

PRESTATIEVERKLARING
DEMU boutankers

CONF-DOP_DEMU-BA 02/17-NL
Nr. H03-13/0401

1.	Unieke identificatiecode van het producttype	DEMU boutankers
2.	Type-, partij- of serienummer of een ander code voor de identificatie van het bouwproduct conform artikel 11, lid 4	DEMU boutanker, type 1988 - zie ETA-13/0401, annex A4 en A5 DEMU boutanker, type 1985 - zie ETA-13/0401, annex A4 en A5
3.	Door de fabrikant beoogd gebruik van het bouwproduct, overeenkomstig de toepasselijke geharmoniseerde technische specificatie, zoals door de fabrikant bepaald:	
	Type en gebruik	Ingebetonneerd anker met interne schroefdraad
	Beschikbare product afmetingen	M12x55, M12x100, M12x150, M16x75, M16x140, M16x220, M20x90, M20x150, M20x180, M20x270, M24x110, M24x200, M24x320, M30x160, M30x240, M30x380, M36x300, M36x420, M42x300, M42x460
	Voor gebruik in	Gescheurd en ongescheurd beton C20/25 tot C90/105 conform EN 206:2013
	Ankermateriaal en -sterkte	- Koppelbus gemaakt van galvanisch verzinkt staal, voor droge binnenruimtes, geen blootstelling aan corrosie - Koppelbus gemaakt van thermisch verzinkt staal, voor geringe blootstelling aan corrosie - Koppelbus gemaakt van roestvaststaal (A4-50 en A4-80), voor gemiddelde blootstelling aan corrosie
	Belastingen	Statische, quasi-statische trek- en dwarskrachten of de combinatie van trek- en dwarskrachten
4.	Naam, geregistreerde handelsnaam of geregistreerd handelsmerk en contactadres van de fabrikant conform artikel 11, lid 5	HALFEN GmbH (Deel van Leviat), Liebigstraße 14, 40764 Langenfeld, Duitsland
5.	Indien van toepassing, naam en contactadres van de gemachtigde wiens mandaat de in artikel 12, lid 2, vermelde taken bestrijkt	-
6.	Systeem of systemen voor de beoordeling en verificatie van de prestatiebestendigheid van het bouwproduct als vermeld in annex V	Systeem 1
7.	Prestatieverklaring met betrekking tot een bouwproduct onder een geharmoniseerde norm	-
8.	Prestatieverklaring met betrekking tot een bouwproduct waarvoor een Europees technische beoordeling is afgegeven	Het Duitse Instituut voor Bouwtechniek (DIBt) heeft de ETA-13/0401 afgegeven op basis van EAD 330012-00-0601, versie september 2015. De aangewezen instantie 2323 heeft volgens systeem 1 uitgevoerd: (i) Bepaling van het producttype op basis van een typekeuring (inclusief bemonstering), typeberekening, waardetabellen of documentatie van het product; (ii) Initiële inspectie van de productiefabriek en van de productiecontrole in de fabriek; (iii) Permanente bewaking, beoordeling en evaluatie van de productiecontrole in de fabriek en heeft het certificaat 2323-CPR-0013 afgegeven.

9.	Aangegeven prestaties			
	Belangrijkste kenmerken	Berekeningsmethode	Prestatie	Geharmoniseerde technische specificatie
	Karakteristieke weerstand bij trekbelasting	CEN/TS 1992-4-1 en CEN/TS 1992-4-2	ETA-13/0401, annex C1 en C2	EAD 330012-00-0601, versie September 2015
	Karakteristieke weerstand bij dwarskrachten		ETA-13/0401, annex C3 en C4	
	Vervormingen in bruikbaarheidsgrenstoestand		ETA-13/0401, annex C2 en C4	
	Karakteristieke weerstand bij brandbelasting		ETA-13/0401, annex C5	
	Indien overeenkomstig artikel 37 of 38 in de specifieke technische documentatie is gebruikt, moet het product voldoen aan de eisen		-	
10.	De prestaties van het product volgens punt 1 en 2 komen overeen met de aangegeven prestaties in punt 9.			
Deze prestatieverklaring wordt verstrekt onder volledige verantwoordelijkheid van de fabrikant genoemd in punt 4.				

Langenfeld, 01.10.2020

Ondertekend voor en namens de fabrikant door

Richard Wachter
(Managing Director)

ppa. Dr.-Ing. Dirk Albartus
(Manager Engineering)

Table C-1a: Characteristic values for tension loads

Thread size	d	[mm]	M12	M16	M20	M24	M30	M36	M42
Steel failure, bolt anchor (material 1 or 2) and screw (min. steel strength 4.6) made of electroplated / hot-dipped galvanised steel	$N_{Rk,s}$	[kN]	33.7	62.8	98.0	141.2	224.4	326.8	448.4 ²⁾
Characteristic resistance	$N_{Rk,s}$	[kN]	33.7	62.8	98.0	141.2	224.4	326.8	448.4 ²⁾
Partial safety factor	γ_{Ms}	[-]	2.00						
Steel failure, bolt anchor (material 1 or 2) and screw (min. steel strength 5.6) made of electroplated / hot-dipped galvanised steel	$N_{Rk,s}$	[kN]	42.2	78.5	122.5	176.5	280.5	408.5	560.5 ²⁾
Characteristic resistance	$N_{Rk,s}$	[kN]	42.2	78.5	122.5	176.5	280.5	408.5	560.5 ²⁾
Partial safety factor	γ_{Ms}	[-]	2.00						
Steel failure, bolt anchor (material 1 or 2) and screw (min. steel strength 8.8) made of electroplated / hot-dipped galvanised steel	$N_{Rk,s}$	[kN]	45.8	93.1	139.6	219.5	335.0	490.5	588.1 ²⁾
Characteristic resistance	$N_{Rk,s}$	[kN]	45.8	93.1	139.6	219.5	335.0	490.5	588.1 ²⁾
Partial safety factor	γ_{Ms}	[-]	1.58						
zugehöriger Teilsicherheitsbeiwert	γ_{Ms}	[-]	1.58						
Steel failure, bolt anchor (material 3: A4-50) and screw (min. steel strength A4-50) made of stainless steel	$N_{Rk,s}$	[kN]	42.2	81.0	110.3				
Characteristic resistance	$N_{Rk,s}$	[kN]	42.2	81.0	110.3				
Partial safety factor	γ_{Ms}	[-]	2.86	3.09					
Steel failure, bolt anchor (material 3: A4-50) and screw (min. steel strength A4-70) made of stainless steel	$N_{Rk,s}$	[kN]	46.4	81.0	110.3				
Characteristic resistance	$N_{Rk,s}$	[kN]	46.4	81.0	110.3				
Partial safety factor	γ_{Ms}	[-]	3.09						
Steel failure, bolt anchor (material 4: A4-80) and screw (min. steel strength A4-80) made of stainless steel	$N_{Rk,s}$	[kN]	59.0	125.6	180.1	282.4	448.8		
Characteristic resistance	$N_{Rk,s}$	[kN]	59.0	125.6	180.1	282.4	448.8		
Partial safety factor	γ_{Ms}	[-]	1.48	1.60	1.48		1.60		
Pull-out failure									
Charact. resistance in cracked concrete	$N_{Rk,p}$	[kN]	25.1	44.7	69.8	100.5	168.9	240.3	341.0
Charact. resistance in uncracked concrete	$N_{Rk,p}$	[kN]	35.2	62.5	97.7	140.7	236.4	336.4	477.4
Increasing factors for $N_{Rk,p}$ in cracked and uncracked concrete	ψ_c	[-]	1.20						
	ψ_c	[-]	1.48						
	ψ_c	[-]	1.80						
	ψ_c	[-]	2.00						
	ψ_c	[-]	2.20						
Partial safety factor	ψ_c	[-]	2.40						
	$\gamma_{M,p}$	[-]	1.50						

¹⁾ in absence of other national regulations; ²⁾ only available in GV (material 1 acc. to Annex A4)

DEMU Bolt anchor

Performances
Characteristic values for tension loads

Annex C1

Table C1b: Characteristic values for tension loads

Thread size	d	[mm]	M12	M16	M20	M24	M30	M36	M42
Concrete cone failure									
Effective anchorage depth	$h_{ef}^{1)}$	[mm]	M12x55: 49.0 M16x75: 67.0 M20x90: 79.0 M24x110: 97.0 M30x150: 143.0 M36x300: 279.0 M42x300: 276.0						
		[mm]	M12x100: 94.0 M16x140: 132.0 M20x150: 139.0 M24x200: 187.0 M30x240: 223.0 M36x420: 399.0 M42x460: 436.0						
		[mm]	M12x150: 144.0 M16x220: 212.0 M20x180: 169.0 M24x320: 307.0 M30x380: 363.0						
Factor to take into account the influence of load transfer mechanisms in cracked and uncracked concrete	k_{tr}	[-]	-	-	M20x270: 259.0	8.5			
Characteristic spacing	$s_{cr,N}$	[mm]				11.9			
		[mm]				$3.0 \cdot h_w$			
Characteristic edge distance	$c_{cr,N}$	[mm]				$1.5 \cdot h_w$			
Partial safety factor	$\gamma_{dec}^{2)}$	[-]				1.50			
Splitting									
Effective anchorage depth	$h_{ef}^{1)}$	[mm]	M12x55: 49.0 M16x75: 67.0 M20x90: 79.0 M24x110: 97.0 M30x150: 143.0 M36x300: 279.0 M42x300: 276.0						
		[mm]	M12x100: 94.0 M16x140: 132.0 M20x150: 139.0 M24x200: 187.0 M30x240: 223.0 M36x420: 399.0 M42x460: 436.0						
		[mm]	M12x150: 144.0 M16x220: 212.0 M20x180: 169.0 M24x320: 307.0 M30x380: 363.0						
Characteristic spacing	$s_{cr,sp}$	[mm]			M20x270: 259.0	$4.0 \cdot h_w$			
Characteristic edge distance	$c_{cr,sp}$	[mm]				$2.0 \cdot h_w$			
Partial safety factor	$\gamma_{dec}^{2)}$	[-]				1.50			

¹⁾ for bolt anchor type 1985 the values have to be decreased by 2.0 mm; ²⁾ in absence of other national regulations

Table C2: Displacements under tension loads

Thread size	d	[mm]	M12	M16	M20	M24	M30	M36	M42
Displacements δ_{w0} to 0.7 mm for short term loading in cracked and uncracked concrete under following tension loads ¹⁾	N	[kN]	14.0	20.0	29.0	40.0	63.0	83.0	113.0

¹⁾ for long term tension loading the displacements $\delta_{w,LT}$ can be increased to 1.8 mm

DEMU Bolt anchor

Performances
Characteristic values for tension loads, displacements under tension loads

Annex C2

Table C3a: Characteristic values for shear loads

Thread size	d	[mm]	M12	M16	M20	M24	M30	M36	M42
Shear loads without lever arm									
Group factor (CEN/TS 1992-4-2, 6.3.3.1)	k_g	[-]	1.0						
Steel failure, bolt anchor (material 1 or 2) and screw (min. steel strength 4.6) made of electroplated / hot-dipped galvanised steel									
Characteristic resistance	$V_{Rk,s}$	[kN]	16.9	31.4	49.0	70.6	112.2	163.4	224.2 ²⁾
Partial safety factor	$\gamma_{Mk,s}$	[-]	1.67						
Steel failure, bolt anchor (material 1 or 2) and screw (min. steel strength 5.6) made of electroplated / hot-dipped galvanised steel									
Characteristic resistance	$V_{Rk,s}$	[kN]	21.1	39.3	61.3	88.3	140.3	204.3	280.3 ²⁾
Partial safety factor	$\gamma_{Mk,s}$	[-]	1.67						
Steel failure, bolt anchor (material 1 or 2) and screw (min. steel strength 8.8) made of electroplated / hot-dipped galvanised steel									
Characteristic resistance	$V_{Rk,s}$	[kN]	22.9	46.5	69.8	109.7	167.5	245.2	294.1 ²⁾
Partial safety factor	$\gamma_{Mk,s}$	[-]	1.32						
Steel failure, bolt anchor (material 3: A4-50) and screw (min. steel strength A4-50) made of stainless steel									
Characteristic resistance	$V_{Rk,s}$	[kN]	21.1	40.5	55.1				
Partial safety factor	$\gamma_{Mk,s}$	[-]	2.38	2.58					
Steel failure, bolt anchor (material 3: A4-50) and screw (min. steel strength A4-70) made of stainless steel									
Characteristic resistance	$V_{Rk,s}$	[kN]	23.2	40.5	55.1				
Partial safety factor	$\gamma_{Mk,s}$	[-]		2.58					
Steel failure, bolt anchor (material 4: A4-80) and screw (min. steel strength A4-80) made of stainless steel									
Characteristic resistance	$V_{Rk,s}$	[kN]	29.5	62.8	90.0	141.2	224.4		
Partial safety factor	$\gamma_{Mk,s}$	[-]	1.23	1.33	1.23	1.33	1.33		
Shear loads with lever arm: see Annex C4, Table C3b									
Pry-out failure									
Factor	k_s	[-]	M12x55: 1.0 M12x100: 2.0 M12x150: 2.0	2.0	2.0	2.0	2.0	2.0	2.0
Partial safety factor	$\gamma_{Mk,p}$	[-]	1.50						
Concrete edge failure (without suppl. reinforcement)									
Effective length of fixing anchor (for shear loads)	l_f	[mm]	M12x55: 47.0 M12x100: 92.0 M12x150: 124.0	M16x75: 65.0 M16x140: 130.0 M16x220: 168.0	M20x90: 77.0 M20x150: 137.0 M20x180: 167.0	M24x110: 95.0 M24x200: 185.0 M24x320: 256.0	M30x160: 141.0 M30x240: 221.0 M30x380: 320.0	M36x300: 277.0 M36x420: 380.0	M42x300: 274.0 M42x460: 432.0
Effective outside diameter	d_{nom}	[mm]	-	-	M20x270: 208.0	-	-	-	-
Partial safety factor	$\gamma_{Mk,e}$	[-]	15.5	21.0	26.0	32.0	40.0	47.5	54.0

¹⁾ in absence of other national regulations; ²⁾ only available in GV (material 1 acc. to Annex A4)

DEMU Bolt anchor

Performances
Characteristic values for shear loads

Annex C3

Table C3b: Characteristic values for shear loads

Thread size	d	[mm]	M12	M16	M20	M24	M30	M36	M42
Shear loads with lever arm									
Steel failure, bolt anchor (material 1 or 2) and screw (min. steel strength 4.6) made of electroplated / hot-dipped galvanised steel									
Characteristic resistance	$M_{Rk,s}^{1)}$	[Nm]	52.4	133.2	259.6	449.0	899.6	1581.0	2541.1 ²⁾
Partial safety factor	γ_{Mk}	[-]				1.67			
Steel failure, bolt anchor (material 1 or 2) and screw (min. steel strength 5.6) made of electroplated / hot-dipped galvanised steel									
Characteristic resistance	$M_{Rk,s}^{1)}$	[Nm]	65.5	166.5	324.5	561.3	1124.5	1976.3	3176.3 ²⁾
Partial safety factor	γ_{Mk}	[-]				1.67			
Steel failure, bolt anchor (material 1 or 2) and screw (min. steel strength 8.8) made of electroplated / hot-dipped galvanised steel									
Characteristic resistance	$M_{Rk,s}^{1)}$	[Nm]	104.8	266.4	519.3	898.0	1799.2	3162.1	5082.1 ²⁾
Partial safety factor	γ_{Mk}	[-]				1.25			
Steel failure, bolt anchor (material 3: A4-50) and screw (min. steel strength A4-50) made of stainless steel									
Characteristic resistance	$M_{Rk,s}^{1)}$	[Nm]	65.5	166.5	324.5				
Partial safety factor	γ_{Mk}	[-]		2.38					
Steel failure, bolt anchor (material 3: A4-50) and screw (min. steel strength A4-70) made of stainless steel									
Characteristic resistance	$M_{Rk,s}^{1)}$	[Nm]	91.7	383.7	659.4				
Partial safety factor	γ_{Mk}	[-]		1.56	2.58				
Steel failure, bolt anchor (material 3: A4-50) and screw (min. steel strength A4-80) made of stainless steel									
Characteristic resistance	$M_{Rk,s}^{1)}$	[Nm]	161.6	383.7	659.4				
Partial safety factor	γ_{Mk}	[-]		2.58					
Steel failure, bolt anchor (material 4: A4-80) and screw (min. steel strength A4-80) made of stainless steel									
Characteristic resistance	$M_{Rk,s}^{1)}$	[Nm]	104.8	266.4	519.3	898.0	1799.2		
Partial safety factor	γ_{Mk}	[-]			1.33				

¹⁾ in absence of other national regulations; ²⁾ only available in GV (material 1 acc. to Annex A.4)

Table C4: Displacements under shear loads

Thread size	d	[mm]	M12	M16	M20	M24	M30	M36	M42
Displacements δ_{V0} to 1.5 mm for short term loading in cracked and uncracked concrete under following shear loads ¹⁾	V	[kN]	13.0	23.0	36.0	52.0	82.0	120.0	160.0

¹⁾ for long term shear loading the displacements δ_{Vt} can be increased to 2.0 mm

DEMU Bolt anchor

Performances

Characteristic values for shear loads, displacements under shear loads

Annex C4

Table C5: Characteristic values for resistance to fire

Thread size	d	[mm]	M12	M16	M20	M24	M30	M36	M42
Steel failure for tension and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$), bolt anchor (material 1 or 2) and screw made of electroplated / hot-dipped galvanised steel									
Characteristic resistance	R30	$F_{Rk,s,fi}$ [kN]	1.5	3.0	4.5	7.1	10.8	15.8	19.0
	R60	$F_{Rk,s,fi}$ [kN]	1.1	2.3	3.4	5.3	8.1	11.9	14.2
	R90	$F_{Rk,s,fi}$ [kN]	1.0	2.0	2.9	4.6	7.0	10.3	12.3
	R120	$F_{Rk,s,fi}$ [kN]	0.7	1.5	2.3	3.5	5.4	7.9	9.5
Partial safety factor		$\gamma_{Ms,fi}$ ¹⁾ [-]	1.00						
Characteristic resistance	R30	$M_{Rk,s,fi}^0$ [Nm]	2.8	6.7	13.0	22.5	45.0	79.1	127.1
	R60	$M_{Rk,s,fi}^0$ [Nm]	2.0	5.0	9.7	18.8	33.7	59.3	95.3
	R90	$M_{Rk,s,fi}^0$ [Nm]	1.7	4.3	8.4	14.6	29.2	51.4	82.6
	R120	$M_{Rk,s,fi}^0$ [Nm]	1.3	3.3	6.5	11.2	22.5	39.5	63.5
Partial safety factor		$\gamma_{Ms,fi}$ ¹⁾ [-]	1.00						
Steel failure for tension and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$), bolt anchor (material 3 or 4) and screw made of stainless steel									
Characteristic resistance	R30	$F_{Rk,s,fi}$ [kN]	2.2 / 2.5 ²⁾	4.5 / 4.6 ²⁾	6.8	10.6	16.2	-	-
	R60	$F_{Rk,s,fi}$ [kN]	1.8 / 2.1 ²⁾	3.8 / 3.9 ²⁾	5.6	8.8	13.5		
	R90	$F_{Rk,s,fi}$ [kN]	1.5 / 1.6 ²⁾	3.0 / 3.1 ²⁾	4.5	7.1	10.8		
	R120	$F_{Rk,s,fi}$ [kN]	1.2 / 1.3 ²⁾	2.4 / 2.5 ²⁾	3.6	5.6	8.6		
Partial safety factor		$\gamma_{Ms,fi}$ ¹⁾ [-]	1.00						
Characteristic resistance	R30	$M_{Rk,s,fi}^0$ [Nm]	3.9	10.0	19.5	33.7	87.5	-	-
	R60	$M_{Rk,s,fi}^0$ [Nm]	3.3	8.3	18.2	28.1	56.2		
	R90	$M_{Rk,s,fi}^0$ [Nm]	2.6	6.7	13.0	22.5	45.0		
	R120	$M_{Rk,s,fi}^0$ [Nm]	2.1	5.3	10.4	18.0	38.0		
Partial safety factor		$\gamma_{Ms,fi}$ ¹⁾ [-]	1.00						
Pull-out failure									
Characteristic resistance	R90	$N_{Rk,p,fi}$ [kN]	$N_{Rk,p,fi(90)} = 0.25 \cdot N_{Rk,p}$						
	R120	$N_{Rk,p,fi}$ [kN]	$N_{Rk,p,fi(120)} = 0.20 \cdot N_{Rk,p}$						
Partial safety factor		$\gamma_{Mp,fi}$ ¹⁾ [-]	1.00						
Concrete cone failure									
Characteristic resistance	R90	$N_{Rk,c,fi}$ [kN]	$N_{Rk,c,fi(90)}^0 = h_{ef}/200 \cdot N_{Rk,c}^0 \leq N_{Rk,c}^0$						
	R120	$N_{Rk,c,fi}$ [kN]	$N_{Rk,c,fi(120)}^0 = 0.8 \cdot h_{ef}/200 \cdot N_{Rk,c}^0 \leq N_{Rk,c}^0$						
Characteristic spacing		$s_{cr,H,fi}$ [mm]	$4.0 \cdot h_{ef}$						
Characteristic edge distance		$c_{cr,H,fi}$ [mm]	$2.0 \cdot h_{ef}$						
Partial safety factor		$\gamma_{Mc,fi}$ ¹⁾ [-]	1.00						
Concrete pry-out failure									
Characteristic resistance	R90	$V_{Rk,cp,fi}$ [kN]	$V_{Rk,cp,fi(90)} = k_3 \cdot N_{Rk,c,fi(90)}$						
	R120	$V_{Rk,cp,fi}$ [kN]	$V_{Rk,cp,fi(120)} = k_3 \cdot N_{Rk,c,fi(120)}$						
Partial safety factor		$\gamma_{Mc,fi}$ ¹⁾ [-]	1.00						
Concrete edge failure									
Characteristic resistance	R90	$V_{Rk,c,fi}$ [kN]	$V_{Rk,c,fi(90)}^0 = 0.25 \cdot V_{Rk,c}^0$						
	R120	$V_{Rk,c,fi}$ [kN]	$V_{Rk,c,fi(120)}^0 = 0.20 \cdot V_{Rk,c}^0$						
Partial safety factor		$\gamma_{Mc,fi}$ ¹⁾ [-]	1.00						

¹⁾ in absence of other national regulations; ²⁾ higher value applies for material 3 (acc. to Annex A4)

¹⁾ in absence of other national regulations; ²⁾ higher value applies for material 3 (acc. to Annex A4)

DEMU Bolt anchor

Performances
Characteristic values for resistance to fire

Annex C5