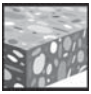
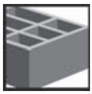
HRD Frame anchor

	Anchor version	Benefits
	HRD-C 8x HRD CR 8x	Innovative screw design for better hold Suitable on practically all base materials
	HRD-C 10x… HRD-CR 10x… HRD-CR2 10x…	Flexible embedment depth (approved at 50mm and 70mm) Suitable for fastening thicknesses up to 260mm Available in 4 different materials for optimum suitability in all corrosive environments Pre-assembled for optimum handling and fastening quality


Concrete


Tensile zone [a]


Solid brick


Hollow brick


Autoclaved aerated concrete


Prestressed hollow core slabs


Fire resistance


European Technical Approval

CE conformity

a) Redundant fastening only

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval [a)]	DIBt, Berlin	ETA-07/0219 / 2012-08-12
Allgemeine bauaufsichtliche Zulassung [c)] (national German approval)	DIBt, Berlin	Z-21.2-1952 / 2011-10-31
Fire test report	MFPA, Leipzig	GS 3.2/10-157-1/ 2010-09-02
Window frame report [b)]	Ift, Rosenheim	Ift report 105 33035 / 2007-07-09

a) All data given in this section according ETA-07/0219, issue 2012-08-12. The anchor is to be used only for redundant fastening for non-structural applications.

b) only available for HRD 8

c) only valid for HRD 10

Basic loading data according ETAG 020

All data in this section applies to

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- Base material as specified in the table
  Minimum base material thickness
- *Steel* failure
- Shear without lever arm
- Anchors in redundant fastening
- The data that are highlighted in light grey are additional Hilti recommended data and not part of the approval

Characteristic resistance

Anchor size				HRD 8	HRD 10		
				h_{nom} =50mm	h_{nom} =50mm	h_{nom} =70mm	h_{nom} =90mm
Concrete C 12/15		N_{Rk}	[kN]	2,0	3,0	6,0	-
		V_{Rk}	[kN]	6,9 / 6,6 [b)]	10,6 / 10,1 [b)] / 11,1 [c)]		-
Concrete C 16/20 –C 50/60		N_{Rk}	[kN]	3,0	4,5	8,5	-
		V_{Rk}	[kN]	6,9 / 6,6 [b)]	10,6 / 10,1 [b)] / 11,1 [c)]		-
Solid clay brick Mz 2,0 DIN V 105-100 / EN 771-1	$f_b \geq 20$ N/mm²	F_{Rk}	[kN]	1,5	3,0 4,5 [d)]	[f)]	-
	$f_b \geq 10$ N/mm²	F_{Rk}	[kN]	1,2	2,0 3,0 [d)]	[f)]	-
Solid sand-lime brick KS 2,0 DIN V 106 / EN 771-2	$f_b \geq 20$ N/mm²	F_{Rk}	[kN]	2,5	3,0 4,5 [d)]	[f)]	-
	$f_b \geq 10$ N/mm²	F_{Rk}	[kN]	2,0	2,0 3,0 [d)]	[f)]	-
Lightweight solid block Vbl 0,9 DIN V 18151-100 / EN 771-3	$f_b \geq 20$ N/mm²	F_{Rk}	[kN]	-	3,5 6,0 [d)]	[f)]	-
	$f_b \geq 10$ N/mm²	F_{Rk}	[kN]	-	2,5 4,5 [d)]	[f)]	-
	$f_b \geq 6$ N/mm^2	F_{Rk}	[kN]	0,50	-	-	-
Lightweight concrete hollow block Hbl 1,2-12DF brick **T** [e)]	$f_b \geq 2$ N/mm^2	F_{Rk}	[kN]	-	0,5	0,75	-
	$f_b \geq 6$ N/mm^2	F_{Rk}	[kN]	-	1,2	2,0	-
Autoclaved aerated concrete AAC	AAC 2	F_{Rk}	[kN]	-	-	0,9	0,9
	AAC 4	F_{Rk}	[kN]	-	-	2,0	2,5
	AAC 6	F_{Rk}	[kN]	-	-	2,0	2,5
		F_{Rk}	[kN]		-	3,5 [d)]	4,5 [d)]

Design resistance

Anchor size				HRD 8	HRD 10		
				h_{nom} =50mm	h_{nom} =50mm	h_{nom} =70mm	h_{nom} =90mm
Concrete C 12/15		N_{Rd}	[kN]	1,1	1,7	3,3	-
		V_{Rd}	[kN]	5,5 / 5,2 [b)]	8,5 / 8,1 [b)] / 8,5 [c)]		-
Concrete C 16/20 –C 50/60		N_{Rd}	[kN]	1,7	2,5	4,7	-
		V_{Rd}	[kN]	5,5 / 5,2 [b)]	8,5 / 8,1 [b)] / 8,5 [c)]		-
Solid clay brick Mz 2,0 DIN V 105-100 / EN 771-1	$f_b \geq 20$ N/mm²	F_{Rd}	[kN]	0,6	1,2 1,8 [d)]	[f)]	-
	$f_b \geq 10$ N/mm²	F_{Rd}	[kN]	0,48	0,8 1,2 [d)]	[f)]	-
Solid sand-lime brick KS 2,0 DIN V 106 / EN 771-2	$f_b \geq 20$ N/mm²	F_{Rd}	[kN]	1,0	1,2 1,8 [d)]	[f)]	-
	$f_b \geq 10$ N/mm²	F_{Rd}	[kN]	0,8	0,8 1,2 [d)]	[f)]	-
Lightweight solid block Vbl 0,9 DIN V 18151-100 / EN 771-3	$f_b \geq 20$ N/mm²	F_{Rd}	[kN]	-	1,4 2,4 [d)]	[f)]	-
	$f_b \geq 10$ N/mm²	F_{Rd}	[kN]	-	1,0 1,8 [d)]	[f)]	-
	$f_b \geq 6$ N/mm^2	F_{Rd}	[kN]	0,2	-	-	-

Design resistance

Anchor size			HRD 8	HRD 10		
			h_{nom} =50mm	h_{nom} =50mm	h_{nom} =70mm	h_{nom} =90mm
Lightweight concrete hollow block Hbl 1,2-12DF brick **T** e)	$f_b \geq 2$ N/mm^2	F_{Rd} [kN]	-	0,2	0,3	-
	$f_b \geq 6$ N/mm^2	F_{Rd} [kN]	-	0,48	0,8	-
Autoclaved aerated concrete AAC EN 771-4	AAC 2	F_{Rd} [kN]	-	-	0,45	0,45
	AAC 4	F_{Rd} [kN]	0,21	-	1,0	1,25
	AAC 6	F_{Rd} [kN]	0,21	-	1,0	1,25
		F_{Rd} [kN]		-	1,75 d)	2,25 d)

Recommended loads a)

Anchor size			HRD 8	HRD 10		
			h_{nom} =50mm	h_{nom} =50mm	h_{nom} =70mm	h_{nom} =90mm
Concrete C 12/15		N_{rec} [kN]	0,8	1,2	2,4	-
		V_{rec} [kN]	3,9 / 3,7 b)	6,1 / 5,8 b) / 6,1 c)		-
Concrete C 16/20 –C 50/60		N_{rec} [kN]	1,2	1,8	3,4	-
		V_{rec} [kN]	3,9 / 3,7 b)	6,1 / 5,8 b) / 6,1 c)		-
Solid clay brick Mz 2,0 DIN V 105-100 / EN 771-1	$f_b \geq 20$ N/mm²	F_{rec} [kN]	0,42	0,85 1,28 d)	f)	-
	$f_b \geq 10$ N/mm²	F_{rec} [kN]	0,34	0,57 0,85 d)	f)	-
Solid sand-lime brick KS 2,0 DIN V 106 / EN 771-2	$f_b \geq 20$ N/mm²	F_{rec} [kN]	0,7	0,85 1,28 d)	f)	-
	$f_b \geq 10$ N/mm²	F_{rec} [kN]	0,57	0,57 0,85 d)	f)	-
Lightweight solid block Vbl 0,9 DIN V 18151-100 / EN 771-3	$f_b \geq 20$ N/mm²	F_{rec} [kN]	-	1,0 1,71 d)	f)	-
	$f_b \geq 10$ N/mm²	F_{rec} [kN]	-	0,71 1,28 d)	f)	-
	$f_b \geq 6$ N/mm^2	F_{rec} [kN]	0,14	-	-	-
Lightweight concrete hollow block Hbl 1,2-12DF brick **T** e)	$f_b \geq 2$ N/mm^2	F_{rec} [kN]	-	0,14	0,21	-
	$f_b \geq 6$ N/mm^2	F_{rec} [kN]	-	0,34	0,57	-
Autoclaved aerated concrete AAC EN 771-4	AAC 2	F_{rec} [kN]	-	-	0,32	0,32
	AAC 4	F_{rec} [kN]	0,15	-	0,71	0,89
	AAC 6	F_{rec} [kN]	0,15	-	0,71	0,89
		F_{rec} [kN]		-	1,25 d)	1,6 d)

a) With overall partial safety factor for action $\gamma = 1,4$. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.
b) Values for hot-dip galanized carbon steel
c) Values for stainless steel
d) Valid for edge distance c≥150mm, intermediate values can be interpolated
e) Specification of hollow base material brick types see separate table below
f) Data can be determined by job-site testing, data for h_{nom} = 50mm can be applied.

Characteristic resistance for pull-out failure (plastic sleeve) for use in concrete

Anchor type					HRD 8	HRD 10	
Pull-out failure in standard concrete slabs							
Embedment depth			$h_{nom} \geq$	[mm]	50	50	70
Characteristic resistance		≥ C16/20	$N_{Rk,p}$	[kN]	3,0	4,5	8,5
		C12/15	$N_{Rk,p}$	[kN]	2,0	3,0	6,0
Partial safety factor			γ_{Mc} a)		1,8		
Pull-out failure in thin skins (weather resistant skins of external wall panels)							
Embedment depth			$h_{nom} \geq$	[mm]	-	50	-
Characteristic resistance	h = 40mm to 100mm	≥ C16/20	$N_{Rk,p}$	[kN]	-	3,5	-
		C12/15	$N_{Rk,p}$	[kN]	-	2,5	-
Partial safety factor			γ_{Mc} a)		1,8		
Pull-out failure in precast prestressed hollow core slabs							
Embedment depth			$h_{nom} \geq$	[mm]	-	50	-
Characteristic resistance	$d_b \geq$ 25mm	≥ C35/45	$N_{Rk,p}$	[kN]	-	0,6	-
	$d_b \geq$ 30mm	≥ C35/45	$N_{Rk,p}$	[kN]	-	1,5	-
	$d_b \geq$ 35mm	≥ C35/45	$N_{Rk,p}$	[kN]	-	2,5	-
	$d_b \geq$ 40mm	≥ C35/45	$N_{Rk,p}$	[kN]	-	3,5	-
Partial safety factor			γ_{Mc} a)		1,8		

a) In absence of other national regulations

Requirements for redundant fastening

The definition of redundant fastening according to Member States is given in the ETAG 020. In Absence of a definition by a Member State the following default values may be taken		
Minimum number of fixing points	**Minimum number of anchors per fixing point**	**Maximum design load of action N_{Sd} per fixing point** [a)]
3	1	3 kN
4	1	4,5 kN

a) The value for maximum design load of actions per fastening point N_{Sd} is valid in general that means all fastening points are considered in the design of the redundant structural system.

Service temperature range

Hilti HRD frame anchors may be applied in the temperature range given below.

Temperature range	Base material temperature	Maximum long term base material temperature	Maximum short term base material temperature
Temperature range	-40°C to +80°C	+50°C	+80°C

Max short term base material temperature
Short-term elevated base material temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

Max long term base material temperature
Long-term elevated base material temperatures are roughly constant over significant periods of time.

Materials

Mechanical properties

Anchor size		HRD 8		HRD 10	
		Galv. steel	Stainless steel	Galv. steel	Stainless steel
Nominal tensile strength f_{uk}	[N/mm²]	600	580	600	630
Yield strength f_{yk}	[N/mm²]	480	450	480	480
Stressed cross-section A_s	[mm²]	22,9	22,9	35,3	35,3
Moment of resistance W	[mm³]	15,5	15,5	29,5	29,5
Char. bending resistance $M^0_{Rk,s}$	[Nm]	11,1	10,8	21,3	22,3

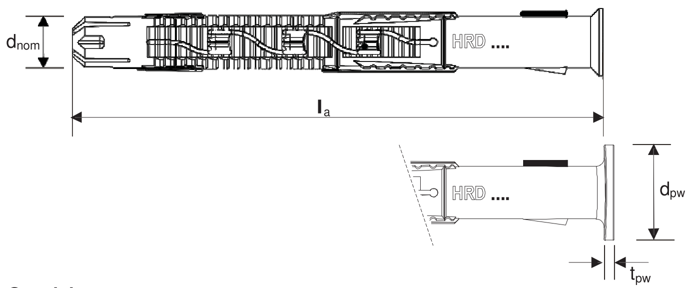
Material quality

Part		Material
Sleeve		Polyamide, colour red
Screw	HRD-C	Carbon steel, galvanised to min. 5 µm
	HRD-CR2,	Stainless steel, corrosion class II: 1.4301 / 1.4567
	HRD-CR,	Stainless steel, corrosion class III: 1.4362 / 1.4401 / 1.4404 / 1.4571

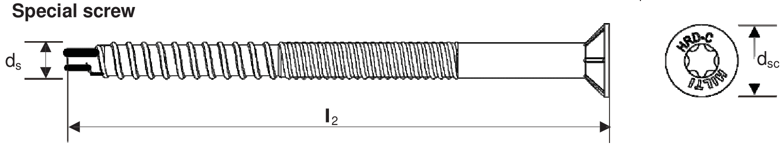
Anchor dimensions

Anchor size			HRD 8	HRD 10
Minimum thickness of fixture	$t_{fix,min}$	[mm]	0	0
Maximum thickness of fixture	$t_{fix,max}$	[mm]	90	260
Diameter of the sleeve	d_{nom}	[mm]	8	10
Minimum length of the sleeve	$\ell_{1,min}$	[mm]	60	60
Maximum length of the sleeve	$\ell_{1,max}$	[mm]	140	310
Diameter of plastic washer	d_{pw}	[mm]	-	17,5
Thickness of plastic washer	t_{pw}	[mm]	-	2
Diameter of the screw	d_S	[mm]	6	7
Minimum length of the screw	$\ell_{2,min}$	[mm]	65	65
Maximum length of the screw	$\ell_{2,max}$	[mm]	145	315
Head diameter of countersunk screw	d_{sc}	[mm]	11	14
Head diameter of hexhead screw	d_{sw}	[mm]	-	17,5

Anchor sleeve



Special screw

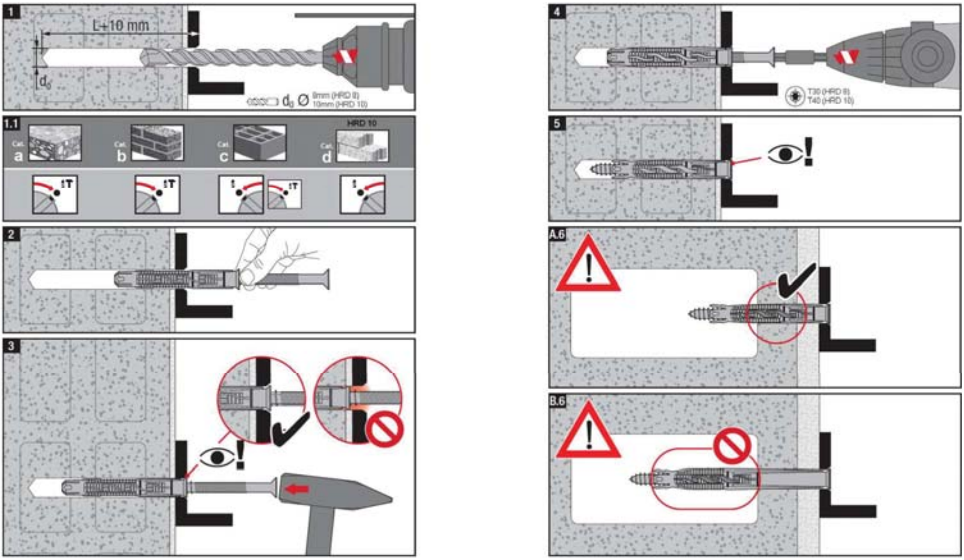


Setting

Installation equipment

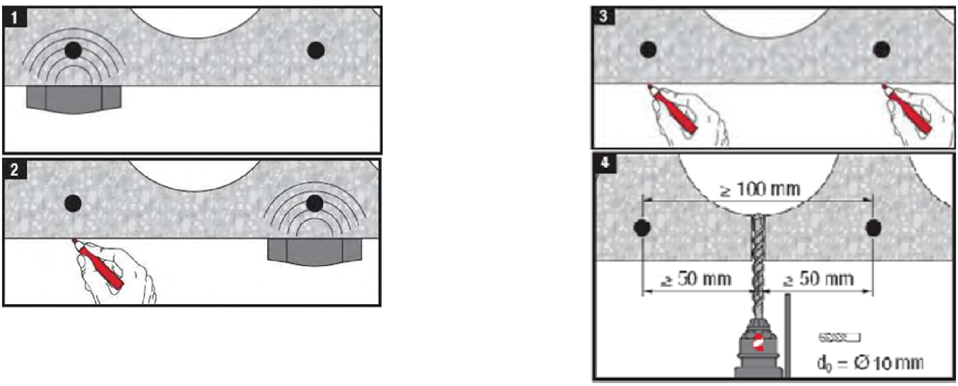
Anchor size	
Rotary hammer	TE2 … TE16
Other tools	hammer, screw driver

Setting instruction

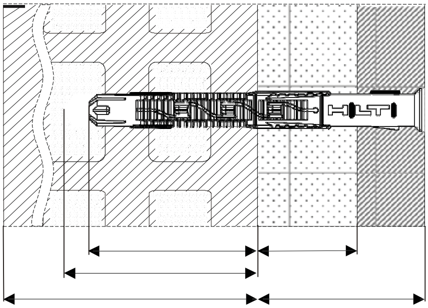


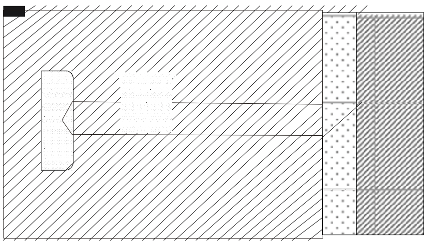
Additional preparation in case of application in precast prestressed hollow core slabs

After drilling follow the main instruction above



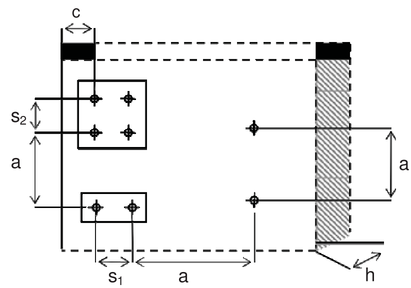
For detailed information on installation see instruction for use given with the package of the product.





Setting parameters

Anchor size				HRD 8	HRD 10	
				h_{nom} =50mm	h_{nom} =50mm	h_{nom} =70mm
Minimum base material thickness	Concrete	h_{min}	[mm]	100	100	120
	Concrete thin skin	h_{min}	[mm]	-	40	-
	Masonry (depending on brick type, see specification of brick types above)	h_{min}	[mm]	115 - 300		
Minimum spacing	Concrete ≥ C16/20	s_{min}	[mm]	100	50	
		for c ≥	[mm]	50	100 [c)]	
	Concrete C12/15	s_{min}	[mm]	140	70	
		for c ≥	[mm]	70	140 [c)]	
	Masonry and AAC	a_{min}	[mm]	250	250	
	Masonry and AAC	s_{min1}	[mm]	200 (120 [d)])	100	
		s_{min2}	[mm]	400 (240 [d)])	100	
Minimum edge distance	Concrete ≥ C16/20	c_{min}	[mm]	50	50	
		for s ≥	[mm]	100	150 [c)]	
	Concrete C12/15	c_{min}	[mm]	70	70	
		for s ≥	[mm]	140	210 [c)]	
	Masonry and AAC	c_{min}	[mm]	100 (60 [d)])	100	
Critical spacing in concrete[a)]	Concrete ≥ C16/20	$s_{cr,N}$	[mm]	62	80	125
	Concrete C12/15	$s_{cr,N}$	[mm]	68	90	135
Critical edge distance in concrete[b)]	Concrete ≥ C16/20	$c_{cr,N}$	[mm]	100	100	
	Concrete C12/15	$c_{cr,N}$	[mm]	140	140	

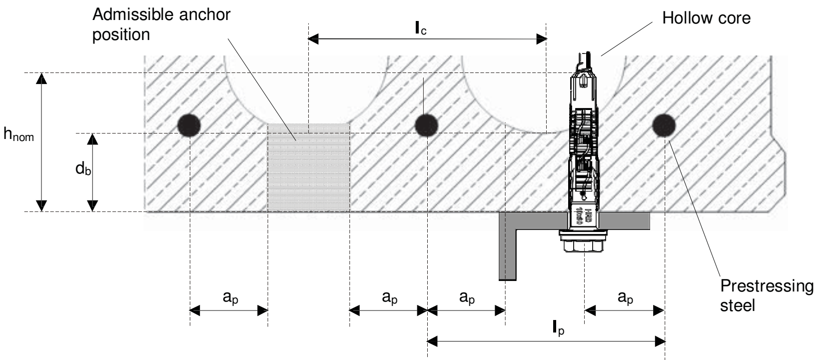


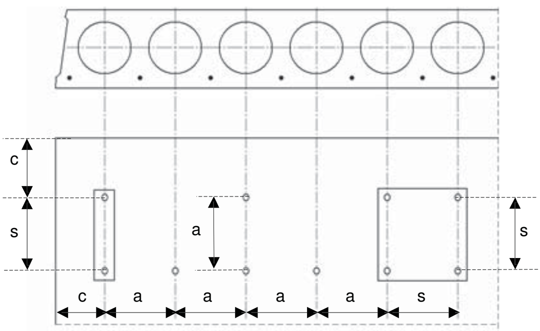
a) For spacing larger than the critical spacing each anchor in a group can be considered in design.
b) For edge distance smaller than critical edge distance the design loads have to be reduced.
c) Linear interpolation allowed
d) only for brick “Doppio Uni” and “Mattone”

Admissible anchor positions, minimum spacing and edge distance of anchors and distance between anchor groups in precast prestressed hollow core slabs

Anchor type			HRD 8	HRD 10
Overall plasic anchor embedment depth in the base material	$h_{nom} \geq$	[mm]	-	50
Bottom flange thickness	$d_b \geq$	[mm]	-	25
Core distance	$l_c \geq$	[mm]	-	100
Prestressing steel distance	$l_p \geq$	[mm]	-	100
Distance between anchor position and prestressing steel	$a_p \geq$	[mm]	-	50
Minimum edge distance	$c_{min} \geq$	[mm]	-	100
Minimum anchor spacing	$s_{min} \geq$	[mm]	-	100
Minimum distance between anchor groups	$a_{min} \geq$	[mm]	-	100

Schemes of distances and spacing





c_1, c_2 edge distances s_1, s_2 anchor spacings a_1, a_2 distances between anchor groups

Design method

Design method according ETAG 020, Annex C. Design resistance according data given in ETA-07/0219, issue 2011-02-01.

- Valid for a group of two anchors
- Influence of edge distance

The design method is based on the following simplifications:

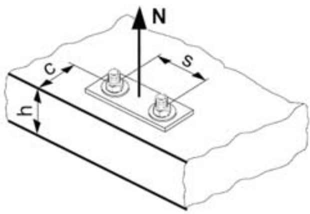
- Minimum base material thickness h_{min}
- All data for concrete C16/20 – C50/60
- No different loads are acting on individual anchors (no eccentricity)
- Shear without lever arm

The values are valid for a single anchor or a anchor group with spacing < $s_{cr,N}$ (for anchor groups with spacing ≥ $s_{cr,N}$ each anchor can be considered as acting like a single anchor).

Tension loading in concrete

The design tensile resistance is the lower value of

- Steel resistance: $N_{Rd,s}$
- Concrete pull-out resistance: $N_{Rd,p}$
- Concrete cone resistance: $N_{Rd,c} = N_{Rd,p} \cdot (c/c_{cr,N})$



Basic design tensile resistance

Design steel resistance $N_{Rd,s}$

Anchor size		HRD 8	HRD 10	
		h_{nom} =50mm	h_{nom} =50mm	h_{nom} ≥70mm
$N_{Rd,s}$	Carbon steel [kN]	7,3	11,7	11,7
	Stainless steel [kN]	6,8	11,6	11,6

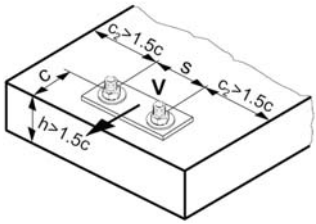
Design pull-out resistance $N_{Rd,p}$
Design concrete cone $N_{Rd,c} = N_{Rd,p} \cdot (c/c_{cr,N})$

Anchor size		HRD 8	HRD 10	
		h_{nom} =50mm	h_{nom} =50mm	h_{nom} ≥70mm
$N_{Rd,p}$	Carbon steel [kN]	1,7	2,5	4,7
	Stainless steel [kN]	1,7	2,5	4,7

Shear loading in concrete

The design shear resistance is the lower value of

- Steel resistance: $V_{Rd,s}$
- Concrete edge resistance: $V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_c$



Basic design shear resistance

Design steel resistance $V_{Rd,s}$

Anchor size		HRD 8	HRD 10	
		h_{nom} =50mm	h_{nom} =50mm	h_{nom} ≥70mm
$V_{Rd,s}$	Carbon steel [kN]	5,5	8,5	8,5
	Stainless steel [kN]	5,2	8,5	8,5

Design concrete edge resistance[a)] $V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_c$

Anchor type		HRD 8	HRD 10	
		h_{nom} =50mm	h_{nom} =50mm	h_{nom} ≥70mm
$V^0_{Rd,c}$	[kN]	5,1	5,5	5,8

a) For anchor groups only the anchors close to the edge must be considered

Influencing factors

Influence of concrete strength

Concrete strength designation (ENV 206)	C 16/20	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_B = (f_{ck,cube}/25N/mm^2)^{1/2}$ [a)]	0,89	1	1,1	1,22	1,34	1,41	1,48	1,55

a) $f_{ck,cube}$ = concrete compressive strength, measured on cubes with 150 mm side length

Influence of edge distance for different base material thickness [a)]

	c [mm]	50	60	70	80	90	100	120	140	160	180	200	220
h = 100 mm	f_c =	0,35	0,46	0,57	0,65	0,73	0,82	0,98	1,14	1,31	1,47	1,63	1,80
h = 120 mm		0,35	0,46	0,59	0,72	0,80	0,89	1,07	1,25	1,43	1,61	1,79	1,97
h = 150 mm		0,35	0,46	0,59	0,72	0,85	1,00	1,20	1,40	1,60	1,80	2,00	2,20
h = 180 mm		0,35	0,46	0,59	0,72	0,85	1,00	1,31	1,53	1,75	1,97	2,19	2,41

a) The edge distance shall not be smaller than the minimum edge distance c_{min}.
The base material thickness shall not be smaller than the minimum base material thickness h_{min}.

Combined TENSION and SHEAR loading in masonry

The design resistance in masonry and AAC F_{Rd} (see basic loading data) shall be used in each load direction for single anchors and anchor groups.