INDO CONSTRUCTION FASTENING SYSTEMS

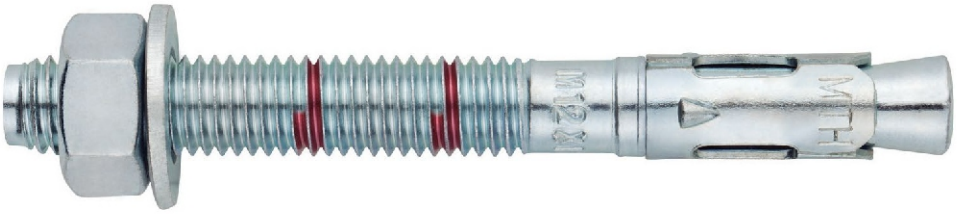
A brand of Indo Spark Group Since 1978

IWA

Indo Wedge Anchor

Through-bolt expansion anchor with controlled torque, for use in non cracked concrete

ETA Assessed Option 7. Zinc-plated shaft. Zinc-plated clip.



PRODUCT INFORMATION

DESCRIPTION
Metallic anchor, with male thread, expansion by controlled torque.

SIZES
M6x60 to M20x270.

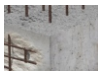
DESIGN LOAD RANGE
From 5,3 to 34,3 kN (standard depth).
From 6,7 to 21,3 kN (reduced depth).

CHARACTERISTICS AND BENEFITS
- Easy installation.
- Use in non-craked concrete.
- Use for medium-heavy duty loads.
- Pre-installation or through the drill-hole of the fixture.
- Variety of lengths and diameters: flexibility in assembly.
- For static and quasi-static loads.
- Two installation depths in M8, M10, M12, M16 and M20, allowing the use in thick anchor plates or in los thickness base materials.
- Available at

BASE MATERIAL
Concrete class from C20/25 to C50/60 non-cracked.


Stone


Concrete


Reinforced Concrete

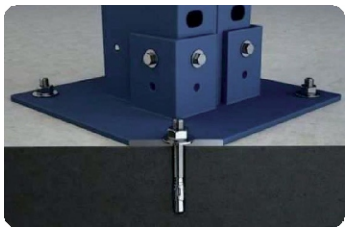
MATERIALS
Shaft: Cold-formed carbon steel, zinc-plated = 5 µm.
Washer: DIN 125 or DIN 9021, zinc-plated = 5 µm.
Nut: DIN 934, zinc-plated = 5 µm.
Clip: Cold-formed carbon steel, zinc-plated = 40 µm

ASSESSMENTS
- Option 7 (Non-cracked concrete).

CE
STRUCTURAL FIXINGS IN UNCRACKED CONCRETE
ETA 16/0502

ETA 16/0502

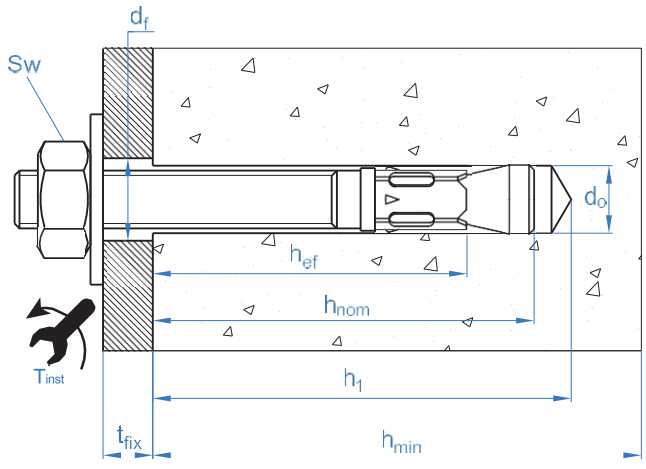
APPLICATIONS
- Anchor Plates
- Structures
- Shelving
- Urban Fitments
- Protective Fence
- Catenaries
- Elevators
- Scaffolding Fix



MECHANICAL PROPERTIES									
			M6	M8	M10	M12	M14	M16	M20
Cone area section									
A_s	(mm^2)	Cone area section	14,5	25,5	46,5	68,0	100,2	122,6	216,3
$f_{u,s}$	(N/mm^2)	Characteristic tension resistance	510	510	510	490	490	490	460
$f_{y,s}$	(N/mm^2)	Yield strength	440	440	440	410	410	410	375
Threaded area section									
A_s	(mm^2)	Cone area section	20,1	36,6	58,0	84,3	115,0	157,0	245,0
$f_{u,s}$	(N/mm^2)	Characteristic tension resistance	510	510	510	490	490	490	490
$f_{y,s}$	(N/mm^2)	Yield strength	440	440	440	410	410	410	410

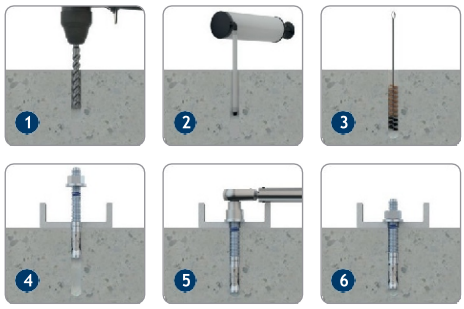
INSTALLATION DATA									
SIZE			M6	M8	M10	M12	M14	M16	M20
Code			IWA06	IWA08	IWA10	IWA12	IWA14	IWA16	IWA20
	d_0	Nominal diameter of drill bit	[mm]	6	8	10	12	14	16	20
	T_{ins}	Installation torque moment	[Nm]	7	20	35	60	90	120	240
	d_f=	Diameter of clearance hole in the fixture	[mm]	7	9	12	14	16	18	22
Standard depth	h_1	Minimum drill hole depth	[mm]	55	65	75	85	100	110	135
	h_{nom}	Installation depth	[mm]	49,5	59,5	66,5	77	91	103,5	125
	h_{ef}	Effective embedment depth	[mm]	40	48	55	65	75	84	103
	h_{min}	Minimum base material thickness	[mm]	100	100	110	130	150	168	206
	t_{fix}	Maximum thickness of fixture*	[mm]	L-58	L-70	L-80	L-92	L-108	L-122	L-147
	$s_{cr,N}$	Critical spacing	[mm]	120	144	165	195	225	252	309
	$c_{cr,N}$	Critical edge distance	[mm]	60	72	83	98	113	126	155
	$s_{cr,sp}$	Critical distance (splitting)	[mm]	160	192	220	260	300	280	360
	$c_{cr,sp}$	Critical edge distance (splitting)	[mm]	80	96	110	130	150	140	180
Reduced depth	h_1	Minimum drill hole depth	[mm]	-	50	60	70	-	90	107
	h_{nom}	Installation depth	[mm]	-	46,5	53,5	62	-	84,5	97
	h_{ef}	Effective embedment depth	[mm]	-	35	42	50	-	65	75
	h_{min}	Minimum base material thickness	[mm]	-	100	100	100	-	130	150
	t_{fix}	Maximum thickness of fixture*	[mm]	-	L-57	L-67	L-77	-	L-103	L-121
	$s_{cr,N}$	Critical spacing	[mm]	-	105	126	150	-	195	225
	$c_{cr,N}$	Critical edge distance	[mm]	-	53	63	75	-	98	113
	$s_{cr,sp}$	Critical distance (splitting)	[mm]	-	140	168	200	-	260	300
	$c_{cr,sp}$	Critical edge distance (splitting)	[mm]	-	70	84	100	-	130	150
	s_{min}	Minimum spacing	[mm]	35	40	50	70	80	90	135
	c_{min}	Minimum edge distance	[mm]	35	40	50	70	80	90	135
	SW	Installation wrench		10	13	17	19	22	24	30

*L= Total anchor length



INSTALLATION PRODUCTS
Hammer drill
Concrete Drill bits
Blow pump
Cleaning Brush
Installation hammering tool
Torque wrench
Hexagonal socket

INSTALLATION



Resistances in C20/25 concrete for an isolated anchor, without effects of edge distance or spacing

Characteristic Resistance N_{rk} y V_{RK}

TENSION									
Size			M6	M8	M10	M12	M14	M16	M20
N_{Rk}	Standard depth	[kN]	7,4	13,0	19,0	25,8	32,0	37,9	51,4
N_{Rk}	Reduced depth	[kN]	-	10,0	13,4	17,4	-	25,8	32,0

SHEAR									
Size			M6	M8	M10	M12	M14	M16	M20
V_{Rk}	Standard depth	[kN]	5,1	9,3	14,7	20,6	28,1	38,4	56,3
V_{Rk}	Reduced depth	[kN]	-	10,2	13,4	17,4	-	38,4	63,9

Design Resistance N_{rd} y V_{Rd}

TENSION									
Size			M6	M8	M10	M12	M14	M16	M20
N_{rd}	Standard depth	[kN]	5,3	9,3	12,7	17,2	21,3	25,2	34,3
N_{rd}	Reduced depth	[kN]	-	6,7	8,9	11,6	-	17,2	21,3

SHEAR									
Size			M6	M8	M10	M12	M14	M16	M20
V_{Rd}	Standard depth	[kN]	4,1	7,4	11,8	16,5	22,5	30,7	45,0
V_{Rd}	Reduced depth	[kN]	-	6,8	8,9	11,6	-	30,7	42,6

Maximum Loads Recommended N_{rec} y V_{rec}

TENSION									
Size			M6	M8	M10	M12	M14	M16	M20
N_{rec}	Standard depth	[kN]	3,8	6,6	9,0	12,3	15,2	18,0	24,5
N_{rec}	Reduced depth	[kN]	-	4,8	6,4	8,3	-	12,3	15,2

SHEAR									
Size			M6	M8	M10	M12	M14	M16	M20
V_{rec}	Standard depth	[kN]	2,9	5,3	8,4	11,8	16,1	21,9	32,2
V_{rec}	Reduced depth	[kN]	-	4,9	6,4	8,3	-	21,9	30,4

Simplified calculation method

European Technical Assessment

Simplified version of the calculation method according to Eurocode 2 EN 1992-4. Resistance is calculated according to the data shown in assessment

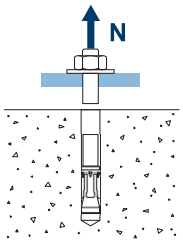
- Influence of concrete strength.
- Influence of edge distance.
- Influence of spacing between anchors.
- Influence of reinforcements.
- Influence of base material thickness.
- Influence of load application angle.
- Valid for a group of two anchors.

The calculation method is based on the following simplification: Different loads do not act on individual anchors, without eccentricity.

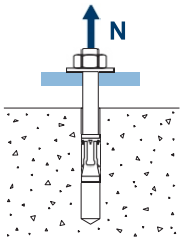
TENSION LOADS

- Steel design resistance: $N_{Rd,s}$
- Pull-out design resistance: $N_{Rd,p} = N^{o}_{Rd,p} \cdot \Psi_{c}$
- Concrete cone design resistance: $N_{Rd,c} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N}$
- Concrete splitting design resistance: $N_{Rd,sp} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp}$

Steel Design resistance									
$N_{Rd,s}$									
Size			M6	M8	M10	M12	M14	M16	M20
N^{o}_{Rd}	Standard depth	[kN]	5,3	9,3	16,9	23,8	35,1	42,9	71,1

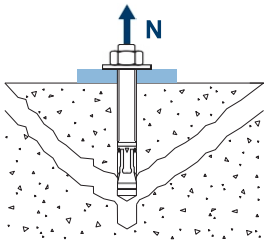


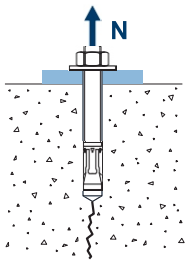
Pull-out design resistance									
$N_{Rd,p} = N^{o}_{Rd,p} \cdot \Psi_{c}$									
Size			M6	M8	M10	M12	M14	M16	M20
$N^{o}_{Rd,p}$	Standard depth	[kN]	-*	-*	12,6	-*	-*	-*	-*
$N^{o}_{Rd,p}$	Reduced depth	[kN]	-	6,6	-*	-*	-	-*	-*



*Pull-out failure is not decisive.

Concrete cone design resistance									
$N_{Rd,c} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N}$									
Concrete splitting design resistance*									
$N_{Rd,sp} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp}$									
Size			M6	M8	M10	M12	M14	M16	M20
N^{o}	Standard depth	[kN]	8,3	10,9	13,4	17,2	21,3	25,2	34,3
N^{o}	Reduced depth	[kN]	-	6,8	8,9	11,6	-	17,2	21,3

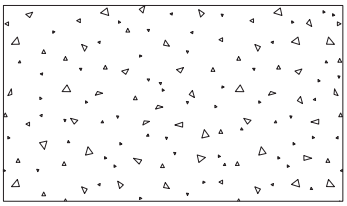




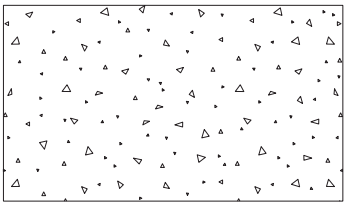
*Concrete splitting design resistance must only be considered for non-cracked concrete.

Coefficients of influence

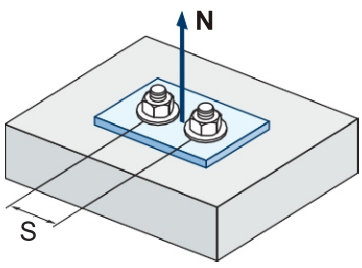
Influence of concrete strength resistance in pul - out failure Ψ_c								
		M6	M8	M10	M12	M14	M16	M20
Ψ_c	C 20/25				1,00			
	C 30/37				1,22			
	C 40/50				1,41			
	C 50/60				1,58			



Influence of concrete strength in concret cone and splitting failure Ψ_b								
		M6	M8	M10	M12	M14	M16	M20
Ψ_b	C 20/25				1,00			
	C 30/37				1,22			
	C 40/50				1,41			
	C 50/60				1,58			



$$\Psi_b \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$



$$\Psi_{s,N} = 0{,}5 + \frac{s}{2 \cdot S_{cr,N}} \leq 1$$

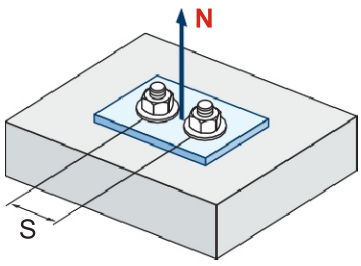
Influence of spacing (concrete cone) $\Psi_{s,N}$ **IWA** Standard depth							
s [mm]	M6	M8	M10	M12	M14	M16	M20
35	0,65						
40	0,67	0,64					
50	0,71	0,67	0,65				
55	0,73	0,69	0,67				
60	0,75	0,71	0,68				
65	0,77	0,73	0,70				
70	0,79	0,74	0,71	0,68			
80	0,83	0,78	0,74	0,71			
85	0,85	0,80	0,76	0,72	0,69		
90	0,88	0,81	0,77	0,73	0,70		
100	0,92	0,85	0,80	0,76	0,72	0,70	
105	0,94	0,86	0,82	0,77	0,73	0,71	
110	0,96	0,88	0,83	0,78	0,74	0,72	
120	1,00	0,92	0,86	0,81	0,77	0,74	
125		0,93	0,88	0,82	0,78	0,75	
126		0,94	0,88	0,82	0,78	0,75	
128		0,94	0,89	0,83	0,78	0,75	
130		0,95	0,89	0,83	0,79	0,76	
135		0,97	0,91	0,85	0,80	0,77	0,72
144		1,00	0,94	0,87	0,82	0,79	0,73
150			0,95	0,88	0,83	0,80	0,74
165			1,00	0,92	0,87	0,83	0,77
170				0,94	0,88	0,84	0,78
180				0,96	0,90	0,86	0,79
195				1,00	0,93	0,89	0,82
200					0,94	0,90	0,82
210					0,97	0,92	0,84
220					0,99	0,94	0,86
225					1,00	0,95	0,86
252						1,00	0,91
255	Value without reduction = 1						0,91
260							0,92
300							0,99
309							1,00

IWA Reduced depth							
s [mm]	M6	M8	M10	M12	M14	M16	M20
40		0,69					
50		0,74	0,70				
55		0,76	0,72				
60		0,79	0,74				
65		0,81	0,76				
70		0,83	0,78	0,73			
80		0,88	0,82	0,77			
85		0,90	0,84	0,78			
90		0,93	0,86	0,80		0,73	
100			0,90	0,83		0,76	
105			0,92	0,85		0,77	
110			0,94	0,87		0,78	
120			0,98	0,90		0,81	
125			1,00	0,92		0,82	
126			1,00	0,92		0,82	
128				0,93		0,83	
130				0,93		0,83	
135						0,85	0,80
144				0,98		0,87	0,82
150						0,88	0,83
165						0,92	0,87
170						0,94	0,88
180						0,96	0,90
195						1,00	0,93
200		Value without reduction = 1					0,94
210							0,97
220							0,99
225							1,00

Influence of spacing (concrete splitting) $\Psi_{s,sp}$							
s [mm]	**IWA** Standard depth						
	M6	M8	M10	M12	M14	M16	M20
35	0,61	0,60					
40	0,63	0,63					
50	0,66	0,64	0,63				
55	0,67	0,66	0,64				
60	0,69	0,67	0,65				
65	0,70	0,68	0,66	0,63			
70	0,72	0,71	0,68	0,65	0,63		
80	0,75	0,72	0,69	0,66	0,64		
85	0,77	0,73	0,70	0,67	0,65	0,66	
90	0,78	0,76	0,73	0,69	0,67	0,68	
100	0,81	0,79	0,75	0,71	0,68	0,70	
110	0,84	0,83	0,78	0,74	0,71	0,72	
125	0,89	0,83	0,79	0,75	0,71	0,73	
128	0,90	0,85	0,81	0,76	0,73	0,74	
135	0,92	0,86	0,82	0,77	0,73	0,75	0,69
140	0,94	0,89	0,84	0,79	0,75	0,77	0,69
150	0,97	0,92	0,86	0,81	0,77	0,79	0,71
160	1,00	0,93	0,88	0,82	0,78	0,79	0,72
165		0,94	0,88	0,82	0,78	0,80	0,73
168		0,97	0,91	0,85	0,80	0,82	0,73
180		1,00	0,94	0,87	0,82	0,84	0,75
192			0,95	0,88	0,83	0,86	0,77
200			0,98	0,90	0,85	0,88	0,78
210			1,00	0,92	0,87	0,89	0,79
220				1,00	0,93	0,96	0,81
260					0,97	1,00	0,86
280					0,98		0,89
288					1,00		0,90
300							0,92
336							0,97
350							0,99
360							1,00

Invalid Value

Value without reduction = 1

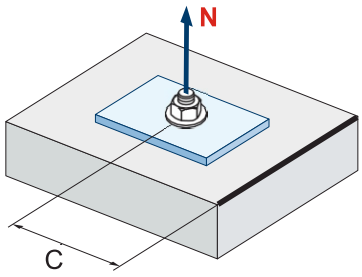


$$\Psi_{s,sp} = 0{,}5 + \frac{s}{2 \cdot S_{cr,sp}} \leq 1$$

s [mm]	**IWA** Reduced depth						
	M6	M8	M10	M12	M14	M16	M20
40		0,64					
50		0,68	0,65				
55		0,70	0,66				
60		0,71	0,68				
65		0,73	0,69				
70		0,75	0,71	0,68			
80		0,79	0,74	0,70			
85		0,80	0,75	0,71			
90		0,82	0,77	0,73		0,67	
100		0,86	0,80	0,75		0,69	
110		0,89	0,83	0,78		0,71	
125		0,95	0,87	0,81		0,74	
128		0,96	0,88	0,82		0,75	
135		0,98	0,90	0,84		0,76	0,73
140		1,00	0,92	0,85		0,77	0,73
150			0,95	0,88		0,79	0,75
160			0,98	0,90		0,81	0,77
165			0,99	0,91		0,82	0,78
168			1,00	0,92		0,82	0,78
180				0,95		0,85	0,80
192				0,98		0,87	0,82
200				1,00		0,88	0,83
210						0,90	0,85
220						0,92	0,87
260						1,00	0,93
280							0,97
288							0,98
300							1,00

Invalid Value

Value without reduction = 1



$$\psi_{c,sp} = 0{,}35 + \frac{0{,}5 \cdot c}{C_{cr,sp}} + \frac{0{,}15 \cdot c^2}{C_{cr,sp}^2} \leq 1$$

Influence of concrete edge distance (splitting) $_{c,sp}$

IWA Standard depth

c [mm]	M6	M8	M10	M12	M14	M16	M20
35							
40	0,64	0,58					
50	0,72	0,65	0,61				
60	0,81	0,72	0,67				
65	0,86	0,76	0,70				
70	0,90	0,79	0,73	0,66			
75	0,95	0,83	0,76	0,69			
80	1,00	0,87	0,79	0,71	0,66		
83		0,89	0,81	0,73	0,67		
84		0,90	0,82	0,74	0,68		
85		0,91	0,83	0,74	0,68		
90		0,95	0,86	0,77	0,70	0,73	
96		1,00	0,90	0,80	0,73	0,76	
100			0,93	0,82	0,75	0,78	
105			0,96	0,85	0,77	0,81	
110			1,00	0,88	0,80	0,84	
125				0,97	0,87	0,92	
128				0,99	0,89	0,93	
130				1,00	0,90	0,94	
135					0,92	0,97	0,81
140					0,95	1,00	0,83
144					0,97		0,85
150					1,00		0,87
168							0,95
175							0,98
180							1,00

Invalid Value

Value without reduction = 1

IWA Standard depth

c [mm]	M6	M8	M10	M12	M14	M16	M20
40		0,68					
50		0,78	0,70				
60		0,89	0,78				
65		0,94	0,83				
70		1,00	0,87	0,77			
75			0,92	0,81			
80			0,96	0,85			
83			0,99	0,87			
84			1,00	0,88			
85				0,88			
90				0,92		0,77	
96				0,97		0,80	
100				1,00		0,82	
105						0,85	
110						0,88	
125						0,97	
128						0,99	
130						1,00	
135							0,92
144							0,97
150							1,00

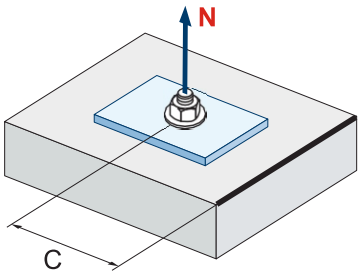
Invalid Value

Value without reduction = 1

Influence of concrete edge distance (concrete cone) $\Psi_{c,N}$							
	IWA Standard depth						
c [mm]	M6	M8	M10	M12	M14	M16	M20
35	0,69						
40	0,75	0,69					
50	0,87	0,77	0,71				
53	0,91	0,80	0,73				
60	1,00	0,87	0,79				
63		0,90	0,82				
65		0,92	0,83				
70		0,98	0,88	0,78			
72		1,00	0,90	0,80			
75			0,92	0,82			
80			0,97	0,86	0,78		
83			1,00	0,88	0,80		
85				0,90	0,81		
90				0,94	0,84	0,78	
98				1,00	0,90	0,83	
100					0,91	0,84	
105					0,94	0,87	
110					0,98	0,90	
113					1,00	0,92	
125						0,99	
126						1,00	
128							
135							0,90
150							0,97
155							1,00

Invalid Value

Value without reduction = 1

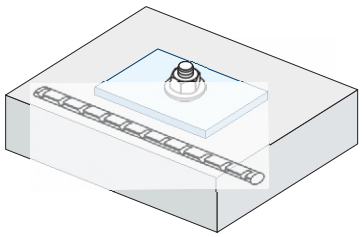


$$\Psi_{c,N} = 0{,}35 + \frac{0{,}5 \cdot c}{C_{cr,N}} + \frac{0{,}15 \cdot c^2}{C_{cr,N}^2} \leq 1$$

	IWA Standard depth						
c [mm]	M6	M8	M10	M12	M14	M16	M20
40		0,81					
50		0,96	0,84				
53		1,00	0,88				
60			0,96				
63			1,00				
65							
70				0,95			
72				0,97			
75				1,00			
80							
83							
85							
90						0,94	
98						1,00	
100							
105							
110							
113							
125							
126							
128							
135							1,00

Invalid Value

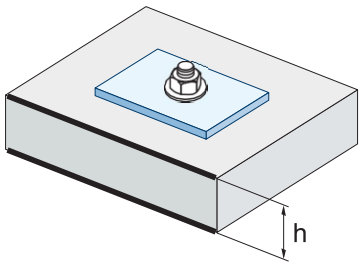
Value without reduction = 1



$$\Psi_{re,N} = 0,5 + \frac{h_{ef}}{200} \leq 1$$

Influence of reinforcements $\Psi_{re,N}$							
$\Psi_{re,N}$	**IWA** Standard depth						
	M6	M8	M10	M12	M14	M16	M20
	0,70	0,74	0,77	0,82	0,87	0,92	1,00
	Reduced depth						
	M6	M8	M10	M12	M14	M16	M20
	-	0,67	0,71	0,75	-	0,83	0,88

*This factor only applies for a high density of reinforcements. If in the area of the anchor there are reinforcements with a distancing of = 150 mm (any diameter) or with a diameter = 10 mm and a distancing of = 100 mm, a $f_{re,N}$ = 1 factor may be applied



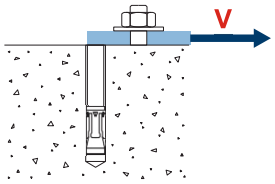
Influence of base material thickness										
$\Psi_{h,sp}$	**IWA**									
h/hef	2,00	2,20	2,40	2,60	2,80	3,00	3,20	3,40	3,60	=3,68
$\Psi_{h,sp}$	1,00	1,07	1,13	1,19	1,25	1,31	1,37	1,42	1,48	1,50

$$\Psi_{h,sp} = \left(\frac{h}{2 \cdot h_{ef}}\right)^{2/3} \leq 1,5$$

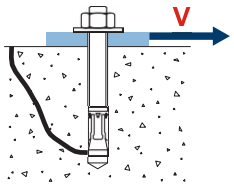
SHEAR LOADS

- Steel design resistance without lever arm : $V_{Rd,s}$
- Pry-out design resistance: $V_{Rd,cp} = k \cdot N^{o}_{Rd,c}$
- Concrete edge design resistance: $V_{Rd,c} = V^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$

Steel design resistance									
$V_{Rd,s}$									
Size			M6	M8	M10	M12	M14	M16	M20
$V_{Rd,s}$	Standard depth	[kN]	4,1	7,4	11,8	16,5	22,5	30,7	45,0
$V_{Rd,s}$	Reduced depth	[kN]		7,4	11,8	16,5		30,7	45,0

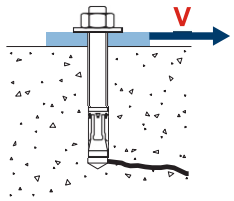


Pry-out design resistance*									
$V_{Rd,cp} = k \cdot N^{o}_{Rd,c}$									
Size			M6	M8	M10	M12	M14	M16	M20
	k (Standard depth)	[kN]	1	1	1	2	2	2	2
	k (Reduced depth)	[kN]	-	1	1	2	-	2	2



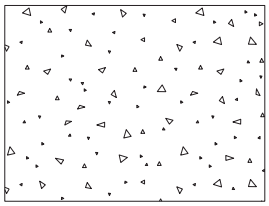
* $N^{o}_{Rd,c}$ Concrete cone design resistance for tension loads

Concrete edge resistance									
$V_{Rd,c} = V^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$									
Size			M6	M8	M10	M12	M14	M16	M20
$V^{o}_{Rd,c}$	Standard depth	[kN]	4,6	6,2	7,7	10,2	12,9	15,6	21,8
$V^{o}_{Rd,c}$	Reduced depth	[kN]	-	3,6	4,9	6,5	-	10,1	12,8



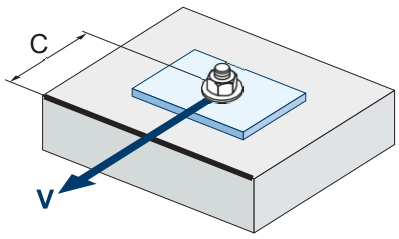
Coefficients of influence

Influence of concrete strength in concrete edge failure Ψ_b								
		M6	M8	M10	M12	M14	M16	M20
Ψ_b	C 20/25				1,00			
	C 30/37				1,22			
	C 40/50				1,41			
	C 50/60				1,55			

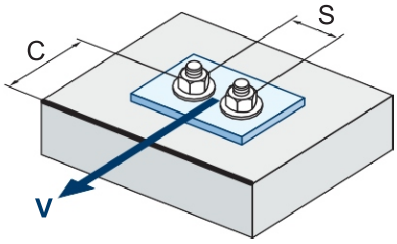


$$\Psi \quad \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$

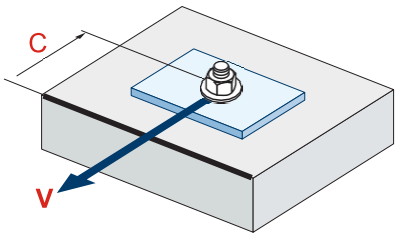
Influence of edge distance and spacing $\Psi_{se,V}$ FOR ONE ANCHOR ONLY																	
c/h_{ef}	0,50	0,75	1,00	1,25	1,50	1,75	2,00	2,25	2,50	2,75	3,00	3,25	3,50	3,75	4,00	4,50	5,00
Isolated	0,35	0,65	1,00	1,40	1,84	2,32	2,83	3,38	3,95	4,56	5,20	5,86	6,55	7,26	8,00	9,55	11,18
FOR TWO ANCHORS																	
c/h_{ef}	0,50	0,75	1,00	1,25	1,50	1,75	2,00	2,25	2,50	2,75	3,00	3,25	3,50	3,75	4,00	4,50	5,00
s/c 1,0	0,24	0,43	0,67	0,93	1,22	1,54	1,89	2,25	2,64	3,04	3,46	3,91	4,37	4,84	5,33	6,36	7,45
1,5	0,27	0,49	0,75	1,05	1,38	1,74	2,12	2,53	2,96	3,42	3,90	4,39	4,91	5,45	6,00	7,16	8,39
2,0	0,29	0,54	0,83	1,16	1,53	1,93	2,36	2,81	3,29	3,80	4,33	4,88	5,46	6,05	6,67	7,95	9,32
2,5	0,32	0,60	0,92	1,28	1,68	2,12	2,59	3,09	3,62	4,18	4,76	5,37	6,00	6,66	7,33	8,75	10,25
=3,0	0,35	0,65	1,00	1,40	1,84	2,32	2,83	3,38	3,95	4,56	5,20	5,86	6,55	7,26	8,00	9,55	11,18



$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1,5}$$



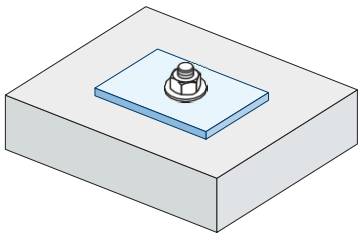
$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1,5} \cdot \left(1 + \frac{s}{3 \cdot c}\right) \cdot 0,5 = \left(\frac{c}{h_{ef}}\right)^{1,5}$$



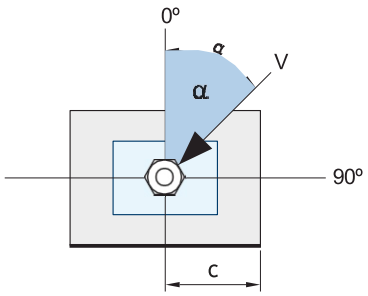
$$\Psi_{c,V} = \left(\frac{d}{c}\right)^{0,20}$$

c [mm]	Influence of concrete edge distance $\Psi_{c,V}$ IWA						
	M6	M10	M10	M12	M14	M16	M20
35	0,70	Invalid Value					
40	0,68	0,70					
45	0,67	0,71					
50	0,65	0,69					
55	0,64	0,68	0,71				
60	0,63	0,67	0,70				
70	0,61	0,65	0,68	0,70			
80	0,60	0,63	0,66	0,68	0,71		
85	0,59	0,62	0,65	0,68	0,70		
90	0,58	0,62	0,64	0,67	0,69	0,71	
100	0,57	0,60	0,63	0,65	0,67	0,69	
105	0,56	0,60	0,62	0,65	0,67	0,69	
110	0,56	0,56	0,62	0,64	0,66	0,68	
120	0,55	0,58	0,61	0,63	0,65	0,67	
125	0,54	0,58	0,60	0,63	0,65	0,66	
128	0,54	0,57	0,60	0,62	0,64	0,66	
130	0,54	0,57	0,60	0,62	0,64	0,66	
135	0,54	0,57	0,59	0,62	0,64	0,65	
140	0,53	0,56	0,59	0,61	0,63	0,65	
150	0,53	0,56	0,58	0,60	0,62	0,64	
160	0,52	0,55	0,57	0,60	0,61	0,63	
170	0,51	0,54	0,57	0,59	0,61	0,62	0,65
175	0,51	0,54	0,56	0,59	0,60	0,62	0,65
180	0,51	0,54	0,56	0,58	0,60	0,62	0,64
190	0,50	0,53	0,55	0,58	0,59	0,61	0,64
200	0,50	0,53	0,55	0,57	0,59	0,60	0,63
210	0,49	0,52	0,54	0,56	0,58	0,60	0,62
220	0,49	0,52	0,54	0,56	0,58	0,59	0,62
230	0,48	0,51	0,53	0,55	0,57	0,59	0,61
240	0,48	0,51	0,53	0,55	0,57	0,58	0,61
250	0,47	0,50	0,53	0,54	0,56	0,58	0,60
260	0,47	0,50	0,52	0,54	0,56	0,57	0,60
270	0,47	0,49	0,52	0,54	0,55	0,57	0,59
280	0,46	0,49	0,51	0,53	0,55	0,56	0,59
290	0,46	0,49	0,51	0,53	0,55	0,56	0,59
300	0,46	0,48	0,51	0,53	0,54	0,56	0,58

Influence of reinforcements $\Psi_{re,V}$			
	Without perimetral reinforcements	Perimetral reinforcements = Ø12mm	Perimetral reinforcements with brackets = 100mm
Non-cracked concrete	1	1	1

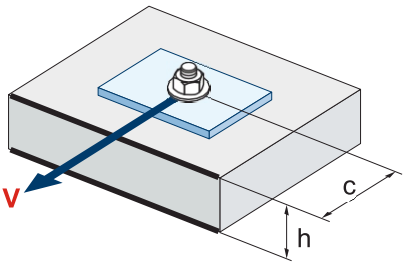


Influence of load application angle $\Psi_{\alpha,V}$										
Angle, α(°)	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
$\Psi_{\alpha,V}$	1,00	1,01	1,05	1,13	1,24	1,40	1,64	1,97	2,32	2,50



$$\Psi_{\alpha,V} = \sqrt{\frac{1}{(\cos \alpha_V)^2 + \left(\frac{\sin \alpha}{2,5}\right)^2}} \geq 1$$

Influence of base material thickness $\Psi_{h,V}$										
IWA										
h/c	0,15	0,30	0,45	0,60	0,75	0,90	1,05	1,20	1,35	=1,5
$\Psi_{h,V}$	0,32	0,45	0,55	0,63	0,71	0,77	0,84	0,89	0,95	1,00



$$\Psi_{h,V} = \left(\frac{h}{\quad}\right)^{0,5} \geq 1,0$$

IWA

IWA

IWA

IWA

CE

STRUCTURAL FIXINGS IN UNCRACKED CONCRETE

ETA 16/0502

ETA 16/0502

CHARACTERISTICS

- Roughness working principle; installation by controlled torque.
- Use for high loads.
- Assessed for two installation depths.
- Easy installation.
- Use in non-cracked concrete.
- Previous installation, or through the Fixture.
- Use for static or quasi-static loads.
- Three versions zinc plated, stainless steel A2 and A4.
- Variety of lengths and sizes, assembly Flexibility.
- DIN 440 for fixing wood structures to concrete.
- Available in ICFS Anchor Design Software

BASE MATERIAL

SIZE RANGE

M6 - M20

DRILL HOLE CONDITION

DRY

WELL

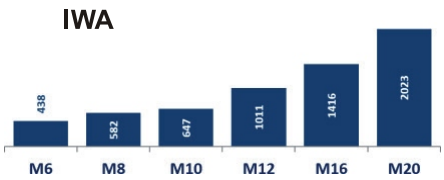
FLOODED

APPLICATION

- Structural applications in non-cracked concrete.
- Safety barriers.
- Billboards, machinery, boilers, signals, steel beams, etc.
- Fixings wood structures in concrete.

MAXIMUM LOADS RECOMMENDED IN NON-CRACKED CONCRETE [kg]

*M14 only for IWA



APPLICATION EXAMPLES

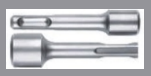
3.2. INSTALLATION PARAMETERS

				General installation parameters				Standard installation depth										Reduced installation depth									
Family [–]	Code [–]	Size / Bolt letter [–]	Assessed ETA	Drill bit diameter d_0 [mm]	Fixture clearance hole d_f [mm]	Torque T_{inst} [Nm]	Minimum allowable spacing S_{min} [mm]	Minimum allowable edge distance C_{min} [mm]	Minimum concrete Thickness h_{min} [mm]	Depth of drill hole ⩾ h_1 [mm]	Installation depth h_{nom} [mm]	Effective anchorage depth h_{ef} [mm]	Thickness of fixtures ⩽ t_{fix} [mm]	Critical spacing (concrete cone) $S_{cr,N}$ [mm]	Critical edge distance (concrete cone) $C_{cr,N}$ [mm]	Critical spacing (splitting) $S_{cr,sp}$ [mm]	Critical edge (splitting) $C_{cr,sp}$ [mm]	Minimum concrete thickness h_{min} [mm]	Depth of drill hole ⩾ h_1 [mm]	Installation depth h_{nom} [mm]	Effective anchorage depth h_{ef} [mm]	Thickness of fixtures ⩽ t_{fix} [mm]	Critical spacing (concrete cone) $S_{cr,N}$ [mm]	Critical edge distance (concrete cone) $C_{cr,N}$ [mm]	Critical spacing (splitting) $S_{cr,sp}$ [mm]	Critical edge distance(splitting) $C_{cr,sp}$ [mm]
IWA	IWA06060	M6x60 (B)	✓										2									--				
	IWA06070	M6x70 (C)	✓										12									--				
	IWA06080	M6x80 (D)	✓										22									--				
	IWA06090	M6x90 (E)	✓										32									--				
	IWA06100	M6x100(E)	✓										42									--				
	IWA06110	M6x110(F)	✓										52									--				
	IWA06120	M6x120(G)	✓	6	7	7	35	35	100	55	49,5	40	62	120	60	160	80	–	--	--	–	--	--	--	–	--
	IWA06130	M6x130(H)	✓										72									--				
	IWA06140	M6x140(I)	✓										82									--				
	IWA06150	M6x150(I)	✓										92									--				
	IWA06160	M6x160(J)	✓										102									--				
	IWA06170	M6x170(K)	✓										112									--				
	IWA06180	M6x180(L)	✓										122									--				
	IWA08060	M8x60 (B)	✓						--	–	--	--	--	–	--	--	--					3				
	IWA08075	M8x75 (C)	✓										5									18				
	IWA08090	M8x90 (E)	✓										20									33				
	IWA08100	M8x100(E)	✓										30									43	105	53	140	70
	IWA08115	M8x115(G)	✓	8	9	20	40	40	100	65	59,5	48	45	144	72	192	96	100	50	46,5	35	58				
	IWA08120	M8x120(G)	✓										50									63				
	IWA08130	M8x130(H)	✓										60									73				
	IWA08155	M8x155(J)	✓										85									98				
	IWA10070	M10x70(C)	✓						–	–	--	--	--	–	--	--	--					3				
	IWA10080	M10x80(D)	✓						--	–	--	--	--	–	--	--	--					13				
	IWA10090	M10x90(E)	✓	10	12	35	50	50					10					100	60	53,5	42	23	126	63	168	84
	IWA10100	M10x100(E)	✓						110	75	66,5	55	20	165	83	220	110					33				
	IWA10120	M10x120(G)	✓										40									53				

1. RANGE

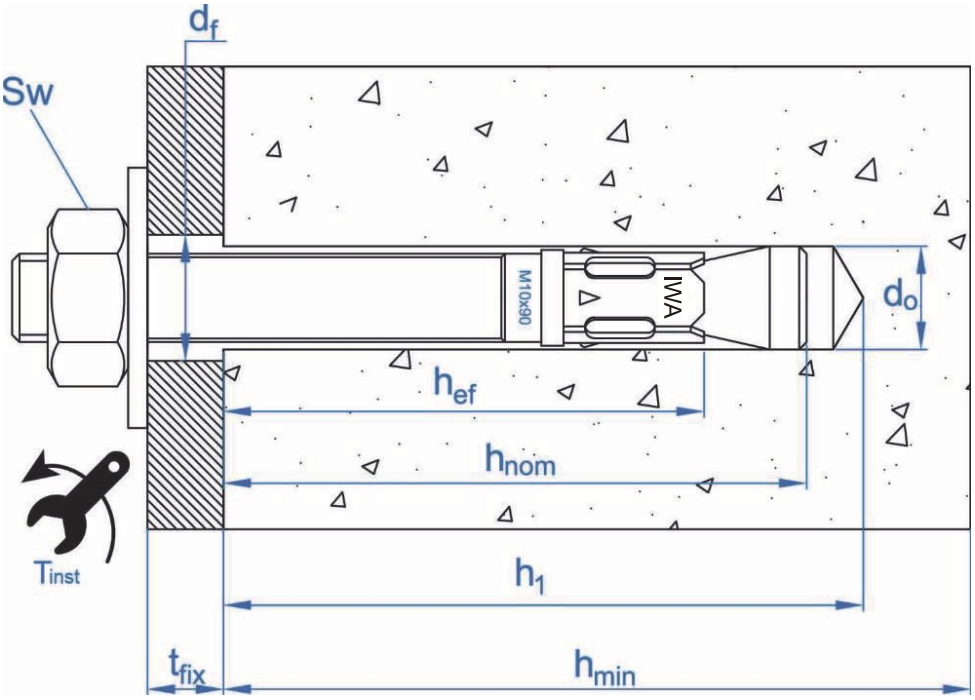
ITEM	CODE	SIZE	PHOTO	COMPONENT	MATERIAL
1	IWA	M6 to M20		Bolt Clip Nut Washer	Carbon steel cold formed, zinc-plated = 5µm Carbon steel, zinc-plated = 5µm DIN 934 class 6 ISO 898-1 zinc-plated = 5µm DIN 125, DIN 9021 o DIN 440 zinc-plated = 5µm
2	IWA	M6 to M20		Bolt Clip Nut Washer	Carbon steel cold formed, atlantis = 8µm Carbon steel, atlantis = 8µm DIN 934 class 6 ISO 898-1 atlantis = 8µm DIN 125, DIN 9021 o DIN 440 atlantis = 8µm
3	IWA	M6 to M20		Bolt Clip Nut Washer	Stainless steel, grade A2 Stainless steel, grade A2 DIN 934 stainless steel, grade A2 DIN 125, DIN 9021 o DIN 440 stainless steel, grade A2
4	IWA	M6 to M20		Bolt Clip Nut Washer	Stainless steel, grade A4 Stainless steel, grade A4 DIN 934 stainless steel, grade A4 DIN 125, DIN 9021 o DIN 440 stainless steel, grade A4

2. ACCESSORIES

ITEM	CODE	PHOTO	DESCRIPTION
1	DOMTA		Accessory for anchor installation with hammer drill

3. INSTALLATION DATA

3.1. INSTALLATION DRAWING



3.2. INSTALLATION PARAMETERS

Family [–]	Code [–]	Size / Bolt letter [–]	Assessed ETA	General installation parameters: Drill bit diameter d_0 [mm]	Fixture clearance hole d_f [mm]	Torque T_{inst} [Nm]	Minimum allowable spacing S_{min} [mm]	Standard installation depth: Minimum allowable edge distance C_{min} [mm]	Minimum concrete Thickness h_{min} [mm]	Depth of drill hole ⩾ h_1 [mm]	Installation depth h_{nom} [mm]	Effective anchorage depth h_{ef} [mm]	Thickness of fixtures ⩽ t_{fix} [mm]	Critical spacing (concrete cone) $S_{cr,N}$ [mm]	Critical edge distance (concrete cone) $C_{cr,N}$ [mm]	Critical spacing (splitting) $S_{cr,sp}$ [mm]	Critical edge (splitting) $C_{cr,sp}$ [mm]	Reduced installation depth: Minimum concrete thickness h_{min} [mm]	Depth of drill hole ⩾ h_1 [mm]	Installation depth h_{nom} [mm]	Effective anchorage depth h_{ef} [mm]	Thickness of fixtures ⩽ t_{fix} [mm]	Critical spacing (concrete cone) $S_{cr,N}$ [mm]	Critical edge distance (concrete cone) $C_{cr,N}$ [mm]	Critical spacing (splitting) $S_{cr,sp}$ [mm]	Critical edge distance(splitting) $C_{cr,sp}$ [mm]
IWA	IWA10140	M10x140(I)	✓										60									73				
	IWA10150	M10x150(I)	✓										70									83				
	IWA10160	M10x160(J)	✓	10	12	35	50	50	110	75	66.5	55	80	165	83	220	110	100	60	53.5	42	93	126	63	168	84
	IWA10170	M10x170(K)	✓										90									103				
	IWA10210	M10x210(N)	✓										130									143				
	IWA10230	M10x230(P)	✓										150									163				
	IWA12090	M12x90(E)	✓						--	–	--	--	--	–	--	--	--					13				
	IWA12100	M12x100(E)	✓										8									23				
	IWA12110	M12x110(F)	✓										18									33				
	IWA12120	M12x120(G)	✓										28									43				
	IWA12130	M12x130(H)	✓	12	14	60	70	70	130	85	77	65	38	195	98	260	130	100	70	62	50	53	150	75	200	100
	IWA12140	M12x140(I)	✓										48									63				
	IWA12160	M12x160(J)	✓										68									83				
	IWA12180	M12x180(L)	✓										88									103				
	IWA12200	M12x200(M)	✓										108									123				
	IWA12220	M12x220(O)	✓										128									143				
	IWA12250	M12x250(Q)	✓										158									173				
	IWA14120	M14x120(G)	✓										12									--				
	IWA14145	M14x145(I)	✓										37									--				
	IWA14170	M14x170(K)	✓	14	16	90	80	80	150	100	91	75	62	225	113	300	150	–	--	--	–	--	--	--	–	--
	IWA14220	M14x220(O)	✓										112									--				
	IWA14250	M14x250(Q)	✓										142									--				

3.2. INSTALLATION PARAMETERS

				General installation parameters				Standard installation depth										Reduced installation depth									
Family [–]	Code [–]	Size / Bolt letter [–]	Assessed ETA	Drill bit diameter d_0 [mm]	Fixture clearance hole d_f [mm]	Torque T_{inst} [Nm]	Minimum allowable spacing S_{min} [mm]	Minimum allowable edge distance C_{min} [mm]	Minimum concrete Thickness h_{min} [mm]	Depth of drill hole ⩾ h_1 [mm]	Installation depth h_{nom} [mm]	Effective anchorage depth h_{ef} [mm]	Thickness of fixtures ⩽ t_{fix} [mm]	Critical spacing (concrete cone) $S_{cr,N}$ [mm]	Critical edge distance (concrete cone) $C_{cr,N}$ [mm]	Critical spacing (splitting) $S_{cr,sp}$ [mm]	Critical edge (splitting) $C_{cr,sp}$ [mm]	Minimum concrete thickness h_{min} [mm]	Depth of drill hole ⩾ h_1 [mm]	Installation depth h_{nom} [mm]	Effective anchorage depth h_{ef} [mm]	Thickness of fixtures ⩽ t_{fix} [mm]	Critical spacing (concrete cone) $S_{cr,N}$ [mm]	Critical edge distance (concrete cone) $C_{cr,N}$ [mm]	Critical spacing (splitting) $S_{cr,sp}$ [mm]	Critical edge distance(splitting) $C_{cr,sp}$ [mm]
IWA	IWA16125	M16 x 125(G)	✓										3									22				
	IWA16145	M16 x 145(I)	✓										23									42				
	IWA16170	M16 x 170(K)	✓	16	18	120	90	90	168	110	103,5	84	48	252	126	280	140	130	90	84,5	65	67	195	98	260	130
	IWA16220	M16 x 220(O)	✓										98									117				
	IWA16250	M16 x 250(Q)	✓										128									147				
	IWA16280	M16 x 280(S)	✓										158									177				
	IWA20170	M20 x 170(K)	✓										23									49				
	IWA20220	M20 x 220(O)	✓	20	22	240	135	135	206	135	125	103	73	309	155	360	180	150	107	97	75	99	225	113	300	150
	IWA20270	M20 x 270(S)	✓										123									149				
IWA	IWA06045	M6 x 45 (A)	[x]						--	–	--	--	–	–	--	--	--	10	40	35	25	1	75	38	160	80
	IWA06060	M6 x 60 (B)	✓										2									--				
	IWA06080	M6 x 80 (D)	✓										22									--				
	IWA06120	M6 x 120(G)	✓	6	7	7	50	50					62									--				
	IWA06140	M6 x 140(I)	✓						100	55	49,5	40	82	120	60	160	80	–	--	--	–	--	--	--	–	--
	IWA06160	M6 x 160(J)	✓										102									--				
	IWA06170	M6 x 170(K)	✓										112									--				
	IWA06180	M6 x 180(L)	✓										122									–				
IWA	IWA08050	M8 x 50 (A)	[x]						–	–	–	–	–	–	–	–	–	100	40	35	23	4	69	35	140	70
	IWA08075	M8 x 75 (C)	✓	8	9	20	65	65					5									18				
	IWA08090	M8 x 90 (E)	✓						100	65	59,5	48	20	144	72	192	96	100	50	46,5	35	33	105	53	140	70
	IWA08115	M8 x 115(G)	✓										45									58				
	IWA10070	M10 x 70 (C)	✓						–	–	–	–	--	–	–	–	–					3				
	IWA10090	M10 x 90 (E)	✓	10	12	35	70	70					10					100	60	53,5	42	23	126	63	168	84
	IWA10120	M10 x 120(G)	✓						110	75	66,5	55	40	165	83	220	110					53				
	IWA10150	M10 x 150(I)	✓										70									83				

3.2. INSTALLATION PARAMETERS

Family	Code	Size / Bolt letter	Assessed	General installation parameters				Standard installation depth										Reduced installation depth								
[–]	[–]	[–]	ETA	Drill bit diameter d_0 [mm]	Fixture clearance hole d_f [mm]	Torque T_{inst} [Nm]	Minimum allowable spacing S_{min} [mm]	Minimum allowable edge distance C_{min} [mm]	Minimum concrete Thickness h_{min} [mm]	Depth of drill hole ⩾ h_1 [mm]	Installation depth h_{nom}	Effective anchorage depth h_{ef} [mm]	Thickness of fixtures ⩽ t_{fix} [mm]	Critical spacing (concrete cone) $S_{cr,N}$ [mm]	Critical edge distance (concrete cone) $C_{cr,N}$ [mm]	Critical spacing (splitting) $S_{cr,sp}$ [mm]	Critical edge (splitting) $C_{cr,sp}$ [mm]	Minimum concrete thickness h_{min} [mm]	Depth of drill hole ⩾ h_1 [mm]	Installation depth h_{nom}	Effective anchorage depth h_{ef} [mm]	Thickness of fixtures ⩽ t_{fix} [mm]	Critical spacing (concrete cone) $S_{cr,N}$ [mm]	Critical edge distance (concrete cone) $C_{cr,N}$ [mm]	Critical spacing (splitting) $S_{cr,sp}$ [mm]	Critical edge distance(splitting) $C_{cr,sp}$ [mm]
IWA	IWA12075	M12 x 75(C)	[x]						--	–	--	--	–	–	–	--	–	100	60	55	43	5	129	65	200	100
	IWA12090	M12 x 90 (D)	✓						–	–	--	--	--	–	--	--	--					13				
	IWA12110	M12 x 110(F)	✓	12	14	60	85	85					18					100	70	62	50	33	150	75	200	100
	IWA12140	M12 x 140 (1)	✓						130	85	77	65	48	195	98	260	130					63				
	IWA16090	M16 x 90 (D)	[x]						–	–	--	--	--	–	--	--	--	100	75	69	49	4	147	74	280	140
	IWA16145	M16 x 145 (I)	✓	16	18	120	110	110					23									--				
	IWA16170	M16 x 170(K)	✓						168	110	103,5	84	48	252	126	336	168	–	--	--	–	--	--	--	–	--
	IWA20120	M20 x 120(G)	[x]						–	–	--	--	--	–	–	–	–	145	105	93	71	5	213	107	360	180
	IWA20170	M20 x 170(K)	✓	20	22	240	135	135					23									--				
	IWA20220	M20 x 220(O)	✓						206	135	125	103	73	309	155	412	200	–	–	--	–	--	--	–	–	–
	IWA406045	M6 x 45(A)	[x]						–	–	–	--	--	–	–	–	–	100	40	35	25	1	75	38	160	80
	IWA406060	M6 x 60(B)	✓	6	7	7	50	50					2	120	60	160	80									
	IWA406080	M6 x 80 (D)	✓						100	55	49,5	40	22					–	–	--	–	--	--	–	–	–
	IWA408050	M8 x 50(A)	[x]						–	–	–	--	--	–	–	–	–	100	40	35	23	4	69	35	140	70
	IWA408075	M8 x 75 (C)	✓	8	9	20	65	65					5									8				
	IWA408090	M8 x 90 (E)	✓						100	65	59,5	48	20	144	72	192	96	100	50	46,5	35	23	105	53	140	70
	IWA408115	M8 x 115(G)	✓										45									58				
	IWA410070	M10 x 70 (C)	✓						–	–	–	--	--	–	–	–	–					3				
	IWA410090	M10 x 90 (E)	✓	10	12	35	70	70					10					100	60	53,5	42	23	126	63	168	84
	IWA410120	M10 x 120(G)	✓						110	75	66,5	55	40	165	83	220	110					53				
	IWA410150	M10 x 150(I)	✓										70									83				
	IWA412075	M12 x 75 (C)	[x]						--	–	--	--	--	–	--	--	--	100	60	55	43	5	129	65	200	100
	IWA412090	M12 x 90 (D)	✓	12	14	60	85	85	–	–	--	--	--	–	--	--	--					13				
	IWA412110	M12 x 110(F)	✓						130	85	77	65	18	195	98	260	130	100	70	62	50	33	150	75	200	100
	IWA412140	M12 x 140(I)	✓										48									63				

3.2. INSTALLATION PARAMETERS

				General installation parameters				Standard installation depth										Reduced installation depth								
Family [–]	Code [–]	Size / Bolt letter [–]	Assessed ETA	Drill bit diameter d_0 [mm]	Fixture clearance hole d_f [mm]	Torque T_{inst} [Nm]	Minimum allowable spacing S_{min} [mm]	Minimum allowable edge distance C_{min} [mm]	Minimum concrete Thickness h_{min} [mm]	Depth of drill hole ⩾ h_1 [mm]	Installation depth h_{nom} [mm]	Effective anchorage depth h_{ef} [mm]	Thickness of fixtures ⩽ t_{fix} [mm]	Critical spacing (concrete cone) $S_{cr,N}$ [mm]	Critical edge distance (concrete cone) $C_{cr,N}$ [mm]	Critical spacing (splitting) $S_{cr,sp}$ [mm]	Critical edge (splitting) $C_{cr,sp}$ [mm]	Minimum concrete thickness h_{min} [mm]	Depth of drill hole ⩾ h_1 [mm]	Installation depth h_{nom} [mm]	Effective anchorage depth h_{ef} [mm]	Thickness of fixtures ⩽ t_{fix} [mm]	Critical spacing (concrete cone) $S_{cr,N}$ [mm]	Critical edge distance (concrete cone) $C_{cr,N}$ [mm]	Critical spacing (splitting) $S_{cr,sp}$ [mm]	Critical edge distance(splitting) $C_{cr,sp}$ [mm]
IWA	IWA416090	M16x90(D)	[x]						--	–	--	--	--	–	--	--	--	100	75	69	49	4	147	74	280	140
	IWA416145	M16x145(I)	✓	16	18	120	110	110					23					–	--	--	–	--	--	--	–	--
	IWA416170	M16x170(K)	✓						168	110	103,5	84	48	252	126	336	168									
	IWA420120	M20x120(G)	[x]	20	22	240	135	135	--	–	--	--	--	–	--	--	--	145	105	93	71	5	213	107	360	180
	IWA420170	M20x170(K)	✓						206	135	125	103	23	309	155	412	206	–	--	--	–	--	--	--	–	--
	IWA420220	M20x220(O)	✓										73													

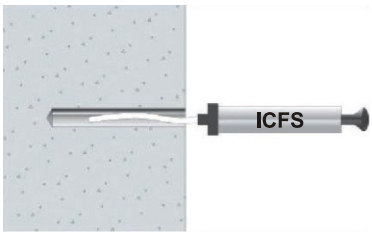
3.2. INSTALLATION PARAMETERS

				General installation parameters				Standard installation depth										Reduced installation depth								
Family [–]	Code [–]	Size / Bolt letter [–]	Assessed ETA	Drill bit diameter d_0 [mm]	Fixture clearance hole d_f [mm]	Torque T_{inst} [Nm]	Minimum allowable spacing S_{min} [mm]	Minimum allowable edge distance C_{min} [mm]	Minimum concrete Thickness h_{min} [mm]	Depth of drill hole ⩾ h_1 [mm]	Installation depth h_{nom} [mm]	Effective anchorage depth h_{ef} [mm]	Thickness of fixtures ⩽ t_{fix} [mm]	Critical spacing (concrete cone) $S_{cr,N}$ [mm]	Critical edge distance (concrete cone) $C_{cr,N}$ [mm]	Critical spacing (splitting) $S_{cr,sp}$ [mm]	Critical edge (splitting) $C_{cr,sp}$ [mm]	Minimum concrete thickness h_{min} [mm]	Depth of drill hole ⩾ h_1 [mm]	Installation depth h_{nom} [mm]	Effective anchorage depth h_{ef} [mm]	Thickness of fixtures ⩽ t_{fix} [mm]	Critical spacing (concrete cone) $S_{cr,N}$ [mm]	Critical edge distance (concrete cone) $C_{cr,N}$ [mm]	Critical spacing (splitting) $S_{cr,sp}$ [mm]	Critical edge distance(splitting) $C_{cr,sp}$ [mm]
IWA	IWA06060	M6x60 (B)	✓										2									--				
	IWA06080	M6x80 (D)	✓	6	7	7	35	35	100	55	49,5	40	22	120	60	160	80	--	--	--	--	--	--	--	--	--
	IWA06100	M6x100(E)	✓										42									--				
IWA	IWA08060	M8x60 (B)	✓						--	–	--	--	--	–	--	--	--					3				
	IWA08075	M8x75 (C)	✓										5									18				
	IWA08090	M8x90 (E)	✓										20									33				
	IWA08115	M8x115(G)	✓	8	9	20	40	40					45					100	50	46,5	35	58	105	53	140	70
	IWA08120	M8x120(G)	✓						100	65	59,5	48	50	144	72	192	96					63				
	IWA08130	M8x130(H)	✓										60									73				
	IWA08155	M8x155(J)	✓										85									98				
IWA	IWA10070	M10x70(C)	✓						--	–	--	--	--	–	--	--	--					3				
	IWA10080	M10x80(D)	✓						--	–	--	--	--	–	--	--	--					13				
	IWA10090	M10x90(E)	✓										10									23				
	IWA10100	M10x100(E)	✓										20									33				
	IWA10120	M10x120(G)	✓	10	12	35	50	50					40									53				
	IWA10140	M10x140(I)	✓										60					100	60	53,5	42	73	126	63	168	84
	IWA10150	M10x150(I)	✓						110	75	66,5	55	70	165	83	220	110					83				
	IWA10160	M10x160(J)	✓										80									93				
	IWA10170	M10x170(K)	✓										90									103				
	IWA10210	M10x210(N)	✓										130									143				
IWA	IWA12090	M12x90(E)	✓						--	–	--	--	--	–	--	--	--					13				
	IWA12100	M12x100(E)	✓										8									23				
	IWA12110	M12x110(F)	✓										18									33				
	IWA12130	M12x130(H)	✓										38									53				
	IWA12140	M12x140(I)	✓	12	14	60	70	70					48					100	70	62	50	63	150	75	200	100
	IWA12160	M12x160(J)	✓						130	85	77	65	68	195	98	260	130					83				
	IWA12180	M12x180(L)	✓										88									103				
	IWA12200	M12x200(M)	✓										108									123				
	IWA12220	M12x220(O)	✓										128									143				
	IWA12250	M12x250(Q)	✓										158									173				

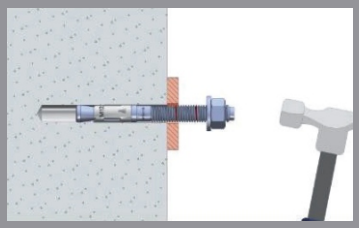
4. INSTALLATION PROCEDURE

4.1 CONCRETE INSTALLATION

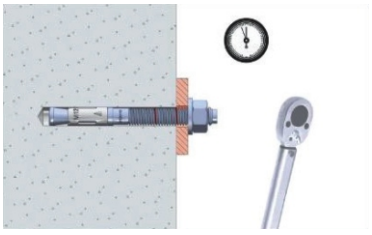
1. DRILLING
Check the concrete is well compacted without significant porosity.
Suitable for dry, wet and flooded holes.
Use drill in hammer mode.
Drill according to specified depths in previous tables



2. BLOW AND CLEAN
Clean the hole from dust and concrete remains.
Use blow pump and brush.



3. INSTALL
Insert the anchor until the red depth mark is at the same level with the surface of the base material.
Use a hammer in case of need. DOMTA tool could be used alternatively.
Installation could be performed through the fixture or before setting the fixture.



4. APPLY THE TOROQUE
Apply the nominal torque specified in previous tables.
Use torque wrench in order to ensure correct installation.

5. RESISTANCES

Resistance in concrete class C20/25 for an isolated anchor without spacing or concrete edge distance effects are indicated in the following table:

5.1 CHARACTERISTICS RESISTANCE [kN]

General Parameter				Standard installation depth			
Family	Code	Size	Assessed	Tension N_{Rk}	Shear V_{Rk}	Tension N_{Rk}	Shear V_{Rk}
IWA	IWA06060	M6x60	✓				
	IWA06070	M6x70	✓				
	IWA06080	M6x80	✓				
	IWA06090	M6x90	✓				
	IWA06100	M6x100	✓				
	IWA06110	M6x110	✓				
	IWA06120	M6x120	✓	7,40	5,10	--	--
	IWA06130	M6x130	✓				
	IWA06140	M6x140	✓				
	IWA06150	M6x150	✓				
	IWA06160	M6x160	✓				
	IWA06170	M6x170	✓				
	IWA06180	M6x180	✓				
	IWA08060	M8x60	✓	--	--	10,00	10,19
	IWA08075	M8x75	✓				
	IWA08090	M8x90	✓				
	IWA08100	M8x100	✓				
	IWA08115	M8x115	✓	13,00	9,30	10,00	10,19
	IWA08120	M8x120	✓				
	IWA08130	M8x130	✓				
	IWA08155	M8x155	✓				
	IWA10070	M10 x 70	✓				
	IWA10080	M10 x 80	✓	--	--	13,39	13,39
	IWA10090	M10 x 90	✓				
	IWA10100	M10 x 100	✓				
	IWA10120	M10 x 120	✓				
	IWA10140	M10 x 140	✓				
	IWA10150	M10 x 150	✓	19,00	14,70	13,39	13,39
	IWA10160	M10 x 160	✓				
	IWA10170	M10 x 170	✓				
	IWA10210	M10 x 210	✓				
	IWA10230	M10 x 230	✓				
	IWA12090	M12 x 90	✓	--	--	17,39	17,39
	IWA12100	M12 x100	✓				
	IWA12110	M12 x110	✓				
	IWA12120	M12 x120	✓				
	IWA12130	M12 x130	✓				
	IWA12140	M12 x140	✓				
	IWA12160	M12 x160	✓	25,78	20,60	17,39	17,39
	IWA12180	M12 x180	✓				
	IWA12200	M12 x200	✓				
	IWA12220	M12 x220	✓				
	IWA12250	M12 x250	✓				
	IWA14120	M14 x120	✓				
	IWA14145	M14 x145	✓				
	IWA14170	M14 x170	✓	31,95	28,10	--	--
	IWA14220	M14 x220	✓				
	IWA14250	M14 x250	✓				

General Parameter				Standard installation depth		Reduced installation depth	
Family	Code	Size	Assessed	Tension N_{Rk}	Shear V_{Rk}	Tension N_{Rk}	Shear V_{Rk}
IWA	IWA16125	M16x125	✓	**37,87**	*38,40*	**25,78**	*38,40*
	IWA16145	M16x145	✓				
	IWA16170	M16x170	✓				
	IWA16220	M16x220	✓				
	IWA16250	M16x250	✓				
	IWA16280	M16x280	✓				
	IWA20170	M20x170	✓	**51,42**	*56,30*	**31,95**	**63,90**
	IWA20220	M20x220	✓				
	IWA20270	M20x270	✓				
IWA	IWA06045	M6x 45	[x]	--	--	**6,15**	*6,00*
	IWA06060	M6x 60	✓	*10,10*	6,00	--	--
	IWA06080	M6x 80	✓				
	IWA06120	M6x 120	✓				
	IWA06140	M6x 140	✓				
	IWA06160	M6x 160	✓				
	IWA06170	M6x 170	✓				
	IWA06180	M6x 180	✓				
	IWA08050	M8x 50	[x]	--	--	**5,43**	**5,43**
	IWA08075	M8x 75	✓	12,00	*10,90*	9,00	**10,19**
	IWA08090	M8x 90	✓				
	IWA08115	M8x115	✓				
	IWA10070	M10 x70	✓	--	--	12,00	**13,39**
	IWA10090	M10 x90	✓	16,00	*17,40*		
	IWA10120	M10 x120	✓				
	IWA10150	M10 x150	✓				
	IWA12075	M12 x75	[x]	--	--	**13,87**	**13,87**
	IWA12090	M12 x90	✓	--	--	16,00	**17,39**
	IWA12110	M12 x110	✓	25,00	*25,20*		
	IWA12140	M12 x140	✓				
	IWA16090	M16 x90	[x]	--	--	16,87	16,87
	IWA16145	M16 x145	✓	35,00	*47,10*	--	--
	IWA16170	M16 x170	✓				
	IWA20120	M20 x120	[x]	--	--	**29,43**	**58,86**
	IWA20170	M20 x170	✓	50,00	*73,50*	--	--
	IWA20220	M20 x220	✓				
IWA	IWA406045	M6x45	[x]	--	--	**6,15**	*6,00*
	IWA406060	M6x60	✓	10,10	6,00	--	--
	IWA406080	M6x80	✓				
	IWA408050	M8x50	[x]	--	--	**5,43**	**5,43**
	IWA408075	M8x75	✓	12,00	*10,90*	9,00	**10,19**
	IWA408090	M8x90	✓				
	IWA408115	M8x115	✓				
	IWA410070	M10 x70	✓	--	--	12,00	**13,39**
	IWA410090	M10 x90	✓	16,00	*17,40*		
	IWA410120	M10 x120	✓				
	IWA410150	M10 x150	✓				
	IWA412075	M12 x75	[x]	--	--	**13,87**	**13,87**
	IWA412090	M12 x90	✓	--	--	16,00	**17,39**
	IWA412110	M12 x110	✓	25,00	*25,20*		
	IWA412140	M12 x140	✓				
	IWA416090	M16 x90	[x]	--	--	**16,87**	**16,87**
	IWA416145	M16 x145	✓	35,00	*47,10*	--	--
	IWA416170	M16 x170	✓				
	IWA420120	M20 x120	[x]	--	--	**29,43**	**58,86**
	IWA420170	M20 x170	✓	50,00	*73,50*	--	--
	IWA420220	M20 x220	✓				

Family	General Parameter Code	Size	Assessed	Standard installation depth Tension N_{Rk}	Standard installation depth Shear V_{Rk}	Reduced installation depth Tension N_{Rk}	Reduced installation depth Shear V_{Rk}
IWA	IWA06060	M6 x 60	✓	*7,40*	*5,10*	--	--
	IWA06080	M6 x80	✓				
	IWA06100	M6 x 100	✓				
	IWA08060	M8 x 60	✓	--	--	10,00	**10,19**
	IWA08075	M8 x 75	✓	*13,00*	*9,30*	10,00	**10,19**
	IWA08090	M8 x 90	✓				
	IWA08100	M8 x 100	✓				
	IWA08115	M8 x 115	✓				
	IWA08130	M8 x 130	✓				
	IWA08155	M8 x 155	✓				
	IWA10070	M10 x 70	✓	--	--	**13,39**	**13,39**
	IWA10080	M10 x 80	✓				
	IWA10090	M10 x 90	✓	19,00	*14,70*	**13,39**	**13,39**
	IWA10100	M10 x 100	✓				
	IWA10120	M10 x 120	✓				
	IWA10140	M10 x 140	✓				
	IWA10150	M10 x 150	✓				
	IWA10160	M10 x 160	✓				
	IWA10170	M10 x 170	✓				
	IWA10210	M10 x 210	✓				
	IWA12090	M12 x 90	✓				
	IWA12100	M12 x 100	✓	--	--	**17,39**	**17,39**
	IWA12110	M12 x 110	✓	**25,78**	*20,60*	**17,39**	**17,39**
	IWA12130	M12 x 130	✓				
	IWA12140	M12 x 140	✓				
	IWA12160	M12 x 160	✓				
	IWA12180	M12 x 180	✓				
	IWA12200	M12 x 200	✓				
	IWA12220	M12 x 220	✓				
	IWA12250	M12 x 250	✓				
	IWA16125	M16 x 125	✓	**37,87**	*38,40*	**25,78**	*38,40*
	IWA16145	M16 x 145	✓				
	IWA16170	M16 x 170	✓				
	IWA16220	M16 x 220	✓				
	IWA16250	M16 x 250	✓				
	IWA16280	M16 x 280	✓				
	IWA20170	M20 x 170	✓	**51,42**	*56,30*	**31,95**	**63,90**
	IWA20220	M20 x 220	✓				
	IWA20270	M20 x 270	✓				

1KN = 1kg

Values *underlined and in italics* show Steel failure, **bold** values concrete failure and other indicate pull out failure.

5.2 DESIGN RESISTANCE [kN]

General Parameter				Standard installation depth		Reduced installation depth	
Family	Code	Size	Assessed	Tension N_{Rk}	Shear V_{Rk}	Tension N_{Rk}	Shear V_{Rk}
IWA	IWA06060	M6 x 60	✓	*5,29*	*4,08*	--	--
	IWA06070	M6 x 70	✓				
	IWA06080	M6 x 80	✓				
	IWA06090	M6 x 90	✓				
	IWA06100	M6 x 100	✓				
	IWA06110	M6 x 110	✓				
	IWA06120	M6 x 120	✓				
	IWA06130	M6 x 130	✓				
	IWA06140	M6 x 140	✓				
	IWA06150	M6 x 150	✓				
	IWA06160	M6 x 160	✓				
	IWA06170	M6 x 170	✓				
	IWA06180	M6 x 180	✓				
	IWA08060	M8 x 60	✓	--	--	**6,67**	**6,79**
	IWA08075	M8 x 75	✓	*9,29*	*7,44*	6,67	**6,79**
	IWA08090	M8 x 90	✓				
	IWA08100	M8 x 100	✓				
	IWA08115	M8 x 115	✓				
	IWA08120	M8 x 120	✓				
	IWA08130	M8 x 130	✓				
	IWA08155	M8 x 155	✓				
	IWA10070	M10 x 70	✓	--	--	**8,93**	**8,93**
	IWA10080	M10 x 80	✓				
	IWA10090	M10 x 90	✓	12,67	*11,76*	**8,93**	**8,93**
	IWA10100	M10 x 100	✓				
	IWA10120	M10 x 120	✓				
	IWA10140	M10 x 140	✓				
	IWA10150	M10 x 150	✓				
	IWA10160	M10 x 160	✓				
	IWA10170	M10 x 170	✓				
	IWA10210	M10 x 210	✓				
	IWA10230	M10 x 230	✓				
	IWA12090	M12 x 90	✓	--	--	**11,60**	**11,60**
	IWA12100	M12 x 100	✓	*17,19*	*16,48*	**11,60**	**11,60**
	IWA12110	M12 x 110	✓				
	IWA12120	M12 x 120	✓				
	IWA12130	M12 x 130	✓				
	IWA12140	M12 x 140	✓				
	IWA12160	M12 x 160	✓				
	IWA12180	M12 x 180	✓				
	IWA12200	M12 x 200	✓				
	IWA12220	M12 x 220	✓				
	IWA12250	M12 x 250	✓				
	IWA14120	M14 x 120	✓	**21,30**	*22,48*	--	--
	IWA14145	M14 x 145	✓				
	IWA14170	M14 x 170	✓				
	IWA14220	M14 x 220	✓				
	IWA14250	M14 x 250	✓				

General Parameter				Standard installation depth		Reduced installation depth	
Family	Code	Size	Assessed	Tension N_{Rk}	Shear V_{Rk}	Tension N_{Rk}	Shear V_{Rk}
IWA	IWA16125	M16x125	✓	25,25	30,72	17,19	30,72
	IWA16145	M16x145	✓				
	IWA16170	M16x170	✓				
	IWA16220	M16x220	✓				
	IWA16250	M16x250	✓				
	IWA16280	M16x280	✓				
	IWA20170	M20x170	✓	34,28	45,04	21,30	42,60
	IWA20220	M20x220	✓				
	IWA20270	M20x270	✓				
	IWA06045	M6x 45	[x]	--	--	4,10	3,95
	IWA06060	M6x 60	✓	6,01	3,95	--	--
	IWA06080	M6x 80	✓				
	IWA06120	M6x 120	✓				
	IWA06140	M6x 140	✓				
	IWA06160	M6x 160	✓				
	IWA06170	M6x 170	✓				
	IWA06180	M6x 180	✓				
	IWA08050	M8x 50	[x]	--	--	3,01	3,62
	IWA08075	M8x 75	✓	8,00	7,15	5,00	6,79
	IWA08090	M8x 90	✓				
	IWA08115	M8x115	✓				
	IWA10070	M10 x70	✓	--	--	6,67	8,93
	IWA10090	M10 x90	✓	8,89	11,45		
	IWA10120	M10 x120	✓				
	IWA10150	M10 x150	✓				
	IWA12075	M12 x75	[x]	--	--	7,71	9,25
	IWA12090	M12 x90	✓	--	--	8,89	11,60
	IWA12110	M12 x110	✓	13,89	16,58		
	IWA12140	M12 x140	✓				
	IWA16090	M16 x90	[x]	--	--	9,37	11,25
	IWA16145	M16 x145	✓	19,44	30,99	--	--
	IWA16170	M16 x170	✓				
	IWA20120	M20 x120	[x]	--	--	16,35	39,24
	IWA20170	M20 x170	✓	27,78	48,36	--	--
	IWA20220	M20 x220	✓				
	IWA406045	M6x45	[x]	--	--	4,10	3,95
	IWA406060	M6x60	✓	6,01	3,95	--	--
	IWA406080	M6x80	✓				
	IWA408050	M8x50	[x]	--	--	3,01	3,62
	IWA408075	M8x75	✓	8,00	7,17	5,00	6,79
	IWA408090	M8x90	✓				
	IWA408115	M8x115	✓				
	IWA410070	M10 x70	✓	--	--	6,67	8,93
	IWA410090	M10 x90	✓	8,89	11,45		
	IWA410120	M10 x120	✓				
	IWA410150	M10 x150	✓				
	IWA412075	M12 x75	[x]	--	--	7,71	9,25
	IWA412090	M12 x90	✓	--	--	8,89	11,60
	IWA412110	M12 x110	✓	13,89	16,58		
	IWA412140	M12 x140	✓				
	IWA416090	M16 x90	[x]	--	--	9,37	11,25
	IWA416145	M16 x145	✓	19,44	30,99	--	--
	IWA416170	M16 x170	✓				
	IWA420120	M20 x120	[x]	--	--	16,35	39,24
	IWA420170	M20 x170	✓	27,78	48,36	--	--
	IWA420220	M20 x220	✓				

General Parameter				Standard installation depth		Reduced installation depth	
Family	Code	Size	Assessed	Tension N_{Rk}	Shear V_{Rk}	Tension N_{Rk}	Shear V_{Rk}
IWA	IWA06060	M6 x 60	✓	*5,29*	*4,08*	--	--
	IWA06080	M6 x 80	✓				
	IWA06100	M6 x 100	✓				
	IWA08060	M8 x 60	✓	--	--	6,67	**6,79**
	IWA08075	M8 x 75	✓	*9,29*	*7,44*	6,67	**6,79**
	IWA08090	M8 x 90	✓				
	IWA08100	M8 x 100	✓				
	IWA08115	M8 x 115	✓				
	IWA08130	M8 x 130	✓				
	IWA08155	M8x 155	✓				
	IWA10070	M10 x 70	✓	--	--	**8,93**	**8,93**
	IWA10080	M10 x 80	✓				
	IWA10090	M10 x 90	✓	12,67	*11,76*	**8,93**	**8,93**
	IWA10100	M10 x 100	✓				
	IWA10120	M10 x 120	✓				
	IWA10140	M10 x 140	✓				
	IWA10150	M10 x 150	✓				
	IWA10160	M10 x 160	✓				
	IWA10170	M10 x 170	✓				
	IWA10210	M10 x 210	✓				
	IWA12090	M12 x 90	✓				
	IWA12100	M12 x 100	✓	--	--	**11,60**	**11,60**
	IWA12110	M12 x 110	✓	**17,19**	*16,48*	**11,60**	**11,60**
	IWA12130	M12 x 130	✓				
	IWA12140	M12 x 140	✓				
	IWA12160	M12 x 160	✓				
	IWA12180	M12 x 180	✓				
	IWA12200	M12 x 200	✓				
	IWA12220	M12 x 220	✓				
	IWA12250	M12 x 250	✓				
	IWA16125	M16 x 125	✓	**25,25**	*30,72*	**17,19**	*30,72*
	IWA16145	M16 x 145	✓				
	IWA16170	M16 x 170	✓				
	IWA16220	M16 x 220	✓				
	IWA16250	M16 x 250	✓				
	IWA16280	M16 x 280	✓				
	IWA20170	M20 x 170	✓	**34,28**	*45,04*	**21,30**	**42,60**
	IWA20220	M20 x 220	✓				
	IWA20270	M20 x 270	✓				

1KN = 1kg

Values *underlined and in italics* show Steel failure, **bold** values concrete failure and other indicate pull out failure.

5.2 MAXIMUM LOADS RECOMMENDED [kN] (with yf=1.4)

General Parameter				Standard installation depth		Reduced installation depth	
Family	Code	Size	Assessed	Tension N_{Rk}	Shear V_{Rk}	Tension N_{Rk}	Shear V_{Rk}
IWA	IWA06060	M6 x 60	✓	*3,78*	*2,91*	--	--
	IWA06070	M6 x 70	✓				
	IWA06080	M6 x 80	✓				
	IWA06090	M6 x 90	✓				
	IWA06100	M6 x 100	✓				
	IWA06110	M6 x 110	✓				
	IWA06120	M6x120	✓				
	IWA06130	M6x130	✓				
	IWA06140	M6x140	✓				
	IWA06150	M6x150	✓				
	IWA06160	M6x160	✓				
	IWA06170	M6x170	✓				
	IWA06180	M6x180	✓				
	IWA08060	M8x60	✓	--	--	4,76	**4,85**
	IWA08075	M8x75	✓	*6,63*	*5,31*	4,76	**4,85**
	IWA08090	M8x90	✓				
	IWA08100	M8x100	✓				
	IWA08115	M8x115	✓				
	IWA08120	M8x120	✓				
	IWA08130	M8x130	✓				
	IWA08155	M8x155	✓				
	IWA10070	M10 x70	✓	--	--	**6,38**	**6,38**
	IWA10080	M10 x80	✓				
	IWA10090	M10 x90	✓	9,05	*8,40*	**6,38**	**6,38**
	IWA10100	M10 x100	✓				
	IWA10120	M10 x120	✓				
	IWA10140	M10 x140	✓				
	IWA10150	M10 x150	✓				
	IWA10160	M10 x160	✓				
	IWA10170	M10 x170	✓				
	IWA10210	M10 x210	✓				
	IWA10230	M10 x230	✓				
	IWA12090	M12 x90	✓	--	--	**8,28**	**8,28**
	IWA12100	M12 x100	✓	**12,28**	*11,77*	**8,28**	**8,28**
	IWA12110	M12 x110	✓				
	IWA12120	M12 x120	✓				
	IWA12130	M12 x130	✓				
	IWA12140	M12 x 140	✓				
	IWA12160	M12 x 160	✓				
	IWA12180	M12 x 180	✓				
	IWA12200	M12 x 200	✓				
	IWA12220	M12 x 220	✓				
	IWA12250	M12 x250	✓				
	IWA14120	M14 x120	✓	**15,22**	*16,06*	--	--
	IWA14145	M14 x145	✓				
	IWA14170	M14 x170	✓				
	IWA14220	M14 x220	✓				
	IWA14250	M14 x250	✓				

General Parameter				Standard installation depth		Reduced installation depth	
Family	Code	Size	Assessed	Tension N_{Rk}	Shear V_{Rk}	Tension N_{Rk}	Shear V_{Rk}
IWA	IWA16125	M16x125	✓	**18,03**	*21,94*	**12,28**	*21,94*
	IWA16145	M16x145	✓				
	IWA16170	M16x170	✓				
	IWA16220	M16x220	✓				
	IWA16250	M16x250	✓				
	IWA16280	M16x280	✓				
	IWA20170	M20x170	✓	**24,49**	*32,17*	**15,22**	**30,43**
	IWA20220	M20x220	✓				
	IWA20270	M20x270	✓				
IWA	IWA06045	M6x 45	[x]	--	--	**2,93**	*2,82*
	IWA06060	M6x 60	✓	4,29	2,82	--	--
	IWA06080	M6x 80	✓				
	IWA06120	M6x 120	✓				
	IWA06140	M6x 140	✓				
	IWA06160	M6x 160	✓				
	IWA06170	M6x 170	✓				
	IWA06180	M6x 180	✓				
	IWA08050	M8x 50	[x]	--	--	**2,15**	**2,58**
	IWA08075	M8x 75	✓	5,71	5,12	3,57	**4,85**
	IWA08090	M8x 90	✓				
	IWA08115	M8x115	✓				
	IWA10070	M10 x70	✓	--	--	4,76	**6,38**
	IWA10090	M10 x90	✓	6,35	*8,18*		
	IWA10120	M10 x120	✓				
	IWA10150	M10 x150	✓				
	IWA12075	M12 x75	[x]	--	--	**5,50**	**6,61**
	IWA12090	M12 x90	✓	--	--	6,35	**8,28**
	IWA12110	M12 x110	✓	9,92	*11,84*		
	IWA12140	M12 x140	✓				
	IWA16090	M16 x90	[x]	--	--	**6,70**	**8,03**
	IWA16145	M16 x145	✓	13,89	*22,13*	--	--
	IWA16170	M16 x170	✓				
	IWA20120	M20 x120	[x]				
	IWA20170	M20 x170	✓	19,84	*34,54*	--	--
	IWA20220	M20 x220	✓				
IWA	IWA406045	M6x45	[x]	--	--	**2,93**	*2,82*
	IWA406060	M6x60	✓	*4,29*	*2,82*	--	--
	IWA406080	M6x80	✓				
	IWA408050	M8x50	[x]	--	--	**2,15**	**2,58**
	IWA408075	M8x75	✓	5,71	*5,12*	3,57	**4,85**
	IWA408090	M8x90	✓				
	IWA408115	M8x115	✓				
	IWA410070	M10 x70	✓	--	--	4,76	**6,38**
	IWA410090	M10 x90	✓	6,35	*8,18*		
	IWA410120	M10 x120	✓				
	IWA410150	M10 x150	✓				
	IWA412075	M12 x75	[x]	--	--	**5,50**	**6,61**
	IWA412090	M12 x90	✓	--	--	6,35	**8,28**
	IWA412110	M12 x110	✓	9,92	*11,84*		
	IWA412140	M12 x140	✓				
	IWA416090	M16 x90	[x]	--	=	**6,70**	**8,03**
	IWA416145	M16 x145	✓	13,39	*22,13*	--	--
	IWA416170	M16 x170	✓				
	IWA420120	M20 x120	[x]	--	--	**11,68**	**28,03**
	IWA420170	M20 x170	✓	19,84	*34,54*	--	--
	IWA420220	M20 x220	✓				

General Parameter				Standard installation depth		Reduced installation depth	
Family	Code	Size	Assessed	Tension N_{Rk}	Shear V_{Rk}	Tension N_{rk}	Shear V_{Rk}
IWA	IWA06060	M6 x 60	✓	*3,78*	*2,91*	--	--
	IWA06080	M6 x 80	✓				
	IWA06100	M6 x 100	✓				
	IWA08060	M8 x 60	✓	--	--	4,76	**4,85**
	IWA08075	M8 x 75	✓	*6,63*	*5,31*	4,76	**4,85**
	IWA08090	M8 x 90	✓				
	IWA08100	M8 x 100	✓				
	IWA08115	M8 x 115	✓				
	IWA08130	M8 x 130	✓				
	IWA08155	M8 x 155	✓				
	IWA10070	M10 x 70	✓	--	--	**6,38**	**6,38**
	IWA10080	M10 x 80	✓				
	IWA10090	M10 x 90	✓	9,05	*8,40*	**6,38**	**6,38**
	IWA10100	M10 x 100	✓				
	IWA10120	M10 x120	✓				
	IWA10140	M10 x 140	✓				
	IWA10150	M10 x 150	✓				
	IWA10160	M10 x 160	✓				
	IWA10170	M10 x 170	✓				
	IWA10210	M10 x 210	✓				
	IWA12090	M12 x 90	✓				
	IWA12100	M12 x 100	✓	--	--	**8,28**	**8,28**
	IWA12110	M12 x 110	✓	**12,28**	*11,77*	**8,28**	**8,28**
	IWA12130	M12 x 130	✓				
	IWA12140	M12 x 140	✓				
	IWA12160	M12 x 160	✓				
	IWA12180	M12 x 180	✓				
	IWA12200	M12 x 200	✓				
	IWA12220	M12 x 220	✓				
	IWA12250	M12 x 250	✓				
	IWA16125	M16 x 125	✓	**18,03**	*21,94*	**12,28**	*21,94*
	IWA16145	M16 x 145	✓				
	IWA16170	M16 x 170	✓				
	IWA16220	M16 x 220	✓				
	IWA16250	M16 x 250	✓				
	IWA16280	M16 x 280	✓				
	IWA20170	M20 x 170	✓	**24,49**	*32,17*	**15,22**	**30,43**
	IWA20220	M20 x 220	✓				
	IWA20270	M20 x 270	✓				

1KN = 1kg

Values *underlined and in italics* show Steel failure, **bold** values concrete failure and other indicate pull out failure.

INDO CONSTRUCTION FASTENING SYSTEMS

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