ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	European Federation of Concrete Admixtures Associations Ltd. (EFCA)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-EFC-20150089-IAG1-EN
ECO EPD Ref. No.	ECO-00000383
Issue date	14.09.2015
Valid to	13.09.2021

Concrete admixtures – Hardening Accelerators

European Federation of Concrete Admixtures Associations Ltd. (EFCA)

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

1. General Information

European Federation of Concrete Admixtures Associations Ltd. (EFCA)

Programme holder
IBU - Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Declaration number
EPD-EFC-20150089-IAG1-EN

This Declaration is based on the Product Category Rules:
Concrete admixtures, 07.2014
(PCR tested and approved by the SVR)

Issue date
14.09.2015

Valid to
13.09.2021

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)

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(Managing Director IBU)

Concrete admixtures – hardening accelerators

Owner of the Declaration
European Federation of Concrete Admixtures Associations Ltd. (EFCA)
Radius House, 51 Clarendon Road, Watford,
Herts, WD17 1HP United Kingdom

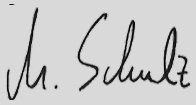
Declared product / Declared unit
1 kg of hardening accelerator, density: 1 - 1.6 kg/l

Scope:
This validated Declaration entitles EFCA to bear the symbol of the Institut Bauen und Umwelt e.V. It exclusively applies for the product groups referred to for plants operated in Belgium, France, Germany, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, Turkey and the United Kingdom by companies that are members of EFCA National Associations in these countries and for a period of five years from the date of issue. It involves a Model EPD where the product displaying the highest environmental impact in a group was selected for calculating the Life Cycle Assessment. Please refer to the EFCA website www.efca.info for a list of National Associations.

The application of this EPD is only possible for member companies of EFCA's member associations and only for specific formulations with a total score below the declared maximum score for a product group according to the associated guidance document.
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.

Verification

The CEN Norm /EN 15804/ serves as the core PCR
Independent verification of the declaration according to /ISO 14025/
☐ internally ☒ externally



Matthias Schulz
(Independent verifier appointed by SVR)

2. Product

2.1 Product description
Admixtures are liquid or powdery agents that are introduced in small amounts (< 5% by mass of the cement content) to concrete while it is being mixed and that enhance the properties of the fresh and/or hardened concrete.
Hardening accelerators are admixtures which accelerate the initial strength, with or without an influence on the setting time.
The results of the Life Cycle Assessment provided in this declaration have been selected from the product with the highest environmental impact (worst-case scenario).

2.2 Application
Concrete admixtures are used as constituent materials for the production of concrete, mortar and grout (unreinforced concrete, reinforced and prestressed concrete, site-mixed and ready-mixed concrete, precast concrete). Their application should be in line with the manufacturer's technical documents and Declaration of Performance.

2.3 Technical Data
Hardening accelerators must comply with the general requirements of /EN 934-1:2008/ and the additional requirements of /EN 934-2:2009+A1:2012/.
The corresponding requirements in line with /EN 934-1:2008/ and /EN 934-2:2009+A1:2012/ must be maintained.

Constructional data

Name	Value	Unit
Density /ISO 758/	1 - 1.6	g/ml
Solids content /EN 480-8/	-[1]	M.-%
pH value /ISO 4316/	-[1]	- $\log_{10}(a_{H+})$
Chloride content /EN 480-10/	Maximum value to be declared by the manufacturer	M.-%
Alkali content /EN 480-12/	Maximum value to be declared by the manufacturer	M.-%
Corrosion behavior /EN 934-1/, /EN 480-14/	-[2]	µ A/cm²
SiO2 content /EN 192-2/	-[3]	M.-%
Air content of fresh concrete /EN 12350-7/	Test mix ≤ 2% by volume above the control mix unless stated otherwise by the manufacturer	Vol.-%
Compressive strength /EN 12390-3/	At 20 °C and 24 h: Test mix ≥ 120% of control mix At 20 °C and 28 days: Test mix ≥ 90% of control mix At 5 °C and 48 h: Test mix ≥ 130% of control mix	N/mm²
Water reduction /EN 12350-2/, /EN 12350-5/ Plasticizer	-	mm
Increasing / maintaining of consistence /EN 12350-2/, /EN 12350-5/ Superplasticizer	-	mm
Setting time /EN 480-2/ Accelerator/Retarder	-	min
Air void Characteristics in hardened concrete /EN 480-11/ Air entrainer	-	mm
Capillary water absorption /EN 480-5/ Densifier	-	g/mm²

[1] Value will be made available to user on request
[2] No corrosion behaviour test is required for admixtures which only contain active substances in the list of approved substances to /EN 934-1/, Annex A.1 and in the list of declared substances to /EN 934-1/, Annex A.2.
[3] Maximum value must only be indicated when SiO_2 percentage by mass > 5%
 Details not relevant for this type of admixture

2.4 Application rules

For products placed on the market in the European Economic Area (EEA) the Construction Product Regulation (Regulation (EU) No 305/2011) applies /CPR/. Outside of the EEA, the corresponding national regulation applies. Admixture products placed on the market under the CPR require a Declaration of Performance and CE marking taking consideration of /EN 934-2:2009+A1:2012/.
For the application and use of the products the respective national provisions apply.

2.5 Delivery status

Hardening accelerators are usually supplied in liquid, paste or powder form in containers made of steel or plastic.
Typical container sizes are canisters containing approx. 25 kg, drums with approx. 200 kg or Intermediate Bulk Containers (IBC) with 1000 kg. The containers are shipped on wooden pallets.
For larger applications, loose deliveries in tank trucks with a capacity in excess of 1 tonne are also used.

2.6 Base materials / Ancillary materials

The main raw materials used for hardening accelerators are aluminium sulphate, formates, fluorides, aluminates, amorphous aluminium hydroxide, carbonates, silicates and ethanolamines. These raw materials are used on their own or in mixtures, in powder form or in aqueous solutions or as dispersions or suspensions. Apart from the raw materials referred to above, nitrates, nitrites and thiocyanates are also used.
Active substance concentration lies between 10 and 100% by mass. The typical dosage volumes for use in concrete are between 1 and 3% by mass, in terms of the cement weight.
The products covered by this EPD typically contain the following proportions by mass of constituent materials and auxiliaries referred to:

Aluminium sulphate*:	max. 70%
Formates*:	max. 15%
Aluminates*:	max. 50%
Amorphous aluminium hydroxides*:	max. 20%
Citrates*:	max. 50%
Silicates*:	max. 2%
Sulphates*:	max. 10%
Ethanolamines*:	max. 10%
Nitrates*:	max. 20%
Org. acids*:	max. 10%
Thiocyanates*:	max. 25%
Additives:	max. 5%
Water:	approx. 30-90%

**Solid content*
These volumes are average values and the composition of products complying with the EPD can deviate from these concentration levels in individual *cases.*
Note: For companies to declare their products within the scope of this EPD it is not sufficient to simply comply with the product composition shown above. The application of this EPD is only possible for member companies of EFCA's member associations and only for specific formulations with a total score below the declared maximum score for a product group according to the associated guidance document.
Small volumes (< 0.5% by mass) of biocides with functional chemical groups for example isothiazolinones or dioxahexane are used as preservatives in concrete admixtures during storage. More detailed information is available in the respective manufacturer's documentation (e.g. product data sheets, safety data sheets).
Unless indicated on the safety data sheet, concrete admixtures do not contain any substances in concentrations of more than 0.1% which are included in the list of Substances of Very High Concern (SVHC) for inclusion in Annex XIV of the REACH regulation.
No flame retardants are used in concrete admixtures.

2.7 Manufacture

Concrete admixtures are usually manufactured by mixing ingredients together in batch mode and filling

containers for dispatch. The process follows quality standards outlined in /EN 934-6:2001+A1:2005/.

2.8 Environment and health during manufacturing

As a general rule, no environmental or health protection measures other than those specified by law are necessary.

2.9 Product processing/Installation

During concrete manufacture, concrete admixtures are usually added along with the mixing water or included in premixed concrete.
Health and safety measures (eye protection, hand protection, possibly respiratory equipment and body protection) are to be taken and consistently adhered to in accordance with the information on the safety data sheet and conditions on site.

2.10 Packaging

Reusable containers are, where practicable taken back by the manufacturer and redirected into the production circuit. Empty plastic or steel containers which can no longer be used are recyclable.
Wooden reusable pallets are, where practicable taken back by the manufacturer or building material trader who returns them to the building product manufacturer redirecting them into the production process.

2.11 Condition of use

During the use phase, concrete admixtures are firmly bound into the cement matrix in hardened concrete. Concrete admixtures make an essential contribution towards optimising the physical and chemical properties of concrete enhancing its performance, durability, economic value and sustainability.

2.12 Environment and health during use

During the use phase, concrete admixtures are firmly bound into the cement matrix in hardened concrete. No relevant risks are known for water, air and soil if the products are used as designated.

2.13 Reference service life

Not relevant as this declaration relates to a preliminary product.

2.14 Extraordinary effects

Fire
Not relevant as this declaration relates to a preliminary product.

Water
Not relevant as this declaration relates to a preliminary product.

Mechanical destruction
Not relevant as this declaration relates to a preliminary product.

2.15 Re-use phase

Not relevant as this declaration relates to a preliminary product.

2.16 Disposal

Empty, dried containers are directed to the recycling process where practicable.
Residue must be directed to proper waste disposal taking consideration of local guidelines.

2.17 Further information

More information is available in the manufacturers' product or safety data sheets on the manufacturers' Web sites or on request.
An electronic version of this declaration is available at www.efca.info and www.bau-umwelt.com

3. LCA: Calculation rules

3.1 Declared Unit

This EPD refers to the declared unit of 1 kg concrete admixture with a density of 1-1.6 kg/l in accordance with the IBU PCR 07.2014 Part B for concrete admixtures. The results of the Life Cycle Assessment provided in this declaration have been selected from the product with the highest environmental impact (worst-case scenario).
Depending on the application, a corresponding conversion factor such as the density to convert volumetric use to mass must be taken into consideration.

Declared unit

Name	Value	Unit
Declared unit	1	kg
Gross density	1000 - 1600	kg/m^3
Conversion factor to 1 kg	-	-

3.2 System boundary

Modules A1, A2 and A3 are taken into consideration in the LCA:
- A1 Production of preliminary products
- A2 Transport to the plant
- A3 Production incl. provision of energy, production of packaging as well as auxiliaries and consumables and waste treatment

The Declaration is therefore “cradle-to-gate”.

3.3 Estimates and assumptions

For this EPD formulation and production data defined by EFCA were considered. Production waste was assumed to be disposed of to landfill without credits as a worst case.
An average of plastic containers and wooden pallets was considered in the LCA.

3.4 Cut-off criteria

All raw materials submitted for the formulations and production data were taken into consideration.
The manufacture of machinery, plant and other infrastructure required for production of the products under review was not taken into consideration in the LCA.
Transport of packaging materials is also excluded.

3.5 Background data

Data from the GaBi 6 data base was used as background data.

3.6 Data quality

Representative products were applied for this EPD and the product in the group displaying the highest environmental impact was selected for calculating the LCA results. The data sets are no more than 4 years old.
Production data and packaging are based on details provided by the manufacturer. The formulation used for evaluation refers to a specific product.
The data quality of the background data is considered to be good.

3.7 Period under review

Representative formulations were compiled by EFCA in 2011.

3.8 Allocation

No allocations were applied for production.

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.

4. LCA: Scenarios and additional technical information

In accordance with the IBU PCR 07.2014 Part A, no scenarios are indicated as only Modules A1-A3 are declared.

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	MNR	MNR	MNR	MND	MND	MND	MND	MND	MND	MND

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 kg hardening accelerator

Parameter	Unit	A1-A3
Global warming potential	[kg CO_2-Eq.]	2.28E+0
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	1.74E-10
Acidification potential of land and water	[kg SO_2-Eq.]	6.60E-3
Eutrophication potential	[kg $(PO_4)^{3-}$-Eq.]	1.54E-3
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	4.84E-4
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	7.11E-6
Abiotic depletion potential for fossil resources	[MJ]	3.07E+1

RESULTS OF THE LCA - RESOURCE USE: 1 kg hardening accelerator

Parameter	Unit	A1-A3
Renewable primary energy as energy carrier	[MJ]	8.25E+0
Renewable primary energy resources as material utilization	[MJ]	2.60E-1
Total use of renewable primary energy resources	[MJ]	8.51E+0
Non-renewable primary energy as energy carrier	[MJ]	3.30E+1
Non-renewable primary energy as material utilization	[MJ]	1.16E+0
Total use of non-renewable primary energy resources	[MJ]	3.42E+1
Use of secondary material	[kg]	0.00E+0
Use of renewable secondary fuels	[MJ]	0.00E+0
Use of non-renewable secondary fuels	[MJ]	0.00E+0
Use of net fresh water	[m^3]	4.47E-2

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 kg hardening accelerator

Parameter	Unit	A1-A3
Hazardous waste disposed	[kg]	1.32E-5
Non-hazardous waste disposed	[kg]	9.79E-1
Radioactive waste disposed	[kg]	1.42E-3
Components for re-use	[kg]	0.00E+0
Materials for recycling	[kg]	0.00E+0
Materials for energy recovery	[kg]	0.00E+0
Exported electrical energy	[MJ]	0.00E+0
Exported thermal energy	[MJ]	0.00E+0

6. LCA: Interpretation

When considering upstream production and transport of pre-products as well as manufacturing of the concrete admixture (modules A1-A3), the main driver of impacts in all categories is production of pre-products (module A1).
European electricity grid mix is a very important contributor to ozone depletion potential (**ODP**) and also has some influence on radioactive waste. The European electricity grid mix also has a minor influence on e.g. acidification potential (**AP**) and photochemical ozone creation potential (**POCP**). Generally, treatment of production waste has negligible influence on the final results for this product.

7. Requisite evidence

As this involves a declaration of preliminary products, special tests and evidence within the framework of drawing up this Model Environmental Product Declaration have not been carried out or provided.

8. References

Institut Bauen und Umwelt
Institut Bauen und Umwelt e.V., Berlin(pub.): Generation of Environmental Product Declarations (EPDs);
www.ibu-epd.de

ISO 14025
DIN EN ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

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

CPR
Construction Production Regulation (EU) No 305/2011 of the European parliament and of the council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

EN ISO 9001:2008
Quality management systems – Requirements (ISO 9001:2008)

GaBi 6 software & documentation
Data base for Life Cycle Engineering LBP, University of Stuttgart and thinkstep AG, documentation of GaBi 6 data sets http://documentation.gabi-software.com/, 2014

EN 196-2:2013
Test methods for cement – Part 2: Chemical analysis of cement

EN 206:2013
Concrete – Part 1: Specification, performance, production and conformity

EN 480-1:2014
Admixtures for concrete, mortar and grout – Test methods – Part 1: Reference concrete and reference mortar for testing

EN 480-2:2006
Admixtures for concrete, mortar and grout – Test methods – Part 2: Determination of setting time

EN 480-4:2005
Admixtures for concrete, mortar and grout – Test methods – Part 4: Determination of bleeding of concrete

EN 480-5:2005
Admixtures for concrete, mortar and grout – Test methods – Part 5: Determination of capillary absorption

EN 480-6:2005
Admixtures for concrete, mortar and grout – Test methods – Part 6: Infra red analysis

EN 480-8:2012
Admixtures for concrete, mortar and grout – Test methods – Part 8: Determination of the conventional dry material content

EN 480-10:2009
Admixtures for concrete, mortar and grout – Test methods – Part 10: Determination of water-soluble chloride content

EN 480-11:2005
Admixtures for concrete, mortar and grout – Test methods - Part 11: Determination of air void characteristics in hardened concrete

EN 480-12:2005
Admixtures for concrete, mortar and grout – Test methods – Part 12: Determination of the alkali content of admixtures

EN 480-14:2006
Admixtures for concrete, mortar and grout – Test methods – Part 14: Determination of the effect on corrosion susceptibility of reinforcing steel by potentiostatic electro-chemical test

EN 934-1:2008
Admixtures for concrete, mortar and grout – Part 1: Common aspects

EN 934-2:2009+A1:2012
Admixtures for concrete, mortar and grout – Part 2: Concrete admixtures – Definitions, requirements, conformity, marking and labelling

EN 934-5:2007
Admixtures for concrete, mortar and grout – Part 5: Admixtures for sprayed concrete – Definitions, requirements, conformity, marking and labelling

EN 934-6:2001+A1:2005
Admixtures for concrete, mortar and grout – Part 6: Sampling, conformity control and evaluation of conformity

EN 12350-2:2009
Testing fresh concrete – Part 2: Slump test

EN 12390-3:2009
Testing hardened concrete – Part 3: Compressive strength of test specimens

EN 12350-5:2009
Testing fresh concrete – Part 5: Flow table test

EN 12350-7:2009
Testing fresh concrete – Part 7: Air content – Pressure methods

EN 14487-1:2005
Sprayed concrete – Part 1: Definitions, specifications and conformity

EWC/AVV waste code
Directive governing introduction of the European Waste Catalogue
http://www.ngs-mbh.de/zs/eak.html

ISO 758:1976
Liquid chemical products for industrial purposes; Determination of density at 20 °C

ISO 4316:1977
Surface active agents; Determination of the pH value of aqueous solutions; Potentiometric method

PCR Part B
Product Category Rules for Construction Products, Part B: Requirements on the EPD for concrete admixtures, 2014-07

PCR Part A
Product Category Rules for Building-Related Products and Services, Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project report, Version 1.2, Institut Bauen und Umwelt e.V., 2013-04

REACH Directive
European Parliament and Council: Directive on registering, evaluating, approving and restricting chemical substances, 2006-12

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