

# **Products and systems for the protection and repair of concrete structures — Test methods — Determination of adhesion steel-to-steel for characterization of structural bonding agents**

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British Standard

ICS 91.080.40

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## Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 11 and a back cover.

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**EUROPEAN STANDARD**

**EN 12188**

**NORME EUROPÉENNE**

**EUROPÄISCHE NORM**

**May 1999**

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**English version**

**Products and systems for the protection and repair of concrete structures —  
Test methods — Determination of adhesion steel-to-steel for characterization of  
structural bonding agents**

Produits et systèmes pour la protection et la réparation  
des structures en béton — Méthodes d'essais —  
Détermination de l'adhérence acier sur acier pour la  
caractérisation des produits de collage structural

Produkte und Systeme für den Schutz und die  
Instandsetzung von Betontragwerken —  
Prüfverfahren — Bestimmung der Klebewirkung an  
Stahl für die Charakterisierung der Eigenschaften  
von Klebstoffen für konstruktive Zwecke

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**CEN**

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

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## **Foreword**

This European Standard has been prepared by Technical Committee CEN/TC 104, Concrete (performance, production, placing and compliance criteria), 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of an identical text or by endorsement, at the latest by November 1999, and conflicting national standards shall be withdrawn at the latest by November 1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

NOTE This European Standard should be read in conjunction with EN 1504-1 and prEN 1504-4.

## 1 Scope

This European Standard describes a method for the characterization of structural polymer based bonding agents for use in applications such as steel plate structural bonding for the strengthening of concrete structures. It involves the determination of the slant shear strength and the pull-off strength.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 24624, *Paints and varnishes — Pull-off test* (ISO 4624:1978).

EN 1542, *Products and systems for the protection and repair of concrete structures — Test methods — Pull-off test*.

## 3 Principle

The slant shear strength shall be determined using steel prism halves glued together with the bonding agent.

The bond planes shall be inclined at various angles to the longitudinal axis of the prisms.

The complete prisms shall be tested in axial compression.

NOTE Stresses which occur in a joint made with a structural bonding agent can be resolved into normal stress,  $s$ . The object of the test methods described in this standard is to determine the relationship between  $s$  and  $t$  which meets the criterion  $f(s, t) = 0$ , i.e. to determine the shape of the failure envelope which represents failure of the adhesive agent in the bonded joint.

For the purposes of this standard, the failure envelope is defined by three straight lines on a plot of normal stress against shear stress at failure as shown in Figure 1. Conventionally,  $s$  values are plotted as abscissae and  $t$  values as ordinates.

Failure of a bonding agent is governed by its strength parameters: coefficient of friction, cohesion and resistance to separation:

- the coefficient of friction  $m$  is the numerical value of the slope of the inclined lines in Figure 1;
- the cohesion  $c$  is the shear capacity at  $s = 0$ ;
- the resistance to separation  $f_t$  is the pull-off strength e.g. the tensile capacity at  $t = 0^\circ$ .

As these values are constant for a particular material, the shape of the failure envelope can be used to characterize a material.

The failure envelope can be explained as follows:

- sliding failure occurs when numerical values of shear stress  $|t|$  meet the inequality  $|t| \geq c - ms$  ;
- separation failure occurs when the tensile stress exceeds the pull-off strength:  $s \geq f_t$ .

As noted above and as can be seen from Figure 1, the failure envelope is formed by three straight lines. Stress fields within the area containing the origin do not cause failure.

As an option it is possible to extend the test to include a slant shear test in tension to fully complete the failure envelope in Figure 1.