INTERNATIONAL STANDARD

ISO 2320

Fifth edition
2015-12-01

Fasteners — Prevailing torque steel nuts — Functional properties

Fixations — Écrous autofreinés en acier — Caractéristiques fonctionnelles

SIST Preview
(https://ecommerce.sist.si)

ISO 2320:2015
https://ecommerce.sist.si/catalog/standards/sist/80e23757-3d49-4c3c-a6ec-1b6d828d5a5d/iso-2320-2015

Reference number
ISO 2320:2015(E)

© ISO 2015

SIST Preview
(https://ecommerce.sist.si)

ISO 2320:2015
https://ecommerce.sist.si/catalog/standards/sist/80e23757-3d49-4c3c-a6ec-1b6d828d5a5d/iso-2320-2015



COPYRIGHT PROTECTED DOCUMENT

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

 © ISO 2015 – All rights reserved

Contents

Page

Foreword ..... **iv**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **1**

4 Symbols **2**

5 Thread **3**

6 Lubrication **3**

7 Mechanical properties of prevailing torque nuts **3**

8 Functional requirements for prevailing torque properties **3**

9 Test method **11**
9.1 General 11
9.2 Proof load test 11
9.3 Prevailing torque test 11
9.3.1 General 11
9.3.2 Test apparatus 12
9.3.3 Test parts 12
9.3.4 Test procedure 13
9.3.5 Test report 15

Annex A (normative) **Temperature influence on prevailing torques of nuts with non-metallic insert** **16**

Annex B (informative) **Principles for the evaluation of the total coefficient of friction, μ_{tot}** **17**

Annex C (informative) **Test clamp force and prevailing torques for prevailing torque nuts M3 and M4 in property classes 8 and 10** **18**

Bibliography **20**

SIST Preview
(https://ecommerce.sist.si)
ISO 2320:2015
https://standards.iteh.ai/catalog/standards/sist/80e23757-3d49-4c3c-a6ec-1b6d828d5a5d/iso-2320-2015

© ISO 2015 – All rights reserved

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

SIST Preview

The committee responsible for this document is ISO/TC 2, *Fasteners*, Subcommittee SC 12, *Fasteners with metric internal thread*.

(https://ecommerce.sist.si)

This fifth edition cancels and replaces the fourth edition (ISO 2320:2008), which has been technically revised. The following changes have been made:

ISO 2320:2015
https://ecommerce.sist.si/catalog/standards/sist/80e23757-3d49-4c3c-a6ec-1b6d828d5a5d/iso-2320-2015

- property class 9 has been deleted;
- prevailing torques for nuts M3 and M4 have been moved to Annex C;
- in the test fixture, the thread protrusion through the prevailing torque feature has been changed to 3 to 5 pitches;
- the reference surface condition for the test bolt has been specified in accordance with ISO 16047 (plain surface, uncoated and degreased, unless otherwise agreed);
- the determination of the prevailing-off torque has been changed from the upper value to the minimum value (new point 5 in Figure 2), which changes the acceptance conditions;
- other editorial revisions.

 © ISO 2015 – All rights reserved

Fasteners — Prevailing torque steel nuts — Functional properties

1 Scope

This International Standard specifies the functional properties for prevailing torque steel nuts when tested at an ambient temperature range of +10 °C to +35 °C. It includes a combined test method to determine the prevailing torque properties and the torque/clamp force properties at the same time.

It applies to prevailing torque all metal type nuts and prevailing torque non-metallic insert type nuts:

— with triangular ISO thread in accordance with ISO 68-1;

— with diameter/pitch combination in accordance with ISO 261 and ISO 262;

— with coarse pitch thread M5 to M39 or with fine pitch thread M8 × 1 to M39 × 3;

— with thread tolerances in accordance with ISO 965-2;

— with mechanical properties in accordance with ISO 898-2;

Prevailing torque values specified in this standard are based on laboratory test conditions.

NOTE 1 Actual prevailing torques in practical application can vary.

NOTE 2 All metal type nuts conforming to the requirements of this International Standard are used in applications ranging from −50 °C to +150 °C.

NOTE 3 Non-metallic insert type nuts conforming to the requirements of this International Standard are used in applications ranging from −50 °C to +120 °C.

SIST Preview
(https://ecommerce.sist.si)
https://ecommerce.sist.si/catalog/standards/sist/80e23757-3d49-4c3c-a6ec-1b6d828d5a5d/iso-2320-2015

WARNING — Temperatures outside the ambient temperature range can influence the functional properties (torque/clamp force and prevailing torque properties), see Annex A.

2 Normative references

The following referenced documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 273, *Fasteners — Clearance holes for bolts and screws*

ISO 898-1, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread*

ISO 898-2, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 2: Nuts with specified property classes — Coarse thread and fine pitch thread*

ISO 965-2, *ISO general purpose metric screw threads — Tolerances — Part 2: Limits of sizes for general purpose external and internal screw threads — Medium quality*

ISO 16047:2005, *Fasteners — Torque/clamp force testing*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16047 and the following apply.

© ISO 2015 – All rights reserved

3.1
prevailing torque nut
nut which is not free-running on a mating thread by virtue of a self-contained prevailing torque feature, and which provides resistance to rotation independent of clamping or compression forces

3.2
prevailing torque developed by the nut
torque necessary to rotate the nut on its mating externally threaded component and without clamp force

3.3
prevailing-on torque
torque to rotate the nut on its mating externally threaded component with the torque measured while the nut is in motion and without clamp force

3.4
prevailing-off torque
torque to rotate after backing off the nut until the removal of the clamp force in the following 360° rotation of the nut

3.5
prevailing torque all metal type nut
nut which has a one piece or a multiple piece metal construction and derives its prevailing torque characteristics from a controlled distortion of the nut thread and/or body and/or from metallic insert(s)

3.6
prevailing torque non-metallic insert type nut
nut which has a multiple piece construction and derives its prevailing torque characteristics from insert(s) of non-metallic material retained in the nut

SIST Preview
(https://ecommerce.sist.si)

3.7
seating point
point in the tightening process where clamp force first appears

ISO 2320:2015
https://ecommerce.sist.si/catalog/standards/sist/80e23757-3d49-4c3c-a6ec-1b6d828d5a5d/iso-2320-2015

4 Symbols

For the purpose of this International Standard, the following symbols apply together with those defined in ISO 16047.

D nominal diameter, in millimetre

d_4 diameter of the hole of the fixture, in millimetre

F_P proof load, in newton

F_{65} lower load limit for the evaluation of the coefficient of total friction at 65 % of F_P, in newton

F_{75} upper load limit for the evaluation of the coefficient of total friction at 75 % of F_P, in newton

F_{80} test clamp force (shut-down force for the tightening process) at 80 % of F_P, in newton

P pitch of the thread, in millimetre

T_{Fv} prevailing-on torque, in newton metre

T_{Fd} prevailing-off torque, in newton metre

T_{65} lower torque limit for the evaluation of the coefficient of total friction at F_{65}, in newton metre

T_{75} upper torque limit for the evaluation of the coefficient of total friction at F_{75}, in newton metre

© ISO 2015 – All rights reserved

T_{80} test torque corresponding to 80 % of the proof load, in newton metre (see Tables 1 to 7)

μ_{tot} coefficient of total friction

5 Thread

Threads for prevailing torque nuts shall be in accordance with ISO 965-2 except for the prevailing torque feature:

a) for prevailing torque non-metallic insert type nuts, the GO gauge shall be suitable for free installation (by hand) until it is seated against the prevailing torque feature;

b) for prevailing torque all metal type nuts, the GO gauge shall be suitable for free installation (by hand) to one pitch at least.

6 Lubrication

At the option of the manufacturer, a lubricant may be applied to the manufacturing lot to fulfil the functional requirements.

7 Mechanical properties of prevailing torque nuts

The mechanical properties of prevailing torque nuts shall conform to ISO 898-2.

With regard to proof load, the test method specified in 9.2 shall apply.

SIST Preview
(https://ecommerce.sist.si)

8 Functional requirements for prevailing torque properties

The prevailing-on torque shall not exceed the value specified for the applicable nut in Tables 1 to 7.

ISO 2320:2015
https://standards.iteh.ai/catalog/standards/sist/...iso-2320-2015

The prevailing-off torque shall exceed the value specified for the applicable nut in Tables 1 to 7.

For delivery inspection, the first installation/removal test applies, unless otherwise agreed.

For initial type testing and in case of dispute, a 5th removal test shall also be applied unless otherwise agreed.

Prevailing torque performance decreases as a function of the number of reuses; the consumer shall take into consideration the consequences of the decreased performance before any reuse of the nut.

By request of the customer, a temperature influence test for prevailing torque non-metallic insert type nuts as specified in Annex A may be carried out.

© ISO 2015 – All rights reserved

Table 1 — Test clamp force and prevailing torques for prevailing torque nuts of property class 04

Thread D $D \times P$	Test clamp force F_{80}[a] N	Clamp force for evaluation of total friction coefficient μ_{tot}[b]		Prevailing torque Nm		
		Upper limit F_{75}[c] N	Lower limit F_{65}[d] N	1st installation $T_{Fv,max}$[e]	1st removal $T_{Fd,min}$	5th removal $T_{Fd,min}$
M5	4 320	4 050	3 510	1,6	0,29	0,2
M6	6 112	5 730	4 966	3	0,45	0,3
M7	8 800	8 250	7 150	4,5	0,65	0,45
M8	11 120	10 425	9 035	6	0,85	0,6
M8×1	11 920	11 175	9 685			
M10	17 600	16 500	14 300	10,5	1,5	1
M10×1,25	18 640	17 475	15 145			
M10×1	19 600	18 375	15 925			
M12	25 600	24 000	20 800	15,5	2,3	1,6
M12×1,5	26 800	25 125	21 775			
M12×1,25	28 000	26 250	22 750			
M14	34 960	32 775	28 405	24	3,3	2,3
M14×1,5	38 000	35 625	30 875			
M16	47 760	44 775	38 805	32	4,5	3
M16×1,5	50 800	47 625	41 275			
M18	58 400	54 750	47 450	42	6	4,2
M18×1,5	65 360	61 275	53 105			
M20	74 480	69 825	60 515	54	7,5	5,3
M20×1,5	82 720	77 550	67 210			
M22	92 080	86 325	74 815	68	9,5	6,5
M22×1,5	101 200	94 875	82 225			
M24	107 280	100 575	87 165	80	11,5	8
M24×2	116 720	109 425	94 835			
M27	139 520	130 800	113 360	94	13,5	10
M27×2	150 800	141 375	122 525			
M30	170 560	159 900	138 580	108	16	12
M30×2	188 800	177 000	153 400			
M33	210 960	197 775	171 405	122	18	14
M33×2	231 360	216 900	187 980			
M36	248 400	232 875	201 825	136	21	16
M36×3	262 960	246 525	213 655			
M39	296 720	278 175	241 085	150	23	18
M39×3	313 120	293 550	254 410			

NOTE The evaluation of results from the prevailing torque test by statistical process control methods (SPC) has no statistical relevance.

[a] The clamp force for property class 04 nuts is equal to 80 % of the proof load of property class 04 specified in ISO 898-2 for nuts with 5 mm ≤ D ≤ 39 mm.

[b] See Annex B.

[c] The value of the upper limit of the clamp force is equal to 75 % of the proof load, see Annex B.

[d] The value of the lower limit of the clamp force is equal to 65 % of the proof load, see Annex B.

[e] The values of prevailing torque for first assembly apply for all metal type nuts only. For prevailing torque non-metallic insert type nuts, the maximum prevailing torques shall be 50 % of the values.

SIST Preview (https://ecommerce.sist.si)
SIST ISO 2320:2015
https://ecommerce.sist.si/catalog/standards/sist/e23757-3d49-4c3c-afec-1b6d828d5a5d/iso-2320-2015

© ISO 2015 – All rights reserved

Table 2 — Test clamp force and prevailing torques for prevailing torque nuts of property class 05

Thread D $D\times P$	Test clamp force F_{80}[a] N	Clamp force for evaluation of total friction coefficient μ_{tot}[b]		Prevailing torque Nm		
		Upper limit F_{75}[c] N	Lower limit F_{65}[d] N	1st installation $T_{Fv,max}$[e]	1st removal $T_{Fd,min}$	5th removal $T_{Fd,min}$
M5	5 680	5 325	4 615	2,1	0,35	0,24
M6	8 000	7 500	6 500	4	0,55	0,4
M7	11 600	10 875	9 425	6	0,85	0,6
M8	14 640	13 725	11 895	8	1,15	0,8
M8×1	15 680	14 700	12 740			
M10	23 200	21 750	18 850	14	2	1,4
M10×1,25	24 480	22 950	19 890			
M10×1	25 760	24 150	20 930			
M12	33 760	31 650	27 430	21	3,1	2,1
M12×1,5	35 200	33 000	28 600			
M12×1,25	36 800	34 500	29 900			
M14	46 000	43 125	37 375	31	4,4	3
M14×1,5	50 000	46 875	40 625			
M16	62 800	58 875	51 025	42	6	4,2
M16×1,5	66 800	62 625	54 275			
M18	76 800	72 000	62 400	56	8	5,5
M18×1,5	86 000	80 625	69 875			
M20	98 000	91 875	79 625	72	10,5	7
M20×1,5	108 800	102 000	88 400			
M22	121 200	113 625	98 475	90	13	9
M22×1,5	133 200	124 875	108 225			
M24	141 200	132 375	114 725	106	15	10,5
M24×2	153 600	144 000	124 800			
M27	183 600	172 125	149 175	123	17	12
M27×2	198 400	186 000	161 200			
M30	224 400	210 375	182 325	140	19	14
M30×2	248 400	232 875	201 825			
M33	277 600	260 250	225 550	160	21,5	15,5
M33×2	304 400	285 375	247 325			
M36	326 800	306 375	265 525	180	24	17,5
M36×3	346 000	324 375	281 125			
M39	390 400	366 000	317 200	200	26,5	19,5
M39×3	412 000	386 250	334 750			

NOTE The evaluation of results from the prevailing torque test by statistical process control methods (SPC) has no statistical relevance.

[a] The clamp force for property class 05 nuts is equal to 80 % of the proof load of property class 05 specified in ISO 898-2 for nuts with 5 mm ≤ D ≤ 39 mm.

[b] See Annex B.

[c] The value of the upper limit of the clamp force is equal to 75 % of the proof load, see Annex B.

[d] The value of the lower limit of the clamp force is equal to 65 % of the proof load, see Annex B.

[e] The values of prevailing torque for first assembly apply for all metal type nuts only. For prevailing torque non-metallic insert type nuts, the maximum prevailing torques shall be 50 % of the values.

SIST Preview
https://ecommerce.sist.si
ISO 2320:2015
https://ecommerce.sist.si/catalog/standards/sist/80e237...49-4c3c-a6ec-1b6d828d5a5d/iso-2320-2015

© ISO 2015 – All rights reserved

Table 3 — Test clamp force and prevailing torques for prevailing torque nuts of property class 5

Thread D $D\times P$	Test clamp force F_{80}[a] N	Clamp force for evaluation of total friction coefficient μ_{tot}[b]		Prevailing torque Nm		
		Upper limit F_{75}[c] N	Lower limit F_{65}[d] N	1st installation $T_{Fv,max}$[e]	1st removal $T_{Fd,min}$	5th removal $T_{Fd,min}$
M5	4 320	4 050	3 510	1,6	0,29	0,2
M6	6 112	5 730	4 966	3	0,45	0,3
M7	8 800	8 250	7 150	4,5	0,65	0,45
M8	11 120	10 425	9 035	6	0,85	0,6
M8×1	11 920	11 175	9 685			
M10	17 600	16 500	14 300	10,5	1,5	1
M10×1,25	18 640	17 475	15 145			
M10×1	19 600	18 375	15 925			
M12	25 600	24 000	20 800	15,5	2,3	1,6
M12×1,5	26 800	25 125	21 775			
M12×1,25	28 000	26 250	22 750			
M14	34 960	32 775	28 405	24	3,3	2,3
M14×1,5	38 000	35 625	30 875			
M16	47 760	44 775	38 805	32	4,5	3
M16×1,5	50 800	47 625	41 275			
M18	58 400	54 750	47 450	42	6	4,2
M18×1,5	65 680	61 575	53 365			
M20	74 480	69 825	60 515	54	7,5	5,3
M20×1,5	82 400	77 250	66 950			
M22	92 000	86 250	74 750	68	9,5	6,5
M22×1,5	100 800	94 500	81 900			
M24	107 200	100 500	87 100	80	11,5	8
M24×2	116 800	109 500	94 900			
M27	113 600	106 500	92 300	94	13,5	10
M27×2	123 200	115 500	100 100			
M30	139 200	130 500	113 100	108	16	12
M30×2	153 600	144 000	124 800			
M33	172 000	161 250	139 750	122	18	14
M33×2	188 800	177 000	153 400			
M36	202 400	189 750	164 450	136	21	16
M36×3	214 400	201 000	174 200			
M39	242 400	227 250	196 950	150	23	18
M39×3	255 200	239 250	207 350			

NOTE The evaluation of results from the prevailing torque test by statistical process control methods (SPC) has no statistical relevance.

[a] The clamp force for property class 5 nuts is equal to 80 % of the proof load of property class 5.8 specified in ISO 898-1 for bolts

[b] See Annex B.

[c] The value of the upper limit of the clamp force is equal to 75 % of the proof load, see Annex B.

[d] The value of the lower limit of the clamp force is equal to 65 % of the proof load, see Annex B.

[e] The values of prevailing torque for first assembly apply for all metal type nuts only. For prevailing torque non-metallic insert type nuts, the maximum prevailing torques shall be 50 % of the values.

SIST Preview (https://ecommerce.sist.si)
ISO 2320:2015
https://ecommerce.sist.si/catalog/standards/sist/8...757-3d49-4c3c-a6ec-1b6d828d5a5d/iso-2320-2015

© ISO 2015 – All rights reserved

Table 4 — Test clamp force and prevailing torques for prevailing torque nuts of property class 6

Thread D $D \times P$	Test clamp force F_{80}[a] N	Clamp force for evaluation of total friction coefficient μ_{tot}[b]		Prevailing torque Nm		
		Upper limit F_{75}[c] N	Lower limit F_{65}[d] N	1st installation $T_{Fv,max}$[e]	1st removal $T_{Fd,min}$	5th removal $T_{Fd,min}$
M5	5 000	4 688	4 063	1,6	0,29	0,2
M6	7 072	6 630	5 746	3	0,45	0,3
M7	10 160	9 525	8 255	4,5	0,65	0,45
M8	12 880	12 075	10 465	6	0,85	0,6
M8×1	13 760	12 900	11 180			
M10	20 400	19 125	16 575	10,5	1,5	1
M10×1,25	21 520	20 175	17 485			
M10×1	22 720	21 300	18 460			
M12	29 680	27 825	24 115	15,5	2,3	1,6
M12×1,5	31 040	29 100	25 220			
M12×1,25	32 400	30 375	26 325			
M14	40 480	37 950	32 890	24	3,3	2,3
M14×1,5	44 000	41 250	35 750			
M16	55 280	51 825	44 915	32	4,5	3
M16×1,5	58 800	55 125	47 775			
M18	67 600	63 375	54 925	42	6	4,2
M18×1,5	76 000	71 250	61 750			
M20	86 400	81 000	70 200	54	7,5	5,3
M20×1,5	96 000	90 000	78 000			
M22	106 400	99 750	86 450	68	9,5	6,5
M22×1,5	116 800	109 500	94 900			
M24	124 000	116 250	100 750	80	11,5	8
M24×2	135 200	126 750	109 850			
M27	161 600	151 500	131 300	94	13,5	10
M27×2	174 400	163 500	141 700			
M30	197 600	185 250	160 550	108	16	12
M30×2	218 400	204 750	177 450			
M33	244 000	228 750	198 250	122	18	14
M33×2	268 000	251 250	217 750			
M36	287 200	269 250	233 350	136	21	16
M36×3	304 800	285 750	247 650			
M39	343 200	321 750	278 850	150	23	18
M39×3	362 400	339 750	294 450			

NOTE The evaluation of results from the prevailing torque test by statistical process control methods (SPC) has no statistical relevance.

[a] The clamp force for property class 6 nuts is equal to 80 % of the proof load of property class 6.8 specified in ISO 898-1 for bolts.

[b] See Annex B.

[c] The value of the upper limit of the clamp force is equal to 75 % of the proof load, see Annex B.

[d] The value of the lower limit of the clamp force is equal to 65 % of the proof load, see Annex B.

[e] The values of prevailing torque for first assembly apply for all metal type nuts only. For prevailing torque non-metallic insert type nuts, the maximum prevailing torques shall be 50 % of the values.

SIST Preview (https://ecommerce.sist.si)
ISO 2320:2015
https://ecommerce.sist.si/catalog/standards/sist/80e237...-4c3e-a6ec-1b6d828d5a5d/iso-2320-2015

© ISO 2015 – All rights reserved