

# 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

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

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

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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.

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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.

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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

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

## 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.