BRITISH STANDARD

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1504-7:2006

Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity —

Part 7: Reinforcement corrosion protection

The European Standard EN 1504-7:2006 has the status of a British Standard

ICS 91.080.40

BSI
British Standards

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 1504-7:2006.

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A list of organizations represented on B/517/8 can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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Produits et systèmes pour la protection et la réparation des structures en béton - Définitions, exigences, maîtrise de la qualité et évaluation de la conformité - Partie 7: Protection contre la corrosion des armatures

Produkte und Systeme für den Schutz und die Instandsetzung von Betontragwerken - Definitionen, Anforderungen, Qualitätsüberwachung und Beurteilung der Konformität - Teil 7: Korrosionsschutz der Bewehrung

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Foreword

This document (EN 1504-7:2006) has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2007, and conflicting national standards shall be withdrawn at the latest by December 2008.

It has been developed by sub-committee 8 "Protection and repairs of concrete structures" (Secretariat AFNOR).

This Part of EN 1504 does not supersede any other European Standard.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EU Construction Products Directive (89/106/EC).

For the relationship with the EU Directive, see informative Annex ZA, which is an integral part of this document.

This Part of EN 1504 includes an informative Annex A, dealing with minimum frequency of testing for factory production control.

This Part of EN 1504 is one of the parts of this standard on products and systems for the repair and protection of concrete structures. The other parts are listed below:

EN 1504-1, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 1: Definitions.*

EN 1504-2, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 2: Surface protection systems for concrete.*

EN 1504-3, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 3: Structural and non-structural repair.*

EN 1504-4, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 4: Structural bonding.*

EN 1504-5, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 5: Concrete injection.*

prEN 1504-6[1], *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 6: Anchoring of reinforcing steel bar.*

EN 1504-8, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 8: Quality control and evaluation of conformity.*

[1] This document is in preparation.

ENV 1504-9[2)], *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 9: General principles for the use of products and systems.*

EN 1504-10, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 10: Site application of products and systems and quality control of the works*.

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2) ENV 1504-9 will have to be modified when adopted as EN according to finalisation of this European Standard.

1 Scope

This Part of EN 1504 specifies requirements for the identification and the performance (including durability aspects) of products and systems for active and barrier coatings for protection of existing uncoated steel reinforcement and embedded steel in concrete structures under repair.

This standard does not cover products for corrosion protection of pre-stressing steels and stainless steels.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1015-4, *Methods of test for mortar for masonry — Part 4: Determination of consistence of fresh mortar (by plunger penetration)*

EN 1504-1:2005, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 1: Definitions*

EN 1504-8:2004, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 8: Quality control and evaluation of conformity*

ENV 1504-9:1997, *Products and systems for the protection and repair of concrete structures — Definitions, Requirements, Quality control and evaluation of conformity — Part 9: General principles for the use of products and systems*

EN 1767, *Products and systems for the protection and repair of concrete structures — Test methods — Infrared analysis*

EN 1877-1, *Products and systems for the protection and repair of concrete structures — Test methods — Reactive functions related to epoxy resins — Part 1: Determination of epoxy equivalent*

EN 1877-2, *Products and systems for the protection and repair of concrete structures — Test methods — Reactive functions related to epoxy resins — Part 2: Determination of amine functions using the total basicity number*

EN 12614, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of glass transition temperatures of polymers*

EN 13062, *Products and systems for the protection and repair of concrete structure — Test method — Determination of thixotropy of products for protection of reinforcement*

EN 15183 [3)] *Products and systems for the protection and repair of concrete structures — Test methods — Corrosion protection test*

EN 15184 [3)] *Products and systems for the protection and repair of concrete structures — Test methods — Shear adhesion of coated steel to concrete (pull-out test)*

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[3] This document is in preparation.

EN ISO 868, *Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness) (ISO 868:2003)*

EN ISO 2811-1, *Paints and varnishes — Determination of density — Part 1: Pyknometer method (ISO 2811-1:1997)*

EN ISO 2811-2, *Paints and varnishes — Determination of density — Part 2: Immersed body (plummet) method (ISO 2811-2:1997)*

EN ISO 3219, *Plastics — Polymers/resins in the liquid state or as emulsions or dispersions — Determination of viscosity using a rotational viscometer with defined shear rate (ISO 3219:1993)*

EN ISO 3251, *Paints, varnishes and plastics — Determination of non-volatile-matter content (ISO 3251:2003)*

EN ISO 9514, *Paints and varnishes - Determination of the pot life of multicomponent coating systems — Preparation and conditioning of samples and guidelines for testing (ISO 9514:2005)*

EN ISO 11358, *Plastics — Thermogravimetry (TG) of polymers — General principles (ISO 11358:1997)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1504-1:2005, EN 1504-8:2004, ENV 1504-9:1997 and the following apply.

3.1
active coatings
coatings, which contain electrochemically active pigments, which may function as inhibitors or which may provide localised cathodic protection

NOTE Cement is considered to be an active pigment due to its alkalinity.

3.2
barrier coatings
coatings which isolate the reinforcement from pore water in the surrounding cementitious matrix

4 Performance characteristics for intended uses

Table 1 lists the performance characteristics of reinforcement corrosion protection products and systems, which are required for “all intended uses” or “for certain intended uses” according to the “principles” and “methods” defined in ENV 1504-9. Performance characteristics which are required for “all intended uses” are marked ■. All other performance characteristics which are marked □ may be required for “certain intended uses”.

Performance requirements are given in 5.2.

Table 1 — Performance characteristics for all and certain intended uses

Test methods defined in	Performance characteristics	Intended uses	
		Active coating 11.1[a]	Barrier coating 11.2[a]
EN 15183	Corrosion protection	■	■
EN 12614	Glass transition temperature	□	□
EN 15184	Shear adhesion (coated steel to concrete)	□	□
[a] Method in accordance with ENV 1504-9.			

5 Requirements

5.1 Identification requirements

The manufacturer shall undertake selected representative initial identification tests for the product or system as specified in Table 2. These tests may be used to confirm the composition of the product at any time. Acceptable tolerances are given in Table 2. The manufacturer shall hold the test records.

Table 2 — Identification test methods and requirements

Property	Test method	Requirement/tolerance
Components (liquid)		
Colour/general appearance	Visual	Uniform and similar to the description provided by the manufacturer
Density — Pyknometer method — Immersed body method	 EN ISO 2811-1 EN ISO 2811-2	 ± 3 % ± 3 %
Infrared spectrum	EN 1767	Confirmed by visual comparison
Epoxy equivalent[a]	EN 1877-1	± 5 %
Amine functions[a]	EN 1877-2	± 6 %
Volatile and non-volatile matter	EN ISO 3251	± 5 %
Thermogravimetric analysis	EN ISO 11358	Confirmed by comparison and ± 5 % with respect to loss of mass at 600°C
Viscosity	EN ISO 3219	± 20 %
Mixture		
Pot-life[a]	EN ISO 9514	± 15 %
Consistency	EN 1015-4	± 15 %
Thixotropy	EN 13062	± 15 %
Hardness (shore D after 7 days)	EN ISO 868	± 3 units
[a] Only for epoxy (EP).		

5.2 Performance requirements

The manufacturer shall undertake initial performance tests on corrosion protection products in accordance with Table 3 and the product shall comply with the requirements.

Table 3 — Performance requirements

Test methods defined in	Performance characteristics	Requirements
EN 15183	Corrosion protection	The test is considered to have been passed if the coated zones of the steels are free of corrosion and if rust creep at the ground plate edge < 1 mm.
EN 12614	Glass transition temperature	At least 10 K above maximum service temperature
EN 15184	Shear adhesion (coated steel to concrete)	Assessment criterion is the bond stress at a displacement of Δ = 0,1 mm. The test is considered to have been passed if the bond stress determined with the coated bars is in each case at least 80 % of the reference bond stress determined for the uncoated bars.

5.3 Release of dangerous substances

Corrosion protection products shall not release substances dangerous to health, hygiene and the environment. See Annex B (informative).

6 Sampling

General requirements for sampling are set out in EN 1504-8.

7 Evaluation of conformity

7.1 General

General requirements for procedures for evaluation of conformity are set out in EN 1504-8.

7.2 Initial type testing

General requirements for initial type testing are set out in EN 1504-8.

7.3 Factory production control

The manufacturer shall operate a factory production control (FPC) system to ensure that production continues to meet the identification and performance requirements set out in 5.1 and 5.2 of this Part of EN 1504.

For FPC, the manufacturer can select representative identification or performance tests or may select other test methods. Such other FPC test methods shall be correlated to the initial identification and performance test methods to ensure conformity of the product to the requirements of this standard. Such correlation shall be clearly documented in the FPC system.

The FPC shall be undertaken in accordance with EN 1504-8.

Guidance on the frequency of identification and performance tests for FPC is given in Annex A (informative). Frequencies may need to be increased during initial production or following an incident of non-conformity.

Any deviation from this guidance shall be justified by documented evidence which demonstrates equivalence.

7.4 Assessment, surveillance and certification of factory production control

Provisions for the assessment, surveillance and certification of FPC are given in EN 1504-8:2004, Annex A (informative).

8 Marking and labelling

Requirements for marking and labelling are set out in Clause 6 of EN 1504-8:2004.

NOTE For CE marking and labelling ZA.3 applies.

Annex A
(informative)

Minimum frequency of testing for factory production control

Identification/performance characteristic	Polymer resins
Liquid components	
Colour/general appearance	A
Density	A
Volatile and non-volatile matter	B
Viscosity	A
Mixture	
Pot-life[a]	B
Consistency	A
Thixotropy	B
Frequency: A every batch (as defined in EN 1504-8). B every 10 batches, every two weeks, or every 1 000 t, whichever is the sooner (that is, whichever requires the most frequent testing).	
[a] Only for epoxy resin.	

Annex B
(informative)

Release of dangerous substances

In the absence of specific requirements relating to substances dangerous to health, hygiene and the environment in this European Standard, Annex ZA applies.

Annex ZA
(informative)

Clauses of this European Standard addressing the provisions of the EU Construction Products Directive

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under mandate M/128 “Products related to concrete, mortar and grout” given to CEN by the European Commission and the European Free Trade Association.

The clauses of this and other European Standards shown in this annex meet the requirements of this Mandate given under the EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of the reinforcement corrosion protection products and systems covered by this annex for the intended uses indicated herein: reference shall be made to the information accompanying the CE marking.

WARNING — Other requirements and other EU Directives, not affecting the fitness for intended uses, can be applicable to the construction product falling within the scope of this European Standard.

NOTE 1 In addition to any specific clauses relating to dangerous substances contained in this standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

NOTE 2 An informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (accessed through http://europa.eu.int/comm/enterprise/construction/internal/dangsub/dangmain.htm).

This annex establishes the conditions for the CE marking of the reinforcement corrosion protection products and systems intended for the uses indicated in Table ZA.1 and shows the relevant clauses applicable.

This annex has the same scope as Clause 1 of this standard and is defined by Table ZA.1.

Table ZA.1 — Scope and relevant clauses

Construction products: Corrosion protection products for repair and protection of concrete **Intended use: In buildings and civil engineering works**			
Essential characteristics	Requirement clauses in this standard	Level(s) or class(es)	Notes: (expression of results)
Pull out strength of coated steel in concrete (bond adhesion of coating to steel and alkali resistance)	5.2 Performance requirements Table 3 Shear adhesion	None	pass/fail criteria
Diffusion Resistance	5.2 Performance requirements Table 3 Corrosion protection	None	pass/fail criteria
Corrosion protection and workability			pass/fail criteria
Durability			pass/fail criteria
Glass transition temperature (where relevant)	5.2 Performance requirements Table 3 Glass transition temperature	None	Complying with the threshold value in K
Release of dangerous substances	5.3 Dangerous Substances	None	See NOTE 1 in ZA.1 and note after Figure ZA.1. Manufacturer's declaration

NOTE Corrosion protection products are applied to reinforcement and then a mortar applied over them. In these cases they are totally enclosed by the repair mortar. That is the reason why reaction to fire has not to be tested.

The requirements on a certain essential characteristic is not of application in those Member States where there are no regulations for such characteristic. In this case, manufacturers willing to place their products in the market of these Member States are not obliged to determine nor to declare the performance of their products with regard to this characteristic and the option "no performance determined" in the information accompanying the CE mark may be used.

ZA.2 Attestation of conformity

ZA.2.1 System(s) of attestation of conformity

The system of attestation of conformity for the products indicated in Table ZA.1, in accordance with the decision of the Commission 1999/469/EC as amended by 01/596/EC, as given for this product family in Annex III of the Mandate M/128 "Products related to concrete, mortar and grout", is shown in Table ZA.2 for the indicated intended use:

Table ZA.2 — System of attestation of conformity

Product(s)	Intended use(s)	Level(s) or class(es)	Attestation of conformity system(s)
Concrete protection and repair products	For uses with low performance requirements in buildings and civil engineering works	-	4
	For uses in buildings and civil engineering works	-	2+
System 2+ : See CPD Annex III.2 (ii) (First possibility, including certification of the factory production control by an approved body on the basis of initial inspection of factory and of factory production control as well as of continuous surveillance, assessment and approval of factory production control. System 4: See CPD Annex III.2(ii), Third possibility			

The attestation of conformity of the structural bonding products in Table ZA.1 shall be based on the evaluation of conformity procedures indicated in Table(s) ZA.3 a) and ZA.3 b) resulting from the application of those clauses of this or other European standards indicated therein.

Table ZA.3 a) — Assignment of evaluation of conformity tasks for corrosion protection products for any intended uses other than those with low performance (system 2+)

Tasks			Content of the task	Evaluation of conformity clauses to apply
Tasks for the manufacturer	Factory production control (FPC)		Parameters related to all characteristics in Table ZA.1	EN 1504-8:2004,5.5 EN 1504-7:2006, Clause 7
	Initial type testing by the manufacturer		All relevant characteristics of Table ZA.1	EN 1504-8:2004,5.2 EN 1504-7:2006,7.2
	Further testing of samples taken at the factory		All relevant characteristics of Table ZA.1	EN 1504-8:2004, 5.5
Tasks for the notified body	Certification of FPC on the basis of	Initial inspection of factory and of FPC	Parameters related to all relevant characteristics of Table ZA.1	EN 1504-8:2004, 5.5 EN 1504-7:2006, 7.2
		Continuous surveillance, assessments and approval of FPC	Parameters related to all relevant characteristics of Table ZA.1,	EN 1504-8:2004, Clause 7 EN 1504-7:2006, 7.4

Table ZA.3 b) — Assignment of evaluation of conformity tasks for injection products for uses with low performance (system 4)

Tasks		Content of the task	Evaluation of conformity clauses to apply
Tasks for the manufacture	Factory production control (FPC)	Parameters related to all relevant characteristics of Table ZA.1	EN 1504-8:2004, 5.5 and EN 1504-7:2006, Clause 7
	Initial type testing by the manufacturer	All relevant characteristics of Table ZA.1	EN 1504-8:2004, 5.2

ZA.2.2 EC Certificate and Declaration of conformity

Corrosion protection products under system 2+: When compliance with the conditions of this annex is achieved, and once the notified body has drawn up the certificate mentioned below, the manufacturer or his agent established in the EEA shall prepare and retain a declaration of conformity, which entitles the manufacturer to affix the CE marking. This declaration shall include:

— name and address of the manufacturer, or his authorised representative established in the EEA, and the place of production;

NOTE 1 The manufacturer may also be the person responsible for placing the product onto the EEA market, if he takes responsibility for CE marking.

— description of the product (type, identification, use, ...), and a copy of the information accompanying the CE marking;

NOTE 2 Where some of the information required for the Declaration is already given in the CE marking information, it does not need to be repeated.

— provisions to which the product conforms (i.e. Annex ZA of this EN);

— particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions, etc);

— the number of the accompanying factory production control certificate;

— name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or his authorised representative.

The declaration shall be accompanied by a factory production control certificate, drawn up by the notified body, which shall contain, in addition to the information above, the following:

— name and address of the notified body;

— the number of the factory production control certificate;

— conditions and period of validity of the certificate, where applicable;

— name of, and position held by, the person empowered to sign the certificate.

Corrosion protection products under system 4: When compliance with the annex is achieved, the manufacturer or his agent established in the EEA shall prepare and retain a declaration of conformity, (EC Declaration of conformity) which entitles the manufacturer to affix the CE marking. This declaration shall include:

— name and address of the manufacturer, or his authorised representative established in the EEA, and the place of production;

— description of the product (type, identification, use, ...), and a copy of the information accompanying the CE marking;

— provisions to which the product conforms (i.e. Annex ZA of this EN);

— particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions, etc.);

— name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or of his authorised representative.

The above mentioned declaration and certificate shall be presented in the official language or languages of the Member State in which the product is to be used.

ZA.3 CE marking and labelling

The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE marking symbol to affix shall be in accordance with Directive 93/68/EEC and shall be shown on the repair product (or when not possible it may be on the accompanying label, the packaging or on the accompanying commercial documents e.g. a delivery note). The following information shall accompany the CE marking symbol:

— identification number of the certification body (only for products under systems 2+);

— name or identifying mark and registered address of the producer;

— the last two digits of the year in which the marking is affixed;

— number of factory production control certificate (if relevant);

— reference to this European Standard;

— description of the product: generic name, material, dimensions, … and intended use;

— information on those relevant essential characteristics listed in Table ZA.1 which are to be declared presented as :

  — declared values and, where relevant, level or class (including “pass” for pass/fail requirements, where necessary) to declare for each essential characteristic as indicated in "Notes" in Table ZA.1;

  — “no performance determined” for characteristics where this is relevant;

  — as an alternative, a standard designation which shows some or all of the relevant characteristics (where the designation covers only some characteristics, it will need to be supplemented with declared values for other characteristics as above.

The “No performance determined” (NPD) option may not be used where the characteristic is subject to a threshold level. Otherwise, the NPD option may be used when and where the characteristic, for a given intended use, is not subject to regulatory requirements in the Member State of destination.

Figure ZA.1 gives an example of the information accompanying the CE-marking.

CE 01234	*CE conformity marking, consisting of the "CE"-symbol given in Directive 93/68/EEC.* *Identification number of the certification body (where relevant)*
Any Co Ltd, PO Box 21, B-1050 **06** 01234-CPD-00234	*Name or identifying mark and registered address of the producer* *Last two digits of the year in which the marking was affixed* *Certificate number (where relevant)*
EN 1504-7 Reinforcement corrosion protection product for uses other than low performance requirements Shear adhesion — Pass Corrosion protection — Pass Glass transition temperature: — $\geq$45 °C Dangerous Substances — Comply with 5.3	*No. of European Standard* *Description of product* *and* *information on regulated characteristics*

Figure ZA.1 — CE marking information

The product should be accompanied, when and where required and in the appropriate form, by documentation listing any legislation on dangerous substances for which compliance is claimed, together with any information required by that legislation.

NOTE 1 European legislation without national derogations need not be mentioned.

NOTE 2 Affixing the CE marking symbol means, if a product is subject to more than one directive that it complies with all applicable directives.

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