SLOVENSKI STANDARD
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Geotehnično preiskovanje in preskušanje - Preskušanje geotehničnih konstrukcij - 6. del: Obremenilni preskus zemeljskih žebljev in skalnih vijakov (ISO/DIS 22477-6:2025)

Geotechnical investigation and testing - Testing of geotechnical structures - Part 6: Load testing of soil nails and rock bolts (ISO/DIS 22477-6:2025)

Geotechnische Erkundung und Untersuchung - Prüfung von geotechnischen Bauwerken und Bauwerksteilen - Teil 6: Belastungsprüfung von Bodennägeln und Felsankern (ISO/DIS 22477-6:2025)

Reconnaissance et essais géotechniques - Essais de structures géotechniques - Partie 6: Essai de chargement de clous et de boulons (ISO/DIS 22477-6:2025)

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93.020	Zemeljska dela. Izkopavanja. Gradnja temeljev. Dela pod zemljo	Earthworks. Excavations. Foundation construction. Underground works

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ISO/DIS 22477-6

Geotechnical investigation and testing — Testing of geotechnical structures —

Part 6: Load testing of soil nails and rock bolts

Reconnaissance et essais géotechniques – Essais de structures géotechniques —

Partie 6: Essai de chargement de clous et de boulons

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 182, *Geotechnics*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 341, *Geotechnical Investigation and Testing*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 22477 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Geotechnical investigation and testing — Testing of geotechnical structures —

Part 6: Load testing of soil nails and rock bolts

1 Scope

This document establishes the specifications for the execution of tension tests to be carried out on soil nails and rock bolts.

NOTE 1 Soils nails and rock bolts are referred as elements in the scope of this document.

NOTE 2 This document covers but is not limited to grouted soil nails and rock bolts.

NOTE 3 This document does not provide specification for the number of tests, the type of test, the Test Method, the value of the proof load and the limiting criteria. These aspects reside in EN 1997-3 or its national annex for CEN countries and in similar national application documents for ISO countries.

This document provides specifications for three types of tension tests: investigation tests, suitability tests and acceptance tests.

Two methods of testing are recognised by this document. Test Method A involves step-loaded maintained load tension tests. Test Method B involves constant displacement rate tension tests.

This document provides specifications for the experimental devices, the measurement apparatus, the test procedures, the definition and the presentation of the test results and the content of records, aiming at:

a) measuring the pull-out resistance of a soil nail or a rock bolt,

NOTE 4 A loading test performed using this standard provides the pulled-out resistance along the bonded length, that might differ from the pull-out resistance considered in design.

b) checking that a soil nail or rock bolt behaves as designed.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system*

EN 1990, *Eurocode: Basis of structural design*

EN 1997, *Eurocode 7: Geotechnical design*

3 Terms, definitions and symbols

For the purposes of this document, the terms and definitions given in EN 1990 and EN 1997 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 Terms, definitions

3.1.1
applied load
P
tension load applied to the tendon head during the test

3.1.2
proof load
P_p
maximum load to which a test element is to be subjected

3.1.3
measured pull-out resistance
$R_{t,m}$
measured value of the pull-out resistance at the element-ground interface

3.1.4
tendon
soil nail or rock bolt reinforcing element (steel, fiber glass, etc.)

3.1.5
test element
element on which a test is performed

3.1.6
sacrificial element
test element installed in the same way as production elements, but not forming part of the completed reinforced ground structure

3.1.7
production element
test element which forms part of the completed reinforced ground structure

3.1.8
investigation test
load test to establish the geotechnical ultimate load resistance of a soil nail or rock bolt at the interface between the supporting element and the ground and to determine the behaviour of the element in the working load range

3.1.9
suitability test
load test to confirm that a particular soil nail or rock bolt design will be adequate in particular ground conditions

3.1.10
acceptance test
load test to confirm that an individual soil nail or rock bolt conforms with its acceptance criteria

3.2 Symbols

A_t	Minimum cross section of the tendon, including the connecting parts
E_t	elastic modulus of the tendon material
L_b	bonded length of the test element
L_{db}	debonded length of the test element
L_e	external length of the tendon
P	applied load
P_a	datum load
P_c	critical creep load
P'_c	intermediate parameter to derive the critical creep load P_c
P_p	proof load
$R_{t,m}$	measured pull-out resistance
f_{tk} (= f_{uk})	tensile strength
$f_{t0,2k}$	yield strength at 0,2 % strain
s	axial displacement of tendon head
s_1	axial displacement of tendon head at time t_1, for creep rate determination
s_2	axial displacement of tendon head at time t_2, for creep rate determination
t	time
t_{min}	minimum load step duration for Test Method A
t_1	time at the beginning of the interval used for creep rate determination
t_2	time at the end of the interval used for creep rate determination
α	creep rate (defined in Annex A)
α_A	limiting criterion for creep rate for Test Method A

4 Equipment

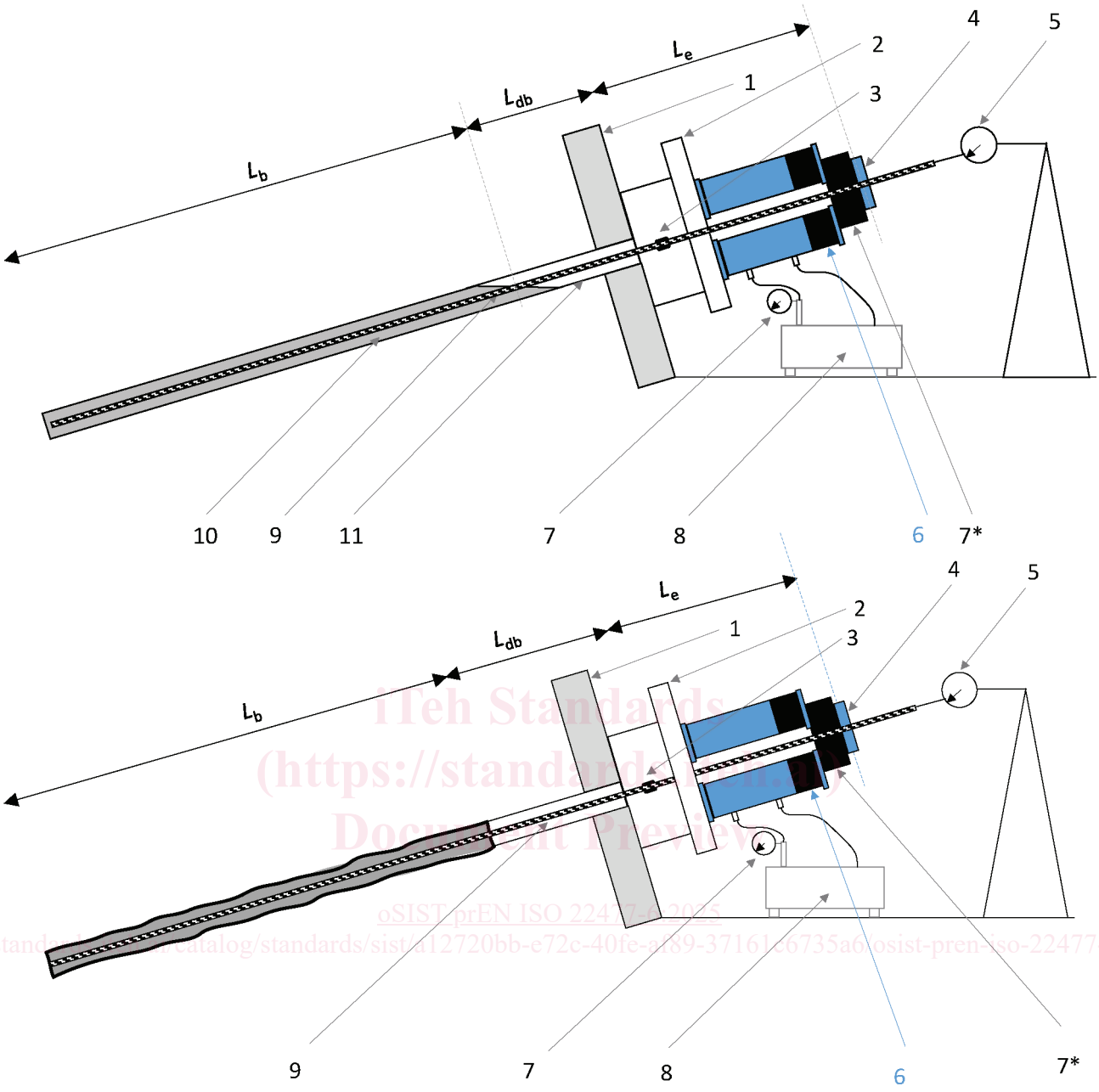
4.1 Test set-up

The equipment comprises: one jack used as a loading device, displacement and load monitoring devices, a reaction system, associated locking nuts, tendon extension, etc.

An example of test set-up is given in Figure 1.

The test set-up shall take into account the aim of the test, the ground conditions and the expected displacement of the test element.

Where the facing system or the load test reaction system can influence the test result, then the test element should be de-bonded over the zone of influence.



Key

1 facing
2 reaction structure
3 extension of test element
4 locking nut and plate at top of jack
5 displacement monitoring of tendon end
6 jack
7 pressure gauge
7* load cell
8 hydraulic system (pump)