

HEXAGONAL HEAD BOLT

- Cylindrical metal connector with CE marking according to EN 14592
- Carbon steel of strength grade 8.8 for all hexagonal head bolts (KOS)
- Hexagonal head bolt supplied with an incorporated nut (for the carbon steel version)
- Available also in A2 | AISI304 stainless steel for outdoor applications (service class 3)



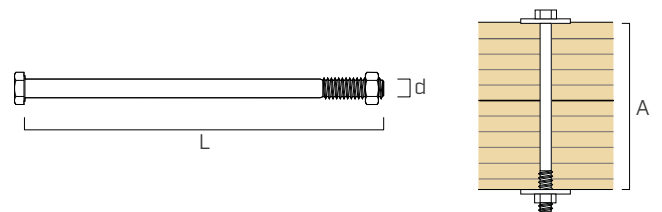
CODES AND DIMENSIONS

KOS – hexagonal head bolt with nut and CE marking

Steel class 8.8 - zinc plated
DIN 601 (ISO 4016*)

d [mm]	CODE	L [mm]	A _{max} [mm]	pcs
M12	KOS12100B	100	75	25
	KOS12120B	120	95	25
	KOS12140B	140	115	25
	KOS12160B	160	135	25
	KOS12180B	180	155	25
	KOS12200B	200	175	25
	KOS12220B	220	195	25
	KOS12240B	240	215	25
	KOS12260B	260	235	25
	KOS12280B	280	255	25
	KOS12300B	300	275	25
	KOS12320B	320	295	25
	KOS12340B	340	315	25
	KOS12360B	360	335	25
	KOS12380B	380	355	25
	KOS12400B	400	375	25
M16	KOS16140B	140	105	15
	KOS16160B	160	125	15
	KOS16180B	180	145	15
	KOS16200B	200	165	15
	KOS16220B	220	185	15
	KOS16240B	240	205	15
	KOS16260B	260	225	15
	KOS16280B	280	245	15
	KOS16300B	300	265	15
	KOS16320B	320	285	15
	KOS16340B	340	305	15
	KOS16360B	360	325	15
	KOS16380B	380	345	15
	KOS16400B	400	365	15
	KOS16420B	420	385	15
	KOS16440B	440	405	15
KOS16460B	460	425	15	
KOS16500B	500	465	15	

d [mm]	CODE	L [mm]	A _{max} [mm]	pcs
M20	KOS20120B	120	75	10
	KOS20140B	140	95	10
	KOS20160B	160	115	10
	KOS20180B	180	135	10
	KOS20200B	200	155	10
	KOS20220B	220	175	10
	KOS20240B	240	195	10
	KOS20260B	260	215	10
	KOS20280B	280	235	10
	KOS20300B	300	255	10
	KOS20320B	320	275	10
	KOS20340B	340	295	10
	KOS20360B	360	315	10
	KOS20380B	380	335	10
	KOS20400B	400	355	10
	KOS20420B	420	375	10
KOS20440B	440	395	10	
KOS20460B	460	415	10	



The maximum thickness A is evaluated considering a nut MUT934 and two ULS 440 washers.

* Standard ISO 4016 differs from standard DIN 601 in the M12 diameter for parameter SW.

KOS A2 | AISI304 - hexagonal head bolt

A2 | AISI304 stainless steel
DIN 931 (ISO 4014*)

A2
AISI 304

d [mm]	CODE	L [mm]	pcs
M12	AI60112100	100	25
	AI60112120	120	25
	AI60112140	140	25
	AI60112160	160	10
	AI60112180	180	10
	AI60112200	200	10
	AI60112220	220	10
	AI60112240	240	10
	AI60112260	260	10
	M16	AI60116120	120
AI60116140		140	25
AI60116150		150	25
AI60116160		160	10
AI60116180		180	10
AI60116200		200	10
AI60116220		220	10
AI60116240		240	10
AI60116260		260	10
AI60116280		280	10
AI60116300	300	10	

d [mm]	CODE	L [mm]	pcs
M20	AI60120160	160	10
	AI60120180	180	10
	AI60120200	200	10
	AI60120220	220	10
	AI60120240	240	10
	AI60120260	260	10
	AI60120280	280	10
	AI60120300	300	5
	AI60120320	320	5
	AI60120340	340	5
AI60120360	360	5	
AI60120380	380	5	
AI60120400	400	5	



* Standard ISO 4014 differs from standard DIN 931 in the M12 diameter for parameter SW.

MATERIAL AND DURABILITY

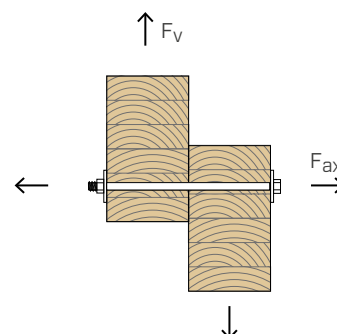
KOS: strength grade 8.8 bright zinc plated carbon steel.
Use for service classes 1 and 2 (EN 1995-1-1).

KOS A2 | AISI304: A2 | AISI304 stainless steel.
To be used in service class 3 (EN 1995-1-1).

FIELD OF USE

- Timber-to-timber joints
- Timber-to-steel joints

EXTERNAL LOADS



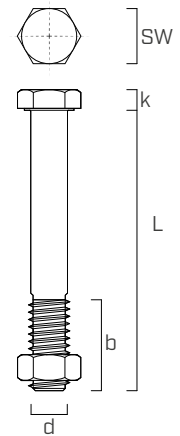
GEOMETRY AND MECHANICAL CHARACTERISTICS | KOS

Nominal diameter	d	[mm]	M12	M16	M20
Wrench	SW	[mm]	19	24	30
Head thickness	k	[mm]	7,5	10,0	12,5
Thread length	b	[mm] $L \leq 125$ mm	30	38	46
		[mm] $125 < L \leq 200$ mm	36	44	52
		[mm] $L > 200$ mm	49	57	65

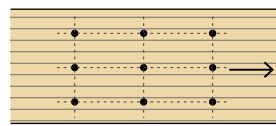
Design according to standard DIN 601 (ISO 4016) and DIN 931 (ISO 4014).

Material	steel	8,8	8,8	8,8	
	$f_{u,k}$	[N/mm ²]	800	800	800
	$f_{y,k}$	[N/mm ²]	640	640	640
Characteristic yield moment	$M_{y,k}$	[Nmm]	153000	324000	579000

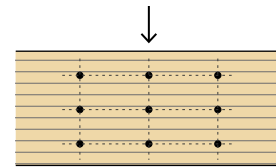
Mechanical parameters according to CE marking, in accordance with EN 14592.



MINIMUM DISTANCES FOR CONNECTORS SUBJECTED TO SHEAR STRESS⁽¹⁾



Load-to-grain angle $\alpha = 0^\circ$



Load-to-grain angle $\alpha = 90^\circ$

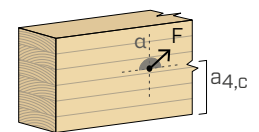
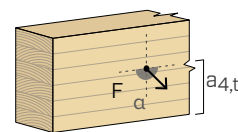
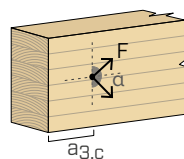
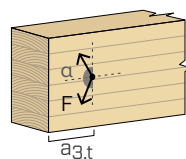
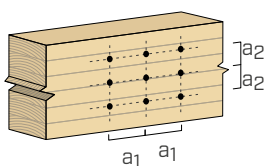
		12	16	20	12	16	20
a_1	[mm]	60	80	100	48	64	80
a_2	[mm]	48	64	80	48	64	80
$a_{3,t}$	[mm]	84	112	140	84	112	140
$a_{3,c}$	[mm]	48	64	80	84	112	140
$a_{4,t}$	[mm]	36	48	60	48	64	80
$a_{4,c}$	[mm]	36	48	60	36	48	60

stressed end
 $-90^\circ < \alpha < 90^\circ$

unloaded end
 $90^\circ < \alpha < 270^\circ$

stressed edge
 $0^\circ < \alpha < 180^\circ$

unload edge
 $180^\circ < \alpha < 360^\circ$

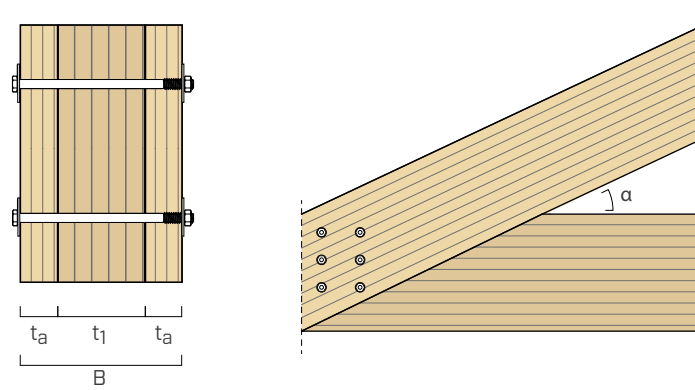


NOTES:

⁽¹⁾ The minimum distances are compliant with EN 1995-1-1.

STATIC VALUES | KOS

NODE WITH 3 WOODEN ELEMENTS



d	L	t _a	t ₁	R _{Vk,0°}	R _{Vk,30°}	R _{Vk,45°}	R _{Vk,60°}	R _{Vk,90°}
[mm]	[mm]	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]
12	220	60	60	20,0	20,0	20,0	19,3	18,5
	240	60	80	22,5	21,2	20,2	19,3	18,5
	260	60	100	22,5	21,2	20,2	19,3	18,5
	280	60	120	22,5	21,2	20,2	19,3	18,5
	300	80	100	26,0	24,3	22,9	21,7	20,7
	320	80	120	26,0	24,3	22,9	21,7	20,7
	340	80	140	26,0	24,3	22,9	21,7	20,7
	360	80	160	26,0	24,3	22,9	21,7	20,7
	≥ 380	-	-	26,8	26,1	25,4	24,4	23,2
16	280	80	80	33,9	33,9	33,8	32,2	30,5
	300	80	100	38,1	35,7	33,8	32,2	30,5
	320	80	120	38,1	35,7	33,8	32,2	30,5
	340	80	140	38,1	35,7	33,8	32,2	30,5
	360	80	160	38,1	35,7	33,8	32,2	30,5
	380	100	140	42,7	39,6	37,2	35,2	33,5
	400	100	160	42,7	39,6	37,2	35,2	33,5
	420	100	180	42,7	39,6	37,2	35,2	33,5
	440	100	200	42,7	39,6	37,2	35,2	33,5
	460	120	180	44,7	43,3	40,9	38,5	36,4
20	380	100	120	55,8	51,9	48,9	46,4	44,0
	400	100	140	55,8	51,9	48,9	46,4	44,0
	420	100	160	55,8	51,9	48,9	46,4	44,0
	440	100	180	55,8	51,9	48,9	46,4	44,0
	460	120	160	61,2	56,4	52,7	49,7	47,2

GENERAL PRINCIPLES:

- Characteristic values according to EN 1995-1-1.
- The design values are obtained from the characteristic values as follows:

$$R_d = \frac{R_k \cdot k_{mod}}{\gamma_M}$$

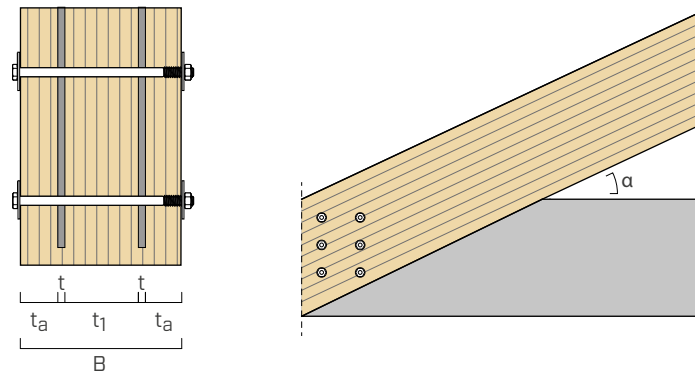
The coefficients γ_M and k_{mod} should be taken according to the current regulations used for the calculation.

- For the calculation process a timber density $\rho_k = 385 \text{ kg/m}^3$ has been considered.

- Dimensioning and verification of the timber elements must be carried out separately.
- The calculation was made taking into account the hollow effect of the bolt with DIN 9021 washers.
- The angle of inclination indicated for R_{V_k} is referred to the two external elements.

STATIC VALUES | KOS

NODE WITH 2 METAL BITS IN A WOODEN ELEMENT



d	L	B	t _a	t ₁	R _{Vk,0°}	R _{Vk,30°}	R _{Vk,45°}	R _{Vk,60°}	R _{Vk,90°}
[mm]	[mm]	[mm]	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]
12	140	100	29	45	34,3	30,3	27,1	24,6	22,4
	160	120	39	45	39,1	36,0	32,4	29,3	26,8
	180	140	39	65	45,8	41,9	37,7	34,1	31,2
	200	160	39	85	50,9	47,8	43,0	38,9	35,5
	220	180	49	85	52,0	48,6	44,6	41,4	38,7
	240	200	49	105	52,0	48,9	46,4	44,3	42,6
	260	220	59	105	53,6	50,2	47,5	45,2	43,3
	280	240	59	125	53,6	50,2	47,5	45,2	43,3
16	140	100	29	35	39,5	34,4	30,5	27,4	24,8
	160	120	29	55	47,9	41,8	37,0	33,2	30,2
	180	140	39	55	56,4	49,2	43,6	39,1	35,5
	200	160	39	75	64,9	56,6	50,1	45,0	40,8
	220	180	39	95	73,4	64,0	56,7	50,9	46,2
	240	200	49	95	80,5	71,4	63,2	56,8	51,5
	260	220	59	95	81,7	73,7	67,5	62,5	56,8
	280	240	59	115	86,1	80,7	74,0	68,4	62,2
20	160	100	28	47	52,0	44,8	39,3	35,0	31,5
	180	120	29	65	62,1	53,4	46,9	41,8	37,7
	200	140	29	85	72,2	62,1	54,5	48,6	43,8
	220	160	39	85	82,3	70,8	62,1	55,4	49,9
	240	180	49	85	92,4	79,5	69,8	62,1	56,0
	260	200	49	105	102,5	88,2	77,4	68,9	62,1
	280	220	59	105	111,2	96,9	85,0	75,7	68,3
	300	240	59	125	121,3	105,6	92,6	82,5	74,4

CORRECTIVE COEFFICIENT k_F FOR DIFFERENT DENSITIES ρ_k

Strength class	C24	GL22h	C30	GL24h	C40 / GL32c	GL28h	D24	D30
ρ _k [kg/m ³]	350	370	380	385	400	425	485	530
k _F	0,91	0,96	0,99	1,00	1,02	1,04	1,17	1,23

For different densities ρ_k the wood-side design resistance is calculated as: R'_{V,d} = R_{V,d} · k_F.

GENERAL PRINCIPLES:

- Characteristic values according to EN 1995-1-1.
- The design values are obtained from the characteristic values as follows:

$$R_d = \frac{R_k \cdot k_{mod}}{\gamma_M}$$

The coefficients γ_M and k_{mod} should be taken according to the current regulations used for the calculation.

- The values provided are calculated using 5 mm thick plates, a 6 mm thick milled cut in the timber and a single KOS bolt.

- For the calculation process a timber density ρ_k = 385 kg/m³ has been considered.
- Dimensioning and verification of the timber elements must be carried out separately.
- The calculation was made taking into account the hollow effect of the bolt with DIN 9021 washers.
- The angle of inclination indicated for R_{Vk} is referred to the two external elements.