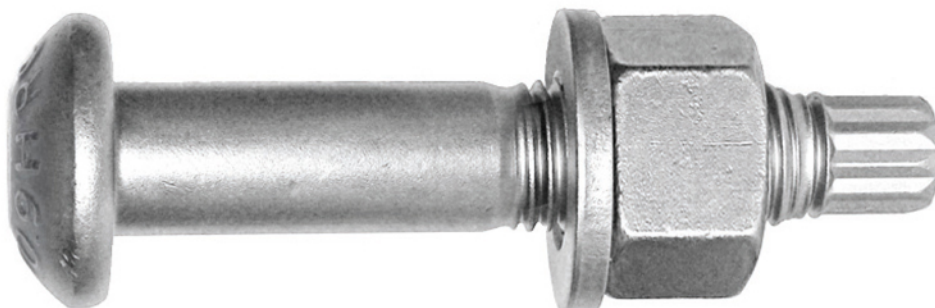




Technical

- Consistent tension
- Visual inspection
- Higher grade steel and increased pre-load facilitates the use of smaller diameter bolts
- TCBs can be used in Shear and Tension
- No bolt relaxation since no torsional shear is induced during tightening
- Does not loosen with vibration – no locknut required
- Greenkote® metal finish has a very hard surface and does not crack or flake
- Greenkote® metal finish accepts paint without any preparation

Cost saving

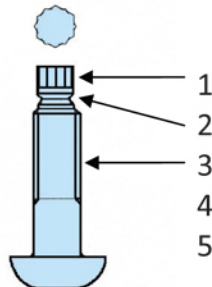
- Quick, safe and easy to install
- One man installation
- Reduced tool maintenance
- One tool can install several diameters
- Tools do not self destruct so last many years
- Greenkote® metal finish requires no further treatment which means less time at site

Safety

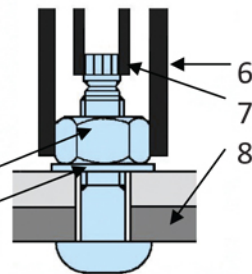
- Non-impacting electric shear wrenches
- No risk of HAVS (hand-arm vibration syndrome)
- Reduced operator fatigue
- No air compressors with dangerous pipes & cables
- Low on-site noise – under HSE minimum levels
- No heavy calibrated torque wrenches required
- Ultra-light weight wrenches of varying shapes & sizes
- No acid required to etch bolts prior to painting due to special Greenkote® metal finish

Installation procedure

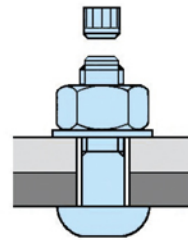
Before installation



During installation

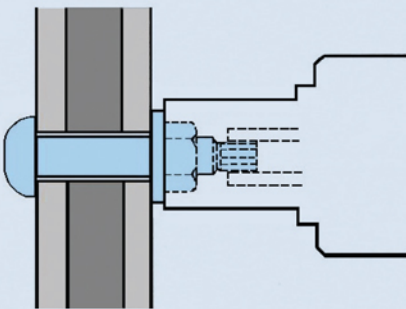


After installation



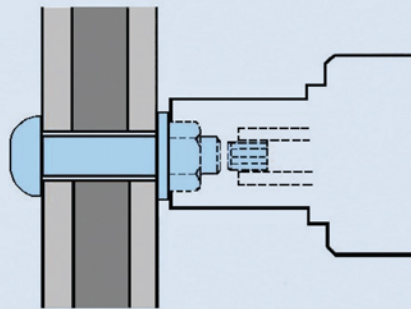
- 1 Spline
- 2 Break-neck
- 3 Thread
- 4 HRD Nut
- 5 Washer
- 6 Outer socket
- 7 Inner socket
- 8 Grip

1



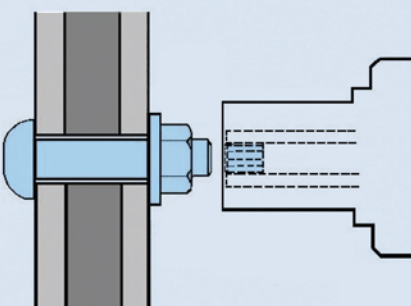
The inner socket of the shear wrench fits over the bolts spline while the outer socket fits over the nut.

2



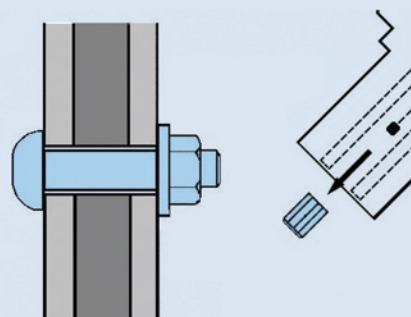
Press the trigger switch. The outer socket rotates clockwise and tightens the nut. When the correct preload is reached the outer socket stops rotating, the inner socket counter rotates and shears the spline off.

3



Stop the wrench and pull the outer socket off the nut. The spline is retained in the inner socket.

4

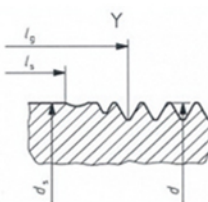
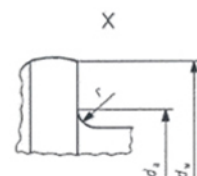


The wrench has a second trigger to eject the spline safely. The bolt is now properly installed with the correct tension.

Specifications, mechanical properties and standards for bolts

General requirements	EN 14399-1
Thread tolerance	6g
Thread standards	ISO 261, ISO 965-2
Mechanical properties: property class	10.9
Mechanical properties: standard	EN ISO 898-1
Dimensions and tolerances	EN 14399-10
Product marking	EN 14399-10

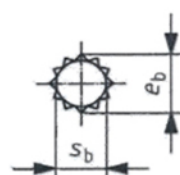
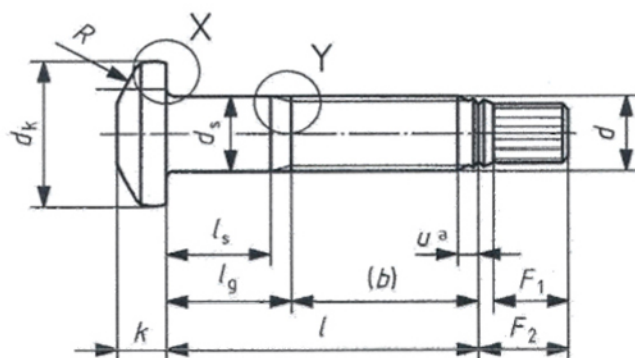
Nominal $\varnothing$	Stress area mm ²	Proof load min kN	Ultimate load kN	Hardness Rockwell	
				min	max
M12	84.3	70	87.7	32	39
M16	157	130	163		
M20	245	203	255		
M22	303	252	315		
M24	353	293	367		
M27	459	381	477		
M30	561	466	583		
M36	817	678	850		



Dimensions of bolts^a



Bolt head marking



Thread d		All dimensions in millimetres							
		M12	M16	M20	M22	M24	M27	M30	M36
p^b		1.75	2	2.5	2.5	3	3	3.5	4
b (ref)	c	30	38	46	50	54	60	66	78
	d	-	44	52	56	60	66	72	84
	e	-	-	65	69	73	79	85	97
d_a	max	15.2	19.2	24.4	26.4	28.4	32.4	35.4	42.4
d_s	max	12.7	16.7	20.84	22.84	24.84	27.84	30.84	37.00
	min	11.3	15.3	19.16	21.16	23.16	26.16	29.16	35.00
d_k	min	21	27	34	38.5	43	48	52	66
d_w	min	20	26	33	37	41	46	50	61
k	nom	8	10	13	14	15	17	19	23
	max	8.8	10.8	13.9	14.9	15.9	17.9	20.0	24.0
	min	7.2	9.2	12.1	13.1	14.1	16.1	18.0	22.0
r	min	1.2	1.2	1.5	1.5	1.5	2.0	2.0	2.0
R	nom	18	20	22	23	25	27	30	36
F_1	min	11	13	15	15.5	16	19	21	25
F_2	max	16	18	20	21	21.5	24	26	31
U^a		Incomplete thread $u \leq 2 p$							

^a – the dimensions apply before coating

^b – p is the pitch of thread

^c – for lengths $l_{nom} \leq 125mm$

^d – for lengths $125mm < l_{nom} \leq 200mm$

^e – for lengths $l_{nom} > 200mm$

Note – $l_{gmax} = l_{nom} - b$, $l_{smin} = l_{gmax} - 5 p$

Note – when l_{smin} as calculated by the formula in f is less than $0.5d$ then its value shall be $0.5d$ and $l_{gmax} = l_{smin} + 3p$

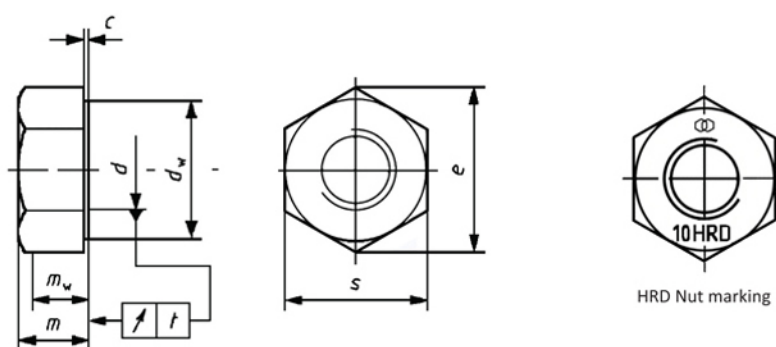
Specifications, mechanical properties and standards for nuts

General requirements	EN 14399-1
Thread tolerance	6H pre-coating + 0.3mm
Thread standards	ISO 261, ISO 965-2
Mechanical properties; property class	10
Mechanical properties; standard	EN 20898-2

Proof load value and hardness of nuts

Thread d	Nominal stress area of standard test mandrel mm ²	Proof load kN HRD ^a Nuts (nuts with height $m = 1 d$)	Vickers Hardness	
			Min	Max
M12	84.3	104.9	272	353
M16	157	195.5		
M20	245	305.0		
M22	303	377.2		
M24	353	439.5		
M27	459	571.5		
M30	561	698.4		
M36	817	1017.1		

^a – the proof load values are based on the stress under proof load of 1,245 MPa



Dimensions of HRD nuts ^a

All dimensions in millimetres									
Thread d	M12	M16	M20	M22	M24	M27	M30	M36	
p^b	1.75	2	2.5	2.5	3	3	3.5	4	
d_a	max	13	17.3	21.6	23.7	25.9	29.1	32.4	38.9
	min	12	16	20	22	24	27	30	36
d_w	max	^c							
	min	20.1	24.9	29.5	33.3	38.0	42.8	46.6	55.9
e	min	23.91	29.56	35.03	39.55	45.20	50.85	55.37	66.44
m	max	12.35	16.35	20.65	22.65	24.65	27.65	30.65	36.65
	min	11.65	15.65	19.35	21.35	23.35	26.35	29.35	35.35
m_w	min	9.32	12.52	15.48	17.08	18.68	21.08	23.48	28.28
	max	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
c	min	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	max	22	27	32	36	41	46	50	60
s	min	21.16	26.16	31	35	40	45	49	58.8
t		0.38	0.47	0.58	0.63	0.72	0.80	0.87	1.05

^a – dimensions apply after Greenkote®

^b – p is the pitch of thread

^c – $d_w \text{ max} = s \text{ actual}$

Specifications, mechanical properties and standards for washers

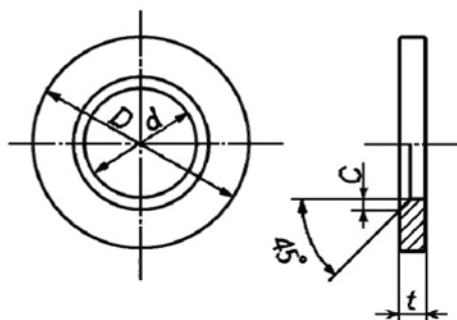
General requirements	JIS B 1186	Nominal diameter	Vickers hardness (HRC)	
Mechanical properties; standard	JIS B 1186		min	max
Dimensions and tolerances	JIS B 1186	M16 to M36	35	45

Dimensions of JIS B 1186 washers ^a

All dimensions in millimetres

Nominal		M12	M16	M20	M22	M24	M27	M30	M36
d	nom	13	17	21	23	25	28	31	37
	tolerance	+0.7	+0.7	+0.8	+0.8	+0.8	+0.8	+1.0	+1.0
		-0	-0	-0	-0	-0	-0	-0	-0
D	nom	26	32	40	44	48	56	60	72
	tolerance	+0	+0	+0	+0	+0	+0	+0	+0
		-0.8	-1.0	-1.0	-1.0	-1.0	-1.2	-1.2	-1.2
t	nom	3.2	4.5	4.5	6.0	6.0	6.0	8.0	8.0
	tolerance	± 0.4	± 0.5	± 0.5	± 0.7	± 0.7	± 0.7	± 0.7	± 0.7
c	approx	1.5	1.5	2.0	2.0	2.4	2.4	2.8	2.8

^a – dimensions apply before Greenkote®



Minimum specified preloads

Thread <i>d</i>	Nominal stress area of standard test mandrel <i>A_s</i> mm ²	<i>F_r</i> min 0.7 x <i>f_{ub}</i> x <i>A_s</i> ^a kN	<i>F_r</i> mean min 0.77 x <i>f_{ub}</i> x <i>A_s</i> ^a kN
		<i>Minimum individual value of bolt force at spline shear when tested in accordance with EN 14399-2 & 10</i>	<i>Minimum mean value of bolt force at spline shear of 5 sets tested in accordance with EN 14399-2 & 10</i>
M12	84.3	59.01	64.911
M16	157	109.9	120.89
M20	245	171.5	188.65
M22	303	212.1	233.31
M24	353	247.1	271.81
M27	459	321.3	353.43
M30	561	392.7	431.97
M36	817	571.9	629.09

^a *f_{ub}* is the nominal tensile strength of the bolt (*R_m*, nom)

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