 Disposal

The disposal of non-recycled parts of HALFEN Iso-Element HIT can be disposed of at any waste disposal site with appropriate waste number /EWC/ 191001 (for steel components) or /EWC/ 170904 (for other components) according to the /European Waste Code/ of the European Waste Catalogue.

2.17 Further information

www.halfen.com

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit is 1 m lenght of load bearing thermal insulation element HALFEN Iso-ElemenT Type HIT-HP MVX-0805-20-100-cc.
The calculation of the average of two production sites is based on actual production volumes.

Declared unit

Name	Value	Unit
Declared unit	1	m
Conversion factor to 1 kg	0.054	-
Grammage	18,6	kg/m

3.2 System boundary

Type of the EPD: cradle-to-gate - with options.
The declaration considers the life cycle stages of production (A1-A3),
including processes that provide
materials (mainly steel and PVC-parts) and energy input for the system,manufacturing and transport processes up to the
factory gate, as well as waste processing.
The production takes place in sites in Germany and Poland. Certain parts are produced in the german site and transported to Poland for final assembly.
The end of life stages covers the impacts of recycling of steel and landfilling other materials (module C4) and module D which covers loads and benefits beyond the system boundaries are also considered.

3.3 Estimates and assumptions

Assumptions are made considering the following processes:
The steel fibres of the high performance mortar is estimated with reinforcement steel.
The recycling process of PVC production waste is approximated with the recycling process of PET.

3.4 Cut-off criteria

In this assessment all data for the production process is considered. This includes input flows with a contribution of less than 1% of mass or energy. The transport expenditure for all raw materials are considered. Impacts relating to the production of machines and facilities required during production are outside the scope of this assessment.
The impacts arising from the dismantling of the products from the building structure (seperating concrete, metal and other building materials) are not considered. The impacts are estimated to contribute less than 1% to the overall result.

3.5 Background data

For life cycle modelling of the considered products, the /GaBi ts Software/,
developed by thinkstep AG, has been
used. All relevant background datasets are taken from the /GaBi ts Software/ database. The datasets from the GaBi database are documented in the online documentation /GaBi ts Data/.

3.6 Data quality

The data quality can be described as good. The primary data collection was done thoroughly, all flows were considered. Technological, geographical and temporal representativeness is given. Primary data refers to the year 2015. Background datasets were taken from the /Gabi ts Data/ database. The last update of the database was 2016.

3.7 Period under review

The period under review is the year 2015.

3.8 Allocation

The overall production of Halfen comprises further products beside the product considered in this study. Data for thermal and electrical energy as well as auxiliary material refer to the declared product. During data collection the allocation is done via meter (m). Specific information on allocation within the background data is given in the GaBi dataset documentation
(http://www.gabi-software.com/international/databases/gabi-data-search/).

3.9 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to /EN 15804/ and the building context, respectively the product-specific characteristics of performance, are taken into account.

3.10 Factors for minimum and maximum variants

The HALFEN Iso-Element is available with different load bearing capacities. The following table shows factors to calculate the LCA results for the two product types based on the values declared in chapter 5.

Factors to calculate the results for minimum and maximum load bearing thermal insulation						
Variant	HIT-HP MVX-0202-20-100			HIT-HP MVX-1610-20-100		
Parameter \ Module	A1-A3	C	D	A1-A3	C	D
GWP	0,41	0,79	0,31	1,81	1,36	2,01
ODP	0,70	0,79	0,31	1,40	1,36	2,00
AP	0,36	0,79	0,28	1,86	1,37	2,00
EP	0,46	0,78	0,30	1,74	1,36	2,00
POCP	0,42	0,79	0,33	1,78	1,37	2,00
ADPE	0,25	0,79	0,25	2,00	1,36	2,00
ADPF	0,45	0,79	0,30	1,76	1,36	2,00
PERT	0,66	0,79	0,28	1,48	1,36	2,00
PENRT	0,46	0,79	0,30	1,75	1,36	2,00

4. LCA: Scenarios and additional technical information

The following technical information is a basis for the declared modules or can be used for developing specific scenarios in the context of a building assessment if modules are not declared (MND).

End of life (C3-C4)

Name	Value	Unit
Collected as mixed construction waste	18.6	kg
Recycling (Steel)	10.5	kg
Landfilling	8.1	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Name	Value	Unit
Net steel scrap volume	-0,9	kg
Net stainless steel scrap volume	1,34	kg

The net steel scrap volume is -0,9 kg, resulting from an input steel scrap of 9,79 kg and an EoL steel scrap volume of 8,84 kg, under consideration of 5% recycling loss.
The net stainless steel scrap volume is 1,34 kg, resulting from an input stainless steel scrap of 0,25 kg and an EoL stainless steel scrap volume of 1,66 kg, under consideration of 5% recycling loss.
The collection rate is assumed to be 100%, the loss of recycling 5%.

5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN 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	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-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	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: HIT Iso-Element, 1m

Parameter	Unit	A1-A3	C3	C4	D
Global warming potential	[kg CO_2-Eq.]	3.04E+1	0.00E+0	1.31E-1	-7.43E+0
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	1.23E-9	0.00E+0	1.45E-12	-5.31E-11
Acidification potential of land and water	[kg SO_2-Eq.]	1.39E-1	0.00E+0	7.83E-4	-6.35E-2
Eutrophication potential	[kg $(PO_4)^{3-}$-Eq.]	1.04E-2	0.00E+0	1.07E-4	-2.58E-3
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	9.48E-3	0.00E+0	7.53E-5	-2.96E-3
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	2.22E-3	0.00E+0	4.51E-8	-2.50E-4
Abiotic depletion potential for fossil resources	[MJ]	3.66E+2	0.00E+0	1.70E+0	-8.77E+1

RESULTS OF THE LCA - RESOURCE USE: HIT Iso-Element, 1m

Parameter	Unit	A1-A3	C3	C4	D
Renewable primary energy as energy carrier	[MJ]	8.52E+1	0.00E+0	2.00E-1	-9.51E+0
Renewable primary energy resources as material utilization	[MJ]	2.01E+1	0.00E+0	0.00E+0	0.00E+0
Total use of renewable primary energy resources	[MJ]	1.05E+2	0.00E+0	2.00E-1	-9.51E+0
Non-renewable primary energy as energy carrier	[MJ]	3.26E+2	0.00E+0	1.76E+0	-8.85E+1
Non-renewable primary energy as material utilization	[MJ]	7.82E+1	0.00E+0	0.00E+0	0.00E+0
Total use of non-renewable primary energy resources	[MJ]	4.04E+2	0.00E+0	1.76E+0	-8.85E+1
Use of secondary material	[kg]	1.34E+1	0.00E+0	0.00E+0	0.00E+0
Use of renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of non-renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of net fresh water	[m^3]	1.43E-1	0.00E+0	3.59E-4	-3.74E-2

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: HIT Iso-Element, 1m

Parameter	Unit	A1-A3	C3	C4	D
Hazardous waste disposed	[kg]	1.55E-6	0.00E+0	4.02E-8	-2.21E-7
Non-hazardous waste disposed	[kg]	7.57E+0	0.00E+0	8.15E+0	-4.94E+0
Radioactive waste disposed	[kg]	1.52E-2	0.00E+0	2.46E-5	-2.98E-4
Components for re-use	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	[kg]	0.00E+0	1.05E+1	0.00E+0	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0

6. LCA: Interpretation

Product stage:

The impact category **GWP** (Global warming potential) in the product stage is dominated by steel and stainless steel, which constitute the tension bars. The PVC of the casing box and the polypropylene of the end caps are also contributing to this impact category. The ozone depletion potential is dominated by PVC and polypropylene, some influence arises from steel, stainless steel and the mineral wool. The impact category **AP** (Acidification potential) is dominated by stainless steel, with a significant contribution. All other pre-products show minor influence.

The **EP** (Eutrophication potential)is dominated by stainless steel, which has a relevant influence. The other pre-products are fairly important. The impact category **POCP** (Photochemical ozone creation potential)is also dominated by stainless steel, with a significant influence. Steel and PVC / polypropylene have some influence.

ADPE (Abiotic depletion potential for non fossil resourcess) is dominated by the production of stainless steel. All other pre-products are negligible. The impact category **ADPF** (Abiotic depletion potential for fossil resources)is dominated by stainless steel, PVC, polypropylene and steel. These have relevant or some influence. The renewable primary energy demand is dominated by the packaging (wooden pallet). PVC and polypropylene have a relevant influence, stainless steel and steel show some influence. The non-renewable primary energy demand is dominated by stainless steel and steel, as well as PVC and polypropylene.

7. Requisite evidence

No evidence required.

8. References

DIN EN ISO 50001
Energy management systems - Requirements with guidance for use 2011-12

EN 13501-2
Fire classification of construction products and building elements
Part 2: Classification using data from fire resistance tests, excluding ventilation services
DIN EN 13501-2: 2010-02
2010

ETA 13/0546
European Technical Approval
Halfen Insulated Connection - HIT-HP MV, HIT-SP MV, HIT-HP ZV, and HIT-SP ZV
Load bearing thermal insulation elements for thermal break of reinforced concrete members
OIB - Austrian Institute for Building Technology
Dated: 29.06.2013

EWC
European Waste code according to European Waste Catalogue
Directive 2008/98/EC
European Parliament and of the Council
2014

IAS
International Accreditation Service
Subsidiary of the International Code Council
Brea / California / USA

ICC-ES ESR 3799
Evaluation Report 3799
HALFEN Insulated Connections (HIT)
International Code Council - Evaluation Service
September 2016

ISO 9001
DIN EN ISO 9001
Quality management systems
2015

ISO 15686
Building and constructed assets - servie life planning
2014

ITB
Instytut Techniki Budowlanej (Building Research Institute)
Warsaw / Poland

KIWA
Kiwa Nederland B.V.
Rijswijk / Netherlands

MPA NRW
Materialprüfungsamt Nordrhein-Westfalen
Dortmund / Germany

Z-15.7-293
National Technical Approval
HALFEN Insulated Connection HIT-HP / HIT-SP with compression shear bearings according to DIN 1045-1
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Dated: 07.09.2015

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EN 15804
EN 15804:2012-04+A1 2013: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

GaBi ts Data
GaBi 7.3 dataset documentation for the software-system and databases, LBP, University of Stuttgart and thinkstep AG, Leinfelden-Echterdingen, 2016 (http://www.gabi-software.com/international/databases/gabi-data-search/)

GaBi ts Software
Software and database for life cycle Engineering, LBP, University of Stuttgart and thinkstep AG, Leinfelden-Echterdingen, 2016

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