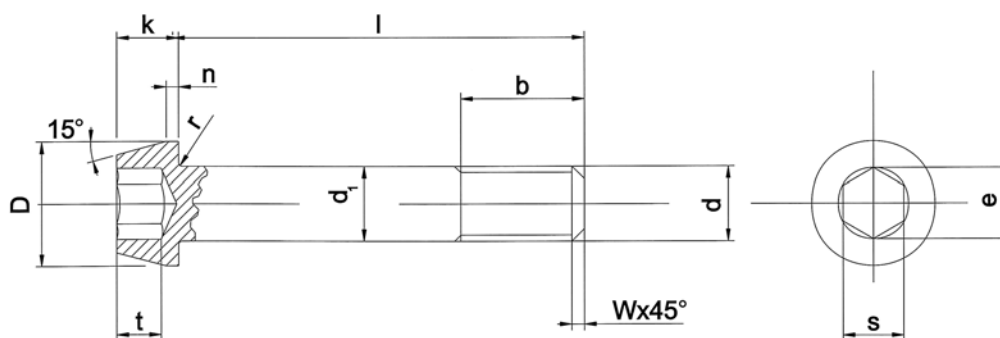


Le viti LLS sono stampate a caldo e con il filetto rullato
LLS screws are all hot forged and with rolled thread

Confronto tra le proprietà meccaniche della lega di titanio 6AL 4V ed altri materiali strutturali
 Comparison between mechanical properties of titanium 6AL 4V alloy and other structural materials

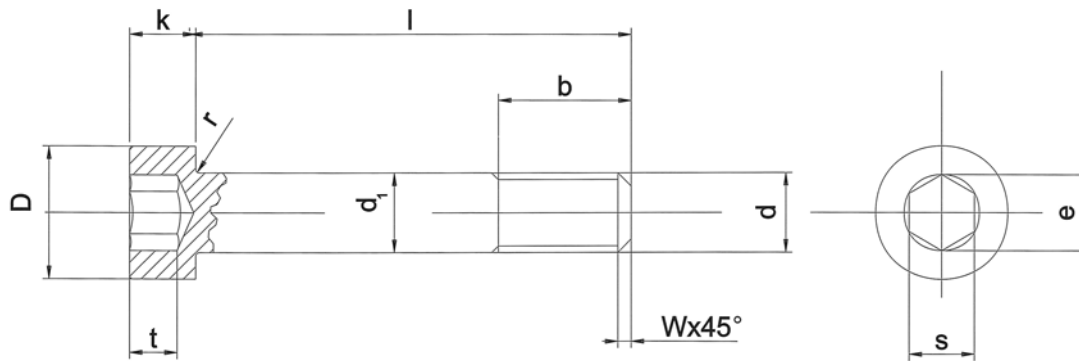
	Ti 6Al 4V	Acciaio al carbonio	Acciaio microlegato	Acciaio inox	Lega AL 7075 T6	Superlega (hastelloy)
Densità Kg/dm ³ Density Kg/dm ³	4.4	7.8	7.8	7.9	2.7	8.9
Resist. a trazione N/mm ² Tensile strength N/mm ²	902	441	687	587	600	530
Resist. a snerv. N/mm ² Yield strength N/mm ²	824	294	539	285	530	313
Allungamento % Stretching %	12	30	25	54	8	15
Modulo elastico (N/mm ²) Modulus of elasticity (N/mm ²)	108.000	207.000	210.000	199.000	70.000	196.000

Per ulteriori informazioni richiedere il catalogo tecnico / For more infos please ask for technical catalogue



Viti a testa conica cava esagonale / Hexagon socket head cap screws

TCCE (UNI 5931) - (DIN 912)				
FILETT. (Thread) d	M6	M8	M10	M12
d1	6	8	10	12
s	5	6	8	10
k	6	8	10	12
D	10	13	16	18
t	3	4	5	6

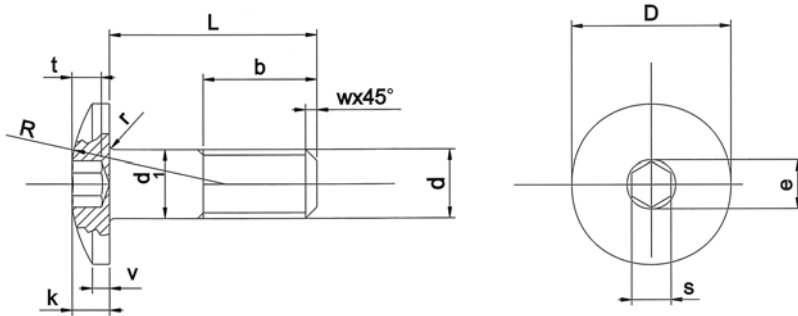


Viti a testa cilindrica cava esagonale / Hexagon socket head cap screws

TCEI UNI 5931 - DIN 912

FILETT. (Thread) d	M3	M4	M5	M6	M8	M10	M12
d1	3	4	5	6	8	10	12
s	2.5	3	4	5	6	8	10
k	3	4	5	6	8	10	12
D	5.5	7	8.5	10	13	16	18
t	1.3	2	2.5	3	4	5	6

Viti testa cilindrica bombata esag. incass.
Hexagon socket recessed pan head screws



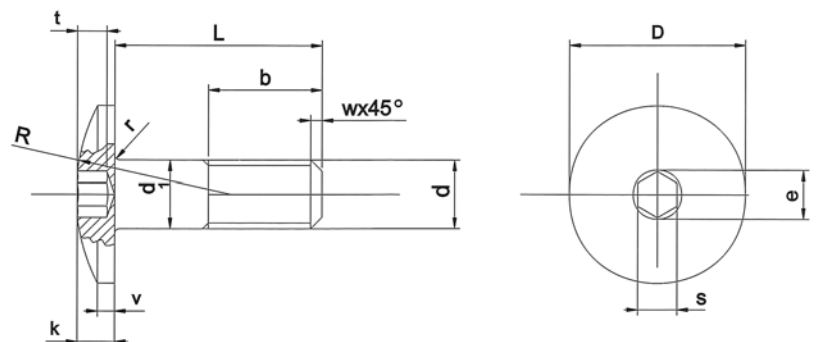
TCBEI Special

FILETT. (Thread) d	M4	M5	M6	M8	M10
d1	4	5	6	8	10
s	2.5	3	4	5	6
k	2.50	3	3.50	4	4.50
D	10	12	14	16	18
t	1.8	2	2.30	2.80	3

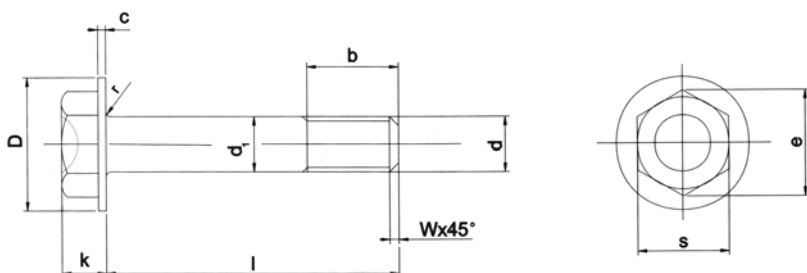
Viti a testa tonda larga esag. incass.
Slotted round large head hex. socket

TTLEI Special

FILETT. (Thread) d	M5	M6	M8
d1	5	6	8
s	3	4	5
k	3	3.50	4
D	14	16	22
t min.	2	2.5	3

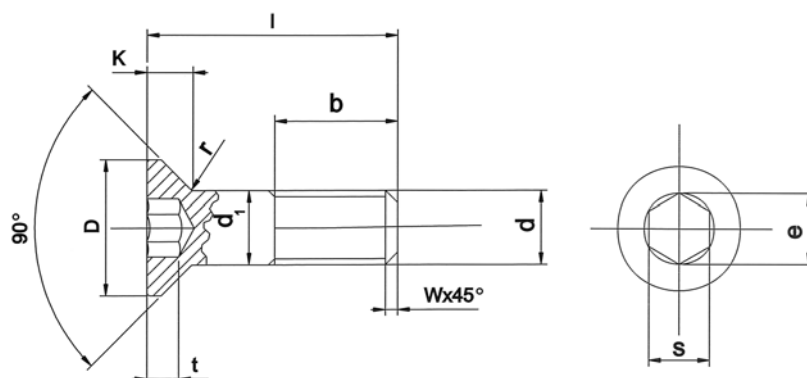


Viti testa esagonale con rond.
Hexagon screws with washer



TER Special					
FILETT. (Thread) d	M4	M5	M6	M8	M10
d1	4	5	6	8	10
s	7	7	8	12	14
k	4.50	5	5.50	6	7
D	10	10	12	16	19
c	1	1.3	1.5	1.6	1.8

Per ulteriori Informazioni richiedere il catalogo tecnico
For more infos please ask for technical catalogue



Viti a testa svasata piana esagono incassato / Hexagon socket countersunk flat head cap screws

TSPEI UNI 5933 - DIN 7991

FILETT. (Thread) d	M3	M4	M5	M6	M8	M10	M12
d1	3	4	5	6	8	10	12
D	6	8	10	12	16	20	24
k	1.7	2.3	2.8	3.3	4.4	5.5	6.5
b	12	14	16	18	22	26	30
t nom.	1.2	1.8	2.3	2.5	3.5	4.4	4.6
l max	30	50	60	140	140	140	140

(*) Coppie di serraggio "M" consigliate per viti in Titanio GR 5 ed Al 7075 (ergal)

Tightening moment "M" for Titanium GR 5 and aluminum (Al 7075) screws

Diametro vite Diameter screw	M (Nm) Tit gr5	M (Nm) Al 7075 (Ergal)
M 3	1.73	0.75
M 4	3.57	1.5
M 5	6.9	3.0
M 6	11.1	5.2
M 8	28.3	12.3
M 10	57.6	25.0
M 12	97.5	42.4
M 14	155.2	67.5
M 16	235.7	102.5

* N.B.: Valido per viti DIN 931, DIN 912 e TER / Modulus of elasticity (N/mm²)

viteria / screws

Alloys Titanium commercial

Designation	Impurity Limits %					Nominal Composition %				
	N	C	H	Fe	O	Al	Sn	Zi	Mo	Others
Unalloyed Grades										
ASTM Grade 1	0.03	0.10	0.015	0.20	0.18	...	....	...	...	...
ASTM Grade 2	0.03	0.10	0.015	0.30	0.35	...	....	...	...	...
ASTM Grade 4	0.05	0.10	0.015	0.5	0.470	...	....	...	...	...
ASTM Grade 7	0.03	0.10	0.015	0.30	0.25	...	....	...	...	0.2 Pd
Alpha Beta Alloys										
Ti 6Al 4V Grade 5	0.05	0.1	0.0125	0.30	0.20	6	....	...	...	4 V
Ti 6Al 4V ELI	0.05	0.08	0.0125	0.25	0.13	6	....	...	...	4 V
Ti 3Al 2.5V Grade 9	0.015	0.05	0.015	0.30	0.12	3.0	....	...	...	2.5 V

Physical and mechanical characteristics of Titanium and its Alloy.

GRADE	Commercially pure Titanium				Alpha + Beta Titanium Alloy		
	Grado 1	Grado 2	Grado 4	Grado 7	Grado 5	Grado 5 ELI	Grado 9
Rm (MPa)	240	345	550	345	900	900	620
Rp02 (MPa)	170	275	485	375	830	830	520
Allungam. %	24	20	15	20	10	10	15
KCU resilienza (J)	110-160	40-80	14-27	40-80	15-20	24	54
Durezza	120 HB/30	160 HB/30	250 HB/30	160 HB/30	36 HRC	35 HRC	20 HRC
Peso spec. Kg/dm ³	4.51	4.51	4.51	4.51	4.4	4.4	4.48
Modulo di elasticità normale (GPa)	103	103	107	107	110	110	103
Modulo di elasticità tangenziale (GPa)	40	40	40	40	40	40	40
Saldabilità	ottima	ottima	ottima	ottima	buona	buona	ottima
Temp di fucinat. (°C)	870-930	870-930	900-930	900-930	950-980	950-980	870-900
Temp di Stamp. (°C)	815-870	815-870	840-870	815-870	900-950	900-950	760-815
Beta Transus (°C +/- 25°)	882	900	940	900	1000	990	795
Tipologia di semilavorati	Barre billetta lamiera filo tubo vergella	Barre billetta lamiera filo tubo vergella	Barre billetta lamiera filo tubo vergella	Barre billetta lamiera filo tubo vergella	Barre billetta lamiera filo tubo vergella	Barre billetta lamiera filo tubo vergella	Barre billetta lamiera filo tubo vergella
Applicazioni	Nell' industria chimica e navale per la resistenza alla corrosione. Nei componenti aeronautici in cui si desidera la massima formabilità				Componenti di motori di aereo. Viteria, strutture aeronautiche. è la lega più usata	Alta tenacità alla frattura, basse temperature di esercizio. Usato per applicazioni Biomediche e marine.	Condotti oleodinamici in aeronautica. Il carico di rottura può essere aumentato a 700 Mpa con deformazione a freddo.



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The following table shows physical characteristics of Alloy TiAl4V (the most used) and other materials.

Table 1 - COMPARISON BETWEEN MECHANICAL PROPERTIES OF TITANIUM 6Al 4V ALLOY AND OTHER STRUCTURAL MATERIALS.						
	Ti 6Al 4V	Acciaio al Carbonio	Acciaio microlegato	Acciaio Inox	Lega Al 7075 T6	Super lega (Hastelloy)
Density Kg/dm ³	4.4	7.8	7.8	7.9	2.7	8.9
Pullout strength N/mm ²	902	441	687	587	600	530
Yield strength N/mm ²	824	294	539	285	530	313
Stretching %	12	30	25	54	8	15
Modulus of elasticity (N/mm ²)	108.000	207.000	210.000	199.000	70.000	196.000
		Medium values				

• **SECTORS OF APPLICATION**

L.L.S. products find their placing into different fields, such as:

SECTORS	GENERALLY USED MATERIALS
• Transport (cycling, motor-cycling, motoring ...)	Tit Gr 5, Al 7075
• Chemistry and petrochemistry	Tit Gr 2-4
• Dental and bony implantology	Tit Gr 5 ELI e Tit Gr 4
• Galvanic and anodic oxidation	Tit Gr 2-3-4
• Aircraft and featherweight flight	Tit Gr 5
• Navigation	Tit Gr 2, Al 7075
• Navy and defense armaments	Tit Gr 5, Tit Gr 2
• Nuclear	Tit Gr 5
• Sports and hobbies	Tit Gr 5, Al 7075

A detailed description of L.L.S. products will follow (specially in Tit.gr.5, gr.2 and Al7075): all of them are generally available at stock.



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**COPPIE DI SERRAGGIO "M" CONSIGLIATE PER VITI
IN TITANIO GR 5 ED AL 7075 (ERGAL)
(TIGHTENING MOMENT "M" FOR TITANIUM GR5 AND
ALLUMINIUM (AL7075) SCREWS)**

Diametro vite (Diameter screw)	M (N m) Tit gr5	M (N m) Al 7075 (Ergal)
M 3	1.73	0.75
M 4	3.57	1.5
M 5	6.9	3.0
M 6	11.1	5.2
M 8	28.3	12.3
M 10	57.6	25.0
M 12	97.5	42.4
M 14	155.2	67.5
M 16	235.7	102.5

**SOSTITUIBILITA' DELLE VITI IN ACCIAIO CON
I NOSTRI PRODOTTI**

(POSSIBILITY OF SUBSTITUTION OF THE STEEL SCREWS WITH OUR PRODUCTS)

Class of resist. of bolts in steel		3.6	4.6	4.8	5.6	5.8	6.8	8.8 <=M16 >M16		10.9	12.9
Unitary tensile Rm N/mm ²	nom.	300	400	400	500	500	600	800	800	1000	1200
	min.	330	400	420	500	520	600	800	830	1040	1220
Unitary yield point Rel N/mm ²	nom.	180	240	320	300	400	480				
	min.	190	240	340	300	420	480				
Unit. dev. of prop. R _{p02} N/mm ²	nom.							640	640	900	1080
	min.							640	640	940	1100
Vickers hardness HV.F>=98 N	nom.	95	120	130	155	160	190	250	258	320	375
	max.	220	220	220	220	220	250	310	320	375	430
Substitution with Ti Gr 5		⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	
Substitution with Al 7075		⊗	⊗	⊗	⊗						

COMMERCIALLY PURE TITANIUM AND ALLOYS TITANIUM SPECIFICATIONS

SPECIFICATIONS												
RMI	AFNOR	AIR	DIN	ALEM ANDES LW	ENGLISH DTD	ENGLISH BSTA	AICMA	AMS	MIL-T	ASTM B 265 348 381 337 338 382	EQUIV. IMI	EQUIV. KRUPP
COMMERCIALLY PURE TITANIUM												
RMI 40	T40	9182	DIN 17850 17860 17862 17863 17864	LW 37034 37035	DTD 5073	BSTA 2-3 ,4,5	TiP02	4902 4951 4941	MIL T type 9046 comp A	Grade 2	125	RT15
RMI 70	T60	9182	DIN 17850 7860 17862 17863 17864	LW 37064 37065	DTD 5063	BSTA 6 7,8,9	TiP04	4901 4921	MIL T type 1 9046 comp B	Grade 4	160	RT20
RMI 0.2%PD	T40 PD	--	DIN 17850 7860 17862 17863 17864	--	--	--	--	--	--	Grade 7	260	RT12 PD
ALLOYS TITANIUM COMMERCIAL												
6Al4V	TA6V	9183	18850/51 18860/62/64	LW 37165	--	TA 10-11- 12-13-28- 56	Ti P63	4928 4935 4965 4911 4906 4954	9046 type 3 comp C 9047 class 6	Grade 5	318	RT31
3Al2.5V	TA3V2.5	--	--	--	--	--	--	--	--	Grade 9	--	--