Submittal Form

Submittal: Fixing Bolt	**Submittal No.:**	138
Project Name : Norther Cross Block 02	**Project Number**	NX001
Description : Fixing Bolt - Throughbolt	**Date Submitted:**	22/02/2022
Submitted To: BM	**Response Required by:**	01/03/2022

Information: Fixing Bolt to be used to hold the Steel Beam in the Ventilation Shaft

Attachments: ☐ **Nil** ☒ **Material Certificates** ☐ **Drawings** ☐ **Calculations:** ☐ **Other:**

Response

☐ Approved. ☐ Acceptable with concessions, outlined below; ☐ Unacceptable as outlined below;

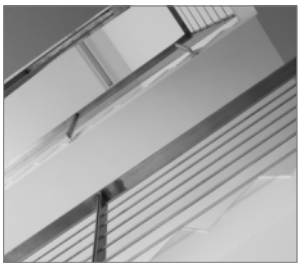
Comments/Stamp:

Print Name and Title:	Sign & Date:

Please direct response to: *tarun.saini@glenbrier.ie*

R-HPTII-ZF Zinc Flake Throughbolt

Throughbolt anchor with corrosion-resistant coating for cracked and non-cracked concrete



Approvals and Reports

- ETA 17/0184

Product information

Features and benefits

- New generation of throughbolt with unique corrosion-resistant coating
- High performance in cracked and non-cracked concrete confirmed by ETA Option 1
- Highest quality ensures maximum load capability
- For applications requiring fire resistance up to 120 minutes
- Suitable for reduced embedment to avoid contact with reinforcement
- Embedment depth markings help to ensure precise installation of the anchor
- Design of R-HPTII allows drilling and installing directly through the fixture and helps to reduce installation time
- Fire resistant

Applications

- Cladding restraints
- Consoles
- Barriers
- Structural steel
- Curtain walling
- Handrails
- Heavy Plant
- Balustrading
- Passenger lifts
- Facades
- Racking systems
- Platforms
- Fencing & gates manufacturing and installation

Base materials

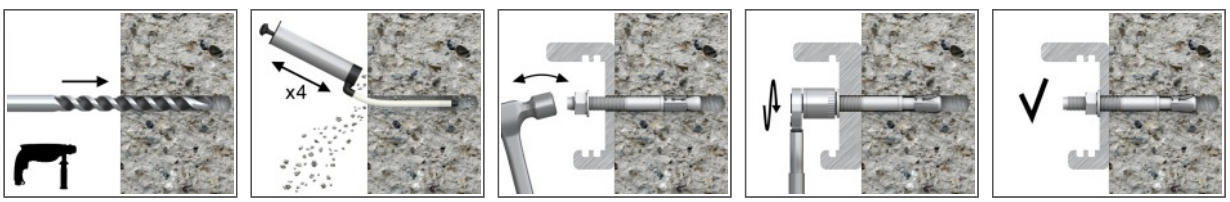
Approved for use in:

- Cracked concrete C20/25-C50/60
- Non-cracked concrete C20/25-C50/60
- Reinforced concrete
- Unreinforced concrete

Also suitable for use in:

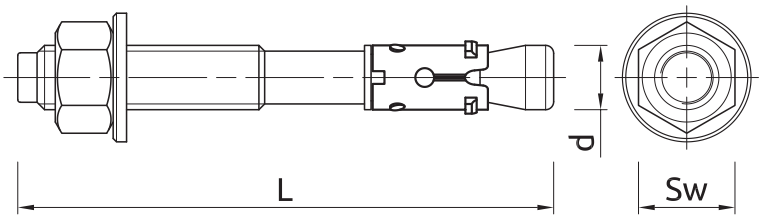
- Natural Stone (after site testing)

Installation guide



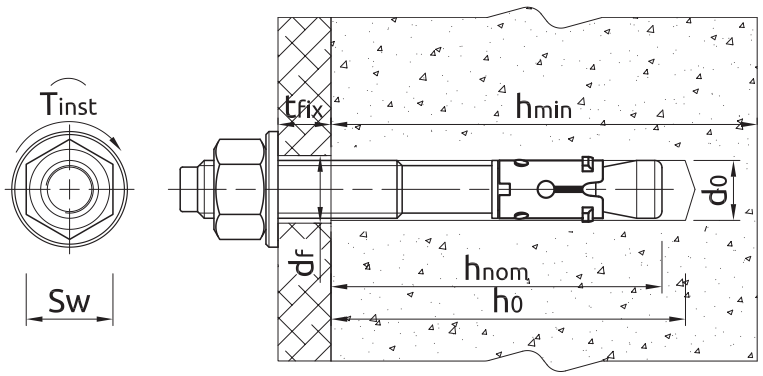
1. Drill a hole of required diameter and depth
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Lightly tap the throughbolt through the fixture into hole with a hammer, until fixing depth is reached
4. Tighten to the recommended torque

Product information



Size	Product Code	Anchor		Fixture		
		Diameter	Length	Max. thickness t_{fix} for:		Hole diameter
		d	L	$h_{nom,red}$	$h_{nom,std}$	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-HPTIIZF-08065/15	8	65	15	-	9
	R-HPTIIZF-08080/15	8	80	30	15	9
	R-HPTIIZF-08100/35	8	100	50	35	9
	R-HPTIIZF-08115/50	8	115	65	50	9
M10	R-HPTIIZF-10065/5	10	65	5	-	11
	R-HPTIIZF-10080/20	10	80	20	-	11
	R-HPTIIZF-10095/15	10	95	35	15	11
	R-HPTIIZF-10115/35	10	115	55	35	11
	R-HPTIIZF-10130/50	10	130	70	50	11
M12	R-HPTIIZF-12080/5	12	80	5	-	13
	R-HPTIIZF-12100/5	12	100	25	5	13
	R-HPTIIZF-12120/25	12	120	45	25	13
	R-HPTIIZF-12135/40	12	135	60	40	13
	R-HPTIIZF-12150/55	12	150	75	55	13
M16	R-HPTIIZF-16105/10	16	105	10	-	18
	R-HPTIIZF-16140/20	16	140	40	20	18
	R-HPTIIZF-16180/60	16	180	80	60	18
	R-HPTIIZF16220/100	16	220	120	100	18
M20	R-HPTIIZF-20125/5	20	125	5	-	22
	R-HPTIIZF-20160/20	20	160	40	20	22
	R-HPTIIZF-20200/60	20	200	80	60	22

Installation data



Size			M8	M10	M12	M16	M20
Thread diameter	d	[mm]	8	10	12	16	20
Hole diameter in substrate	d_0	[mm]	8	10	12	16	20
Installation torque	T_{inst}	[Nm]	10	20	40	100	180
Wrench size	Sw	[mm]	13	17	19	24	30
External diameter of washer		[mm]	16	20	24	30	37

Installation data

Size			M8	M10	M12	M16	M20
STANDARD EMBEDMENT DEPTH							
Min. hole depth in substrate	$h_{0,s}$	[mm]	65	79	90	110	129
Min. installation depth	$h_{nom,s}$	[mm]	55	69	80	100	119
Min. substrate thickness	$h_{min,s}$	[mm]	100	120	140	170	200
Min. spacing (Non-cracked concrete)	$s_{min,s}$	[mm]	50	70	90	180	180
Min. spacing (Cracked concrete)	$s_{min,s}$	[mm]	50	70	90	180	180
Min. edge distance (Non-cracked concrete)	$c_{min,s}$	[mm]	40	50	65	100	120
Min. edge distance (Cracked concrete)	$c_{min,s}$	[mm]	40	45	65	100	100
REDUCED EMBEDMENT DEPTH							
Min. hole depth in substrate	$h_{0,r}$	[mm]	50	59	70	90	110
Min. installation depth	$h_{nom,r}$	[mm]	40	49	60	80	100
Min. substrate thickness	$h_{min,r}$	[mm]	100	100	100	130	160
Min. spacing (Non-cracked concrete)	$s_{min,r}$	[mm]	55	75	150	300	300
Min. spacing (Cracked concrete)	$s_{min,r}$	[mm]	55	75	150	300	300
Min. edge distance (Non-cracked concrete)	$c_{min,r}$	[mm]	45	60	70	160	200
Min. edge distance (Cracked concrete)	$c_{min,r}$	[mm]	40	50	80	120	120

Mechanical properties

Size			M8	M10	M12	M16	M20
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	620	620	620	620	620
Nominal ultimate tensile strength - shear	f_{uk}	[N/mm²]	520	520	520	520	520
Nominal yield strength - tension	f_{yk}	[N/mm²]	531	531	531	531	531
Nominal yield strength - shear	f_{yk}	[N/mm²]	416	416	416	416	416
Cross sectional area - tension	A_s	[mm²]	25.5	40.7	60.1	106.6	162.9
Cross sectional area - shear	A_s	[mm²]	38.9	61.7	89.6	165.2	259.1
Elastic section modulus	W_{el}	[mm³]	34.3	68.3	119.6	299.5	588.3
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	19	38	67	167	328
Design bending resistance	M	[Nm]	15	31	53	134	263

Basic performance data

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M8	M10	M12	M16	M20
NON-CRACKED CONCRETE						
Standard embedment depth h_{ef}	[mm]	47.00	59.00	68.00	85.00	99.00
Reduced embedment depth h_{ef}	[mm]	32.00	39.00	48.00	65.00	80.00
CRACKED CONCRETE						
Standard embedment depth h_{ef}	[mm]	47.00	59.00	68.00	85.00	99.00
Reduced embedment depth h_{ef}	[mm]	32.00	39.00	48.00	65.00	80.00

Basic performance data

Size		M8	M10	M12	M16	M20
MEAN ULTIMATE LOAD						
TENSION LOAD $N_{Ru,m}$						
NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	12.40	20.60	27.70	45.50	64.80
Reduced embedment depth	[kN]	9.60	13.60	17.60	34.50	47.10
CRACKED CONCRETE						
Standard embedment depth	[kN]	7.50	12.50	19.90	27.30	41.90
Reduced embedment depth	[kN]	4.80	8.60	12.80	26.80	32.70
SHEAR LOAD $V_{Ru,m}$						
NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	12.20	19.20	28.00	51.50	80.90
Reduced embedment depth	[kN]	12.20	19.20	28.00	51.50	80.90
CRACKED CONCRETE						
Standard embedment depth	[kN]	12.20	19.20	28.00	51.50	80.90
Reduced embedment depth	[kN]	12.20	19.20	28.00	51.50	80.90
CHARACTERISTIC LOAD						
TENSION LOAD N_{Rk}						
NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	9.00	12.00	20.00	35.00	49.74
Reduced embedment depth	[kN]	7.50	9.00	12.00	26.46	36.13
CRACKED CONCRETE						
Standard embedment depth	[kN]	5.00	9.00	12.00	20.00	30.00
Reduced embedment depth	[kN]	3.00	6.00	9.00	16.00	25.76
SHEAR LOAD V_{Rk}						
NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	9.10	15.70	23.70	47.10	60.60
Reduced embedment depth	[kN]	9.10	12.30	16.79	47.10	60.60
CRACKED CONCRETE						
Standard embedment depth	[kN]	9.10	15.70	23.70	47.10	60.60
Reduced embedment depth	[kN]	6.52	8.77	11.97	37.73	51.52
DESIGN LOAD						
TENSION LOAD N_{Rd}						
NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	5.00	8.00	13.30	23.33	33.16
Reduced embedment depth	[kN]	4.17	5.00	8.00	17.64	24.09
CRACKED CONCRETE						
Standard embedment depth	[kN]	2.78	6.00	8.00	13.33	20.00
Reduced embedment depth	[kN]	1.67	3.33	6.00	10.67	17.17
SHEAR LOAD V_{Rd}						
NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	7.28	12.56	18.96	37.68	48.48
Reduced embedment depth	[kN]	6.09	8.20	11.20	35.29	48.18
CRACKED CONCRETE						
Standard embedment depth	[kN]	7.28	10.88	18.96	37.62	47.28
Reduced embedment depth	[kN]	4.34	5.85	7.98	25.15	34.35

Basic performance data

Size		M8	M10	M12	M16	M20
RECOMMENDED LOAD						
TENSION LOAD N_{rec}						
NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	3.57	5.71	9.52	16.67	23.69
Reduced embedment depth	[kN]	2.98	3.57	5.71	12.60	17.21
CRACKED CONCRETE						
Standard embedment depth	[kN]	1.98	4.29	5.71	9.52	14.29
Reduced embedment depth	[kN]	1.19	2.38	4.29	7.62	12.27
SHEAR LOAD V_{rec}						
NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	5.20	8.97	13.54	26.91	34.63
Reduced embedment depth	[kN]	4.35	5.86	8.00	25.20	34.41
CRACKED CONCRETE						
Standard embedment depth	[kN]	5.20	7.77	13.54	26.87	33.77
Reduced embedment depth	[kN]	3.10	4.18	5.70	17.97	24.53

Design performance data

Standard embedment depth

(-) failure is not decisive

Size			M8	M10	M12	M16	M20
Effective embedment depth	h_{ef}	[mm]	47.00	59.00	68.00	85.00	99.00
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	11.00	17.50	25.80	45.80	70.00
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	9.00	12.00	20.00	35.00	-
PULL-OUT FAILURE; CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	5.00	9.00	12.00	20.00	30.00
PULL-OUT FAILURE							
Installation safety factor	γ_2	-	1.20	1.00	1.00	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.12	1.22	1.00	1.14	1.07
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.22	1.44	1.00	1.28	1.14
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.33	1.67	1.00	1.43	1.21
CONCRETE CONE FAILURE							
Factor for cracked concrete	k	-	7.20	7.20	7.20	7.20	7.20
Factor for cracked concrete	$k_{cr,N}$	-	7.70	7.70	7.70	7.70	7.70
Factor for non-cracked concrete	k	-	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00
Installation safety factor	γ_2	-	1.20	1.00	1.00	1.00	1.00
Spacing	$s_{cr,N}$	[mm]	141.00	177.00	204.00	255.00	297.00
Edge distance	$c_{cr,N}$	[mm]	71.00	89.00	102.00	128.00	149.00
CONCRETE SPLITTING FAILURE							
Spacing	$s_{cr,sp}$	[mm]	220.00	300.00	340.00	430.00	530.00
Edge distance	$c_{cr,sp}$	[mm]	110.00	150.00	170.00	215.00	265.00
Installation safety factor	γ_2	-	1.20	1.00	1.00	1.00	1.00

Design performance data

Size			M8	M10	M12	M16	M20
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	9.10	15.70	23.70	47.10	60.60
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	22.00	45.00	79.00	200.00	389.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25
CONCRETE PRY-OUT FAILURE							
Factor	k	-	1.00	1.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE							
Effective length of anchor	ℓ_f	[mm]	47.00	59.00	68.00	85.00	99.00
Anchor diameter	d_{nom}	[mm]	8.00	10.00	12.00	16.00	20.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00

Design performance data

Resistance to tension and shear loads under fire exposure - Standard embedment depth

Size			M8	M10	M12	M16	M20
TENSION LOAD							
Spacing	s_{cr}	[mm]	188.00	236.00	272.00	340.00	369.00
Edge distance	c_{cr}	[mm]	94.00	118.00	136.00	170.00	198.00
R (for EI) = 30 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.40	0.90	1.70	3.10	4.90
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	1.30	2.30	3.00	5.00	-
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.40	0.90	1.70	3.10	4.90
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.40	1.10	2.60	6.70	13.00
R (for EI) = 60 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.30	0.80	1.30	2.40	3.70
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	1.30	2.30	3.00	5.00	-
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.30	0.80	1.30	2.40	3.70
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.30	1.00	2.00	5.00	9.70
R (for EI) = 90 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.30	0.60	1.10	2.00	3.20
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	1.30	2.30	3.00	5.00	-
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.30	0.60	1.10	2.00	3.20
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.30	0.70	1.70	4.30	8.40
R (for EI) = 120 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.20	0.50	0.80	1.60	2.50
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	1.00	1.80	2.40	4.00	-
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.20	0.50	0.80	1.60	2.50
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.20	0.60	1.30	3.30	6.50

Design performance data

Allowable values for resistance in case of Seismic performance category C1 - Standard embedment depth

Size			M8	M10	M12	M16	M20
Effective embedment depth	h_{ef}	[mm]	47.00	59.00	68.00	85.00	99.00
TENSION LOAD, STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	11.00	17.50	25.80	45.80	70.00
Partial safety factor	$\gamma_{MsN,seisC1}$	-	1.40				
TENSION LOAD, PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	5.00	9.00	12.00	20.00	30.00
Partial safety factor	$\gamma_{Mp,seisC1}$	-	1.80	1.50			
SHEAR LOAD, STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.20	9.40	23.80	33.30	55.10
Partial safety factor	$\gamma_{MsV,seisC1}$	-	1.25				

Allowable values for resistance in case of Seismic performance category C2 - Standard embedment depth

Size			M10	M12	M16
Effective embedment depth	h_{ef}	[mm]	59.00	68.00	85.00
TENSION LOAD, STEEL FAILURE					
Characteristic resistance	$N_{Rk,s}$	[kN]	17.50	25.80	45.80
Partial safety factor	$\gamma_{MsN,seisC2}$	-	1.40		
TENSION LOAD, PULL-OUT FAILURE					
Characteristic resistance	$N_{Rk,p}$	[kN]	3.40	7.00	10.90
Partial safety factor	$\gamma_{Mp,seisC2}$	-	1.50		
SHEAR LOAD, STEEL FAILURE					
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	9.20	11.10	28.20
Partial safety factor	$\gamma_{MsV,seisC2}$	-	1.25		

Design performance data

Reduced embedment depth

(-) failure is not decisive

Size			M8	M10	M12	M16	M20
Effective embedment depth	h_{ef}	[mm]	32.00	39.00	48.00	65.00	80.00
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	11.00	17.50	25.80	45.80	70.00
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	7.50	9.00	12.00	-	-
PULL-OUT FAILURE; CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	3.00	6.00	9.00	16.00	-
PULL-OUT FAILURE							
Installation safety factor	γ_2	-	1.20	1.20	1.00	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.20	1.16	1.22	1.11	1.12
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.40	1.33	1.44	1.22	1.26
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.60	1.50	1.67	1.33	1.39
CONCRETE CONE FAILURE							
Factor for cracked concrete	k	-	7.20	7.20	7.20	7.20	7.20
Factor for cracked concrete	$k_{cr,N}$	-	7.70	7.70	7.70	7.70	7.70
Factor for non-cracked concrete	k	-	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00
Installation safety factor	γ_2	-	1.20	1.20	1.00	1.00	1.00
Spacing	$s_{cr,N}$	[mm]	96.00	117.00	144.00	195.00	240.00
Edge distance	$c_{cr,N}$	[mm]	48.00	59.00	72.00	98.00	120.00
CONCRETE SPLITTING FAILURE							
Spacing	$s_{cr,sp}$	[mm]	170.00	200.00	250.00	320.00	410.00
Edge distance	$c_{cr,sp}$	[mm]	85.00	100.00	125.00	160.00	205.00
Installation safety factor	γ_2	-	1.20	1.20	1.00	1.00	1.00
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	9.10	15.70	23.70	47.10	60.60
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	22.00	45.00	79.00	200.00	389.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25
CONCRETE PRY-OUT FAILURE							
Factor	k	-	1.00	1.00	1.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE							
Effective length of anchor	ℓ_f	[mm]	32.00	39.00	48.00	65.00	80.00
Anchor diameter	d_{nom}	[mm]	8.00	10.00	12.00	16.00	20.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00

Design performance data

Resistance to tension and shear loads under fire exposure - Reduced embedment depth

Size			M8	M10	M12	M16	M20
TENSION LOAD							
Spacing	s_{cr}	[mm]	128.00	156.00	192.00	260.00	320.00
Edge distance	c_{cr}	[mm]	64.00	78.00	96.00	130.00	160.00
R (for EI) = 30 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.40	0.90	1.70	3.10	4.90
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	0.80	1.50	2.30	4.00	-
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.40	0.90	1.70	3.10	4.90
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.40	1.10	2.60	6.70	13.00
R (for EI) = 60 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.30	0.80	1.30	2.40	3.70
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	0.80	1.50	2.30	4.00	-
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.30	0.80	1.30	2.40	3.70
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.30	1.00	2.00	5.00	9.70
R (for EI) = 90 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.30	0.60	1.10	2.00	3.20
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	0.80	1.50	2.30	4.00	-
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.30	0.60	1.10	2.00	3.20
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.30	0.70	1.70	4.30	8.40
R (for EI) = 120 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.20	0.50	0.80	1.60	2.50
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	0.60	1.20	1.80	3.20	-
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.20	0.50	0.80	1.60	2.50
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.20	0.60	1.30	3.30	6.50

Design performance data

Allowable values for resistance in case of Seismic performance category C1 - Reduced embedment depth

Size			M8	M10	M12	M16	M20
Effective embedment depth	h_{ef}	[mm]	32.00	39.00	48.00	65.00	80.00
TENSION LOAD, STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	11.00	17.50	25.80	45.80	70.00
Partial safety factor	$\gamma_{MsN,seisC1}$	-	1.40				
TENSION LOAD, PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	3.00	6.00	9.00	16.00	-
Partial safety factor	$\gamma_{Mp,seisC1}$	-	1.80		1.50		
SHEAR LOAD, STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	-		23.80	33.30	55.10
Partial safety factor	$\gamma_{MsV,seisC1}$	-	1.25				

Product commercial data

Size	Product Code	Anchor		Quantity [pcs]			Weight [kg]			Bar Codes
		Diameter [mm]	Length [mm]	Box	Outer	Pallet	Box	Outer	Pallet	
M8	R-HPTIIZF-08065/15 [1]	8	65	100	100	16000	2.8	2.8	474.6	5906675022840
	R-HPTIIZF-08080/15 [1]	8	80	100	100	16000	3.2	3.2	544.7	5906675022857
	R-HPTIIZF-08100/35 [1]	8	100	100	100	12000	3.9	3.9	494.3	5906675034881
	R-HPTIIZF-08115/50 [1]	8	115	100	100	16000	4.3	4.3	711.8	5906675022871
M10	R-HPTIIZF-10065/5 [1]	10	65	50	50	8000	2.4	2.4	409.4	5906675022888
	R-HPTIIZF-10080/20 [1]	10	80	50	50	8000	2.8	2.8	471.1	5906675022895
	R-HPTIIZF-10095/15 [1]	10	95	50	50	8000	3.1	3.1	528.2	5906675022901
	R-HPTIIZF-10115/35 [1]	10	115	50	50	6000	3.6	3.6	463.3	5906675022918
	R-HPTIIZF-10130/50 [1]	10	130	50	50	6000	4.0	4.0	510.1	5906675022925
M12	R-HPTIIZF-12080/5 [1]	12	80	50	50	8000	4.1	4.1	682.0	5906675022932
	R-HPTIIZF-12100/5 [1]	12	100	50	50	8000	4.8	4.8	794.3	5906675022949
	R-HPTIIZF-12120/25 [1]	12	120	50	50	6000	5.4	5.4	679.8	5906675022956
	R-HPTIIZF-12135/40 [1]	12	135	50	50	6000	6.1	6.1	758.9	5906675022963
	R-HPTIIZF-12150/55 [1]	12	150	50	50	4000	6.6	6.6	557.2	5906675022970
M16	R-HPTIIZF-16105/10 [1]	16	105	25	25	4000	4.6	4.6	765.7	5906675022987
	R-HPTIIZF-16140/20 [1]	16	140	25	25	4000	5.7	5.7	941.2	5906675022994
	R-HPTIIZF-16180/60 [1]	16	180	25	25	3000	7.1	7.1	883.3	5906675023007
	R-HPTIIZF16220/100 [1]	16	220	25	25	3000	8.4	8.4	1041.5	5906675023014
M20	R-HPTIIZF-20125/5 [1]	20	125	25	25	3000	8.2	8.2	1013.3	5906675023021
	R-HPTIIZF-20160/20 [1]	20	160	25	25	3000	10.1	10.1	1245.4	5906675023038
	R-HPTIIZF-20200/60 [1]	20	200	10	10	3000	4.9	4.9	1492.2	5906675023045

1) ETA 17/0184

R-XPT Throughbolt

Throughbolt for non-cracked concrete

Approvals and Reports

- ETA 17/0183

Product information

Features and benefits

- High performance in non-cracked concrete confirmed by ETA Option 7
- High quality with cost effectiveness
- Suitable for reduced embedment to avoid contact with reinforcement
- Embedment depth markings help to ensure precise installation of the anchor
- Design allows drilling and installing directly through the fixture and helps to reduce installation effort
- Cold formed body ensures consistent dimensional accuracy
- Simple through-installation (drilling and installation through fixed material)
- Optimized expander design with six grip features allows for a high load-bearing capacity

Applications

- Cladding restraint
- Curtain wall
- Balustrading
- Barriers
- Handrails
- Racking
- Structural steel
- Bollards

Base materials

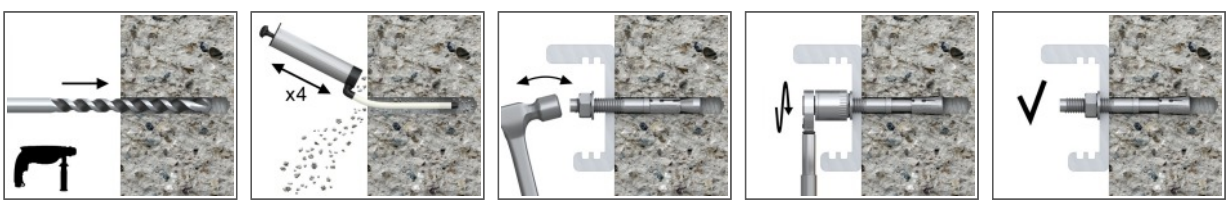
Approved for use in:

- Non-cracked concrete C20/25-C50/60
- Unreinforced concrete
- Reinforced concrete

Also suitable for use in:

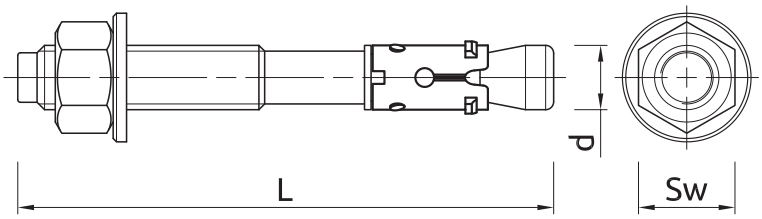
- Natural Stone (after site testing)

Installation guide



1. Drill a hole of required diameter and depth
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Lightly tap the throughbolt through the fixture into hole with a hammer, until fixing depth is reached
4. Tighten to the recommended torque

Product information

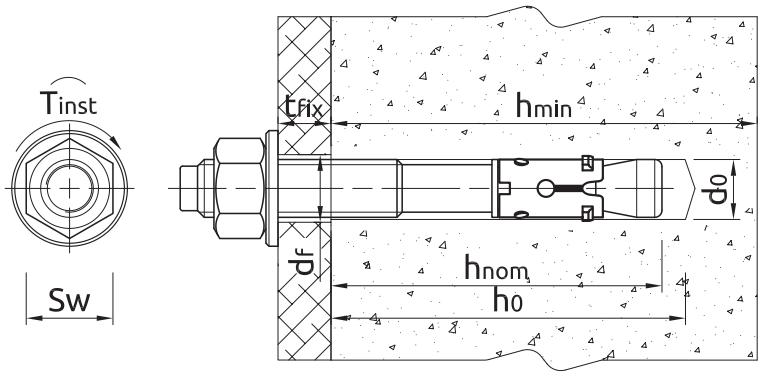


Size	Product Code	Approval type	Anchor		Fixture		
			Diameter	Length	Max. thickness t_{Fix} for:		Hole diameter
			d	L	$h_{nom,red}$	$h_{nom,std}$	d_f
		-	[mm]	[mm]	[mm]	[mm]	[mm]
M6	R-XPT-06050/10	AT-15-9327/14	6	50	10	-	7
	R-XPT-06065/5	AT-15-9327/14	6	65	25	5	7
	R-XPT-06085/25	AT-15-9327/14	6	85	45	25	7
	R-XPT-06100/40	AT-15-9327/14	6	100	60	40	7
M8	R-XPT-08050/5	AT-15-9327/14	8	50	5	-	9
	R-XPT-08060/10	ETA 17/0183	8	60	10	-	9
	R-XPT-08065/15	ETA 17/0183	8	65	15	-	9
	R-XPT-08075/10	ETA 17/0183	8	75	25	10	9
	R-XPT-08080/15	ETA 17/0183	8	80	30	15	9
	R-XPT-08085/20	ETA 17/0183	8	85	35	20	9
	R-XPT-08095/30	ETA 17/0183	8	95	45	30	9
	R-XPT-08115/50	ETA 17/0183	8	115	65	50	9
	R-XPT-08140/75	ETA 17/0183	8	140	90	75	9
	R-XPT-08150/85	ETA 17/0183	8	150	100	85	9
M10	R-XPT-10065/5	ETA 17/0183	10	65	5	-	11
	R-XPT-10080/10	ETA 17/0183	10	80	20	10	11
	R-XPT-10095/25	ETA 17/0183	10	95	35	25	11
	R-XPT-10115/45	ETA 17/0183	10	115	55	45	11
	R-XPT-10130/60	ETA 17/0183	10	130	70	60	11
	R-XPT-10140/70	ETA 17/0183	10	140	80	70	11
	R-XPT-10150/80	ETA 17/0183	10	150	90	80	11
	R-XPT-10180/110	ETA 17/0183	10	180	120	110	11
M12	R-XPT-12080/5	ETA 17/0183	12	80	5	-	13
	R-XPT-12100/5	ETA 17/0183	12	100	25	5	13
	R-XPT-12120/25	ETA 17/0183	12	120	45	25	13
	R-XPT-12125/30	ETA 17/0183	12	125	50	30	13
	R-XPT-12135/40	ETA 17/0183	12	135	60	40	13
	R-XPT-12140/45	ETA 17/0183	12	140	65	45	13
	R-XPT-12150/55	ETA 17/0183	12	150	75	55	13
	R-XPT-12160/65	ETA 17/0183	12	160	85	65	13
	R-XPT-12180/85	ETA 17/0183	12	180	105	85	13
	R-XPT-12200/105	ETA 17/0183	12	200	125	105	13
	R-XPT-12220/125	ETA 17/0183	12	220	145	125	13
	R-XPT-12250/155	ETA 17/0183	12	250	175	155	13
	R-XPT-12280/185	ETA 17/0183	12	280	205	185	13
M16	R-XPT-16100/5	ETA 17/0183	16	100	5	-	18
	R-XPT-16105/10	ETA 17/0183	16	105	10	-	18
	R-XPT-16125/5	ETA 17/0183	16	125	25	5	18
	R-XPT-16140/20	ETA 17/0183	16	140	40	20	18
	R-XPT-16150/30	ETA 17/0183	16	150	50	30	18
	R-XPT-16160/40	ETA 17/0183	16	160	60	40	18
	R-XPT-16180/60	ETA 17/0183	16	180	80	60	18
	R-XPT-16200/80	ETA 17/0183	16	200	100	80	18
	R-XPT-16220/100	ETA 17/0183	16	220	120	100	18

Product information

Size	Product Code	Approval type	Anchor		Fixture		
			Diameter	Length	Max. thickness t_{fix} for:		Hole diameter
			d	L	$h_{nom,red}$	$h_{nom,std}$	d_f
		-	[mm]	[mm]	[mm]	[mm]	[mm]
M16	R-XPT-16250/130	ETA 17/0183	16	250	150	130	18
	R-XPT-16280/160	ETA 17/0183	16	280	180	160	18
	R-XPT-16300/180	ETA 17/0183	16	300	200	180	18
M20	R-XPT-20125/5	ETA 17/0183	20	125	5	-	22
	R-XPT-20160/20	ETA 17/0183	20	160	40	20	22
	R-XPT-20200/60	ETA 17/0183	20	200	80	60	22
	R-XPT-20250/110	ETA 17/0183	20	250	130	110	22
	R-XPT-20300/160	ETA 17/0183	20	300	180	160	22
M24	R-XPT-24180/20	AT-15-9327/14	24	180	35	20	26
	R-XPT-24260/100	AT-15-9327/14	24	260	115	100	26
	R-XPT-24300/140	AT-15-9327/14	24	300	155	140	26

Installation data



Size			M6	M8	M10	M12	M16	M20	M24
Thread diameter	d	[mm]	6	8	10	12	16	20	24
Hole diameter in substrate	d_0	[mm]	6	8	10	12	16	20	24
Installation torque	T_{inst}	[Nm]	5	15	30	50	100	200	300
Wrench size	Sw	[mm]	10	13	17	19	24	30	36
STANDARD EMBEDMENT DEPTH									
Min. hole depth in substrate	$h_{0,s}$	[mm]	55	55	59	80	100	119	140
Min. installation depth	$h_{nom,s}$	[mm]	50	55	59	80	100	119	135
Min. substrate thickness	$h_{min,s}$	[mm]	84	100	100	136	170	198	224
Min. spacing	$s_{min,s}$	[mm]	45	50	55	75	90	140	180
Min. edge distance	$c_{min,s}$	[mm]	50	40	50	65	80	100	200
REDUCED EMBEDMENT DEPTH									
Min. hole depth in substrate	$h_{0,r}$	[mm]	35	40	49	60	80	100	125
Min. installation depth	$h_{nom,r}$	[mm]	30	40	49	60	80	100	120
Min. substrate thickness	$h_{min,r}$	[mm]	80	100	100	100	130	158	194
Min. spacing	$s_{min,r}$	[mm]	40	45	55	100	100	125	160
Min. edge distance	$c_{min,r}$	[mm]	45	40	65	100	100	125	160

Mechanical properties

Size			M6	M8	M10	M12	M16	M20	M24
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	620	620	620	620	620	620	620
Nominal yield strength - tension	f_{yk}	[N/mm²]	531	531	531	531	531	531	531
Cross sectional area - tension	A_s	[mm²]	14.25	25.5	40.7	60.1	106.6	162.9	234.52
Elastic section modulus	W_{el}	[mm³]	13.15	31.2	62.3	109	276.4	539.9	940.9
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	7	17	35	61	154	301	525
Design bending resistance	M	[Nm]	5.6	13.6	28	48.8	123.2	240.8	420

Basic performance data

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M6	M8	M10	M12	M16	M20	M24
MEAN ULTIMATE LOAD								
TENSION LOAD $N_{Ru,m}$								
Standard embedment depth	[kN]	8.70	18.10	19.80	28.00	49.70	65.30	67.60
Reduced embedment depth	[kN]	5.70	10.90	11.40	21.50	43.00	45.50	62.70
SHEAR LOAD $V_{Ru,m}$								
Standard embedment depth	[kN]	6.00	12.20	19.20	28.00	51.50	80.90	118.60
Reduced embedment depth	[kN]	6.00	12.20	19.06	28.00	51.50	94.70	118.60
CHARACTERISTIC LOAD								
TENSION LOAD N_{Rk}								
Standard embedment depth	[kN]	8.67	12.00	12.00	25.00	39.57	40.00	38.14
Reduced embedment depth	[kN]	4.27	9.00	9.00	16.00	26.46	35.00	31.92
SHEAR LOAD V_{Rk}								
Standard embedment depth	[kN]	5.50	10.10	16.00	23.30	43.00	67.40	97.10
Reduced embedment depth	[kN]	5.50	9.14	9.14	16.79	43.00	67.40	97.10
DESIGN LOAD								
TENSION LOAD N_{Rd}								
Standard embedment depth	[kN]	3.44	6.67	6.67	13.89	21.99	22.22	15.13
Reduced embedment depth	[kN]	1.69	5.00	5.00	8.89	14.70	19.44	12.67
SHEAR LOAD V_{Rd}								
Standard embedment depth	[kN]	4.40	8.08	11.55	18.64	34.40	53.92	77.68
Reduced embedment depth	[kN]	4.40	6.09	6.09	11.20	34.40	42.28	77.68
RECOMMENDED LOAD								
TENSION LOAD N_{rec}								
Standard embedment depth	[kN]	2.46	4.76	4.76	9.92	15.70	15.87	10.81
Reduced embedment depth	[kN]	1.21	3.57	3.60	6.35	10.50	13.89	9.05
SHEAR LOAD V_{rec}								
Standard embedment depth	[kN]	3.14	5.77	8.25	13.31	24.57	38.51	55.49
Reduced embedment depth	[kN]	3.14	4.35	4.35	8.00	24.57	33.77	55.49

Design performance data

Standard embedment depth

(-) failure is not decisive

Size			M6	M8	M10	M12	M16	M20	M24
Effective embedment depth	h_{ef}	[mm]	42.00	47.00	49.00	68.00	85.00	99.00	112.00
TENSION LOAD									
STEEL FAILURE									
Characteristic resistance	$N_{Rk,s}$	[kN]	8.84	15.80	25.20	37.30	66.10	101.00	145.40
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
Characteristic resistance	$N_{Rk,p}$	[kN]	8.67	12.00	12.00	25.00	40.00	40.00	38.14
PULL-OUT FAILURE									
Installation safety factor	γ_2	-	1.68	1.20	1.20	1.20	1.20	1.20	1.68
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.00	1.10	1.37	1.16	1.17	1.30	1.00
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.00	1.21	1.74	1.33	1.34	1.59	1.00
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.00	1.32	2.10	1.49	1.50	1.89	1.00
CONCRETE CONE FAILURE									
Factor for non-cracked concrete	k	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Installation safety factor	γ_2	-	1.68	1.20	1.20	1.20	1.20	1.20	1.68
Spacing	$s_{cr,N}$	[mm]	126.00	141.00	147.00	204.00	255.00	297.00	336.00
Edge distance	$c_{cr,N}$	[mm]	63.00	71.00	74.00	102.00	128.00	149.00	168.00
CONCRETE SPLITTING FAILURE									
Spacing	$s_{cr,sp}$	[mm]	210.00	240.00	260.00	370.00	430.00	530.00	580.00
Edge distance	$c_{cr,sp}$	[mm]	105.00	120.00	130.00	185.00	215.00	265.00	290.00
Installation safety factor	γ_2	-	1.68	1.20	1.20	1.20	1.20	1.20	1.68
SHEAR LOAD									
STEEL FAILURE									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.50	10.10	16.00	23.30	43.00	67.40	97.10
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	7.34	17.00	35.00	61.00	154.00	301.00	525.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
CONCRETE PRY-OUT FAILURE									
Factor	k	-	1.00	1.00	1.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Effective length of anchor	ℓ_f	[mm]	42.00	47.00	49.00	68.00	85.00	99.00	112.00
Anchor diameter	d_{nom}	[mm]	6.00	8.00	10.00	12.00	16.00	20.00	24.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Design performance data

Reduced embedment depth

(-) failure is not decisive

Size			M6	M8	M10	M12	M16	M20	M24
Effective embedment depth	h_{ef}	[mm]	22.00	32.00	39.00	48.00	65.00	79.00	97.00
TENSION LOAD									
STEEL FAILURE									
Characteristic resistance	$N_{Rk,s}$	[kN]	8.84	15.80	25.20	37.30	66.10	101.00	145.40
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
Characteristic resistance	$N_{Rk,p}$	[kN]	4.27	9.00	9.00	16.00	30.00	35.00	31.92
PULL-OUT FAILURE									
Installation safety factor	γ_2	-	1.68	1.20	1.20	1.20	1.20	1.20	1.68
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.00	1.25	1.36	1.20	1.12	1.18	1.00
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.00	1.50	1.72	1.40	1.23	1.36	1.00
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.00	1.76	2.08	1.60	1.34	1.54	1.00
CONCRETE CONE FAILURE									
Factor for non-cracked concrete	k	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Installation safety factor	γ_2	-	1.68	1.20	1.20	1.20	1.20	1.20	1.68
Spacing	$s_{cr,N}$	[mm]	66.00	96.00	117.00	144.00	195.00	237.00	291.00
Edge distance	$c_{cr,N}$	[mm]	33.00	48.00	59.00	72.00	98.00	119.00	156.00
CONCRETE SPLITTING FAILURE									
Spacing	$s_{cr,sp}$	[mm]	110.00	160.00	200.00	250.00	360.00	410.00	500.00
Edge distance	$c_{cr,sp}$	[mm]	55.00	80.00	100.00	125.00	180.00	205.00	250.00
Installation safety factor	γ_2	-	1.68	1.20	1.20	1.20	1.20	1.20	1.68
SHEAR LOAD									
STEEL FAILURE									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.50	10.10	16.00	23.30	43.00	67.40	97.10
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	7.34	17.00	35.00	61.00	154.00	301.00	525.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
CONCRETE PRY-OUT FAILURE									
Factor	k	-	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Effective length of anchor	ℓ_f	[mm]	22.00	32.00	39.00	48.00	65.00	79.00	97.00
Anchor diameter	d_{nom}	[mm]	6.00	8.00	10.00	12.00	16.00	20.00	24.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Product commercial data

Size	Product Code	Anchor		Quantity [pcs]			Weight [kg]			Bar Codes
		Diameter [mm]	Length [mm]	Box	Outer	Pallet	Box	Outer	Pallet	
M6	R-XPT-06050/10	6	50	100	100	16000	1.27	1.27	233.2	5906675233499
	R-XPT-06065/5	6	65	100	100	16000	1.55	1.55	278.0	5906675233505
	R-XPT-06085/25	6	85	100	100	16000	1.85	1.85	326.0	5906675233512
	R-XPT-06100/40	6	100	100	100	16000	2.1	2.1	370.8	5906675250311
M8	R-XPT-08050/5[1)]	8	50	100	100	16000	2.3	2.3	396.4	5906675250328
	R-XPT-08060/10[1)]	8	60	100	100	16000	2.6	2.6	446.0	5906675234601
	R-XPT-08065/15[1)]	8	65	100	100	16000	2.7	2.7	465.2	5906675250335
	R-XPT-08075/10[1)]	8	75	100	100	16000	3.1	3.1	518.0	5906675233536
	R-XPT-08080/15[1)]	8	80	100	100	16000	3.2	3.2	542.0	5906675250342
	R-XPT-08085/20[1)]	8	85	100	100	16000	3.4	3.4	578.8	5906675249636
	R-XPT-08095/30[1)]	8	95	100	100	12000	3.7	3.7	469.2	5906675233543

Product commercial data

Size	Product Code	Anchor		Quantity [pcs]			Weight [kg]			Bar Codes
		Diameter [mm]	Length [mm]	Box	Outer	Pallet	Box	Outer	Pallet	
M8	R-XPT-08115/50[1)]	8	115	100	100	12000	4.3	4.3	540.0	5906675233550
	R-XPT-08140/75[1)]	8	140	100	100	16000	5.2	5.2	855.6	5906675233567
	R-XPT-08150/85[1)]	8	150	100	100	16000	5.4	5.4	887.6	5906675250359
M10	R-XPT-10065/5[1)]	10	65	50	50	8000	2.4	2.4	408.4	5906675233574
	R-XPT-10080/10[1)]	10	80	50	50	8000	2.7	2.7	468.4	5906675233581
	R-XPT-10095/25[1)]	10	95	50	50	8000	3.1	3.1	527.6	5906675233598
	R-XPT-10115/45[1)]	10	115	50	50	6000	3.6	3.6	463.2	5906675233604
	R-XPT-10130/60[1)]	10	130	50	50	8000	4.0	4.0	664.4	5906675249643
	R-XPT-10140/70[1)]	10	140	50	50	8000	4.2	4.2	705.2	5906675233611
	R-XPT-10150/80[1)]	10	150	50	50	8000	4.5	4.5	742.0	5906675249650
	R-XPT-10180/110[1)]	10	180	50	50	6000	5.2	5.2	654.6	5906675250366
M12	R-XPT-12080/5[1)]	12	80	50	50	8000	4.1	4.1	678.0	5906675233628
	R-XPT-12100/5[1)]	12	100	50	50	8000	4.8	4.8	792.4	5906675233635
	R-XPT-12120/25[1)]	12	120	50	50	6000	5.5	5.5	690.0	5906675250373
	R-XPT-12125/30[1)]	12	125	50	50	6000	5.7	5.7	709.2	5906675233642
	R-XPT-12135/40[1)]	12	135	50	50	6000	6.1	6.1	757.8	5906675250380
	R-XPT-12140/45[1)]	12	140	50	50	6000	6.2	6.2	769.2	5906675249667
	R-XPT-12150/55[1)]	12	150	50	50	4000	6.6	6.6	558.4	5906675233659
	R-XPT-12160/65[1)]	12	160	50	50	4000	6.9	6.9	584.4	5906675216416
	R-XPT-12180/85[1)]	12	180	50	50	4000	7.6	7.6	639.2	5906675233666
	R-XPT-12200/105[1)]	12	200	50	50	4000	8.3	8.3	696.4	5906675312132
	R-XPT-12220/125[1)]	12	220	50	50	4000	9.1	9.1	755.2	5906675233673
	R-XPT-12250/155[1)]	12	250	25	25	3000	5.1	5.1	637.8	5906675312149
	R-XPT-12280/185[1)]	12	280	20	20	1600	4.6	4.6	395.8	5906675312156
M16	R-XPT-16100/5[1)]	16	100	25	25	4000	4.4	4.4	731.6	5906675233680
	R-XPT-16105/10[1)]	16	105	25	25	4000	4.6	4.6	763.6	5906675250403
	R-XPT-16125/5[1)]	16	125	25	25	4000	5.3	5.3	869.6	5906675233697
	R-XPT-16140/20[1)]	16	140	25	25	4000	5.7	5.7	948.4	5906675249063
	R-XPT-16150/30[1)]	16	150	25	25	4000	6.1	6.1	1001.2	5906675249674
	R-XPT-16160/40[1)]	16	160	25	25	3000	6.4	6.4	792.9	5906675250410
	R-XPT-16180/60[1)]	16	180	25	25	3000	7.0	7.0	873.3	5906675249681
	R-XPT-16200/80[1)]	16	200	25	25	3000	12.5	12.5	1530.0	5906675312163
	R-XPT-16220/100[1)]	16	220	25	25	3000	8.4	8.4	1037.4	5906675233727
	R-XPT-16250/130[1)]	16	250	25	25	3000	9.3	9.3	1148.1	5906675312170
	R-XPT-16280/160[1)]	16	280	15	15	1200	6.3	6.3	532.3	5906675250427
	R-XPT-16300/180[1)]	16	300	10	10	650	4.4	4.4	318.5	5906675312187
M20	R-XPT-20125/5[1)]	20	125	25	25	3000	8.3	8.3	1020.0	5906675233734
	R-XPT-20160/20[1)]	20	160	25	25	2000	10.1	10.1	836.0	5906675233741
	R-XPT-20200/60[1)]	20	200	10	10	1200	4.9	4.9	619.7	5906675233758
	R-XPT-20250/110[1)]	20	250	10	10	1200	5.0	5.0	630.0	5906675312194
	R-XPT-20300/160[1)]	20	300	10	10	800	7.1	7.1	593.7	5906675233765
M24	R-XPT-24180/20	24	180	10	10	1200	7.0	7.0	872.2	5906675233772
	R-XPT-24260/100	24	260	10	10	1200	9.3	9.3	1148.8	5906675233789
	R-XPT-24300/140	24	300	10	10	800	10.5	10.5	872.7	5906675233796

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