LOCXELL®

2017 09 DNV-GL certified thermal treatment facility
2017 09 DNV-GL system and product certification
2017 09 PED system and product certification
2017 09 KR system and product certification
2017 09 Nuclear Q-Class certification
2017 09 Qualification of high temperature and high voltage bolt for turbine
2017 09 Single PPM quality qualification

JUNGSAN

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SEP. 2017 PAT. permitted by Findmold Co., Ltd

Anti-loosening Bolts & Nuts
Never loosened under vibrating
Quick and easy installation

LOCXELL®

JUNGSAN FIND MOLD

01 PRODUCT INTRODUCTIONS

LOCXELL BOLT·NUT M

Anti-loosening Bolts & Nuts LOCXELL M

WORKING MECHANISM

Maintain initial fastening force by magnetic force

As the loosening rotation is suppressed by the magnetic force formed on the bolt & nut, the increase of the loosening torque increases the frictional force, and the larger the loosening torque, the more the friction coefficient increases and thereby the loosening is prevented.

[Patent]

[Patent]

FEATURES

Loosening prevention

By forming a groove in the flange surface of the bolt and nut and inserting a magnet into the groove, it is possible to prevent the loosening by suppressing the loosening force by increasing the frictional force in the vibration impact and the JUNKER axial performance test and the NAS3350 vibration test have proven their anti-loosening performance.

Quick fastening

The bolt and nut with magnetic force is attached to the joining material, which makes it unnecessary to use auxiliary manpower when working at a high place, so that even one person can quickly fasten.

Safe operation

Since the bolts and nuts do not fall during the fastening operation at the high work site, personal injuries are prevented and the safety of the workplace is improved.

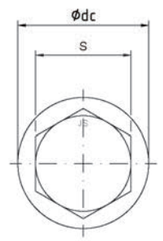
Economical

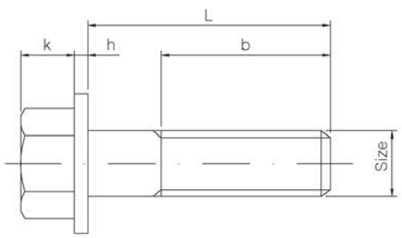
A. Reduce labor cost by about 20% by time saving through quick fastening
B. Reduce material cost by about 5% through loss prevention of bolt & nut

M BOLT

Anti-loosening Bolts

PRODUCT SPECIFICATIONS





Locxell SHLB-M DIMENSION Unit:mm

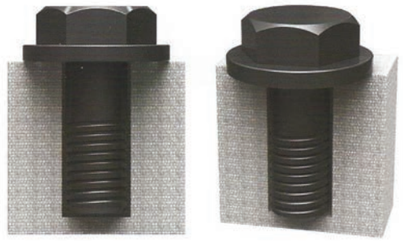
No.	Size	L	K	S	h	dc
MR016	M16x2.0P	40~100	10±0.29	23.6±0.4	4.5(±0.5)	32
MR020	M20X2.5P	45~100	12.5±0.35	29.6±0.4	4.5(±0.5)	40
MR022	M22X2.5P	50~100	14±0.35	31.5±0.5	6(±0.5)	44

Expanded sizes up to M56 are available on request and can be supplied in DNV-GL, PED and KR classification in accordance with ISO 898-1.

INSTALLATION

Installation in the threaded hole

Designed to fit the tapped hole,
it is securely and firmly fastened to the joint surface of the steel.



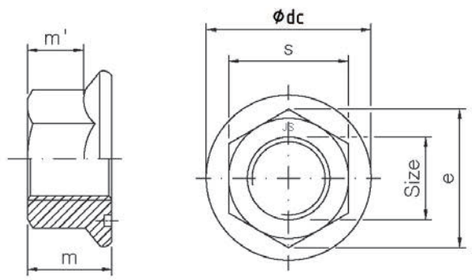
M NUT

Anti-loosening Nuts

PRODUCT SPECIFICATIONS

Size	Pitch (Coarse)	Dimension						
		s		m		m'	e	dc
		Min.	Max.	Min.	Max.	Min.	Min.	Max.
M8	1.25	12.73	13.00	7.6	8	4.5	14.38	17.9
M10	1.5	14.73	16.00	9.6	10	5.5	17.77	21.8
M12	1.75	17.73	18.00	11.6	12	6.7	20.03	26.0
M14	2.0	20.67	21.00	13.3	14	7.8	23.36	29.9
M16	2.0	23.67	24.00	15.3	16	9.0	26.75	34.5
M18	2.5	26.16	27.00	17.2	18	10.0	29.56	38.5
M20	2.5	29.67	30.00	18.9	20	11.1	32.95	42.8
M22	2.5	33.00	34.00	20.8	22	12.6	37.29	47.0
M24	3.0	35.00	36.00	22.7	24	13.3	39.65	51.7
M27	3.0	40.00	41.00	25.6	27	15.2	45.20	57.7
M30	3.5	45.00	46.00	28.4	30	17.0	80.85	64.2

All dimensions are in millimeters.



Expanded sizes up to M56 are available on request and can be supplied in DNV-GL, PED and KR classification in accordance with DIN 6923, ISO 4161 and ANSI B 18.

LOCXELL NUT R

Anti-loosening Nuts LOCXELL R

WORKING MECHANISM

The double nut keeps the initial fastening force firm

It has proved to be the best in the world by the performance comparison test of the authorized institution that the specially designed double nut has the best performance to prevent loosening by external force such as vibration or impact tensile.

[Locxell NUT R can be made of various materials such as iron, stainless steel, copper alloy, and plastic and so on]

FEATURES

Loosening prevention

Specially designed double threads increase the frictional force of the upper and lower nuts in the external vibration impact, so that the initial fastening force is maintained firmly.

Easy fastening

It is fastened with a predetermined torque value, and is easily disassembled without breakage of the nut.

Safety of Structures

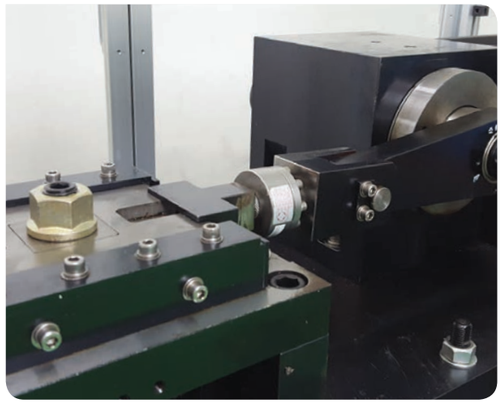
Due to the mechanical characteristics of the double nut, the loosening does not occur at all, which greatly improves the safety of the structure.

Economical

Once fastened, it is permanently prevented from being loosened, which greatly reduces the maintenance cost.

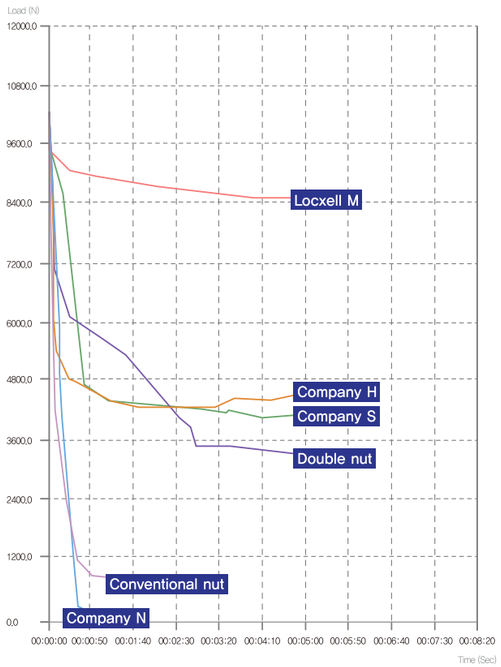
02 RELIABILITY VERIFICATION

■ Junker Test : German Standard DIN 65151

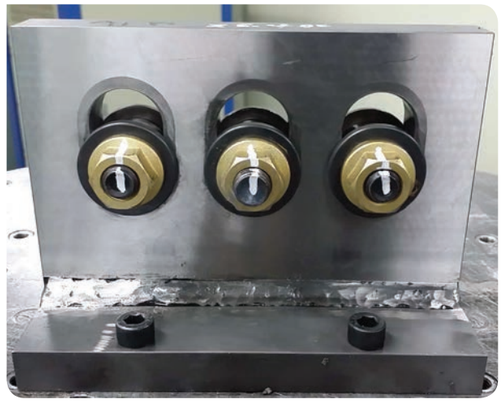


〈Junker tester at KIMS (Korea Institute of Material Science)〉

■ Comparison of Junkr Test for Nut M16



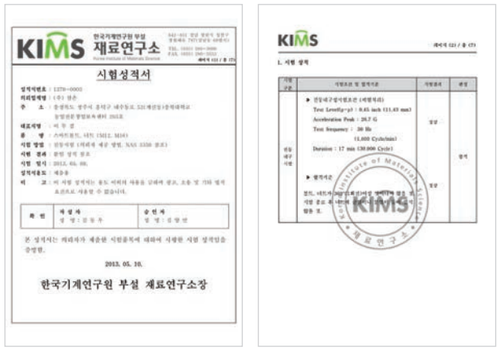
■ NAS 3350 Test



〈Vibration test according to NAS3350 at KIMS〉

1. Related regulations : KS W ISO 7481_2005
2. Vibration characteristics
   - Displacement : 11.5mm
   - Number of revolutions : 30Hz/sec
   - Impact : 20G
   - Time : 30,000Cycle(About 17 minutes)

■ Vibration test report according to NAS3350



〈Vibration test report according to NAS3350 at KIMS〉

03 APPLICATION EXAMPLES

Mining machinery
Janggye-myeon, Jangsu-gun, Jeollabuk-do

M16, M20 Locxell bolt/nut

2013.10~

- Applied to feeder equipment of mining machinery
- Began operations in January 2014

Molding machines for sidewalk blocks
Daeil Tech., Jincheon-gun, Chungcheongbuk-do

M16 Locxell bolt

2013.11~

- Fixing mold frmae
- The base material has nut-like tabs to apply the Locxell bolt

Frame for fogging dissipation device
Yeosu, Jeollanam-do, etc.

M22 Locxell bolt/nut

2014.08~

- Devices installed from 2014
- Jeonnam Yeosu, Chungnam Yesan, Gyeongbuk Andong, etc.
- Locxell bols are installed to prevent bolt loosening by vibration.

Railroad cars
Hyundai Rotem Co., Ltd.

M8*50 Locxell bolt,
M8 Locxell nut

2015.07.15

- Connection device of trains

Subway turnout
Incheon Subway Line 1

M16 Locxell nut

2015.06.27

- Assembly of turnout

Light rail
Hongsun Station, Uijeongbu Light Railway

M22 Locxell nut
(tightening torque 40 Nm)

2015.09.16

- For fixing 3TH rails

Excavator equipment
Juhyu Ltd.

M16, M12 wrench bolt

2015.10.08

High-speed railway turnout
Sampyo Railway Co., Ltd.

M20, M22, M24, M27
Locxell bolts, nuts

- Honam High Speed Railway, Installed in Jeongeup Station in May 2017

04 REFERENCES

Table 5 — Proof loads — ISO metric coarse pitch thread

Thread [a] d	Nominal stress area $A_{s,nom}$ [b] mm²	Property class 4.6	4.8	5.6	5.8	6.8	8.8	9.8	10.9	12.9/12.9
		Proof load, F_p ($A_{s,nom} \times S_{p,nom}$), N								
M3	5,03	1 130	1 560	1 410	1 910	2 210	2 920	3 270	4 180	4 880
M3,5	6,78	1 530	2 100	1 900	2 580	2 980	3 940	4 410	5 630	6 580
M4	8,78	1 980	2 720	2 460	3 340	3 860	5 100	5 710	7 290	8 520
M5	14,2	3 200	4 400	3 980	5 400	6 250	8 230	9 230	11 800	13 800
M6	20,1	4 520	6 230	5 630	7 640	8 840	11 600	13 100	16 700	19 500
M7	28,9	6 500	8 960	8 090	11 000	12 700	16 800	18 800	24 000	28 000
M8	36,6	8 240 [c]	11 400	10 200 [c]	13 900	16 100	21 200 [c]	23 800	30 400 [c]	35 500
M10	58	13 000 [c]	18 000	16 200 [c]	22 000	25 500	33 700 [c]	37 700	48 100 [c]	56 300
M12	84,3	19 000	26 100	23 600	32 000	37 100	48 900 [d]	54 800	70 000	81 800
M14	115	25 900	35 600	32 200	43 700	50 600	66 700 [d]	74 800	95 500	112 000
M16	157	35 300	48 700	44 000	59 700	69 100	91 000 [d]	102 000	130 000	152 000
M18	192	43 200	59 500	53 800	73 000	84 500	115 000	—	159 000	186 000
M20	245	55 100	76 000	68 600	93 100	108 000	147 000	—	203 000	238 000
M22	303	68 200	93 900	84 800	115 000	133 000	182 000	—	252 000	294 000
M24	353	79 400	109 000	98 800	134 000	155 000	212 000	—	293 000	342 000
M27	459	103 000	142 000	128 000	174 000	202 000	275 000	—	381 000	445 000
M30	561	126 000	174 000	157 000	213 000	247 000	337 000	—	466 000	544 000
M33	694	156 000	215 000	194 000	264 000	305 000	416 000	—	576 000	673 000
M36	817	184 000	253 000	229 000	310 000	359 000	490 000	—	678 000	792 000
M39	976	220 000	303 000	273 000	371 000	429 000	586 000	—	810 000	947 000

[a] Where no thread pitch is indicated in a thread designation, coarse pitch is specified.
[b] To calculate $A_{s,nom}$, see 9.1.6.1.
[c] For fasteners with thread tolerance 6az according to ISO 965-4 subject to hot dip galvanizing, reduced values in accordance with ISO 10684:2004, Annex A, apply.
[d] For structural bolting 50 700 N (for M12), 68 800 N (for M14) and 94 500 N (for M16).

Table 4 — Minimum ultimate tensile loads — ISO metric coarse pitch thread

Thread [a] d	Nominal stress area $A_{s,nom}$ [b] mm²	Property class 4.6	4.8	5.6	5.8	6.8	8.8	9.8	10.9	12.9/12.9
		Minimum ultimate tensile load, $F_{m,min}$ ($A_{s,nom} \times R_{m,min}$), N								
M3	5,03	2 010	2 110	2 510	2 620	3 020	4 020	4 530	5 230	6 140
M3,5	6,78	2 710	2 850	3 390	3 530	4 070	5 420	6 100	7 050	8 270
M4	8,78	3 510	3 690	4 390	4 570	5 270	7 020	7 900	9 130	10 700
M5	14,2	5 680	5 960	7 100	7 380	8 520	11 350	12 800	14 800	17 300
M6	20,1	8 040	8 440	10 000	10 400	12 100	16 100	18 100	20 900	24 500
M7	28,9	11 600	12 100	14 400	15 000	17 300	23 100	26 000	30 100	35 300
M8	36,6	14 600 [c]	15 400	18 300 [c]	19 000	22 000	29 200 [c]	32 900	38 100 [c]	44 600
M10	58	23 200 [c]	24 400	29 000 [c]	30 200	34 800	46 400 [c]	52 200	60 300 [c]	70 800
M12	84,3	33 700	35 400	42 200	43 800	50 600	67 400 [d]	75 900	87 700	103 000
M14	115	46 000	48 300	57 500	59 800	69 000	92 000 [d]	104 000	120 000	140 000
M16	157	62 800	65 900	78 500	81 600	94 000	125 000 [d]	141 000	163 000	192 000
M18	192	76 800	80 600	96 000	99 800	115 000	159 000	—	200 000	234 000
M20	245	98 000	103 000	122 000	127 000	147 000	203 000	—	255 000	299 000
M22	303	121 000	127 000	152 000	158 000	182 000	252 000	—	315 000	370 000
M24	353	141 000	148 000	176 000	184 000	212 000	293 000	—	367 000	431 000
M27	459	184 000	193 000	230 000	239 000	275 000	381 000	—	477 000	560 000
M30	561	224 000	236 000	280 000	292 000	337 000	466 000	—	583 000	684 000
M33	694	278 000	292 000	347 000	361 000	416 000	576 000	—	722 000	847 000
M36	817	327 000	343 000	408 000	425 000	490 000	678 000	—	850 000	997 000
M39	976	390 000	410 000	488 000	508 000	586 000	810 000	—	1 020 000	1 200 000

[a] Where no thread pitch is indicated in a thread designation, coarse pitch is specified.
[b] To calculate $A_{s,nom}$, see 9.1.6.1.
[c] For fasteners with thread tolerance 6az according to ISO 965-4 subject to hot dip galvanizing, reduced values in accordance with ISO 10684:2004, Annex A, apply.
[d] For structural bolting 70 000 N (for M12), 95 500 N (for M14) and 130 000 N (for M16).

Table 7 — Proof loads — ISO metric fine pitch thread

Thread $d \times P$	Nominal stress area $A_{s,nom}$ [a] mm²	Property class 4.6	4.8	5.6	5.8	6.8	8.8	9.8	10.9	12.9/12.9
		Proof load, F_p ($A_{s,nom} \times S_{p,nom}$), N								
M8 × 1	39,2	8 820	12 200	11 000	14 900	17 200	22 700	25 500	32 500	38 000
M10 × 1,25	61,2	13 800	19 000	17 100	23 300	26 900	35 500	39 800	50 800	59 400
M10 × 1	64,5	14 500	20 000	18 100	24 500	28 400	37 400	41 900	53 500	62 700
M12 × 1,5	88,1	19 800	27 300	24 700	33 500	38 800	51 100	57 300	73 100	85 500
M12 × 1,25	92,1	20 700	28 600	25 800	35 000	40 500	53 400	59 900	76 400	89 300
M14 × 1,5	125	28 100	38 800	35 000	47 500	55 000	72 500	81 200	104 000	121 000
M16 × 1,5	167	37 600	51 800	46 800	63 500	73 500	96 900	109 000	139 000	162 000
M18 × 1,5	216	48 600	67 000	60 500	82 100	95 000	130 000	—	179 000	210 000
M20 × 1,5	272	61 200	84 300	76 200	103 000	120 000	163 000	—	226 000	264 000
M22 × 1,5	333	74 900	103 000	93 200	126 000	146 000	200 000	—	276 000	323 000
M24 × 2	384	86 400	119 000	108 000	146 000	169 000	230 000	—	319 000	372 000
M27 × 2	496	112 000	154 000	139 000	188 000	218 000	298 000	—	412 000	481 000
M30 × 2	621	140 000	192 000	174 000	236 000	273 000	373 000	—	515 000	602 000
M33 × 2	761	171 000	236 000	213 000	289 000	335 000	457 000	—	632 000	738 000
M36 × 3	865	195 000	268 000	242 000	329 000	381 000	519 000	—	718 000	839 000
M39 × 3	1 030	232 000	319 000	288 000	391 000	453 000	618 000	—	855 000	999 000

[a] To calculate $A_{s,nom}$, see 9.1.6.1.

Table 6 — Minimum ultimate tensile loads — ISO metric fine pitch thread

Thread $d \times P$	Nominal stress area $A_{s,nom}$ [a] mm²	Property class 4.6	4.8	5.6	5.8	6.8	8.8	9.8	10.9	12.9/12.9
		Minimum ultimate tensile load, $F_{m,min}$ ($A_{s,nom} \times R_{m,min}$), N								
M8 × 1	39,2	15 700	16 500	19 600	20 400	23 500	31 360	35 300	40 800	47 800
M10 × 1,25	61,2	24 500	25 700	30 600	31 800	36 700	49 000	55 100	63 600	74 700
M10 × 1	64,5	25 800	27 100	32 300	33 500	38 700	51 600	58 100	67 100	78 700
M12 × 1,5	88,1	35 200	37 000	44 100	45 800	52 900	70 500	79 300	91 600	107 000
M12 × 1,25	92,1	36 800	38 700	46 100	47 900	55 300	73 700	82 900	95 800	112 000
M14 × 1,5	125	50 000	52 500	62 500	65 000	75 000	100 000	112 000	130 000	152 000
M16 × 1,5	167	66 800	70 100	83 500	86 800	100 000	134 000	150 000	174 000	204 000
M18 × 1,5	216	86 400	90 700	108 000	112 000	130 000	179 000	—	225 000	264 000
M20 × 1,5	272	109 000	114 000	136 000	141 000	163 000	226 000	—	283 000	332 000
M22 × 1,5	333	133 000	140 000	166 000	173 000	200 000	276 000	—	346 000	406 000
M24 × 2	384	154 000	161 000	192 000	200 000	230 000	319 000	—	399 000	469 000
M27 × 2	496	198 000	208 000	248 000	258 000	298 000	412 000	—	516 000	605 000
M30 × 2	621	248 000	261 000	310 000	323 000	373 000	515 000	—	646 000	758 000
M33 × 2	761	304 000	320 000	380 000	396 000	457 000	632 000	—	791 000	928 000
M36 × 3	865	346 000	363 000	432 000	450 000	519 000	718 000	—	900 000	1 055 000
M39 × 3	1 030	412 000	433 000	515 000	536 000	618 000	855 000	—	1 070 000	1 260 000

[a] To calculate $A_{s,nom}$, see 9.1.6.1.

Table 3 — Mechanical and physical properties of bolts, screws and studs

No.	Mechanical or physical property		Property class									
			4.6	4.8	5.6	5.8	6.8	8.8		9.8	10.9	12.9/ 12.9
								$d \leqslant$ 16 mm [a]	$d >$ 16 mm [b]	$d \leqslant$ 16 mm		
1	Tensile strength, R_m, MPa	nom. [c]	400		500		600	800		900	1 000	1 200
		min.	400	420	500	520	600	800	830	900	1 040	1 220
2	Lower yield strength, R_{eL} [d], MPa	nom. [c]	240	—	300	—	—	—	—	—	—	—
		min.	240	—	300	—	—	—	—	—	—	—
3	Stress at 0,2 % non-proportional elongation, $R_{p0,2}$, MPa	nom. [c]	—	—	—	—	—	640	640	720	900	1 080
		min.	—	—	—	—	—	640	660	720	940	1 100
4	Stress at 0,0048 d non-proportional elongation for full-size fasteners, R_{pf}, MPa	nom. [c]	—	320	—	400	480	—	—	—	—	—
		min.	—	340 [e]	—	420 [e]	480 [e]	—	—	—	—	—
5	Stress under proof load, S_p [f], MPa	nom.	225	310	280	380	440	580	600	650	830	970
	Proof strength ratio $S_{p,nom}/R_{eL\,min}$ or $S_{p,nom}/R_{p0,2\,min}$ or $S_{p,nom}/R_{pf\,min}$		0,94	0,91	0,93	0,90	0,92	0,91	0,91	0,90	0,88	0,88
6	Percentage elongation after fracture for machined test pieces, A, %	min.	22	—	20	—	—	12	12	10	9	8
7	Percentage reduction of area after fracture for machined test pieces, Z, %	min.	—					52		48	48	44
8	Elongation after fracture for full-size fasteners, A_f (see also Annex C)	min.	—	0,24	—	0,22	0,20	—	—	—	—	—
9	Head soundness		No fracture									
10	Vickers hardness, HV $F \geqslant 98$ N	min.	120	130	155	160	190	250	255	290	320	385
		max.	220 [g]				250	320	335	360	380	435
11	Brinell hardness, HBW $F = 30\,D^2$	min.	114	124	147	152	181	238	242	276	304	366
		max.	209 [g]				238	304	318	342	361	414
12	Rockwell hardness, HRB	min.	67	71	79	82	89	—				
		max.	95,0 [g]				99,5	—				
	Rockwell hardness, HRC	min.	—					22	23	28	32	39
		max.	—					32	34	37	39	44
13	Surface hardness, HV 0,3	max.	—					h			h, i	h, j
14	Height of non-decarburized thread zone, E, mm	min.	—					$^1/_2\,H_1$			$^2/_3\,H_1$	$^3/_4\,H_1$
	Depth of complete decarburization in the thread, G, mm	max.	—					0,015				
15	Reduction of hardness after retempering, HV	max.	—					20				
16	Breaking torque, M_B, N·m	min.	—					in accordance with ISO 898-7				
17	Impact strength, K_V [k, l], J	min.	—		27		—	27	27	27	27	m
18	Surface integrity in accordance with		ISO 6157-1 [n]									ISO 6157-3

[a] Values do not apply for structural bolting.

[b] For structural bolting $d \geqslant$ M12.

[c] Nominal values are specified only for the purpose of the designation system for property classes. See Clause 5.

[d] In cases where the lower yield strength R_{eL} cannot be determined, it is permissible to measure the stress at 0,2 % non-proportional elongation $R_{p0,2}$.

[e] For the property classes 4.8, 5.8 and 6.8 the values for $R_{pf\,min}$ are under investigation. The present values are given for calculation of the proof stress ratio only. They are not test values.

[f] Proof loads are specified in Tables 5 and 7.

[g] Hardness determined at the end of a fastener shall be 250 HV, 238 HB or 99,5 HRB maximum.

[h] Surface hardness shall not be more than 30 Vickers points above the measured core hardness of the fastener when determination of both surface hardness and core hardness are carried out with HV 0,3.

[i] Any increase in hardness at the surface which indicates that the surface hardness exceeds 390 HV is not acceptable.

[j] Any increase in hardness at the surface which indicates that the surface hardness exceeds 435 HV is not acceptable.

[k] Values are determined at a test temperature of −20 °C, see 9.14.

[l] Applies to $d \geqslant$ 16 mm.

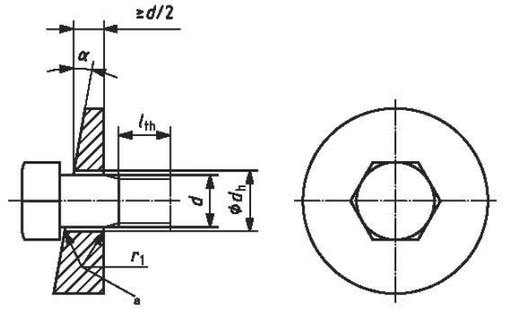
[m] Value for K_V is under investigation.

[n] Instead of ISO 6157-1, ISO 6157-3 may apply by agreement between the manufacturer and the purchaser.

Table 14 — Thread tolerance classes of internally threaded adaptors

Finish of fastener	Thread tolerance class	
	Thread tolerance class of fastener before any surface coating	Thread tolerance class of internally threaded adaptor
As processed	6h or 6g	6H
Electroplating to ISO 4042	6g or 6e or 6f	6H
Zinc flake coating to ISO 10683	6g or 6e or 6f	6H
Hot dip galvanizing to ISO 10684 in order to mate with nuts tapped to thread tolerance classes:		
— 6H	6az	6H
— 6AZ	6g or 6h	6AZ
— 6AX	6g or 6h	6AX

The testing device should be sufficiently rigid to ensure that bending occurs in the transition section between the head and the unthreaded shank or the thread.



[a] Radius or chamfer of 45°. See Table 15.