

SVENSK STANDARD

SS-EN 14038-1:2016

Fastställt/Approved: 2016-04-06
Publicerad/Published: 2016-04-18
Utgåva/Edition: 1
Språk/Language: engelska/English
ICS: 91.080.40

Elektrokemisk realkalisering och kloridutdrivning för armerad betong – Del 1: Realkalisering

Electrochemical realkalization and chloride extraction treatments for reinforced concrete – Part 1: Realkalization

This preview is downloaded from www.sis.se. Buy the entire standard via <https://www.sis.se/std-8019780>

Standarder får världen att fungera

SIS (Swedish Standards Institute) är en fristående ideell förening med medlemmar från både privat och offentlig sektor. Vi är en del av det europeiska och globala nätverk som utarbetar internationella standarder. Standarder är dokumenterad kunskap utvecklad av framstående aktörer inom industri, näringsliv och samhälle och befrämjar handel över gränser, bidrar till att processer och produkter blir säkrare samt effektiviserar din verksamhet.

Delta och påverka

Som medlem i SIS har du möjlighet att påverka framtida standarder inom ditt område på nationell, europeisk och global nivå. Du får samtidigt tillgång till tidig information om utvecklingen inom din bransch.

Ta del av det färdiga arbetet

Vi erbjuder våra kunder allt som rör standarder och deras tillämpning. Hos oss kan du köpa alla publikationer du behöver – allt från enskilda standarder, tekniska rapporter och standardpaket till handböcker och onlinetjänster. Genom vår webbtjänst e-nav får du tillgång till ett lättnavigerat bibliotek där alla standarder som är aktuella för ditt företag finns tillgängliga. Standarder och handböcker är källor till kunskap. Vi säljer dem.

Utveckla din kompetens och lyckas bättre i ditt arbete

Hos SIS kan du gå öppna eller företagsinterna utbildningar kring innehåll och tillämpning av standarder. Genom vår närhet till den internationella utvecklingen och ISO får du rätt kunskap i rätt tid, direkt från källan. Med vår kunskap om standarders möjligheter hjälper vi våra kunder att skapa verklig nytta och lönsamhet i sina verksamheter.

Vill du veta mer om SIS eller hur standarder kan effektivisera din verksamhet är du välkommen in på www.sis.se eller ta kontakt med oss på tel 08-555 523 00.



Standards make the world go round

SIS (Swedish Standards Institute) is an independent non-profit organisation with members from both the private and public sectors. We are part of the European and global network that draws up international standards. Standards consist of documented knowledge developed by prominent actors within the industry, business world and society. They promote cross-border trade, they help to make processes and products safer and they streamline your organisation.

Take part and have influence

As a member of SIS you will have the possibility to participate in standardization activities on national, European and global level. The membership in SIS will give you the opportunity to influence future standards and gain access to early stage information about developments within your field.

Get to know the finished work

We offer our customers everything in connection with standards and their application. You can purchase all the publications you need from us - everything from individual standards, technical reports and standard packages through to manuals and online services. Our web service e-nav gives you access to an easy-to-navigate library where all standards that are relevant to your company are available. Standards and manuals are sources of knowledge. We sell them.

Increase understanding and improve perception

With SIS you can undergo either shared or in-house training in the content and application of standards. Thanks to our proximity to international development and ISO you receive the right knowledge at the right time, direct from the source. With our knowledge about the potential of standards, we assist our customers in creating tangible benefit and profitability in their organisations.

If you want to know more about SIS, or how standards can streamline your organisation, please visit www.sis.se or contact us on phone +46 (0)8-555 523 00



Europastandarden EN 14038-1:2016 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 14038-1:2016.

Denna standard ersätter SIS-CEN/TS 14038-1:2005, utgåva 1.

The European Standard EN 14038-1:2016 has the status of a Swedish Standard. This document contains the official English version of EN 14038-1:2016.

This standard supersedes the Swedish Standard SIS-CEN/TS 14038-1:2005, edition 1.

© Copyright/Upphovsrätten till denna produkt tillhör SIS, Swedish Standards Institute, Stockholm, Sverige. Användningen av denna produkt regleras av slutanvändarlicensen som återfinns i denna produkt, se standardens sista sidor.

© Copyright SIS, Swedish Standards Institute, Stockholm, Sweden. All rights reserved. The use of this product is governed by the end-user licence for this product. You will find the licence in the end of this document.

Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna upplysningar om svensk och utländsk standard.

Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about Swedish and foreign standards.

Denna standard är framtagen av kommittén för Korrosion i jord inklusive katodiskt skydd, SIS/TK 146/AG 2658.

Har du synpunkter på innehållet i den här standarden, vill du delta i ett kommande revideringsarbete eller vara med och ta fram andra standarder inom området? Gå in på www.sis.se - där hittar du mer information.

EUROPEAN STANDARD

EN 14038-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2016

ICS 91.080.40

Supersedes CEN/TS 14038-1:2004

English Version

Electrochemical realkalization and chloride extraction treatments for reinforced concrete - Part 1: Realkalization

Réalcalinisation électrochimique et traitements
d'extraction des chlorures applicables au béton armé -
Partie 1: Réalcalinisation

Elektrochemische Realkalisierung und
Chloridextraktionsbehandlungen für Stahlbeton - Teil
1: Realkalisierung

This European Standard was approved by CEN on 15 January 2016.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

European foreword.....	4
Introduction	5
1 Scope.....	6
2 Normative references.....	6
3 Terms and definitions	6
4 General.....	7
4.1 Quality management systems.....	7
4.2 Personnel	7
5 Principle	7
6 Assessment and repair of the structure.....	8
6.1 General.....	8
6.2 Review of records.....	8
6.3 Inspection	8
6.4 Carbonation depth measurement.....	8
6.4.1 General.....	8
6.4.2 Determination of chloride content.....	8
6.5 Concrete cover thickness and reinforcement location measurements.....	9
6.6 Alkali aggregate reaction	9
6.7 Reinforcement continuity and size.....	9
6.8 Repair	9
6.8.1 General.....	9
6.8.2 Concrete removal	9
6.8.3 Reinforcement preparation	9
7 Materials and apparatus.....	10
7.1 Calibration of instrumentation	10
7.2 Anode system.....	10
7.2.1 General.....	10
7.2.2 Anode.....	10
7.2.3 Anode zone	10
7.2.4 Alkaline electrolyte solution.....	10
7.3 Electric cables.....	10
7.4 Power supply	11
8 Installation procedures	11
8.1 Electrical continuity of reinforcement.....	11
8.2 Performance monitoring.....	11
8.3 Installation of anode system	11
8.4 Protection of electrolyte solution	12
8.5 Electrical installation.....	12
8.6 Preliminary testing and documentation	12
9 Commissioning, operation and termination of treatment.....	12
9.1 Visual inspection	12

9.2	Energizing and adjustment of current output.....	12
9.3	Routine inspection and maintenance.....	12
9.4	Realkalization process monitoring.....	13
9.5	Termination of treatment.....	13
10	Final report.....	13
11	Post-treatment coating and monitoring.....	14
	Bibliography	15

European foreword

This document (EN 14038-1:2016) has been prepared by Technical Committee CEN/TC 219 “Cathodic protection”, the secretariat of which is held by BSI.

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 September 2016, and conflicting national standards shall be withdrawn at the latest by September 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes CEN/TS 14038-1:2004.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

The purpose of realkalization is to provide long-term corrosion protection of steel reinforcement in concrete, which has become carbonated.

There are other electrochemical procedures, which can be used to provide corrosion protection of steel in concrete structures. These include cathodic protection and chloride extraction. There are a European Standard for cathodic protection of steel in concrete (EN ISO 12696) and a Technical Specification for electrochemical chloride extraction (CEN/TS 14038-2).

The execution of the provisions of this standard should be carried out by appropriately qualified and competent people, for whose use it has been prepared.

1 Scope

This European Standard specifies a procedure for carrying out impressed current electrochemical realkalization (ER) of carbonated reinforced concrete in existing structures. It is applicable to atmospherically exposed parts of structures with ordinary reinforcement embedded in concrete.

This European Standard does not apply to concrete containing prestressing steel which can suffer hydrogen embrittlement during realkalization, or to concrete containing epoxy-coated or galvanized reinforcement, or if chloride contamination is contributing to reinforcement corrosion.

NOTE In case of post-tensioned prestressing concrete, the endangered tendon strands may be shielded by the tendon ducts from unwanted and/ or exceeded polarization into the cathodic range and respective water reduction.

2 Normative references

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

EN 1504-9, *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 14629, *Products and systems for the protection and repair of concrete structures - Test methods - Determination of chloride content in hardened concrete*

EN 14630, *Products and systems for the protection and repair of concrete structures - Test methods - Determination of carbonation depth in hardened concrete by the phenolphthalein method*

CEN/TS 14038-2, *Electrochemical re-alkalization and chloride extraction treatments for reinforced concrete - Part 2: Chloride extraction*

EN ISO 8044, *Corrosion of metals and alloys - Basic terms and definitions (ISO 8044)*

EN ISO 12696:2012, *Cathodic protection of steel in concrete (ISO 12696:2012)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 8044 and the following apply.

3.1 realkalization

electrochemical treatment for restoring alkalinity to concrete which surrounds reinforcing bars with a high pH pore solution corresponding to sound and non-carbonated concrete

4 General

4.1 Quality management systems

The design, the installation, the energising, the commissioning, the long-term operation of all elements of electrochemical realkalization systems for steel in concrete shall be fully documented.

NOTE EN ISO 9000 constitutes a suitable Quality Management Systems Standard which can be utilized.

Each element of the work shall be undertaken in accordance with a fully documented quality plan.

Each stage of the design shall be checked and the checking shall be documented.

Each stage of the installation, energising, commissioning and operation shall be the subject of appropriate visual, mechanical and/or electrical testing and all testing shall be documented.

All test instrumentation shall have valid calibration certificates traceable to national or European Standards of calibration.

The documentation shall constitute part of the permanent records for the works.

4.2 Personnel

Each aspect of the ER system design, installation, testing of the installation, energising, commissioning and long-term operational control shall be under the supervision of personnel with appropriate qualification, training, expertise and experience in the particular element of the work for which they are responsible.

NOTE ER of steel in concrete is a specialist multidiscipline activity. Expertise is required in the fields of electrochemistry, concrete technology, civil and/or structural engineering and cathodic protection engineering.

Personnel who undertake the design, supervision of installation, commissioning, supervision of operation, measurements, monitoring and supervision of maintenance of cathodic protection systems shall have the appropriate level of competence for the tasks undertaken. EN 15257 constitutes a suitable method of assessing Competence of Cathodic Protection Personnel which may be utilized for ER as well as cathodic protection.

Competence of Personnel to the appropriate level for tasks undertaken should be demonstrated by certification in accordance with EN 15257 and suitable experience with ER or by another equivalent prequalification procedure.

5 Principle

Realkalization of reinforced concrete is performed by applying an electric field for a limited period of time between the steel reinforcement embedded in the concrete and a temporary anode surrounded by an alkaline electrolyte solution containing carbonate or hydroxyl ions temporarily placed on the concrete surface.

NOTE 1 The carbonated area treated by realkalization lies beneath the anode and around the first layer of reinforcement.

NOTE 2 Details of the principle underlying this process are given in the European Federation of Corrosion report [1] and in LCP report [7].

Electrolyte solutions of sodium, potassium and lithium may be used.