

DECLARACIÓN DE PRESTACIONES

DoP 0332

para Upat UKA3 Plus (Anclaje químico para uso en hormigón)

ES

1. Código de identificación única del producto tipo: DoP 0332
2. Usos previstos: Fijación a posteriori en hormigón fisurado y no fisurado
véase el apéndice, especialmente los anexos B1- B7.
3. Fabricante: Upat Vertriebs GmbH, Bebelstraße 11, 79108 Freiburg im Breisgau, Alemania
4. Representante autorizado: -
5. Sistemas de evaluación y verificación de la constancia de las prestaciones (EVCP): 1
6. Documento de evaluación europeo: EAD 330499-01-0601, Edition 04/2020
Evaluación técnica europea: ETA-17/0197; 2023-01-30
Organismo de evaluación técnica: DIBt- Deutsches Institut für Bautechnik
Organismos notificados: 2873 TU Darmstadt
7. Prestaciones declaradas:
Resistencia mecánica y estabilidad (BWR 1)
Resistencia característica a tracción (carga estática y cuasi-estática):
Resistencia de rotura del acero: Anexo C2
Resistencia para la combinación de rotura por cono de hormigón y extracción: Anexos C4, C5
Resistencia de rotura por cono de hormigón: Anexos C3
Distancia al borde para evitar la rotura del acero sometido a carga: Anexos C3
Robustez: Anexos C3-C5
Par máximo de montaje: Anexos B3, B4
Distancia mínima entre el borde y el centro: Anexos B3, B4

Resistencia característica a cortante (carga estática y cuasi-estática):
Resistencia de rotura del acero: Anexos C1, C2
Resistencia falla por arrancamiento lateral: Anexo C3
Resistencia de rotura del hormigón al borde: Anexo C3

Desplazamientos bajo carga a corto y largo plazo:
Desplazamientos bajo carga a corto y largo plazo: Anexo C6

Resistencia y desplazamientos característicos para las categorías sísmicas C1 y C2:
Resistencia a carga de tracción, desplazamientos, categoría C1: NPD
Resistencia a carga de tracción, desplazamientos, categoría C2: NPD
Resistencia a esfuerzo cortante, desplazamientos, categoría C1: NPD
Resistencia a esfuerzo cortante, desplazamientos, categoría C2: NPD
Factor espacio anular: NPD

Higiene, salud y medio ambiente (BWR 3)
Contenido, emisión y/o desprendimiento de sustancias peligrosas: NPD
8. Documentación técnica adecuada o documentación técnica específica: -

$\psi_{\text{sus}}^0 = \text{NPD}$

$\tau_{\text{Rk},100} = \text{NPD}$

Las prestaciones del producto identificado anteriormente son conformes con el conjunto de prestaciones declaradas. La presente declaración de prestaciones se emite, de conformidad con el Reglamento (UE) no 305/2011, bajo la sola responsabilidad del fabricante arriba identificado.

Firmado por y en nombre del fabricante por:




Dr.-Ing. Oliver Geibig, Director General Unidades de Negocio e Ingeniería
Tumlingen, 2023-02-13

Jürgen Grün, Director General de Química y Calidad

Esta DdR se ha preparado en distintos idiomas. En caso de que haya alguna controversia sobre la interpretación prevalecerá siempre la versión inglesa.

El Apéndice incluye información voluntaria y complementaria en idioma inglés que excede los requisitos legales (de idioma neutral).

Specific Part

1 Technical description of the product

The Upat UKA3 Plus is a bonded anchor for use in concrete consisting of a capsule Upat UKA3 Plus and a steel element according to Annex A2.

The capsule Upat UKA3 Plus is placed in the hole and the steel element is driven by machine with simultaneous hammering and turning.

The element is anchored via the bond between steel element, chemical mortar and concrete.

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)	See Annex B 3 and B 4, C 1 to C 5
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 1 to C 3
Displacements under short-term and long-term loading	See Annex C 6
Characteristic resistance and displacements for seismic performance categories C1 and C2	No performance assessed

3.2 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Content, emission and/or release of dangerous substances	No performance assessed

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

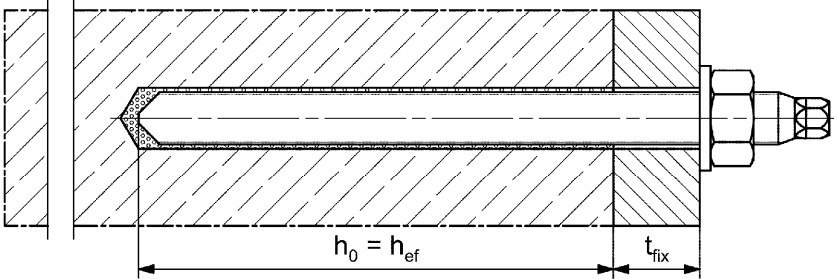
In accordance with the European Assessment Document EAD 330499-01-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

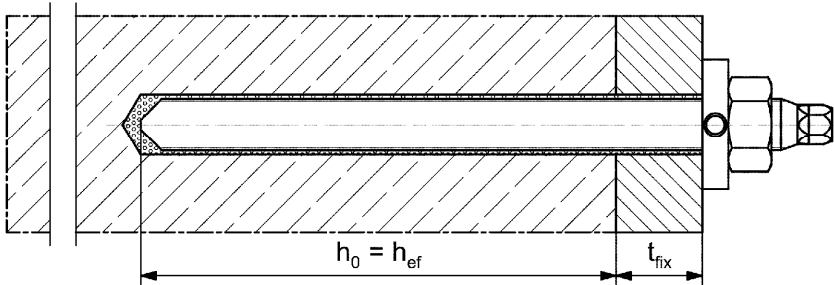
Installation conditions

Upat anchor rod ASTA; installation in concrete

Pre-positioned installation:

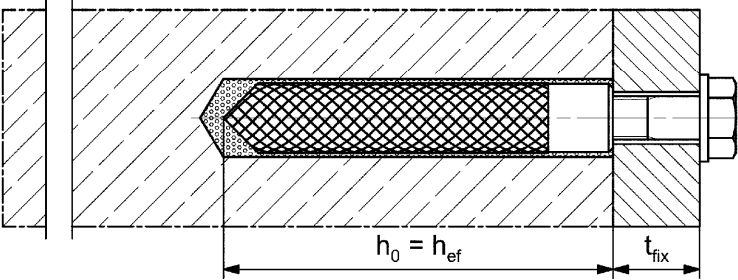


Pre-positioned installation with subsequently injected filling disc:

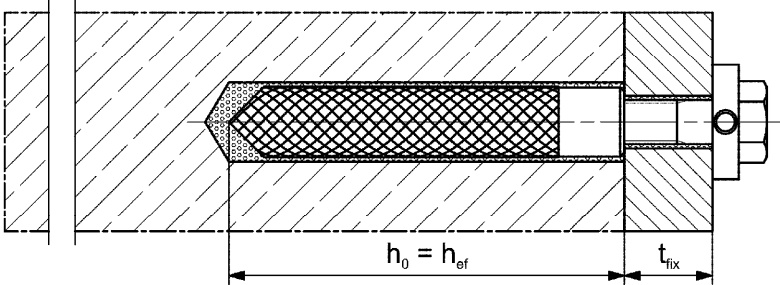


Upat internal threaded anchor IST; installation in concrete

Pre-positioned installation:



Pre-positioned installation with subsequently injected filling disc:



Figures not to scale

h_0 = drill hole depth
 t_{fix} = thickness of fixture

h_{ef} = effective embedment depth

Upat UKA3 Plus

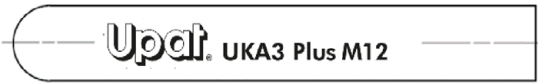
Product description
Installation conditions

Annex A 1

Overview product components

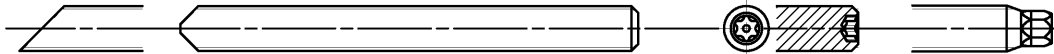
Capsule UKA3 Plus

Size: 8, 10, 12, 16, 16E, 20/22, 24



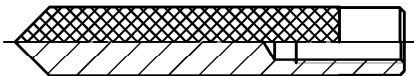
Upat Anchor rod ASTA

Size: M8, M10, M12, M16, M20, M24

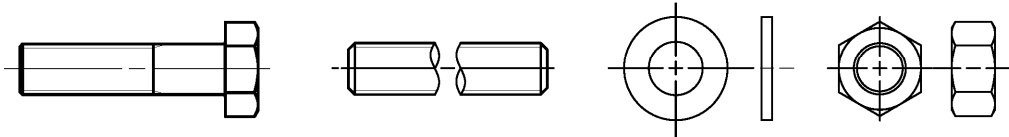


Upat internal threaded anchor IST

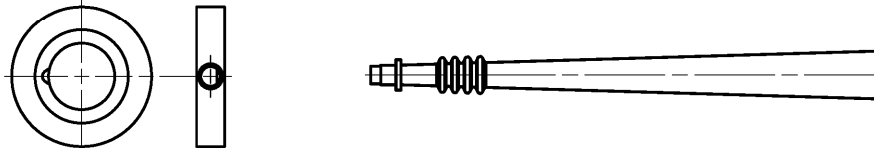
Size: M8, M10, M12, M16, M20



Screw / threaded rod / washer / hexagon nut



Filling disc with injection adapter



Figures not to scale

Upat UKA3 Plus

Product description
Overview product components

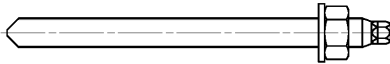
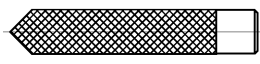
Annex A 2

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Table A3.1: Materials				
Part	Designation	Material		
1	Capsule UKA3 Plus	Mortar, hardener, filler		
	Steel grade	Steel zinc plated	Stainless steel R	High corrosion resistant steel HCR
			acc. to EN 10088-1:2014 Corrosion resistance class CRC III acc. to EN 1993-1-4: 2006+A1:2015	acc. to EN 10088-1:2014 Corrosion resistance class CRC V acc. to EN 1993-1-4: 2006+A1:2015
2	Upat anchor rod ASTA	Property class 4.8, 5.8 or 8.8; EN ISO 898-1:2013 zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised ≥ 40 µm EN ISO 10684:2004+AC:2009 f _{uk} ≤ 1000 N/mm ²	Property class 50, 70 or 80 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4062, 1.4662, 1.4462 EN 10088-1:2014 f _{uk} ≤ 1000 N/mm ²	Property class 50 or 80 EN ISO 3506-1:2020 or property class 70 with f _{yk} = 560 N/mm ² 1.4565; 1.4529 EN 10088-1:2014 f _{uk} ≤ 1000 N/mm ²
		Fracture elongation A ₅ > 8 %,		
3	Washer ISO 7089:2000	zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised ≥ 40 µm EN ISO10684:2004+AC:2009	1.4401; 1.4404; 1.4578;1.4571; 1.4439; 1.4362 EN 10088-1:2014	1.4565;1.4529 EN 10088-1:2014
4	Hexagon nut	Property class 4, 5 or 8; EN ISO 898-2:2012 zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised≥ 40 µm EN ISO10684:2004+AC:2009	Property class 50, 70 or 80 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088-1:2014	Property class 50, 70 or 80 EN ISO 3506-1:2020 1.4565; 1.4529 EN 10088-1:2014
5	Upat internal threaded anchor IST	Property class 5.8 ISO 898-1:2013 zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K)	Property class 70 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088-1:2014	Property class 70 EN ISO 3506-1:2020 1.4565; 1.4529 EN 10088-1:2014
6	Commercial standard screw or threaded rod for internal threaded anchor IST	Property class 5.8 or 8.8; EN ISO 898-1:2013 zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) fracture elongation A ₅ > 8 %	Property class 70 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088-1:2014 fracture elongation A ₅ > 8 %	Property class 70 EN ISO 3506-1:2020 1.4565; 1.4529 EN 10088-1:2014 fracture elongation A ₅ > 8 %
7	filling disc	zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised ≥ 40 µm EN ISO10684:2004+AC:2009	1.4401; 1.4404; 1.4578;1.4571; 1.4439; 1.4362 EN 10088-1:2014	1.4565;1.4529 EN 10088-1:2014
Upat UKA3 Plus				Annex A 3 Appendix 5 / 18
Product description Materials				

Specifications of intended use part 1

Table B1.1: Overview use and performance categories

Fastenings subject to		UKA3 Plus with ...			
		Upat anchor rod ASTA 		Upat internal threaded anchor IST 	
Hammer drilling with standard drill bit 		all sizes			
Hammer drilling with hollow drill bit (fischer „FHD“, Heller "Duster Expert"; Bosch „Speed Clean“; Hilti "TE-CD, TE-YD", DreBo „D-Plus“, DreBo „D-Max“) 		Nominal drill bit diameter (d ₀) 12 mm to 28 mm		all sizes	
Static and quasi static loading, in	uncracked concrete	all sizes	Tables: C1.1, C3.1, C4.1, C6.1	all sizes	Tables: C2.1, C3.1, C5.1, C6.2
	cracked concrete	M10, M12, M16, M20, M24			
	I1 dry or wet concrete	all sizes		all sizes	
	I2 water filled hole	M12, M16, M20, M24		M8, M10, M16	
Seismic performance category	C1	_1)		_1)	
	C2				
Installation direction		D3 (downward and horizontal and upwards (e.g. overhead) installation)			
Installation temperature		T _{i,min} = -15 °C to T _{i,max} = +40 °C			
In-service temperature	Temperature range I	-40 °C to +40 °C	(max. short term temperature +40 °C and max. long term temperature +24 °C)		
	Temperature range II	-40 °C to +80 °C	(max. short term temperature +80 °C and max. long term temperature +50 °C)		
	Temperature range III	-40 °C to +120 °C	(max. short term temperature +120 °C and max. long term temperature +72 °C)		
1) No performance assessed					
Upat UKA3 Plus					Annex B 1 Appendix 6 / 18
Intended Use Specifications part 1					

Specifications of intended use part 2

Base materials:

- Compacted reinforced or unreinforced normal weight concrete without fibres of strength classes C20/25 to C50/60 according to EN 206:2013+A1:2016

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (zinc coated steel, stainless steel or high corrosion resistant steel).
- For all other conditions according to EN1993-1-4:2006+A1:2015 corresponding to corrosion resistance classes to Annex A 3 Table 3.1.

Design:

- Fastenings are designed under the responsibility of an engineer experienced in fastenings and concrete work.
- Verifiable calculation notes and drawings are to be 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.).
- Fastenings are designed in accordance with:
EN 1992-4:2018 and EOTA Technical Report TR 055, Edition February 2018.

Installation:

- Fastener installation is to be carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Fastening depth should be marked and adhered to installation.
- Overhead installation is allowed (necessary equipment see installation instruction).

Upat UKA3 Plus

Intended Use
Specifications part 2

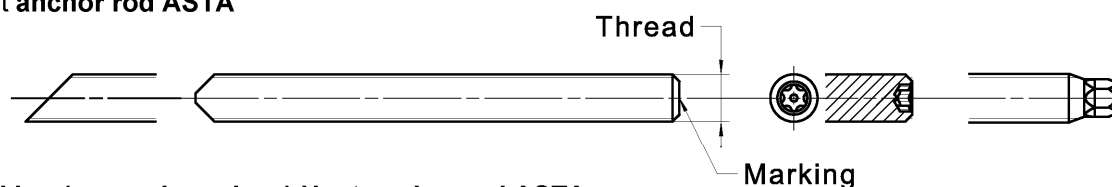
Annex B 2

Appendix 7 / 18

Table B3.1: Installation parameters for Upat anchor rods ASTA

Anchor rods ASTA		thread	M8	M10	M12	M16	M20	M24
Nominal drill bit diameter	d_0		10	12	14	18	25	28
Drill hole depth	h_0		$h_0 = h_{ef}$					
Effective embedment depth	h_{ef}		80	90	110	125	170	210
Minimum spacing and minimum edge distance	$s_{min} = c_{min}$		40	45	55	65	85	105
Diameter of clearance hole in the pre-positioned installation fixture	d_f		9	12	14	18	22	26
Minimum thickness of concrete member	h_{min}		$h_{ef} + 30$ (≥ 100)			$h_{ef} + 2d_0$		
Maximum installation torque	$\max T_{inst}$	[Nm]	10	20	40	60	120	150

Upat anchor rod ASTA



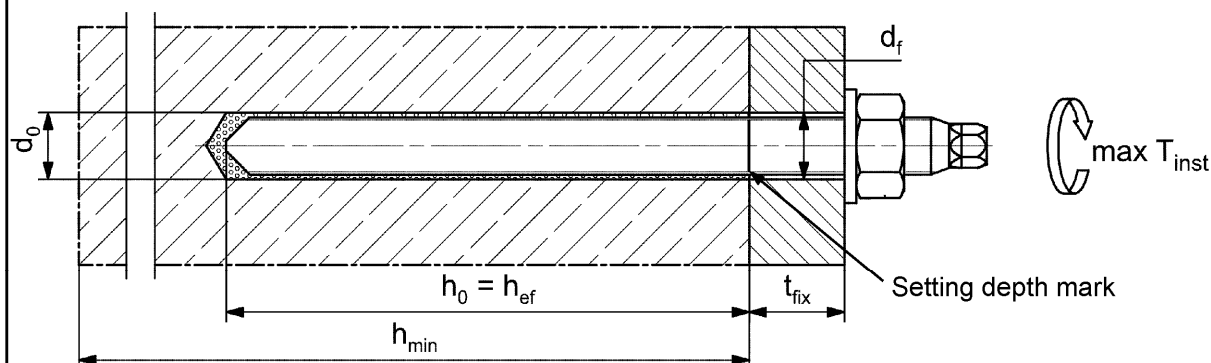
Marking (on random place) Upat anchor rod ASTA

Steel zinc plated PC ¹⁾ 8.8	• or +	Steel hot-dip PC ¹⁾ 8.8	•
High corrosion resistant steel HCR PC ¹⁾ 50	•	High corrosion resistant steel HCR PC ¹⁾ 70	-
High corrosion resistant steel HCR PC ¹⁾ 80	(	Stainless steel R property class 50	~
Stainless steel R property class 80	*		

Alternatively: Colour coding according to DIN 976-1:2016

¹⁾ PC = property class

Installation conditions:



Figures not to scale

Upat UKA3 Plus

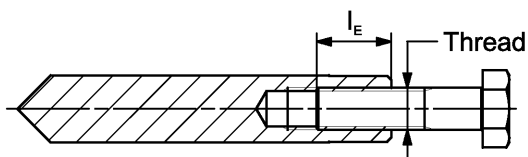
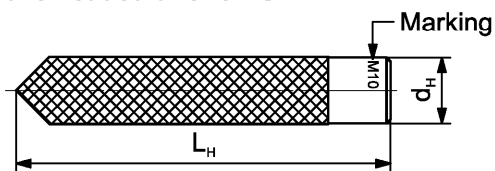
Intended Use
Installation parameters anchor rods ASTA

Annex B 3

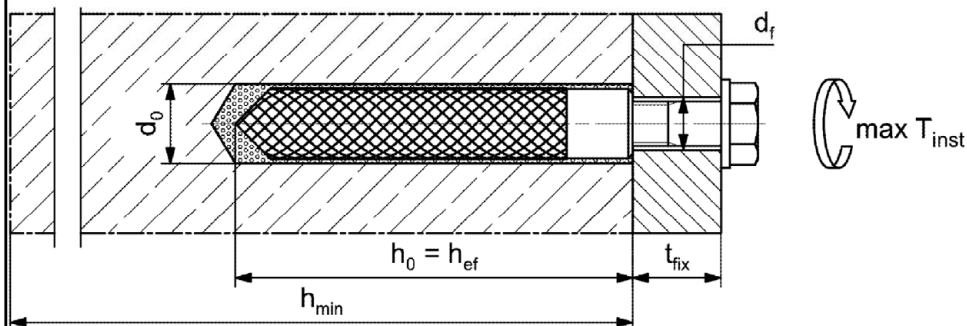
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Table B4.1: Installation parameters for Upat internal threaded anchors IST

Internal threaded anchors IST		thread	M8	M10	M12	M16	M20
Diameter of anchor	$d = d_H$	[mm]	12	16	18	22	28
Nominal drill bit diameter	d_0		14	18	20	24	32
Drill hole depth	h_0		$h_0 = h_{ef} = L_H$				
Effective embedment depth ($h_{ef} = L_H$)	h_{ef}		90	90	125	160	200
Minimum spacing and minimum edge distance	s_{min} = c_{min}		55	65	75	95	125
Diameter of clearance hole in the fixture	d_f		9	12	14	18	22
Minimum thickness of concrete member	h_{min}		120	125	165	205	260
Maximum screw-in depth	$l_{E,max}$		18	23	26	35	45
Minimum screw-in depth	$l_{E,min}$		8	10	12	16	20
Maximum installation torque	$\max T_{inst}$	[Nm]	10	20	40	80	120

Upat internal threaded anchor IST**Marking:** Anchor size e. g.: **M10**Stainless steel → additional **R**; e.g.: **M10 R**High corrosion resistant steel → additional **HCR**; e.g.: **M10 HCR**

Retaining bolt or threaded rods (including nut and washer) must comply with the appropriate material and strength class of Annex A 3, Table A3.1.

Installation conditions:

Figures not to scale

Upat UKA3 Plus

Intended Use

Installation parameters Upat internal threaded anchors IST

Annex B 4

Appendix 9 / 18

Table B5.1: Dimensions of resin capsule UKA3 Plus

Capsule UKA3 Plus		8	10	12	16	16 E	20/22	24	
Capsule diameter	d _P	[mm]	9,0	10,5	12,5	16,5		23,0	
Capsule length	L _P		85	90	97	95	123	160	190

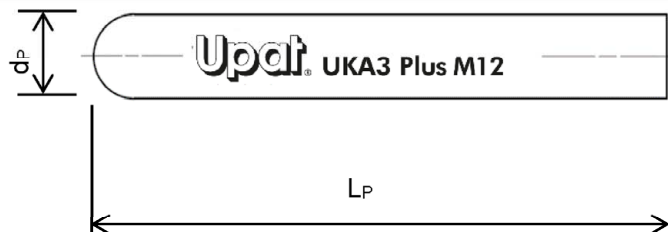


Table B5.2: Assignment of resin capsule UKA3 Plus to Upat anchor rod ASTA

Anchor rod ASTA		M8	M10	M12	M16	M20	M24
Effective embedment depth	h _{ef} [mm]	80	90	110	125	170	210
Related capsule UKA3 Plus	[-]	8	10	12	16	20/22	24

Table B5.3: Assignment of resin capsule UKA3 Plus to the Upat internal threaded anchor IST

Internal threaded anchor IST		M8	M10	M12	M16	M20
Effective embedment depth	h _{ef} [mm]	90	90	125	160	200
Related capsule UKA3 Plus	[-]	10	12	16	16E	24

Table B5.4: Minimum curing time

(During the curing time of the mortar the concrete temperature may not fall below the listed minimum temperature; minimal capsule temperature -15 °C)

Concrete temperature [°C]	Minimum curing time t _{cure}
-15 to -10	30 h
> -10 to -5	16 h
> -5 to 0	10 h
> 0 to 5	45 min
> 5 to 10	30 min
> 10 to 20	20 min
> 20 to 30	5 min
> 30 to 40	3 min

Upat UKA3 Plus

Intended Use

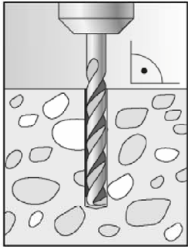
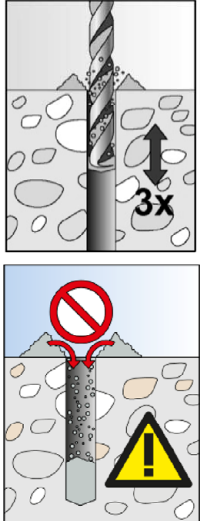
Dimensions of the capsules, Assignment of the capsule to the anchor rod and internal threaded anchor, Minimum curing time

Annex B 5

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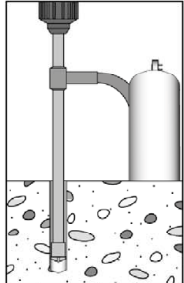
Installation instructions part 1

Drilling and cleaning the hole (hammer drilling with standard drill bit)

1		Specified drill hole depth h_0 should be adhered to (e.g. mark on the drill bit). Drill the hole. Drill hole diameter d_0 and drill hole depth h_0 see Tables B3.1, B4.1
2		When reaching the drill hole depth h_0 pull out the drill bit whilst power drill is switched on. To reduce the drill dust in the drill hole repeat this step minimum three times, beginning from the drill hole bottom (discharging the bore hole) Trickling of the bore dust into the drill hole has to be avoided. (e.g. with exhausting the drill dust) Blowing out or brushing the drill hole is not necessary

Go to step 3

Drilling and cleaning the hole (hammer drilling with hollow drill bit)

1		Check a suitable hollow drill (see Table B1.1) for correct operation of the dust extraction
2		Use a suitable dust extraction system, e.g. fischer FVC 35 M or a comparable dust extraction system with equivalent performance data Drill the hole with hollow drill bit. The dust extraction system has to extract the drill dust nonstop during the drilling process and must be adjusted to maximum power. Diameter of drill hole d_0 and drill hole depth h_0 see Tables B3.1, B4.1

Go to step 3

Upat UKA3 Plus

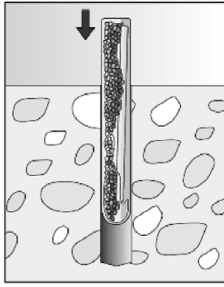
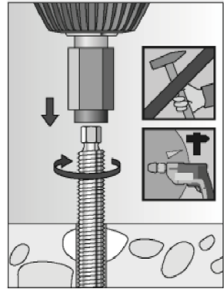
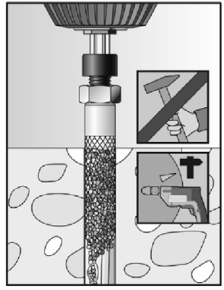
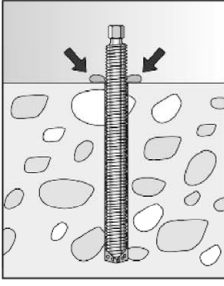
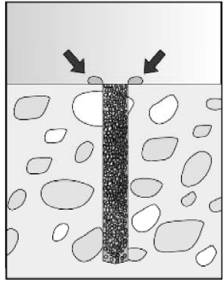
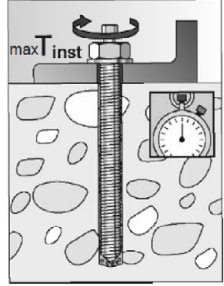
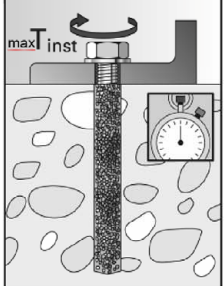
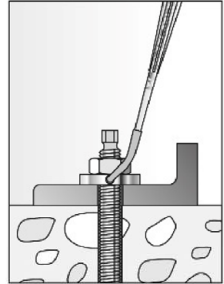
Intended use
Installation instructions part 1

Annex B 6

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Installation instructions part 2

Installation of capsule UKA3 Plus with Upat anchor rods ASTA or Upat internal threaded anchors IST

3		Push the capsule UKA3 Plus into the drill hole	 Depending on the anchor being installed, use a suitable setting tool (e.g. MW-SDS)
4			Only use clean and oil-free metal parts. Using a suitable adapter, drive the ASTA or internal threaded anchor IST into the capsule using a hammer drill set on rotary hammer action. Stop when the metal part reaches the bottom of the hole and is set to the correct embedment depth
5			When reaching the correct embedment depth, excess mortar must be emerged from the mouth of the drill hole
6			Wait for the specified curing time, t_{cure} see Table B5.4 Mounting the fixture $max T_{inst}$ see Table B3.1, B4.1
Option		After the minimum curing time is reached, the gap between metal part and fixture (annular clearance) may be filled with mortar via the filling disc. compressive strength $\geq 50 \text{ N/mm}^2$ (e.g. Upat injection mortars UPM 33, UPM 44, UPM 55, UPM 66)	

Upat UKA3 Plus

Intended use
Installation instructions part 2

Annex B 7

Appendix 12 / 18

Table C1.1: Characteristic resistance to steel failure under tension / shear loading of Upat anchor rods ASTA											
Anchor rod ASTA				M8	M10	M12	M16	M20	M24		
Characteristic resistance to steel failure under tension loading ²⁾											
Characteristic resistance N _{Rk,s}	Steel zinc plated	Property class	4.8	[kN]	15(13)	23(21)	33	63	98	141	
			5.8		19(17)	29(27)	43	79	123	177	
			8.8		29(27)	47(43)	68	126	196	282	
	Stainless steel R and high corrosion resistant steel HCR		50		19	29	43	79	123	177	
			70		26	41	59	110	172	247	
			80		30	47	68	126	196	282	
Partial factors ¹⁾											
Partial factor γ _{Ms,N}	Steel zinc plated	Property class	4.8	[-]	1,50						
			5.8		1,50						
			8.8		1,50						
	Stainless steel R and high corrosion resistant steel HCR		50		2,86						
			70		1,50 ³⁾ / 1,87						
			80		1,60						
Characteristic resistance to steel failure under shear loading ²⁾											
without lever arm											
Characteristic resistance V ⁰ _{Rk,s}	Steel zinc plated	Property class	4.8	[kN]	9(8)	14(13)	20	38	59	85	
			5.8		11(10)	17(16)	25	47	74	106	
			8.8		15(13)	23(21)	34	63	98	141	
	Stainless steel R and high corrosion resistant steel HCR		50		9	15	21	39	61	89	
			70		13	20	30	55	86	124	
			80		15	23	34	63	98	141	
Ductility factor		k ₇	[-]	1,0							
with lever arm											
Characteristic resistance M ⁰ _{Rk,s}	Steel zinc plated	Property class	4.8	[Nm]	15(13)	30(27)	52	133	259	448	
			5.8		19(16)	37(33)	65	166	324	560	
			8.8		30(26)	60(53)	105	266	519	896	
	Stainless steel R and high corrosion resistant steel HCR		50		19	37	65	166	324	560	
			70		26	52	92	232	454	784	
			80		30	60	105	266	519	896	
Partial factors ¹⁾											
Partial factor γ _{Ms,V}	Steel zinc plated	Property class	4.8	[-]	1,25						
			5.8		1,25						
			8.8		1,25						
	Stainless steel R and high corrosion resistant steel HCR		50		2,38						
			70		1,25 ³⁾ / 1,56						
			80		1,33						
¹⁾ In absence of other national regulations ²⁾ Values in brackets are valid for hot dip galvanised anchor rods ³⁾ Only for ASTA made of high corrosion-resistant steel HCR											
Upat UKA3 Plus								Annex C 1			
Performances Characteristic resistance to steel failure under tension / shear loading of Upat anchor rods ASTA											
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Table C2.1: Characteristic resistance to **steel failure** under tension / shear loading of **Upat internal threaded anchors IST**

Internal threaded anchor IST				M8	M10	M12	M16	M20	
Characteristic resistance to steel failure under tension loading									
Characteristic bearing capacity with screw	$N_{Rk,s}$	Property class	5.8	[kN]	19	29	43	79	123
			8.8		29	47	68	108	179
		Property class	R		26	41	59	110	172
		class 70	HCR		26	41	59	110	172
Partial factors ¹⁾									
Partial factor	$\gamma_{Ms,N}$	Property class	5.8	[-]	1,50				
			8.8		1,50				
		Property class	R		1,87				
		class 70	HCR		1,87				
Characteristic resistance to steel failure under shear loading									
without lever arm									
Characteristic bearing capacity with screw	$V^0_{Rk,s}$	Property class	5.8	[kN]	9,2	14,5	21,1	39,2	62,0
			8.8		14,6	23,2	33,7	54,0	90,0
		Property class	R		12,8	20,3	29,5	54,8	86,0
		class 70	HCR		12,8	20,3	29,5	54,8	86,0
Ductility factor			k_7	[-]	1,0				
with lever arm									
Characteristic bending moment with screw	$M^0_{Rk,s}$	Property class	5.8	[Nm]	20	39	68	173	337
			8.8		30	60	105	266	519
		Property class	R		26	52	92	232	454
		class 70	HCR		26	52	92	232	454
Partial factors ¹⁾									
Partial factor	$\gamma_{Ms,V}$	Property class	5.8	[-]	1,25				
			8.8		1,25				
		Property class	R		1,56				
		class 70	HCR		1,56				

¹⁾ In absence of other national regulations

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Performances

Characteristic resistance to steel failure under tension / shear loading of Upat internal threaded anchor IST

Annex C 2

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Table C3.1: Characteristic resistance to **concrete failure** under **tension / shear loading**

Size			All sizes						
Characteristic resistance to concrete failure under tension loading									
Installation factor		γ_{inst}	[-]	See annex C 4 to C 5					
Factors for the compressive strength of concrete > C20/25									
Increasing factor ψ_c for cracked or uncracked concrete $\tau_{RK} = \psi_c \cdot \tau_{RK}(C20/25)$	C25/30	[-]	[mm]	1,02					
	C30/37			1,04					
	C35/45			1,07					
	C40/50			1,08					
	C45/55			1,09					
	C50/60			1,10					
Splitting failure									
Edge distance	$h / h_{ef} \geq 2,0$	$c_{cr,sp}$	[mm]	1,0 h_{ef}					
	$2,0 > h / h_{ef} > 1,3$			4,6 h_{ef} - 1,8 h					
	$h / h_{ef} \leq 1,3$			2,26 h_{ef}					
Spacing	$s_{cr,sp}$	2 $c_{cr,sp}$							
Concrete cone failure									
Uncracked concrete	$k_{ucr,N}$	[-]	[mm]	11,0					
Cracked concrete	$k_{cr,N}$			7,7					
Edge distance	$c_{cr,N}$	[mm]		1,5 h_{ef}					
Spacing	$s_{cr,N}$			2 $c_{cr,N}$					
Factors for sustained tension loading									
Factor		ψ_{sust}^0	[-]	_2)					
Characteristic resistance to concrete failure under shear loading									
All installation conditions		γ_{inst}	[-]	1,0					
Concrete pry-out failure									
Factor for pry-out failure		k_8	[-]	2,0					
Concrete edge failure									
Effective length of fastener in shear loading		l_f	[mm]	for $d_{nom} \leq 24$ mm: min (h_{ef} ; 12 d_{nom})					
Calculation diameters									
Size				M8	M10	M12	M16	M20	M24
Upat anchor rods		d	[mm]	8	10	12	16	20	24
Upat internal threaded anchors IST		d_{nom}		12	16	18	22	28	_1)
1) Anchor type not part of the assessment 2) No performance assessed									
Upat UKA3 Plus								Annex C 3 Appendix 15 / 18	
Performances Characteristic resistance to concrete failure under tension / shear loading									

Table C4.1: Characteristic resistance to combined pull-out and concrete failure for Upat anchor rods ASTA in hammer drilled holes; uncracked or cracked concrete									
Anchor rod ASTA			M8	M10	M12	M16	M20	M24	
Combined pullout and concrete cone failure									
Calculation diameter		d	[mm]	8	10	12	16	20	24
Uncracked concrete									
Characteristic bond resistance in uncracked concrete C20/25									
Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete)									
Tem- perature range	I: 40 °C / 24 °C	$\tau_{Rk,ucr}$	[N/mm ²]	12,5	12,5	12,5	12,5	12,5	12,5
	II: 80 °C / 50 °C			12,0	12,0	12,0	12,0	12,0	12,0
	III: 120 °C / 72 °C			10,5	10,5	10,5	10,5	10,5	10,5
Hammer-drilling with standard drill bit or hollow drill bit (water-filled hole)									
Tem- perature range	I: 40 °C / 24 °C	$\tau_{Rk,ucr}$	[N/mm ²]	– ¹⁾	– ¹⁾	12,5	12,5	12,5	12,5
	II: 80 °C / 50 °C			– ¹⁾	– ¹⁾	12,0	12,0	12,0	12,0
	III: 120 °C / 72 °C			– ¹⁾	– ¹⁾	10,5	10,5	10,5	10,5
Installation factors									
Dry and wet concrete		γ_{inst}	[-]	1,2					
Water-filled hole				– ¹⁾	– ¹⁾	1,4			
Cracked concrete									
Characteristic bond resistance in cracked concrete C20/25									
Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete)									
Tem- perature range	I: 40 °C / 24 °C	$\tau_{Rk,cr}$	[N/mm ²]	– ¹⁾	4,5	4,5	4,5	4,5	4,5
	II: 80 °C / 50 °C			– ¹⁾	4,0	4,0	4,0	4,0	4,0
	III: 120 °C / 72 °C			– ¹⁾	3,5	3,5	3,5	3,5	3,5
Hammer-drilling with standard drill bit or hollow drill bit (water-filled hole)									
Tem- perature range	I: 40 °C / 24 °C	$\tau_{Rk,cr}$	[N/mm ²]	– ¹⁾	– ¹⁾	4,5	4,5	4,5	4,5
	II: 80 °C / 50 °C			– ¹⁾	– ¹⁾	4,0	4,0	4,0	4,0
	III: 120 °C / 72 °C			– ¹⁾	– ¹⁾	3,5	3,5	3,5	3,5
Installation factors									
Dry and wet concrete		γ_{inst}	[-]	– ¹⁾	1,2				
Water-filled hole				– ¹⁾	– ¹⁾	1,4			
¹⁾ No performance assessed									
Upat UKA3 Plus							Annex C 4		
Performances Characteristic resistance to combined pull-out and concrete failure for Upat anchor rod ASTA									
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Table C5.1: Characteristic resistance to combined pull-out and concrete failure for Upat internal threaded anchors IST in hammer drilled holes; uncracked or cracked concrete								
Internal threaded anchors IST			M8	M10	M12	M16	M20	
Combined pullout and concrete cone failure								
Calculation diameter		d	[mm]	12	16	18	22	28
Uncracked concrete								
Characteristic bond resistance in uncracked concrete C20/25								
Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete)								
Temperature range	I: 40 °C / 24 °C	$\tau_{Rk,ucr}$	[N/mm ²]	11	11	11	11	11
	II: 80 °C / 50 °C			10,5	10,5	10,5	10,5	10,5
	III: 120 °C / 72 °C			9,5	9,5	9,5	9,5	9,5
Hammer-drilling with standard drill bit or hollow drill bit (water-filled hole)								
Temperature range	I: 40 °C / 24 °C	$\tau_{Rk,ucr}$	[N/mm ²]	11	11	- ¹⁾	11	- ¹⁾
	II: 80 °C / 50 °C			10,5	10,5	- ¹⁾	10,5	- ¹⁾
	III: 120 °C / 72 °C			9,5	9,5	- ¹⁾	9,5	- ¹⁾
Installation factors								
Dry and wet concrete		γ_{inst}	[-]	1,2				
Water-filled hole				1,4	- ¹⁾	1,4	- ¹⁾	
Cracked concrete								
Characteristic bond resistance in cracked concrete C20/25								
Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete)								
Temperature range	I: 40 °C / 24 °C	$\tau_{Rk,cr}$	[N/mm ²]	4,5	4,5	4,5	4,5	4,5
	II: 80 °C / 50 °C			4,0	4,0	4,0	4,0	4,0
	III: 120 °C / 72 °C			3,5	3,5	3,5	3,5	3,5
Hammer-drilling with standard drill bit or hollow drill bit (water-filled hole)								
Temperature range	I: 40 °C / 24 °C	$\tau_{Rk,cr}$	[N/mm ²]	4,5	4,5	- ¹⁾	4,5	- ¹⁾
	II: 80 °C / 50 °C			4,0	4,0	- ¹⁾	4,0	- ¹⁾
	III: 120 °C / 72 °C			3,5	3,5	- ¹⁾	3,5	- ¹⁾
Installation factors								
Dry and wet concrete		γ_{inst}	[-]	1,2				
Water-filled hole				1,4	- ¹⁾	1,4	- ¹⁾	
¹⁾ No performance assessed								
Upat UKA3 Plus							Annex C 5 Appendix 17 / 18	
Performances Characteristic resistance to combined pull-out and concrete failure for Upat internal threaded anchors IST								

Table C6.1: Displacements for Upat anchor rods ASTA

Anchor rod ASTA		M8	M10	M12	M16	M20	M24
Displacement-Factors for tension loading ¹⁾							
Uncracked or cracked concrete; Temperature range I, II, III							
δ_{N0} -Factor	[mm/(N/mm ²)]	0,07	0,08	0,09	0,10	0,11	0,12
$\delta_{N\infty}$ -Factor		0,13	0,14	0,15	0,17	0,17	0,18
Displacement-Factors for shear loading ²⁾							
Uncracked or cracked concrete; Temperature range I, II, III							
δ_{V0} -Factor	[mm/kN]	0,18	0,15	0,12	0,09	0,07	0,06
$\delta_{V\infty}$ -Factor		0,27	0,22	0,18	0,14	0,11	0,09
1) Calculation of effective displacement:				2) Calculation of effective displacement:			
$\delta_{N0} = \delta_{N0\text{-Factor}} \cdot \tau$				$\delta_{V0} = \delta_{V0\text{-Factor}} \cdot V$			
$\delta_{N\infty} = \delta_{N\infty\text{-Factor}} \cdot \tau$				$\delta_{V\infty} = \delta_{V\infty\text{-Factor}} \cdot V$			
τ = acting bond strength under tension loading				V = acting shear loading			

Table C6.2: Displacements for Upat internal threaded anchors IST

Internal threaded anchor IST		M8	M10	M12	M16	M20
Displacement-Factors for tension loading ¹⁾						
Uncracked or cracked concrete; Temperature range I, II, III						
δ _{N0} -Factor	[mm/(N/mm ²)]	0,09	0,10	0,10	0,11	0,19
δ _{N∞} -Factor		0,13	0,15	0,15	0,17	0,19
Displacement-Factors for shear loading ²⁾						
Uncracked or cracked concrete; Temperature range I, II, III						
δ _{V0} -Factor	[mm/kN]	0,12	0,09	0,08	0,07	0,05
δ _{V∞} -Factor		0,18	0,14	0,12	0,10	0,08
1) Calculation of effective displacement:				2) Calculation of effective displacement:		
δ _{N0} = δ _{N0-Factor} · τ				δ _{V0} = δ _{V0-Factor} · V		
δ _{N∞} = δ _{N∞-Factor} · τ				δ _{V∞} = δ _{V∞-Factor} · V		
τ = acting bond strength under tension loading				V = acting shear loading		