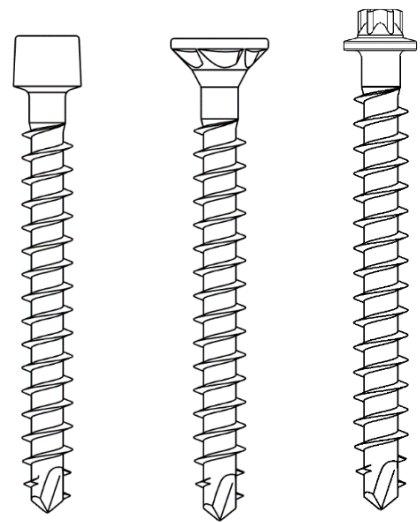
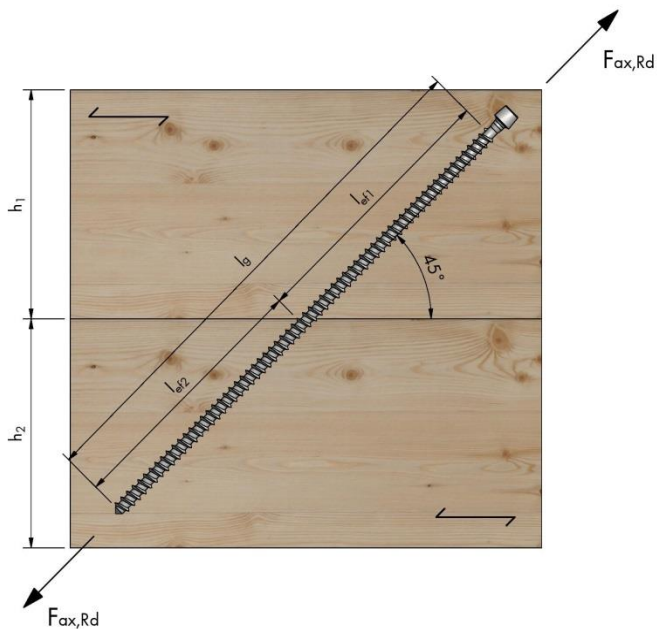


# TENSILE STRENGTH OF ASSY<sup>®</sup> PLUS VG SCREWS WOOD-WOOD (SOFTWOOD)



**STRENGTHENS THE WOOD -  
INSTEAD OF SPLITTING IT**

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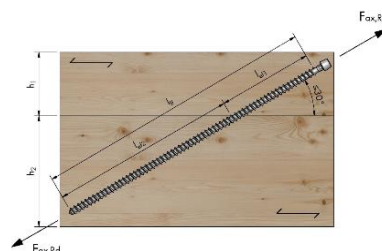
## DETERMINING THE TENSILE STRENGTH - TABLE VALUES OF ASSY® PLUS VG SCREWS

### Boundary conditions

The example calculation is based on ETA-11/0190 and DIN EN 1995-1-1. This example assumes a connection between C24 wood and C24 wood that exerts a pullout force on a fastener 30° to the direction of the grain. The analyzed fastener is a Würth ASSY plus VG Ø8x260mm.

**Component 1** Height  $h_1 = 80$  mm  
**Wood** Width = 200 mm  
 $\rho_{k,1} = 350$  kg/m<sup>3</sup>  
 $l_{ef1} = 160$  mm

**Component 2** Height  $h_2 = 140$  mm  
**Wood** Width = 200 mm  
 $\rho_{k,2} = 350$  kg/m<sup>3</sup>  
 $l_{ef2} = 100$  mm



### Würth ASSY plus VG Ø8x260mm "vertical milling pocket head"

$d = 8$  mm "Screw diameter"  
 $d_h = 15$  mm "Head diameter"  
 $M_{y,Rk} = 20000$  Nmm "Characteristic yield moment [Annex 1 Table 1.1]"  
 $f_{ax,k} = 11$  N/mm<sup>2</sup> "Characteristic pull-out parameter [A.1.3.1]"

### Notes

The head pull-through for full thread screws may be neglected when the connecting component "t<sub>1</sub>" is greater than 4 x d (d = screw diameter).

### Pullout strength

$\alpha = 30^\circ$  "Angle between screw axis and direction of grain"  
 $k_{ax} = 0,767$  "Factor [A.1.3.1]"  
 $f_{head,k} = 13$  N/mm<sup>2</sup> "Head pull-through parameter [A.1.3.2]"  
 $f_{tens,k} = 20000$  N "Characteristic tensile strength [Annex 1 Table 1.1]"  
 $l_{ef} = 100$  mm "Effective thread length in wood (t<sub>2</sub>)"

$$F_{ax,\alpha,Rk,1} = 8800 \text{ N} = k_{ax} \times f_{ax,k} \times d \times l_{ef} \times \left(\frac{\rho_k}{350}\right)^{0,8}$$

$$F_{ax,\alpha,Rk,2} = 2925 \text{ N} = F_{ax,\alpha,Rk,2} = f_{head,k} \times d_h^2 \times \left(\frac{\rho_k}{350}\right)^{0,8}$$

NOTE: These are planning aids. These values must be measured by authorized persons for each project.

## DETERMINING THE TENSILE STRENGTH - TABLE VALUES OF ASSY® PLUS VG SCREWS

$F_{ax,\alpha,Rk,3} = 20000 \text{ N}$  "Characteristic tensile strength [Annex 1 Table 1.1]"

$F_{ax,\alpha,Rk} = 8800 \text{ N}$  "Minimum pullout strength"

$F_{ax,\alpha,Rk,2}$  (head pull-through) can be neglected because the connecting component thickness is greater than  $4 \times d$ .

*Data according to ETA-11/0190 and corresponding product details*

### Design situation according to DIN EN 1995-1-1

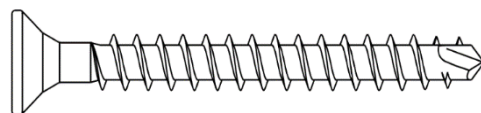
Utilization class = 1 "Utilization class [2.3.1.3]"

KLED = short/very short "Load duration class [Table 2.2] (load case wind is decisive)"

$k_{mod} = 1,0$  "Modification factor [Table 3.1]"

$\gamma_M = 1,3$  "Part safety coefficient [Table 2.3]"

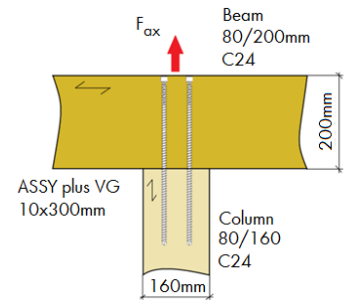
$$F_{ax,Rd} = \mathbf{6769 \text{ N}} = \mathbf{6.77 \text{ kN}} = \frac{F_{ax,Rk} \times k_{mod}}{1,3}$$



## USING THE TABLE VALUES

### Example calculation

- System: Front beam connection
- Beam:  $w/h = 80 \text{ mm} / 200 \text{ mm}$ , softwood, strength class C24 according to EN 338 ( $\rho_k = 350 \text{ kg/m}^3$ )
- Column:  $w/h = 80 \text{ mm} / 160 \text{ mm}$ , softwood, strength class C24 according to EN 338 ( $\rho_k = 350 \text{ kg/m}^3$ )
- Basic for calculation: Dimensioning: EC5 or DIN EN 1995-1-1:2010-12 and national German application document DIN 20000-6:2012-06; ETA-11/0190 ASSY wood screws.
- Lifting force:  $F_{ax} = 2,1 \text{ kN}$  (utilization class = 1, KLED = "medium")
- (perpendicular to the beam)
- Connection / design load: According to the table, each ASSY plus VG  $\varnothing 8,0 \times 100 \text{ mm}$  screw has the following load-bearing capacity.
- Effective anchorage length:  $l_{ef} = 300 \text{ mm} - 200 \text{ mm} = 100 \text{ mm}$



- Field designation in table:
- |             |                       |
|-------------|-----------------------|
| $F_{ax,Rk}$ | Characteristic values |
| $F_{ax,Rd}$ |                       |
- Design value KLED: medium;  $k_{mod} = 0.8$

### Values taken from the table for ASSY plus VG $\varnothing 10 \times 300 \text{ mm}$

#### TENSILE STRENGTHS OF ASSY PLUS VG SCREWS - ANGLE $\leq 45^\circ$

$l_{ef}$	Angle between direction of grain and screw axis									
	0°	5°	10°	15°	20°	25°	30°	35°	40°	$\geq 45^\circ$
40 mm	1,20	1,51	1,82	2,13	2,44	2,76	3,07	3,38	3,69	4,00
	0,74	0,93	1,12	1,31	1,50	1,70	1,89	2,08	2,27	2,46
50 mm	1,50	1,89	2,28	2,67	3,06	3,44	3,83	4,22	4,61	5,00
	0,92	1,16	1,40	1,64	1,88	2,12	2,36	2,60	2,84	3,08
90 mm	2,70	3,40	4,10	4,80	5,50	6,20	6,90	7,60	8,30	9,00
	1,66	2,09	2,52	2,95	3,38	3,82	4,25	4,68	5,11	5,54
100 mm	3,00	3,78	4,56	5,33	6,11	6,89	7,67	8,44	9,22	10,00
	1,85	2,32	2,80	3,28	3,76	4,24	4,72	5,20	5,68	6,15
110 mm	3,30	4,16	5,01	5,87	6,72	7,58	8,43	9,29	10,14	11,00
	2,03	2,56	3,08	3,61	4,14	4,66	5,19	5,72	6,24	6,77

$\varnothing 10,0 \text{ mm}$

Design pullout value:

$$F_{ax,Rk} = 3.0 \text{ kN (characteristic value)}$$

Consideration of  $k_{mod}$ :

Utilization class	continuously	long	medium	short	short / very short	very short
1 or 2	0,462	0,538	0,615	0,692	0,769	0,846

Factor  $k_{mod}/\gamma_M$

$$F_{ax,Rd} = 2 \times 3.0 \text{ kN} \times 0.615 = 3.69 \text{ kN (for two screws)}$$

$$\eta = 0,57 < 1.0 \quad 56,91\%$$

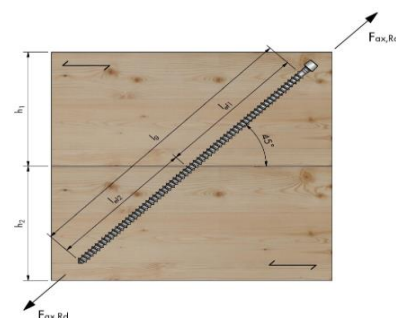
When the design affects a KLED "medium", the lower grayed-out value can be used directly in the calculations. For explanatory purposes, the calculation was made with the aid of the factor table  $k_{mod}/\gamma_M$ .

NOTE: These are planning aids. These values must be measured by authorized persons for each project.

## LEGEND OF THE TENSILE STRENGTH TABLES

### Legend

$F_{ax,Rd}$	Design pullout strength in [kN] of a screw for an angle of $\leq 45^\circ$ between direction of grain and screw axis.
$l$	Screw length in [mm]
$l_{ef}$	Thread length anchored in wood in [mm]
$d$	Nominal diameter / outer thread diameter of screw in [mm]
$t_1$	Side wood thickness on screw head size in [mm]; the minimum component thickness is 24mm, see A1.4 ETA-11/0190
$t_2$	Side wood thickness on screw tip side in [mm] with $t_2 = l - \frac{t_1}{\sin \alpha}$
$k_{ax}$	Factor considering the angle $\alpha$ between screw axis and direction of grain
$\alpha$	Angle between screw axis and direction of grain, $0^\circ \leq \alpha \leq 90^\circ$



### Values in the table

$F_{ax,Rk}$	Characteristic values
$F_{ax,Rd}$	Design value KLED: medium; $k_{mod} = 0.8$

### Bases for calculation

DIN EN 1/1/1995:2010-12	Design of timber structures – Common rules and rules for buildings
DIN EN 1995-1-1/NA:2013-08	National Annex – Nationally determined parameters
DIN 20000-6	Application of construction products in structures – Part 6: Dowel-type fasteners and connectors
ETA-11/0190	Würth self-tapping screws for use in timber constructions
EN 14081-1	Timber structures – General requirements
EN 338	Construction wood for load bearing purposes, strength classes

NOTE: These are planning aids. These values must be measured by authorized persons for each project.

## QUICK REFERENCE DIAGRAM FOR ESTIMATING TENSILE STRENGTH

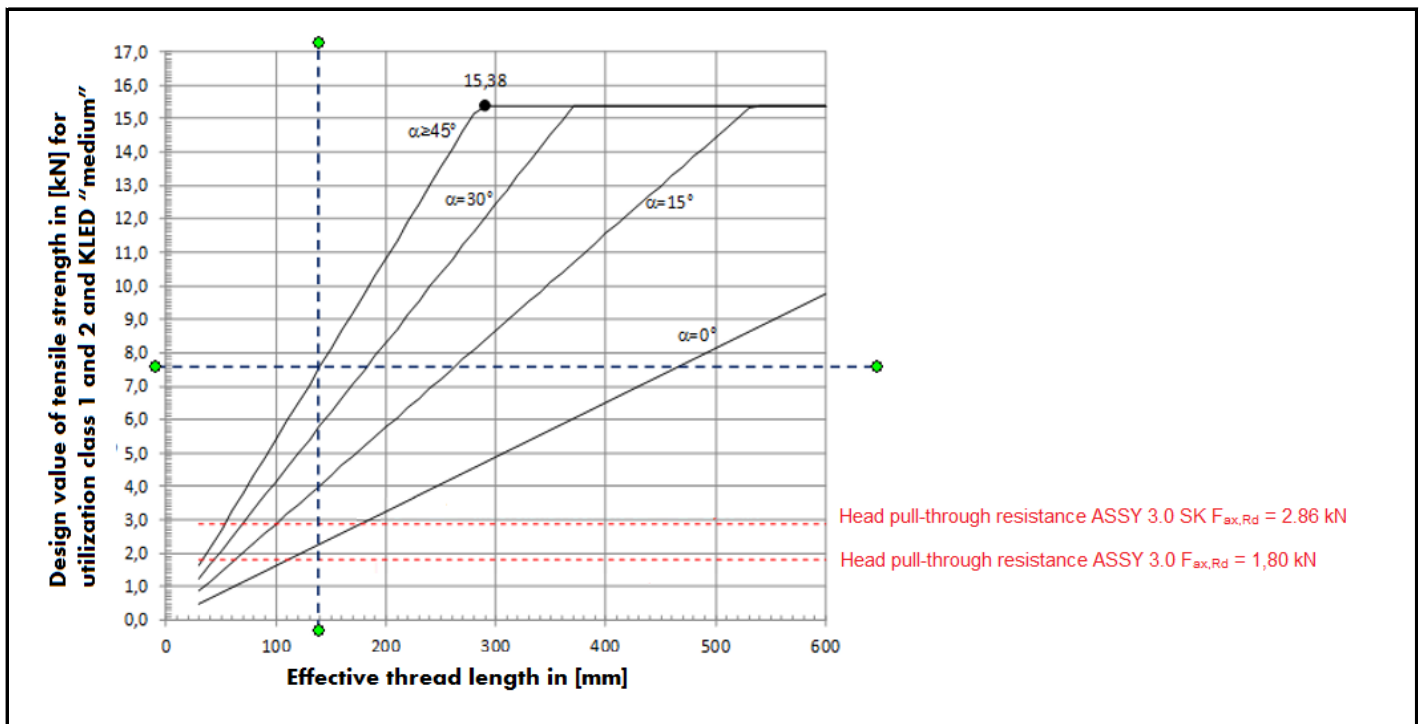
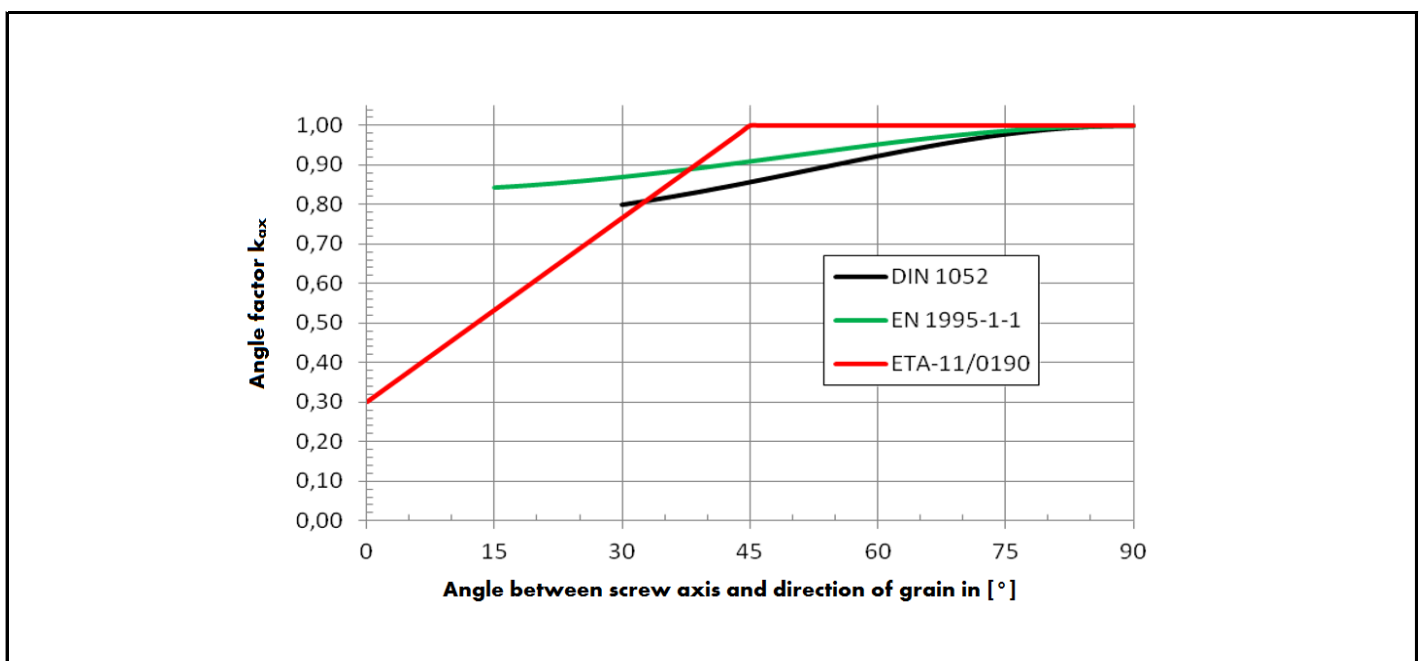


Diagram 1: Würth ASSY plus VG ø8 mm, design values for tensile strength  $F_{ax,Rd}$  (KLED = "medium",  $k_{mod} = 0.8$  for utilization class 1 and 2) as a function of effective thread length.

Example: Screw ASSY plus VG diameter 8 mm, effective thread length 140 mm, screw-in angle 45°, design value for tensile strength = 7.6 kN for KLED medium, utilization class 1 and 2. This yields a higher strength than ASSY 3.0 or ASSY 3.0 SK, where the head pull-through resistance is decisive. Greater than 15.38 kN, the tensile strength is decisive in the steel cross section.

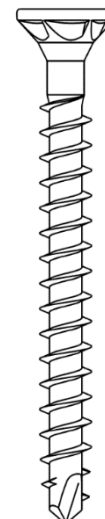


NOTE: These are planning aids. These values must be measured by authorized persons for each project.

## TENSILE STRENGTHS OF ASSY® PLUS VG SCREWS - ANGLE $\leq 45^\circ$

l <sub>ef</sub>	Angle between direction of grain and screw axis									
	0°	5°	10°	15°	20°	25°	30°	35°	40°	≥ 45°
30 mm	0,62	0,78	0,94	1,10	1,27	1,43	1,59	1,75	1,91	2,07
	0,38	0,48	0,58	0,68	0,78	0,88	0,98	1,08	1,17	1,27
40 mm	0,83	1,04	1,26	1,47	1,69	1,90	2,12	2,33	2,55	2,76
	0,51	0,64	0,77	0,91	1,04	1,17	1,30	1,43	1,57	1,70
50 mm	1,04	1,30	1,57	1,84	2,11	2,38	2,65	2,91	3,18	3,45
	0,64	0,80	0,97	1,13	1,30	1,46	1,63	1,79	1,96	2,12
60 mm	1,24	1,56	1,89	2,21	2,53	2,85	3,17	3,50	3,82	4,14
	0,76	0,96	1,16	1,36	1,56	1,76	1,95	2,15	2,35	2,55
70 mm	1,45	1,82	2,20	2,58	2,95	3,33	3,70	4,08	4,45	4,83
	0,89	1,12	1,35	1,59	1,82	2,05	2,28	2,51	2,74	2,97
80 mm	1,66	2,09	2,51	2,94	3,37	3,80	4,23	4,66	5,09	5,52
	1,02	1,28	1,55	1,81	2,08	2,34	2,60	2,87	3,13	3,40
90 mm	1,86	2,35	2,83	3,31	3,80	4,28	4,76	5,24	5,73	6,21
	1,15	1,44	1,74	2,04	2,34	2,63	2,93	3,23	3,52	3,82
100 mm	2,07	2,61	3,14	3,68	4,22	4,75	5,29	5,83	6,36	6,90
	1,27	1,60	1,93	2,26	2,59	2,93	3,26	3,59	3,92	4,25
110 mm	2,28	2,87	3,46	4,05	4,64	5,23	5,82	6,41	7,00	7,59
	1,40	1,76	2,13	2,49	2,85	3,22	3,58	3,94	4,31	4,67
120 mm	2,48	3,13	3,77	4,42	5,06	5,70	6,35	6,99	7,64	8,28
	1,53	1,92	2,32	2,72	3,11	3,51	3,91	4,30	4,70	5,10
140 mm	2,90	3,65	4,40	5,15	5,90	6,65	7,41	8,16	8,91	9,66
	1,78	2,25	2,71	3,17	3,63	4,10	4,56	5,02	5,48	5,94
160 mm	3,31	4,17	5,03	5,89	6,75	7,61	8,46	9,32	10,18	11,00
	2,04	2,57	3,09	3,62	4,15	4,68	5,21	5,74	6,27	6,80
180 mm	3,73	4,69	5,66	6,62	7,59	8,56	9,52	10,49	11,00	11,00
	2,29	2,89	3,48	4,08	4,67	5,27	5,86	6,45	6,80	7,15
200 mm	4,14	5,21	6,29	7,36	8,43	9,51	10,58	11,00	11,00	11,00
	2,55	3,21	3,87	4,53	5,19	5,85	6,51	6,80	7,15	7,50
220 mm	4,55	5,73	6,92	8,10	9,28	10,46	11,00	11,00	11,00	11,00
	2,80	3,53	4,26	4,98	5,71	6,44	6,80	7,15	7,50	7,85
240 mm	4,97	6,26	7,54	8,83	10,12	11,00	11,00	11,00	11,00	11,00
	3,06	3,85	4,64	5,44	6,23	6,80	7,15	7,50	7,85	8,20

∅  
**6,0**  
mm



Utilization class	continuously	long	medium	short	short / very short	very short
1 or 2	0,462	0,538	0,615	0,692	0,769	0,846

Factor  $k_{mod}/\gamma_M$

### Factor bulk density

GL24c	GL24h	GL28c	GL28h	GL30c	GL30h	GL32c	GL32h
1,034	1,079	1,090	1,168	1,090	1,179	1,113	1,200

### Calculation assumptions

Calculated values apply to softwood according to EN 14081-1 of the strength class C24 according to EN 338.

Each load-bearing capacity for one screw. The group effect must be taken into account when there is more than one screw.

Load-bearing connections must consist of at least two screws. There may be deviations according to DIN EN 1995-1-1/NA:2010-12, NCI for 8.3.1.2 (NA 10), and ETA-11/0190, 4.2.

All screws must be driven in flush to the surface. Preliminary holes may be drilled with a maximum core diameter  $d_1$ . See legend for table interpretation.

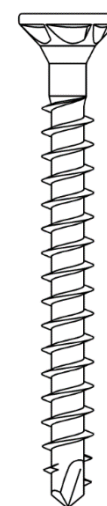
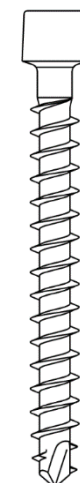
NOTE: These are planning aids. These values must be measured by authorized persons for each project.



## TENSILE STRENGTHS OF ASSY® PLUS VG SCREWS - ANGLE $\leq 45^\circ$

l <sub>ef</sub>	Angle between direction of grain and screw axis									
	0°	5°	10°	15°	20°	25°	30°	35°	40°	≥ 45°
40 mm	1,06	1,33	1,60	1,88	2,15	2,42	2,70	2,97	3,25	3,52
	0,65	0,82	0,99	1,16	1,32	1,49	1,66	1,83	2,00	2,17
50 mm	1,32	1,66	2,00	2,35	2,69	3,03	3,37	3,72	4,06	4,40
	0,81	1,02	1,23	1,44	1,65	1,87	2,08	2,29	2,50	2,71
60 mm	1,58	1,99	2,41	2,82	3,23	3,64	4,05	4,46	4,87	5,28
	0,97	1,23	1,48	1,73	1,99	2,24	2,49	2,74	3,00	3,25
70 mm	1,85	2,33	2,81	3,29	3,76	4,24	4,72	5,20	5,68	6,16
	1,14	1,43	1,73	2,02	2,32	2,61	2,91	3,20	3,50	3,79
80 mm	2,11	2,66	3,21	3,75	4,30	4,85	5,40	5,94	6,49	7,04
	1,30	1,64	1,97	2,31	2,65	2,98	3,32	3,66	4,00	4,33
90 mm	2,38	2,99	3,61	4,22	4,84	5,46	6,07	6,69	7,30	7,92
	1,46	1,84	2,22	2,60	2,98	3,36	3,74	4,12	4,49	4,87
100 mm	2,64	3,32	4,01	4,69	5,38	6,06	6,75	7,43	8,12	8,80
	1,62	2,05	2,47	2,89	3,31	3,73	4,15	4,57	4,99	5,42
110 mm	2,90	3,66	4,41	5,16	5,92	6,67	7,42	8,17	8,93	9,68
	1,79	2,25	2,71	3,18	3,64	4,10	4,57	5,03	5,49	5,96
120 mm	3,17	3,99	4,81	5,63	6,45	7,27	8,10	8,92	9,74	10,56
	1,95	2,45	2,96	3,47	3,97	4,48	4,98	5,49	5,99	6,50
140 mm	3,70	4,65	5,61	6,57	7,53	8,49	9,45	10,40	11,36	12,32
	2,27	2,86	3,45	4,04	4,63	5,22	5,81	6,40	6,99	7,58
160 mm	4,22	5,32	6,41	7,51	8,60	9,70	10,79	11,89	12,98	14,08
	2,60	3,27	3,95	4,62	5,30	5,97	6,64	7,32	7,99	8,66
180 mm	4,75	5,98	7,22	8,45	9,68	10,91	12,14	13,38	14,61	15,84
	2,92	3,68	4,44	5,20	5,96	6,72	7,47	8,23	8,99	9,75
200 mm	5,28	6,65	8,02	9,39	10,76	12,12	13,49	14,86	16,23	17,60
	3,25	4,09	4,93	5,78	6,62	7,46	8,30	9,15	9,99	10,83
220 mm	5,81	7,31	8,82	10,33	11,83	13,34	14,84	16,35	17,85	19,36
	3,57	4,50	5,43	6,35	7,28	8,21	9,13	10,06	10,99	11,91
240 mm	6,34	7,98	9,62	11,26	12,91	14,55	16,19	17,83	19,48	20,00
	3,90	4,91	5,92	6,93	7,94	8,95	9,96	10,98	11,99	15,38
260 mm	6,86	8,64	10,42	12,20	13,98	15,76	17,54	19,32	20,00	20,00
	4,22	5,32	6,41	7,51	8,60	9,70	10,79	11,89	15,38	15,38
280 mm	7,39	9,31	11,22	13,14	15,06	16,97	18,89	20,00	20,00	20,00
	4,55	5,73	6,91	8,09	9,27	10,45	11,63	15,38	15,38	15,38
300 mm	7,92	9,97	12,03	14,08	16,13	18,19	20,00	20,00	20,00	20,00
	4,87	6,14	7,40	8,66	9,93	11,19	15,38	15,38	15,38	15,38

∅  
**8,0**  
mm



### Calculation assumptions

Calculated values apply to softwood according to EN 14081-1 of the strength class C24 according to EN 338.

Each load-bearing capacity for one screw. The group effect must be taken into account when there is more than one screw.

Load-bearing connections must consist of at least two screws. There may be deviations according to DIN EN 1995-1-1/NA:2010-12, NCI for 8.3.1.2 NA 10), and ETA-11/0190, 4.2.

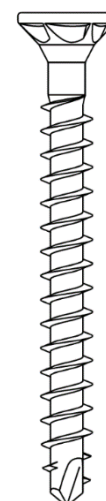
All screws must be driven in flush to the surface. Preliminary holes may be drilled with a maximum core diameter d<sub>1</sub>. See legend for table interpretation.

NOTE: These are planning aids. These values must be measured by authorized persons for each project.

## TENSILE STRENGTHS OF ASSY® PLUS VG SCREWS - ANGLE $\leq 45^\circ$

$l_{ef}$	Angle between direction of grain and screw axis									
	0°	5°	10°	15°	20°	25°	30°	35°	40°	$\geq 45^\circ$
320 mm	8,45	10,64	12,83	15,02	17,21	19,40	20,00	20,00	20,00	20,00
	5,20	6,55	7,89	9,24	10,59	11,94	15,38	15,38	15,38	15,38
340 mm	8,98	11,30	13,63	15,96	18,28	20,00	20,00	20,00	20,00	20,00
	5,52	6,96	8,39	9,82	11,25	15,38	15,38	15,38	15,38	15,38
360 mm	9,50	11,97	14,43	16,90	19,36	20,00	20,00	20,00	20,00	20,00
	5,85	7,36	8,88	10,40	11,91	15,38	15,38	15,38	15,38	15,38
380 mm	10,03	12,63	15,23	17,83	20,00	20,00	20,00	20,00	20,00	20,00
	6,17	7,77	9,37	10,98	15,38	15,38	15,38	15,38	15,38	15,38
400 mm	10,56	13,30	16,04	18,77	20,00	20,00	20,00	20,00	20,00	20,00
	6,50	8,18	9,87	11,55	15,38	15,38	15,38	15,38	15,38	15,38
420 mm	11,09	13,96	16,84	19,71	20,00	20,00	20,00	20,00	20,00	20,00
	6,82	8,59	10,36	12,13	15,38	15,38	15,38	15,38	15,38	15,38
440 mm	11,62	14,63	17,64	20,00	20,00	20,00	20,00	20,00	20,00	20,00
	7,15	9,00	10,85	15,38	15,38	15,38	15,38	15,38	15,38	15,38
460 mm	12,14	15,29	18,44	20,00	20,00	20,00	20,00	20,00	20,00	20,00
	7,47	9,41	11,35	15,38	15,38	15,38	15,38	15,38	15,38	15,38
480 mm	12,67	15,96	19,24	20,00	20,00	20,00	20,00	20,00	20,00	20,00
	7,80	9,82	11,84	15,38	15,38	15,38	15,38	15,38	15,38	15,38
500 mm	13,20	16,62	20,00	20,00	20,00	20,00	20,00	20,00	20,00	20,00
	8,12	10,23	15,38	15,38	15,38	15,38	15,38	15,38	15,38	15,38
520 mm	13,73	17,29	20,00	20,00	20,00	20,00	20,00	20,00	20,00	20,00
	8,45	10,64	15,38	15,38	15,38	15,38	15,38	15,38	15,38	15,38
540 mm	14,26	17,95	20,00	20,00	20,00	20,00	20,00	20,00	20,00	20,00
	8,77	11,05	15,38	15,38	15,38	15,38	15,38	15,38	15,38	15,38
560 mm	14,78	18,62	20,00	20,00	20,00	20,00	20,00	20,00	20,00	20,00
	9,10	11,46	15,38	15,38	15,38	15,38	15,38	15,38	15,38	15,38

Ø  
**8,0**  
mm



Utilization class	continuously	long	medium	short	short / very short	very short
1 or 2	0,462	0,538	0,615	0,692	0,769	0,846

Factor  $k_{mod}/\gamma_M$

### Factor bulk density

GL24c	GL24h	GL28c	GL28h	GL30c	GL30h	GL32c	GL32h
1,034	1,079	1,090	1,168	1,090	1,179	1,113	1,200

### Calculation assumptions

Calculated values apply to softwood according to EN 14081-1 of the strength class C24 according to EN 338.

Each load-bearing capacity for one screw. The group effect must be taken into account when there is more than one screw.

Load-bearing connections must consist of at least two screws. There may be deviations according to DIN EN 1995-1-1/NA:2010-12, NCI for 8.3.1.2 (NA 10), and ETA-11/0190, 4.2.

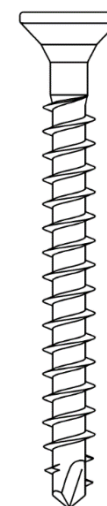
All screws must be driven in flush to the surface. Preliminary holes may be drilled with a maximum core diameter  $d_1$ . See legend for table interpretation.

NOTE: These are planning aids. These values must be measured by authorized persons for each project.

## TENSILE STRENGTHS OF ASSY® PLUS VG SCREWS - ANGLE $\leq 45^\circ$

l <sub>ef</sub>	Angle between direction of grain and screw axis									
	0°	5°	10°	15°	20°	25°	30°	35°	40°	≥ 45°
40 mm	1,20	1,51	1,82	2,13	2,44	2,76	3,07	3,38	3,69	4,00
	0,74	0,93	1,12	1,31	1,50	1,70	1,89	2,08	2,27	2,46
50 mm	1,50	1,89	2,28	2,67	3,06	3,44	3,83	4,22	4,61	5,00
	0,92	1,16	1,40	1,64	1,88	2,12	2,36	2,60	2,84	3,08
60 mm	1,80	2,27	2,73	3,20	3,67	4,13	4,60	5,07	5,53	6,00
	1,11	1,39	1,68	1,97	2,26	2,54	2,83	3,12	3,41	3,69
70 mm	2,10	2,64	3,19	3,73	4,28	4,82	5,37	5,91	6,46	7,00
	1,29	1,63	1,96	2,30	2,63	2,97	3,30	3,64	3,97	4,31
80 mm	2,40	3,02	3,64	4,27	4,89	5,51	6,13	6,76	7,38	8,00
	1,48	1,86	2,24	2,63	3,01	3,39	3,77	4,16	4,54	4,92
90 mm	2,70	3,40	4,10	4,80	5,50	6,20	6,90	7,60	8,30	9,00
	1,66	2,09	2,52	2,95	3,38	3,82	4,25	4,68	5,11	5,54
100 mm	3,00	3,78	4,56	5,33	6,11	6,89	7,67	8,44	9,22	10,00
	1,85	2,32	2,80	3,28	3,76	4,24	4,72	5,20	5,68	6,15
110 mm	3,30	4,16	5,01	5,87	6,72	7,58	8,43	9,29	10,14	11,00
	2,03	2,56	3,08	3,61	4,14	4,66	5,19	5,72	6,24	6,77
120 mm	3,60	4,53	5,47	6,40	7,33	8,27	9,20	10,13	11,07	12,00
	2,22	2,79	3,36	3,94	4,51	5,09	5,66	6,24	6,81	7,38
140 mm	4,20	5,29	6,38	7,47	8,56	9,64	10,73	11,82	12,91	14,00
	2,58	3,25	3,92	4,59	5,26	5,94	6,61	7,28	7,95	8,62
160 mm	4,80	6,04	7,29	8,53	9,78	11,02	12,27	13,51	14,76	16,00
	2,95	3,72	4,49	5,25	6,02	6,78	7,55	8,31	9,08	9,85
180 mm	5,40	6,80	8,20	9,60	11,00	12,40	13,80	15,20	16,60	18,00
	3,32	4,18	5,05	5,91	6,77	7,63	8,49	9,35	10,22	11,08
200 mm	6,00	7,56	9,11	10,67	12,22	13,78	15,33	16,89	18,44	20,00
	3,69	4,65	5,61	6,56	7,52	8,48	9,44	10,39	11,35	12,31
220 mm	6,60	8,31	10,02	11,73	13,44	15,16	16,87	18,58	20,29	22,00
	4,06	5,11	6,17	7,22	8,27	9,33	10,38	11,43	12,49	13,54
240 mm	7,20	9,07	10,93	12,80	14,67	16,53	18,40	20,27	22,13	24,00
	4,43	5,58	6,73	7,88	9,03	10,17	11,32	12,47	13,62	14,77
260 mm	7,80	9,82	11,84	13,87	15,89	17,91	19,93	21,96	23,98	26,00
	4,80	6,04	7,29	8,53	9,78	11,02	12,27	13,51	14,76	16,00
280 mm	8,40	10,58	12,76	14,93	17,11	19,29	21,47	23,64	25,82	28,00
	5,17	6,51	7,85	9,19	10,53	11,87	13,21	14,55	15,89	17,23
300 mm	9,00	11,33	13,67	16,00	18,33	20,67	23,00	25,33	27,67	30,00
	5,54	6,97	8,41	9,85	11,28	12,72	14,15	15,59	17,03	18,46

∅  
10,0  
mm



### Calculation assumptions

Calculated values apply to softwood according to EN 14081-1 of the strength class C24 according to EN 338.

Each load-bearing capacity for one screw. The group effect must be taken into account when there is more than one screw.

Load-bearing connections must consist of at least two screws. There may be deviations according to DIN EN 1995-1-1/NA:2010-12, NCI for 8.3.1.2 (NA 10), and ETA-11/0190, 4.2.

All screws must be driven in flush to the surface. Preliminary holes may be drilled with a maximum core diameter d<sub>1</sub>. See legend for table interpretation.

NOTE: These are planning aids. These values must be measured by authorized persons for each project.

## TENSILE STRENGTHS OF ASSY® PLUS VG SCREWS - ANGLE $\leq 45^\circ$

l <sub>ef</sub>	Angle between direction of grain and screw axis									
	0°	5°	10°	15°	20°	25°	30°	35°	40°	≥ 45°
320 mm	9,60	12,09	14,58	17,07	19,56	22,04	24,53	27,02	29,51	32,00
	5,91	7,44	8,97	10,50	12,03	13,57	15,10	16,63	18,16	24,62
340 mm	10,20	12,84	15,49	18,13	20,78	23,42	26,07	28,71	31,36	32,00
	6,28	7,90	9,53	11,16	12,79	14,41	16,04	17,67	19,30	24,62
360 mm	10,80	13,60	16,40	19,20	22,00	24,80	27,60	30,40	32,00	32,00
	6,65	8,37	10,09	11,82	13,54	15,26	16,98	18,71	24,62	24,62
380 mm	11,40	14,36	17,31	20,27	23,22	26,18	29,13	32,00	32,00	32,00
	7,02	8,83	10,65	12,47	14,29	16,11	17,93	24,62	24,62	24,62
400 mm	12,00	15,11	18,22	21,33	24,44	27,56	30,67	32,00	32,00	32,00
	7,38	9,30	11,21	13,13	15,04	16,96	18,87	24,62	24,62	24,62
420 mm	12,60	15,87	19,13	22,40	25,67	28,93	32,00	32,00	32,00	32,00
	7,75	9,76	11,77	13,78	15,79	17,81	24,62	24,62	24,62	24,62
440 mm	13,20	16,62	20,04	23,47	26,89	30,31	32,00	32,00	32,00	32,00
	8,12	10,23	12,34	14,44	16,55	18,65	24,62	24,62	24,62	24,62
460 mm	13,80	17,38	20,96	24,53	28,11	31,69	32,00	32,00	32,00	32,00
	8,49	10,69	12,90	15,10	17,30	19,50	24,62	24,62	24,62	24,62
480 mm	14,40	18,13	21,87	25,60	29,33	32,00	32,00	32,00	32,00	32,00
	8,86	11,16	13,46	15,75	18,05	24,62	24,62	24,62	24,62	24,62
500 mm	15,00	18,89	22,78	26,67	30,56	32,00	32,00	32,00	32,00	32,00
	9,23	11,62	14,02	16,41	18,80	24,62	24,62	24,62	24,62	24,62
520 mm	15,60	19,64	23,69	27,73	31,78	32,00	32,00	32,00	32,00	32,00
	9,60	12,09	14,58	17,07	19,56	24,62	24,62	24,62	24,62	24,62
540 mm	16,20	20,40	24,60	28,80	32,00	32,00	32,00	32,00	32,00	32,00
	9,97	12,55	15,14	17,72	24,62	24,62	24,62	24,62	24,62	24,62
560 mm	16,80	21,16	25,51	29,87	32,00	32,00	32,00	32,00	32,00	32,00
	10,34	13,02	15,70	18,38	24,62	24,62	24,62	24,62	24,62	24,62
580 mm	17,40	21,91	26,42	30,93	32,00	32,00	32,00	32,00	32,00	32,00
	10,71	13,48	16,26	19,04	24,62	24,62	24,62	24,62	24,62	24,62
600 mm	18,00	22,67	27,33	32,00	32,00	32,00	32,00	32,00	32,00	32,00
	11,08	13,95	16,82	19,69	24,62	24,62	24,62	24,62	24,62	24,62
620 mm	18,60	23,42	28,24	32,00	32,00	32,00	32,00	32,00	32,00	32,00
	11,45	14,41	17,38	24,62	24,62	24,62	24,62	24,62	24,62	24,62
640 mm	19,20	24,18	29,16	32,00	32,00	32,00	32,00	32,00	32,00	32,00
	11,82	14,88	17,94	24,62	24,62	24,62	24,62	24,62	24,62	24,62
660 mm	19,80	24,93	30,07	32,00	32,00	32,00	32,00	32,00	32,00	32,00
	12,18	15,34	18,50	24,62	24,62	24,62	24,62	24,62	24,62	24,62

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mm



### Calculation assumptions

Calculated values apply to softwood according to EN 14081-1 of the strength class C24 according to EN 338.

Each load-bearing capacity for one screw. The group effect must be taken into account when there is more than one screw.

Load-bearing connections must consist of at least two screws. There may be deviations according to DIN EN 1995-1-1/NA:2010-12, NCI for 8.3.1.2 (NA 10), and ETA-11/0190, 4.2.

All screws must be driven in flush to the surface. Preliminary holes may be drilled with a maximum core diameter d<sub>1</sub>. See legend for table interpretation.

NOTE: These are planning aids. These values must be measured by authorized persons for each project.

## TENSILE STRENGTHS OF ASSY® PLUS VG SCREWS - ANGLE $\leq 45^\circ$

$l_{ef}$	Angle between direction of grain and screw axis										
	0°	5°	10°	15°	20°	25°	30°	35°	40°	$\geq 45^\circ$	
680 mm	20,40	25,69	30,98	32,00	32,00	32,00	32,00	32,00	32,00	32,00	32,00
	12,55	15,81	19,06	24,62	24,62	24,62	24,62	24,62	24,62	24,62	24,62
700 mm	21,00	26,44	31,89	32,00	32,00	32,00	32,00	32,00	32,00	32,00	32,00
	12,92	16,27	19,62	24,62	24,62	24,62	24,62	24,62	24,62	24,62	24,62
720 mm	21,60	27,20	32,00	32,00	32,00	32,00	32,00	32,00	32,00	32,00	32,00
	13,29	16,74	24,62	24,62	24,62	24,62	24,62	24,62	24,62	24,62	24,62
740 mm	22,20	27,96	32,00	32,00	32,00	32,00	32,00	32,00	32,00	32,00	32,00
	13,66	17,20	24,62	24,62	24,62	24,62	24,62	24,62	24,62	24,62	24,62
760 mm	22,80	28,71	32,00	32,00	32,00	32,00	32,00	32,00	32,00	32,00	32,00
	14,03	17,67	24,62	24,62	24,62	24,62	24,62	24,62	24,62	24,62	24,62
780 mm	23,40	29,47	32,00	32,00	32,00	32,00	32,00	32,00	32,00	32,00	32,00
	14,40	18,13	24,62	24,62	24,62	24,62	24,62	24,62	24,62	24,62	24,62

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mm

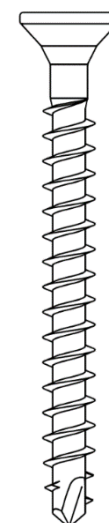


Utilization class	continuously	long	medium	short	short / very short	very short
1 or 2	0,462	0,538	0,615	0,692	0,769	0,846

Factor  $k_{mod}/\gamma_M$

### Factor bulk density

GL24c	GL24h	GL28c	GL28h	GL30c	GL30h	GL32c	GL32h
1,034	1,079	1,090	1,168	1,090	1,179	1,113	1,200



### Calculation assumptions

Calculated values apply to softwood according to EN 14081-1 of the strength class C24 according to EN 338.

Each load-bearing capacity for one screw. The group effect must be taken into account when there is more than one screw.

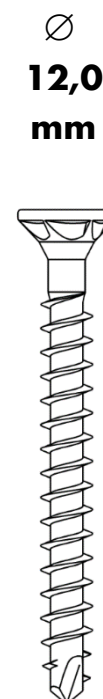
Load-bearing connections must consist of at least two screws. There may be deviations according to DIN EN 1995-1-1/NA:2010-12, NCI for 8.3.1.2 (NA 10), and ETA-11/0190, 4.2.

All screws must be driven in flush to the surface. Preliminary holes may be drilled with a maximum core diameter  $d_1$ . See legend for table interpretation.

NOTE: These are planning aids. These values must be measured by authorized persons for each project.

## TENSILE STRENGTHS OF ASSY® PLUS VG SCREWS - ANGLE $\leq 45^\circ$

l <sub>ef</sub>	Angle between direction of grain and screw axis									
	0°	5°	10°	15°	20°	25°	30°	35°	40°	≥ 45°
50 mm	1,80	2,27	2,73	3,20	3,67	4,13	4,60	5,07	5,53	6,00
	1,11	1,39	1,68	1,97	2,26	2,54	2,83	3,12	3,41	3,69
60 mm	2,16	2,72	3,28	3,84	4,40	4,96	5,52	6,08	6,64	7,20
	1,33	1,67	2,02	2,36	2,71	3,05	3,40	3,74	4,09	4,43
70 mm	2,52	3,17	3,83	4,48	5,13	5,79	6,44	7,09	7,75	8,40
	1,55	1,95	2,35	2,76	3,16	3,56	3,96	4,37	4,77	5,17
80 mm	2,88	3,63	4,37	5,12	5,87	6,61	7,36	8,11	8,85	9,60
	1,77	2,23	2,69	3,15	3,61	4,07	4,53	4,99	5,45	5,91
90 mm	3,24	4,08	4,92	5,76	6,60	7,44	8,28	9,12	9,96	10,80
	1,99	2,51	3,03	3,54	4,06	4,58	5,10	5,61	6,13	6,65
100 mm	3,60	4,53	5,47	6,40	7,33	8,27	9,20	10,13	11,07	12,00
	2,22	2,79	3,36	3,94	4,51	5,09	5,66	6,24	6,81	7,38
110 mm	3,96	4,99	6,01	7,04	8,07	9,09	10,12	11,15	12,17	13,20
	2,44	3,07	3,70	4,33	4,96	5,60	6,23	6,86	7,49	8,12
120 mm	4,32	5,44	6,56	7,68	8,80	9,92	11,04	12,16	13,28	14,40
	2,66	3,35	4,04	4,73	5,42	6,10	6,79	7,48	8,17	8,86
140 mm	5,04	6,35	7,65	8,96	10,27	11,57	12,88	14,19	15,49	16,80
	3,10	3,91	4,71	5,51	6,32	7,12	7,93	8,73	9,53	10,34
160 mm	5,76	7,25	8,75	10,24	11,73	13,23	14,72	16,21	17,71	19,20
	3,54	4,46	5,38	6,30	7,22	8,14	9,06	9,98	10,90	11,82
180 mm	6,48	8,16	9,84	11,52	13,20	14,88	16,56	18,24	19,92	21,60
	3,99	5,02	6,06	7,09	8,12	9,16	10,19	11,22	12,26	13,29
200 mm	7,20	9,07	10,93	12,80	14,67	16,53	18,40	20,27	22,13	24,00
	4,43	5,58	6,73	7,88	9,03	10,17	11,32	12,47	13,62	14,77
220 mm	7,92	9,97	12,03	14,08	16,13	18,19	20,24	22,29	24,35	26,40
	4,87	6,14	7,40	8,66	9,93	11,19	12,46	13,72	14,98	16,25
240 mm	8,64	10,88	13,12	15,36	17,60	19,84	22,08	24,32	26,56	28,80
	5,32	6,70	8,07	9,45	10,83	12,21	13,59	14,97	16,34	17,72
260 mm	9,36	11,79	14,21	16,64	19,07	21,49	23,92	26,35	28,77	31,20
	5,76	7,25	8,75	10,24	11,73	13,23	14,72	16,21	17,71	19,20
280 mm	10,08	12,69	15,31	17,92	20,53	23,15	25,76	28,37	30,99	33,60
	6,20	7,81	9,42	11,03	12,64	14,24	15,85	17,46	19,07	20,68
300 mm	10,80	13,60	16,40	19,20	22,00	24,80	27,60	30,40	33,20	36,00
	6,65	8,37	10,09	11,82	13,54	15,26	16,98	18,71	20,43	22,15
320 mm	11,52	14,51	17,49	20,48	23,47	26,45	29,44	32,43	35,41	38,40
	7,09	8,93	10,77	12,60	14,44	16,28	18,12	19,95	21,79	23,63



### Calculation assumptions

Calculated values apply to softwood according to EN 14081-1 of the strength class C24 according to EN 338.

Each load-bearing capacity for one screw. The group effect must be taken into account when there is more than one screw.

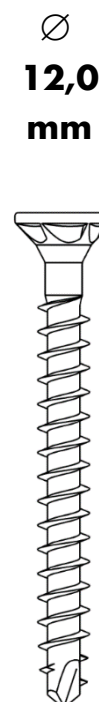
Load-bearing connections must consist of at least two screws. There may be deviations according to DIN EN 1995-1-1/NA:2010-12, NCI for 8.3.1.2 (NA 10), and ETA-11/0190, 4.2.

All screws must be driven in flush to the surface. Preliminary holes may be drilled with a maximum core diameter d<sub>1</sub>. See legend for table interpretation.

NOTE: These are planning aids. These values must be measured by authorized persons for each project.

## TENSILE STRENGTHS OF ASSY® PLUS VG SCREWS - ANGLE $\leq 45^\circ$

l <sub>ef</sub>	Angle between direction of grain and screw axis									
	0°	5°	10°	15°	20°	25°	30°	35°	40°	≥ 45°
340 mm	12,24	15,41	18,59	21,76	24,93	28,11	31,28	34,45	37,63	40,80
	7,53	9,49	11,44	13,39	15,34	17,30	19,25	21,20	23,15	25,11
360 mm	12,96	16,32	19,68	23,04	26,40	29,76	33,12	36,48	39,84	43,20
	7,98	10,04	12,11	14,18	16,25	18,31	20,38	22,45	24,52	26,58
380 mm	13,68	17,23	20,77	24,32	27,87	31,41	34,96	38,51	42,05	45,00
	8,42	10,60	12,78	14,97	17,15	19,33	21,51	23,70	25,88	34,62
400 mm	14,40	18,13	21,87	25,60	29,33	33,07	36,80	40,53	44,27	45,00
	8,86	11,16	13,46	15,75	18,05	20,35	22,65	24,94	27,24	34,62
420 mm	15,12	19,04	22,96	26,88	30,80	34,72	38,64	42,56	45,00	45,00
	9,30	11,72	14,13	16,54	18,95	21,37	23,78	26,19	34,62	34,62
440 mm	15,84	19,95	24,05	28,16	32,27	36,37	40,48	44,59	45,00	45,00
	9,75	12,27	14,80	17,33	19,86	22,38	24,91	27,44	34,62	34,62
460 mm	16,56	20,85	25,15	29,44	33,73	38,03	42,32	45,00	45,00	45,00
	10,19	12,83	15,47	18,12	20,76	23,40	26,04	34,62	34,62	34,62
480 mm	17,28	21,76	26,24	30,72	35,20	39,68	44,16	45,00	45,00	45,00
	10,63	13,39	16,15	18,90	21,66	24,42	27,18	34,62	34,62	34,62
500 mm	18,00	22,67	27,33	32,00	36,67	41,33	45,00	45,00	45,00	45,00
	11,08	13,95	16,82	19,69	22,56	25,44	34,62	34,62	34,62	34,62
520 mm	18,72	23,57	28,43	33,28	38,13	42,99	45,00	45,00	45,00	45,00
	11,52	14,51	17,49	20,48	23,47	26,45	34,62	34,62	34,62	34,62
540 mm	19,44	24,48	29,52	34,56	39,60	44,64	45,00	45,00	45,00	45,00
	11,96	15,06	18,17	21,27	24,37	27,47	34,62	34,62	34,62	34,62
560 mm	20,16	25,39	30,61	35,84	41,07	45,00	45,00	45,00	45,00	45,00
	12,41	15,62	18,84	22,06	25,27	34,62	34,62	34,62	34,62	34,62
580 mm	20,88	26,29	31,71	37,12	42,53	45,00	45,00	45,00	45,00	45,00
	12,85	16,18	19,51	22,84	26,17	34,62	34,62	34,62	34,62	34,62



Utilization class	continuously	long	medium	short	short / very short	very short
1 or 2	0,462	0,538	0,615	0,692	0,769	0,846

Factor  $k_{mod}/\gamma_M$

### Factor bulk density

GL24c	GL24h	GL28c	GL28h	GL30c	GL30h	GL32c	GL32h
1,034	1,079	1,090	1,168	1,090	1,179	1,113	1,200

### Calculation assumptions

Calculated values apply to softwood according to EN 14081-1 of the strength class C24 according to EN 338.

Each load-bearing capacity for one screw. The group effect must be taken into account when there is more than one screw.

Load-bearing connections must consist of at least two screws. There may be deviations according to DIN EN 1995-1-1/NA:2010-12, NCI for 8.3.1.2 (NA 10), and ETA-11/0190, 4.2.

All screws must be driven in flush to the surface. Preliminary holes may be drilled with a maximum core diameter  $d_1$ . See legend for table interpretation.

NOTE: These are planning aids. These values must be measured by authorized persons for each project.

## TENSILE STRENGTHS OF ASSY® PLUS VG SCREWS - ANGLE $\leq 45^\circ$

l <sub>ef</sub>	Angle between direction of grain and screw axis									
	0°	5°	10°	15°	20°	25°	30°	35°	40°	≥ 45°
100 mm	4,20	5,29	6,38	7,47	8,56	9,64	10,73	11,82	12,91	14,00
	2,58	3,25	3,92	4,59	5,26	5,94	6,61	7,28	7,95	8,62
200 mm	8,40	10,58	12,76	14,93	17,11	19,29	21,47	23,64	25,82	28,00
	5,17	6,51	7,85	9,19	10,53	11,87	13,21	14,55	15,89	17,23
300 mm	12,60	15,87	19,13	22,40	25,67	28,93	32,20	35,47	38,73	42,00
	7,75	9,76	11,77	13,78	15,79	17,81	19,82	21,83	23,84	25,85
400 mm	16,80	21,16	25,51	29,87	34,22	38,58	42,93	47,29	51,64	56,00
	10,34	13,02	15,70	18,38	21,06	23,74	26,42	29,10	31,78	34,46
500 mm	21,00	26,44	31,89	37,33	42,78	48,22	53,67	59,11	62,00	62,00
	12,92	16,27	19,62	22,97	26,32	29,68	33,03	36,38	47,69	47,69
600 mm	25,20	31,73	38,27	44,80	51,33	57,87	62,00	62,00	62,00	62,00
	15,51	19,53	23,55	27,57	31,59	35,61	47,69	47,69	47,69	47,69
700 mm	29,40	37,02	44,64	52,27	59,89	62,00	62,00	62,00	62,00	62,00
	18,09	22,78	27,47	32,16	36,85	47,69	47,69	47,69	47,69	47,69
800 mm	33,60	42,31	51,02	59,73	62,00	62,00	62,00	62,00	62,00	62,00
	20,68	26,04	31,40	36,76	47,69	47,69	47,69	47,69	47,69	47,69
900 mm	37,80	47,60	57,40	62,00	62,00	62,00	62,00	62,00	62,00	62,00
	23,26	29,29	35,32	47,69	47,69	47,69	47,69	47,69	47,69	47,69
1000 mm	42,00	52,89	62,00	62,00	62,00	62,00	62,00	62,00	62,00	62,00
	25,85	32,55	47,69	47,69	47,69	47,69	47,69	47,69	47,69	47,69
1100 mm	46,20	58,18	62,00	62,00	62,00	62,00	62,00	62,00	62,00	62,00
	28,43	35,80	47,69	47,69	47,69	47,69	47,69	47,69	47,69	47,69
1200 mm	50,40	62,00	62,00	62,00	62,00	62,00	62,00	62,00	62,00	62,00
	31,02	47,69	47,69	47,69	47,69	47,69	47,69	47,69	47,69	47,69
1300 mm	54,60	62,00	62,00	62,00	62,00	62,00	62,00	62,00	62,00	62,00
	33,60	47,69	47,69	47,69	47,69	47,69	47,69	47,69	47,69	47,69
1400 mm	58,80	62,00	62,00	62,00	62,00	62,00	62,00	62,00	62,00	62,00
	36,18	47,69	47,69	47,69	47,69	47,69	47,69	47,69	47,69	47,69
1500 mm	62,00	62,00	62,00	62,00	62,00	62,00	62,00	62,00	62,00	62,00
	47,69	47,69	47,69	47,69	47,69	47,69	47,69	47,69	47,69	47,69

∅  
14,0  
mm



Utilization class	continuously	long	medium	short	short / very short	very short
1 or 2	0,462	0,538	0,615	0,692	0,769	0,846

Factor  $k_{mod}/\gamma_M$

### Factor bulk density

GL24c	GL24h	GL28c	GL28h	GL30c	GL30h	GL32c	GL32h
1,034	1,079	1,090	1,168	1,090	1,179	1,113	1,200

### Calculation assumptions

Calculated values apply to softwood according to EN 14081-1 of the strength class C24 according to EN 338.

Each load-bearing capacity for one screw. The group effect must be taken into account when there is more than one screw.

Load-bearing connections must consist of at least two screws. There may be deviations according to DIN EN 1995-1-1/NA:2010-12, NCI for 8.3.1.2 (NA 10), and ETA-11/0190, 4.2.

All screws must be driven in flush to the surface. Preliminary holes (10% of L) must be drilled in the core diameter d<sub>1</sub>. See legend for table interpretation.

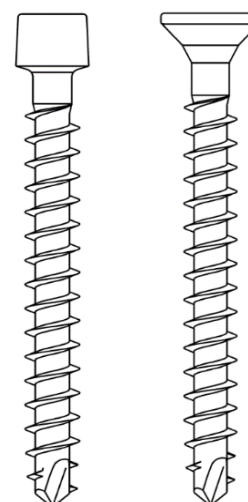
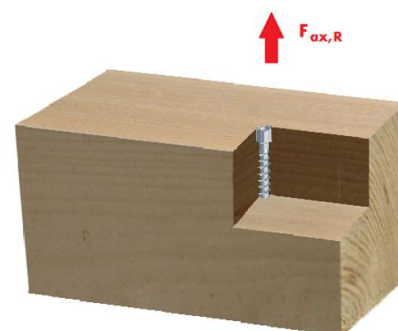
NOTE: These are planning aids. These values must be measured by authorized persons for each project.



## PULL-OUT STRENGTH IN SOFTWOOD C24 $\alpha = 90^\circ$ - ASSY® PLUS VG

**ASSY plus VG pull-out strength  $F_{ax,Rk}$  and  $F_{ax,Rd}$  ( $k_{mod} = 0.8$ ) in kN per cm anchorage length**

$t_1$ degrees	$\varnothing 6mm$	$\varnothing 8mm$	$\varnothing 10mm$	$\varnothing 12mm$	$\varnothing 14mm^*$
	in kN	in kN	in kN	in kN	in kN
$90^\circ - 45^\circ$	0,69	0,88	1,00	1,20	1,40
	0,42	0,54	0,62	0,74	0,86
$40^\circ$	0,64	0,81	0,92	1,11	1,29
	0,39	0,50	0,57	0,68	0,79
$35^\circ$	0,58	0,74	0,84	1,01	1,18
	0,36	0,46	0,52	0,62	0,73
$30^\circ$	0,53	0,67	0,77	0,92	1,07
	0,33	0,42	0,47	0,57	0,66
$25^\circ$	0,48	0,61	0,69	0,83	0,96
	0,29	0,37	0,42	0,51	0,59
$20^\circ$	0,42	0,54	0,61	0,73	0,86
	0,26	0,33	0,38	0,45	0,53
$15^\circ$	0,37	0,47	0,53	0,64	0,75
	0,23	0,29	0,33	0,39	0,46
$10^\circ$	0,31	0,40	0,46	0,55	0,64
	0,19	0,25	0,28	0,34	0,39
$5^\circ$	0,26	0,33	0,38	0,45	0,53
	0,16	0,20	0,23	0,28	0,33
$0^\circ$	0,21	0,26	0,30	0,36	0,42
	0,13	0,16	0,18	0,22	0,26



### Legend

$\alpha$	=	Angle between screw axis and direction of grain
$F_{ax,R}$	=	Thread pull-out strength of a screw
$F_{ax,R}$	=	$\min \{ \text{table value} \times l_{ef}; F_{tens} \}$
$l_{ef}$	=	Effective anchorage length of thread in cm
$F_{tens}$	=	Tear-off strength

$F_{tens,k} =$	$F_{tens,d} =$	
11,0 kN	8,46 kN	for $\varnothing 6$ mm
20,0 kN	15,4 kN	for $\varnothing 8$ mm
32,0 kN	24,6 kN	for $\varnothing 10$ mm
45,0 kN	34,6 kN	for $\varnothing 12$ mm
62,0 kN	47,7 kN	for $\varnothing 14$ mm*

$\varnothing 6mm$
in kN
$F_{ax,Rk}$
$F_{ax,Rd}$

### Basis for calculation

- ETA-11/0190
- EN 1995-1-1:2010-12

\* Values do not apply to hot-galvanized screws

Load-bearing capacities apply to a characteristic bulk density  $\rho_k \geq 350$  kg/m<sup>3</sup>

Design value of load-bearing capacity with  $k_{mod} = 0.8$  and  $\gamma_M = 1.3$

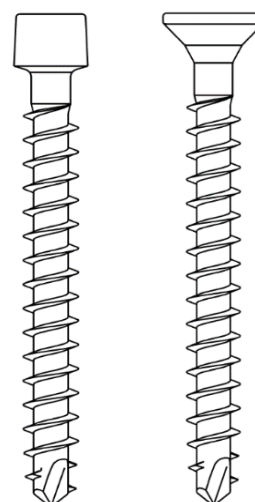
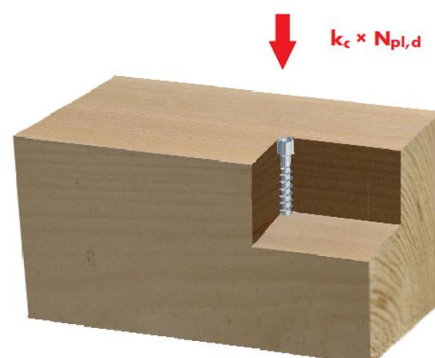
NOTE: These are planning aids. These values must be measured by authorized persons for each project.

## PUSH-THROUGH STRENGTH IN SOFTWOOD C24 $\alpha = 90^\circ$ - ASSY® PLUS VG

### ASSY plus VG design value for maximum push-through strength

$k_c \times N_{pl,d}$  in kN

$\alpha$	Ø 6mm	Ø 8mm	Ø 10mm	Ø 12mm	Ø 14mm*
90°	6,19	10,9	17,1	22,8	33,1
85°	6,15	10,9	17,0	22,7	33,0
80°	6,11	10,8	16,9	22,5	32,8
75°	6,07	10,7	16,8	22,4	32,6
70°	6,02	10,6	16,7	22,2	32,3
65°	5,98	10,6	16,6	22,1	32,1
60°	5,93	10,5	16,4	21,9	31,9
55°	5,88	10,4	16,3	21,7	31,7
50°	5,83	10,3	16,2	21,6	31,4
45°	5,77	10,2	16,0	21,4	31,2
40°	5,72	10,1	15,9	21,2	30,9
35°	5,66	10,0	15,7	21,0	30,6
30°	5,60	9,92	15,6	20,8	30,3
25°	5,54	9,81	15,4	20,6	30,0
20°	5,47	9,69	15,2	20,4	29,7
15°	5,40	9,57	15,0	20,1	29,3
10°	5,33	9,45	14,8	19,9	29,0
5°	5,25	9,31	14,6	19,6	28,6
0°	5,17	9,17	14,4	19,3	28,2



### Legend

- $k_c \times N_{pl,d}$  Design value for maximum load bearing capacity of a screw under pressure
- $\alpha$  = Angle between screw axis and direction of grain
- $F_{ax,Rd} = \min \{k_{mod} / \gamma_M \times F_{ax,Rk}; K_C \times N_{pl,d}\}$
- $F_{ax,Rk}$  = Characteristic pull-out strength value of the thread as a function of the screw-in length

\* Values do not apply to hot-galvanized screws

Load-bearing capacities apply to a characteristic bulk density  $\rho_k \geq 350 \text{ kg/m}^3$

### Basis for calculation

- ETA-11/0190
- EN 1995-1-1:2010-12

NOTE: These are planning aids. These values must be measured by authorized persons for each project.

# **ASSY<sup>®</sup> – THE SCREW FOR WOOD AND BUILDING CRAFTS**

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