# ISO 3506-5:2022-04 (E)

## Fas teners - Mechanical properties of corrosion-resistant stainless steel fasteners - Part 5: Special fasteners (also including fasteners from nickel alloys) for hi gh temperature applications

## Contents

Page


Foreword ..... v

Introduction ..... vi

1 Scope ..... 1

2 Normative references ..... 2

3 Termsanddefinitions ..... 2

4 Symbols ..... 4

5 Designation system for fasteners made from stainless steels and nickel alloys ..... 5

6 Materials and manufacture ..... 5
6.1 Chemical composition ..... 5
6.2 Heat treatment for fasteners ..... 7
6.3 Finish ..... 8
6.4 Design of bolt/nut assemblies ..... 9
6.5 Service temperatures for fasteners ..... 10

7 Mechanical and physical properties ..... 10
7.1 Mechanical properties of bolts, screws and studs ..... 10
7.2 Mechanical properties of nuts ..... 14

8 Applicability of test methods and inspection ..... 15
8.1 Applicability of test methods ..... 15
8.2 Manufacturer's inspection ..... 16
8.3 Supplier's inspection ..... 16
8.4 Purchaser's inspection ..... 16
8.5 Delivery of test results ..... 16

9 Test methods at ambient temperature ..... 17
9.1 Tensile test for bolts, screws and studs at ambient temperature ..... 17
9.1.1 General ..... 17
9.1.2 Applicability ..... 17
9.1.3 Apparatus and testing device ..... 17
9.1.4 General test procedure ..... 18
9.1.5 Test procedure for the simultaneous determination of Rmf, Rpf, and A ..... 19
9.1.6 Reference test procedure for the determination of stress at 0,2 % non- proportional elongation, Rpf ..... 20
9.1.7 Alternative test procedure for the determination of elongation, A ..... 21
9.1.8 Test results and requirements for tensile strength, Rmf ..... 22
9.1.9 Test results and requirements for stress at 0,2 % non-proportional elongation, Rpf ..... 23
9.1.10 Test results and requirements for elongation after fracture, A ..... 23
9.2 Hardness test for bolts, screws and studs ..... 23
9.2.1 General ..... 23
9.2.2 Test procedure ..... 23
9.2.3 Test results and requirements for hardness ..... 24

9.3 Proof load test for nuts ..... 24
9.3.1 General ..... 24
9.3.2 Applicability ..... 24
9.3.3 Apparatus and testing device ..... 24
9.3.4 Test procedure ..... 25
9.3.5 Additional testing procedure for prevailing torque nuts ..... 26
9.3.6 Test results and requirements for nut proof load ..... 27
9.4 Hardness test for nuts ..... 27
9.4.1 General ..... 27
9.4.2 Test procedure ..... 27
9.4.3 Test results and requirements for nut hardness ..... 28

10 Test methods at high temperature ..... 28

10.1 High temperature tensile test for bolts, screws, studs and nuts ..... 28
10.1.1 General ..... 28
10.1.2 Test apparatus ..... 28
10.1.3 Test procedure ..... 29
10.1.4 Test report ..... 30
10.2 High temperature stress rupture test for bolts, screws, studs and nuts ..... 31
10.2.1 General ..... 31
10.2.2 Test apparatus and testing device ..... 31
10.2.3 Test procedure ..... 32
10.2.4 Test report ..... 32
10.3 Relaxation test for bolts, screws, studs and nuts ..... 33
10.3.1 General ..... 33
10.3.2 Bolted joint models ..... 33
10.3.3 Test apparatus and measuring devices ..... 34
10.3.4 Test procedure ..... 34
10.3.5 Test results ..... 35
10.3.6 Test report ..... 35
10.4 Creep test ..... 36

11 Fastener marking and labelling ..... 36
11.1 General requirements for marking ..... 36
11.2 Manufacturer's identification mark ..... 37
11.3 Marking on the fasteners ..... 37
11.3.1 Hexagon head bolts and screws and hexagon nuts ..... 37
11.3.2 Hexagon socket and hexalobular socket bolts and screws ..... 38
11.3.3 Other types of bolts, screws and nuts ..... 38
11.3.4 Studs (one-end and double-end studs) ..... 38
11.3.5 Fully threaded studs ..... 38
11.3.6 Left-hand thread marking ..... 39
11.4 Marking of the packages (labelling) ..... 39

Annex A (informative) Tempering of martensitic stainless steels ..... 40

Bibliography ..... 42