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PRODUCT QUALIFICATION
QUALIFICATION DE PRODUIT / ERZEUGNISQUALIFIKATION

CERTIFICATE NO. No DE CERTIFICAT ZERTIFIKAT NR.	PQ800 Change Request

This is to certify that the manufacturer / Ceci certifie que le fabricant / Hiermit wird bescheinigt, dass der Hersteller

COMPANY NAME : NOM DE SOCIETE : FIRMA :	Amphenol Air-LB 2 Rue Clément Ader Carignan 8110 FRANCE
PLACE OF MANUFACTURE : LIEU DE FABRICATION : HERSTELLUNGSORT :	As above

has met the requirements of EN9133 in respect of the following standards:
a satisfait les exigences de l'EN9133 en ce qui concerne les normes suivantes:
die Forderungen der EN9133 erfüllt unter Berücksichtigung der folgenden Normen:

Approved under Report No : 718-(MCR) – Amphenol-Air LB – Carignan (FR) PQ800 test **Dated:** 17 Jan 2019
Completed by ASD-CERT Auditor :

Applicable Standard Norme applicable Zutreffende Norm & Publication Date	Standard Number	Designation (or identifiers)	Products Produits Erzeugnisse

This certificate is valid until / Ce certificat est valable jusqu'au / Dieses Zertifikat ist gültig bis

01-May-2020

except if cancelled in the meantime / sauf si annulé entre-temps / sofern zwischenzeitlich nicht widerrufen

Christelle Festaud, ASD-CERT Secretary General
331-476-57011 17 January 2019

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 3752

November 2004

ICS 49.030.30

Supersedes EN 3752:2003

English version

Aerospace series - Nuts, self-locking, MJ threads, in heat resisting steel FE-PA2601 (A286), MoS_2 coated – Classification: 1 100 MPa (at ambient temperature)/425 °C – Technical specification

Série aérospatiale - Écrous, à freinage interne, à filetage MJ, en acier résistant à chaud FE-PA2601 (A286), revêtus MoS_2 – Classification : 1 100 MPa (à température ambiante)/425 °C – Spécification technique

Luft- und Raumfahrt - Muttern, selbstsichernd, MJ-Gewinde, aus hochwarmfestem Stahl FE-PA2601 (A286), MoS_2-beschichtet – Klasse: 1 100 MPa (bei Raumtemperatur)/425 °C – Technische Lieferbedingungen

This European Standard was approved by CEN on 11 September 2003.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN 3752:2004: E

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Christelle Festaud, ASD-CERT Secretary General
331-476-57011 5 January 2019

Foreword

This document (EN 3752:2004) has been prepared by the European Association of Aerospace Manufacturers - Standardization (AECMA-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of AECMA, prior to its presentation to CEN.

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 May 2005, and conflicting national standards shall be withdrawn at the latest by May 2005.

This document supersedes EN 3752:2003.

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

01-May-2020

Christelle Festaud, ASD-CERT Secretary General
331-476-57011 5 January 2019

1 Scope

This standard specifies the characteristics; qualification and acceptance requirements for self-locking nuts with MJ threads in FE-PA2601, MoS_2 coated, for aerospace applications.

Classification: 1 100 MPa [1] / 425 °C [2]

It is applicable whenever referenced.

2 Normative references

The following referenced documents are indispensable for the application 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 2859-1, *Sampling procedures for inspection by attributes – Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 3452, *Non-destructive testing – Penetrant inspection – General principles*

ISO 4288, *Geometrical Product Specifications (GPS) – Surface texture: Profile method – Rules and procedures for the assessment of surface texture*

ISO 5855-2, *Aerospace – MJ threads – Part 2: Limit dimensions for bolts and nuts*

ISO 7481, *Aerospace – Nuts, self-locking, with maximum operating temperature less than or equal to 425 °C – Test methods*

EN 2491, *Aerospace series – Molybdenum disulphide dry lubricants – Coating methods*

EN 9133, *Aerospace series – Quality management systems – Qualification procedure for aerospace standard parts* [3]

ASTM E 112-96, *Standard Test Methods for Determining Average Grain Size* [4]

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply.

3.1
batch
quantity of finished nuts, of the same type and same diameter, produced from the same material obtained from the same melt, manufactured in the course of the same production cycle, following the same manufacturing route and having undergone all the relevant heat treatments and surface treatments

01-May-2020

1) Correspond to the minimum te... which the nut is able to withstand at ambient temperature without breaking or cracking when tested with a
2) Maximum test temperature of
3) Published as AECMA Prestan
4) Published by: American Socie... ladelphia, PA 19103, USA

3.2
inspection lot
quantity of nuts from a single production batch with the same part number which completely defines the nut

3.3 Surface discontinuities

3.3.1
crack
rupture in the material which may extend in any direction and which may be intercrystalline or transcrystalline in character

3.3.2
seam
open surface defect

3.3.3
lap
surface defect caused by folding over metal fins or sharp corners and then rolling or forging them into the surface

3.3.4
inclusions
non-metallic particles originating from the material manufacturing process. These particles may be isolated or arranged in strings.

3.4
test temperature
ambient temperature unless otherwise specified

3.5
simple random sampling
the taking of *n* items from a population of *N* items in such a way that all possible combinations of *n* items have the same probability of being chosen

3.6
critical defect
a defect that, according to judgement and experience, is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the considered product, or that is likely to prevent performance of the function of a major end item

3.7
major defect
a defect other than critical, that is likely to result in a failure or to reduce materially the usability of the considered product for its intended purpose

3.8
minor defect
a defect that is not likely to reduce materially the usability of the considered product for its intended purpose, or that is a departure from established specification having little bearing on the effective use or operation of this product

3.9
sampling plan
a plan according to which one or more samples are taken in order to obtain information and possibly to reach a decision

3.10
limiting quality (LQ_{10})
in a sampling plan, the q ability of acceptance

3.11
acceptance quality limit (AQL)
a quality limit which in a sampling plan corresponds to a specified but relatively high probability of acceptance

It is the maximum per cent defective (or the maximum number of defects per hundred units) that, for purposes of sampling inspection can be considered satisfactory as a process average.

3.12
finished nut
a nut ready for use, inclusive of any possible treatments and/or surface coatings, as specified in the product standard or definition document

3.13
definition document
document specifying all the requirements for finished nuts

3.14
self-locking torque
the torque to be applied to the nut or bolt to maintain movement of rotation in relation to the associated part, the assembly being under no axial load and the nut locking system being completely engaged with the bolt (minimum protrusion of two pitches including end chamfer)

3.15
seating torque
the tightening torque to be applied to the nut or bolt to introduce or to increase the axial load in the assembly

3.16
unseating torque
the untightening torque to be applied to the nut or bolt to reduce or remove the axial load in the assembly

3.17
breakaway torque
the torque required to start unscrewing the nut or bolt with respect to the associated part, with the nut locking device still fully engaged on the bolt, but after the axial load in the assembly has been removed by unscrewing half a turn followed by a halt in rotational movement

3.18
wrench feature torque
the torque to be applied to the wrenching feature of the nut

4 Quality assurance

4.1 Qualification

EN 9133

Qualification inspections and tests (requirements, methods, numbers of nuts) are specified in Table 1. They shall be carried out on:

— each type and diameter of nut;

— 46 nuts selected from a single inspection lot by simple random sampling.

The test programme may possibly be reduced, or the qualification of a nut be granted without inspection or testing. Any such decision shall be based on the results obtained on similar types and diameters of nuts provided that the design and m

Table 2 indicates the allocation

4.2 Acceptance

4.2.1 Purpose

The purpose of acceptance inspections and tests is to check, as simply as possible, by a method representative of actual use conditions, with the uncertainty inherent to statistical sampling, that the nuts constituting the batch satisfy the requirements of this standard.

4.2.2 Conditions

Acceptance inspections and tests (requirements, methods, numbers of nuts) are specified in table 1 ; they shall be carried out on each production batch or inspection lot. Nuts from the batch or lot to be tested shall be selected by simple random sampling.

Each nut may be submitted to several inspections or tests.

If a more stringent inspection is deemed necessary, all or part of the qualification inspections and tests may be performed during the acceptance inspection and testing. In this case, the number of nuts submitted to these inspections and tests is the same as that submitted for qualification inspection and tests.

4.2.3 Responsibility

Acceptance inspections and tests shall be carried out by the manufacturer, or under his responsibility.

4.2.4 Inspection and test report

A test report showing actual numerical values shall be provided if specified in the purchase order.

5 Requirements

See Table 1.

Table 1 – Technical requirements and test methods

Clause	Characteristic	Requirement	Inspection and test method	Q/A [a]	Sample size
5.1	**Material**	In accordance with the product standard or definition document	Chemical analysis or certificate of conformity issued by the manufacturer of the semi-finished product	Q	
				A	
5.2	**Dimensions, tolerances and tolerances of form and position**	In accordance with the product standard or definition document	Standard gauging	Q	46
				A	Tables 3 and 4
5.3	**Manufacturing**				
5.3.1	**Forming**	Nuts shall be formed by a hot or cold forming process. If hot formed, the forming temperature shall not exceed 1 150 °C and they shall be air cooled or faster. The equipment shall ensure a uniform temperature throughout the production batch.	The method of forming shall be indicated.	Q	
5.3.2	**Heat treatment**	The heat treatment medium or atmosphere shall not cause any surface contamination except as permitted by 5.5.4. Any scale which will not be removed by subsequent machining shall be removed by abrasive blasting with an appropriate equipment. Solution treat at a temperature of 900 °C to 980 °C, hold at the selected temperature within ± 15 °C for between 1 h min. and 2 h max., quench in oil, or alternative medium or faster. Precipitation treatment at (720 ± 10) °C, held at temperature for 16 h ± 15 min, cooled in air or faster.	Calibration of the heat treatment equipment shall be confirmed. Visual examination Examination of the heat treatment specification	Q	

continued

Table 1 (*continued*)

Clause	Characteristic	Requirement	Inspection and test method	Q/A [a]	Sample size
5.3.3	**Bearing surface perpendicularity**	In accordance with the product standard or definition document For non-floating plate nuts having a bearing surface exceeding × 1,5 the thread nominal diameter, the perpendicularity requirement shall, unless otherwise specified by the product standard or definition document, apply only to that portion of the bearing surface of the part contained within a diameter equal to × 1,5 the thread nominal diameter.	ISO 7481	Q	46
				A	Tables 3 and 4
5.3.4	**Thread and thread deformation** (form-out-of round)	Threads in the locking region may be deformed in any manner provided that the nut meets the requirements of this standard. Any tool marks shall blend smoothly without any abrupt changes. The finished nuts shall allow the "GO" thread plug gauge to enter a minimum of one turn before engagement of the locking element for nuts having overall length of thread portion not less than × 1,2 the nominal thread diameter. After coating, a bolt with ISO 5855-2 threads shall be able to be hand threaded one turn minimum in the nut. Finished nuts having shorter threaded portion shall allow the "GO" thread plug gauge to enter a minimum of three quarters of a turn.	Standard gauging	Q	46
				A	Tables 3 and 4
5.3.5	**Surface roughness**	In accordance with the product standard or definition document	ISO 4288 Visual examination	Q	3
				A	Tables 3 and 4
5.3.6	**Surface coating**	In accordance with the product standard or definition document	EN 2491	Q	43
				A	Tables 3 and 4

continued

Table 1 (*continued*)

Clause	Characteristic	Requirement	Inspection and test method	Q/A [a]	Sample size
5.4	**Mechanical properties**				
5.4.1	**Axial load**				
5.4.1.1	**– at ambient temperature**	Finished nuts shall withstand the minimum loads specified in Table 5. After the load has been applied the nut shall not display: – any cracks; – any permanent set; – any significant reduction in self-locking torque.	ISO 7481, 100 % test	Q A	4 Table 6
5.4.1.2	**– after 425 °C baking**	Finished nuts shall withstand the minimum loads specified in Table 5. After testing, the nuts shall not display: – any cracks; – any fracture. Permanent set and resultant effects (reduction of the self-locking torque) are permissible.	ISO 7481, 100 % test Prior to testing, the nut shall be assembled on a bolt of the same material, at least two thread pitches protruding. The assembly shall be heated to (425 ± 8) °C, held at this temperature for 6 h ± 15 min and cooled to ambient temperature. Remove the nut from the bolt and proceed in accordance with ISO 7481. A new test bolt shall be used for each nut to be tested.	Q	4
5.4.2	**Wrench feature test**	All wrenchable nuts shall withstand 15 successive applications of the torque specified in Table 5 without any permanent damage to the wrench feature.	ISO 7481	Q	3
5.4.3	**Vibration test**	After the test, rotation of the nut relative to the bolt less than or equal to 360° is permissible. The nut shall not be cracked and shall not be capable of turning by hand.	ISO 7481 Cycle: 30 000 Total displacement: 11,25 mm Seating torque to be applied, see Table 5.		
5.4.3.1	**– at ambient temperature**	See 5.4.3.	See 5.4.3.	Q	5

continued

Table 1 (*continued*)

Clause	Characteristic	Requirement	Inspection and test method	Q/A [a]	Sample size
5.4.3.2	– after 425 °C baking	See 5.4.3.	The nut shall be assembled on the spacer used for self-locking torque test in ISO 7481:2000, Figure 9 and the assembly shall be heated to (425 ± 8) °C, held at this temperature for 6 h ± 15 min and cooled to ambient temperature. Then proceed in accordance with 5.4.3.	Q	5
5.4.4	Permanent set test	Measured torques of the nuts shall not exceed the maximum self-locking torque nor shall be less than the minimum breakaway torque, see Table 7.	ISO 7481	Q	3
5.4.5	Reusability test	General After testing, nut threads shall not show any indications of distortion, galling or scratches of such a depth as to prevent reassembly of the nut freely, with the fingers, up to the self-locking feature. Bolt threads shall remain serviceable and permit assembly of a new nut freely with the fingers up to the self-locking device.	Wrenchable nuts shall be turned. For non-wrenchable nuts, the bolt shall be turned. Standard wrenches shall be used where possible. The self-locking torques shall be recorded for each cycle. Test bolts shall be uncoated, heat resisting steel or NI-PH2601 or NI-PH1302.		
5.4.5.1	Self-locking torque at ambient temperature (15 cycles)	Shall conform to the minimum breakaway torque and the maximum self-locking torque, see Table 7, for each cycle.	ISO 7481 Nuts shall be seated × 15 to the torques in Table 7.	Q	10

continued

Table 1 (*continued*)

Clause	Characteristic	Requirement	Inspection and test method	Q/A [a]	Sample size
5.4.5.2	**Self-locking torque at ambient temperature after 425 °C baking** (five cycles)	Shall be measured on each installation and removal and shall not exceed the self-locking torque, nor shall be less than the minimum breakaway torque given in Table 7.	ISO 7481 The nuts to be tested shall be assembled with the test bolt and spacer and loaded to 517 MPa. Loading shall be determined by measurement of elongation of the bolt at ambient temperature, using bolts having a shank diameter equal to the thread pitch diameter. The correct loading shall be determined by using a modulus of elasticity of 203,4 GPa. The elongation shall be equal to 0,002 542 L (where L = length of spacer). In the case of use of test bolts of a different configuration, the elongation shall be calculated according to the formula specified in ISO 7481. The assembly shall be heated in a furnace to (425 ± 8) °C and held at this temperature for 6 h ± 15 min, removed from the furnace and cooled to ambient temperature. Repeat above a total of × 5.	Q	10
5.4.5.3	**Self-locking torque at ambient temperature** (three cycles)	The breakaway torque shall not be below the values in Table 7 for the first, second and third cycle. The self-locking torque shall not exceed the values in Table 7.	ISO 7481 Nuts as received shall be seated × 3 to the torques in Table 7.	A	Table 6
5.4.6	**Flareability test**	Unless otherwise specified on the product standard or definition document, the shank of shank (clinch) nuts shall be capable of being flared to a diameter equal to 120 % of maximum shank diameter without cracking.	Use a 60° included angle conical tool to flare to required diameter. Visually examine the flared shank for cracks at a magnification of × 10 to × 20.	Q A	5 Table 6

continued

Table 1 (*continued*)

Clause	Characteristic	Requirement	Inspection and test method	Q/A [a]	Sample size
5.4.7	**Push out test**	This test is applicable to gang channel nuts, floating anchor nuts, and non-floating anchor nuts except side by side, corner and side mounted types. Nuts shall withstand the loads specified in table 5 without separating from the plate or channel. Any deformation of the part measured at the thread axis shall be less than 0,8 mm and shall not prevent a corresponding bolt being installed over at least one turn.	ISO 7481	Q	5
5.4.8	**Torque out test**	This test is applicable to clip nuts. Nuts shall withstand the loads specified in Table 5 without cracking, rupture, or being deformed to a degree which will prevent normal use.	ISO 7481 This test shall be performed with no axial load on the bearing surface of the nut.	Q	5
5.4.9	**Hardness**	Nuts formed from bar or wire: 27 HRC to 41 HRC Nuts formed from sheet or strip: 27 HRC to 44 HRC	ISO 7481	Q A	5 Table 6
5.5	**Metallurgical properties**		NOTE The same test sample may be utilized for more than one test provided that none of the characteristics of the samples are altered during the examination procedure (see Table 2).		
5.5.1	**Microstructure**	Nuts shall have a predominantly recrystallized microstructure.	Test samples shall be etched in a suitable solution. Microscopic examination at a magnification of × 100	Q A	2 Table 6
5.5.2	**Grain size**	Grain size may vary according to section thickness and/or thread deformation, but shall, when compared with plate II of ASTM E112, not be coarser than four. Isolated grains not exceeding a mean diameter [b] of 0,23 mm are acceptable.	See 5.5.1.	Q A	2 Table 6

continued

Table 1 (*concluded*)

Clause	Characteristic	Requirement	Inspection and test method	Q/A [a]	Sample size
5.5.3	**Surface discontinuities** (before coating)	Nuts shall be examined for laps, seams and inclusions. See Table 8. Care shall be exercised to avoid confusing cracks with other discontinuities. Cracks are not permitted.	ISO 3452 In the event of any doubt arising as to the nature of the defects detected, inspect nut under low magnification after sectioning.	Q A	3 Tables 3 and 4
5.5.4	**Surface contamination**	On unmachined surfaces depth of oxide penetration to 0,025 mm is permissible. Machined surfaces shall be free from surface oxide.	See 5.5.1.	Q A	2 Table 6
5.6	**Product identification**	Marking in accordance with the product standard or definition document	Visual examination	Q A	46 Tables 3 and 4
5.7	**Packaging**	The nuts shall be packed in such a way as to prevent any damage or corrosion occurring in the course of handling, transportation and storage. Each basic package shall only contain nuts with the same part number and of the same batch number.	Visual examination	A	100 %
5.8	**Labelling**	Each basic package shall bear a label upon which is legibly recorded: – designation as specified by the product standard or definition document; – quantity; – batch number; – manufacturer's name and trade mark.	Visual examination	A	100 %

[a] Q : Qualification, A : Acceptance

[b] Mean diameter = the average of the major and minor axes of an individual grain

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Table 2 – Allocation of qualification testing requirements

Type of test	Defined in	Nut sample number																																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
Non-destructive																																															
Dimensions, tolerances of form and position Bearing surface perpendicularity Thread deformation	5.2 5.3.3 5.3.4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Surface roughness	5.3.5 [a]	X	X	X																																											
	5.3.6				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ties	5.5.3 [a]	X	X	X																																											
n	5.6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
perature	5.4.1.1				X	X	X	X																																							
aking	5.4.1.2								X	X	X	X																																			
	5.4.2																									X	X	X																			
perature	5.4.3.1												X	X	X	X	X																														
aking	5.4.3.2																	X	X	X	X	X																									
	5.4.4																						X	X	X																						
nbient	5.4.5.1																									X	X	X	X	X	X	X	X	X	X												
er 425 °C	5.4.5.2																																			X	X	X	X	X	X	X	X	X	X		
	5.4.6																														X	X	X	X	X												
	5.4.7																									X	X	X	X	X																	
Torque out	5.4.8																														X	X	X	X	X												
Hardness	5.4.9																														X	X	X	X	X												
Microstructure	5.5.1																																													X	X
Grain size	5.5.2																																													X	X
Surface contamination	5.5.4																																													X	X

[a] Tests to be carried out prior to coating

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Table 3 – Classification of defects

Category of defects	AQL	Characteristics
Major	0,065 %	Presence of locking element Surface discontinuities
	1,0 %	Thread size Perpendicularity of head-bearing surface Coating Product marking Shank diameter Shank length Rivet hole size Rivet hole location Surface roughness
Minor	2,5 %	Wrenching size and configuration Nut height Bearing diameter Float of nut element Burrs and sharp corners Depth of counterbore Flange thickness
	4,0 %	All other dimensions and any deviation in tolerances of form and position

Table 4 – Sampling plans for visual inspections and dimensional characteristics

Batch size	Sample size	Acceptance number (Ac) and limiting quality (LQ_{10}) in accordance with the acceptance quality limit (AQL)							
		AQL 0,065 %		AQL 1,0 %		AQL 2,5 %		AQL 4,0 %	
		Ac	LQ_{10} %	Ac	LQ_{10} %	Ac	LQ_{10} %	Ac	LQ_{10} %
≤ 50	100 %	↓	↓	↓	↓	↓	↓	↓	↓
51 to 90	13	↓	↓	0	16,2	↓	↓	1	26,8
91 to 150	20	↓	↓	↑	↑	01	18,1	2	24,5
151 to 280	32	↓	↓	↓	↓	02	15,8	3	19,7
281 to 500	50	↓	↓	1	7,56	03	12,9	5	17,8
501 to 1 200	80	↓	↓	2	6,52	05	11,3	7	14,3
1 201 to 3 200	125	↓	↓	3	5,27	07	9,24	10	12,1
3 201 to 10 000	200	0	1,14	5	4,59	10	7,60	14	9,81
10 001 to 35 000	315	↑	↑	7	3,71	14	6,33	21	8,84
35 001 to 150 000	500	↓	↓	10	3,06	21	5,60	↑	↑
150 001 to 500 000	800	1	0,485	14	2,51	↑	↑	↑	↑

↑ Use sampling plan above.
↓ Use sampling plan below.

The data given in this table are based on single sampling plans for a normal inspection, as specified in ISO 2859-1, Tables 2-A and 6-A.

Other sampling plans specified in ISO 2859-1 may be used (double or multiple sampling), but these shall be chosen in such a way as to ensu

For those manufacturers who c ıspection on a machine and/or inspection between oper compiled in such a way that the overall inspection plan s

Table 5 – Minimum values for axial load, wrench feature torque, push out load, torque out test and seating torque for vibration test

Thread size	Axial load at ambient temperature [a] kN	Wrench feature torque [b] Nm	Push out load N	Torque out test for clip nuts Nm	Seating torque for vibration test Nm
MJ3 × 0,5	5,9	2,5	800	3	0,6
MJ4 × 0,7	10,5	5,8	850	5	1,4
MJ5 × 0,8	16,8	11,4	900	10	2,8
MJ6 × 1	23,9	19,5	950	16	4,7
MJ7 × 1	34	32	1 050	22	9,6
MJ8 × 1	45,8	48	1 100	33	11,6
MJ10 × 1,25	71,6	94		63	23
MJ12 × 1,25	106,8	166			40
MJ14 × 1,5	144,7	262			63
MJ16 × 1,5	193,2	397			95
MJ18 × 1,5	248,5	571			137
MJ20 × 1,5	310,8	790			190

NOTE Load requirements for axial tensile strength test are based on 1 100 MPa stress.

[a] Tensile stress area formula $A = \pi/4\ (d_3)^2\ [2 - (d_3/d_2)^2]$
where:
A is the tensile stress area in square millimetres;
d_2 is the max. pitch diameter in millimetres;
d_3 is the max. root diameter in millimetres.

[b] Values = 2 × torque.

Table 6 – Sampling plans for the inspection of mechanical and metallurgical characteristics

Batch size	Sample size		Acceptance number
	Non-destructive tests A	Destructive tests B	(Ac)
≤ 500	8	3	0
501 to 3 200	13	5	0
3 201 to 35 000	20	5	0
≥ 35 001	32	8	0

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Table 7 – Values of breakaway torque, self-locking torque and seating torque

Thread size	Breakaway torque Nm			Self-locking torque Nm		Seating torque Nm
	min. [a]	min. [b]	min. [c]	max. [d]	max. [e]	[f]
MJ3 × 0,5	0,1	0,2	0,12	0,75	1,5	1,4
MJ4 × 0,7	0,15	0,3	0,18	1,6	3,2	3
MJ5 × 0,8	0,25	0,5	0,3	2	4	5,7
MJ6 × 1	0,35	0,7	0,4	3,2	6,4	9,6
MJ7 × 1	0,50	1	0,6	4,6	9,2	15
MJ8 × 1	0,65	1,3	0,8	6	12	23
MJ10 × 1,25	1,2	2,4	1,4	9,5	19	43
MJ12 × 1,25	1,8	3,6	2,2	15	30	75
MJ14 × 1,5	2,6	5,2	3,1	22	44	117
MJ16 × 1,5	3,7	7,4	4,4	33	66	177
MJ18 × 1,5	4,9	9,8	5,9	44	88	253
MJ20 × 1,5	6,3	12,6	7,6	50	100	344

[a] For 15 cycle test, five cycle test, and permanent set test
[b] For first cycle of three cycle test
[c] For second and third cycle of three cycle test
[d] For 15 cycle test, three cycle test and permanent set test
[e] For five cycle test
[f] For 15 cycle and three cycle tests for nuts. Values equal torque required to induce 75 % of 0,2 % proof stress in companion bolt.

Table 8 – Permissible surface discontinuities

Dimensions in millimetres

Nominal thread diameter	Depth max.
3	0,1
4	0,12
5	
6	0,13
7	
8	0,15
10	
12	0,2
14	0,22
16	0,25
18	

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