Centre Scientifique et Technique du Bâtiment
84 avenue Jean Jaurès
CHAMPS-SUR-MARNE
F-77447 Marne-la-Vallée Cedex 2

Tél. : (33) 01 64 68 82 82
Fax : (33) 01 60 05 70 37

Designated according to Article 29 of Regulation (EU) No 305/2011

Member of EOTA
www.eota.eu

European Technical Assessment

ETA-16/0867 of 02/01/2020

English translation prepared by CSTB - Original version in French language

General Part

Nom commercial: *Trade name:*	**Blue-Tip 2 Screw-Bolt, Blue-Tip 2 Screw-Bolt+** **Hangermate, Hangermate+**
Famille de produit: *Product family:*	**Vis à béton pour usage dans du béton non fissuré et fissuré.** *Concrete screw for use in uncracked and cracked concrete*
Titulaire: *Manufacturer:*	DEWALT / Powers Richard-Klinger-Str. 11 65510 Idstein Germany
Usine de fabrication: *Manufacturing plant:*	Usine 5, Usine 2 *Plant 5, Plant 2*
Cette evaluation contient: *This assessment contains:*	13 pages incluant 9 pages d'annexes qui font partie intégrale de cette évaluation *13 pages including 9 pages of annexes which form an integral part of this assessment*
Base de l'ETE: *Basis of ETA:*	EAD 330232-00-0601 *EAD* 330232-00-0601
Cette evaluation remplace: *This Assessment replaces:*	ETE-16/0867 délivrée le 12/04/2019 *ETA-16/0867 issued on 12/04/2019*

Specific Part

1 Technical description of the product

The Powers Screwbolt is an anchor made of zinc plated steel or mechanicaly galvanized steel. The anchor is screwed into a predrilled cylindrical drill hole drilled with a standard or hollow drill bit. The special thread of the anchor cuts an internal thread into the member while setting. The anchorage is characterised by mechanical interlock in the special thread.

The illustration and the description of the product are given in Annexes A.

2 Specification of the intended use

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

The provisions made in this European technical assessment are based on an assumed working life of the anchor of 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.Performance of the product

3 Performance of the product

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance under static and quasi-static actions according to EN 1992-4	See Annex C1
Characteristic resistance under seismic action according to EN 1992-4	See Annex C2
Displacements	See Annex C3

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Characterisitc resistance under fire exposure according to EN 1992-4	See Annex C4

3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances contained in this European technical approval, there may be requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

3.4 Safety in use (BWR 4)

For Basic requirement Safety in use the same criteria are valid as for Basic Requirement Mechanical resistance and stability.

3.5 Protection against noise (BWR 5)

Not relevant.

3.6 Energy economy and heat retention (BWR 6)

Not relevant.

3.7 Sustainable use of natural resources (BWR 7)

For the sustainable use of natural resources no performance was determined for this product.

3.8 General aspects relating to fitness for use

Durability and Serviceability are only ensured if the specifications of intended use according to Annex B1 are kept.

4 Assessment and verification of constancy of performance (AVCP)

According to the Decision 96/582/EC of the European Commission, as amended, the system of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) given in the following table apply.

Product	Intended use	Level or class	System
Metal anchors for use in concrete	For fixing and/or supporting to concrete, structural elements (which contributes to the stability of the works) or heavy units	—	1

5 Technical details necessary for the implementation of the AVCP system

Technical details necessary for the implementation of the Assessment and verification of constancy of performance (AVCP) system are laid down in the control plan deposited at Centre Scientifique et Technique du Bâtiment.

The manufacturer shall, on the basis of a contract, involve a notified body approved in the field of anchors for issuing the certificate of conformity CE based on the control plan.

The original French version is signed by

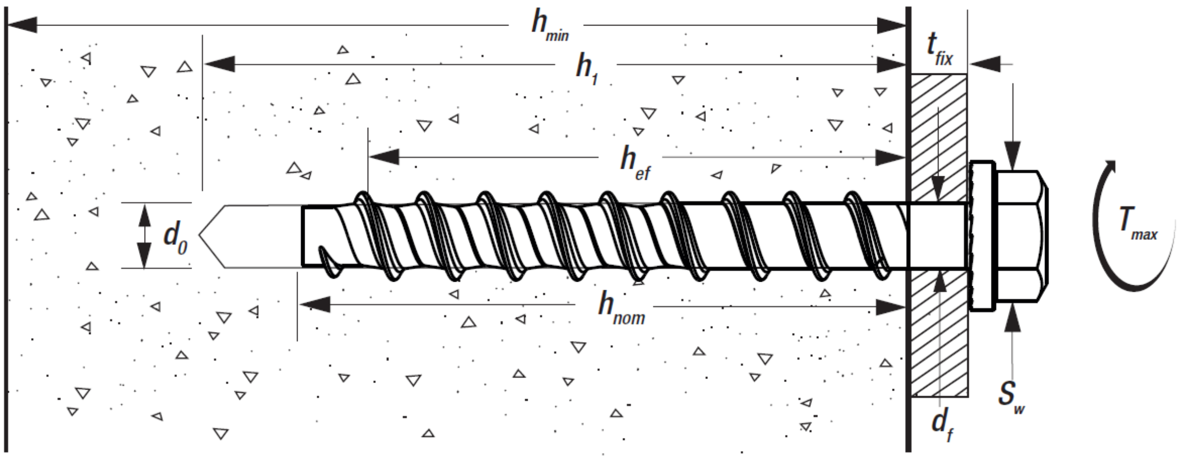
Technical Director

Anchor:

Head Marking:

Marking D x L where
D = Nominal diameter of the bore hole [mm]
L = Length of anchor [mm]

Anchor in use:



BT2 Screw-Bolt	**Annex A1**
Product description Installation condition Materials	

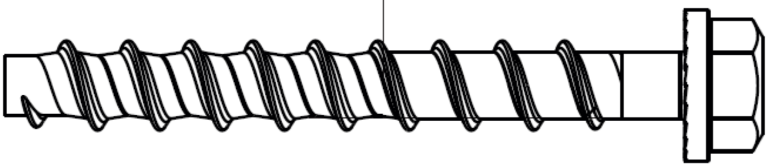
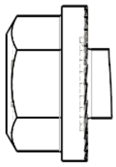
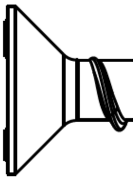
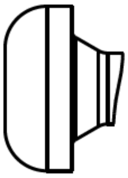
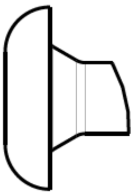
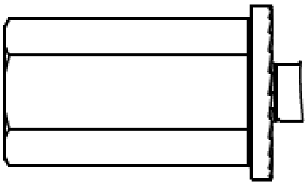
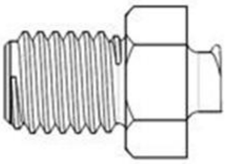


Table 1: Materials

Part	Version	Material	Protection
1	Blue-Tip 2 Screw-Bolt Hangermate Zinc Plated Version	C-Steel, special hardened	Zinc plated > 5 µm
1	Blue-Tip 2 Screw-Bolt Hangermate Mechanically Galv. Version	C-Steel, special hardened	Zinc plated > 50 µm

Table 2: Different head styles

Drawing	Denomination	Abbreviation	Diameters
	Hex Head Version	BT2 HH	6, 8, 10,12, 14, 16
	Countersunk Version	BT2 CSK	6, 8, 10,12
	Pan Head Version	BT2 Pan	6
	Dome Head Version	BT2 Dome	6
	Internal Thread Version Single thread M8 Single thread M10 Step thread M8/M10	BT2 Hanger M8 BT2 Hanger M10 BT2 Hanger M8/M10	6
	Single thread M12	BT2 Hanger M12	8
	External Thread Version Single thread M6 Single thread M8 Single thread M10	BT2 EXT M6 BT2 EXT M8 BT2 EXT M10	6

BT2 Screw-Bolt

Product description

Material

Annex A3

Specifications of intended use

Anchorages subject to:

- Static, quasi-static, seismic loads and fire exposure.

Base materials:

- Reinforced or unreinforced normal weight concrete according to EN 206:2013.
- Strength classes of C20/25 to C50/60 according to EN 206:2013.
- Cracked concrete and uncracked concrete.

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions.

Design:

- The anchorages are designed in accordance with EN 1992-4 under the responsibility of an engineer experienced in anchorages and concrete work.
- For seismic application the anchorages are designed in accordance with EN 1992-4
- For application with resistance under fire exposure the anchorages are designed in accordance with EN 1992-4.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings.

Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Use of the anchor only as supplied by the manufacturer without exchanging the components of an anchor.
- Anchor installation in accordance with the manufacturer's specifications and drawings and using the appropriate tools.
- Effective anchorage depth, edge distances and spacing not less than the specified values without minus tolerances.
- Hole drilling by hammer drill with standard or hollow drill bit.
- Cleaning of the hole of drilling dust. This step can be omitted if a hollow drill bit has been used.
- The anchor is suited for installation with a torque wrench by hand and for installation with a suitable impact wrench.
- In case of aborted hole, drilling of new hole at a minimum distance of twice the depth of the aborted hole, or smaller distance provided the aborted drill hole is filled with high strength mortar and no shear or oblique tension loads in the direction of aborted hole.

Table 3: Anchor dimensions

				BT2 6	BT2 8	BT2 10	BT2 12	BT2 14	BT2 16
Length of the anchor	**Min.**	**L**	**[mm]**	40	50	60	75	80	95
	Max.		**[mm]**	140	160	280	280	280	280
Fixture thickness	**Max.**	t_{fix}	**[mm]**	100	110	220	205	200	185
Diameter of the shaft		d_k	**[mm]**	5,9	7,7	9,6	11,4	13,3	15,0
Outer diameter of the thread		d_0	**[mm]**	7,9	10,2	12,5	14,7	16,8	18,5
Width torque wrench		S_W	**[mm]**	10	13	17	19	21	24

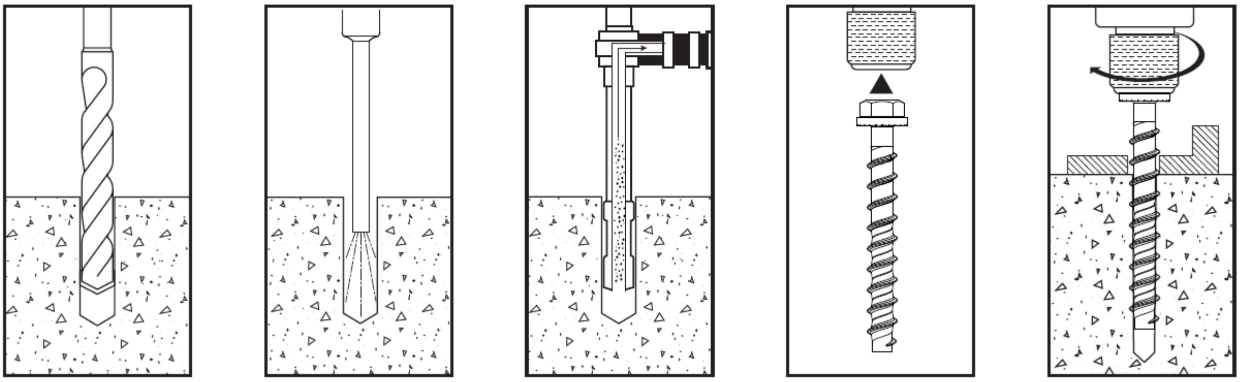
Table 4: Installation data

			BT2 6		BT2 8		BT2 10		BT2 12		BT2 14		BT2 16	
Drill hole diameter	d_{cut}	**[mm]**	≤ 6,45		≤ 8,45		≤ 10,45		≤ 12,50		≤ 14,50		≤ 16,50	
Drill hole depth	h_1	**[mm]**	50	65	60	85	70	95	85	110	90	125	115	150
Nom. embedment depth	h_{nom}	**[mm]**	40	55	50	75	60	85	75	100	80	115	95	130
Embedment depth	h_{ef}	**[mm]**	30,5	43,3	37,9	59,1	45,1	66,3	56,7	78,0	59,2	89,0	70,9	100,7
Diameter through hole fixture	d_f	**[mm]**	9	9	12	12	14	14	16	16	18	18	20	20
Min. member thickness	h_{min}	**[mm]**	80	100	100	120	105	140	125	160	150	185	160	195
Min. edge distance	c_{min}	**[mm]**	40	40	50	50	55	55	60	60	60	60	70	70
Min. spacing	S_{min}	**[mm]**	40	40	50	50	55	55	60	60	60	60	70	70
Maximum installation torque	$T_{inst,max}$	**[Nm]**	22.5	22.5	40	40	70	70	75	75	100	100	120	120
Maximum impact wrench torque	$T_{imp,max}$	**[Nm]**	203	203	203	203	440	440	950	950	950	950	950	950
Example of setting tool			Dewalt DCF880 Dewalt DCF887				Dewalt DW292 Dewalt DCF899 (Pos. 2)		Dewalt DCF899 (Pos. 3) Dewalt DCF894 (Pos. 3)					

Installation: Blue-Tip 2 Screw-Bolt and Hangermate

Hex Head Version / Countersunk Version / Pan Head Version / Dome Head Version

Standard Drill Bit **Hollow Drill Bit**



1.) Using the proper drill bit size, drill a hole into the base material to the required depth.

2.) Remove dust and debris from the hole using a hand pump or compressed air.

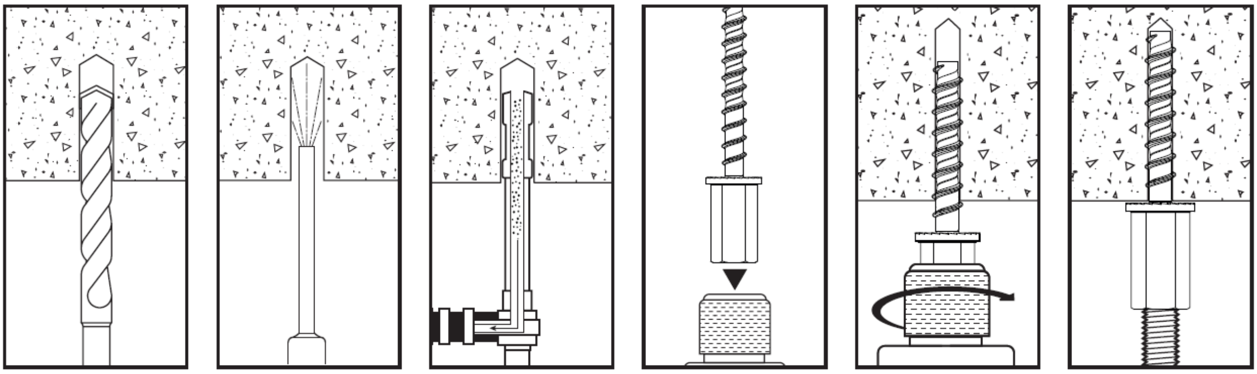
1. & 2.) Connect the hollow drill bit of proper size to a vacuum, and drill a hole into the base material to the required depth while the vac is running. The dust is removed during the drilling process.

3.) Select impact wrench and mount the screw anchor head into the hex socket.

4.) Drive the anchor through the fixture into the hole at least to the minimum required embedment depth and until the head of the anchor comes into contact with the fixture.

Internal Thread Version / External Thread Version

Standard Drill Bit **Hollow Drill Bit**



1.) Using the proper drill bit size, drill a hole into the base material to the required depth.

2.) Remove dust and debris from the hole using a hand pump or compressed air.

1. & 2.) Connect the hollow drill bit of proper size to a vacuum, and drill a hole into the base material to the required depth while the vac is running. The dust is removed during the drilling process.

3.) Select impact wrench and mount the screw anchor head into the hex socket.

4.) Drive the anchor into the hole at least to the minimum required embedment depth and until the head of the anchor comes into contact with the base material.

5.) Screw the threaded rod into the anchor head.

BT2 Screw-Bolt	**Annex B3**
Intended Use Installation instructions	

Table 5: Product performance for static and quasi-static actions

			BT2 6		BT2 8		BT2 10		BT2 12		BT2 14		BT2 16	
Nominal embedment depth	h_{nom}	[mm]	40	55	50	75	60	85	75	100	80	115	95	130
Steel failure for tension and shear load														
Char. resistance tension	$N_{Rk,s}$	[kN]	16,5	16,5	32,4	32,4	48,3	48,3	72,4	72,4	88,0	88,0	108,1	108,1
Partial safety factor	$\gamma_{Ms,N}$	[-]	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5
Char. resistance shear	$V^0_{Rk,s}$	[kN]	4,2	6,6	9,1	13,3	14,6	20,3	31,4	35,2	46,1	55,9	64,9	64,9
Partial safety factor	$\gamma_{Ms,V}$	[-]	1,25	1,25	1,25	1,25	1,25	1,25	1,25	1,25	1,25	1,25	1,25	1,25
Factor taking account the ductility	k_7	[-]	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8
Char. bending resistance	$M^0_{Rk,s}$	[Nm]	16,9	16,9	41,4	41,4	78,2	78,2	139,6	139,6	194,0	194,0	262,4	262,4
Pullout failure (tension)														
Char. resistance non cracked concrete C20/25	$N_{Rk,p}$	[kN]	7,5	12,0	10,0	20,0	-1)	-1)	-1)	-1)	-1)	-1)	-1)	-1)
Char. resistance cracked concrete C20/25	$N_{Rk,p}$	[kN]	3,5	4,5	2,0	9,0	5,0	11,0	14,0	15,0	9,0	19,0	10,0	28,0
Increasing factor concrete strength ψ_c	C30/37	[-]	1,22											
	C40/50	[-]	1,41											
	C50/60	[-]	1,58											
Concrete cone and splitting														
Eff. embedment depth	h_{ef}	[mm]	30,5	43,3	37,9	59,1	45,1	66,3	56,7	78,0	59,2	89,0	70,9	100,7
Factor cracked concrete	$k_{cr,N}$	[-]	7,7											
Factor uncracked concrete	$k_{ucr,N}$	[-]	11,0											
Char. edge distance/ spacing concrete cone failure	$c_{cr,N}$	[mm]	$1{,}5 \cdot h_{ef}$											
	$s_{cr,N}$	[mm]	$3 \cdot h_{ef}$											
Char. edge distance/ spacing splitting failure	$c_{cr,sp}$	[mm]	100	140	70	115	150	220	145	200	185	275	105	150
	$s_{cr,sp}$	[mm]	200	280	140	230	300	440	290	400	370	550	210	300
Installation safety factor	γ_{Inst}	[Nm]	1,4	1,2	1,0	1,2	1,0	1,2	1,2	1,0	1,0	1,0	1,2	1,4
Concrete pryout failure														
Factor for pry-out failure	k_8	[-]	1,0	1,0	1,0	1,0	1,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0
Concrete edge failure														
Effective length of anchor	$l_f = h_{ef}$	[mm]	30,5	43,3	37,9	59,1	45,1	66,3	56,7	78,0	59,2	89,0	70,9	100,7
Outside diameter of anchor	d_{nom}	[mm]	6	6	8	8	10	10	12	12	14	14	16	16

1) Pullout failure is not decisive

Note: Reported shear resistance values for the versions with an external or internal thread do not consider the inserted ou coupled steel element which must be verified by the designer

Table 6: Product performance for seismic category C1

			BT2 6		BT2 8		BT2 10		BT2 12		BT2 14		BT2 16	
Nominal embedment depth	h_{nom}	[mm]	40	55	50	75	60	85	75	100	80	115	95	130
Factor for in presence an annular gap	α_{gap}	[-]	0,5											
Steel failure for tension and shear load														
Char. resistance tension	$N_{Rk,s,eq}$	[kN]	16,5	16,5	32,4	32,4	48,3	48,3	72,4	72,4	88,0	88,0	108,1	108,1
Partial safety factor	$\gamma_{Ms,N}$	[-]	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5
Char. resistance shear	$V_{Rk,s,eq}$	[kN]	2,5	3,9	6,1	9,2	9,1	13,6	17,9	18,9	38,3	43,6	47,4	47,4
Partial safety factor	$\gamma_{Ms,V}$	[-]	1,25	1,25	1,25	1,25	1,25	1,25	1,25	1,25	1,25	1,25	1,25	1,25
Pullout Failure (tension)														
Seismic Char. resistance cracked concrete C20/25	$N_{Rk,p,eq}$	[kN]	2,0	4,5	2,0	8,0	4,0	10,0	7,5	15,0	8,5	16,0	6,0	18,0

Table 7: Displacements under tension loading in uncracked concrete

			BT2 6	BT2 8	BT2 10	BT2 12	BT2 14	BT2 16
Minimum embedment depth		[mm]	40	50	60	75	80	95
Displacement	δ_{N0}	[mm]	0,03	0,04	0,25	0,07	0,07	0,11
	$\delta_{N\infty}$	[mm]	0,16	0,14	0,14	0,20	0,29	0,17
Maximum embedment depth			55	75	85	100	115	130
Displacement	δ_{N0}	[mm]	0,05	0,30	0,03	0,14	0,18	0,15
	$\delta_{N\infty}$	[mm]	0,16	0,14	0,14	0,20	0,29	0,17

Table 8: Displacements under tension loading in cracked concrete

			BT2 6	BT2 8	BT2 10	BT2 12	BT2 14	BT2 16
Minimum embedment depth		[mm]	40	50	60	75	80	95
Displacement	δ_{N0}	[mm]	0,04	0,00	0,01	0,13	0,12	0,03
	$\delta_{N\infty}$	[mm]	0,61	0,07	0,29	0,85	0,79	0,63
Maximum embedment depth		[mm]	55	75	85	100	115	130
Displacement	δ_{N0}	[mm]	0,06	0,46	0,06	0,14	0,16	0,22
	$\delta_{N\infty}$	[mm]	0,64	0,48	0,34	0,57	0,74	1,13

Table 9: Displacements under shear loads in uncracked and cracked concrete

			BT2 6	BT2 8	BT2 10	BT2 12	BT2 14	BT2 16
Minimum embedment depth		[mm]	40	50	60	75	80	95
Displacement	δ_{V0}	[mm]	1,0	1,1	1,7	1,9	3,2	3,3
	$\delta_{V\infty}$	[mm]	1,5	1,6	2,6	2,8	4,9	5,0
Maximum embedment depth		[mm]	55	75	85	100	115	130
Displacement	δ_{V0}	[mm]	2,8	0,9	1,8	1,3	1,9	4,1
	$\delta_{V\infty}$	[mm]	4,1	1,3	2,6	2,0	2,9	6,2

Additional displacement due to anular gap between anchor and fixture is to be taken into account.

Table 10: Characteristic resistance under fire exposure in cracked and uncracked concrete

			BT2 6		BT2 8		BT2 10		BT2 12		BT2 14		BT2 16	
Steel failure														
Characteristic resistance	R30 $N_{Rk,s,fi}$	[kN]	0,24		0,42		0,97		1,81		2,51		3,28	
	R60 $N_{Rk,s,fi}$	[kN]	0,21		0,38		0,84		1,36		1,89		2,46	
	R90 $N_{Rk,s,fi}$	[kN]	0,17		0,29		0,64		1,18		1,63		2,13	
	R120 $N_{Rk,s,fi}$	[kN]	0,12		0,21		0,52		0,91		1,26		1,64	
Pullout failure (cracked and uncracked concrete)														
Eff. embedment depth	h_{ef}	[mm]	30,5	43,3	37,9	59,1	45,1	66,3	56,7	78,0	59,2	89,0	70,9	100,7
Characteristic resistance in concrete ≥ C20/25	R30 $N_{Rk,p,fi}$	[kN]	0,88	1,13	0,50	2,25	1,25	2,75	3,50	3,75	2,25	4,75	2,50	7,00
	R60 $N_{Rk,p,fi}$	[kN]	0,88	1,13	0,50	2,25	1,25	2,75	3,50	3,75	2,25	4,75	2,50	7,00
	R90 $N_{Rk,p,fi}$	[kN]	0,88	1,13	0,50	2,25	1,25	2,75	3,50	3,75	2,25	4,75	2,50	7,00
	R120 $N_{Rk,p,fi}$	[kN]	0,70	0,90	0,40	1,80	1,00	2,20	2,80	3,00	1,80	3,80	2,00	5,60
Concrete cone and splitting failure[2] (cracked and uncracked concrete)														
Eff. embedment depth	h_{ef}	[mm]	30,5	43,3	37,9	59,1	45,1	66,3	56,7	78,0	59,2	89,0	70,9	100,7
Characteristic resistance in concrete ≥ C20/25	R30 $N^0_{Rk,c,fi}$	[kN]	0,88	2,12	1,52	4,62	2,35	6,16	4,17	9,25	4,64	12,87	7,29	17,52
	R60 $N^0_{Rk,c,fi}$	[kN]	0,88	2,12	1,52	4,62	2,35	6,16	4,17	9,25	4,64	12,87	7,29	17,52
	R90 $N^0_{Rk,c,fi}$	[kN]	0,88	2,12	1,52	4,62	2,35	6,16	4,17	9,25	4,64	12,87	7,29	17,52
	R120 $N^0_{Rk,c,fi}$	[kN]	0,71	1,70	1,22	3,70	1,88	4,93	3,33	7,40	3,71	10,29	5,83	14,02
Characteristic spacing	$s_{cr,N,min,fi}$	[mm]	160	220	200	300	240	340	300	400	320	460	380	520
	$c_{cr,N,max,fi}$	[mm]	80	110	100	150	120	170	150	200	160	230	190	260
Steel failure without lever arm														
Characteristic resistance	R30 $V_{Rk,s,fi}$	[kN]	0,24		0,42		0,97		1,81		2,51		3,28	
	R60 $V_{Rk,s,fi}$	[kN]	0,21		0,38		0,84		1,36		1,89		2,46	
	R90 $V_{Rk,s,fi}$	[kN]	0,17		0,29		0,64		1,18		1,63		2,13	
	R120 $V_{Rk,s,fi}$	[kN]	0,12		0,21		0,52		0,91		1,26		1,64	
Steel failure with lever arm														
Characteristic bending resistance	R30 $M^0_{Rk,s,fi}$	[Nm]	0,19		0,46		1,31		2,91		4,77		7,10	
	R60 $M^0_{Rk,s,fi}$	[Nm]	0,17		0,42		1,14		2,19		3,58		5,32	
	R90 $M^0_{Rk,s,fi}$	[Nm]	0,14		0,32		0,87		1,89		3,10		4,61	
	R120 $M^0_{Rk,s,fi}$	[Nm]	0,10		0,23		0,70		1,46		2,39		3,55	
Factor for determination of resistance to pry-out failure	k_8	[-]	1,0	1,0	1,0	1,0	1,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0
Characteristic resistance in concrete ≥ C20/25	R30 $V_{Rk,cp,fi}$	[kN]	0,9	2,1	1,5	4,6	2,4	12,3	4,2	18,5	4,6	25,7	14,6	35,0
	R60 $V_{Rk,cp,fi}$	[kN]	0,9	2,1	1,5	4,6	2,4	12,3	4,2	18,5	4,6	25,7	14,6	35,0
	R90 $V_{Rk,cp,fi}$	[kN]	0,9	2,1	1,5	4,6	2,4	12,3	4,2	18,5	4,6	25,7	14,6	35,0
	R120 $V_{Rk,cp,fi}$	[kN]	0,7	1,7	1,2	3,7	1,9	9,9	3,3	14,8	3,7	20,6	11,7	28,0
Concrete edge failure														
Effective length under shear loading	$l_{f,max}$	[mm]	30,5	43,3	37,9	59,1	45,1	66,3	56,7	78,0	59,2	89,0	70,9	100,7
Outside diameter of anchor	d_{nom}	[mm]	6		8		10		12		14		16	
Partial safety factor	γ_{inst}[1]	[-]	1,4	1,2	1,0	1,2	1,0	1,2	1,2	1,0	1,0	1,0	1,2	1,4

[1] Design under fire exposure is performed according to the design method given in EN 1992-4. Under fire exposure usually cracked concrete is assumed.

EN 1992-4 covers design for fire exposure from one side. For fire attack from more than one side the edge distance must be increased to c_{min} ≥ 300 mm and ≥ 2 · h_{ef}.