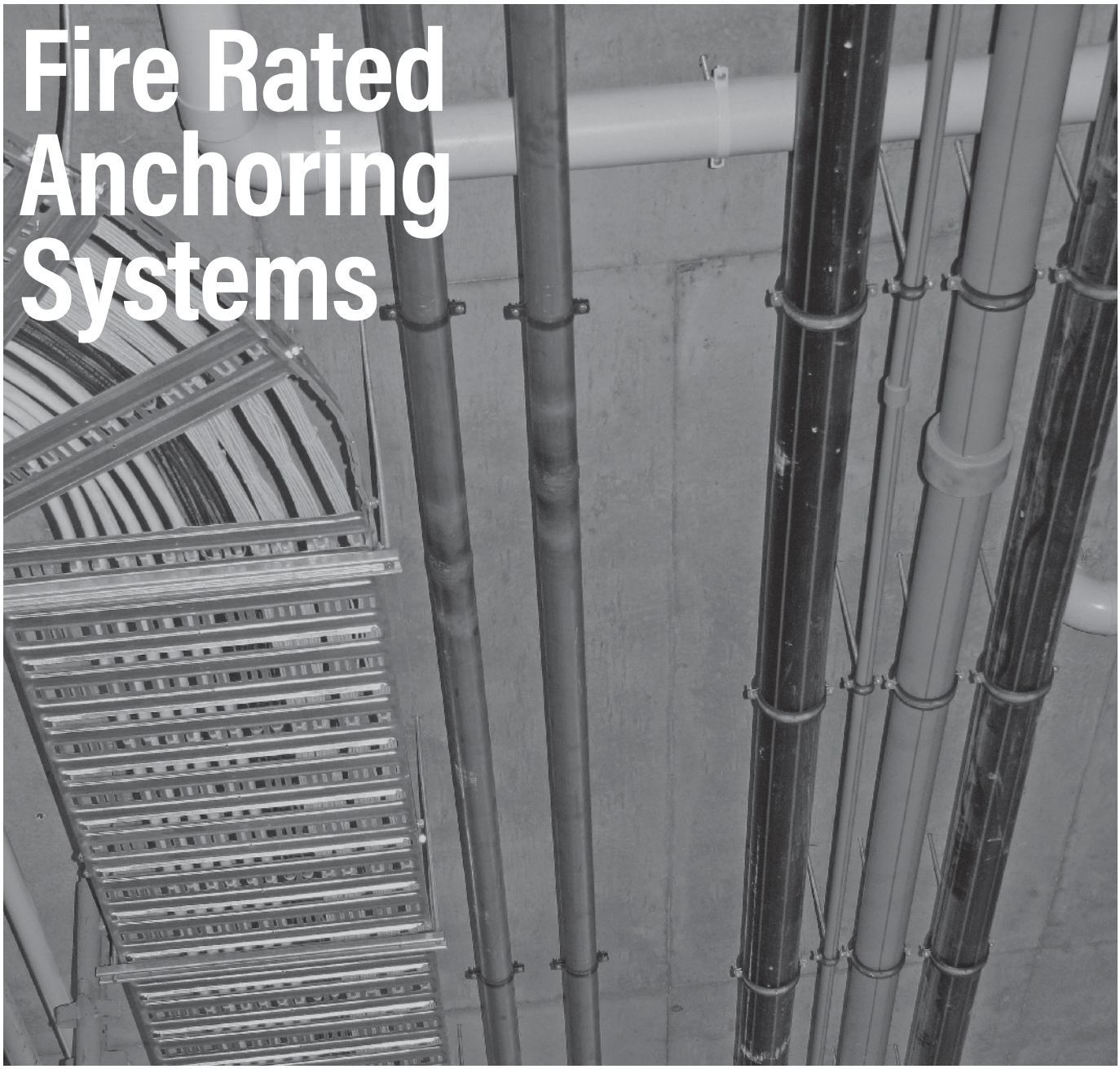
Introduction

FIRE RATED ANCHORING SYSTEMS



Introduction

Ramset™ has a number of anchoring systems which are specifically designed to achieve Fire Rating requirements for various applications. The existing range of medium duty suspension anchors such as, AnkaScrew™ and DynaSet™ Anchors, have been independently tested in accordance with Australian Fire test standards AS1530.4 to provide up to 2 hours capacity in a fire situation.

Furthermore, Ramset™ also have a range of heavy duty mechanical and chemical anchoring systems such as, SpaTec™ Xtrem™, TruBolt™ Xtrem™, AnkaScrew Xtrem™, EPCON™ C8 Xtrem™, and ChemSet™ 801 Xtrem™, which have all been independently tested for capacity in a fire situation. The Fire resistance duration for these anchoring systems varies with design cases available between 30 to 240 minutes. This section will provide you with data to help with your Fire Rating Level requirements when considering a post-installed fixing system.

Suspension Anchors

FIRE RATED MECHANICAL ANCHOR

GENERAL INFORMATION

Ramset™ Suspension Anchors have been fire rated and designed for fast high strength anchoring of suspension systems.

- AnkaScrew™ 5 x 30mm Hex head for fast fixing of retrofit fire collars, metal boxes and metal ducts.
- DynaSet™ M10 flanged and M12 drop in anchors for heavy duty pipe and cable tray suspensions.

Product

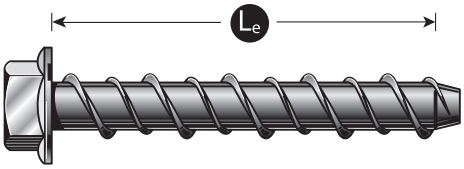
The AnkaScrew™ Anchor is a medium duty, rotation setting thread forming anchor.

Benefits, Advantages and Features

Fast and easy to install:
- Simply screws into hole.

Fast and easy to remove:
- Screws out leaving an empty hole with no protruding metal parts to grind off.

Close to edge and for close anchor spacing:
- Does not expand and burst concrete.



AnkaScrew™ 5 x 30mm Hex head - Part Number AS05030
- Engineered fire protection (2 hour minimum)

Product

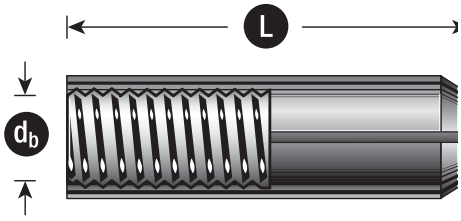
The DynaSet™ Anchor is a heavy duty, displacement setting expansion anchor.

Benefits, Advantages and Features

Fast installation:
- Shallow embedment and simple setting action.

Convenient:
- Threaded rod can be cut to equal lengths.
- Flanged version sits flush with surface in overdrilled holes.

Ideal as reusable anchorage point:
- Internal threaded design.
- No protruding metal parts when bolt or rod is removed.



DynaSet™ M10 flanged - Part Number DSF10
M12 drop in anchors - Part Number DSM12
- Fire tested and compliant to AS1530.4-2005
- Engineered fire protection (2 hour minimum)

Principal Applications

- **Suspended services, such as cable tray, ventilation ducts or plumbing fixtures**
- **Installing racking**
- **Suspended ceilings**

IMPORTANT: Consult technical data for tested applications and fire ratings, before commencing use. For detailed technical data and instructions go to www.ramset.com.au. For applications outside those tested, refer to your Fire Consultant for compliance advice.

SpaTec™ Xtrem™

FIRE RATED MECHANICAL ANCHOR

GENERAL INFORMATION

Performance Related	Material	Installation Related

Product

A high security, high performance, through fixing, torque controlled expansion anchor which has approval for use in cracked and non-cracked concrete.

Compliance

European Technical Assessment (option 1) - ETA-10/0276
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 and C2
- Use enclosed data for simplified calculation method

Use Ramset™ iExpert Anchor Software for optimised calculation or where a greater range of anchor layout detail is needed..

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)
- Shallow embedment depths
- Highest performance in cracked concrete
- Zinc Plated to 5µm

Anchor diameters from M10 to M20

Suitable for structural loads:

- Safety critical loads
- High tensile capacity of Grade 8.8 Steel Bolt.
- Heavy duty, heat treated washer. Heavy duty, thick expansion sleeve that provides secure grip to concrete.

Improved security:

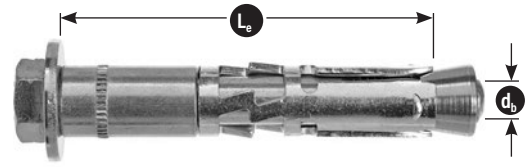
- Large expansion reserve that ensures retention in concrete if overloaded.
- Torque induced pull down closes gaps and induces preload.

Resistant to cyclic loading:

- Heavy duty sleeve with integrated pull-down section works to retain 65% of initial preload.

Fast installation:

- Hex Nut & Hex Bolt versions available
- Countersunk heads available.
- Through fixing eliminates marking out and repositioning of fixtures.

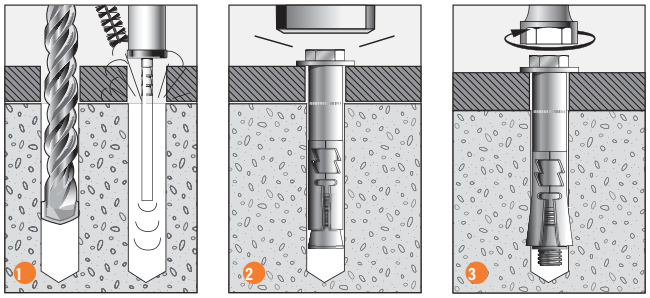


Hex Head

Principal Applications

- Anchoring into cracked & non cracked concrete
- Safety critical loads
- Steel columns & walkways
- Road barrier hold down
- Bridge refurbishment
- Road & Rail tunnel construction
- Wall Plates
- Safety Rails
- Intended working life of the anchor of 50 years

Installation



1. Drill or core a hole to the recommended diameter 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. After ensuring that the anchor is assembled correctly, insert the anchor through the fixture and drive with a hammer until the washer contacts the fixture.
3. Tighten the bolt with a torque wrench to the specified assembly torque.

SpaTec™ Xtrem™

FIRE RATED MECHANICAL ANCHOR

Installation Details

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)	Optimum dimensions*		Concrete substrate thickness, b_m (mm)
						Anchor* spacing, a_c (mm)	Edge** distance, e_c (mm)	
M10	15	17	70	90	50	280	140	140
M12	18	20	80	105	80	320	160	160
M16	24	26	100	131	120	400	200	200
M20	28	30	125	157	200	500	250	250

* For optimised performance data, please use Ramset iExpert Anchoring Software.
** If the fire attack is from more than one side,the edge distance of the anchor has to be ≥ 300mm and 2xh.

DESCRIPTION AND PART NUMBERS

Anchor size, d_b (mm)	Drilled hole diameter, d_h (mm)	Effective Length, L_e (mm)	Fixture thickness, t (mm)	ETA Designation Number	Part Number
					Zinc (Hex Hd)
M10	15	90	20	V10-15/20	SP10105
M12	18	90	10	V12-18/10	SP12105
		105	25	V12-18/25	SP12120
M16	24	125	25	V16-24/25	SP16145
M20	28	150	25	V20-28/25	SP20170

ENGINEERING PROPERTIES - Carbon Steel

Anchor size, d_b (mm)	Shank diameter, d_s (mm)	Bolt stress area, A_s (mm^2)	Bolt yield strength, f_y (MPa)	Bolt UTS, f_u (MPa)	Spacer area, A_s (mm^2)	Spacer yield strength, f_y (MPa)	Spacer UTS, f_u (MPa)	Section modulus Z (mm^3)
M10	9.8	58.0	640	800	83.4	350	480	62.3
M12	11.7	84.3	640	800	119.8	330	430	109.2
M16	15.7	157.0	640	800	201.7	330	430	277.5
M20	19.7	245.0	660	800	242.5	330	430	540.9

SpaTec™ 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)		15	18	24	28
Effective depth, h (mm)	Characteristic Resistance				
70	Steel Failure - $N_{Rk,s,fi,30}$ (kN)	4.5			
	Pull-out failure concrete - $N_{Rk,p,fi,30}$ (kN)	**4.0**			
	Concrete cone failure - $N_{Rk,c,fi,30}$ (kN)	7.4			
80	Steel Failure - $N_{Rk,s,fi,30}$ (kN)		17.6		
	Pull-out failure - $N_{Rk,p,fi,30}$ (kN)		-		
	Concrete cone failure - $N_{Rk,c,fi,30}$ (kN)		**10.3**		
100	Steel Failure - $N_{Rk,s,fi,30}$ (kN)			32.8	
	Pull-out failure concrete - $N_{Rk,p,fi,30}$ (kN)			-	
	Concrete cone failure - $N_{Rk,c,fi,30}$ (kN)			**18.0**	
125	Steel Failure - $N_{Rk,s,fi,30}$ (kN)				51.1
	Pull-out failure - $N_{Rk,p,fi,30}$ (kN)				-
	Concrete cone failure - $N_{Rk,c,fi,30}$ (kN)				**31.4**

Note: Bold values indicates limiting load. Data in table lists all possible failure mechanisms 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)		15	18	24	28
Edge distance, e_c (mm)	Characteristic Resistance				
140	Steel Failure without lever arm - $V^0_{Rk,s,fi,30}$ (kN)	**4.5**			
	Steel Failure with lever arm - $M^0_{Rk,s,fi,30}$ (N.m)	5.8			
	Concrete edge failure - $V^0_{Rk,c,fi,30}$ (kN)	4.9			
160	Steel Failure without lever arm - $V^0_{Rk,s,fi,30}$ (kN)		17.6		
	Steel Failure with lever arm - $M^0_{Rk,s,fi,30}$ (N.m)		27.3		
	Concrete edge failure - $V^0_{Rk,c,fi,30}$ (kN)		**6.5**		
200	Steel Failure without lever arm - $V^0_{Rk,s,fi,30}$ (kN)			32.8	
	Steel Failure with lever arm - $M^0_{Rk,s,fi,30}$ (N.m)			69.5	
	Concrete edge failure - $V^0_{Rk,c,fi,30}$ (kN)			**10.4**	
300	Steel Failure without lever arm - $V^0_{Rk,s,fi,30}$ (kN)				51.1
	Steel Failure with lever arm - $M^0_{Rk,s,fi,30}$ (N.m)				135.5
	Concrete edge failure - $V^0_{Rk,c,fi,30}$ (kN)				**15.9**

Note: Bold values indicates limiting load. Data in table lists all possible failure mechanisms 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

SpaTec™ 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 = 60 minutes

Anchor size, d_b		M10	M12	M16	M20
Drilled hole diam, d_h (mm)		15	18	24	28
Effective depth, h (mm)	Characteristic Resistance				
70	Steel Failure - $N_{Rk,s,fi,60}$(kN)	**3.3**			
	Pull-out failure concrete - $N_{Rk,p,fi,60}$ (kN)	4.0			
	Concrete cone failure - $N_{Rk,c,fi,60}$ (kN)	7.4			
80	Steel Failure - $N_{Rk,s,fi,60}$ (kN)		11.4		
	Pull-out failure - $N_{Rk,p,fi,60}$ (kN)		-		
	Concrete cone failure - $N_{Rk,c,fi,60}$ (kN)		**10.3**		
100	Steel Failure - $N_{Rk,s,fi,60}$(kN)			21.3	
	Pull-out failure concrete - $N_{Rk,p,fi,60}$ (kN)			-	
	Concrete cone failure - $N_{Rk,c,fi,60}$ (kN)			**18.0**	
125	Steel Failure - $N_{Rk,s,fi,60}$ (kN)				33.2
	Pull-out failure - $N_{Rk,p,fi,60}$ (kN)				-
	Concrete cone failure - $N_{Rk,c,fi,60}$ (kN)				**31.4**

Note: Bold values indicates limiting load. Data in table lists all possible failure mechanisms 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)		15	18	24	28
Edge distance, e_c (mm)	Characteristic Resistance				
140	Steel Failure without lever arm - $V^0_{Rk,s,fi,60}$ (kN)	**3.3**			
	Steel Failure with lever arm - $M^0_{Rk,s,fi,60}$ (N.m)	4.2			
	Concrete edge failure - $V^0_{Rk,c,fi,60}$(kN)	4.9			
160	Steel Failure without lever arm - $V^0_{Rk,s,fi,60}$ (kN)		11.4		
	Steel Failure with lever arm - $M^0_{Rk,s,fi,60}$ (N.m)		17.8		
	Concrete edge failure - $V^0_{Rk,c,fi,60}$ (kN)		**6.5**		
200	Steel Failure without lever arm - $V^0_{Rk,s,fi,60}$ (kN)			21.3	
	Steel Failure with lever arm - $M^0_{Rk,s,fi,60}$ (N.m)			45.2	
	Concrete edge failure - $V^0_{Rk,c,fi,60}$(kN)			**10.4**	
300	Steel Failure without lever arm - $V^0_{Rk,s,fi,60}$ (kN)				33.2
	Steel Failure with lever arm - $M^0_{Rk,s,fi,60}$ (N.m)				88.1
	Concrete edge failure - $V^0_{Rk,c,fi,60}$ (kN)				**15.9**

Note: Bold values indicates limiting load. Data in table lists all possible failure mechanisms 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

SpaTec™ Xtrem™

FIRE RATED MECHANICAL ANCHOR

Design Case 3

Fire resistance duration = 90 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)		15	18	24	28
Effective depth, h (mm)	Characteristic Resistance				
70	Steel Failure - $N_{Rk,s,fi,90}$(kN)	**2.1**			
	Pull-out failure concrete - $N_{Rk,p,fi,90}$ (kN)	4.0			
	Concrete cone failure - $N_{Rk,c,fi,90}$ (kN)	7.4			
80	Steel Failure - $N_{Rk,s,fi,90}$ (kN)		**5.3**		
	Pull-out failure - $N_{Rk,p,fi,90}$ (kN)		-		
	Concrete cone failure - $N_{Rk,c,fi,90}$ (kN)		10.3		
100	Steel Failure - $N_{Rk,s,fi,90}$(kN)			**9.8**	
	Pull-out failure concrete - $N_{Rk,p,fi,90}$ (kN)			-	
	Concrete cone failure - $N_{Rk,c,fi,90}$ (kN)			18.0	
125	Steel Failure - $N_{Rk,s,fi,90}$ (kN)				**15.3**
	Pull-out failure - $N_{Rk,p,fi,90}$ (kN)				-
	Concrete cone failure - $N_{Rk,c,fi,90}$ (kN)				31.4

Note: Bold values indicates limiting load. Data in table lists all possible failure mechanisms due to fire.

Table 2b 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)		15	18	24	28
Edge distance, e_c (mm)	Characteristic Resistance				
140	Steel Failure without lever arm - $V^0_{Rk,s,fi,90}$ (kN)	**2.1**			
	Steel Failure with lever arm - $M^0_{Rk,s,fi,90}$ (N.m)	2.7			
	Concrete edge failure - $V^0_{Rk,c,fi,90}$(kN)	4.9			
160	Steel Failure without lever arm - $V^0_{Rk,s,fi,90}$ (kN)		**5.3**		
	Steel Failure with lever arm - $M^0_{Rk,s,fi,90}$ (N.m)		8.2		
	Concrete edge failure - $V^0_{Rk,c,fi,90}$ (kN)		6.5		
200	Steel Failure without lever arm - $V^0_{Rk,s,fi,90}$ (kN)			**9.8**	
	Steel Failure with lever arm - $M^0_{Rk,s,fi,90}$ (N.m)			20.9	
	Concrete edge failure - $V^0_{Rk,c,fi,90}$(kN)			10.4	
300	Steel Failure without lever arm - $V^0_{Rk,s,fi,90}$ (kN)				**15.3**
	Steel Failure with lever arm - $M^0_{Rk,s,fi,90}$ (N.m)				40.7
	Concrete edge failure - $V^0_{Rk,c,fi,90}$ (kN)				15.9

Note: Bold values indicates limiting load. Data in table lists all possible failure mechanisms 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

SpaTec™ 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)		15	18	24	28
Effective depth, h (mm)	Characteristic Resistance				
70	Steel Failure - $N_{Rk,s,fi,120}$ (kN)	**1.5**			
	Pull-out failure concrete - $N_{Rk,p,fi,120}$ (kN)	3.2			
	Concrete cone failure - $N_{Rk,c,fi,120}$ (kN)	5.9			
80	Steel Failure - $N_{Rk,s,fi,120}$ (kN)		**2.2**		
	Pull-out failure - $N_{Rk,p,fi,120}$ (kN)		-		
	Concrete cone failure - $N_{Rk,c,fi,120}$ (kN)		8.2		
100	Steel Failure - $N_{Rk,s,fi,120}$ (kN)			**4.1**	
	Pull-out failure concrete - $N_{Rk,p,fi,120}$ (kN)			-	
	Concrete cone failure - $N_{Rk,c,fi,120}$ (kN)			14.4	
125	Steel Failure - $N_{Rk,s,fi,120}$ (kN)				**6.4**
	Pull-out failure - $N_{Rk,p,fi,120}$ (kN)				-
	Concrete cone failure - $N_{Rk,c,fi,120}$ (kN)				25.2

Note: Bold values indicates limiting load. Data in table lists all possible failure mechanisms 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)		15	18	24	28
Edge distance, e_c (mm)	Characteristic Resistance				
140	Steel Failure without lever arm - $V^0_{Rk,s,fi,120}$ (kN)	**1.5**			
	Steel Failure with lever arm - $M^0_{Rk,s,fi,120}$ (N.m)	1.9			
	Concrete edge failure - $V^0_{Rk,c,fi,120}$ (kN)	3.9			
160	Steel Failure without lever arm - $V^0_{Rk,s,fi,120}$ (kN)		**2.2**		
	Steel Failure with lever arm - $M^0_{Rk,s,fi,120}$ (N.m)		3.4		
	Concrete edge failure - $V^0_{Rk,c,fi,120}$ (kN)		5.2		
200	Steel Failure without lever arm - $V^0_{Rk,s,fi,120}$ (kN)			**4.1**	
	Steel Failure with lever arm - $M^0_{Rk,s,fi,120}$ (N.m)			8.7	
	Concrete edge failure - $V^0_{Rk,c,fi,120}$ (kN)			8.3	
300	Steel Failure without lever arm - $V^0_{Rk,s,fi,120}$ (kN)				**6.4**
	Steel Failure with lever arm - $M^0_{Rk,s,fi,120}$ (N.m)				17.0
	Concrete edge failure - $V^0_{Rk,c,fi,120}$ (kN)				12.7

Note: Bold values indicates limiting load. Data in table lists all possible failure mechanisms 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

Notes

TYPICAL BOLT PERFORMANCE INFORMATION

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

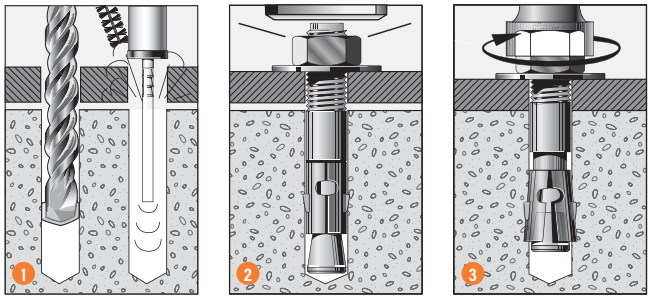
Fast installation:

- 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

AnkaScrew™ Xtrem™

FIRE RATED MECHANICAL ANCHOR

GENERAL INFORMATION

Performance Related	Material	Installation Related

Product

A seismic certified heavy duty screw-in anchor for permanent anchoring into concrete. Certified for seismic C1 & C2 applications.

Compliance

European Technical Assessment (option1) - ETA-20/0731

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

Benefits, Advantages and Features

Fire tested to TR020

- Fire rated performance up to 120 minutes
- Highest level of European assessment for mechanical screw-in anchors
- Approved for all directions (floor, wall, overhead)
- Maximum Tensile & Shear capacities in cracked concrete
- Zinc Plating 5µm
- Anchor diameters 6mm to 12mm

Fast and easy to use:

- Install, simply screws into hole.
- Remove, leaving an empty hole.

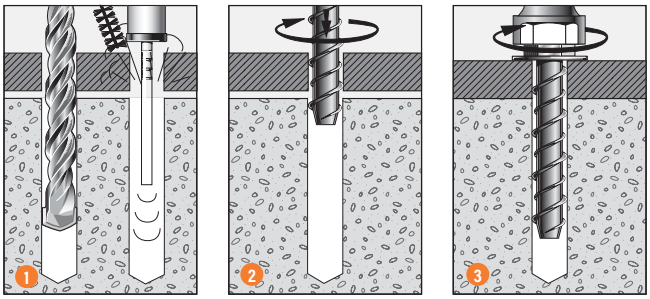
Close to edge and for close anchor spacing:

- Does not expand and burst concrete.

Principal Applications

- **Anchoring into cracked & non cracked concrete**
- **Steel framing**
- **Mechanical services**
- **Pallet racking**
- **Safety barriers**
- **Conveyors**
- **Hand rails**
- **Bottom plates**

Installation



1. Drill hole to correct diameter and depth. Important: Use **Ramset™ Dustless Drilling System** to ensure holes are clean. Alternatively, clean thoroughly with brush and remove debris by way of vacuum or hand pump, compressed air etc.
2. Using a socket wrench, screw the AnkaScrew™ Xtrem™ into the hole using slight pressure until the self tapping action starts.
3. Tighten the AnkaScrew™ Xtrem™ until flush with fixture.
   If resistance is experienced when tightening, unscrew anchor one turn and re-tighten. Ensure not to over tighten. Refer to tightening torque for limitations.

AnkaScrew™ 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)
6	6	8	44	60	10	90	176	88
8	8	12	52	75	20	105	208	104
10	10	14	68	95	40	136	272	136
12	12	16	80	110	60	160	320	160

* For anchor spacings less than the optimum, please contact your local Ramset Engineer.

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

***Note: For performance based on smaller concrete substrate thickness, refer to iExpert Anchor Software or Ramset™ Engineer.

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)	AnkaScrew™ Xtrem™ Description	Part Number
6	6	71	19	6mmx80mm zinc	AS06080X
8	8	67	15	8mmx80mm zinc	AS08080X
10	10	88	20	10mmx100mm zinc	AS10100X
12	12	95	15	12mmx110mm zinc	AS12110X
		135	55	12mmx150mm zinc	AS12150X

Effective depth, h (mm)

$$h = L_e - t$$

t = total thickness of material(s) being fixed

ENGINEERING PROPERTIES

Anchor size, d_b (mm)	Minimum cross sectional diameter (mm)	Stress area, A_s (mm^2)	Yield strength, f_y (MPa)	UTS, F_u (Mpa)
6	5.1	20.4	560	700
8	7.1	39.6	560	700
10	9.1	65.0	560	700
12	11.1	96.8	560	700

AnkaScrew™ 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		M6	M8	M10	M12
Drilled hole diam, d_h (mm)		6	8	10	12
Effective depth, h (mm)	Characteristic Resistance				
44	Steel Failure - $N_{Rk,s,fi,30}$ (kN)	**0.9**			
	Pull-out failure concrete - $N_{Rk,p,fi,30}$ (kN)	1.0			
	Concrete cone failure - $N_{Rk,c,fi,30}$ (kN)	2.2			
52	Steel Failure - $N_{Rk,s,fi,30}$ (kN)		**2.4**		
	Pull-out failure concrete - $N_{Rk,p,fi,30}$ (kN)		3.0		
	Concrete cone failure - $N_{Rk,c,fi,30}$ (kN)		3.4		
68	Steel Failure - $N_{Rk,s,fi,30}$ (kN)			**4.4**	
	Pull-out failure concrete - $N_{Rk,p,fi,30}$ (kN)			4.8	
	Concrete cone failure - $N_{Rk,c,fi,30}$ (kN)			6.6	
80	Steel Failure - $N_{Rk,s,fi,30}$ (kN)				7.3
	Pull-out failure concrete - $N_{Rk,p,fi,30}$ (kN)				**6.2**
	Concrete cone failure - $N_{Rk,c,fi,30}$ (kN)				9.9

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		M6	M8	M10	M12
Drilled hole diam, d_h (mm)		6	8	10	12
Edge distance, e_c (mm)	Characteristic Resistance				
88	Steel Failure without lever arm - $V^0_{Rk,s,fi,30}$ (kN)	0.9			
	Steel Failure with lever arm - $M^0_{Rk,s,fi,30}$ (N.m)	**0.7**			
	Concrete edge failure - $V^0_{Rk,c,fi,30}$ (kN)	1.7			
104	Steel Failure without lever arm - $V^0_{Rk,s,fi,30}$ (kN)		**2.4**		
	Steel Failure with lever arm - $M^0_{Rk,s,fi,30}$ (N.m)		2.4		
	Concrete edge failure - $V^0_{Rk,c,fi,30}$ (kN)		2.5		
136	Steel Failure without lever arm - $V^0_{Rk,s,fi,30}$ (kN)			4.4	
	Steel Failure with lever arm - $M^0_{Rk,s,fi,30}$ (N.m)			5.9	
	Concrete edge failure - $V^0_{Rk,c,fi,30}$ (kN)			**4.1**	
160	Steel Failure without lever arm - $V^0_{Rk,s,fi,30}$ (kN)				7.3
	Steel Failure with lever arm - $M^0_{Rk,s,fi,30}$ (N.m)				12.3
	Concrete edge failure - $V^0_{Rk,c,fi,30}$ (kN)				**5.8**

NOTE: Bold values indicate limiting load for conditions without lever arm. 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

AnkaScrew™ 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 = 60 minutes

Anchor size, d_b		M6	M8	M10	M12
Drilled hole diam, d_h (mm)		6	8	10	12
Effective depth, h (mm)	Characteristic Resistance				
44	Steel Failure - $N_{Rk,s,fi,60}$(kN)	**0.8**			
	Pull-out failure concrete - $N_{Rk,p,fi,60}$ (kN)	1.0			
	Concrete cone failure - $N_{Rk,c,fi,60}$ (kN)	2.2			
52	Steel Failure - $N_{Rk,s,fi,60}$(kN)		**1.7**		
	Pull-out failure concrete - $N_{Rk,p,fi,60}$ (kN)		3.0		
	Concrete cone failure - $N_{Rk,c,fi,60}$ (kN)		3.4		
68	Steel Failure - $N_{Rk,s,fi,60}$(kN)			**3.3**	
	Pull-out failure concrete - $N_{Rk,p,fi,60}$ (kN)			4.8	
	Concrete cone failure - $N_{Rk,c,fi,60}$ (kN)			6.6	
80	Steel Failure - $N_{Rk,s,fi,60}$(kN)				**5.8**
	Pull-out failure concrete - $N_{Rk,p,fi,60}$ (kN)				6.2
	Concrete cone failure - $N_{Rk,c,fi,60}$ (kN)				9.9

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		M6	M8	M10	M12
Drilled hole diam, d_h (mm)		6	8	10	12
Edge distance, e_c (mm)	Characteristic Resistance				
88	Steel Failure without lever arm - $V^0_{Rk,s,fi,60}$ (kN)	0.8			
	Steel Failure with lever arm - $M^0_{Rk,s,fi,60}$ (N.m)	**0.6**			
	Concrete edge failure - $V^0_{Rk,c,fi,60}$ (kN)	1.7			
104	Steel Failure without lever arm - $V^0_{Rk,s,fi,60}$ (kN)		**1.7**		
	Steel Failure with lever arm - $M^0_{Rk,s,fi,60}$ (N.m)		1.8		
	Concrete edge failure - $V^0_{Rk,c,fi,60}$(kN)		2.5		
136	Steel Failure without lever arm - $V^0_{Rk,s,fi,60}$ (kN)			**3.3**	
	Steel Failure with lever arm - $M^0_{Rk,s,fi,60}$ (N.m)			4.5	
	Concrete edge failure - $V^0_{Rk,c,fi,60}$(kN)			4.1	
160	Steel Failure without lever arm - $V^0_{Rk,s,fi,60}$ (kN)				**5.8**
	Steel Failure with lever arm - $M^0_{Rk,s,fi,60}$ (N.m)				9.7
	Concrete edge failure - $V^0_{Rk,c,fi,60}$(kN)				5.8

NOTE: Bold values indicate limiting load for conditions without lever arm. 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

AnkaScrew™ 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		M6	M8	M10	M12
Drilled hole diam, d_h (mm)		6	8	10	12
Effective depth, h (mm)	Characteristic Resistance				
44	Steel Failure - $N_{Rk,s,fi,90}$ (kN)	**0.6**			
	Pull-out failure concrete - $N_{Rk,p,fi,90}$ (kN)	1.0			
	Concrete cone failure - $N_{Rk,c,fi,90}$ (kN)	2.2			
52	Steel Failure - $N_{Rk,s,fi,90}$ (kN)		**1.1**		
	Pull-out failure concrete - $N_{Rk,p,fi,90}$ (kN)		3.0		
	Concrete cone failure - $N_{Rk,c,fi,90}$ (kN)		3.4		
68	Steel Failure - $N_{Rk,s,fi,90}$ (kN)			**2.3**	
	Pull-out failure concrete - $N_{Rk,p,fi,90}$ (kN)			4.8	
	Concrete cone failure - $N_{Rk,c,fi,90}$ (kN)			6.6	
80	Steel Failure - $N_{Rk,s,fi,90}$ (kN)				**4.2**
	Pull-out failure concrete - $N_{Rk,p,fi,90}$ (kN)				6.2
	Concrete cone failure - $N_{Rk,c,fi,90}$ (kN)				9.9

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		M6	M8	M10	M12
Drilled hole diam, d_h (mm)		6	8	10	12
Edge distance, e_c (mm)	Characteristic Resistance				
88	Steel Failure without lever arm - $V^0_{Rk,s,fi,90}$ (kN)	0.6			
	Steel Failure with lever arm - $M^0_{Rk,s,fi,90}$ (N.m)	**0.5**			
	Concrete edge failure - $V^0_{Rk,c,fi,90}$ (kN)	1.7			
104	Steel Failure without lever arm - $V^0_{Rk,s,fi,90}$ (kN)		**1.1**		
	Steel Failure with lever arm - $M^0_{Rk,s,fi,90}$ (N.m)		1.2		
	Concrete edge failure - $V^0_{Rk,c,fi,90}$ (kN)		2.5		
136	Steel Failure without lever arm - $V^0_{Rk,s,fi,90}$ (kN)			**2.3**	
	Steel Failure with lever arm - $M^0_{Rk,s,fi,90}$ (N.m)			3.0	
	Concrete edge failure - $V^0_{Rk,c,fi,90}$ (kN)			4.1	
160	Steel Failure without lever arm - $V^0_{Rk,s,fi,90}$ (kN)				**4.2**
	Steel Failure with lever arm - $M^0_{Rk,s,fi,90}$ (N.m)				7.0
	Concrete edge failure - $V^0_{Rk,c,fi,90}$ (kN)				5.8

NOTE: Bold values indicate limiting load for conditions without lever arm. 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

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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		M6	M8	M10	M12
Drilled hole diam, d_h (mm)		6	8	10	12
Effective depth, h (mm)	Characteristic Resistance				
44	Steel Failure - $N_{Rk,s,fi,120}$ (kN)	**0.4**			
	Pull-out failure concrete - $N_{Rk,p,fi,120}$ (kN)	0.8			
	Concrete cone failure - $N_{Rk,c,fi,120}$ (kN)	1.8			
52	Steel Failure - $N_{Rk,s,fi,120}$ (kN)		**0.7**		
	Pull-out failure concrete - $N_{Rk,p,fi,120}$ (kN)		2.4		
	Concrete cone failure - $N_{Rk,c,fi,120}$ (kN)		2.7		
68	Steel Failure - $N_{Rk,s,fi,120}$ (kN)			**1.7**	
	Pull-out failure concrete - $N_{Rk,p,fi,120}$ (kN)			3.9	
	Concrete cone failure - $N_{Rk,c,fi,120}$ (kN)			5.3	
80	Steel Failure - $N_{Rk,s,fi,120}$ (kN)				**3.4**
	Pull-out failure concrete - $N_{Rk,p,fi,120}$ (kN)				4.9
	Concrete cone failure - $N_{Rk,c,fi,120}$ (kN)				7.9

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		M6	M8	M10	M12
Drilled hole diam, d_h (mm)		6	8	10	12
Edge distance, e_c (mm)	Characteristic Resistance				
88	Steel Failure without lever arm - $V^0_{Rk,s,fi,120}$ (kN)	0.4			
	Steel Failure with lever arm - $M^0_{Rk,s,fi,120}$ (N.m)	**0.3**			
	Concrete edge failure - $V^0_{Rk,c,fi,120}$ (kN)	1.4			
104	Steel Failure without lever arm - $V^0_{Rk,s,fi,120}$ (kN)		**0.7**		
	Steel Failure with lever arm - $M^0_{Rk,s,fi,120}$ (N.m)		0.9		
	Concrete edge failure - $V^0_{Rk,c,fi,120}$ (kN)		2.0		
136	Steel Failure without lever arm - $V^0_{Rk,s,fi,120}$ (kN)			**1.7**	
	Steel Failure with lever arm - $M^0_{Rk,s,fi,120}$ (N.m)			2.3	
	Concrete edge failure - $V^0_{Rk,c,fi,120}$ (kN)			3.3	
160	Steel Failure without lever arm - $V^0_{Rk,s,fi,120}$ (kN)				**3.4**
	Steel Failure with lever arm - $M^0_{Rk,s,fi,120}$ (N.m)				5.7
	Concrete edge failure - $V^0_{Rk,c,fi,120}$ (kN)				4.6

NOTE: Bold values indicate limiting load for conditions without lever arm. 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

EPCON™ C8 Xtrem™

FIRE RATED CHEMICAL ANCHOR

GENERAL INFORMATION

Performance Related

Installation Related

Product

EPCON™ C8 Xtrem™ is a High Performance Pure Epoxy Anchoring adhesive for use in Cracked and Non-Cracked concrete. For structures subject to external exposure, permanently damp or aggressive conditions.

Compliance

European Technical Assessment (option 1) - ETA-10/0309

Design according to:

- AS5216 (formerly TS101)
- EN1992-4 (formerly ETAG001 Annex C, E & TR045)
- Use enclosed data for simplified calculation method
- NZS3101 (A3) Section 17 - Seismic Design C1 & C2

Use Ramset™ iExpert Anchor Software for optimised calculation or where a greater range of anchor layout detail is needed

Benefits, Advantages and Features

Fire tested to European Fire Standards

- CSTB Fire test Report no 26007642/b
- For Wall to Slab connection with reinforcement bar
- For Beam frame reinforcement

Greater productivity:

- Anchors in dry, damp, wet or flooded holes
- No weather delays
- Fast, easy dispensing with high flow mixer

Greater security:

- Highest performance in cracked concrete
- Rated for sustained loading

Versatile

- Anchors all stud & bar diameters in all directions
- Oversized holes*
- Anchors in carbide drilled and diamond cored holes*
- For tropical and Cold weather conditions

Greater safety:

- Low odour

Fire Rated : Refer Fire rated anchoring section

Principal Applications

- Anchoring into cracked & non cracked concrete
- Road barrier hold down bolts
- Bridge refurbishment
- Road & Rail tunnel construction
- Reinforcing bar from 10 to 32mm
- Starter Bars
- Threaded studs from M8 to M30
- Threaded Stud material: Zn, A4 316, HCR steels
- Threaded Stud material: 5.8, 8.8, 10.9 grade

Recommended Installation Temperatures

	Minimum	Maximum
Substrate	5°C	40°C
Adhesive	5°C	40°C

Load should not be applied to anchor until the chemical has sufficiently cured as specified.

Service Temperature Limits

-40°C to 80°C

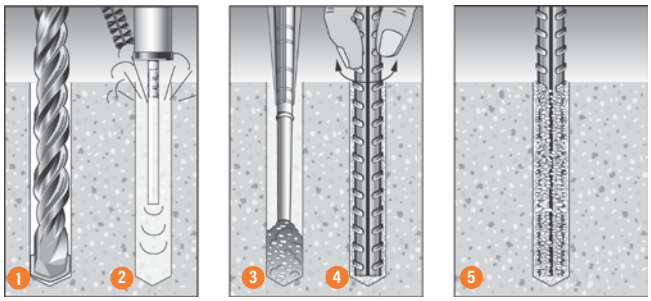
Setting Times EPCON™ C8 Xtrem™

Temperature of base material	Gel Time	Curing time in dry concrete	Curing time in wet concrete
5°C - 9°C	20 min	30 h	60 h
10°C - 19°C	14 min	23 h	46 h
20°C - 24°C	11 min	16 h	32 h
25°C - 29°C	8 min	12 h	24 h
30°C - 39°C	5 min	8 h	16 h
40°C	5 min	6 h	12 h

Note

*Performance of cored & oversized holes was not included in the ETAG test program and therefore is based on testing conducted at Ramset™ Product Engineering Laboratory.

Installation



1. Drill or core hole to specified diameter and depth
2. **Important:** Use **Ramset™** Dustless Drilling System to ensure holes are clean. Alternatively, clean dust and debris from hole with stiff wire or nylon brush and blower in the following sequence: blow x 2, brush x 2, blow x 2.
3. Screw mixing nozzle onto cartridge and dispense 2-3 trigger pulls of adhesive to waste until colour is grey with no streaks
4. Insert tip of nozzle to bottom of hole and dispense adhesive
5. Fill hole to about 2/3 full
6. Insert reinforcing bar with rotating motion to release trapped air
7. Wait until adhesive has fully cured before loading (see Working Time / Loading Time chart)
8. Clean up with Acetone

EPCON™ C8 Xtrem™

FIRE RATED CHEMICAL ANCHOR

Installation Details

EPCON™ C8 Xtrem™ with Reinforcing Bar

Anchor size, d_b (mm)	Drilled hole diameter, d_h (mm)
10	12
12	15
16	20
20	25
24	30
25	30
32	40
40	50

DESCRIPTION AND PART NUMBERS

Description	Cartridge Size	Part No.
EPCON™ C8 Xtrem™	450 ml	**C8-450**

ENGINEERING PROPERTIES

Typical Engineering Properties of Grade 500 Reinforcing Bar

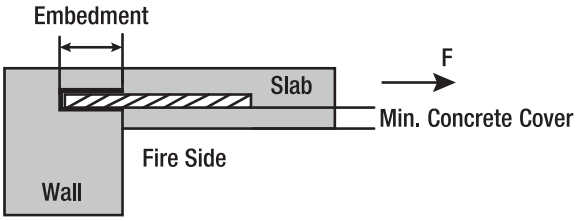
Rebar Size	10	12	16	20	24	25	32	40
Drilled Hole Dia, d_h (mm)	12	15	20	25	30	30	40	50
Stress Area, A_s (mm^2)	78.5	113	201	314	452	491	804	1260
Yield Stress, f_{sy} (MPa)	500	500	500	500	500	500	500	500
Tensile Steel Yield Capacity, N_{sy} (kN)	39.3	56.5	100.5	157.0	226.0	245.5	402.0	630

For further information refer to reinforcing bar manufacturer's published information and current revision of **AS/NZS 4671**

EPCON™ C8 Xtrem™

FIRE RATED CHEMICAL ANCHOR

Reinforcing Bar Anchored with EPCON™ C8 Xtrem™



Design Case 1

Fire resistance duration = 30 minutes

For Reinforcing Bar Steel Grade - 500 MPa and Concrete cylinder compressive strength - 20 MPa

Rebar Size	Hole Diameter	*Min. Concrete Cover	Design resistance in accordance with Eurocode 2 for fire duration 30 minutes (kN)														Rebar Max. Load (kN) in case of fire
10	12	10	6.1	8.1	-	9.6											25.3
12	16	12	7.3	9.7	10.9	-	12.1										36.4
16	20	16		13.0	14.6	-	-	17.8	19.4								64.8
20	25	20		16.2	18.2	-	20.2	22.3	24.3	25.3							101.2
24	30	25								31.6	36.7	39.8					145.8
25	30	25								31.6	36.7	39.8					158.1
32	40	32											51.8	55.0	58.2		259
40	50	40														80.9	404.7
Embedment (mm)			**120**	**160**	**180**	**190**	**200**	**220**	**240**	**250**	**290**	**315**	**320**	**340**	**360**	**400**	

* Note: Minimum concrete cover according to Eurocode 2 part 1.2

Design Case 2

Fire resistance duration = 60 minutes

For Reinforcing Bar Steel Grade - 500 MPa and Concrete cylinder compressive strength - 20 MPa

Rebar Size	Hole Diameter	*Min. Concrete Cover	Design resistance in accordance with Eurocode 2 for fire duration 60 minutes (kN)													Rebar Max. Load (kN) in case of fire
10	12	20	3.0	8.1	-	11.1										25.3
12	16	20	3.2	9.4	10.9	13.4	14.6									36.4
16	20	20		10.5	14.6	17.8	19.4	-	24.3							64.8
20	25	20		16.2	18.2	22.3	24.3	25.3	-	30.9						101.2
24	30	25						31.6	-	-	-	44.2	50.0			145.8
25	30	25						31.6	-	-	-	44.2	50.0			158.1
32	40	32									51.8	58.2	-	-	72.0	259
40	50	40												80.9	-	100.2	404.7
Embedment (mm)			**120**	**160**	**180**	**220**	**240**	**250**	**300**	**305**	**320**	**360****	**395**	**400**	**445**	**495**	

* Note: Minimum concrete cover according to Eurocode 2 part 1.2

** Note: Values for Rebar Size 24 are based on Embedment = 350 mm

Design method for resistance to fire according to Eurocode 2: Fire proof using design resistance: $R_{d,fi} \leq E_{d,fi}$

$R_{d,fi}$ Design resistance in the fire situation

$E_{d,fi}$ Design effect of actions in the fire situation. This value could be calculated from the calculation at normal temperature:

$$E_{d,fi} = \eta_{fi} \times F_{Rdu}$$

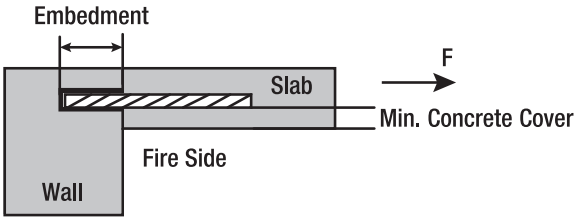
F_{Rdu} Design ultimate limit load at normal temperature for one rebar sealing at the anchorage depth (mm)

η_{fi} Reduction factor for design load level in the fire situation η_{fi} is equal to 0.7.

EPCON™ C8 Xtrem™

FIRE RATED CHEMICAL ANCHOR

Reinforcing Bar Anchored with EPCON™ C8 Xtrem™



Design Case 3 — Fire resistance duration = 90 minutes

For Reinforcing Bar Steel Grade - 500 MPa and Concrete cylinder compressive strength - 20 MPa

Rebar Size	Hole Diameter	*Min. Concrete Cover	Design resistance in accordance with Eurocode 2 for fire duration 90 minutes (kN)														Rebar Max. Load (kN) in case of fire
10	12	25	1.7	5.4	-	11.1	-	13.4									25.3
12	16	25	2.1	5.5	8.6	13.4	-	-	17.0								36.4
16	20	25		5.8	8.9	17.8	-	-	22.7	25.9	27.1						64.8
20	25	25		13.4	18.2	22.3	25.3	-	28.4	-	-	34.4					101.2
24	30	25					30.6	-	36.7	-	-	-	-	55.7			145.8
25	30	25					30.6	-	36.7	-	-	-	-	55.7			158.1
32	40	32								51.8	-	55.0	-	71.2	81.1		259
40	50	40											80.9	-	-	112.3	404.7
Embedment (mm)			120	160	180	220	250	265	290**	320	335	340	400	440	500	555	

* Note: Minimum concrete cover according to Eurocode 2 part 1.2

** Note: Values for Rebar Sizes 12, 16 and 20 are based on Embedment = 280 mm

Design Case 4 — Fire resistance duration = 120 minutes

For Reinforcing Bar Steel Grade - 500 MPa and Concrete cylinder compressive strength - 20 MPa

Rebar Size	Hole Diameter	*Min. Concrete Cover	Design resistance in accordance with Eurocode 2 for fire duration 120 minutes (kN)														Rebar Max. Load (kN) in case of fire
10	12	35	1.2	3.6	12.1	-	14.7										25.3
12	16	35	1.7	3.5	14.6	-	-	18.2									36.4
16	20	35		4.8	19.4	-	-	24.3	25.9	28.7							64.8
20	25	35		10.7	24.3	25.3	-	-	-	-	36.4						101.2
24	30	35				24.5	36.7	-	-	-	-	-	55.7	58.2			145.8
25	30	35				24.5	36.7	-	-	-	-	-	55.7	58.2			158.1
32	40	35							51.8	-	58.2	-	71.2	-	81.1		259
40	50	40										80.9	87.0	-	-	122.4	404.7
Embedment (mm)			120	160	240	250	290	300	320	355	360	400	440**	460	500	605	

* Note: Minimum concrete cover according to Eurocode 2 part 1.2

** Note: Values for Rebar Size 40 are based on Embedment = 430 mm

Design method for resistance to fire according to Eurocode 2: Fire proof using design resistance: $R_{d,fi} \leq E_{d,fi}$

$R_{d,fi}$ Design resistance in the fire situation

$E_{d,fi}$ Design effect of actions in the fire situation. This value could be calculated from the calculation at normal temperature:

$$E_{d,fi} = \eta_{fi} \times F_{Rdu}$$

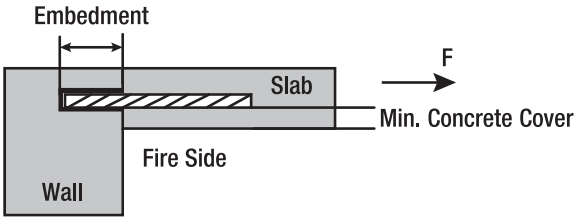
F_{Rdu} Design ultimate limit load at normal temperature for one rebar sealing at the anchorage depth (mm)

η_{fi} Reduction factor for design load level in the fire situation η_{fi} is equal to 0.7.

EPCON™ C8 Xtrem™

FIRE RATED CHEMICAL ANCHOR

Reinforcing Bar Anchored with EPCON™ C8 Xtrem™



Design Case 5 — Fire resistance duration = 180 minutes

For Reinforcing Bar Steel Grade - 500 MPa and Concrete cylinder compressive strength - 20 MPa

Rebar Size	Hole Diameter	*Min. Concrete Cover	Design resistance in accordance with Eurocode 2 for fire duration 180 minutes (kN)														Rebar Max. Load (kN) in case of fire
10	12	50	1.0	1.9	9.6	-	15.2										25.3
12	16	50	1.5	2.4	10.8	-	18.2	19.4	21.2								36.4
16	20	50		3.6	12.8	-	24.3	25.9	-	32.0							64.8
20	25	50		7.9	24.3	25.3	-	-	-	-	40.5						101.2
24	30	50				17.7	-	-	44.2	50.0	-	-	63.2				145.8
25	30	50				17.7	-	-	44.2	50.0	-	-	63.2				158.1
32	40	50						44.5	-	-	-	-	81.1	-	93.1		259
40	50	50									80.9	87.0	-	112.3	-	132.5	404.7
Embedment (mm)			**120**	**160**	**240**	**250**	**300**	**320**	**350**	**395**	**400**	**430**	**500**	**555**	**575**	**655**	

* Note: Minimum concrete cover according to Eurocode 2 part 1.2

Design Case 6 — Fire resistance duration = 240 minutes

For Reinforcing Bar Steel Grade - 500 MPa and Concrete cylinder compressive strength - 20 MPa

Rebar Size	Hole Diameter	*Min. Concrete Cover	Design resistance in accordance with Eurocode 2 for fire duration 240 minutes (kN)														Rebar Max. Load (kN) in case of fire
10	12	70	0.9	1.7	7.8	-	-	17.7									25.3
12	16	70	1.4	2.0	8.0	-	19.4	21.2	22.8								36.4
16	20	70		3.4	9.7	-	25.9	-	-	-	34.4						64.8
20	25	70		6.9	20.1	21.4	-	-	-	40.5	43.0						101.2
24	30	70				15.1	-	44.2	-	-	-	63.2	67.0				145.8
25	30	70				15.1	-	44.2	-	-	-	63.2	67.0				158.1
32	40	70					37.3	-	-	-	-	81.1	-	-	97.9		259
40	50	70								80.9	-	-	-	112.3	122.4	138.6	404.7
Embedment (mm)			**120**	**160**	**240**	**250**	**320**	**350**	**375**	**400**	**425**	**500**	**530**	**555**	**605**	**685**	

* Note: Minimum concrete cover according to Eurocode 2 part 1.2

Design method for resistance to fire according to Eurocode 2: Fire proof using design resistance: $R_{d,fi} \leq E_{d,fi}$

$R_{d,fi}$ Design resistance in the fire situation

$E_{d,fi}$ Design effect of actions in the fire situation. This value could be calculated from the calculation at normal temperature:

$$E_{d,fi} = \eta_{fi} \times F_{Rdu}$$

F_{Rdu} Design ultimate limit load at normal temperature for one rebar sealing at the anchorage depth (mm)

η_{fi} Reduction factor for design load level in the fire situation η_{fi} is equal to 0.7.

ChemSet™ 801 Xtrem™ XC²

FIRE RATED CHEMICAL ANCHOR

GENERAL INFORMATION

Performance Related	Material Specification	Installation Related
	Zn GAL A4 316 HCR	

Product

Chemset™ 801 Xtrem™ XC² is a heavy duty Vinylester for anchoring threaded studs and reinforcing bar into cracked and uncracked concrete.

Compliance

European Technical Assessment (option 1) - ETA-18/0045

Design according to:

- AS5216 (formerly TS101)
- EN1992-4 (formerly ETAG001 Annex C, E & TR045)
- Use enclosed data for simplified calculation method

Use Ramset™ iExpert Anchor Software for optimised calculation or where a greater range of anchor layout detail is needed.

Benefits, Advantages and Features

- Fire rated - MFPA Leipzig GmbH test no. GS 3.2/17-410-3
- Flooded Holes

Greater productivity:

- Easy dispensing even in cold weather
- Apply torque in 2 hours @ 20ºC

Greater security:

- Strong bond
- Rated for sustained loading

Versatile:

- Earthquake, Fire & Flooded Conditions
- Cold and temperate climates

Greater safety:

- Low odour
- Suitable for contact with drinking water
- VOC Compliant

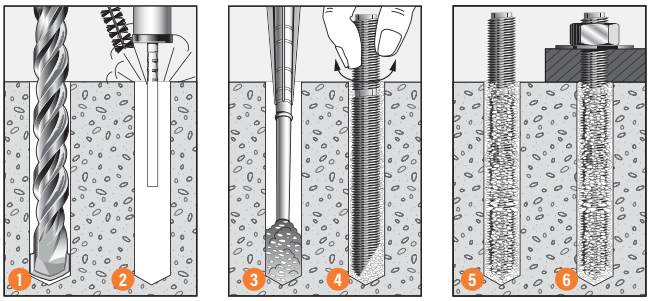
Made in Australia

FIRE TESTED | SEISMIC | 50 YEAR WORKING LIFE | ETA | CRACKED CONCRETE CERTIFIED | FLOODED HOLE APPROVED

Principal Applications

- Threaded Studs
- Starter Bars
- Threaded Inserts
- Over-head installation
- Steel Columns
- Hand Rails
- Road Stitching

Installation



1. Drill recommended diameter and depth hole.
2. **Important:** Use **Ramset™** Dustless Drilling System to ensure holes are clean. Alternativly clean dust and debris from hole with stiff wire or nylon brush and blower in the following sequence: blow x 2, brush x 2, blow x 2.
3. Dispense adhesive to waste until colour is uniform light grey (2-3 trigger pulls). Insert mixing nozzle to bottom of hole. Fill hole to 3/4 the hole depth slowly, ensuring no air pockets form.
4. Insert **Ramset™** ChemSet™ Anchor Stud/rebar to bottom of hole while turning.
5. Allow Chemset™801 Xtrem™ XC² to cure as per setting times.
6. Attach fixture.

Recommended Installation Temperatures

	Minimum	Maximum
Substrate	5°C	40°C
Adhesive	5°C	40°C

Service Temperature Limits

-40°C to 80°C

Setting Times

Temperature of base material	Gel Time	Curing time in dry concrete	Curing time in wet concrete
+5°C	60 min	240 min	480 min
6°C - 10°C	40 min	180 min	360 min
11°C - 20°C	15 min	120 min	240 min
21°C - 30°C	8 min	90 min	180 min
31°C - 40°C	4 min	60 min	120 min
Note: Cartridge temperature minimum +5°C			

ChemSet™ 801 Xtrem™ XC²

FIRE RATED CHEMICAL ANCHOR

Installation and fire performance details: ChemSet™ 801 Xtrem™ XC² and Gr 8.8 Typical Threaded Rod

Anchor size, d_b (mm)	Installation Details				Optimum dimensions*			Characteristic values of resistance to tension loads in 20 MPa to 50 MPa concrete strength - $N_{Rk,s,fi}$ (kN) per anchor *			
	Drilled hole diameter, d_h (mm)	Fixture hole diameter, d_f (mm)	Anchor effective depth, h (mm)	Tightening torque, T_r (Nm)	Edge distance, e_c (mm)	Anchor spacing, a_c (mm)	Concrete substrate thickness, b_m (mm)	Fire reistance duration = 30 Min.	Fire reistance duration = 60 Min.	Fire reistance duration = 90 Min.	Fire reistance duration = 120 Min.
M10	12	12	90	20	135	270	120	2.33	1.68	1.04	0.71
M12	14	14	110	40	165	330	140	3.10	2.44	1.79	1.46
M16	18	18	125	95	187	375	160	5.77	4.54	3.33	2.72
M20	22	22	150	180	225	450	190	9.01	7.09	5.2	4.24
			170		255	510	220				
M24	26	26	160	315	240	480	200	12.9	10.21	7.49	6.11
			210		315	630	270				
M30	35	33	280	650	420	840	350	20.62	16.23	11.91	9.71

*Note:
Data is valid for Grade 8.8 Typical Threaded only or ChemSet™ Anchor Stud Xtrem™
Data applies to uncracked and cracked reinforced concrete
Data applies to a one-sided fire exposure of the structural elements. For conditions of fire load on several sides, please contact your local Ramset™ engineer
Data is based on concrete cylinder strength between 20 MPa to 50 MPa.

DESCRIPTION AND PART NUMBERS

Description	Cartridge Size	Part No.
ChemSet™ 801 Xtrem™ XC²	750ml	C801X750 (AU & NZ)
ChemSet™ 801 Xtrem™ XC²	380ml	C801X380 (AU Only)

ENGINEERING PROPERTIES

ChemSet™ Anchor Studs and Threaded Rod

Anchor Size, d_b	Grade 8.8 Threaded Rod			
	Shank diameter, d_s (mm)	Stressed Area (mm²)	Yield Strength f_y MPa	UTS f_u MPa
M10	8.6	58	640	800
M12	10.4	84.3	640	800
M16	14.1	157	640	800
M20	17.7	245	640	800
M24	21.2	353	640	800
M30	26.7	561	640	800