

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-19/0593
of 19 September 2019

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

Alfa Wedge Anchor and Alfa Wedge Anchor-IG

Product family
to which the construction product belongs

Mechanical fastener for use in concrete

Manufacturer

Alfa GmbH
Ferdinand-Porsche-Straße 10
73479 Ellwangen
DEUTSCHLAND

Manufacturing plant

Werk 1,D

This European Technical Assessment
contains

36 pages including 3 annexes which form an integral part
of this assessment

This European Technical Assessment is
issued in accordance with Regulation (EU)
No 305/2011, on the basis of

EAD 330232-00-0601

The European Technical Assessment is issued by the Technical Assessment Body in its official language. Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and shall be identified as such.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may only be made with the written consent of the issuing Technical Assessment Body. Any partial reproduction shall be identified as such.

This European Technical Assessment may be withdrawn by the issuing Technical Assessment Body, in particular pursuant to information by the Commission in accordance with Article 25(3) of Regulation (EU) No 305/2011.

Specific Part**1 Technical description of the product**

The Alfa Wedge Anchor and Alfa Wedge Anchor-IG is an fastener made of zinc plated steel, stainless steel or high corrosion resistant steel which is placed into a drilled hole and anchored by torque-controlled expansion. The following fastener types are covered:

- Fastener type Alfa Wedge Anchor with external thread, washer and hexagon nut, sizes M8 to M27,
- Fastener type Alfa Wedge Anchor-IG S with internal thread, hexagon head nut and washer S-IG, sizes M6 to M12,
- Fastener type Alfa Wedge Anchor-IG SK with internal thread, countersunk head screw and countersunk washer SK-IG, sizes M6 to M12,
- Fastener type Alfa Wedge Anchor-IG B with internal thread, hexagon nut and washer MU-IG, sizes M6 to M12.

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the fastener is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the fastener of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment**3.1 Mechanical resistance and stability (BWR 1)**

Essential characteristic	Performance
Characteristic resistance to tension load (static and quasi-static loading)	Alfa Wedge Anchor see Annex C1 to C4 Alfa Wedge Anchor-IG see Annex C11 to C12
Characteristic resistance to shear load (static and quasi-static loading)	Alfa Wedge Anchor see Annex C5 Alfa Wedge Anchor-IG see Annex C13
Displacements (static and quasi-static loading)	Alfa Wedge Anchor see Annex C9 to C10 Alfa Wedge Anchor-IG see Annex C15
Characteristic resistance and displacements for seismic performance categories C1 and C2	Alfa Wedge Anchor see Annex C6, C9 and C10
Durability	See Annex B1

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	Alfa Wedge Anchor see Annex C7 to C8 Alfa Wedge Anchor-IG see Annex C14

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with the European Assessment Document EAD 330232-00-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

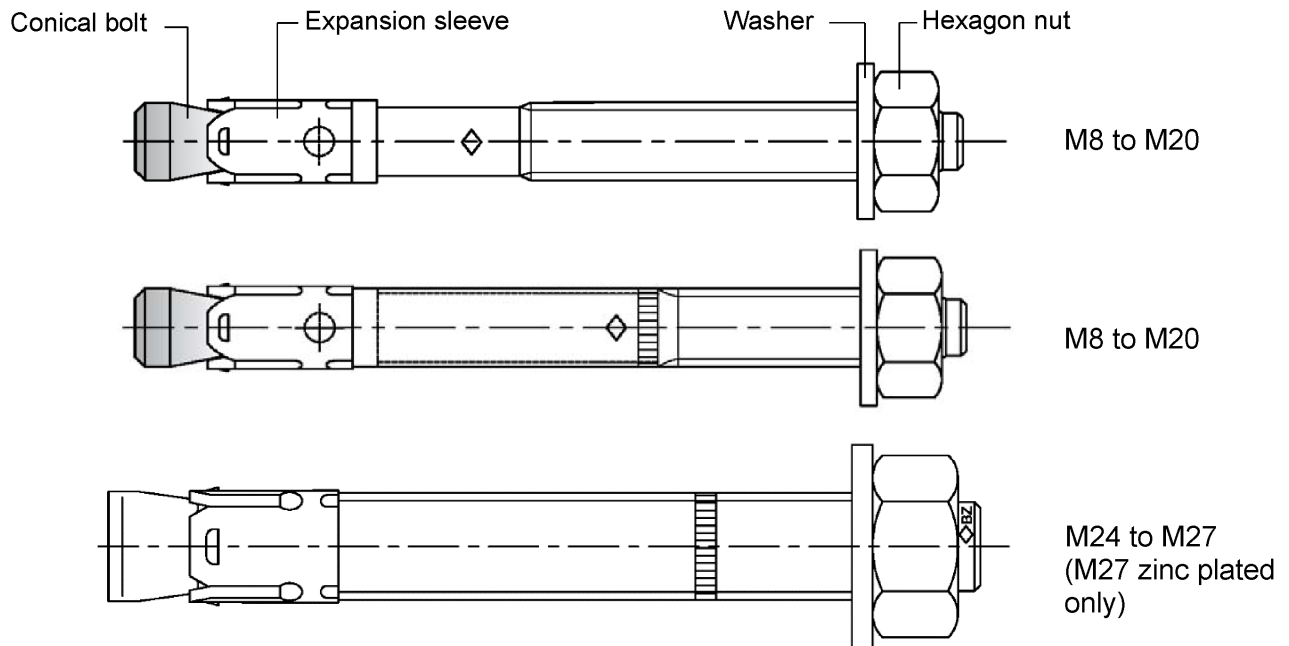
Issued in Berlin on 19. September 2019 by Deutsches Institut für Bautechnik

Dr.-Ing. Lars Eckfeldt
p. p. Head of Department

beglaubigt:
Lange

Fastener version	Product description	Intended use	Performance
Alfa Wedge Anchor	Annex A1 - Annex A4	Annex B1 – Annex B7	Annex C1 – Annex C10
Alfa Wedge Anchor-IG	Annex A1 Annex A5 – Annex A7	Anhang B1 – Anhang B2 Anhang B8 – Anhang B10	Anhang C11 – Anhang C15

Alfa Wedge Anchor



Alfa Wedge Anchor-IG M6 to M12

Fastener system

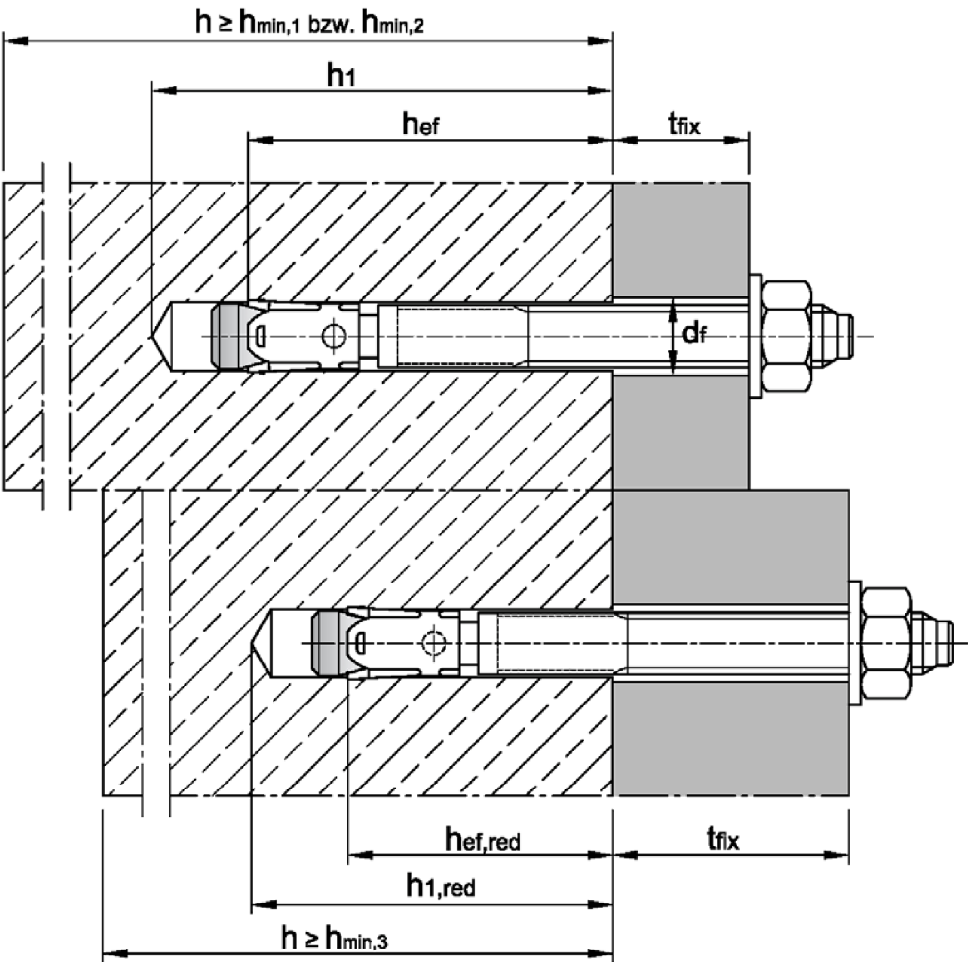
Wedge Anchor-IG S	Conical bolt Expansion sleeve	Washer	Hexagon head screw
Wedge Anchor-IG SK		Countersunk washer	Countersunk head screw
Wedge Anchor-IG B		Washer Hexagon nut	Commercial standard rod

Alfa Wedge Anchor and Alfa Wedge Anchor-IG

Product description
Fastener types

Annex A1

Intended use Alfa Wedge Anchor



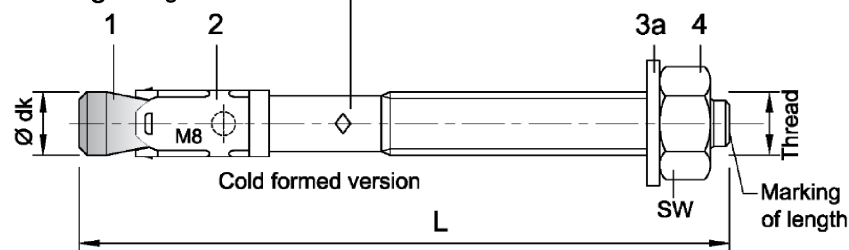
Alfa Wedge Anchor

Product description
Installation situation Alfa Wedge Anchor

Annex A2

Fastener size Alfa Wedge Anchor M8 to M20:

Marking 1 e.g.: $\diamond$ BZ 15/35



Marking 1 e.g.: $\diamond$ BZ 15/35

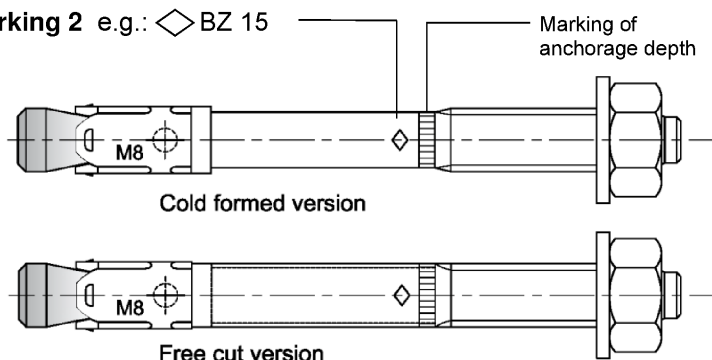
$\diamond$ identifying mark of manufacturing plant
BZ fastener identity
15 max. thickness of fixture for h_{ef}
35 max. thickness of fixture for $h_{ef,red}$
M8 thread diameter

Additional marking:

A4 stainless steel

HCR high corrosion resistant steel

Marking 2 e.g.: $\diamond$ BZ 15



Marking 2 e.g.: $\diamond$ BZ 15

$\diamond$ identifying mark of manufacturing plant

BZ fastener identity

15 maximum thickness of fixture for h_{ef}

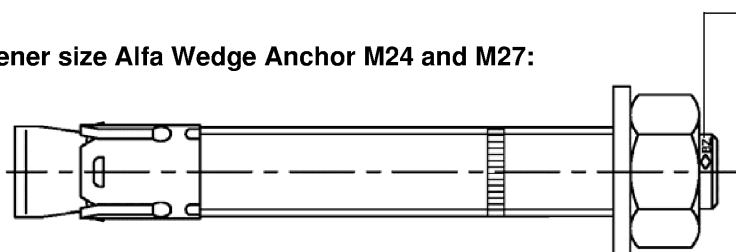
M8 thread diameter

Additional marking:

A4 stainless steel

HCR high corrosion resistant steel

Fastener size Alfa Wedge Anchor M24 and M27:



Marking 3 e.g.: $\diamond$ BZ M24-30

$\diamond$ identifying mark of manufacturing plant

BZ fastener identity

M24 thread diameter

30 maximum thickness of fixture

Additional marking:

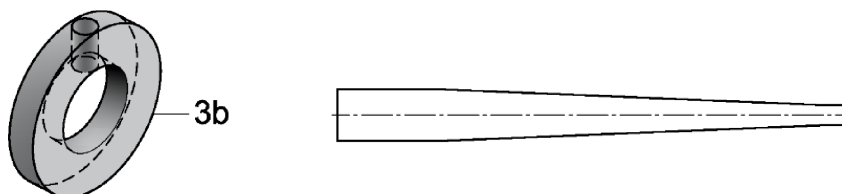
A4 stainless steel

HCR high corrosion resistant steel

Marking of length	C (c)	D (d)	E (e)	F (f)	G (g)	H (h)	I (i)	J (j)	K (k)	L (l)	M (m)	N (n)
Length of fastener min $\geq$	63,5	76,2	88,9	101,6	114,3	127,0	139,7	152,4	165,1	177,8	190,5	203,2
Length of fastener max $<$	76,2	88,9	101,6	114,3	127,0	139,7	152,4	165,1	177,8	190,5	203,2	215,9

Marking of length	O (o)	P (p)	Q (q)	R (r)	S (s)	T (t)	U (u)	V (v)	W (w)	X (x)	Y (y)	Z (z)
Length of fastener min $\geq$	215,9	228,6	241,3	254,0	279,4	304,8	330,2	355,6	381,0	406,4	431,8	457,2
Length of fastener max $<$	228,6	241,3	254,0	279,4	304,8	330,2	355,6	381,0	406,4	431,8	457,2	483,0

Filling washer and reducing adapter for filling the annular gap between fastener and fixture



Alfa Wedge Anchor

Product description

Fastener sizes and marking

Annex A3

Table A1: Fastener dimensions Alfa Wedge Anchor

Fastener size			M8	M10	M12	M16	M20	M24	M27
Conical bolt		Thread	M8	M10	M12	M16	M20	M24	M27
		Ø d _k =	7,9	9,8	12,0	15,7	19,7	24	28
Length of fastener ¹⁾	Steel, zinc plated	L	65 + t _{fix}	80 + t _{fix}	96,5+t _{fix}	118+t _{fix}	137+t _{fix}	161+t _{fix}	178+t _{fix}
	A4, HCR	L	65 + t _{fix}	80 + t _{fix}	96,5+t _{fix}	118+t _{fix}	137+t _{fix}	168+t _{fix}	-
	reduced anchorage depth	L _{hef,red}	54 + t _{fix}	60 + t _{fix}	76,5+t _{fix}	98+t _{fix}	-	-	-
Hexagon nut		SW	13	17	19	24	30	36	41

¹⁾ With additional use of filling washer 3b the usable thickness of fixture will reduce 5mm (M8-M20) or 6mm (≥ M24)

Dimensions in mm

Table A2: Materials Alfa Wedge Anchor

No.	Part	Alfa Wedge Anchor		Alfa Wedge Anchor A4	Alfa Wedge Anchor HCR
		Steel, zinc plated		Stainless steel A4	High corrosion resistant steel (HCR)
		galvanized ≥ 5µm	sherardized ≥ 40µm		
1	Conical bolt	M8 to M20: Cold formed or machined steel, galvanized, cone plastic coated	M8 to M20: Cold formed or machined steel, sherardized, cone plastic coated	M8 to M20: Stainless steel (e.g. 1.4401, 1.4404, 1.4578, 1.4571) EN 10088:2014, cone plastic coated	M8 to M20: High corrosion resistant steel 1.4529 or 1.4565, EN 10088:2014, cone plastic coated
	Threaded bolt	M24 and M27: Steel, galvanized	M24 and M27: steel, sherardized	M24: Stainless steel (e.g. 1.4401, 1.4404) EN 10088:2014	M24: High corrosion resistant steel 1.4529 or 1.4565, EN 10088:2014
	Threaded cone		M24 and M27: Steel, galvanized		
2	Expansion sleeve	M8 to M20: Steel (e.g. 1.4301 or 1.4401) EN 10088:2014, M24 and M27: Steel acc. to EN 10139:1997	M8 to M20: Steel (e.g. 1.4301 or 1.4401) EN 10088:2014, M24 and M27: Steel acc. to EN 10139:1997	Stainless steel (e.g. 1.4401, 1.4404, 1.4571) EN 10088:2014	Stainless steel (e.g. 1.4401, 1.4404, 1.4571) EN 10088:2014
3a	Washer	Steel, galvanized	Steel, zinc plated	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014	High corrosion resistant steel 1.4529 or 1.4565, EN 10088:2014
3b	Filling washer				
4	Hexagon nut	Steel, galvanized, coated	Steel, zinc plated	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014, coated	High corrosion resistant steel 1.4529 or 1.4565, EN 10088:2014, coated

Alfa Wedge Anchor

Product description
Dimensions and materials

Annex A4

Intended use Alfa Wedge Anchor-IG

Pre-setting installation (V)	Through-setting installation (D)
Pre-set fastener body, the fixture bears on the screw or thread rod only	The fastener is set through the fixture, the fixture bears on the conical bolt Alfa Wedge Anchor-IG
Alfa Wedge Anchor-IG S consisting of Alfa Wedge Anchor-IG and S-IG	
Alfa Wedge Anchor-IG SK consisting of Alfa Wedge Anchor-IG and SK-IG	
Alfa Wedge Anchor-IG B consisting of Alfa Wedge Anchor-IG and MU-IG	
Alfa Setting Tool for Wedge Anchor	
BZ-IGS M8 V, BZ-IGS M10 V, BZ-IGS M12 V or BZ-IGS M16 V	BZ-IGS M8 D, BZ-IGS M10 D, BZ-IGS M12 D or BZ-IGS M16 D

Alfa Wedge Anchor-IG

Product description
Installation situation **Alfa Wedge Anchor-IG**

Annex A5

Marking:  identifying mark of manufacturing plant
BZ fastener identity
M6 size of internal thread
10 max. thickness of fixture
(only Through-setting installation)
Additional marking:
A4 stainless steel
HCR high corrosion resistant steel

e.g.:  BZ M6-10 A4

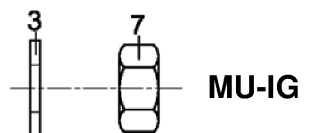
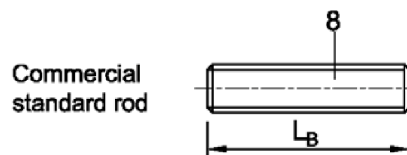
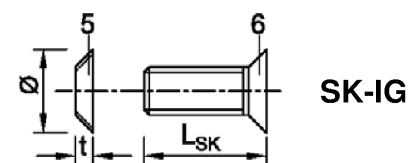
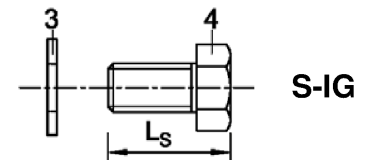
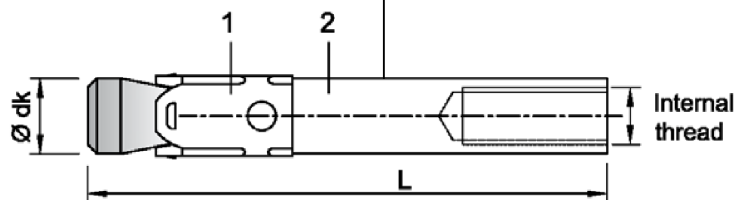


Table A3: Fastener dimensions Alfa Wedge Anchor-IG

No.	Fastener size	M6	M8	M10	M12
1	Conical bolt with internal thread	7,9	9,8	11,8	15,7
	Pre-setting installation	50	62	70	86
	Through-setting installation	50 + t _{fix}	62 + t _{fix}	70 + t _{fix}	86 + t _{fix}
2	Expansion sleeve	see table A4			
3	Washer	see table A4			
4	Hexagon head screw	10	13	17	19
	Pre-setting installation	t _{fix} + (13 to 21)	t _{fix} + (17 to 23)	t _{fix} + (21 to 25)	t _{fix} + (24 to 29)
	Through-setting installation	14 to 20	18 to 22	20 to 22	25 to 28
5	Countersunk washer	17,3	21,5	25,9	30,9
		3,9	5,0	5,7	6,7
6	Countersunk head screw	Torx T30	Torx T45 (Steel, zinc plated) T40 (Stainless steel A4, HCR)	Hexagon socket 6 mm	Hexagon socket 8 mm
	Pre-setting installation	t _{fix} + (11 to 19)	t _{fix} + (15 to 21)	t _{fix} + (19 to 23)	t _{fix} + (21 to 27)
	Through-setting installation	16 to 20	20 to 25	25	30
7	Hexagon nut	10	13	17	19
8	Commercial standard rod ¹⁾	t _{fix} + 21	t _{fix} + 28	t _{fix} + 34	t _{fix} + 41
		21	28	34	41

¹⁾ acc. to specifications (Table A4)

Dimensions in mm

Alfa Wedge Anchor-IG

Product description
Fastener parts, marking and dimensions **Alfa Wedge Anchor-IG**

Annex A6

Table A4: Materials Alfa Wedge Anchor-IG

No.	Part	Alfa Wedge Anchor-IG	Alfa Wedge Anchor-IG A4	Alfa Wedge Anchor-IG HCR
		Steel, galvanized ≥ 5 µm acc. to EN ISO 4042:1999	Stainless steel A4	High corrosion resistant steel HCR
1	Conical bolt Alfa Wedge Anchor-IG with internal thread	Machined steel, Cone plastic coated	Stainless steel (e.g. 1.4401, 1.4404, 1.4571, 1.4362) EN 10088:2014, Cone plastic coated	High corrosion resistant steel, 1.4529, 1.4565, EN 10088:2014, Cone plastic coated
2	Expansion sleeve Alfa Wedge Anchor-IG	Stainless steel (e.g. 1.4301, 1.4401) EN 10088:2014	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014
3	Washer S-IG / MU-IG	Steel, galvanized	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014	High corrosion resistant steel, 1.4529, 1.4565, EN 10088:2014
4	Hexagon head screw S-IG	Steel, galvanized, coated	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014, coated	High corrosion resistant steel, 1.4529, 1.4565, EN 10088:2014, coated
5	Countersunk washer SK-IG	Steel, galvanized	Stainless steel (e.g. 1.4401, 1.4404, 1.4571) EN 10088:2014, zinc plated, coated	High corrosion resistant steel, 1.4529, 1.4565, EN 10088:2014, zinc plated, coated
6	Countersunk head screw SK-IG	Steel, galvanized coated	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014, coated	High corrosion resistant steel, 1.4529, 1.4565, EN 10088:2014, coated
7	Hexagon nut MU-IG	Steel, galvanized coated	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014, coated	High corrosion resistant steel, 1.4529, 1.4565, EN 10088:2014, coated
8	Commercial standard rod	Property class 8.8, EN ISO 898-1:2013 A ₅ > 8 % ductile	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014, property class 70, EN ISO 3506:2009	High corrosion resistant steel, 1.4529, 1.4565, EN 10088:2014, property class 70, EN ISO 3506:2009

Alfa Wedge Anchor-IG

Product description
Materials **Alfa Wedge Anchor-IG**

Annex A7

Specifications of intended use

Alfa Wedge Anchor							
Standard anchorage depth	M8	M10	M12	M16	M20	M24	M27
Steel, galvanized				✓			
Steel, sherardized				✓			
Stainless steel A4 and high corrosion resistant steel HCR			✓				-
Static or quasi-static action				✓			
Fire exposure				✓			
Seismic action (C1 and C2) ¹⁾			✓			-	-
Reduced anchorage depth ¹⁾	M8	M10	M12	M16			
Steel, galvanized			✓				
Steel, sherardized			✓				
Stainless steel A4 and high corrosion resistant steel HCR			✓				
Static or quasi-static action			✓				
Fire exposure			✓				
Seismic action (C1 and C2)			-				

¹⁾ only cold formed anchors acc. to Annex A3

Alfa Wedge Anchor-IG	M6	M8	M10	M12
Steel, galvanized			✓	
Stainless steel A4 and high corrosion resistant steel HCR			✓	
Static or quasi-static action			✓	
Fire exposure			✓	
Seismic action (C1 and C2)			-	

Base materials:

- Compacted, reinforced or unreinforced normal weight concrete (without fibers) according to EN 206:2013
- Strength classes C20/25 to C50/60 according to EN 206:2013
- Cracked or uncracked concrete

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (steel zinc plated, stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure including industrial and marine environment or exposure to permanently damp internal condition, if no particular aggressive conditions exist (stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure and to permanently damp internal condition, if other particular aggressive conditions (high corrosion resistant steel)

Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used.)

Alfa Wedge Anchor and Alfa Wedge Anchor-IG

Intended use
Specifications

Annex B1

Specifications of intended use

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the fastener is indicated on the design drawings (e.g. position of the fastener relative to reinforcement or to supports, etc.).
- Dimensioning of fasteners according to EN 1992-4: 2018 in conjunction with TR 055

Installation:

- Fastener installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- Hole drilling by hammer drill bit or vacuum drill bit
- Use of the fastener only as supplied by the manufacturer without exchanging the components of the fastener
- Optionally, the annular gap between fixture and stud of the Alfa Wedge Anchor can be filled to reduce the hole. For this purpose, the filling washer (3b) must be used in addition to the supplied washer (3a). For filling use high-strength mortar with compressive strength $\geq 40 \text{ N/mm}^2$ (e.g. 292 Alfa Injection mortar)
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of the aborted hole or smaller distance if the aborted drill hole is filled with high strength mortar and if under shear or oblique tension load it is not in the direction of load application

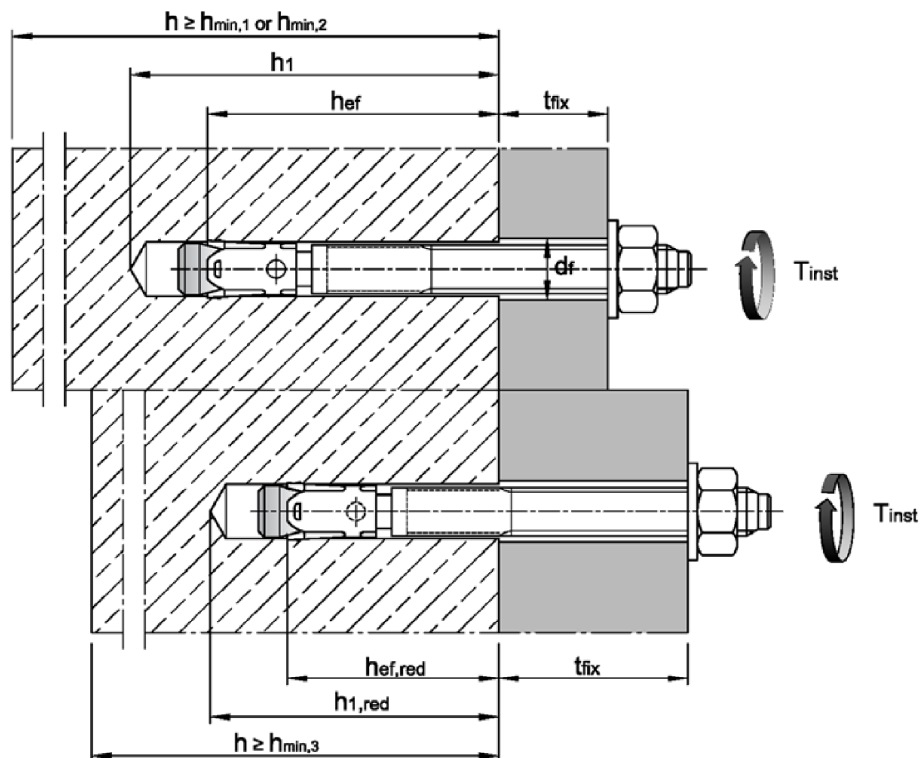
Alfa Wedge Anchor and Alfa Wedge Anchor-IG

Intended use
Specifications

Annex B2

Table B1: Installation parameters, Alfa Wedge Anchor

Fastener size				M8	M10	M12	M16	M20	M24	M27
Nominal drill hole diameter	d_0	[mm]		8	10	12	16	20	24	28
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]		8,45	10,45	12,5	16,5	20,55	24,55	28,55
Installation torque	Steel, galvanized	T_{inst}	[Nm]	20	25	45	90	160	200	300
	Steel, sherardized	T_{inst}	[Nm]	16	22	40	90	160	260	300
	Stainless steel A4, HCR	T_{inst}	[Nm]	20	35	50	110	200	290	-
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]		9	12	14	18	22	26	30
Standard anchorage depth										
Depth of drill hole	Steel, zinc plated	$h_1 \geq$	[mm]	60	75	90	110	125	145	160
	Stainless steel A4, HCR	$h_1 \geq$	[mm]	60	75	90	110	125	155	-
Effective anchorage depth	Steel, zinc plated	h_{ef}	[mm]	46	60	70	85	100	115	125
	Stainless steel A4, HCR	h_{ef}	[mm]	46	60	70	85	100	125	-
Reduced anchorage depth										
Depth of drill hole	$h_{1,red} \geq$	[mm]		49	55	70	90	-	-	-
Reduced effective anchorage depth	$h_{ef,red}$	[mm]		35	40	50	65	-	-	-



Alfa Wedge Anchor

Intended use
Installation parameters

Annex B3

Table B2: Minimum spacings and edge distances, standard anchorage depth, Alfa Wedge Anchor

Fastener size			M8	M10	M12	M16	M20	M24	M27
Standard thickness of concrete member									
Steel zinc plated									
Standard thickness of member	$h_{\min,1}$	[mm]	100	120	140	170	200	230	250
Cracked concrete									
Minimum spacing	$s_{\min}$	[mm]	40	45	60	60	95	100	125
	für $c \geq$	[mm]	70	70	100	100	150	180	300
Minimum edge distance	$c_{\min}$	[mm]	40	45	60	60	95	100	180
	für $s \geq$	[mm]	80	90	140	180	200	220	540
Uncracked concrete									
Minimum spacing	$s_{\min}$	[mm]	40	45	60	65	90	100	125
	für $c \geq$	[mm]	80	70	120	120	180	180	300
Minimum edge distance	$c_{\min}$	[mm]	50	50	75	80	130	100	180
	für $s \geq$	[mm]	100	100	150	150	240	220	540
Stainless steel A4, HCR									
Standard thickness of member	$h_{\min,1}$	[mm]	100	120	140	160	200	250	-
Cracked concrete									
Minimum spacing	$s_{\min}$	[mm]	40	50	60	60	95	125	-
	für $c \geq$	[mm]	70	75	100	100	150	125	
Minimum edge distance	$c_{\min}$	[mm]	40	55	60	60	95	125	
	für $s \geq$	[mm]	80	90	140	180	200	125	
Uncracked concrete									
Minimum spacing	$s_{\min}$	[mm]	40	50	60	65	90	125	-
	für $c \geq$	[mm]	80	75	120	120	180	125	
Minimum edge distance	$c_{\min}$	[mm]	50	60	75	80	130	125	
	für $s \geq$	[mm]	100	120	150	150	240	125	
Minimum thickness of concrete member									
Steel zinc plated, stainless steel A4, HCR									
Minimum thickness of member	$h_{\min,2}$	[mm]	80	100	120	140	-	-	-
Cracked concrete									
Minimum spacing	$s_{\min}$	[mm]	40	45	60	70	-	-	-
	für $c \geq$	[mm]	70	90	100	160			
Minimum edge distance	$c_{\min}$	[mm]	40	50	60	80			
	für $s \geq$	[mm]	80	115	140	180			
Uncracked concrete									
Minimum spacing	$s_{\min}$	[mm]	40	60	60	80	-	-	-
	für $c \geq$	[mm]	80	140	120	180			
Minimum edge distance	$c_{\min}$	[mm]	50	90	75	90			
	für $s \geq$	[mm]	100	140	150	200			
Fire exposure from one side									
Minimum spacing	$s_{\min,fi}$	[mm]	See normal ambient temperature						
Minimum edge distance	$c_{\min,fi}$	[mm]	See normal ambient temperature						
Fire exposure from more than one side									
Minimum spacing	$s_{\min,fi}$	[mm]	See normal ambient temperature						
Minimum edge distance	$c_{\min,fi}$	[mm]	≥ 300 mm						

Intermediate values by linear interpolation.

Alfa Wedge Anchor

Intended use
Minimum spacings and edge distances for standard anchorage depth

Annex B4

Table B3: Minimum **spacings** and **edge distances**, **reduced anchorage depth**,
Alfa Wedge Anchor

Fastener size			M8	M10	M12	M16
Minimum thickness of concrete member	$h_{\min,3}$	[mm]	80	80	100	140
Cracked concrete						
Minimum spacing	$s_{\min}$	[mm]	50	50	50	65
	für $c \geq$	[mm]	60	100	160	170
Minimum edge distance	$c_{\min}$	[mm]	40	65	65	100
	für $s \geq$	[mm]	185	180	250	250
Uncracked concrete						
Minimum spacing	$s_{\min}$	[mm]	50	50	50	65
	für $c \geq$	[mm]	60	100	160	170
Minimum edge distance	$c_{\min}$	[mm]	40	65	100	170
	für $s \geq$	[mm]	185	180	185	65
Fire exposure from one side						
Minimum spacing	$s_{\min,fi}$	[mm]	See normal ambient temperature			
Minimum edge distance	$c_{\min,fi}$	[mm]	See normal ambient temperature			
Fire exposure from more than one side						
Minimum spacing	$s_{\min,fi}$	[mm]	See normal ambient temperature			
Minimum edge distance	$c_{\min,fi}$	[mm]	$\geq 300\text{ mm}$			

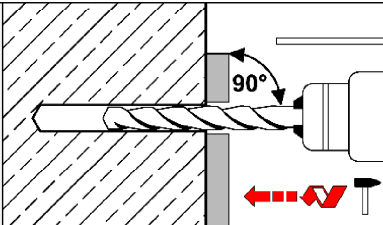
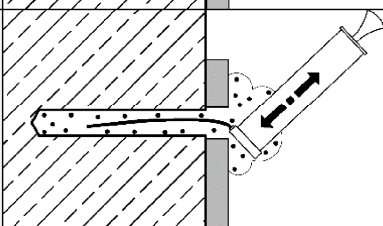
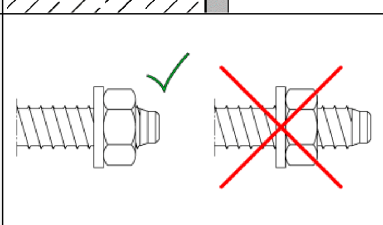
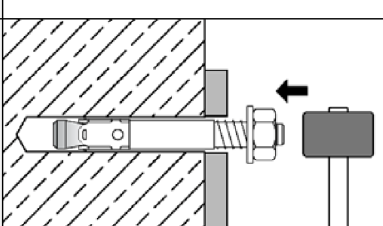
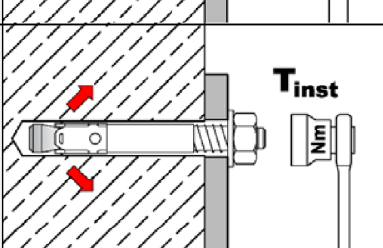
Intermediate values by linear interpolation.

Alfa Wedge Anchor

Intended use
Minimum **spacings** and **edge distances** for **reduced anchorage depth**

Annex B5

Installation instructions Alfa Wedge Anchor

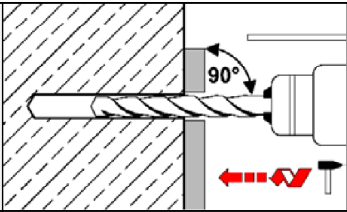
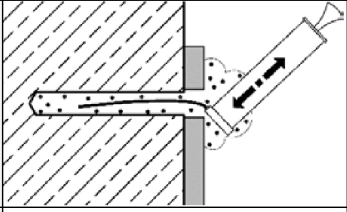
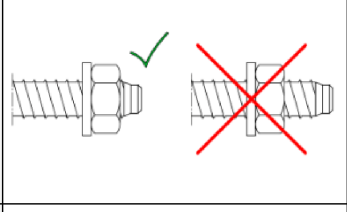
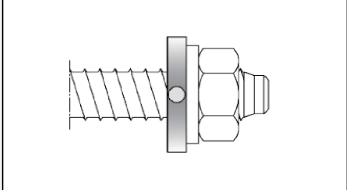
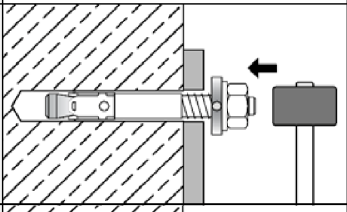
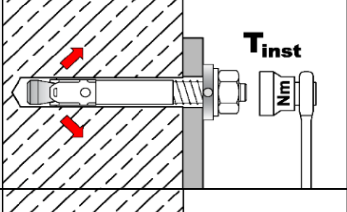
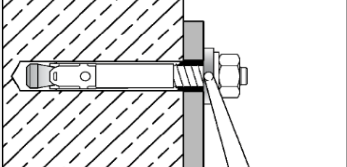
1		Drill hole perpendicular to concrete surface. If using a vacuum drill bit, proceed with step 3.
2		Blow out dust. Alternatively vacuum clean down to the bottom of the hole.
3		Check position of nut.
4		Drive in fastener, such that h_{ef} or $h_{ef,red}$ depth is met. This compliance is ensured, if the thickness of fixture is not greater than the maximum thickness of fixture marked on the fastener in accordance with Annex A3.
5		Installation torque T_{inst} shall be applied by using calibrated torque wrench.

Alfa Wedge Anchor

Intended Use
Installation instructions

Annex B6

Installation instructions Alfa Wedge Anchor with filling of annular gap

1		Drill hole perpendicular to concrete surface. If using a vacuum drill bit, proceed with step 3a.
2		Blow out dust. Alternatively vacuum clean down to the bottom of the hole.
3a		Check position of nut.
3b		Fit the filling washer to the fastener. The thickness of the filling washer must be taken into account with t_{fix} .
4		Drive in fastener with filling washer, such that h_{ef} or $h_{ef,red}$ depth is met. This compliance is ensured, if the thickness of fixture is 5mm (or 6mm when $\geq M24$) smaller than the maximum thickness of fixture marked on the fastener in accordance with Annex A3.
5		Installation torque T_{inst} shall be applied by using calibrated torque wrench.
6		Fill the annular gap between stud and fixture with mortar (compressive strength $\geq 40 \text{ N/mm}^2$ e.g. 292 Alfa Injection mortar). Use enclosed reducing adapter. Observe the processing information of the mortar! The annular gap is completely filled, when excess mortar seeps out.

Alfa Wedge Anchor

Intended Use

Installation instructions with filling washer

Annex B7

Table B4: Installation parameters Alfa Wedge Anchor-IG

Fastener size			M6	M8	M10	M12	
Effective anchorage depth	h_{ef}	[mm]	45	58	65	80	
Drill hole diameter	d_0	[mm]	8	10	12	16	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45	12,5	16,5	
Depth of drill hole	$h_1 \geq$	[mm]	60	75	90	105	
Screwing depth of threaded rod	$L_{sd}^{2)} \geq$	[mm]	9	12	15	18	
Installation torque, steel zinc plated	T_{inst}	S	[Nm]	10	30	30	55
		SK	[Nm]	10	25	40	50
		B	[Nm]	8	25	30	45
Installation torque, stainless steel A4, HCR	T_{inst}	S	[Nm]	15	40	50	100
		SK	[Nm]	12	25	45	60
		B	[Nm]	8	25	40	80
Pre-setting installation							
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	7	9	12	14	
Minimum thickness of fixture	$t_{fix} \geq$	S	[mm]	1	1	1	1
		SK	[mm]	5	7	8	9
		B	[mm]	1	1	1	1
Through-setting installation							
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	9	12	14	18	
Minimum thickness of fixture ¹⁾	$t_{fix} \geq$	S	[mm]	5	7	8	9
		SK	[mm]	9	12	14	16
		B	[mm]	5	7	8	9

¹⁾ The minimum thickness of fixture can be reduced to the value of Pre-setting installation, if the shear load at steel failure is designed with lever arm.

²⁾ see Annex A5

Table B5: Minimum spacings and edge distances Alfa Wedge Anchor-IG

Fastener size			M6	M8	M10	M12
Minimum thickness of concrete member	$h_{\min}$	[mm]	100	120	130	160
Cracked concrete						
Minimum spacing	$s_{\min}$	[mm]	50	60	70	80
	für $c \geq$	[mm]	60	80	100	120
Minimum edge distance	$c_{\min}$	[mm]	50	60	70	80
	für $s \geq$	[mm]	75	100	100	120
Uncracked concrete						
Minimum spacing	$s_{\min}$	[mm]	50	60	65	80
	für $c \geq$	[mm]	80	100	120	160
Minimum edge distance	$c_{\min}$	[mm]	50	60	70	100
	für $s \geq$	[mm]	115	155	170	210
Fire exposure from one side						
Minimum spacing	$s_{\min,fi}$	[mm]	See normal temperature			
Minimum edge distance	$c_{\min,fi}$	[mm]	See normal temperature			
Fire exposure from more than one side						
Minimum spacing	$s_{\min,fi}$	[mm]	See normal temperature			
Minimum edge distance	$c_{\min,fi}$	[mm]	≥ 300 mm			

Intermediate values by linear interpolation.

Alfa Wedge Anchor-IG

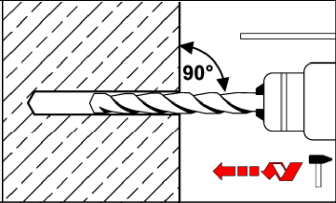
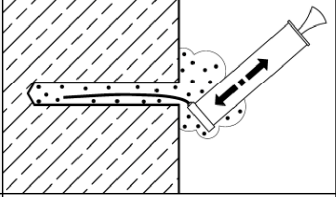
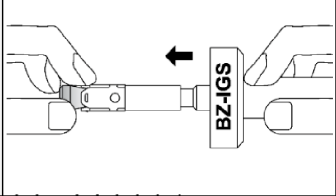
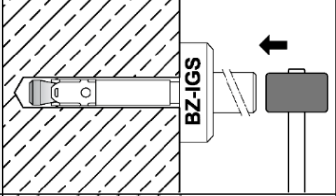
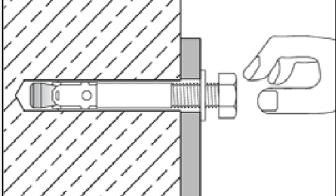
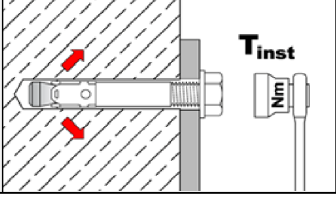
Intended use

Installation parameters, minimum spacings and edge distances **Alfa Wedge Anchor-IG**

Annex B8

Installation instructions Alfa Wedge Anchor-IG

Pre-setting installation

1		Drill hole perpendicular to concrete surface. If using vacuum drill bit, proceed with step 3.
2		Blow out dust. Alternatively vacuum clean down to the bottom of the hole.
3		Setting tool for pre-setting installation insert in fastener.
4		Drive in fastener with setting tool.
5		Drive in screw.
6		Installation torque T_{inst} may be applied by using calibrated torque wrench.

Alfa Wedge Anchor-IG

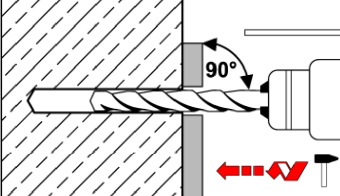
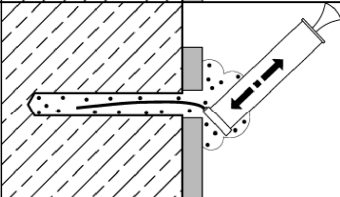
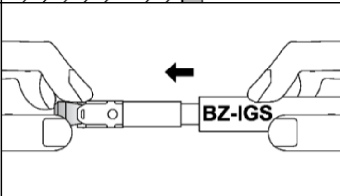
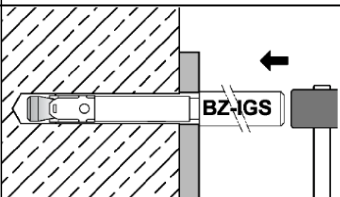
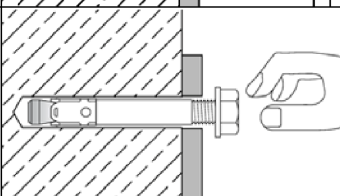
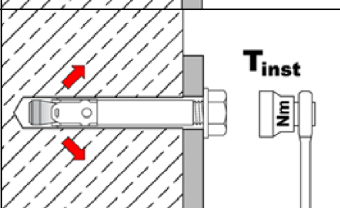
Intended Use

Installation instructions for pre-setting installation Alfa Wedge Anchor-IG

Annex B9

Installation instructions Alfa Wedge Anchor-IG

Through-setting installation

1		Drill hole perpendicular to concrete surface. If using a vacuum drill bit, proceed with step 3.
2		Blow out dust. Alternatively vacuum clean down to the bottom of the hole.
3		Setting tool for through-setting installation insert in fastener.
4		Drive in fastener with setting tool.
5		Drive in screw.
6		Installation torque T_{inst} may be applied by using calibrated torque wrench.

Alfa Wedge Anchor-IG

Intended Use

Installation instructions for through-setting installation Alfa Wedge Anchor-IG

Annex B10

Table C1: Characteristic values for tension loads, Alfa Wedge Anchor zinc plated, cracked concrete, static and quasi-static action

Fastener size			M8	M10	M12	M16	M20	M24	M27
Installation factor	γ_{inst}	[-]	1,0						
Steel failure									
Characteristic resistance	$N_{Rk,s}$	[kN]	16	27	40	60	86	126	196
Partial factor	γ_{Ms}	[-]	1,53		1,5		1,6	1,5	
Pull-out									
Standard anchorage depth									
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5	9	16	25	1)	1)	1)
Reduced anchorage depth									
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5	7,5	1)	1)	-	-	-
Increasing factor for $N_{Rk,p}$	ψ_c	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$						
Concrete cone failure									
Effective anchorage depth	h_{ef}	[mm]	46	60	70	85	100	115	125
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 ²⁾	40	50	65	-	-	-
Factor for cracked concrete	$k_1 = k_{cr,N}$	[-]	7,7						

¹⁾ Pull-out is not decisive

²⁾ Use restricted to anchoring of structural components statically indeterminate

Alfa Wedge Anchor

Performance

Characteristic values for **tension loads**, Alfa Wedge Anchor **zinc plated**, **cracked concrete**, static and quasi-static action

Annex C1

Table C2: Characteristic values for **tension loads**, Alfa Wedge Anchor **A4** / **HCR**, **cracked concrete**, static and quasi-static action

Fastener size			M8	M10	M12	M16	M20	M24
Installation factor	γ_{inst}	[-]	1,0					
Steel failure								
Characteristic resistance	$N_{Rk,s}$	[kN]	16	27	40	64	108	110
Partial factor	γ_{Ms}	[-]	1,5				1,68	1,5
Pull-out								
Standard anchorage depth								
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5	9	16	25	1)	40
Reduced anchorage depth								
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5	7,5	1)	1)	-	-
Increasing factor for $N_{Rk,p}$	ψ_c	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$					
Concrete cone failure								
Effective anchorage depth	h_{ef}	[mm]	46	60	70	85	100	125
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 2)	40	50	65	-	-
Factor for cracked concrete	$k_1 = k_{cr,N}$	[-]	7,7					

¹⁾ Pull-out is not decisive

²⁾ Use restricted to anchoring of structural components statically indeterminate

Alfa Wedge Anchor

Performance

Characteristic values for **tension loads**, Alfa Wedge Anchor **A4** / **HCR**, **cracked concrete**, static and quasi-static action

Annex C2

Table C3: Characteristic values for **tension loads**, Alfa Wedge Anchor **zinc plated**, **uncracked concrete**, static and quasi-static action

Fastener size			M8	M10	M12	M16	M20	M24	M27
Installation factor		γ_{inst}	[-]		1,0				
Steel failure									
Characteristic resistance	$N_{Rk,s}$	[kN]	16	27	40	60	86	126	196
Partial factor	γ_{Ms}	[-]	1,53		1,5		1,6	1,5	
Pull-out									
Standard anchorage depth									
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	12	16	25	35	1)	1)	1)
Reduced anchorage depth									
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	7,5	9	1)	1)	-	-	-
Splitting									
Standard anchorage depth									
Splitting for standard thickness of concrete member (The higher resistance of case 1 and case 2 may be applied; $c_{cr,sp}$ may be linearly interpolated for the member thickness $h_{min,2} < h < h_{min,1}$ (Case 2); $\psi_{h,sp}= 1,0$)									
Standard thickness of concrete	$h_{min,1} \geq$	[mm]	100	120	140	170	200	230	250
Case 1									
Characteristic resistance in uncracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	9	12	20	30	40	62,3	50
Edge distance	$c_{cr,sp}$	[mm]	1,5 h_{ef}						
Case 2									
Characteristic resistance in uncracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	12	16	25	35	50,5	62,3	70,6
Edge distance	$c_{cr,sp}$	[mm]	2 h_{ef}				2,2 h_{ef}	1,5 h_{ef}	2,5 h_{ef}
Splitting for minimum thickness of concrete member									
Minimum thickness of concrete	$h_{min,2} \geq$	[mm]	80	100	120	140	-	-	-
Characteristic resistance in uncracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	12	16	25	35			
Edge distance	$c_{cr,sp}$	[mm]	2,5 h_{ef}						
Reduced anchorage depth									
Minimum thickness of concrete	$h_{min,3} \geq$	[mm]	80	80	100	140	-	-	-
Characteristic resistance in uncracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	7,5	9	17,9	26,5			
Edge distance	$c_{cr,sp}$	[mm]	100	100	125	150			
Increasing factor for $N_{Rk,p}$ and $N^0_{Rk,sp}$		ψ_c	[-]		$\left(\frac{f_{ck}}{20}\right)^{0,5}$				
Concrete cone failure									
Effective anchorage depth	h_{ef}	[mm]	46	60	70	85	100	115	125
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 ²⁾	40	50	65	-	-	-
Factor for uncracked concrete	$k_1 = k_{ucr,N}$	[-]	11,0						

1) Pull-out is not decisive

2) Use restricted to anchoring of structural components statically indeterminate

Alfa Wedge Anchor

Performance

Characteristic values for **tension loads**, Alfa Wedge Anchor **zinc plated**, **uncracked concrete**, static and quasi-static action

Annex C3

Table C4: Characteristic values for **tension loads**, Alfa Wedge Anchor **A4 / HCR**, **uncracked concrete**, static and quasi-static action

Fastener size			M8	M10	M12	M16	M20	M24
Installation factor	γ_{inst}	[-]	1,0					
Steel failure								
Characteristic resistance	$N_{Rk,s}$	[kN]	16	27	40	64	108	110
Partial factor	γ_{Ms}	[-]	1,5				1,68	1,5
Pull-out								
Standard anchorage depth								
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	12	16	25	35	1)	1)
Reduced anchorage depth								
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	7,5	9	1)	1)	-	-
Splitting								
Standard anchorage depth								
Splitting for standard thickness of concrete member (The higher resistance of case 1 and case 2 may be applied; $c_{cr,sp}$ may be linearly interpolated for the member thickness $h_{min,2} < h < h_{min,1}$ (Case 2); $\psi_{h,sp} = 1,0$)								
Standard thickness of concrete	$h_{min,1} \geq$	[mm]	100	120	140	160	200	250
Case 1								
Characteristic resistance in uncracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	9	12	20	30	40	-
Edge distance	$c_{cr,sp}$	[mm]	1,5 h_{ef}					
Case 2								
Characteristic resistance in uncracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	12	16	25	35	50,5	70,6
Edge distance	$c_{cr,sp}$	[mm]	115	125	140	200	220	250
Splitting for minimum thickness of concrete member								
Minimum thickness of concrete	$h_{min,2} \geq$	[mm]	80	100	120	140	-	-
Characteristic resistance in uncracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	12	16	25	35		
Edge distance	$c_{cr,sp}$	[mm]	2,5 h_{ef}					
Reduced anchorage depth								
Minimum thickness of concrete	$h_{min,3} \geq$	[mm]	80	80	100	140	-	-
Characteristic resistance in uncracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	7,5	9	17,9	26,5		
Edge distance	$c_{cr,sp}$	[mm]	100	100	125	150		
Increasing factor for $N_{Rk,p}$ and $N^0_{Rk,sp}$	ψ_c	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$					
Concrete cone failure								
Effective anchorage depth	h_{ef}	[mm]	46	60	70	85	100	125
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 ²⁾	40	50	65	-	-
Factor for uncracked concrete	$k_1 = k_{ucr,N}$	[-]	11,0					

¹⁾ Pull-out is not decisive

²⁾ Use restricted to anchoring of structural components statically indeterminate

Alfa Wedge Anchor

Performance

Characteristic values for **tension loads**, Alfa Wedge Anchor **A4 / HCR**, **uncracked concrete**, static and quasi-static action

Annex C4

Table C5: Characteristic values for **shear loads**, Alfa Wedge Anchor,
cracked and **uncracked concrete**, static or quasi static action

Fastener size			M8	M10	M12	M16	M20	M24	M27	
Installation factor		γ_{inst}	[-]	1,0						
Steel failure without lever arm, Steel zinc plated										
Characteristic resistance		$V^0_{Rk,s}$	[kN]	12,2	20,1	30	55	69	114	169,4
Ductility factor		k_7	[-]	1,0						
Partial factor		γ_{Ms}	[-]	1,25			1,33	1,25	1,25	
Steel failure without lever arm, Stainless steel A4, HCR										
Characteristic resistance		$V^0_{Rk,s}$	[kN]	13	20	30	55	86	123,6	-
Ductility factor		k_7	[-]	1,0						
Partial factor		γ_{Ms}	[-]	1,25			1,4	1,25		
Steel failure with lever arm, Steel zinc plated										
Characteristic bending resistance		$M^0_{Rk,s}$	[Nm]	23	47	82	216	363	898	1331,5
Partial factor		γ_{Ms}	[-]	1,25			1,33	1,25	1,25	
Steel failure with lever arm, Stainless steel A4, HCR										
Characteristic bending resistance		$M^0_{Rk,s}$	[Nm]	26	52	92	200	454	785,4	-
Partial factor		γ_{Ms}	[-]	1,25			1,4	1,25		
Concrete pry-out failure										
Pry-out factor		k_8	[-]	2,4			2,8			
Concrete edge failure										
Effective length of fastener in shear loading with h_{ef}	Steel zinc plated	l_f	[mm]	46	60	70	85	100	115	125
	Stainless steel A4, HCR	l_f	[mm]	46	60	70	85	100	125	-
Effective length of fastener in shear loading with $h_{ef,red}$	Steel zinc plated	$l_{f,red}$	[mm]	35 ¹⁾	40	50	65	-	-	-
	Stainless steel A4, HCR	$l_{f,red}$	[mm]	35 ¹⁾	40	50	65			
Outside diameter of fastener		d_{nom}	[mm]	8	10	12	16	20	24	27

¹⁾ Use restricted to anchoring of structural components statically indeterminate

Alfa Wedge Anchor

Performance

Characteristic values for **shear loads**, Alfa Wedge Anchor,
cracked and **uncracked concrete**, static or quasi static action

Annex C5

Table C6: Characteristic resistance for **seismic loading**, Alfa Wedge Anchor, **standard anchorage depth**, performance category **C1** and **C2**

Fastener size			M8	M10	M12	M16	M20	
Tension loads								
Installation factor		γ_{inst}	[-]	1,0				
Steel failure, Steel zinc plated								
Characteristic resistance C1		$N_{Rk,s,eq,C1}$	[kN]	16	27	40	60	86
Characteristic resistance C2		$N_{Rk,s,eq,C2}$	[kN]	16	27	40	60	86
Partial factor		γ_{Ms}	[-]	1,53		1,5		1,6
Steel failure, Stainless steel A4, HCR								
Characteristic resistance C1		$N_{Rk,s,eq,C1}$	[kN]	16	27	40	64	108
Characteristic resistance C2		$N_{Rk,s,eq,C2}$	[kN]	16	27	40	64	108
Partial factor		γ_{Ms}	[-]	1,5				1,68
Pull-out (steel zinc plated, stainless steel A4 and HCR)								
Characteristic resistance C1		$N_{Rk,p,eq,C1}$	[kN]	5	9	16	25	36
Characteristic resistance C2		$N_{Rk,p,eq,C2}$	[kN]	2,3	3,6	10,2	13,8	24,4
Shear loads								
Steel failure without lever arm, Steel zinc plated								
Characteristic resistance C1		$V_{Rk,s,eq,C1}$	[kN]	9,3	20	27	44	69
Characteristic resistance C2		$V_{Rk,s,eq,C2}$	[kN]	6,7	14	16,2	35,7	55,2
Partial factor		γ_{Ms}	[-]	1,25				1,33
Steel failure without lever arm, Stainless steel A4, HCR								
Characteristic resistance C1		$V_{Rk,s,eq,C1}$	[kN]	9,3	20	27	44	69
Characteristic resistance C2		$V_{Rk,s,eq,C2}$	[kN]	6,7	14	16,2	35,7	55,2
Partial factor		γ_{Ms}	[-]	1,25				1,4
Factor for annular gap	without filling of annular gap	α_{gap}	[-]	0,5				
	with filling of annular gap	α_{gap}	[-]	1,0				

Alfa Wedge Anchor

Performance

Characteristic resistance for **seismic loading**, Alfa Wedge Anchor, **standard anchorage depth**, performance category **C1** and **C2**

Annex C6

Table C7: Characteristic values for tension and shear load under fire exposure, Alfa Wedge Anchor, **standard anchorage depth**, cracked and uncracked concrete C20/25 to C50/60

Fastener size			M8	M10	M12	M16	M20	M24	M27	
Tension load										
Steel failure										
Steel, zinc plated										
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	1,5	2,6	4,1	7,7	9,4	13,6	17,6
	R60			1,1	1,9	3,0	5,6	8,2	11,8	15,3
	R90			0,8	1,4	2,4	4,4	6,9	10,0	13,0
	R120			0,7	1,2	2,2	4,0	6,3	9,1	11,8
Stainless steel A4, HCR										
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	3,8	6,9	12,7	23,7	33,5	48,2	-
	R60			2,9	5,3	9,4	17,6	25,0	35,9	
	R90			2,0	3,6	6,1	11,5	16,4	23,6	
	R120			1,6	2,8	4,5	8,4	12,1	17,4	
Shear load										
Steel failure without lever arm										
Steel, zinc plated										
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	1,6	2,6	4,1	7,7	11	16	20,6
	R60			1,5	2,5	3,6	6,8	11	15	19,8
	R90			1,2	2,1	3,5	6,5	10	15	19,0
	R120			1,0	2,0	3,4	6,4	10	14	18,6
Stainless steel A4, HCR										
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	3,8	6,9	12,7	23,7	33,5	48,2	-
	R60			2,9	5,3	9,4	17,6	25,0	35,9	
	R90			2,0	3,6	6,1	11,5	16,4	23,6	
	R120			1,6	2,8	4,5	8,4	12,1	17,4	
Steel failure with lever arm										
Steel, zinc plated										
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	1,7	3,3	6,4	16,3	29	50	75
	R60			1,6	3,2	5,6	14	28	48	72
	R90			1,2	2,7	5,4	14	27	47	69
	R120			1,1	2,5	5,3	13	26	46	68
Stainless steel A4, HCR										
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	3,8	9,0	19,7	50,1	88,8	153,5	-
	R60			2,9	6,8	14,6	37,2	66,1	114,3	
	R90			2,1	4,7	9,5	24,2	43,4	75,1	
	R120			1,6	3,6	7,0	17,8	32,1	55,5	

If pull-out is not decisive, $N_{Rk,p}$ must be replaced by $N^0_{Rk,c}$ in equation (D.4) and (D.5), EN 1992-4:2018.

Alfa Wedge Anchor

Performance

Characteristic values for tension and shear load under fire exposure, Alfa Wedge Anchor, **standard anchorage depth**, cracked and uncracked concrete C20/25 to C50/60

Annex C7

Table C8: Characteristic values **for tension and shear load** under **fire exposure**, Alfa Wedge Anchor, **reduced anchorage depth**, cracked and uncracked concrete C20/25 to C50/60

Fastener size				M8	M10	M12	M16
Tension load							
Steel failure							
Steel, zinc plated							
Characteristic resistance	R30	N _{Rk,s,fi}	[kN]	1,5	2,6	4,1	7,7
	R60			1,1	1,9	3,0	5,6
	R90			0,8	1,3	1,9	3,5
	R120			0,6	1,0	1,3	2,5
Stainless steel A4, HCR							
Characteristic resistance	R30	N _{Rk,s,fi}	[kN]	3,2	6,9	12,7	23,7
	R60			2,5	5,3	9,4	17,6
	R90			1,9	3,6	6,1	11,5
	R120			1,6	2,8	4,5	8,4
Shear load							
Steel failure without lever arm							
Steel, zinc plated							
Characteristic resistance	R30	V _{Rk,s,fi}	[kN]	1,5	2,6	4,1	7,7
	R60			1,1	1,9	3,0	5,6
	R90			0,8	1,3	1,9	3,5
	R120			0,6	1,0	1,3	2,5
Stainless steel A4, HCR							
Characteristic resistance	R30	V _{Rk,s,fi}	[kN]	3,2	6,9	12,7	23,7
	R60			2,5	5,3	9,4	17,6
	R90			1,9	3,6	6,1	11,5
	R120			1,6	2,8	4,5	8,4
Steel failure with lever arm							
Steel, zinc plated							
Characteristic resistance	R30	M ⁰ _{Rk,s,fi}	[Nm]	1,5	3,3	6,4	16,3
	R60			1,2	2,5	4,7	11,9
	R90			0,8	1,7	3,0	7,5
	R120			0,6	1,2	2,1	5,3
Stainless steel A4, HCR							
Characteristic resistance	R30	M ⁰ _{Rk,s,fi}	[Nm]	3,2	8,9	19,7	50,1
	R60			2,6	6,8	14,6	37,2
	R90			2,0	4,7	9,5	24,2
	R120			1,6	3,6	7,0	17,8

If pull-out is not decisive, $N_{Rk,p}$ must be replaced by $N^0_{Rk,c}$ in equation (D.4) and (D.5), EN 1992-4:2018.

Alfa Wedge Anchor

Performance

Characteristic values **for tension and shear load** under **fire exposure**, Alfa Wedge Anchor, **reduced anchorage depth**, cracked and uncracked concrete C20/25 to C50/60

Annex C8

Table C9: Displacements under tension load, Alfa Wedge Anchor

Fastener size			M8	M10	M12	M16	M20	M24	M27
Standard anchorage depth									
Steel zinc plated									
Tension load in cracked concrete	N	[kN]	2,4	4,3	7,6	11,9	17,1	21,1	24
Displacement	δ_{N0}	[mm]	0,6	1,0	0,4	1,0	0,9	0,7	0,9
	$\delta_{N\infty}$	[mm]	1,4	1,2	1,4	1,3	1,0	1,2	1,4
Tension load in uncracked concrete	N	[kN]	5,7	7,6	11,9	16,7	23,8	29,6	34
Displacement	δ_{N0}	[mm]	0,4	0,5	0,7	0,3	0,4	0,5	0,3
	$\delta_{N\infty}$	[mm]	0,8		1,4	0,8			1,4
Displacements under seismic tension loads C2									
Displacements for DLS	$\delta_{N,eq,(DLS)}$	[mm]	2,3	4,1	4,9	3,6	5,1	-	-
Displacements for ULS	$\delta_{N,eq(ULS)}$	[mm]	8,2	13,8	15,7	9,5	15,2		
Stainless steel A4 , HCR									
Tension load in cracked concrete	N	[kN]	2,4	4,3	7,6	11,9	17,1	19,0	-
Displacement	δ_{N0}	[mm]	0,7	1,8	0,4	0,7	0,9	0,5	
	$\delta_{N\infty}$	[mm]	1,2	1,4	1,4	1,4	1,0	1,8	
Tension load in uncracked concrete	N	[kN]	5,8	7,6	11,9	16,7	23,8	33,5	-
Displacement	δ_{N0}	[mm]	0,6	0,5	0,7	0,2	0,4	0,5	
	$\delta_{N\infty}$	[mm]	1,2	1,0	1,4	0,4	0,8	1,1	
Displacements under seismic tension loads C2									
Displacements for DLS	$\delta_{N,eq(DLS)}$	[mm]	2,3	4,1	4,9	3,6	5,1	-	-
Displacements for ULS	$\delta_{N,eq(ULS)}$	[mm]	8,2	13,8	15,7	9,5	15,2		
Reduced anchorage depth									
Steel zinc plated, stainless steel A4 , HCR									
Tension load in cracked concrete	N	[kN]	2,4	3,6	6,1	9,0	-	-	-
Displacement	δ_{N0}	[mm]	0,8	0,7	0,5	1,0			
	$\delta_{N\infty}$	[mm]	1,2	1,0	0,8	1,1			
Tension load in uncracked concrete	N	[kN]	3,7	4,3	8,5	12,6	-	-	-
Displacement	δ_{N0}	[mm]	0,1	0,2	0,2	0,2			
	$\delta_{N\infty}$	[mm]	0,7	0,7	0,7	0,7			

Alfa Wedge Anchor

Performance
Displacements under tension load

Annex C9

Table C10: Displacements under shear load, Alfa Wedge Anchor

Fastener size			M8	M10	M12	M16	M20	M24	M27
Standard anchorage depth									
Steel zinc plated									
Shear load in cracked and uncracked concrete	V	[kN]	6,9	11,4	17,1	31,4	36,8	64,9	96,8
Displacement	δ_{V0}	[mm]	2,0	3,2	3,6	3,5	1,8	3,5	3,6
	$\delta_{V\infty}$	[mm]	3,0	4,7	5,5	5,3	2,7	5,3	5,4
Displacements under seismic shear loads C2									
Displacements for DLS	$\delta_{V,eq(DLS)}$	[mm]	3,0	2,7	3,5	4,3	4,7	-	-
Displacements for ULS	$\delta_{V,eq(ULS)}$	[mm]	5,9	5,3	9,5	9,6	10,1		
Stainless steel A4, HCR									
Shear load in cracked and uncracked concrete	V	[kN]	7,3	11,4	17,1	31,4	43,8	70,6	-
Displacement	δ_{V0}	[mm]	1,9	2,4	4,0	4,3	2,9	2,8	
	$\delta_{V\infty}$	[mm]	2,9	3,6	5,9	6,4	4,3	4,2	
Displacements under seismic shear loads C2									
Displacements for DLS	$\delta_{V,eq(DLS)}$	[mm]	3,0	2,7	3,5	4,3	4,7	-	-
Displacements for ULS	$\delta_{V,eq(ULS)}$	[mm]	5,9	5,3	9,5	9,6	10,1		
Reduced anchorage depth									
Steel zinc plated									
Shear load in cracked and uncracked concrete	V	[kN]	6,9	11,4	17,1	31,4	-	-	-
Displacement	δ_{V0}	[mm]	2,0	3,2	3,6	3,5			
	$\delta_{V\infty}$	[mm]	3,0	4,7	5,5	5,3			
Stainless steel A4, HCR									
Shear load in cracked and uncracked concrete	V	[kN]	7,3	11,4	17,1	31,4	-	-	-
Displacement	δ_{V0}	[mm]	1,9	2,4	4,0	4,3			
	$\delta_{V\infty}$	[mm]	2,9	3,6	5,9	6,4			

Alfa Wedge Anchor

Performance
Displacements under shear load

Annex C10

Table C11: Characteristic values for **tension loads, Alfa Wedge Anchor-IG, cracked concrete**, static and quasi-static action

Fastener size			M6	M8	M10	M12
Installation factor	γ_{inst}	[-]	1,2			
Steel failure						
Characteristic resistance, steel zinc plated	$N_{Rk,s}$	[kN]	16,1	22,6	26,0	56,6
Partial factor	γ_{Ms}	[-]	1,5			
Characteristic resistance, stainless steel A4, HCR	$N_{Rk,s}$	[kN]	14,1	25,6	35,8	59,0
	γ_{Ms}	[-]	1,87			
Pull-out failure						
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5	9	12	20
Increasing factor for $N_{Rk,p}$	ψ_c	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$			
Concrete cone failure						
Effective anchorage depth	h_{ef}	[mm]	45	58	65	80
Factor for cracked concrete	$k_1 = k_{cr,N}$	[-]	7,7			

Alfa Wedge Anchor-IG

Performance

Characteristic values for **tension loads, Alfa Wedge Anchor-IG, cracked concrete**, static and quasi-static action

Annex C11

Table C12: Characteristic values for **tension loads, Alfa Wedge Anchor-IG, uncracked concrete**, static and quasi-static action

Fastener size			M6	M8	M10	M12
Installation factor	γ_{inst}	[-]	1,2			
Steel failure						
Characteristic resistance, steel zinc plated	$N_{Rk,s}$	[kN]	16,1	22,6	26,0	56,6
Partial factor	γ_{Ms}	[-]	1,5			
Characteristic resistance, stainless steel A4, HCR	$N_{Rk,s}$	[kN]	14,1	25,6	35,8	59,0
Partial factor	γ_{Ms}	[-]	1,87			
Pull-out						
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	12	16	20	30
Splitting (the higher resistance of Case 1 and Case 2 may be applied)						
Minimum thickness of concrete member	h_{min}	[mm]	100	120	130	160
Case 1						
Characteristic resistance in uncracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	9	12	16	25
Edge distance	$C_{cr,sp}$	[mm]	1,5 h_{ef}			
Case 2						
Characteristic resistance in uncracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	12	16	20	30
Edge distance	$C_{cr,sp}$	[mm]	2,5 h_{ef}			
Increasing factor for $N_{Rk,p}$ and $N^0_{Rk,sp}$	ψ_c	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$			
Concrete cone failure						
Effective anchorage depth	h_{ef}	[mm]	45	58	65	80
Factor for uncracked concrete	$k_1 = k_{ucr,N}$	[-]	11,0			

Alfa Wedge Anchor-IG

Performance

Characteristic values for **tension loads, Alfa Wedge Anchor-IG, uncracked concrete**, static and quasi-static action

Annex C12

Table C13: Characteristic values for **shear loads, Alfa Wedge Anchor-IG, cracked and uncracked concrete**, static and quasi-static action

Fastener size			M6	M8	M10	M12
Installation factor	γ_{inst}	[-]	1,0			
Alfa Wedge Anchor-IG, steel zinc plated						
Steel failure without lever arm, Pre-setting installation						
Characteristic resistance	$V^0_{Rk,s}$	[kN]	5,8	6,9	10,4	25,8
Steel failure without lever arm, Through-setting installation						
Characteristic resistance	$V^0_{Rk,s}$	[kN]	5,1	7,6	10,8	24,3
Steel failure with lever arm, Pre-setting installation						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12,2	30,0	59,8	104,6
Steel failure with lever arm, Through-setting installation						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	36,0	53,2	76,0	207
Partial factor for $V_{Rk,s}$ and $M^0_{Rk,s}$	γ_{Ms}	[-]	1,25			
Ductility factor	k_7	[-]	1,0			
Alfa Wedge Anchor-IG, stainless steel A4, HCR						
Steel failure without lever arm, Pre-setting installation						
Characteristic resistance	$V^0_{Rk,s}$	[kN]	5,7	9,2	10,6	23,6
Partial factor	γ_{Ms}	[-]	1,25			
Steel failure without lever arm, Through-setting installation						
Characteristic resistance	$V^0_{Rk,s}$	[kN]	7,3	7,6	9,7	29,6
Partial factor	γ_{Ms}	[-]	1,25			
Steel failure with lever arm, Pre-setting installation						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	10,7	26,2	52,3	91,6
Partial factor	γ_{Ms}	[-]	1,56			
Steel failure with lever arm, Through-setting installation						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	28,2	44,3	69,9	191,2
Partial factor	γ_{Ms}	[-]	1,25			
Ductility factor	k_7	[-]	1,0			
Concrete pry-out failure						
Pry-out factor	k_8	[-]	1,5	1,5	2,0	2,0
Concrete edge failure						
Effective length of fastener in shear loading	l_f	[mm]	45	58	65	80
Effective diameter of fastener	d_{nom}	[mm]	8	10	12	16

Alfa Wedge Anchor-IG

Performance

Characteristic values for **shear loads, Alfa Wedge Anchor-IG, cracked and uncracked concrete**, static and quasi-static action

Annex C13

Table C14: Characteristic values for **tension** and **shear load** under **fire exposure**,
Alfa Wedge Anchor-IG, cracked and uncracked concrete C20/25 to C50/60

Fastener size			M6	M8	M10	M12	
Tension load							
Steel failure							
Steel zinc plated							
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	0,7	1,4	2,5	3,7
	R60			0,6	1,2	2,0	2,9
	R90			0,5	0,9	1,5	2,2
	R120			0,4	0,8	1,3	1,8
Stainless steel A4, HCR							
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	2,9	5,4	8,7	12,6
	R60			1,9	3,8	6,3	9,2
	R90			1,0	2,1	3,9	5,7
	R120			0,5	1,3	2,7	4,0
Shear load							
Steel failure without lever arm							
Steel zinc plated							
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	0,7	1,4	2,5	3,7
	R60			0,6	1,2	2,0	2,9
	R90			0,5	0,9	1,5	2,2
	R120			0,4	0,8	1,3	1,8
Stainless steel A4, HCR							
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	2,9	5,4	8,7	12,6
	R60			1,9	3,8	6,3	9,2
	R90			1,0	2,1	3,9	5,7
	R120			0,5	1,3	2,7	4,0
Steel failure with lever arm							
Steel zinc plated							
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	0,5	1,4	3,3	5,7
	R60			0,4	1,2	2,6	4,6
	R90			0,4	0,9	2,0	3,4
	R120			0,3	0,8	1,6	2,8
Stainless steel A4, HCR							
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	2,2	5,5	11,2	19,6
	R60			1,5	3,9	8,1	14,3
	R90			0,7	2,2	5,1	8,9
	R120			0,4	1,3	3,5	6,2

Alfa Wedge Anchor-IG

Performance

Characteristic values for **tension** and **shear loads** under **fire exposure**,
Alfa Wedge Anchor-IG cracked and uncracked concrete C20/25 to C50/60

Annex C14

Table C15: Displacements under tension load, Alfa Wedge Anchor-IG

Fastener size			M6	M8	M10	M12
Tension load in cracked concrete	N	[kN]	2,0	3,6	4,8	8,0
Displacements	δ_{N0}	[mm]	0,6	0,6	0,8	1,0
	$\delta_{N\infty}$	[mm]	0,8	0,8	1,2	1,4
Tension load in uncracked concrete	N	[kN]	4,8	6,4	8,0	12,0
Displacements	δ_{N0}	[mm]	0,4	0,5	0,7	0,8
	$\delta_{N\infty}$	[mm]	0,8	0,8	1,2	1,4

Table C16: Displacements under shear load, Alfa Wedge Anchor-IG

Fastener size			M6	M8	M10	M12
Shear load in cracked and uncracked concrete	V	[kN]	4,2	5,3	6,2	16,9
Displacements	δ_{V0}	[mm]	2,8	2,9	2,5	3,6
	$\delta_{V\infty}$	[mm]	4,2	4,4	3,8	5,3

Alfa Wedge Anchor-IG

Performance

Displacements under tension load and under shear load Alfa Wedge Anchor-IG

Annex C15