TruBolt™ Xtrem™

FIRE RATED MECHANICAL ANCHOR

GENERAL INFORMATION

Performance Related	Material Specification	Installation Related

Product

A seismic certified heavy duty, torque controlled expansion anchor for permanent anchoring into concrete. Certified for seismic C1 & C2 applications.

Compliance

European Technical Assessment (option 1) - ETA-21/0973
Design according to:

- AS5216 (formerly TS101)
- AS1170.4 - Earthquake Actions
- EN1992-4 (formerly ETAG001 Annex C, E & TR045)
- NZS3101 (A3) Section 17 - Seismic Design C1 & C2

For optimised performance data, please use Ramset™ iExpert Anchor Software.

Benefits, Advantages and Features

Fire tested to TR020

- Fire rated performance up to 120 minutes
- Highest level of European approval for mechanical expansion anchors
- Approved for all directions (floor, wall, overhead)
- Maximum Tensile & Shear capacities in cracked concrete
- Zinc Plating 5µm
- Anchor diameters M10 to M20

Suitable for structural loads:

- "True to size" through fixture anchor

Improved security:

- Torque induced pull down closes gaps and induces preload.

Resistant to cyclic loading:

- Heavy duty sleeve with pull-down of fixture
- Anti rotation expansion sleeve

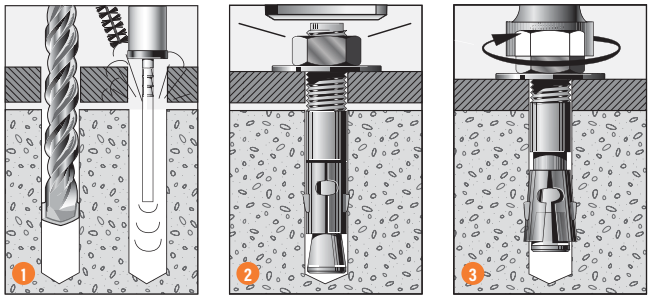
Fast installation:

- Anchor diameter equals hole diameter
- Shallow embedment depths

Principal Applications

- Anchoring into cracked & non cracked concrete
- Structural Steel columns & beams
- Road barrier hold down
- Bridge refurbishment
- Road & Rail tunnel construction
- Wall Plates
- Safety barriers
- Stadium seating
- Pallet racking
- Shallow embedment depths from 50mm
- Intended working life of the anchor of 50 years

Installation



1. Drill or core a hole to the recommended diameter (same as the TruBolt™ Xtrem™) and depth using the fixture as a template. Clean the hole thoroughly with a hole cleaning brush. Remove the debris with a hand pump, compressed air, or vacuum.
2. Insert the anchor through the fixture and drive with a hammer until the washer contacts the fixture.
3. Tighten the nut with a torque wrench to the specified assembly torque.

TruBolt™ Xtrem™

FIRE RATED MECHANICAL ANCHOR

Installation details for fire performance

Anchor size, d_b (mm)	Drilled hole diameter, d_h (mm)	Fixture hole diameter, d_f (mm)	Anchor effective depth, h (mm)	Depth of drill hole, h_1 (mm)	Tightening torque, T_r (Nm)	Concrete substrate thickness, b_m (mm)	Optimum dimensions	
							Anchor* spacing, a_c (mm)	Edge** distance, e_c (mm)
M10	10	12	60	75	45	120	240	120
M12	12	14	70	90	60	140	280	140
M16	16	18	85	110	110	170	340	170
M20	20	22	100	130	160	200	400	200

*For performance based on smaller concrete substrate thickness or For anchor spacings less than the optimum, Refer to iExpert Anchor Software

** If the fire attack is from more than one side,the edge distance of the anchor has to be ≥ 300mm and ≥ 2xh.

*** Tightening Torque. T taken as 75Nm for stainless steel Trubolt Xtrem.

DESCRIPTION AND PART NUMBERS

Anchor size, d_b (mm)	Drilled hole diameter, d_h (mm)	Effective Length , L_e (mm)	Maximum Fixture Thickness, $t_{fix,max}$ (mm)	ETA Designation Number		Part Number	
						Zn	S/S
M10	10	50	10	10x70/10	1	-	T10070SSX #
		65	5	10x85/25-5	D	T10085X	-
		75	15	10x95/35-15	2	-	T10095SSX
		80	20	10x100/40-20	F	T10100X	-
		85	25	10x105/45-25	3	-	T10105SSX
		100	40	10x120/60-40	G	T10120X	-
		110	50	10x130/70-50	4	-	T10130SSX
		120	60	10x140/80-60	I	T10140X	-
M12	12	70	20	12x95/20	1	-	T12095SSX #
		80	10	12x105/30-10	F	T12105X	-
		85	15	12x110/35-15	2	-	T12110SSX
		90	20	12x115/40 -20	G	T12115X	-
		95	25	12x120/45-25	3	-	T12120SSX
		110	40	12x135/60-40	I	T12135X	-
		115	45	12x140/65-45	4	-	T12140SSX
		155	85	12x180/105-85	L	T12180X	-
M16	16	85	20	16x120/20	1	-	T16120SSX #
		105	20	16x140/40-20	2	-	T16140SSX
		110	25	16x145/45-25	I	T16145X	-
		135	50	16x170/70-50	K	T16170X	-
M20	20	130	30	20x170/30	K	T20170X	-
		160	60	20x200/60	M	T20200X	-

#Note: Effective depth not addressed in performance tables. Refer to iExpert for performance details. **NOTE: M20 not available in SS**

Effective depth, h (mm)

$h = L_e - t$

t = total thickness of material(s) being fixed

ENGINEERING PROPERTIES

Decription	Zn		S/S	
	Material	Protection	Material	Protection
Bolt	Carbon Steel	M10 - M20: Zinc electroplated (>5µm) EN ISO 4042:2018	M10-M16 Stainless Steel A4	M10-M16 Stainless Steel A4, EN 10088.3:2014 + ,coated
Clip	M10 - M20 Carbon Steel	M10 - M20: Zinc electroplated (>5µm) EN ISO 4042:2018	M10-M16 Stainless Steel A4	M10-M16 Stainless Steel A4, EN 10088.3:2014
Washer	M10 - M20 EN ISO 7092:200	M10 - M20: Zinc electroplated (>5µm) EN ISO 4042:2018	M10 - M16 EN ISO 7092:200	M10-M16 Stainless Steel A4
Nut	Steel, Strenth class 8, ISO 898-2:2012	M10: Zinc electroplated (>5µm) EN ISO 4042:2018	M10-M16 Stainless Steel A4-80	M10-M16 Stainless Steel A4-80, EN ISO 3506-2:2019, coated
		M12 - M20: Zinc electroplated (>5µm) EN ISO 4042:2018		

TruBolt™ Xtrem™

FIRE RATED MECHANICAL ANCHOR

Design Case 1

Fire resistance duration = 30 minutes

Table 1a Characteristic values of resistance to tension loads in 20 MPa to 50 MPa concrete strength for Fire resistance duration = 30 minutes

Anchor size, d_b		M10		M12		M16		M20	
Drilled hole diam, d_h (mm)		10		12		16		20	
Effective depth, h (mm)	Characteristic Resistance	Zinc	Stainless Steel	Zinc	Stainless Steel	Zinc	Stainless Steel	Zinc	Stainless Steel
60	Steel Failure - $N_{Rk,s,fi,30}$ (kN)	2.8	9.9						
	Pull-out failure concrete - $N_{Rk,p,fi,30}$ (kN)	**2.3**	**2.3**						
	Concrete cone failure - $N_{Rk,c,fi,30}$ (kN)	5.0	5.0						
70	Steel Failure - $N_{Rk,s,fi,30}$ (kN)			**3.6**	9.2				
	Pull-out failure concrete - $N_{Rk,p,fi,30}$ (kN)			4.0	**4.0**				
	Concrete cone failure - $N_{Rk,c,fi,30}$ (kN)			7.4	7.4				
85	Steel Failure - $N_{Rk,s,fi,30}$ (kN)					6.6	16.1		
	Pull-out failure concrete - $N_{Rk,p,fi,30}$ (kN)					**5.0**	**5.0**		
	Concrete cone failure - $N_{Rk,c,fi,30}$ (kN)					12.0	12.0		
100	Steel Failure - $N_{Rk,s,fi,30}$ (kN)							10.4	-
	Pull-out failure concrete - $N_{Rk,p,fi,30}$ (kN)							**7.5**	-
	Concrete cone failure - $N_{Rk,c,fi,30}$ (kN)							18.0	-

NOTE: Bold values indicate limiting load. Data in table lists all possible failure mechanism due to fire.

Table 1b Characteristic values of resistance to shear loads in 20 MPa concrete strength for Fire resistance duration = 30 minutes

Anchor size, d_b		M10		M12		M16		M20	
Drilled hole diam, d_h (mm)		10		12		16		20	
Edge distance, e_c (mm)	Characteristic Resistance	Zinc	Stainless Steel	Zinc	Stainless Steel	Zinc	Stainless Steel	Zinc	Stainless Steel
120	Steel Failure without lever arm - $V^0_{Rk,s,fi,30}$ (kN)	**2.8**	9.9						
	Steel Failure with lever arm - $M^0_{Rk,s,fi,30}$ (N.m)	3.5	12.7						
	Concrete edge failure - $V^0_{Rk,c,fi,30}$ (kN)	3.3	**3.3**						
140	Steel Failure without lever arm - $V^0_{Rk,s,fi,30}$ (kN)			**3.6**	9.2				
	Steel Failure with lever arm - $M^0_{Rk,s,fi,30}$ (N.m)			5.5	14.4				
	Concrete edge failure - $V^0_{Rk,c,fi,30}$ (kN)			4.6	**4.6**				
170	Steel Failure without lever arm - $V^0_{Rk,s,fi,30}$ (kN)					**6.6**	16.1		
	Steel Failure with lever arm - $M^0_{Rk,s,fi,30}$ (N.m)					14.1	34.1		
	Concrete edge failure - $V^0_{Rk,c,fi,30}$ (kN)					7.0	**7.0**		
200	Steel Failure without lever arm - $V^0_{Rk,s,fi,30}$ (kN)							10.4	-
	Steel Failure with lever arm - $M^0_{Rk,s,fi,30}$ (N.m)							27.5	-
	Concrete edge failure - $V^0_{Rk,c,fi,30}$ (kN)							**9.6**	-

NOTE: Bold values indicate limiting load. Data in table lists all possible failure mechanism due to fire.
Note: Concrete edge failure values are based on 20 MPa concrete strength. For values in higher concrete strengths, please multiply $V^0_{Rk,c,fi,30}$ by the concrete compressive strength effect X_{vc}, as follows;

f'_c (MPa)	20	30	40	50
X_{vc}	1	1.22	1.41	1.55

TruBolt™ Xtrem™

FIRE RATED MECHANICAL ANCHOR

Design Case 2

Fire resistance duration = 60 minutes

Table 2a Characteristic values of resistance to tension loads in 20 MPa to 50 MPa concrete strength for Fire resistance duration = 90 minutes

Anchor size, d_b		M10		M12		M16		M20	
Drilled hole diam, d_h (mm)		10		12		16		20	
Effective depth, h (mm)	Characteristic Resistance	Zinc	Stainless Steel	Zinc	Stainless Steel	Zinc	Stainless Steel	Zinc	Stainless Steel
60	Steel Failure - $N_{Rk,s,fi,60}$ (kN)	2.3	6.3						
	Pull-out failure concrete - $N_{Rk,p,fi,60}$ (kN)	**2.3**	**2.3**						
	Concrete cone failure - $N_{Rk,c,fi,60}$ (kN)	5.0	5.0						
70	Steel Failure - $N_{Rk,s,fi,60}$ (kN)			**3.1**	6.5				
	Pull-out failure concrete - $N_{Rk,p,fi,60}$ (kN)			4.0	**4.0**				
	Concrete cone failure - $N_{Rk,c,fi,60}$ (kN)			7.4	7.4				
85	Steel Failure - $N_{Rk,s,fi,60}$ (kN)					5.7	11.3		
	Pull-out failure concrete - $N_{Rk,p,fi,60}$ (kN)					**5.0**	**5.0**		
	Concrete cone failure - $N_{Rk,c,fi,60}$ (kN)					12.0	12.0		
100	Steel Failure - $N_{Rk,s,fi,90}$ (kN)							9.0	-
	Pull-out failure concrete - $N_{Rk,p,fi,60}$ (kN)							**7.5**	-
	Concrete cone failure - $N_{Rk,c,fi,60}$ (kN)							18.0	-

NOTE: Bold values indicate limiting load. Data in table lists all possible failure mechanism due to fire.

Table 2b Characteristic values of resistance to shear loads in 20 MPa concrete strength for Fire resistance duration = 60 minutes

Anchor size, d_b		M10		M12		M16		M20	
Drilled hole diam, d_h (mm)		10		12		16		20	
Edge distance, e_c (mm)	Characteristic Resistance	Zinc	Stainless Steel	Zinc	Stainless Steel	Zinc	Stainless Steel	Zinc	Stainless Steel
120	Steel Failure without lever arm - $V^0_{Rk,s,fi,60}$ (kN)	**2.3**	6.3						
	Steel Failure with lever arm - $M^0_{Rk,s,fi,60}$ (N.m)	2.9	8.1						
	Concrete edge failure - $V^0_{Rk,c,fi,60}$ (kN)	3.3	**3.3**						
140	Steel Failure without lever arm - $V^0_{Rk,s,fi,60}$ (kN)			**3.1**	6.5				
	Steel Failure with lever arm - $M^0_{Rk,s,fi,60}$ (N.m)			4.8	10.1				
	Concrete edge failure - $V^0_{Rk,c,fi,60}$ (kN)			4.6	**4.6**				
170	Steel Failure without lever arm - $V^0_{Rk,s,fi,60}$ (kN)					**5.7**	11.3		
	Steel Failure with lever arm - $M^0_{Rk,s,fi,60}$ (N.m)					12.2	23.9		
	Concrete edge failure - $V^0_{Rk,c,fi,60}$ (kN)					7.0	**7.0**		
200	Steel Failure without lever arm - $V^0_{Rk,s,fi,60}$ (kN)							**9.0**	-
	Steel Failure with lever arm - $M^0_{Rk,s,fi,60}$ (N.m)							23.8	-
	Concrete edge failure - $V^0_{Rk,c,fi,60}$ (kN)							9.6	-

NOTE: Bold values indicate limiting load. Data in table lists all possible failure mechanism due to fire.

Note: Concrete edge failure values are based on 20 MPa concrete strength. For values in higher concrete strengths, please multiply $V^0_{Rk,c,fi,60}$ by the concrete compressive strength effect X_{vc}, as follows;

f'_c (MPa)	20	30	40	50
X_{vc}	1	1.22	1.41	1.55

TruBolt™ Xtrem™

FIRE RATED MECHANICAL ANCHOR

Design Case 3

Fire resistance duration = 90 minutes

Table 3a Characteristic values of resistance to tension loads in 20 MPa to 50 MPa concrete strength for Fire resistance duration = 90 minutes

Anchor size, d_b		M10		M12		M16		M20	
Drilled hole diam, d_h (mm)		10		12		16		20	
Effective depth, h (mm)	Characteristic Resistance	Zinc	Stainless Steel	Zinc	Stainless Steel	Zinc	Stainless Steel	Zinc	Stainless Steel
60	Steel Failure - $N_{Rk,s,fi,90}$ (kN)	**1.8**	2.6						
	Pull-out failure concrete - $N_{Rk,p,fi,90}$ (kN)	2.3	**2.3**						
	Concrete cone failure - $N_{Rk,c,fi,90}$ (kN)	5.0	5.0						
70	Steel Failure - $N_{Rk,s,fi,90}$ (kN)			**2.6**	**3.7**				
	Pull-out failure concrete - $N_{Rk,p,fi,90}$ (kN)			4.0	4.0				
	Concrete cone failure - $N_{Rk,c,fi,90}$ (kN)			7.4	7.4				
85	Steel Failure - $N_{Rk,s,fi,90}$ (kN)					**4.9**	6.5		
	Pull-out failure concrete - $N_{Rk,p,fi,90}$ (kN)					5.0	**5.0**		
	Concrete cone failure - $N_{Rk,c,fi,90}$ (kN)					12.0	12.0		
100	Steel Failure - $N_{Rk,s,fi,90}$ (kN)							7.6	-
	Pull-out failure concrete - $N_{Rk,p,fi,90}$ (kN)							**7.5**	-
	Concrete cone failure - $N_{Rk,c,fi,90}$ (kN)							18.0	-

NOTE: Bold values indicate limiting load. Data in table lists all possible failure mechanism due to fire.

Table 3b Characteristic values of resistance to shear loads in 20 MPa concrete strength for Fire resistance duration = 90 minutes

Anchor size, d_b		M10		M12		M16		M20	
Drilled hole diam, d_h (mm)		10		12		16		20	
Edge distance, e_c (mm)	Characteristic Resistance	Zinc	Stainless Steel	Zinc	Stainless Steel	Zinc	Stainless Steel	Zinc	Stainless Steel
120	Steel Failure without lever arm - $V^0_{Rk,s,fi,90}$ (kN)	**1.8**	**2.6**						
	Steel Failure with lever arm - $M^0_{Rk,s,fi,90}$ (N.m)	2.3	3.3						
	Concrete edge failure - $V^0_{Rk,c,fi,90}$ (kN)	3.3	3.3						
140	Steel Failure without lever arm - $V^0_{Rk,s,fi,90}$ (kN)			**2.6**	3.7				
	Steel Failure with lever arm - $M^0_{Rk,s,fi,90}$ (N.m)			4.0	5.7				
	Concrete edge failure - $V^0_{Rk,c,fi,90}$ (kN)			4.6	**4.6**				
170	Steel Failure without lever arm - $V^0_{Rk,s,fi,90}$ (kN)					**4.9**	**6.5**		
	Steel Failure with lever arm - $M^0_{Rk,s,fi,90}$ (N.m)					10.3	13.8		
	Concrete edge failure - $V^0_{Rk,c,fi,90}$ (kN)					7.0	7.0		
200	Steel Failure without lever arm - $V^0_{Rk,s,fi,90}$ (kN)							**7.6**	-
	Steel Failure with lever arm - $M^0_{Rk,s,fi,90}$ (N.m)							20.1	-
	Concrete edge failure - $V^0_{Rk,c,fi,90}$ (kN)							9.6	-

NOTE: Bold values indicate limiting load. Data in table lists all possible failure mechanism due to fire.

Note: Concrete edge failure values are based on 20 MPa concrete strength. For values in higher concrete strengths, please multiply $V^0_{Rk,c,fi,90}$ by the concrete compressive strength effect X_{vc}, as follows;

f'_c (MPa)	20	30	40	50
X_{vc}	1	1.22	1.41	1.55

TruBolt™ Xtrem™

FIRE RATED MECHANICAL ANCHOR

Design Case 4

Fire resistance duration = 120 minutes

Table 4a Characteristic values of resistance to tension loads in 20 MPa to 50 MPa concrete strength for Fire resistance duration = 120 minutes

Anchor size, d_b		M10		M12		M16		M20	
Drilled hole diam, d_h (mm)		10		12		16		20	
Effective depth, h (mm)	Characteristic Resistance	Zinc	Stainless Steel	Zinc	Stainless Steel	Zinc	Stainless Steel	Zinc	Stainless Steel
60	Steel Failure - $N_{Rk,s,fi,120}$ (kN)	**1.6**	**0.8**						
	Pull-out failure concrete - $N_{Rk,p,fi,120}$ (kN)	1.8	1.8						
	Concrete cone failure - $N_{Rk,c,fi,120}$ (kN)	4.0	4.0						
70	Steel Failure - $N_{Rk,s,fi,90}$ (kN)			**2.4**	**2.3**				
	Pull-out failure concrete - $N_{Rk,p,fi,120}$ (kN)			3.2	3.2				
	Concrete cone failure - $N_{Rk,c,fi,120}$ (kN)			5.9	5.9				
85	Steel Failure - $N_{Rk,s,fi,120}$ (kN)					4.4	4.1		
	Pull-out failure concrete - $N_{Rk,p,fi,120}$ (kN)					**4.0**	**4.0**		
	Concrete cone failure - $N_{Rk,c,fi,120}$ (kN)					9.6	9.6		
100	Steel Failure - $N_{Rk,s,fi,90}$ (kN)							6.9	-
	Pull-out failure concrete - $N_{Rk,p,fi,120}$ (kN)							**6.0**	-
	Concrete cone failure - $N_{Rk,c,fi,120}$ (kN)							14.4	-

NOTE: Bold values indicate limiting load. Data in table lists all possible failure mechanism due to fire.

Table 4b Characteristic values of resistance to shear loads in 20 MPa concrete strength for Fire resistance duration = 120 minutes

Anchor size, d_b		M10		M12		M16		M20	
Drilled hole diam, d_h (mm)		10		12		16		20	
Edge distance, e_c (mm)	Characteristic Resistance	Zinc	Stainless Steel	Zinc	Stainless Steel	Zinc	Stainless Steel	Zinc	Stainless Steel
120	Steel Failure without lever arm - $V^0_{Rk,s,fi,120}$ (kN)	**1.6**	**0.8**						
	Steel Failure with lever arm - $M^0_{Rk,s,fi,120}$ (N.m)	2.0	1.0						
	Concrete edge failure - $V^0_{Rk,c,fi,120}$ (kN)	3.3	3.3						
140	Steel Failure without lever arm - $V^0_{Rk,s,fi,120}$ (kN)			**2.4**	**2.3**				
	Steel Failure with lever arm - $M^0_{Rk,s,fi,120}$ (N.m)			3.7	3.6				
	Concrete edge failure - $V^0_{Rk,c,fi,120}$ (kN)			4.6	4.6				
170	Steel Failure without lever arm - $V^0_{Rk,s,fi,120}$ (kN)					**4.4**	**4.1**		
	Steel Failure with lever arm - $M^0_{Rk,s,fi,120}$ (N.m)					9.3	8.7		
	Concrete edge failure - $V^0_{Rk,c,fi,120}$ (kN)					7.0	7.0		
200	Steel Failure without lever arm - $V^0_{Rk,s,fi,120}$ (kN)							**6.9**	-
	Steel Failure with lever arm - $M^0_{Rk,s,fi,120}$ (N.m)							18.2	-
	Concrete edge failure - $V^0_{Rk,c,fi,120}$ (kN)							9.6	-

NOTE: Bold values indicate limiting load. Data in table lists all possible failure mechanism due to fire.

Note: Concrete edge failure values are based on 20 MPa concrete strength. For values in higher concrete strengths, please multiply $V^0_{Rk,c,fi,120}$ by the concrete compressive strength effect X_{vc}, as follows;

f'_c (MPa)	20	30	40	50
X_{vc}	1	1.22	1.41	1.55