

Development of Reference Design Values for Eurotec Screws

The design values in the tables that follow were developed with the provisions of the 2018 National Design Specification for Wood Construction (NDS). Geometric and material properties for the Eurotec screws were taken from the European Technical Assessment No. ETA-11/0024 dated 2 March 2017. No attempt was made to develop design values by format conversion from the provisions of Eurocode 5. In some cases, engineering judgement was applied when interpreting and applying the NDS provisions, and those cases are discussed in light type as warranted.

Reference Withdrawal Design Values, W

Reference design values for withdrawal are based upon NDS Equation (12.2-1) for lag screws. As discussed in the NDS Commentary, Section C12.2.1, this equation represents an effective factor of safety of 4.0 applied to the average results from ultimate load tests of joints made with five different species of wood and seven sizes of lag screws. The design value applies for a unit (1-inch) length of thread penetration into side grain of the main member of the connection. The length of the tapered tip is not to be included as part of the thread penetration.

For Eurotec screws, the length of the tapered tip is estimated to be the same as the nominal diameter of the screw. Use of Equation (12.2-1) is assumed to be appropriate and conservative for Eurotec screws because the latter have higher material strength, sharper threads, and a larger ratio of nominal diameter to root diameter than conventional lag screws.

NDS Equation (12.2-1) applies for screws inserted into side grain of a wood member and loaded directly in withdrawal. For screws inserted into end grain, the reference withdrawal value is reduced by the end-grain factor, $C_{eg} = 0.75$. However, reference design values for screws inserted at other angles to the grain are not specified. Eurocode 5 uses a form of the Hankinson formula to determine the withdrawal design value for screws at any angle to the grain. The corresponding form of the Hankinson formula applied to the withdrawal values in the following tables is:



$$W_{\alpha} = \frac{W}{\sin^2 \alpha + \left(\frac{4}{3}\right) \cos^2 \alpha}$$

where α is the angle to the grain of the screw. For example, for $\alpha = 45^{\circ}$, $W_{\alpha} = 0.857 W$.

The withdrawal capacity of a screw, given by the unit value W multiplied by the length of thread penetration in the main member and the appropriate adjustment factors in NDS Table 11.3.1., shall not exceed the allowable tension capacity listed in the table.

The allowable tension capacity for each screw includes a factor of safety of 2.0 applied to the tensile yield strength of the screw at its root diameter, as reported in ETA 11/0024.

Reference Head-Pull-Through Design Values, W_H

Reference design values for head pull-through are based upon NDS Equation (12.2-6) for fasteners with round heads. The equation includes an effective factor of safety of 5.0 applied to average results from physical tests. The design values listed in the table shall be multiplied by the appropriate adjustment factors in NDS Table 11.3.1. After application of any adjustment factors, the pull-through capacity shall not be taken as greater than the allowable tension capacity given in the table. As stated in NDS Section 12.2.5, use of Equation (12.2-6) is limited to fastener head diameters, material specific gravity, and net side-member thickness within the ranges given in NDSTable 12.2F.

The following tables for Eurotec screws extend use of Equation (12.2-6) for head diameter greater than 1/2", specific gravity greater than 0.50, and net side-member thickness greater than 1 1/2". The applicability of Equation (12.2-6) outside the ranges given in NDSTable 12.2F is not recognized by the NDS provisions, so users of these design values are cautioned to apply them with appropriate engineering judgement.



Reference Lateral Design Values, Z

Reference lateral design values for Eurotec screws are based upon the yield limit equations presented in NDS Section 12.3.1, Tables 12.3.1 and 12.3.1B, with the provisions for dowel bearing strength, dowel bearing length, and dowel diameter in Sections 12.3.3, 12.3.5 and 12.3.7, respectively. Geometric parameters given in ETA 11/0024 for the screws are used directly in the yield limit equations. The NDS references the methods provided in ASTM F1575 for determining dowel bending yield strength. Those methods are based on a definition of yield using the 5% offset method.

Dowel bending yield strengths for the Eurotec screws were determined from the characteristic yield moment of the fasteners reported in ETA 11/0024, which may differ from the results that would be obtained by testing according to ASTM F1575. Nevertheless, the dowel bending yield strengths derived from the ETA are within the range of typical values for high-strength screws. Hence, use of those values is regarded as reasonable and safe.



Lateral Design Values Z (lb) - Both Members Loaded Parallel to Grain

Nominal Screw Diameter		Dowel Bending Yield (psi)	Side Member Thickness (in)	Min. Screw Length (in)	Specific Gravity							
(mm)	(in)				0.31	0.36	0.42	0.46	0.50	0.55	0.67	0.73
4.0	0.157	184,000	3/4	2 1/2	37	44	54	61	68	78	97	105
			1 1/2	3 1/4	48	55	63	69	74	81	97	105
4.5	0.177	199,000	3/4	2 1/2	43	51	62	70	78	89	118	128
			1 1/2	3 1/4	58	67	77	83	90	98	118	128
5.0	0.197	153,000	3/4	2 3/4	53	63	76	86	95	109	144	160
			1 1/2	3 1/2	70	83	96	104	113	123	148	160
6.0	0.236	145,000	3/4	3 1/4	72	85	101	112	125	141	184	208
			1 1/2	4	90	111	133	145	156	171	205	221
			3 1/2	6	101	116	133	145	156	171	205	221
8.0	0.315	117,000	3/4	3 3/4	103	120	140	154	169	189	241	270
			1 1/2	4 1/2	118	144	178	203	226	247	296	321
			3 1/2	6 1/2	146	167	193	210	226	247	296	321
10.0	0.394	128,000	3/4	4 1/2	120	150	174	191	207	229	286	317
			1 1/2	5 1/4	140	168	204	230	259	296	377	407
			3 1/2	7 1/4	185	213	245	266	288	314	377	407



Lateral Design Values Z (lb) - Both Members Loaded Perpendicular to Grain												
		Dowel Bending Yield (psi)	Side Member Thickness (in)	Min. Screw Length (in)	Specific Gravity							
(mm)	(in)				0.31	0.36	0.42	0.46	0.50	0.55	0.67	0.73
4.0	0.157	184,000	3/4	2 1/2	37	44	54	61	68	78	97	105
			1 1/2	3 1/4	48	55	63	69	74	81	97	105
4.5	0.177	199,000	3/4	2 1/2	43	51	62	70	78	89	118	128
			1 1/2	3 1/4	58	67	77	83	90	98	118	128
5.0	0.197	153,000	3/4	2 3/4	53	63	76	86	95	109	144	160
			1 1/2	3 1/2	70	83	96	104	113	123	148	160
6.0	0.236	145,000	3/4	3 1/4	72	85	101	112	125	141	184	208
			1 1/2	4	90	111	133	145	156	171	205	221
			3 1/2	6	101	116	133	145	156	171	205	221
8.0	0.315	117,000	3/4	3 3/4	83	96	112	124	136	151	193	216
			1 1/2	4 1/2	94	115	142	163	181	198	237	256
			3 1/2	6 1/2	117	134	154	168	181	198	237	256
10.0	0.394	128,000	3/4	4 1/2	96	120	139	152	166	183	229	253
			1 1/2	5 1/4	112	134	163	184	207	237	301	326
			3 1/2	7 1/4	148	170	196	213	230	251	301	326



Withdrawal Design Values <i>W</i> (lb/in)										Allowable Tension Capacity (lb)
Nominal Screw Diameter		Specific Gravity								
(mm)	(in)	0.31	0.36	0.42	0.46	0.50	0.55	0.67	0.73	
4.0	0.157	78	97	122	140	159	184	247	281	560
4.5	0.177	85	106	134	153	174	200	270	307	720
5.0	0.197	92	115	145	166	188	217	292	332	890
6.0	0.236	105	132	166	190	216	249	334	380	1,240
8.0	0.315	131	163	206	236	268	309	415	472	2,250
10.0	0.394	154	193	244	279	316	365	491	558	3,150



Paneltwistec AG Countersunk Head 60° Screw -													Allowable Tension Capacity (lb)
Head Pull-Through Design Values P (lb)													
Nominal Screw Diameter		Head Diameter		Side Member Thickness (in)	Specific Gravity								
(mm)	(in)	(mm)	(in)		0.31	0.36	0.42	0.46	0.50	0.55	0.67	0.73	
4.0	0.157	6.00	0.236	3/4	29	39	53	64	76	91	136	161	560
				1 1/2	29	39	53	64	76	91	136	161	
				3 1/2	29	39	53	64	76	91	136	161	
4.5	0.177	7.00	0.276	3/4	40	53	73	87	103	125	185	219	720
				1 1/2	40	53	73	87	103	125	185	219	
				3 1/2	40	53	73	87	103	125	185	219	
5.0	0.197	7.25	0.285	3/4	42	57	78	93	110	134	198	235	890
				1 1/2	42	57	78	93	110	134	198	235	
				3 1/2	42	57	78	93	110	134	198	235	
6.0	0.236	11.00	0.433	3/4	68	91	124	149	176	213	316	375	1,240
				1 1/2	98	132	179	215	254	307	456	542	
				3 1/2	98	132	179	215	254	307	456	542	
8.0	0.315	13.00	0.512	3/4	80	108	147	176	208	252	374	443	2,250
				1 1/2	136	184	250	300	355	429	637	756	
				3 1/2	136	184	250	300	355	429	637	756	
10.0	0.394	16.40	0.646	3/4	101	136	185	222	262	318	471	559	3,150
				1 1/2	202	272	370	444	525	635	942	1,119	
				3 1/2	217	293	399	478	565	683	1,014	1,204	



Paneltwistec AG Countersunk Head 60° Screw - dimensions															
Nominal Size		3.5 mm	#6	4.0 mm	#8	4.5 mm	#10	5.0 mm	#12	6.0 mm	¼"	8.0 mm	5/16"	10.0 mm	3/8"
d	min	3.30	.130	3.75	.148	4.25	.278	4.70	.185	5.75	.226	7.60	.299	9.70	.382
	max	3.65	.144	4.05	.159	4.55	.303	5.10	.201	6.15	.242	8.20	.323	10.30	.406
di	min	2.00	.079	2.35	.093	2.60	.171	3.00	.118	3.80	.150	5.10	.201	6.00	.236
	max	2.25	.089	2.65	.104	2.80	.193	3.45	.136	4.20	.165	5.50	.217	6.50	.256
dh	min	4.50	.177	5.50	.217	6.00	.394	6.50	.256	10.00	.394	12.00	.472	15.40	.606
	max	5.50	.217	6.50	.256	8.00	.472	8.00	.315	12.00	.472	14.00	.551	17.40	.685
hh	min	1.75	.069	2.00	.079	2.25	.148	2.50	.098	3.00	.118	-	-	-	-
	max	2.10	.083	2.50	.098	2.75	.181	3.00	.118	4.00	.157	-	-	-	-
p	min	2.02	.080	2.27	.089	2.52	.169	2.79	.110	4.41	.174	5.04	.198	5.94	.234
	max	2.46	.097	2.77	.109	3.08	.206	3.41	.134	5.39	.212	6.16	.243	7.26	.286
ds	min	2.20	.087	2.60	.102	2.80	.189	3.60	.142	4.50	.177	5.70	.224	6.90	.272
	max	2.40	.094	2.80	.110	3.10	.205	3.80	.150	4.50	.177	5.90	.232	7.20	.283
dm	min	2.65	.104	2.85	.112	3.35	.217	3.75	.148	4.80	.189	6.60	.260	7.90	.311
	max	2.85	.112	3.05	.120	3.55	.232	3.95	.156	5.00	.197	6.80	.268	8.10	.319
dt	min	1.90	.075	2.20	.087	2.40	.161	2.80	.110	3.30	.130	5.10	.201	6.00	.236
	max	2.10	.083	2.40	.094	2.60	.177	3.00	.118	3.50	.138	5.50	.217	6.50	.256
t	min	3.30	.130	3.80	.150	4.30	.280	4.80	.189	4.80	.189	5.00	.197	6.00	.236
	max	3.50	.138	4.00	.157	4.50	.295	5.00	.197	5.00	.197	5.20	.205	6.20	.244
dc	min	3.30	.130	3.75	.148	5.15	.278	5.75	.226	6.95	.274	7.65	.301	9.60	.378
	max	3.70	.146	4.25	.167	5.65	.313	6.25	.246	7.45	.293	8.35	.329	10.40	.409
hhc	min	3.70	.146	4.20	.165	4.70	.311	5.30	.209	5.60	.220	6.00	.236	6.50	.256
	max	3.90	.154	4.40	.173	4.90	.327	5.50	.217	5.80	.228	6.30	.248	6.80	.268
dh2	min	-	-	5.30	.209	6.65	.209	8.25	.325	11.00	.433	-	-	-	-
	max	-	-	5.70	.224	7.15	.224	8.75	.344	11.50	.453	-	-	-	-
p2	min	-	-	7.50	.295	8.40	.295	9.30	.366	14.70	.579	16.80	.661	26.40	1.039
	max	-	-	10.00	.394	11.20	.394	12.40	.488	19.60	.772	22.40	.882	33.00	1.299
dm2	min	-	-	2.70	.106	3.10	.106	3.70	.146	4.50	.177	6.10	.240	7.10	.280
	max	-	-	2.90	.114	3.30	.114	3.90	.154	4.70	.185	6.30	.248	7.30	.287
tx	size	tx20	-	tx20	-	tx20	-	tx20	-	tx30	-	tx40	-	tx50	-

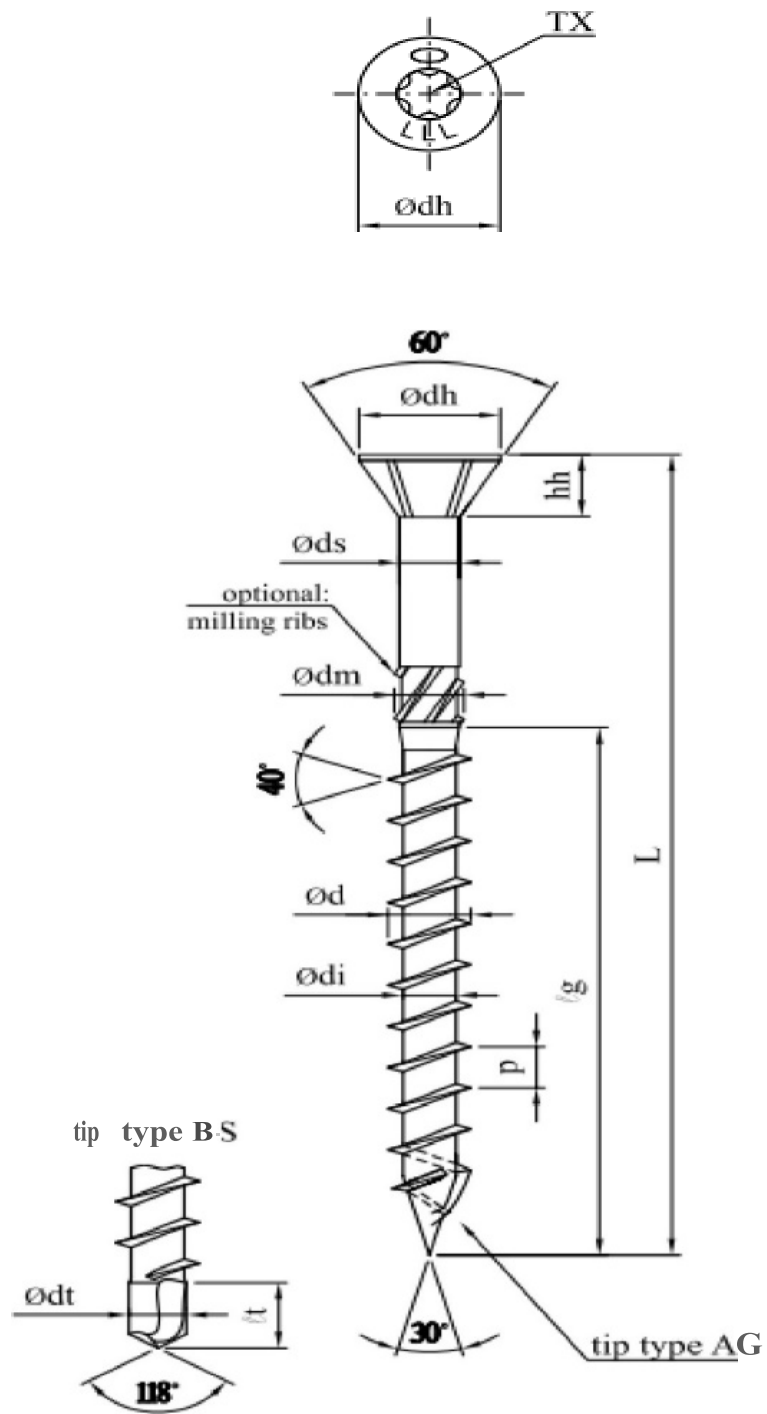


Paneltwistec AG Countersunk Head 60° Screw –															
thread length															
L metric	L Inches	3.5 mm	#6	4.0 mm	#8	4.5 mm	#10	5.0 mm	#12	6.0 mm	¼"	8.0 mm	5/16"	10 mm	3/8"
25	0.98	15	0.59	15	0.59										
30	1.18	18	0.71	18	0.71										
40	1.57	24	0.94	24	0.94	24	0.94	24	0.94						
45	1.77	27	1.06	27	1.06	27	1.06	27	1.06						
50	1.97	30	1.18	30	1.18	30	1.18	30	1.18	30	1.18				
60	2.36			36	1.42	36	1.42	36	1.42	36	1.42				
70	2.76			42	1.65	42	1.65	42	1.65	42	1.65				
80	3.15			48	1.89	48	1.89	48	1.89	48	1.89	48/50	1.83/ 1.97	48/50	1.83/ 1.97
90	3.54							54	2.13	54	2.13	54	2.13		
100	3.94							60	2.36	60	2.36	60	2.36	60	2.36
110	4.33							66	2.60	70	2.76	80	3.15	90	3.54
120	4.72							70	2.76	70	2.76	80/70	3.15/ 2.76	90/70	3.54/ 2.76
140	5.51									70	2.76	80	3.15	90/80	3.54/ 3.15
160	6.30									70	2.76	80/90	3.15/ 3.54	90	3.54
180	7.09									70	2.76	80/100	3.15/ 3.54	90/100	3.54/ 3.94
200	7.87									70	2.76	80/100	3.15/ 3.54	90/100	3.54/ 3.94
Plus 20 mm steps										70	2.76	80/100	3.15/ 3.54	90/100	3.54/ 3.94
300	11.81									70	2.76	80/100	3.15/ 3.54	90/100	3.54/ 3.94
320	12.60											80/100	3.15/ 3.54	90/100	3.54/ 3.94
Plus 20 mm steps												80/100	3.15/ 3.54	90/100	3.54/ 3.94
460	18.11											80/100	3.15/ 3.54	90/100	3.54/ 3.94
480	18.90											80/100	3.15/ 3.54	90/100	3.54/ 3.94



L metric	L Inches	3.5 mm	#6	4.0 mm	#8	4.5 mm	#10	5.0 mm	#12	6.0 mm	¼"	8.0 mm	5/16"	10 mm	3/8"
500	19.69											80/100	3.15/ 3.54	90/100	3.54/ 3.94
550	21.65											80/100	3.15/ 3.54	90/100	3.54/ 3.94
600	23.62											80/100	3.15/ 3.54	90/100	3.54/ 3.94





Paneltwistec AG Countersunk Head 90° Screw -													Allowable Tension Capacity (lb)
Head Pull-Through Design Values P (lb)													
Nominal Screw Diameter		Head Diameter		Side Member Thickness (in)	Specific Gravity								
(mm)	(in)	(mm)	(in)		0.31	0.36	0.42	0.46	0.50	0.55	0.67	0.73	
4.0	0.157	7.75	0.305	3/4	48	64	88	105	124	150	223	264	3
				1 1/2	48	65	89	107	126	153	226	269	
				3 1/2	48	65	89	107	126	153	226	269	
4.5	0.177	8.75	0.344	3/4	54	73	99	119	140	169	251	298	720
				1 1/2	62	83	113	136	161	195	289	343	
				3 1/2	62	83	113	136	161	195	289	343	
5.0	0.197	9.75	0.384	3/4	60	81	110	132	156	189	280	333	890
				1 1/2	77	103	141	169	200	242	358	426	
				3 1/2	77	103	141	169	200	242	358	426	
6.0	0.236	11.75	0.463	3/4	72	97	133	159	188	228	338	401	1,240
				1 1/2	111	150	205	245	290	351	521	618	
				3 1/2	111	150	205	245	290	351	521	618	
8.0	0.315	14.50	0.571	3/4	89	120	164	196	232	281	417	495	2,250
				1 1/2	170	229	312	374	442	534	793	941	
				3 1/2	170	229	312	374	442	534	793	941	
10.0	0.394	17.80	0.701	3/4	109	148	201	241	285	345	511	607	3,150
				1 1/2	219	295	402	482	570	689	1,023	1,214	
				3 1/2	256	345	469	563	665	805	1,195	1,418	



Paneltwistec AG Countersunk Head 90° Screw - dimensions

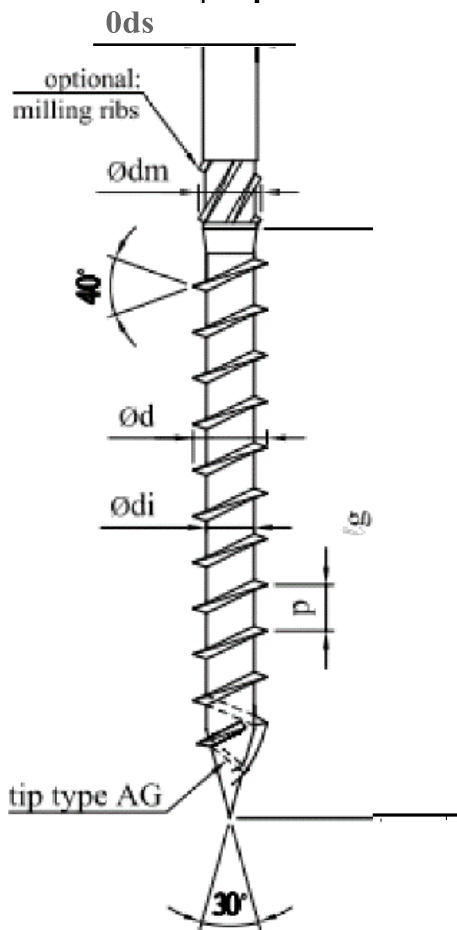
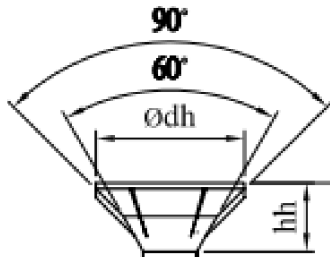
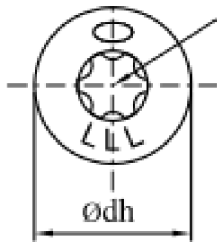
Nomin al Size	3.5 mm	#6	4.0 mm	#8	4.5 mm	#10	5.0 mm	#12	6.0 mm	¼"	8.0 mm	5/16"	10.0 mm	3/8"	12.0 mm	½"
d	3.30 3.65	.130 .144	3.75 4.05	.148 .159	4.25 4.55	.167 .179	4.70 5.10	.185 .201	5.75 6.15	.226 .242	7.60 8.20	.299 .323	9.70 10.30	.382 .406	11.50 12.30	.453 .484
di	2.00 2.25	.079 .089	2.35 2.65	.093 .104	2.60 2.80	.102 .110	3.00 3.45	.118 .136	3.80 4.20	.150 .165	5.10 5.50	.201 .217	6.00 6.50	.236 .256	6.90 7.40	.272 .291
dh	6.60 7.00	.260 .276	7.50 8.00	.295 .315	8.50 9.00	.335 .354	9.50 10.00	.374 .394	11.50 12.00	.453 .472	14.10 14.90	.555 .587	17.40 18.20	.685 .717	19.00 21.00	.748 .827
hh	3.25 3.65	.128 .144	3.75 4.25	.148 .167	4.15 4.65	.163 .183	4.55 5.05	.179 .199	5.40 5.90	.213 .232	6.50 7.50	.256 .295	8.20 9.20	.323 .362	8.90 9.70	.350 .382
p	2.02 2.46	.080 .097	2.27 2.77	.089 .109	2.52 3.08	.099 .121	2.79 3.41	.110 .134	4.41 5.39	.174 .212	5.04 6.16	.198 .248	5.94 7.26	.234 .286	5.94 7.26	.234 .286
ds	2.20 2.40	.087 .094	2.60 2.80	.102 .110	2.80 3.10	.110 .122	3.60 3.80	.142 .150	4.30 4.50	.169 .177	5.70 5.90	.224 .232	6.90 7.20	.272 .283	7.90 8.20	.311 .323
dm	2.65 2.85	.104 .112	2.85 3.05	.112 .120	3.35 3.55	.132 .140	3.75 3.95	.148 .156	4.80 5.00	.189 .197	6.60 6.80	.260 .268	7.90 8.10	.311 .319	9.40 9.80	.370 .386
dc	2.30 3.70	.091 .146	3.75 4.25	.148 .165	5.15 5.65	.203 .222	5.75 6.25	.226 .246	6.95 7.45	.274 .293	7.65 8.35	.301 .329	9.60 10.40	.378 .409		
hhc	3.70 3.90	.146 .154	4.00 4.40	.157 .173	4.50 4.90	.177 .193	5.10 5.50	.201 .217	5.40 5.80	.231 .288	7.00 7.50	.276 .295	8.00 8.50	.315 .335		
dh2			5.30 5.70	.209 .224	6.65 7.15	.262 .281	8.25 8.75	.235 .344	11.00 11.50	.433 .453						
p2			7.50 10.00	.295 .394	8.40 11.20	.331 .441	9.30 12.40	.366 .488	14.70 19.60	.579 .772	16.80 22.40	.661 .882	26.40 33.00	1.039 1.299		
dm2			2.70 2.90	.106 .114	3.00 3.30	.118 .130	3.70 3.90	.146 .154	4.50 4.70	.177 .185	6.10 6.30	.240 .248	7.10 7.30	.280 .287		
TX	tx20		tx20		tx20		tx20		tx30		tx40		tx50		tx50	

Paneltwistec AG Countersunk Head 90° Screw - thread length																	
L metric	L Inches	3.5 mm	#6	4.0 mm	#8	4.5 mm	#10	5.0 mm	#12	6.0 mm	¾"	8 mm	5/16"	10.0 mm	3/8"	12 mm	½"
25	0.98	15	0.59	15	0.59												
30	1.18	18	0.71	18	0.71												
40	1.57	24	0.94	24	0.94	24	0.94	24	0.94								
45	1.77	27	1.06	27	1.06	27	1.06	27	1.06								
50	1.97	30	1.18	30	1.18	30	1.18	30	1.18	30	1.18						
60	2.36			36	1.42	36	1.42	36	1.42	36	1.42						
70	2.76			42	1.65	42	1.65	42	1.65	42	1.65						
80	3.15			48	1.89	48	1.89	48	1.89	48	1.89	48/50	1.83/ 1.97	48/50	1.83/ 1.97		
90	3.54							54	2.13	54	2.13	54	2.13				
100	3.94							60	2.36	60	2.36	60	2.36	60	2.36		
110	4.33							66	2.60	70	2.76	80	3.15	90	3.54		
120	4.72							70	2.76	70	2.76	80/70	3.15/ 2.76	90/70	3.54/ 2.76	80	3.15
140	5.51									70	2.76	80	3.15	90/80	3.54/ 3.15	80	3.15
160	6.30									70	2.76	80/90	3.15/ 3.54	90	3.54	80	3.15
180	7.09									70	2.76	80/100	3.15/ 3.54	90/100	3.54/ 3.94	80	3.15
200	7.87									70	2.76	80/100	3.15/ 3.54	90/100	3.54/ 3.94	80	3.15
Plus 20 mm steps										70	2.76	80/100	3.15/ 3.54	90/100	3.54/ 3.94	100	3.54
300	11.81									70	2.76	80/100	3.15/ 3.54	90/100	3.54/ 3.94	100	3.54
320	12.60											80/100	3.15/ 3.54	90/100	3.54/ 3.94	100	3.54
Plus 20 mm steps												80/100	3.15/ 3.54	90/100	3.54/ 3.94	120	4.17

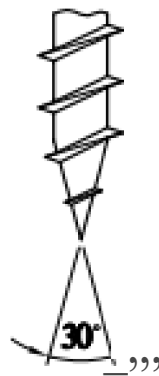


L metric	L Inches	3.5 mm	#6	4.0 mm	#8	4.5 mm	#10	5.0 mm	#12	6.0 mm	¾"	8 mm	5/16"	10.0 mm	3/8"	12 mm	½"
460	18.11											80/100	3.15/ 3.54	90/100	3.54/ 3.94	120	4.17
480	18.90											80/100	3.15/ 3.54	90/100	3.54/ 3.94		
500	19.69											80/100	3.15/ 3.54	90/100	3.54/ 3.94		
550	21.65											80/100	3.15/ 3.54	90/100	3.54/ 3.94		
600	23.62											80/100	3.15/ 3.54	90/100	3.54/ 3.94		





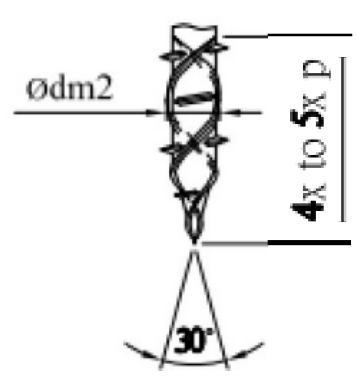
tip type N



tip type 17



tip type D · G



Paneltwistec AG Washer Head Screw -													Allowable Tension Capacity (lb)
Head Pull-Through Design Values P (lb)													
Nominal Screw Diameter		Head Diameter		Side Member Thickness (in)	Specific Gravity								
(mm)	(in)	(mm)	(in)		0.31	0.36	0.42	0.46	0.50	0.55	0.67	0.73	
4.0	0.157	10.0	0.394	3/4	62	83	113	135	160	194	287	341	560
				1 1/2	81	109	148	178	210	254	377	448	
				3 1/2	81	109	148	178	210	254	377	448	
4.5	0.177	11.0	0.433	3/4	68	91	124	149	176	213	316	375	720
				1 1/2	98	132	179	215	254	307	456	542	
				3 1/2	98	132	179	215	254	307	456	542	
5.0	0.197	12.0	0.472	3/4	74	100	135	163	192	232	345	409	890
				1 1/2	116	157	213	256	302	366	543	645	
				3 1/2	116	157	213	256	302	366	543	645	
6.0	0.236	14.0	0.551	3/4	86	116	158	190	224	271	402	478	1,240
				1 1/2	158	213	290	348	412	498	739	877	
				3 1/2	158	213	290	348	412	498	739	877	
8.0	0.315	22.0	0.866	3/4	135	182	248	298	352	426	632	750	2,250
				1 1/2	271	365	497	596	704	852	1,264	1,501	
				3 1/2	391	527	717	860	1,016	1,230	1,825	2,167	
10.0	0.394	25.0	0.984	3/4	154	207	282	339	400	484	718	853	3,150
				1 1/2	308	415	565	677	800	968	1,437	1,705	
				3 1/2	505	680	926	1,111	1,312	1,588	2,357	2,798	



Paneltwistec AG Washer Head Screw - dimensions

Nominal size		4.0 mm	*8	4.5 mm	*10	5.0 mm	*12	6.0 mm	¼"	8.0 mm	5/16"	10.0mm	3/8"
d	Min	3.75	.148	4.25	.167	4.70	.185	5.75	.226	7.80	.307	9.70	.382
	max	4.05	.159	4.55	.179	5.10	.201	6.15	.242	8.20	.323	10.30	.406
di	min	2.35	.093	2.60	.102	3.00	.118	3.60	.142	5.10	.201	6.00	.236
	max	2.65	.104	2.80	.110	3.45	.136	4.10	.161	5.50	.217	6.50	.256
dh	min	9.50	.374	10.50	.413	11.50	.453	13.50	.531	21.00	.827	24.00	.945
	max	10.50	.413	11.50	.453	12.50	.492	14.50	.571	23.00	.906	26.00	1.024
dc	min	4.50	.177	5.20	.205	5.70	.224	6.40	.252	9.50	.374	11.20	.441
	max	5.10	.201	5.80	.228	6.30	.248	7.00	.276	10.50	.413	12.00	.472
p	min	2.27	.089	2.52	.099	2.79	.110	4.41	.174	5.04	.198	5.94	.234
	max	2.77	.109	3.08	.121	3.41	.134	5.39	.212	6.16	.243	7.26	.286
ds	min	2.50	.098	2.80	.110	3.30	.130	3.80	.150	5.70	.224	6.90	.272
	max	2.90	.114	3.20	.126	3.70	.146	4.50	.177	5.90	.232	7.20	.283
dm	min	2.85	.112	3.35	.132	3.75	.148	4.80	.189	6.60	.260	7.90	.311
	max	3.05	.120	3.55	.140	3.95	.156	5.10	.201	6.80	.268	8.10	.319
p2	min	7.50	.295	8.40	.331	9.30	.366	14.70	.579	16.80	.661	26.40	1.039
	max	10.00	.394	11.20	.441	12.40	.488	19.60	.772	22.40	.882	33.00	1.299
dms	min	2.70	.106	3.10	.122	3.70	.146	4.50	.177	6.10	.240	7.10	.280
	max	2.90	.114	3.30	.130	3.90	.154	4.70	.185	6.30	.248	7.30	.287
tx	size	tx20		tx20		tx20		tx30		tx40		tx40	

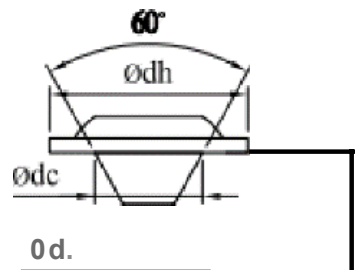
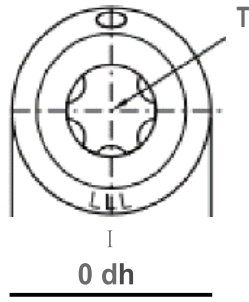


Paneltwistec AG Washer Head Screw - thread length													
L metric	In.	4.0 mm	#8	4.5 mm	#10	5.0 mm	#12	6.0 mm	¼"	8.0 mm	5/16"	10.0 mm	3/8"
25	0.98	15	0.59										
30	1.18	18	0.71					30					
40	1.57	24	0.94	24	0.94	24	0.94	40				40	1.57
45	1.77	27	1.06	27	1.06	27	1.06						
50	1.97	30	1.18	30	1.18	30	1.18	30	1.18			50	1.97
60	2.36	36	1.42	36	1.42	36	1.42	36	1.42			36	1.42
70	2.76	42	1.65	42	1.65	42	1.65	42	1.65				
80	3.15	48	1.89	48	1.89	48	1.89	48	1.89	48/50	1.89/ 1.97	52/50	2.05/1.97
90	3.54					54	2.13	54	2.13				
100	3.94					60	2.36	70/60	2.76/ 2.36	60	2.36	80/60	2.36
110	4.33					66	2.60	70	2.76				
120	4.72					70	2.76	70	2.76	80/70	3.15/ 2.76	90/70	3.54/2.76
130	5.12							70	2.76				
140	5.51							70	2.76	80	3.15	90/80	3.54/3.15
150	5.91							70	2.76				
160	6.30							70	2.76	80/90	3.15/3.54	90	3.54
180	7.09							70	2.76	80/100	3.15/3.54	90/100	3.54/3.94
Plus 20 mm steps								70	2.76	80/100	3.15/3.54	90/100	3.54/3.94
300	11.81							70	2.76	80/100	3.15/3.54	90/100	3.54/3.94

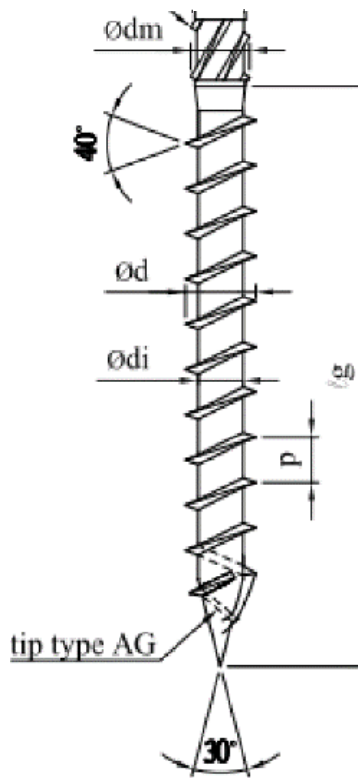


L metric	In.	4.0 mm	#8	4.5 mm	#10	5.0 mm	#12	6.0 mm	¾'	8.0 mm	5/16"	10.0 mm	3/8"
Plus 20 mm steps										80/100	3.15/3.54	90/100	3.54/3.94
460	18.11									80/100	3.15/3.54	90/100	3.54/3.94
480	18.90									80/100	3.15/3.54	90/100	3.54/3.94
500	19.69									80/100	3.15/3.54	90/100	3.54/3.94
550	21.65									80/100	3.15/3.54	90/100	3.54/3.94
600	23.62									80/100	3.15/3.54	90/100	3.54/3.94

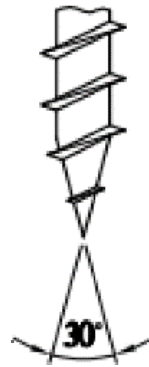




Optional
milliblogri



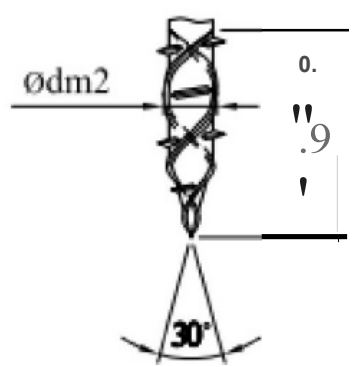
tip type



tip type 17



tip type D | G



Paneltwistec AG Small Washer Head Screw													Allowable Tension Capacity (lb)
Head Pull-Through Design Values P (lb)													
Nominal Screw Diameter		Head Diameter		Side Member Thickness (in)	Specific Gravity								
(mm)	(in)	(mm)	(in)		0.31	0.36	0.42	0.46	0.50	0.55	0.67	0.73	
8.0	0.315	18.0	0.709	3/4	111	149	203	244	288	349	517	614	2,250
				1 1/2	221	299	406	488	576	697	1,034	1,228	
				3 1/2	262	353	480	576	680	823	1,222	1,450	

Paneltwistec AG Small Washer Head Screw

Paneltwistec AG Small Washer Head Screw

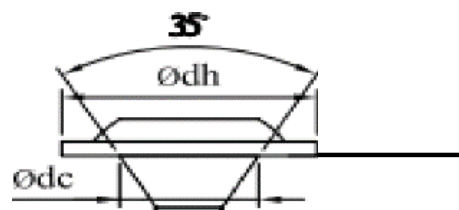
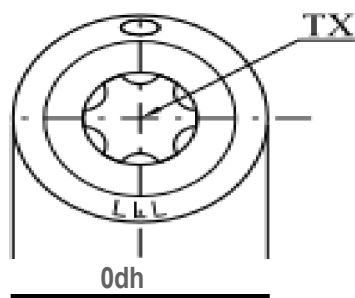
Dimensions

Nominal Size		8.0	5/16
d	min	7.80	.307
	max	8.20	.323
di	min	5.10	.201
	max	5.50	.217
dh	min	17.50	.689
	max	18.50	.728
dc	min	7.70	.303
	max	8.00	.315
p	min	4.68	.184
	max	5.72	.225
ds	min	5.70	.224
	max	5.90	.232
dm	min	6.60	.260
	max	6.80	.268
p2	min	16.80	.661
	max	22.40	.882
dm2	min	6.10	.240
	max	6.30	.248
TX		tx40	

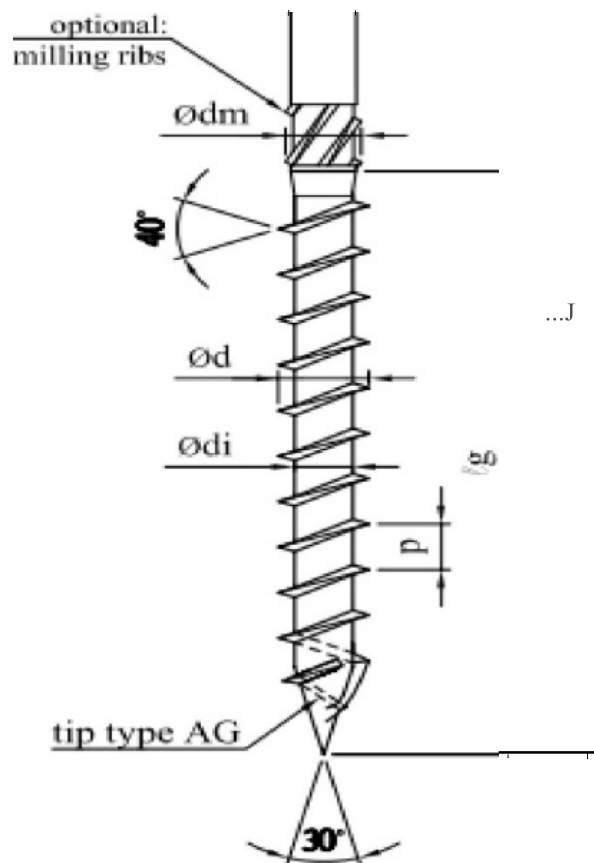
thread length

L mm	L in	8	5/16
80	3.15	48/50	1.89/1.97
100	3.94	80/60	3.15/2.36
110	4.33		
120	4.72	80/70	3.15/2.76
130	5.12		
140	5.51	80	3.15
150	5.91		
160	6.30	80/90	3.15/3.54
180	7.09	80/100	3.15/3.94
200	2.76/2.36	80/100	3.15/3.94
mm		80/100	3.15/3.94
460	18.11	80/100	3.15/3.94





d.



KonstruX ST Lateral Design Values Z (lb) - Both Members Loaded Parallel to Grain												
Nominal Screw Diameter		Dowel Bending Yield (psi)	Side Member Thickness (in)	Min. Screw Length (in)	Specific Gravity							
(mm)	(in)				0.31	0.36	0.42	0.46	0.50	0.55	0.67	0.73
6.5	0.256	143,000	3/4	3 1/4	94	109	128	142	156	175	225	252
			1 1/2	4	110	134	167	190	205	224	269	291
			3 1/2	6	132	152	175	190	205	224	269	291
8.0	0.315	159,000	3/4	3 3/4	116	134	155	170	186	207	260	289
			1 1/2	4 1/2	127	153	188	213	240	276	334	361
			3 1/2	6 1/2	164	188	217	236	255	278	334	361
10.0	0.394	169,000	3/4	4 1/2	119	156	186	203	221	243	301	332
			1 1/2	5 1/4	148	175	212	238	267	304	404	438
			3 1/2	7 1/4	199	228	263	286	309	337	404	438



KonstruX ST Lateral Design Values Z (lb) - Both Members Loaded Perpendicular to Grain												
		Dowel Bending Yield (psi)	Side Member Thickness (in)	Min. Screw Length (in)	Specific Gravity							
(mm)	(in)				0.31	0.36	0.42	0.46	0.50	0.55	0.67	0.73
6.5	0.256	143,000	3/4	3 1/4	75	87	103	114	125	140	180	202
			1 1/2	4	88	108	134	152	164	179	215	233
			3 1/2	6	106	121	140	152	164	179	215	233
8.0	0.315	159,000	3/4	3 3/4	93	107	124	136	149	165	208	231
			1 1/2	4 1/2	102	123	150	171	192	221	267	289
			3 1/2	6 1/2	131	151	174	189	204	223	267	289
10.0	0.394	169,000	3/4	4 1/2	95	125	149	163	177	195	241	266
			1 1/2	5 1/4	118	140	170	191	213	243	323	350
			3 1/2	7 1/4	159	183	211	229	247	270	323	350



KonstruX ST Withdrawal Design Values W (lb/in)										Allowable Tension Capacity (lb)
Nominal Screw Diameter		Specific Gravity								
(mm)	(in)	0.31	0.36	0.42	0.46	0.50	0.55	0.67	0.73	
6.5	0.256	112	140	176	202	229	264	355	404	1,900
8.0	0.315	131	163	206	236	268	309	415	472	2,800
10.0	0.394	154	193	244	279	316	365	491	558	3,700

KonstruX ST Cylinder Head Screw -- Head Pull-Through Design Values P (lb)												Allowable Tension Capacity (lb)	
Nominal Screw Diameter		Head Diameter		Side Member Thickness (in)	Specific Gravity								
(mm)	(in)	(mm)	(in)		0.31	0.36	0.42	0.46	0.50	0.55	0.67		0.73
6.5	0.256	8.0	0.315	3/4	49	66	90	108	128	155	230	273	1,900
				1 1/2	52	70	95	114	134	163	241	286	
				3 1/2	52	70	95	114	134	163	241	286	
8.0	0.315	10.0	0.394	3/4	62	83	113	135	160	194	287	341	2,800
				1 1/2	81	109	148	178	210	254	377	448	
				3 1/2	81	109	148	178	210	254	377	448	
10.0	0.394	13.0	0.512	3/4	80	108	147	176	208	252	374	443	3,700
				1 1/2	136	184	250	300	355	429	637	756	
				3 1/2	136	184	250	300	355	429	637	756	



KonstruX ST Countersunk Head 60° or 90° Screw - Head Pull-Through Design Values P (lb)													
Nominal Screw Diameter		Head Diameter		Side Member Thickness (in)	Specific Gravity								Allowable Tension Capacity (lb)
(mm)	(in)	(mm)	(in)		0.31	0.36	0.42	0.46	0.50	0.55	0.67	0.73	
6.5	0.256	11.50	0.453	3/4	71	95	130	156	184	223	330	392	1,900
				1 1/2	107	144	196	235	278	336	499	592	
				3 1/2	107	144	196	235	278	336	499	592	
8.0	0.315	14.50	0.571	3/4	89	120	164	196	232	281	417	495	2,800
				1 1/2	170	229	312	374	442	534	793	941	
				3 1/2	170	229	312	374	442	534	793	941	
10.0	0.394	17.80	0.701	3/4	109	148	201	241	285	345	511	607	3,700
				1 1/2	219	295	402	482	570	689	1,023	1,214	
				3 1/2	256	345	469	563	665	805	1,195	1,418	



KonstruX ST Countersunk Head 60° or 90° Screw - dimensions

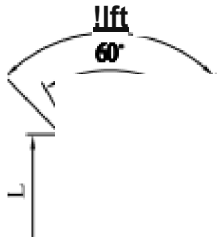
Nominal size		6.5 mm	¼"	8.0 mm	5/16"	10 mm	3/8"
d	min	6.20	.126	7.60	.299	9.60	.378
	max	6.80	.268	8.13	.327	10.20	.402
di	min	4.20	.165	4.90	.193	5.70	.224
	max	4.80	.189	5.40	.213	6.10	.240
dh	min	7.70	.303	9.50	.374	12.50	.492
	max	8.30	.327	10.50	.413	13.50	.531
hh	min	5.00	.197	6.00	.236	6.00	.236
	max	6.00	.236	7.00	.276	7.00	.276
p	min	2.70	.106	3.40	.134	4.10	.161
	max	3.30	.130	4.20	.165	5.10	.201
dt	min	4.10	.161	4.70	.185	5.30	.209
	max	4.50	.177	5.10	.201	5.70	.224
lt	min	3.50	.138	4.00	.157	5.00	.197
	max	5.00	.197	5.00	.197	6.00	.236
dh2	min	11.00	.433	14.00	.551	17.30	.681
	max	12.00	.472	15.00	.591	18.30	.720
hh2	min	5.40	.213	7.00	.276	7.30	.287
	max	5.90	.232	7.40	.291	7.70	.303
dh3	min			21.50	.846	19.50	.768
	max			22.50	.886	20.50	.807
dm	min	4.60	.181	5.40	.213	6.10	.240
	max	5.20	.205	6.20	.244	6.90	.272
tx	size	tx30		tx40		tx50	



KonstruX ST Countersunk Head 60° or 90° Screw - thread lengths					
6.5 mm	¼"	8.0 mm	5/16"	10.0 mm	3/8"
80- 2.0	3.1 5	95- 2.0	3.74	125- 2.0	4.92
100- 2.0	3.9 4	125- 2.0	4.92	155- 2.0	6.1
120- 2.0	4.7 2	155- 2.0	6.1	195- 2.0	7.68
140- 2.0	5.5 1	195- 2.0	7.68	220- 3.0	8.66
160- 2.0	6.3 0	220- 3.0	8.66	245- 3.0	9.65
195- 2.0	7.6 8	245- 3.0	9.65	270- 3.0	10.63
		275- 3.0	10.83	300- 3.0	11.81
		295- 3.0	11.61	330- 4.0	12.99
		330- 4.0	12.99	360- 4.0	14.17
		375- 4.0	14.76	400- 4.0	15.75
		400- 4.0	15.75	450- 5.0	17.72
		430- 5.0	16.93	500 5.0	19.69
		480- 5.0	18.9	550- 5.0/ +2.0	21.65
				600- 5.0/ +2.0	23.62



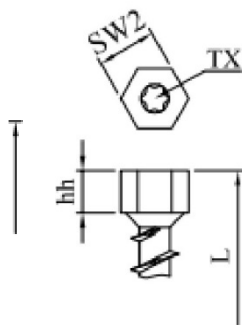
conical lead



washer head

1.?

hexagon head 2



tip type rBS DAG

thread-free part

acceptable for:
 $L < 300$ mm with ≈ 3 mm
 $L \geq 300$ mm with $\approx 3x p$

