



'ROCK ANCHORS'
**Climbing and
Mountaineering Equipment**

**UIAA
123**

Foreword

This UIAA Standard is only published in the English language version, which is the master text. For any validations in translation, the UIAA Safety Commission should be contacted via the UIAA Office in Bern, Switzerland.

UIAA Standards are the only 'globally recognized' standards for mountaineering equipment. In order to prevent multiplicity, the UIAA collaborates with its partner in standardization CEN; and bases UIAA standard 123 on the European Standard EN 959:2018. The EN Standards in turn are based on the original UIAA Standards, the first of their kind in the world. Additionally, the UIAA publishes pictorials for each of the standards in a user-friendly way. This UIAA Standard 123 also has additional requirements over and above those in EN 959:2018.

Owing to copyright restrictions, this UIAA Standard does not state the full requirements of EN 959:2018 to which it refers. Hence it is necessary to obtain a copy of EN 959:2018. The procedure for purchasing the EN Standards is included at the end of the text of this standard. The UIAA Standards are reviewed at intervals to see whether they meet the latest technical requirements and revised if necessary.

IMPORTANT DISCLAIMER This standard has been updated based on our best knowledge on Atmospherically Induced Stress Corrosion Cracking, i.e. with respect mainly to chloride resistance. In some locations, the environment can be such as it is not the appropriate procedure and where additional tests shall be performed, e.g. under high sulphate content.

The UIAA invites manufacturers of mountaineering and climbing equipment worldwide to become members of the UIAA Safety Commission as Safety Label Holders. Members can participate in discussions on standard requirements, test methods and revisions thereof (see the "General Regulations for the UIAA Safety Label").

A [complete list of UIAA Standards](#) for mountaineering and climbing equipment can be found on the UIAA website.

This standard has been created and updated based on scientific research coordinated and funded by UIAA, as a service to all mountaineers.

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Copyright and Version Management

This document was first published in English. The English master text is decisive in any conflict of interpretation. For any validations in translation the UIAA should be contacted via the UIAA Office in Bern, Switzerland.

UIAA declarations, standards, documents and guidelines are subject to review. Updates are recorded in the version details stated on the front page of this document.

UIAA documents are generally produced by the responsible Commission and are subject to approval in accordance with the UIAA Articles of Association.

All UIAA documents can be found on the relevant subject area on the UIAA website.

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The Version number refers to the latest revision, e.g. V4 is the fourth change to the document. The last update is the date of this latest version.

1 General Remarks on the UIAA Trademark and UIAA Label

- 1.1 The UIAA Trademark (see section 7.1) is copyright protected internationally. The UIAA Label is only given to items of mountaineering and climbing equipment upon approval of prospective label holder's application from the UIAA.
- 1.2 The procedure to be followed by a manufacturer, when applying for a UIAA Label, is laid down in the "General Regulations for the UIAA Safety Label Certification".

2 Acronyms

ASTM:	American Society for Testing and Materials
CEN:	European Committee for Standardization
EN:	European Standard
MSST:	Modified Salt Spray Test
NSST:	Neutral Salt Spray Test
SCC:	Stress Corrosion Cracking
TCE:	Torque Controlled Expansion

3 Requirements for Rock anchors

- 3.1 The UIAA Label can only be granted for bolts which meet all the requirements of EN 959:2018, with the following exception:
 - 3.1.1 No EN number required.
 - 3.1.2 No printed leaflet if all information is provided in accordance with 6.1.
- 3.2 For the award of the UIAA Label, the following additional safety requirements shall be met:

Design:

 - 3.2.1 The embedded part of any rock anchor held in place by a chemical bonding agent shall have deformations or roughness, intended to prevent extraction and/or rotation.
 - 3.2.2 When tested in accordance with 4.2 all types of rock anchors shall have an axial load bearing capacity of 20 kN.
 - 3.2.3 When tested in accordance with 4.3 all types of rock anchors held in place by a chemical bonding agent shall withstand a torque of 150 (+5/0) N-m for 60 (0/+5) seconds without rotating in the hole.

Corrosion resistance:

 - 3.2.4 The entire anchor, including all constitutive parts (e.g. nut, washer, bolt), shall be tested according to Table 2, depending on the corrosion class that is claimed.
 - 3.2.5 The "UIAA" letters and the corrosion class as per Table 1 shall be marked on each anchor in a visible area after installation: e.g. "UIAA SCC".

Table 1: Rock anchors class and environment characteristics

Class	Signification	Characteristics of environment	Important considerations
SCC	High SCC and General Corrosion Resistance	SCC in evidence, for example (but not only): high chloride concentration, temperature above 30°C, humidity between 20% to 70%, sea salt and/or other chloride salts, and/or acidic environment	Although SCC is commonly associated with seaside cliffs, it can also occur inland and in other locations, e.g. indoor swimming pools. See Table 3 for more information about contributing factors to SCC.
GC	General Corrosion Resistance	No SCC in evidence and none suspected some corrosion agents	
LC	Low Corrosion Resistance	No SCC in evidence and none suspected	Rock anchors in indoor gyms and in proximity to industrial areas, swimming pools, or the sea may require use of class SCC anchor.

4 Test Methods

- 4.1 Check by visual examination that the requirements according to 3.2.1 and 3.2.5 are met.
- 4.2 Carry out an axial load test on a rock anchor of any type in accordance with the test methods in the relevant parts of EN 959:2018.
- 4.3 Carry out a torque test on a rock anchor of any type by applying a torque of 150 N-m to the eye of the rock anchor.
- 4.4 Five entire anchors shall be tested according to 4.5.
- 4.5 Depending on the corrosion class that is claimed, the entire anchors shall be tested according to Table 2.

Table 2: Rock anchors required tests

Class	Stress Corrosion Cracking (SCC) resistance	General corrosion resistance	Required general corrosion test	Required SCC test
SCC	High to immune	High	4-week MSST mod. ASTM B117 [2]	1-week ASTM G36 [3]
GC	Unspecified	High	4-week MSST mod. ASTM B117 [2]	None
LC	Unspecified	Medium	4-week NSST ASTM B117 [1]	None

[1] Neutral Salt Spray test (NSST) according to ASTM B117;

[2] Modified salt spray test with 5% CaCl₂;

[3] ASTM G36 test with anchors installed in a way simulating service conditions, i.e. including installation stress.

4.6 Owing to copyright restrictions, this UIAA Standard does not state the full requirements of ASTM B117 - 19 and ASTM G36 - 94 (2018) to which it refers.

Hence it is necessary to obtain copies of the standards.

4.7 All safety-relevant parts of coated or painted anchors shall be scribed with a 0.5-mm scribing tool through the coating so as to expose the underlying metal before testing.

4.8 Anchors shall be inspected for presence of cracks (resulting from manufacturing process) under 50× magnification before testing.

4.9 Metallic anchors shall be degreased in acetone. Painted anchors shall be cleaned with ethanol.

NSST and MSST:

4.10 Assembled anchors shall be individually labelled, photographed and exposed in a salt spray chamber. No engraving for testing identification is allowed.

4.11 For MSST, the salt solution shall be prepared by dissolving 5 ± 1 parts by mass of calcium chloride in 95 parts of water. The pH of the salt solution shall not be modified.

4.12 Anchors shall be gently washed in clean running water at the end of the test to remove salt deposits from their surface, and then immediately dried.

4.13 Anchors shall be photographed and degree of rusting evaluated following the EN ISO 4628-3 standard. To pass the test, all anchor parts of at least four of five tested replicates shall be classified Ri 2 or better (less than 1% surface coverage with red rust). No coating or paint delamination from scribes shall be tolerated.

SCC Test:

- 4.14 Anchors shall be labelled and photographed. No engraving for testing identification is allowed.
- 4.15 Torque controlled expansion (TCE) anchors shall be installed in a way simulating service conditions, e.g. in a granite block, with the required installation torque according to the manufacturer's instruction for use. After 24 hours left for relaxation, the anchors shall be re-torqued and exposed.
- Glue-in anchors shall be exposed freely.
- 4.16 Any apparatus made of glass, titanium or other resistant material with provisions for a thermometer and water-cooled condenser can be used, provided that it has been designed to contain the stressed specimen while maintaining a constant temperature and concentration of the magnesium chloride solution by minimizing or preventing losses of condensate and water vapour during prolonged periods of test.
- 4.17 Anchors shall be gently washed in clean running water at the end of the test.
- 4.18 Anchors shall be photographed and inspected for presence of cracks under 50× magnification. To pass the test, all anchor parts of five tested replicates shall be free of cracking. No general corrosion shall be tolerated.
- In case of uncertainty, more inspection is requested, either non-destructive or destructive, e.g. pull test.

5 Demonstrating that the Requirements are met

- 5.1 The requirements of section 3.1 shall be satisfied by a test report from a UIAA-approved test laboratory.
- 5.2 The requirements of section 3.2 shall be satisfied by a test report from a UIAA-approved test laboratory.

6 Information to be supplied

- 6.1 The "information to be supplied" shall be given in Standard English and, if required, in the official language(s) of the country in which the product is made available on the market. As an alternative to a printed form, the information may be provided via an electronic or other data storage format link (e.g. a QR code) allowing the downloading of the information. The information link shall be preceded or surmounted by an icon showing an open booklet; the information link and icon may be directly printed on the product in a clearly visible and accessible place.

7 Attachment of the UIAA Label

- 7.1 For any model of mountaineering equipment, which has been awarded the UIAA Label, the UIAA Trademark (see below) or the four letters "UIAA" shall be marked clearly and indelibly on each item sold in accordance with the branding guidelines specified in the "General regulations for UIAA Safety Label".



- 7.2 The corrosion class as per Table 1 shall be marked on each anchor. The UIAA and corrosion class marking (e.g. "UIAA SCC") shall remain visible on the anchor after its installation.
- 7.3 In addition, the UIAA Trademark or the four letters "UIAA" may be included in the instructions for use and/or on a swing ticket as well as in catalogues and other publications of the manufacturer. In the last case, the illustration and/or the text must clearly apply only to the equipment which has been awarded the UIAA Label.

Annex 1 Information about Stress Corrosion Cracking of Steel Anchors

The next table is based on the best knowledge of the UIAA Safety Commission by analysis of anchor failures, in-situ and laboratory testing.

Table 3: Factors contributing to stress corrosion cracking of climbing anchors

FACTORS	MOST CRITICAL ONE	Remarks
ENVIRONMENTAL CHARACTERISTICS		
concentration of chloride	magnesium chloride, calcium chloride, sea salt	Chloride deposits containing salts with high solubility can be formed.
Temperature	NOT any cut-off/"safe" level, but above 30°C is worse	SCC could start at 20°C, a higher temperature increases the cracking speed; the temperature of a bolt in the sun can be significantly higher than the ambient air temperature.
Humidity	low relative humidity, between 20% and 70%	RH close to the deliquescence point of the chloride solution poses a significant danger of SCC. Localized RH of the anchor can be significantly different from ambient RH, e.g. when exposed to the sun.
location – coastal / wind from the sea	next to the sea up to typically 30 km from the coast	There is no clear limit; winds from the sea with significant salt concentration can travel very far inland.
washed by rain or not	not washed by rain	The absence of washing allows the chloride to concentrate locally on anchors.
rock type	Unspecified, all rock types could be affected	Some rock types can make conditions worse than others, depending on specific circumstances.
ANCHOR CHARACTERISTICS		
stresses	high tensile stress	<ul style="list-style-type: none"> – from manufacturing, due to rolling, bending, cutting, drilling, and welding – from installation, due e.g. to tightening – from plastic deformation; hard falls, hammering during installation, etc – from use, due to multiple hard falls

References

Jiří Lieberzeit, Tomáš Prošek, Alan Jarvis, Lionel Kiener, Atmospheric Stress Corrosion Cracking of Stainless Steel Rock Climbing Anchors, Part 1, CORROSION. 2019;75(10):1255-1271.

Tomáš Prošek, Jiří Lieberzeit, Alan Jarvis, Lionel Kiener, Atmospheric Stress Corrosion Cracking of Stainless Steel Rock Climbing Anchors, Part 2: Laboratory Experiments, CORROSION. 2019;75(11):1371-1382.

Annex 2 Recommendation on Anchors Installation

The installation shall be done according to the manufacturer’s instructions.

The expansion anchors shall be tightened with a torque control wrench and shall apply the torque value given by the manufacturer.

For glue-in anchors, the glue shall be chosen in accordance with the anchor manufacturer recommendations and shall be compatible with the rock type.

To avoid generating scratches and impacts on the anchor, which could be a corrosion initiator, **hammering with any metallic tool shall be avoided.**

Do not combine bolts, nuts, washers or hangers of dissimilar metals, even different stainless steels because galvanic corrosion could be initiated due to the different electrochemical potentials.

Last Updated	Remarks
December 2020	Update to include corrosion classes and associated tests, including Annex 1 and 2
Feb 2018	Update to contact information British Standards Institution (BSI)
June 2017	<p><u>5.1 The information to be supplied:</u> (in accordance with EN 959:2018) shall be given in English, or at least in the language of the country in which the product is sold.</p> <p>Has been updated with: The "information to be supplied" shall be given in standard English and, if required, in the official language(s) of the country in which the product is made available on the market. As an alternative to a printed form, the information may be provided via an electronic or other data storage format link (e.g. a QR code) allowing the downloading of the information. The information link shall be preceded or surmounted by an icon showing an open booklet; the information link and icon may be directly printed on the product in a clearly visible and accessible place. Unanimously approved Safecom Worden June 2017</p>
March 8, 2013	<u>Corrections in points 2 and 3. Regarding Material requirements, under review due to corrosion in tropical areas.</u>

*Copies of the EN Standards can be purchased from [EN website](#)