Fixing Design Guide

MECHANICAL ANCHORS • CHEMICAL ANCHORS • REBAR FIXINGS
LIGHTWEIGHT ANCHORS • INSULATION ANCHORS

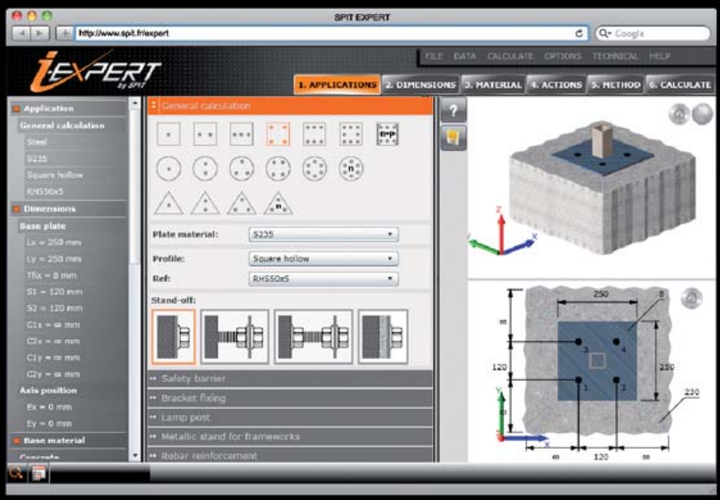
i-EXPERT by SPIT

Issue 2015-2016

SPIT ANCHOR SOFTWARE

i-EXPERT by SPIT

Interface 3D



A userfriendly 3D visual interface

The new one I-Expert software allows you to create 3D design models of all your applications:

- Rectangular, circular, triangular base plates;
- Predefined applications such as safety barriers, brackets, lamp post, metallic stand for framework;
- Post installed rebar connections;

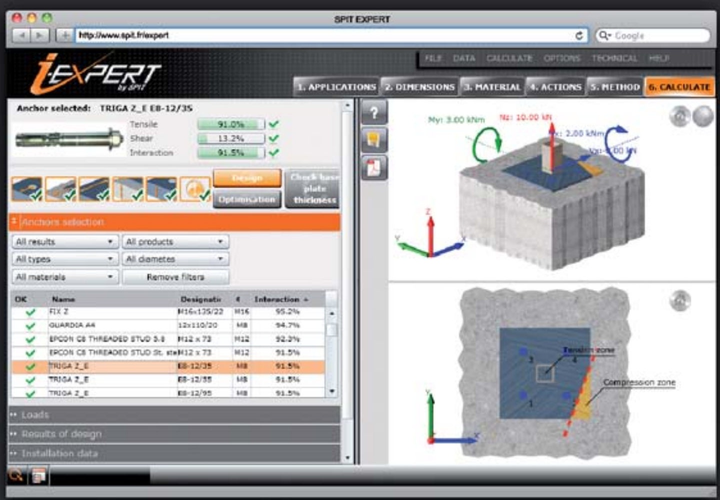
A logical and intuitive interface

A logical and intuitive interface

The main menu guides you through the easy to follow steps:

- Selection of the application,
- Definition of the dimensions of the base plate,
- Defintion of thee concrete base material and the environmental conditions,
- Data input of combined forces ie : tensile, shear, bending moment, torsion moment…

A userfriendly result display

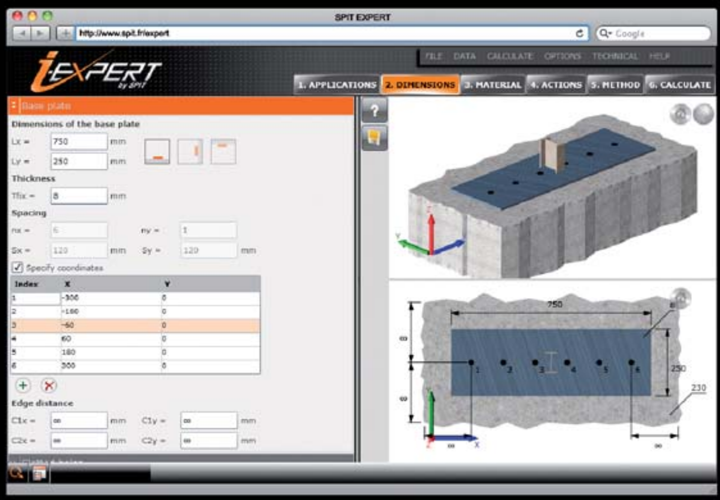


A userfriendly result display

From the resulting display, by using filter you can select the optimal anchor, have access to the resistance tables for the group of anchors, the installation data and edit the calculation sheet in PDF format.

You can also select one anchor and run the manual and automatic optimisation program.

Custom mode



WITH THE CUSTOM MOD, I-EXPERT HAS NO LIMITS

It gives the possibility to design applications with unlimited fixings and defines the position coordinates of each anchors

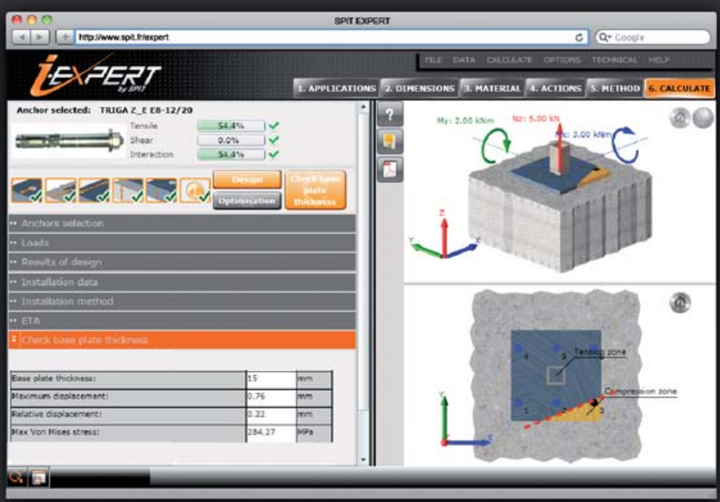
Calculation method

EUROPEAN CALCULATION METHOD

The new I-Expert software allows you to design according to the following calculation methods :

- Design according to ETAG 001 Annex C (Amended September 2010);
- Design according to Technical Report TR029 (amended September 2010) for chemical anchors with variable embedment);
- Design resistance to fire according to Technical report TR020;
- Design of anchorage under seismic actions according to TR045 technical report;
- Design rebar reinforcement according to Eurocode 2, including the possibility to design to fire and seismic actions (DTA 3/11-684).

Checking of the base plate thickness



FINITE ELEMENTS CALCULATION

I-EXPERT software offers the possibility of creating a design model of the base plate using finite elements in order to check that it is thick enough to guarantee its rigidity.

Index

Foreword

The anchor design is carried out according to Method A of ETAG for metallic anchors - Annex C.

This method takes into account the direction of stresses, the different failure types. This method is very precise but as a consequence of that demands a lot of time to make the design calculations.

In order to make the design calculation easier for our users, this technical guide proposes an approximate «method CC» (Concrete Capacity). This method uses the technical specifications stipulated in the ETA's or the SPIT specifications based on the assessment system of the ETAG.

	Anchor diameter	INOX STAINLESS STEEL Stainless steel	ETE CE Evaluation Technique Européenne Approvals	Crack concrete	XTREM Seismic
MECHANICAL ANCHORS					
TRIGA Z XTREM	M6 - M20		ETA 05/0044	●	●
TRIGA Z - A4	M8 - M16	●		●	
GUARDIA	M12	●	ETA 07/0047		
FIX Z XTREM	M8 - M20		ETA 15/0388	●	●
FIX Z - A4	M8 - M16	●	ETA 04/0010	●	
FIX3	M6 - M20		ETA 13/0005		
FIX II HDG	M8 - M16				
TAPCON II & III	Ø6 - Ø10	●	ETA 11/0071 ETA 11/0073	●	
GRIP & GRIP L	M6 - M16		ETA 05/0053		
GRIP SA A4	M6 - M16	●	ETA 06/0268		
PRIMA	M6 - M12		SOCOTEC KX 0827		
UNI	M6 - M12		SOCOTEC NPO 088		
DYNABOLT	M6 - M12				
CHEMICAL ANCHORS					
EPCON C8 XTREM	M8 - M30	●	ETA 10/0309	●	
EPOMAX - tiges	M8 - M30	●	ETA 05/0111		
EPOMAX - ATP	M8 - M20	●	ETA 05/0111		
MULTIMAX	M8 - M24	●	ETA 13/0435		
C-MIX PLUS	M8 - M16		SOCOTEC YX0006		
MAXIMA	M8 - M30	●	ETA 03/0008		
CHEMICAL REBARS					
EPCON C8 XTREM	Ø8 - Ø40		ETA 07/0189	●	●
EPOBAR/EPOMAX	Ø8 - Ø32		ETA 08/0201	●	
MULTIMAX	Ø8 - Ø20		ETA 13/0436		

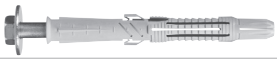
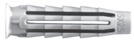
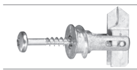
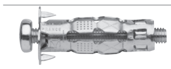
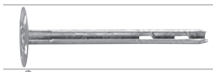
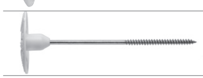
Anchor selection guide

General

Fire resistance	Waterproof	Concrete	Stone/Solid concrete block/ Solid brick	Hollow concrete blok/ Hollow brick	Plasterboard	Aerated concrete	Beam slab	Page
●		●						28
		●						34
		●						38
●		●						42
●		●						48
		●						52
		●						56
●		●						60
●		●	●			●	●	64
		●	●					68
		●	●	●		●	●	72
		●	●					76
		●	◊				●	78
	●	●	●					82
	●	●	●	●				98
	●	●	●					104
	●	●	●	●				108
	●	●	●	●		◊		113
	●	●	●					114
●	●	●						118
●	●	●						126
	●	●						134

● SUITABLE ◊ POSSIBLE USE

Anchor selection guide

		Anchor diameter	Stainless steel	Approvals	Crack concrete	Seismic
LIGHT WEIGHT ANCHORS						
	**HIT M & HIT M A2**	Ø5 - Ø8	●	ETA 06/0032		
	**B-LONG**	Ø8 - Ø10	●	ETA 13/1068		●
	**PROLONG**	Ø10 - Ø16		ETA 11/1035		
	**L**	M10				
	**PRO6**	Ø5 - Ø14				
	**UDZ**	Ø6		ETA 05/0038		
	**P6**	Ø6				
	**G8**	Ø8				
	**RM6**	M6				
	**LAITON**	M4 - M8				
	**DRIVA CLICK**	Ø4,5				
	**DRIVA PLUS**	Ø4,5				
	**DRIVA**	Ø4,5				
	**DRILL**	Ø3,0				
	**ZENTECH / CC**	M4 - M6				
	**NYL**	Ø5 - Ø14				
	**ARPON**	M6 - M8				
INSULATION ANCHORS						
	**ISO-N**	Ø8		ETA 13/0094		
	**ISO-S**	Ø8		ETA 13/0560		
	**ISO**	Ø10		ETA 04/0076		
	**CB & BR**	Ø8				
	**ISOMET**	Ø8	●	SOCOTEC PT 3043		
	**ISOMET CC**	Ø12				
	**ISOWOOD**	Ø4,5				

Anchor selection guide

General

Fire resistance	Waterproof	Concrete	Stone/Solid concrete block/ Solid brick	Hollow concrete blok/ Hollow brick	Plasterboard	Aerated concrete	Beam slab	Page
		●	●	●	●	●		136
●		●	●	●	◊	●		138
●		●	●	●	◊			140
●		●	◊					141
		●	●	●	●			142
●		●						143
●		●						144
●		●						144
		●	●	●				145
		●	●					145
					●	●		146
					●			146
					●			147
					●			147
				●	●			148
		●	●	●		●		149
		●	●	●		●		149
		●	●	●				150
		●	●	●				151
		●	●	●				152
		●	●	◊				153
●		●	●	◊				154
●				●	●		●	155
		Base material : **wood only**						156

● SUITABLE ◊ POSSIBLE USE

Type of anchors

Torque controlled expansion anchor - type A

The expansion is achieved by a torque acting on the screw or bolt, the intensity of the anchorage is controlled by this torque.

Hammer set expansion anchor - type B

The expansion is achieved by impacts acting on a sleeve or cone. In the case of the SPIT GRIP anchor, the sleeve is expanded by driving in the cone, the anchorage being controlled by the length of travel of the cone.

Undercut anchors - type C

Undercut anchors are anchored by mechanical interlock provided by an undercut in the concrete. The undercutting can be achieved by hammering or rotating the anchor sleeve into a drilled undercut hole, or by driving the anchor sleeve onto the tapered bolt in a cylindrical hole.

Bonded anchors - type D

Bonded anchors are anchored in drilled holes by bonding the metal parts to the sides of the drilled hole with a resin mortar. Tensile loads are transmitted to the concrete via bond stresses between the metal parts and the resin, and the resin and the concrete face of the drilled hole.

Light weight plastic anchors

Plastic sleeves are expanded by hammering or screwing in the expansion element which presses the sleeve against the wall of the drilled hole. The expansion element could be a nail or a screw.

ETAG

Part and application range for each anchor type

Suitable anchors type	ETA Guideline number	Application range
TORQUE CONTROLLED EXPANSION ANCHORS	ETAG n° 001 Part 2	Applications for concrete with high risk level • «actual» risk of loss of human life • serious economic consequences • affect fitness of the structure to fulfil its functions Applications for concrete with limited risk level • «negligible» risk of human life • low economic consequences • localized damages
UNDERCUT ANCHORS	ETAG n° 001 Part 3	
HAMMER SET EXPANSION ANCHORS	ETAG n° 001 Part 4	
BONDED ANCHORS: embedded parts may be threaded rod, internal threaded socket	ETAG n° 001 Part 5	
RESISTANCE UNDER SEISMIC ACTIONS	TR n° 045	• Design of metal anchors for use in concrete under seismic actions
TORQUE CONTROLLED EXPANSION ANCHORS UNDERCUT ANCHORS HAMMER SET EXPANSION ANCHORS BONDED ANCHORS	ETAG n° 001, Part 6	Anchors for multiple use in non-structural applications (typical example include pipework,ductwork and cable tray)
BONDED ANCHORS	TR029-Design method	• Design of bonded anchors
RESISTANCE TO FIRE	TR n° 020	Evaluation of anchorages in concrete concerning resistance to fire.
BONDED ANCHORS : Post-installed rebar connections	TR n° 023 Technical Report for post-installed Rebar Connections	Application for rebar connections designed in accordance with Eurocode 2
BONDED ANCHORS : for masonries	ETAG n° 029	ETAG of metal injection anchors for use in masonry
LIGHT WEIGHT PLASTIC ANCHORS	ETAG n° 014	Anchors for fixing external thermal insulation composite systems with rendering
LIGHT WEIGHT PLASTIC ANCHORS	ETAG n° 020	ETAG of plastic anchors for multiple use in concrete and masonry for non-stuctural applications

ETAG options

Option n°	Cracked and non cracked	Non cracked only	C20/25 only	C20/25 to C50/60	One value F_{Rk}	F_{Rk} according to direction	C_{cr}	S_{cr}	C_{min}	S_{min}	Design method
1	•			•		•	•	•	•	•	A
2	•		•			•	•	•	•	•	
3	•			•	•		•	•	•	•	B
4	•		•		•		•	•	•	•	
5	•			•	•		•	•			C
6	•		•		•		•	•			
7		•		•		•	•	•	•	•	A
8		•	•			•	•	•	•	•	
9		•		•	•		•	•	•	•	B
10		•	•		•		•	•	•	•	
11		•		•	•		•	•			C
12		•	•		•		•	•			

Safety concept

Design method according to ETA guideline

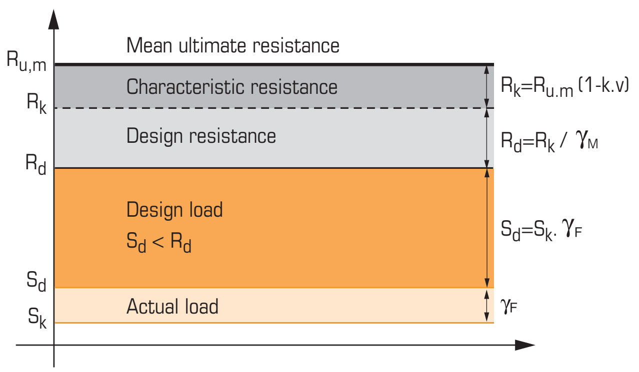
General

For the design of anchorages according to method A of the guideline ETAG 0001, the safety concept of partial safety factors shall be applied at the ultimate limit state. It shall be shown that the value of the design action $\mathbf{S_d}$ does not exceed the value of the design resistance $\mathbf{R_d}$

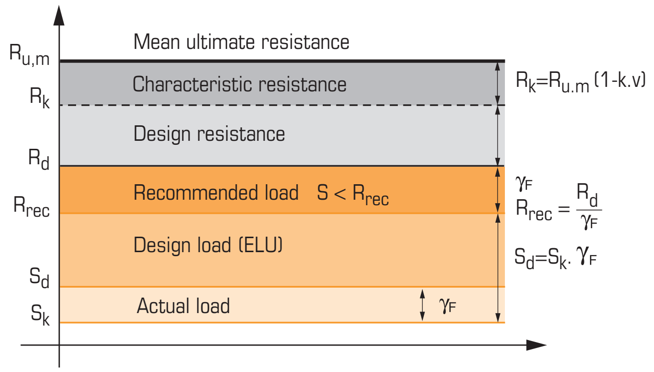
$$S_d \leq R_d$$

Principle of partial safety concept

Case of ultimate limit state



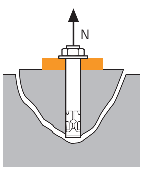
Case of serviceability limit state



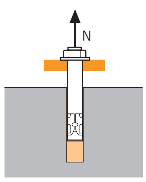
Different types of failure mode

According to the method A of the guideline ETAG 0001, the proof of the resistance must be carried out for each following types of failures in tensile and shear load. The purpose of differentiating these failure modes, is to be able to apply an appropriate safety factor as a function of the specific failure mode.

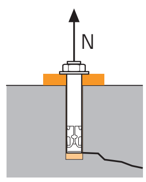
Tensile load



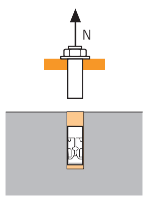
Concrete cone failure



Pull-out failure

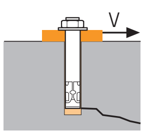


Splitting failure

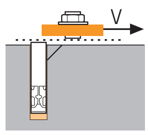


Steel failure

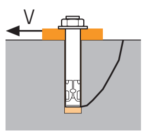
Shear load



Concrete edge failure



Steel failure



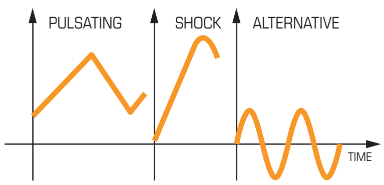
Pryout failure

Type of loads

Static or quasi-static loads

The static or quasi-static loads are dead loads of the element fixed, permanent and variable actions as wind, snow …

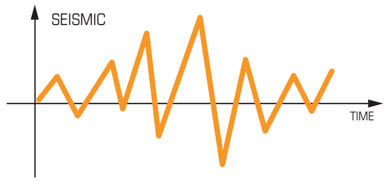
Dynamic loads



The dynamic loads are variable actions in time with a medium or high amplitude. For example, motor vibration, regular shock …

Some dynamic loads could be considered as quasi-static loads (wind …).

Seismic loads



The seismic loads are calculated using the acceleration spectrum of the seismic zone, according to Eurocode 8.

Design action calculation

The design actions for tensile and shear load in the ultimate limit state are calculated according to Eurocode 2 or 3.

- **In the simplest case**

(permanent load «G» and one variable load «Q»), the design load is calculated as follows:

$$Sd = 1.35 \times G + 1.5 \times Q$$

The factor 1,35 and 1,5 are the partial safety factor applied on the action.

For simplification, in this book we have adopted the safety factor : $\gamma_F = 1{,}4$:

$$Sd = \gamma_F Sk$$

with $\gamma_F = 1{,}4$
$Sk = G + Q$

- **Other cases**

The variable loads can be influenced by wind, or / and snow.
To calculate these actions in ultimate limit state, we will take the most unfavourable of the following actions combined.
Details on Eurocode 1 for the loading codes.

	Permanent load	Variable load			
		One with its characteristic value		Others with combination value	
U.L.S.	1.35 G	+	1.5 Q_B	+	1.2 W
	1.35 G	+	1.5 W	+	1.3 Ψ_0 Q_B
	1.35 G	+	1.5 Sn	+	1.3 Ψ_0 Q_B

Symbols : **G** = permanent load
Q_B = imposed load
W = wind load
Sn = snow load
Ψ_0 = 0,77 or all premises, except record offices and parking.
If the basic variable action is the snow, Ψ_0 is increase by 10%

Seismic performance of anchors

Seismic performance categories C1 and C2

The seismic performance of anchors subjected to seismic loading is categorized by performance categories C1 and C2. Seismic performance category C1 provides anchor capacities only in terms of resistances at ultimate limit state, while seismic performance category C2 provides anchor capacities in terms of both resistances at ultimate limit state and displacements at damage limitation state and ultimate limit state.

Table below relates the seismic performance categories C1 and C2 to the seismicity level and building importance class. The level of seismicity is defined as a function of the product **a_g.S**, where **a_g** is the design ground acceleration on Type A ground and S the soil factor both in accordance with EN 1998-1.

The value of **a_g** or that of the product **a_g.S** used in a Member State to define thresholds for the seismicity classes may be found in its National Annex of EN 1998-1 and may be different to the values given in Table below. Furthermore, the assignment of the seismic performance categories C1 and C2 to the seismicity level and building importance classes is in the responsibility of each individual Member State.

Category	European requirement according to TR 045 Technical Report	Assessment of tests according to ETAG 001 - Annex E
Category C1	for non-structural applications	Alternative tests in cracked-concrete (crack widths 0,5 mm)
Category C2	for structural and non-structural applications	Tests of increased severity with varying crack widths, simulating earthquake (crack widths 0,8 mm)

Recommended seismic performance categories for metal anchors

Seismicity level[a]		Building importance class acc. to EN 1998-1:2004, 4.2.5			
Class	**a_g.S[c]**	**I**	**II**	**III**	**IV**
Very low[b]	**$a_g.S \leq 0{,}05$ g**	**No additional requirement**			
Low[b]	**$0{,}05 \text{ g} < a_g.S \leq 0{,}10$ g**	**C1**	**C1[d] or C2[e]**		**C2**
> Low	**$a_g.S > 0{,}10$ g**	**C1**	**C2**		

[a] The values defining the seismicity levels are may be found in the National Annex of EN 1988-1.
[b] Definition according to EN 1998-1:2004, 3.2.1.
[c] ag = design ground acceleration on Type A ground (EN 1998-1:2004, 3.2.1),
S = soil factor (see e.g. EN 1998-1:2004, 3.2.2).
[d] C1 for Type 'B' connections (see TR045 §5.1) for fixings of non-structural elements to structures
[e] C2 for Type 'A' connections (see TR045 § 5.1) for fixings structural elements to structures

Class	Building type
I	Buildings and structures that normally are not subject to human occupancy (e.g., equipment storage sheds, barns, and other agricultural buildings) and that do not contain equipment or systems necessary for disaster response or hazardous materials..
II	Most buildings and structures of ordinary occupancy (e.g., residential, commercial, and industrial buildings) except those buildings contained in other categories (less than 300 people, building high ≤ 28 m).
III	Buildings and structures that: • Have large numbers of occupants (more than 300 people, building high ≥ 28 m) e.g., high-rise office buildings,sports arenas, and large theaters... • Shelter persons with limited mobility (e.g., jails, schools, andsome healthcare facilities); • Support lifelines and utilities important to a community's welfare; • Contain materials that pose some risk to the public if released.
IV	Buildings and structures that: • Are essential to post-earthquake response (e.g., hospitals, police stations, fire stations, and emergency communications centers) • House very large quantities of hazardous materials.

Symbols used

Actions

S_k — Action on the anchor at the serviceability limit state (ELS)

S_d — Action on the anchor at the ultimate limit state (ELU)

Resistance of the anchor

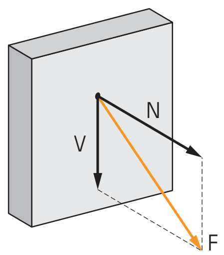
$R_{u,m}$ — Mean ultimate resistance

R_k — Characteristic resistance

R_d — Design resistance

F_{rec} — Recommended resistance

Type of load



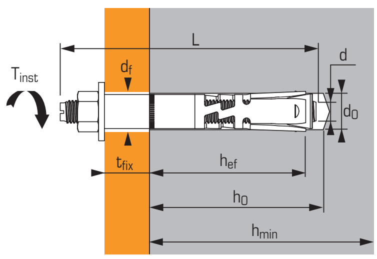
N — Tensile force (N_{Sd}, $N_{Ru,m}$, N_{Rk}, N_{Rdp}, N_{Rds}, N_{Rdc}, N_{rec})

V — Shear force (V_{Sd}, $V_{Ru,m}$, V_{Rk}, V_{Rds}, V_{Rdc}, V_{rec})

F — Oblique force (F_{Sd}, $F_{Ru,m}$, F_{Rk}, F_{Rds}, F_{Rdc}, F_{rec})

M — Bending moment (M_{Rk}, M_{Rec})

Anchors



h_{ef} — Effective anchorage depth

h_{nom} — Embedment depth in the concrete

h_0 — Drilling depth

d — Thread diameter

d_0 — Drilling diameter

d_f — Clearance hole diameter in the part to be fixed

d_{nom} — External diameter of the anchor

L — Total anchor length

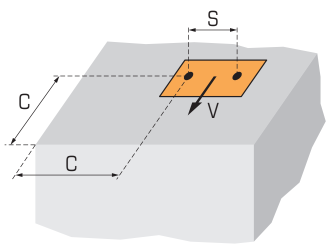
l_2 — Threaded length

T_{inst} — Required setting torque

t_{fix} — Thickness of the part to be fixed

h_{min} — Minimum thickness of base material

Distances



S — Distance between 2 anchors

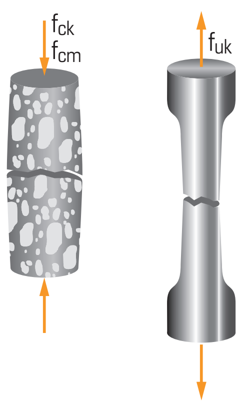
S_{cr} — Spacing for ensuring the realisation of the characteristic resistance

S_{min} — Minimum allowable spacing

C_{min} — Minimum allowable edge distance

$C_{cr,N}$ — Edge distance for ensuring the realisation of the characteristic tensile resistance

Concrete and steel



f_{cm} — Average concrete compression strength

f_{ck} — Characteristic concrete compression strength

f_{uk} — Characteristic steel ultimate strength

f_{yk} — Characteristic yield strength

Design resistance

Calculation of the design resistance

The design value of resistance R_d, in any direction and for all type of failure, is calculated from the characteristic resistance and the partial safety factor.

$$R_d = \frac{R_k}{\gamma_M}$$

with R_k : characteristic resistance of the anchor

γ_M : partial safety factor depends on the type of failure

Characteristic resistance

- The characteristic load of the anchor for concrete cone failure, in any direction, is calculated from the average value of the mean failure load for the single anchor, without the effect of spacing and edges. The characteristic load corresponds to the 5% - fractile of failure loads for the level of confidence (90%).

$$F_{Rk} = (1- k.v) \,.\, F_{Ru,m}$$

This calculation depends on number of tests (k) and the variation coefficient of tests (v)
Example : for a number of tests equal to 10 anchors, we can take k = 2,568.

- The characteristic load of steel failure are calculated as follows :

• For tensile load:

$N_{Rk,s} = A_0.f_{uk}$ [N]

A_0: min cross section [mm²]

f_{uk}: min tensile strength [N/mm²]

• For shear load:

$V_{Rk,s} = 0{,}5.A_S.f_{uk}$[N]

A_s: stressed cross section [mm²]

f_{uk}: min tensile strength [N/mm²]

Calculation of partial safety factor

- **For concrete cone failure:** $\gamma_{Mc} = \gamma_c \,.\, \gamma_1 \,.\, \gamma_2$

γ_c: Partial safety factor for concrete under compression :γ_c = 1,5
γ_1: Partial safety factor taking account of the scatter of the tensile strength of site concrete.
$\gamma 1$ =1 for concrete produced and cured with normal care (EUROCODE 2 chap. 7)
γ_2: Partial safety factor taking into account of the installation safety* of an anchor system

Tensile load:
γ_2 = 1 for systems with high installation safety*,
γ_2 = 1,2 for systems with normal installation safety*,
γ_2 = 1,4 for systems with low but still acceptable installation safety*.

Shear load:
γ_2 = 1

- **For steel failure:** γ_{Ms}

Tensile load:

• $\gamma_{Ms} = \frac{1{,}2}{f_{yk}/f_{uk}} \geq 1{,}4$

Shear load:

• $\gamma_{Ms} = \frac{1{,}0}{f_{yk}/f_{uk}} \geq 1{,}25$ with $f_{uk} \leq 800$ N/mm² and $f_{yk}/f_{uk} \leq 0{,}8$

• γ_{Ms} = 1,5 with $f_{uk} > 800$ N/mm² or $f_{yk}/f_{uk} > 0{,}8$

(*) Installation safety means the influence of installation defects, such as diameter of drilled hole, cleaning of the hole, intensity of anchorage and striking the reinforcement during drilling.

Flowchart

In this guide, we use the calculation method SPIT-CC (Concrete capacity). It is a simplified method extracted from the method A as detailed in the Annexe C of the ETA guideline.

Tensile resistance

Pull out failure

$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$	Design resistance for pull-out failure
f_b	Factor taking into account the concrete strength

Concrete cone failure

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$	Design resistance at the ultimate limit state for one anchor without influence of spacing and distance from the edge concrete
f_b	Factor taking into account the concrete strength
Ψ_s	Factor taking into account the influence of spacing
$\Psi_{c,N}$	Factor taking into account the influence of distance from the edge concrete

Steel failure

$N_{Rd,s}$	Design resistance at the ultimate limit state for steel failure

$N_{Rd} = \min(N_{Rd,p}\ ;\ N_{Rd,c}\ ;\ N_{Rd,s})$

$\beta_N = N_{Sd} / N_{Rd}$

Shear resistance

Concrete edge failure

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c}$	Design resistance at the ultimate limit state for one anchor placed at C_{min} from edge concrete
f_b	Factor taking into account the concrete strength
$f_{\beta,V}$	Factor taking into account the influence of shear loading direction.
$\Psi_{S\text{-}C,V}$	Factor taking into account the influence of spacing between anchor and edge distance.

Pryout failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$	Design resistance at the ultimate limit state for pryout failure
f_b	Factor taking into account the concrete strength
Ψ_s	Factor taking into account the influence of spacing
$\Psi_{c,N}$	Factor taking into account the influence of distance from the edge concrete

Steel failure

$V_{Rd,s}$	Design resistance at the ultimate limit state for steel failure

$V_{Rd} = \min(V_{Rd,c}\ ;\ V_{Rd,cp}\ ;\ V_{Rd,s})$

$\beta_V = V_{Sd} / V_{Rd}$

Combined load

$\beta_N = N_{Sd} / N_{Rd} \le 1$

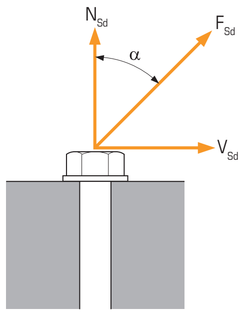
$\beta_V = V_{Sd} / V_{Rd} \le 1$

$\beta_N + \beta_V \le 1{,}2$

The anchor is suitable for your application

Combined load

The combined load F_{Sd} with an angle α is obtained by:

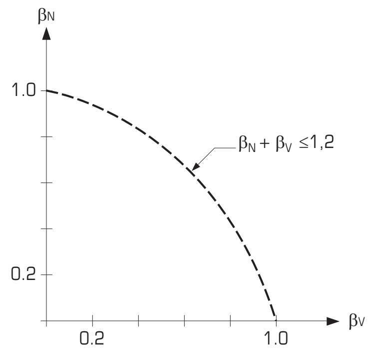


$$F_{Sd} = \sqrt{(N_{Sd})^2 + (V_{Sd})^2} \qquad \alpha = \arctan (V_{Sd}/N_{Sd})$$

with N_{Sd}: action in tensile direction ($N_{Sd} = F_{Sd} \times \cos \alpha$)
V_{Sd}: action in shear direction ($V_{Sd} = F_{Sd} \times \sin \alpha$)

To verify the resistance for a combined load with the method CC, we proceed as follows :

- the tensile resistance: $\beta_N = N_{Sd} / N_{Rd} \leq 1$
- the shear resistance: $\beta_V = V_{Sd} / V_{Rd} \leq 1$
- the combined load with the following interactive equation: $\beta_N + \beta_V \leq 1{,}2$



Using CC methodology

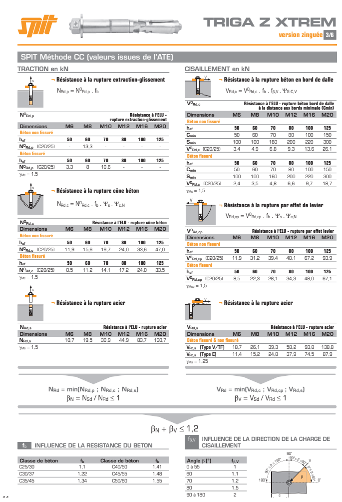
This simplified method is based on the principle of Method A from ETAG – Annex C, without taking into account splitting and pryout failure. This method was simplified to retain as much as possible of the ETAG method, whilst including as much of the latest approach as possible.

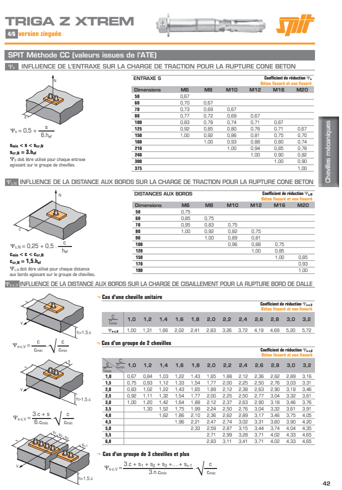
In this technical guide, for each product covered by the calculation method CC, you will find 4 pages:

- Pages 1/4 and 2/4 give the general technical data on the product and the performance of the product
- Pages 3/4 and 4/4 contain data to design according to this method.

Page 3/4 gives the design resistance Rd for each type of failure, this data is calculated with the characteristic resistance (R_k) and the safety partial factor (γ_M) given in the ETA (if the anchor has CE marking), or from the product evaluation according to ETAG carried out by SPIT.

Page 4/4 gives the factors (Ψ_S, $\Psi_{C,N}$ et $\Psi_{S\text{-}C,V}$) to be used in the calculation for concrete cone failure in tensile and shear load to take into account the influence of spacing and distance from edge.

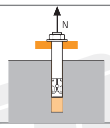
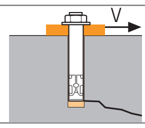
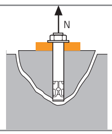
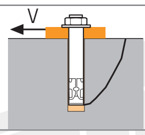




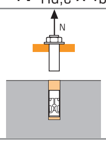
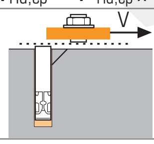
Using CC methodology

Photocopy this form and insert figures for your calculation

Project Description :

TENSILE LOAD		SHEAR LOAD	
Ultimate design action N_{Sd}	**kN**	**Ultimate design action V_{Sd}**	**kN**
 **Pull-out failure**		 **Edge concrete failure** (do not take into account for group of anchors without edge infuence)	
☐ Non-cracked concrete ☐ Cracked concrete		$V^0_{Rd,c}$ for Cmin =	kN
		Concrete class : f_b	
$N^0_{Rd,p}$	kN	Shear direction : $f_{\beta,V}$	
Concrete class: f_b		**Distance C :** Edge distance in the direction of shear load, otherwise the edge distance in the direction perpendicular to shear load	
$N_{Rd,p} = N^0_{Rd,p} \times f_b$	kN	Case of single anchor fastening C = C / Cmin = $\Psi_{S\_C,V}$ = Case of 2 anchors fastening C = C / Cmin = $\Psi_{S\_C,V}$ = S = S / Cmin = Case of 3 anchors fastening $\Psi_{S\_C,V} = \frac{3.c + S_1 + S_2 + S_3 + ... + S_{n-1}}{3.n.c_{min}} \sqrt{\frac{C}{C_{min}}}$ C = S1 = $\Psi_{S\_C,V}$ = S2 = S3 =	
		$V_{Rd,c} = V^0_{Rd,c} \times f_b \times f_{\beta,V} \times \Psi_{S\_C,V}$	kN
 **Concrete cone failuree**		 **Pryout failure**	
$N_{Rd,c}$	kN	$V^0_{Rd,cp}$	kN

Concrete class:	f_b	
Spacing and edge distance	Reduction factor	
s1 =	Ψ_{s1}	
s2 =	Ψ_{s2}	
s3 =	Ψ_{s2}	
C1 =	$\Psi_{C1,N}$	
C2 =	$\Psi_{C2,N}$	
C3 =	$\Psi_{C3,N}$	
C4 =	$\Psi_{C4,N}$	

$N_{Rd,c} = N^0_{Rd,c} \times f_b \times \Psi_{s1} \times .... \times \Psi_{s3} \times \Psi_{C1,N} \times .... \times \Psi_{C4,N}$	kN	$V_{Rd,cp} = V^0_{Rd,cp} \times fb \times \Psi_{s1} \times .... \times \Psi_{s3} \times \Psi_{C1,N} \times ... \times \Psi_{C4,N}$	kN
 **Steel failure**		 **Steel failure**	
$N_{Rd,s}$	kN	$V_{Rd,s}$	kN
Ultimate design resistance N_{Rd} **$N_{Rd} = \min(N_{Rd,p} ; N_{Rd,c} ; N_{Rd,s})$**	kN	**Ultimate design resistance V_{Rd}** **$V_{Rd} = \min(V_{Rd,c} ; V_{Rd,cp} ; V_{Rd,s})$**	kN
$\beta_N = N_{Sd} / N_{Rd} \leq 1$		$\beta_V = V_{Sd} / V_{Rd} \leq 1$	

CCOMBINED LOAD:

$\beta_N + \beta_V \leq 1,2$*

*If bN + bV>1,1, we recommend you to check the result with the EXPERT SOFTWARE or to call our technical support

Example:

SPIT TRIGA Z V12 anchor

Project:

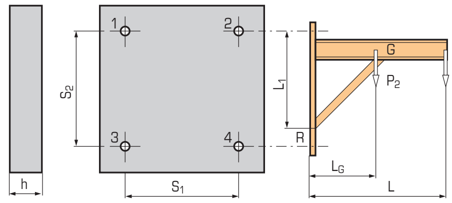
Concrete : 25 Mpa – Non cracked concrete

Thickness of base material:	200 mm
L = 1500 mm	L_g = 750 mm
S_1 = 165 mm	S_2 = 220 mm
No edge distance	
P_1 = 6 kN	P_2 = 100 kg

Design actions per anchor:

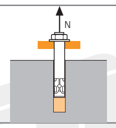
N_{Sd} = 17,8 kN

V_{Sd} = 1,75 kN



TENSILE LOAD

Ultimate design action N_{Sd}	17,8 **kN**

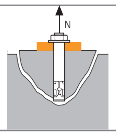


Pull-out failure

☒ Non-cracked concrete

☐ Cracked concrete

$N^0_{Rd,p}$		/ kN
Concrete class:	f_b	
$N_{Rd,p} = N^0_{Rd,p} \times f_b$		/ kN

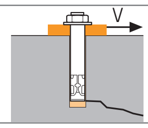


Concrete cone failuree

$N_{Rd,c}$	24 kN

SHEAR LOAD

Ultimate design action V_{Sd}	1,75 **kN**



Edge concrete failure
(do not take into account for group of anchors without edge infuence)

$V^0_{Rd,c}$ for Cmin =		/ kN
Concrete class :	f_b	/
Shear direction :	$f\beta_{,V}$	/

Distance C : Edge distance in the direction of shear load, otherwise the edge distance in the direction perpendicular to shear load

Case of single anchor fastening

C = C / Cmin = $\Psi_{S\_C,V}$ =

Case of 2 anchors fastening

C = C / Cmin = $\Psi_{S\_C,V}$ = /

S = S / Cmin =

Case of 3 anchors fastening

$$\Psi_{S\_C,V} = \frac{3.c + S_1 + S_2 + S_3 + ... + S_{n-1}}{3.n.c_{min}} \sqrt{\frac{C}{C_{min}}}$$

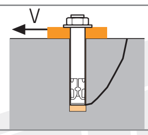
C =

S1 = $\Psi_{S\_C,V}$ =

S2 =

S3 =

$V_{Rd,c} = V^0_{Rd,c} \times f_b \times f_{\beta,V} \times \Psi_{S\_C,V}$	/ kN

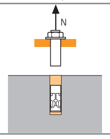


Pryout failure

$V^0_{Rd,cp}$	48 kN

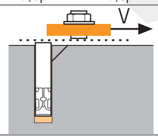
Concrete class: *C20/25*	f_b	*1*
Spacing and edge distance	Reduction factor	
s1 = *165 mm*	Ψ_{s1}	*0.84*
s2 = *220 mm*	Ψ_{s2}	*0.96*
s3 = /	Ψ_{s2}	/
C1 = /	$\Psi_{C1,N}$	/
C2 = /	$\Psi_{C2,N}$	/
C3 = /	$\Psi_{C3,N}$	/
C4 = /	$\Psi_{C4,N}$	/

$N_{Rd,c} = N^0_{Rd,c} \times f_b \times \Psi_{s1} \times .... \times \Psi_{s3} \times \Psi_{C1,N} \times .... \times \Psi_{C4,N}$	*19.35* kN
$V_{Rd,cp} = V^0_{Rd,cp} \times fb \times \Psi_{s1} \times .... \times \Psi_{s3} \times \Psi_{C1,N} \times ... \times \Psi_{C4,N}$	*38.7* kN



Steel failure

$N_{Rd,s}$	*44.9* kN
Ultimate design resistance N_{Rd}	
$N_{Rd} = \min(N_{Rd,p} ; N_{Rd,c} ; N_{Rd,s})$	*19.35* kN
$\beta_N = N_{Sd} / N_{Rd} \leq 1$	*0.92*



Steel failure

$V_{Rd,s}$	*58.2* kN
Ultimate design resistance V_{Rd}	
$V_{Rd} = \min(V_{Rd,c} ; V_{Rd,cp} ; V_{Rd,s})$	*38.7* kN
$\beta_V = V_{Sd} / V_{Rd} \leq 1$	*0.04*

COMBINED LOAD: *0.92 + 0.04 = 0.96 < 1.2*

$\beta_N + \beta_V \leq 1{,}2$* *the TRIGA Z V12 anchor is suitable for this application*

*If bN + bV>1,1, we recommend you to check the result with the EXPERT SOFTWARE or to call our technical support

Example:

SPIT FIX Z A4 M10 anchor with minimum embedment

Project:

Crack concrete - class C20/25

Thickness of base material: 200 mm

S = 105 mm

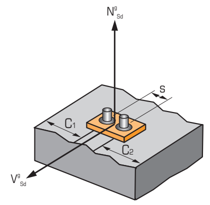
C_1 = 100 mm

C_2 = 100 mm

Design actions per anchor:

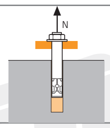
N_{Sd} = 2,5 kN

V_{Sd} = 3 kN



TENSILE LOAD

Ultimate design action N_{Sd}		*2.5* **kN**

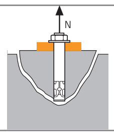


Pull-out failure

☐ Non-cracked concrete

☒ Cracked concrete

$N^0_{Rd,p}$		*4.0* kN
Concrete class:	f_b	*1.0*
$N_{Rd,p} = N^0_{Rd,p} \times f_b$		*4.0* kN

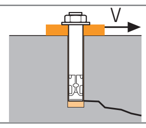


Concrete cone failuree

$N_{Rd,c}$	*6.5* kN

SHEAR LOAD

Ultimate design action V_{Sd}		*3.0* **kN**



Edge concrete failure
(do not take into account for group of anchors without edge infuence)

$V^0_{Rd,c}$ for Cmin = *65 mm*		*4.1* kN
Concrete class :	f_b	*1.0*
Shear direction :	$f_{\beta,V}$	*2.0*

Distance C : Edge distance in the direction of shear load, otherwise the edge distance in the direction perpendicular to shear load

Case of single anchor fastening

C = C / Cmin = $\Psi_{S\_C,V}$ = */*

Case of 2 anchors fastening

C = C / Cmin = *1.5* $\Psi_{S\_C,V}$ = *1.28*

S = S / Cmin = *1.6*

Case of 3 anchors fastening

$$\Psi_{S\_C,V} = \frac{3.c + S_1 + S_2 + S_3 + ... + S_{n-1}}{3.n.c_{min}} \sqrt{\frac{C}{C_{min}}}$$

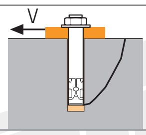
C =

S1 = $\Psi_{S\_C,V}$ = */*

S2 =

S3 =

$V_{Rd,c} = V^0_{Rd,c} \times f_b \times f_{\beta,V} \times \Psi_{S\_C,V}$	*10.5* kN

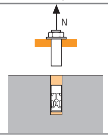


Pryout failure

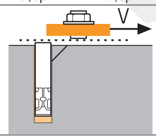
$V^0_{Rd,cp}$	*6.5* kN

Concrete class: *C20/25*	f_b	*1*
Spacing and edge distance	Reduction factor	
s1 = *105 mm*	Ψ_{s1}	*0.92*
s2 = /	Ψ_{s2}	*/*
s3 = /	Ψ_{s2}	/
C1 = *100 mm*	$\Psi_{C1,N}$	*1.0*
C2 = *100 mm*	$\Psi_{C2,N}$	*1.0*
C3 = /	$\Psi_{C3,N}$	/
C4 = /	$\Psi_{C4,N}$	/

$N_{Rd,c} = N^0_{Rd,c} \times f_b \times \Psi_{s1} \times .... \times \Psi_{s3} \times \Psi_{C1,N} \times .... \times \Psi_{C4,N}$	*5.98* kN	$V_{Rd,cp} = V^0_{Rd,cp} \times fb \times \Psi_{s1} \times .... \times \Psi_{s3} \times \Psi_{C1,N} \times ... \times \Psi_{C4,N}$	*5.98* kN



Steel failure



Steel failure

$N_{Rd,s}$	*14.4* kN	$V_{Rd,s}$	*12* kN
Ultimate design resistance N_{Rd}		**Ultimate design resistance V_{Rd}**	
N_{Rd} = min($N_{Rd,p}$; $N_{Rd,c}$; $N_{Rd,s}$)	*4.0* kN	**V_{Rd} = min($V_{Rd,c}$; $V_{Rd,cp}$; $V_{Rd,s}$)**	*5.98* kN
$\beta_N = N_{Sd} / N_{Rd} \leq 1$	*0.62*	$\beta_V = V_{Sd} / V_{Rd} \leq 1$	*0.50*

COMBINED LOAD: *0.62 + 0.50 = 1.12 < 1.2*

$\beta_N + \beta_V \leq 1,2$* *the FIX Z A4 M10 anchor is suitable for this application*

*If bN + bV>1,1, we recommend you to check the result with the EXPERT SOFTWARE or to call our technical support

Example:

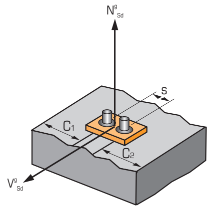
SPIT EPOMAX M12 anchor (with MAXIMA rod)

Project:
Non-cracked concrete - class C20/25
Thickness of base material: 350 mm
S = 130 mm
C_1 = 170 mm
C_2 = 170 mm
An oblique load F^g_{Sd} = 26 kN with F^g_{Sd} = 55° is applied in the middle of the base plate

Design actions per anchor:

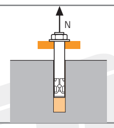
N^g_{Sd} = F^g_{Sd} x cos (55°) = 26 x cos (55°) = 14,9 kN
then per anchor N_{Sd} = 14,9 / 2 = 7,45 kN

V^g_{Sd} = F^g_{Sd} x sin (55°) = 26 x sin (55°) = 21,3 kN
then per anchor V_{Sd} = 21,3 / 2 = 10,6 kN



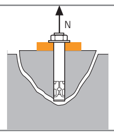
TENSILE LOAD

Ultimate design action N_{Sd}		7.45 kN



Pull-out failure

☒ Non-cracked concrete		
☐ Cracked concrete		
$N^0_{Rd,p}$		30.4 kN
Concrete class:	f_b	1.0
$N_{Rd,p} = N^0_{Rd,p} \times f_b$		30.4 kN

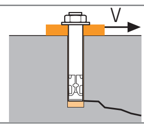


Concrete cone failuree

$N_{Rd,c}$	38.8 kN

SHEAR LOAD

Ultimate design action V_{Sd}		10.6 kN



Edge concrete failure
(do not take into account for group of anchors without edge infuence)

$V^0_{Rd,c}$ for Cmin = 65 mm		5.5 kN
Concrete class : C20/25	f_b	1.0
Shear direction :	$f_{\beta,V}$	2.0

Distance C : Edge distance in the direction of shear load, otherwise the edge distance in the direction perpendicular to shear load

Case of single anchor fastening

C = C / Cmin = $\Psi_{S\_C,V}$ = /

Case of 2 anchors fastening

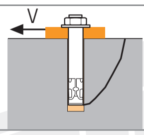
C = 170 C / Cmin = 3.09 $\Psi_{S\_C,V}$ = 3.18
S = 130 S / Cmin = 2.36

Case of 3 anchors fastening

$$\Psi_{S\_C,V} = \frac{3.c + S_1 + S_2 + S_3 + ... + S_{n-1}}{3.n.c_{min}} \sqrt{\frac{C}{C_{min}}}$$

C =
S1 = $\Psi_{S\_C,V}$ = /
S2 =
S3 =

$V_{Rd,c} = V^0_{Rd,c} \times f_b \times f_{\beta,V} \times \Psi_{S\_C,V}$	35 kN

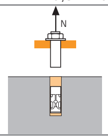


Pryout failure

$V^0_{Rd,cp}$	60.8 kN

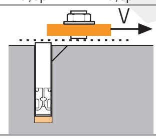
Concrete class: C20/25	f_b	1
Spacing and edge distance	Reduction factor	
s1 = 130 mm	Ψ_{s1}	0.79
s2 = /	Ψ_{s2}	/
s3 = /	Ψ_{s2}	/
C1 = 170 mm	$\Psi_{C1,N}$	1.0
C2 = 170 mm	$\Psi_{C2,N}$	1.0
C3 = /	$\Psi_{C3,N}$	/
C4 = /	$\Psi_{C4,N}$	/

$N_{Rd,c} = N^0_{Rd,c} \times f_b \times \Psi_{s1} \times .... \times \Psi_{s3} \times \Psi_{C1,N} \times .... \times \Psi_{C4,N}$	30.65 kN
$V_{Rd,cp} = V^0_{Rd,cp} \times fb \times \Psi_{s1} \times .... \times \Psi_{s3} \times \Psi_{C1,N} \times ... \times \Psi_{C4,N}$	48 kN



Steel failure (tensile)

$N_{Rd,s}$	29.8 kN
Ultimate design resistance N_{Rd}	
N_{Rd} = min($N_{Rd,p}$; $N_{Rd,c}$; $N_{Rd,s}$)	29.8 kN
$\beta_N = N_{Sd} / N_{Rd} \leq 1$	0.25



Steel failure (shear)

$V_{Rd,s}$	17.7 kN
Ultimate design resistance V_{Rd}	
V_{Rd} = min($V_{Rd,c}$; $V_{Rd,cp}$; $V_{Rd,s}$)	17.7 kN
$\beta v = V_{Sd} / V_{Rd} \leq 1$	0.60

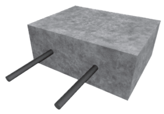
COMBINED LOAD: 0.25 + 0.60 = 0.85 < 1.2

$\beta_N + \beta_V \leq 1,2$* the EPOMAX M12 anchor is suitable for this application

*If bN + bV>1,1, we recommend you to check the result with the EXPERT SOFTWARE or to call our technical support

Concrete strength

Concrete is classified according to its compressive strength which is based on the classification per strength measured on cylinders as indicated in the NF EN 206-1 standard. For information, the table below gives an equivalence between the characteristic values and average strength on cylindrical and cubic specimens in Mpa.



Concrete classes		**Characteristic strength fck**		**Average strength**		
According to Eurocode 2	According to P18-305	Cylinder 16 x 32 cm	Cube 15 x 15 x 15 cm	Cylinder (fcm) 16 x 32 cm	Cube 15 x 15 x 15 cm	Cube 20 x 20 x 20 cm
C 16/20	B16	16	20	20	25	24
C 20/25*	B20	20	25	25	31	29
C 25/30	B25	25	30	30	37	36
C 30/37*	B30	30	37	37	46	43
C 35/45	B35	35	45	45	56	53
C 40/50*	B40	40	50	50	62	59
C 45/55	B45	45	55	55	69	65
C 50/60*	B50	50	60	60	72	68

* The most usual classes

Field of usage: cracked or non cracked concrete

Concrete can be considered as cracked for many reasons. According to the ETA Guideline, we must verify if the concrete is cracked or non cracked by calculation of stresses in the works or part of the works serving as the base material (ETA Guideline - Annex C - §4.1) :

$\sigma_L + \sigma_R \leq 0$

σ_L: Stresses in the concrete induced by external loads, including anchors loads

σ_R: Stresses in the concrete due to restraint of instrinsic imposed deformations

(e.g; shrinkage of concrete) or extrinsic imposed deformations (e.g. due to displacement of support or temperature variations). If no detailed analysis is conducted, then σ_R = 3N/mm^2 should be assumed, according to Eurocode 2.

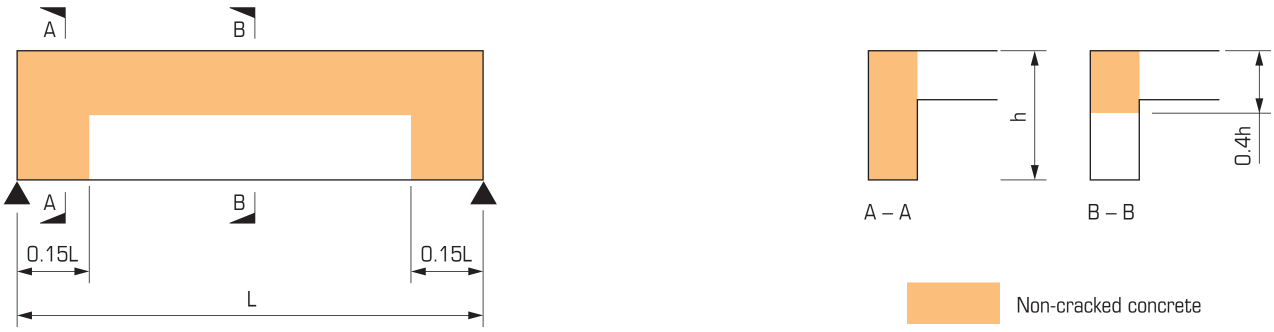
If there are no details available to make the above calculation, use the table below.

Nevertheless, it is the responsibility of the designer to check the status of the base material (cracked or non cracked).

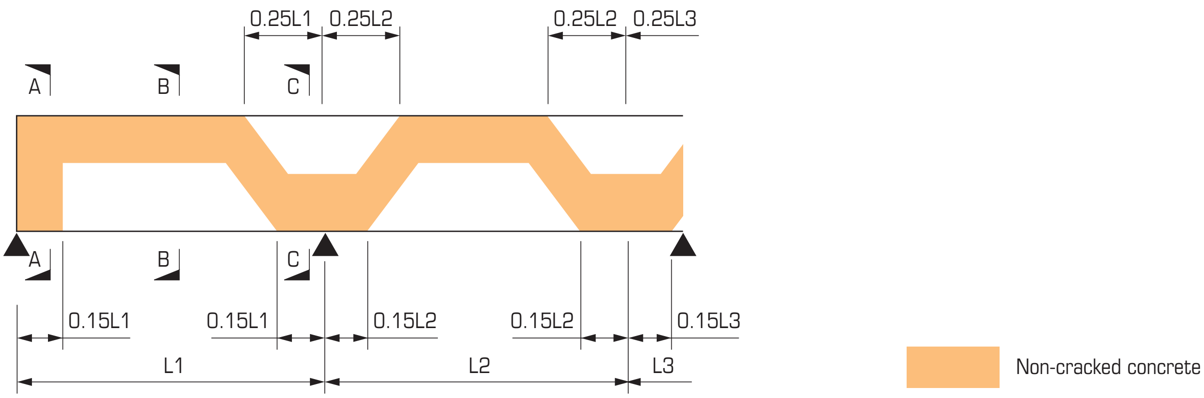
Works or parts of works used as anchoring base	**Concrete conditions**	
	Non cracked	**Cracked**
Deflected elements (slabs, longitudinal beam, firder, purlin) in reinforced concrete		X
Deflected elements (slabs, longitudinal beam, firder, purlin) in prestressed concrete	X	
Outside wall of a building in not reinforced (according to BAEL) or with reinforced skin		X
Outside wall of a building in reinforced concrete	X	
Inside wall of a building	X	
Angle or edge post		X
Inside post	X	
Base plate paving		X
Keying areas of a building made from prefabricated elements		X
Ends of deflected elements (ex: projected balcony noses)	X	
Tanking	X	

The following are examples of non-cracked locations in simple structures (issue from the technical report n° CEN/TC250/SC2/WG2 "effect of cracking" published by CEN.

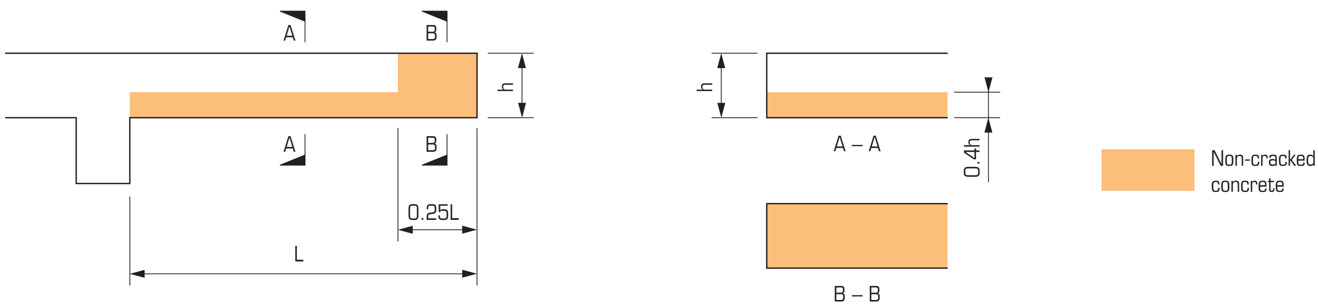
Solid slabs, beams - simply supported



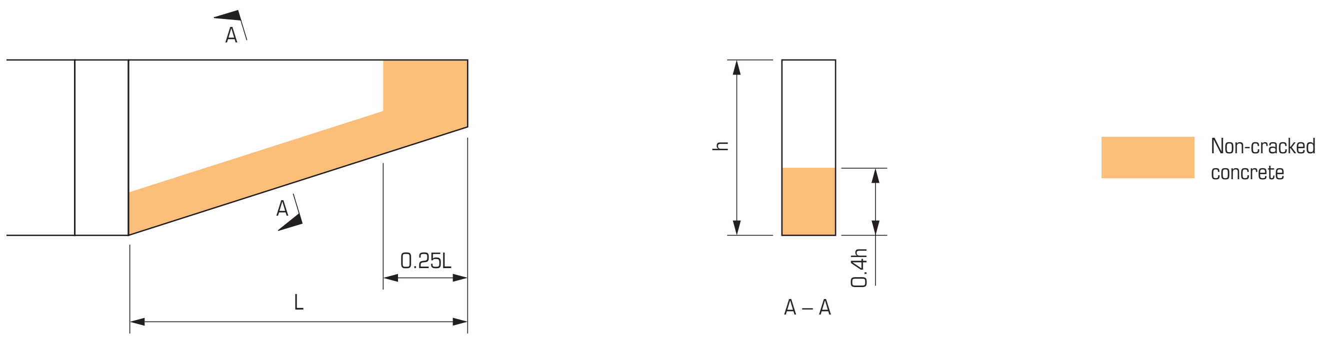
Solid slabs, beams, ribbed floors - Continuous



Cantilever slabs



Cantilever beams



Other base substrate

Perforated clay bricks
type ECO-30, not rendered or rendered
Rc = 3.7 N/mm² – 57x20x30 (cm) - NF EN 771-1

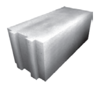
Engineer clay bricks Murbric type T20,
not rendered or rendered
Rc = 14.5 N/mm² – 20x24x50 - NF EN 771-1

Clay bricks
Rc = 55 N/mm² 22x10x5.5 (cm) NF EN 771-1

Solid concrete blocs B120
Rc = 13,5 N/mm² - 20x20x50 (cm) – NF EN 771-3

Hollow concrete block type B40,
not rendered or rendered
Rc = 6,5 N/mm² – 20x20x50 (cm) – NF EN 771-3

Plasterboard Lafarge type BA13
et BA10 + polystyren – NFP 72-302



Aerated concrete
Mvn = 500 kg/m³ – NF EN 771-4

Steel mechanical properties

Mechanical characteristics

The steel properties are determined by :
- the tensile strength f_{uk} (N/mm²),
- the yield strength f_{yk} (N/mm²).

Zinc coated steel : the standard NF EN 20898-1 gives the characteristics of studs and screws depending on the grade of steel.
Stainless steel : the standard NF EN 25100-0 gives the stainless steel characteristics.

Mechanical characteristics	Steel Grade									Stainless Steel grade A1, A2 & A4		
	3.6	4.6	4.8	5.6	5.8	6.8	8.8	10.9	12.9	50	70	80
Min. tensile strength. f_{uk} (N/mm²)	330	400	420	500	520	600	800	1040	1220	500	700	800
Min yield strength. f_{yk} (N/mm²)	190	240	340	300	420	480	640	940	1100	210	450	600

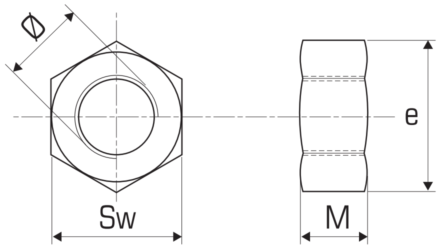
Minimum Failure loads (kN) - Iso metric thread to NF EN 20898-1

Nominal thread diameter	Thread pitch	Nominal cross section	Steel Grade									Stainless Steel A4 grade		
			3.6	4.6	4.8	5.6	5.8	6.8	8.8	10.9	12.9	50	70	80
(mm)	(mm)	As/mm²	Minimum failure load									Minimum failure load		
1.6	0.35	1.27	0.420	0.510	0.530	0.640	0.660	0.760	1.020	1.320	1.550	0.640	0,89	1.020
2.0	0.4	2.07	0.680	0.830	0.870	1.040	1.080	1.240	1.660	2.150	2.530	1.040	1,45	1.660
2.5	0.45	3.39	1.120	1.360	1.420	1.700	1.760	2.030	2.710	3.530	4.140	1.700	2,37	2.710
3.0	0.5	5.03	1.660	2.010	2.110	2.510	2.620	3.020	4.020	5.230	6.140	2.510	3,52	4.020
3.5	0.6	6.78	2.240	2.710	2.850	3.390	3.530	4.070	5.420	7.050	8.270	3.390	4,74	5.420
4.0	0.7	8.78	2.900	3.510	3.690	4.390	4.570	5.270	7.020	9.130	10.700	4.390	6,15	7.020
5.0	0.8	14.2	4.690	5.680	5.960	7.100	7.380	8.520	11.350	14.800	17.300	7.100	9,94	11.350
6.0	1.0	20.1	6.630	8.040	8.440	10.000	10.400	12.100	16.100	20.900	24.500	10.000	14,07	16.100
7.0	1.0	28.9	9.540	11.600	12.100	14.400	15.000	17.300	23.100	30.100	35.300	14.400	20,23	23.100
8.0	1.25	36.6	12.100	14.600	15.400	18.300	19.000	22.000	29.200	38.100	44.600	18.300	25,62	29.200
10.0	1.5	58.0	19.100	23.200	24.400	29.000	30.200	34.800	46.400	60.300	70.800	29.000	40,6	46.400
12.0	1.75	84.3	27.800	33.700	35.400	42.200	43.800	50.600	67.400	87.700	103.000	42.200	59,01	67.400
14.0	2.0	115.0	38.000	46.000	48.300	57.500	59.800	69.000	92.000	120.000	140.000	57.500	80,5	92.000
16.0	2.0	157.0	51.800	62.800	65.900	78.500	81.600	94.000	125.000	163.000	192.000	78.500	109,9	125.000
18.0	2.5	192.0	63.400	76.800	80.600	96.000	99.800	115.000	159.000	200.000	234.000	96.000	134,4	159.000
20.0	2.5	245.0	80.800	98.000	103.000	122.000	127.000	147.000	203.000	255.000	299.000	122.000	171,5	203.000
22.0	2.5	303.0	100.000	121.000	127.000	152.000	158.000	182.000	252.000	315.000	370.000	152.000	212,1	252.000
24.0	3.0	353.0	116.000	141.000	148.000	176.000	184.000	212.000	293.000	367.000	431.000	176.000	247,1	293.000
27.0	3.0	459.0	152.000	184.000	193.000	230.000	239.000	275.000	381.000	477.000	560.000	230.000	321,3	381.000
30.0	3.5	561.0	185.000	224.000	236.000	280.000	292.000	337.000	466.000	583.000	684.000	280.000	392,7	466.000
33.0	3.5	694.0	229.000	278.000	292.000	347.000	361.000	416.000	576.000	722.000	847.000	347.000	485,8	576.000
36.0	4.0	817.0	270.000	327.000	343.000	408.000	425.000	490.000	678.000	885.000	997.000	408.000	571,9	678.000
39.0	4.0	976.0	322.000	390.000	410.000	488.000	508.000	586.000	810.000	1020.000	1200.000	488.000	683,2	810.000

Dimensions:

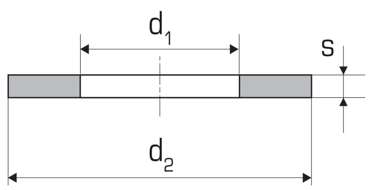
torque wrench sockets / nuts / washers

NUTS dimensions for torque wrench sockets



	NUTS according to DIN 934			NUTS according to NF EN ISO 4032		
(mm)	**Sw**	**e**	**M**	**Sw**	**e**	**M**
M6	10	11,5	5	10	11,05	5,2
M8	13	15	6,5	13	14,38	6,8
M10	17	19,6	8	16	17,77	8,4
M12	19	21,9	10	18	20,03	10,8
M16	24	27,7	13	24	26,75	14,8
M20	30	34,6	16	30	32,95	18
M24	36	41,6	19	36	39,55	21,5
M30	46	53,1	24	46	50,85	25,6

Washers: dimensions of the washers used with SPIT Products



	WASHERS according to NF EN ISO 7091			special WASHERS (used with SPIT TRIGA Z)			TRIGAZ A4		
(mm)	**d_2**	**d_1**	**s**	**d_2**	**d_1**	**s**	**d_2**	**d_1**	**s**
M6	12	6,6	1,6	18	6,7	2	18	6,3	2
M8	16	9,0	1,6	20	8,7	2	22	8,2	2
M10	20	11,0	2	26	10,5	3	28	10,5	3
M12	24	13,5	2,5	30	12,5	3	30	12,3	3
M16	30	17,5	3	40	16,7	4	-	-	-
M20	37	22,0	3	45	20,7	4	-	-	-
M24	44	26,0	4	-	-	-	-	-	-
M30	56	33,0	4	-	-	-	-	-	-

Units

Length: 1 mm = 0,1 cm = 0,0394 in (pouce)
Force: 1 kN = 100 daN = 1000 N ~ 100 kg
1 kg = 9,81 N
1 N = 0,2248 lbf (livre-force)

Concrete compressive strength:
1 Mpa = 1 N/mm2 = 10 kg/cm²
1 Mpa = 10 bars
1 N/mm2 = 149,2 lbf/in² (pound-force per square inch)

Conversion table

METRIC Units	**Symbols**	**IMPERIAL Units**	**Symbols**	**Factor conversion**	
Concrete strength					
newton per square millimeter	N/mm² (=Mpa)	livre-force per square inch	lbf/in² (=psi)	1 lbf/in2 = 0,00689 N/mm²	1 N/mm² = 145,0 lbf/in²
Tightening torque					
newton-meter	Nm	pound-force foot	lbf/ft	1 lbf ft = 1,356 Nm	1 Nm = 0,738 lbf ft
Mass					
ton	t	pound	Lb	1 lb = 0,00454 t	1 t = 220,26 lb
ton	t	ton	Ton	1 ton = 1,016 t	1 t = 0,9842 ton
kilogram	kg	pound	lb	1 lb = 0,4536 kg	1 kg = 2,204 lb
Force					
kilonewton	kN	ton-force	ton f	1 ton f = 0,10036 kN	1 kN = 9,9640 ton f
kilonewton	kN	pound-force	lbf	1 lbf = 0,004448 kN	1 kN = 224,8 lbf
newton	N	pound-force	lbf	1 lbf = 4,448 N	1 N = 0,2248 lbf
Length					
meter	m	foot	ft	1ft = 0,3048 m	1 m = 3,2808 ft
centimeter	cm	inch	in	1 in = 2,54 cm	1 cm = 0,3937 in
millimeter	mm	inch	in	1 in = 25,4 mm	1 mm = 0,03937 in
Area					
square millimeter	mm²	square inch	in²	1 in² = 645,16 mm²	1 mm² = 0,0015 in²
Temperature					
Celsius degree	°C	Fahrenheit degree	°F	1°F = (9/5 °C + 32)	1°C = 5/9(°F - 32)
				0 °C = 32 °F	30 °C = 86 °F
				10 °C = 50 °F	40 °C = 104 °F
				20 °C = 68 °F	50 °C = 122 °F

Choice of steel quality according to atmosphere

Atmospheric corrosion is linked to ambient atmosphere. The agents combined themselves to air components. The mixture of oxygen, moisture and industrial pollutants, mainly chlorous and sulphurous, attacks and destroys metals and alloys. We can indicate 6 principal types of atmosphere.

TYPES OF ATMOSPHERE			Zinc deposit 5-10 µm	Hot dip galvanized 45 µm mini	Stainless steel A4
INSIDE	DRY	Clean rooms, heated in winter without condensation. Housing inside, air-conditioned rooms.	●	●	●
INSIDE	HUMID	Rooms subjected to condensation, warehouses, stores, cellars...	□	●	●
OUTSIDE	RURAL	Housing in temperate climate and a long way from large cites and factories (country).	□	○	●
OUTSIDE	URBAN	Housing in towns with one or more factories emitting smoke creating atmospheric corrosion.	□	○	●
OUTSIDE	INDUSTRIAL	Factories and their surroundings significant atmospheric corrosion (depending on industrial process).	□	□	●
OUTSIDE	SALT ATMOSPHERE	Atmosphere of seaside or on sea. High corrosion due to presence of relatively high humidity combined with certain contents of sea salt in the air	□	□	●

Source : NFA 91-102 - Metal surface

□ Quality not suitable for the medium
○ Get into touch with us
● Possible use

Choice of steel quality according to contacts between materials

Electrolytic corrosion may occur when two different metals are in contact with each other. This creates an electrolytic action which causes the gradual destruction of one of the elements.

Metal of the part to be fixed	Metal of the fixing					
	Stainless steel	Galvanised steel	Zin coated steel	Zink alloy	Lead	Brass
Stainless steel	●	↑	↑	↑	↑	↑
Galvanised steel	←	●	●	●	●	←
Zinc coated steel	←	●	●	●	●	←
Mild steel	←	↑	↑	↑	●	←
Aluminium alloy	←	↑	↑	↑	●	↑
Zinc alloy	←	●	●	●	←	←

● Possible contact between the two metals ← Metal of part to be fixed is attacked ↑ Metal of fixing is attacked

Solutions for corrosion

Coatings and corrosion resistance

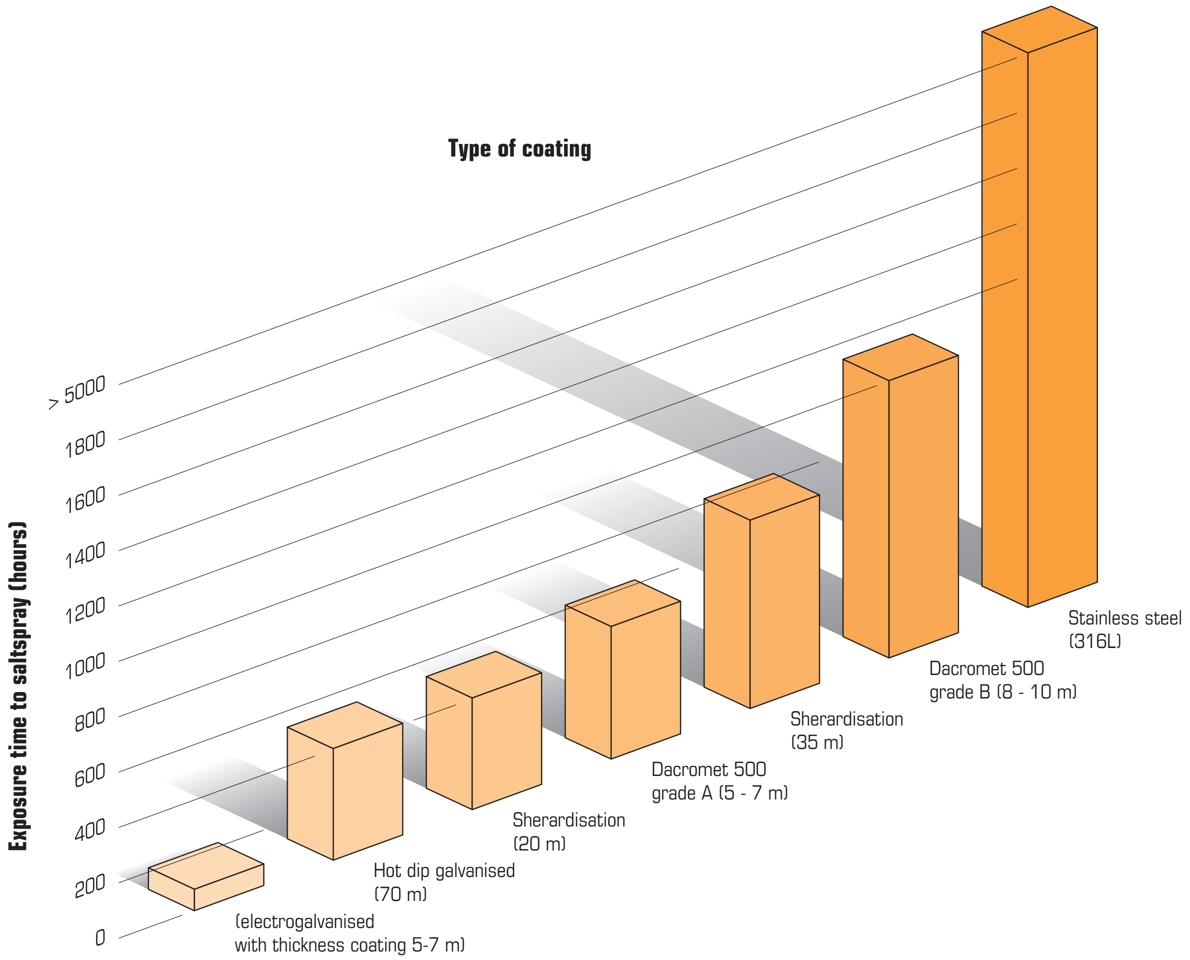


Table of principal stainless resistance

FRANCE NF EN 10088-1		According to NFA 35-573 1990, NFA 35-574 1990 (or NFA 36-209 or NFA 35-577)	USA	GERMANY		SWEEDEN	U.K.	ITALY	Quality grade
Symbol	**Code**		**AISI**	**Werkstoff**	**DIN**	**SIS**	**BS 970**	**UNI**	
X2 CrNi 19-11	14306	Z3 CN 18-10	304 L	1.4306	X2 Cr Ni 18-09	2352	304-512	X2 CrNi 18-11	A2L
		Z3 CN 19-11							
X5 CrNi 18-10	14301	Z6 CN 18-09	304	1.4301	X5 Cr Ni 18-09	2332	304-515	X5 CrNi 18-10	A2
		Z7 CN 18-09							
X10 CrNi 18-8	14310	Z11 CN 17-08	≈ 302	1.4300	X12 Cr Ni 18-09	2330/31	302-525	X10 CrNi 18-09	A2
		Z11 CN 18-08							
		Z12 CN 18-09							
X4 CrNi 18-12	14303	Z5 CN 18-11	305	1.4303	X5 CrNi-19-11		305-519	X8 CrNi 18-12	A2
X6CrNiTi 18-10	14541	Z6 CND 18-10	321	1.4541	X10 CrNiTi 18-09	2337	321-512		A3
X5CrNiMo 17-12-2	14401	Z6 CND 17-12	316	1.4401	X5CrNiMo 18-10	2343	316-516	X5CrNiMo17-12	A4
X6 CrNiMoTi 17-12-2	14571	Z6 CNDT 17-11	316 Ti	1.4571	X10CrNiTi 18-10	2334	320-517	X6CrNiMoTi17-12	A5
X2 CrNiMo 17-13-3	14404	Z3 CND 17-12	316 L	1.4404	X2CrNiMo 18-10	2353	316-512	X2CrNiMo17-12	A4L
X2CrNiMoN17-13-3	14406	Z3 CND 17-11 AZ							A4L
X3CrNiCu 18-9-3	14560	Z4 CNU 19-09 FF							A2

Reference document : the test has been performed according to the following document « Evaluation of Anchorages in Concrete concerning resistance to fire "Technical Report TR020" published by EOTA, with standardised fire curve (ISO 834).

The design value resistance under fire exposure $\mathbf{R_{d,fi(t)} = R_{k,fi(t)} / \gamma_{M,fi}}$ usually the safety factor for resistance under fire exposure $\gamma_{M,fi} = \mathbf{1}$.

The design value of resistance under fire exposure does not deal with the mechanical design at ambient temperature. So, the fire proof must be done in addition the design at ambient temperature.

For more details, concerning the design method for the determination of the duration of the fire resistance of anchorages in cracked and non cracked concrete according to ETAG001, you could refer to the technical report TR 020.

The table below gives characteristic resistance under fire exposure **($R_{k,fi(t)}$ in kN)** established from test results.

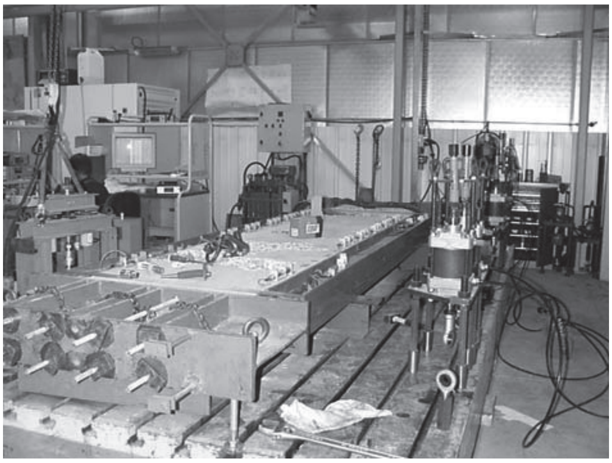
Anchor type	Dimension	Reference approval	Steel characteristic resistance under fire exposure $N_{Rk,s,fi}$			
			$N_{Rk,s,fi}$ (kN) 30 min.	$N_{Rk,s,fi}$ (kN) 60 min.	$N_{Rk,s,fi}$ (kN) 90 min.	$N_{Rk,s,fi}$ (kN) 120 min.
SPIT TRIGA Z type E, V, TF	**M6**	Fire resistance included in ETA 05/0044	0,9	0,6	0,4	0,3
	M8		2,8	2,1	1,3	0,9
	M10		4,5	3,3	2,1	1,5
	M12		17,6	11,4	5,3	2,2
	M16		32,8	21,3	9,8	4,1
	M20		51,1	33,2	15,3	6,4
SPIT FIX Z	**M8**	Fire resistance included in ETA 99/0002	0,9	0,7	0,5	0,4
	M10		1,4	1,1	0,8	0,6
	M12		4,7	3,5	2,2	1,5
	M16		8,8	6,4	4,1	2,9
SPIT FIX Z-A4	**M8**	Fire resistance included in ETA 04/0010	4,9	3,2	1,5	0,7
	M10		7,7	5,1	2,4	1,1
	M12		11,3	8,2	5,1	3,5
	M16		21,0	15,2	9,5	6,6
SPIT FIX II	**M8**	CSTB Test report n° RS05-158/E	1,5	1,2	0,8	0,7
	M10		2,4	1,9	1,3	1,0
	M12		4,7	3,3	1,9	1,2
	M16		8,6	6,1	3,6	2,2
	M20		13,5	9,6	5,6	3,4
SPIT GRIP / GRIP L	**M6**	CSTB Test report n° RS05-158/G	1,0	0,7	0,5	0,4
	M8		1,7	1,3	0,9	0,7
	M10		1,8	1,4	1,0	0,8
	M12		2,5	2,0	1,4	1,2
	M16		4,7	3,7	2,6	2,2
SPIT EPOMAX with studs (grade 5.8 minimum)	**M8**	CSTB Test report n° RS05-158/B	2,3	1,1	0,6	0,4
	M10		3,6	1,7	1,0	0,6
	M12		8,5	3,5	2,0	1,2
	M16		13,5	6,5	3,7	2,2
	M20		21,0	10,2	5,8	3,5
	M24		30,0	14,7	8,4	5,0
	M30		45,0	22,0	14,0	8,0

SPIT laboratory

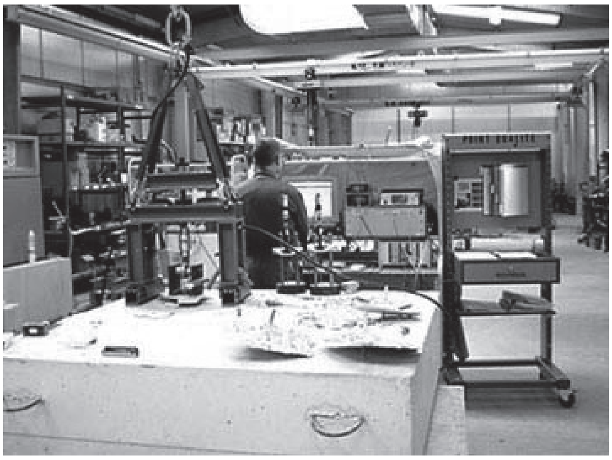
At Spit we have our own laboratory to test all types of fixings in any base material. This laboratory is used for new product development, approvals and quality control.

Our laboratory is accredited by COFRAC in accordance with programme 39.2 «testing of mechanical anchors - Part 2 : Expansion Anchors». Tests for metal anchors in concrete are carried out in accordance with ETA Guide no.001 «European Technical Approval for metal anchors in concrete».

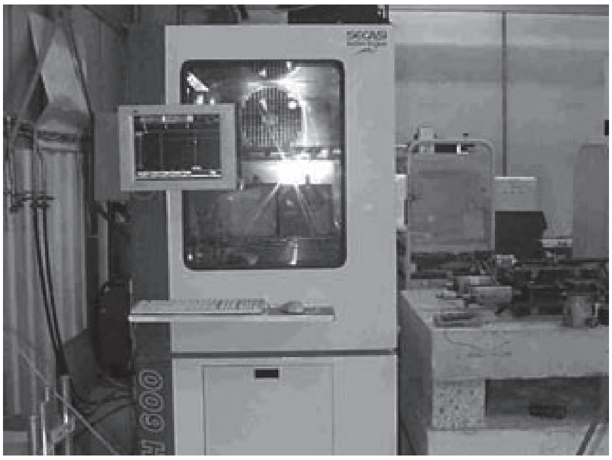
To carry out these tests, the laboratory is equipped with high performance test benches able to apply pull out loads up to 80 tonnes. Shear tests, long term load tests, pulsating load tests, tests in static cracks from 0.3 mm to 0.5 mm, tests in dynamic cracks are also carried out on this equipment.



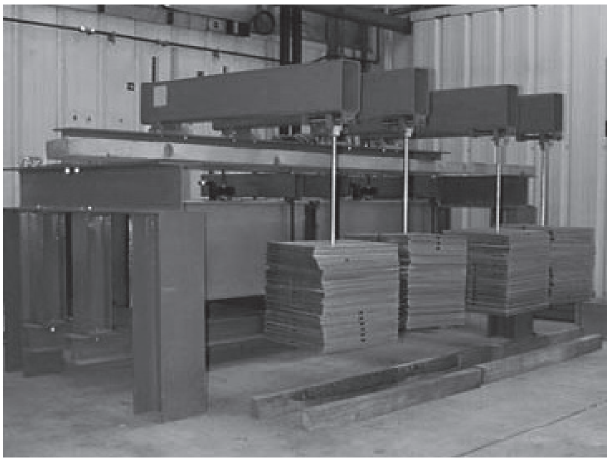
Equipment for testing in cracked concrete



Pull out equipment test



Oven to test the behaviour at high temperature chemical resins

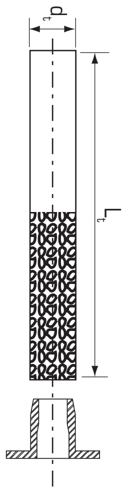


Equipment for creep test

FIXINGS OF REBARS AND THREADED STUDS M8 TO M20 IN CEILING USING CEILING CAP AND MEASURING CONNECTOR

- Resin injection (EPOBAR for rebars or EPOMAX for studs) with measuring connector
- Cap introduction into drilled hole
- Installation : the rebar or the stud is maintained by the cap blades

FIXINGS OF THREADED STUDS M8 TO M20 IN CEILING IN USING SIEVE

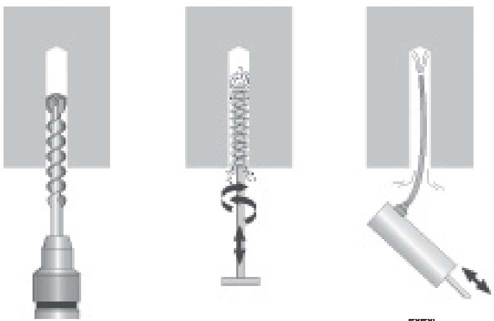


Characteristics of these sieve and installation data :

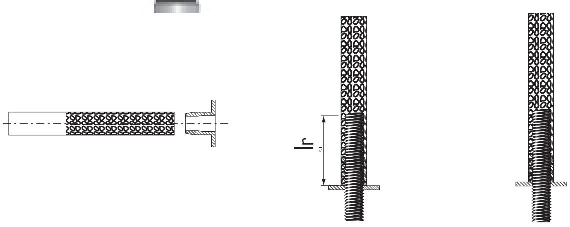
Stud dimension	Min. support thickness (mm)	Hole diameter d_0 (mm)	Hole depth h_0 (mm)	Stud length inserted into sieve L_r (mm)
M8	120	15	80	10
M10	130	15	90	10
M12	160	18	110	15
M16	175	22	125	50
M20	220	28	170	65

Internal diameter of the sieve d_t (mm)	Sieve length L_t (mm)	Sieve codes	Cap types	Cap codes
12,5	75	63400	W5	63460
12,5	85	63400	W5	63460
15	105	63410	W7	63470
20,5	120	63420	W10	63480
26	165	63430	W13	63490

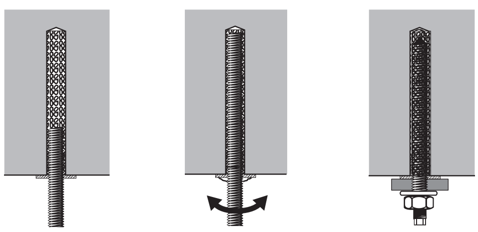
The design resistances for stud dimensions M8 to M20 in ceiling are reduced by 20 % for anchoring with resin.



1 - Drill a hole according to the diameter and the selected depth
2 - Carefully clean with metal brush
3 - Remove the dust by blowing with air pump



4 - Cut a length of screen corresponding to the length L_t of the table above and insert the cap.
5 - Insert the threaded stud in the cap and push it into the sieve to the length l_r of the table above
6 - Fill the remaining volume of sieve with resin.



7 - Insert the assembly in the hole until the cap locks itself in the hole
8 - Push the stud by hand with a twisting motion through the cap to the bottom of the hole. A slight excess of resin should emerge.
9 - Observe loading and tightening torque times.

Design calculations in compliance with eurocode 2

The reference anchoring length is calculated according to Eurocode 2 rules and in compliance with the ETA, according to technical report TR 023 concerning post-installed rebar connections, to transfer the stress to the ultimate limit state of the concrete reinforcing bar N_{Rd}.

CALCULATION METHOD

Calculation of reference anchoring length $L_{b,rqd}$:

$$L_{b,rqd} = \frac{F_{Rd}}{\Pi \cdot Ø \cdot f_{bd}}$$

- **F_{Rd}** Ultimate resistance (N)
- **Ø** $Ø_{fer}$ (mm)
- **f_{bd}** Bond stress (N/mm²) depending on concrete strength

Calculation of design anchoring length L_{bd}:

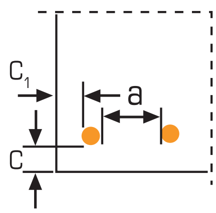
$$L_{bd} = \alpha 2 \cdot \alpha 5 \cdot L_{b,rqd}$$

Calculation of coefficient $\alpha 2$ [(1)] taking the influence of the cover into account:

$$\alpha 2 = 1 - 0{,}15(C_d - Ø) / Ø$$

$$C_d = \min(a/2 \; ; \; c_1 \; ; \; c)$$

- **$\alpha 2$** Influence of minimum cover ($0{,}7 \le \alpha 2 \le 1$)
- **$\alpha 5$** Influence of confinement by transverse compression ($\alpha 5 = 1$)
- **a** Distance between rebars (mm)
- **c, c1** Cover thickness (mm)



Determination of minimum anchoring length $L_{b,min}$:

$$L_{b,min} = \max(0{,}3 . L_{b,rqd\ max} \; ; \; 10\ Ø \; ; \; 100\ mm)$$

- **$L_{b,rqd\ max}$** reference anchoring length for the maximum ultimate load

The anchoring length used must be the maximum value (L_{bd} ; $L_{b,min}$).

(1) In the absence of edge distances, and spacing distances greater than or equal to 7 Ø, coefficient $\alpha 2$ equals 0.7.

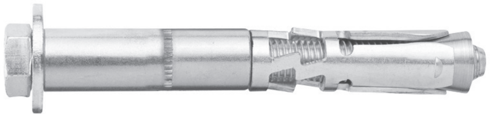
HA bar diameter	8	10	12	14	16	20	25	32
Distance between rebars ≥ 7.Ø	56	70	84	98	112	140	175	224

Adhesion design calculations

FIELD OF APPLICATION

With SPIT EPCON C8 and SPIT EPOBAR resins, the adhesion design calculations can be used to determine the anchoring lengths in the case of application without influence of edge or spacing distances.

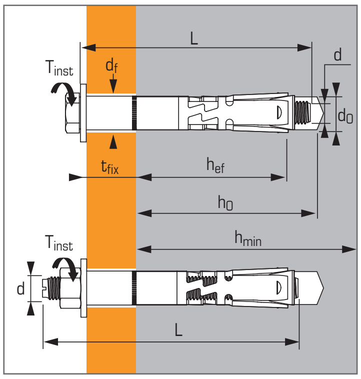
Tensile tests are generally performed on site to validate the minimum anchoring lengths (see p 118 - 135).



TRIGA Z XTREM

High security, high performance fixing for use in cracked and non-cracked concrete

ETA Option 1- 05/0044



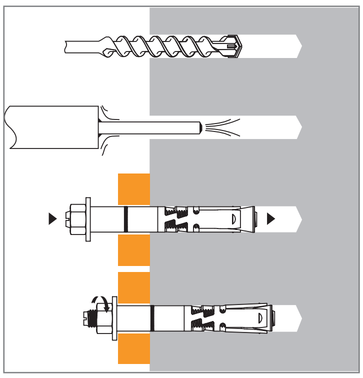
APPLICATION

- Safety critical loads
- Overhead crane rails
- Steel columns and walkways
- Wall plates
- Safety rail

MATERIAL

- **Bolt :** class 8.8 NF EN 20898-1
- **Threaded stud :** class 8.8 NF EN 20898-1
- **Nut :** class 8 NF EN 20898-2
- **Wascher :** F12T4 as per NF A37501
- **Sleeve :** TS37-a BK extended as per NF A49341
- **Expansion cone :** 35 MF6Pb
- **Expansion sleeve :** 355 MC as per NF EN 10-149-2
- **Protection :** min. zinc coating 5 µm

INSTALLATION



Technical data

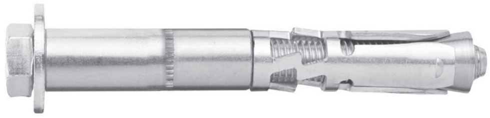
Anchor size	Min. anchor depth (mm) h_{ef}	Max. thick. of part to be fixed (mm) t_{fix}	Min. thick. of base material (mm) h_{min}	Thread diameter (mm) d	Drilling depth (mm) h_0	Drilling diameter (mm) d_0	Clearance diameter (mm) d_f	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code
V6-10/5		5						65		050673
V6-10/20	50	20	100	M6	70	10	12	80	15	050674
E6-10/50		50						117		050675
V8-12/1*		1						65		050677
V8-12/10		10						80		050678
V8-12/20		20						90		050679
V8-12/50		50						120		053001
E8-12/20	60	20	120	M8	80	12	14	99	25	050681
E8-12/35		35						114		050683
E8-12/55		55						134		050684
E8-12/95		95						174		050685
V10-15/1*		1						75		050687
V10-15/10		10						95		050688
V10-15/20		20						105		050689
V10-15/55		55						140		053003
E10-15/20	70	20	140	M10	90	15	17	114	50	050691
E10-15/35		35						129		050692
E10-15/55		55						149		050693
E10-15/100		100						194		050694
V12-18/10		10						105		050696
V12-18/25		25						120		050697
V12-18/55		55						150		053004
E12-18/25	80	25	160	M12	105	18	20	132	80	050698
E12-18/45		45						152		050699
E12-18/65		65						172		050701
E12-18/100		100						207		050702
V16-24/10		10						130		050704
V16-24/25		25						145		050705
V16-24/50		50						170		050710
E16-24/25	100	25	200	M16	131	24	26	159	120	050706
E16-24/55		55						189		050707
E16-24/100		100						234		050708
V20-28/25		25						170		050711
E20-28/25	125	25	250	M20	157	28	31	192	200	050712
E20-28/60		60						227		050713
E20-28/100		100						267		050714
TF V8-12/16	60	16	120	M8	80	12	14	85	25	050686
TF V8-12/26	60	26	120	M8	80	12	14	95	25	053002
TF V10-15/27	70	27	140	M10	90	15	17	105	50	050695
TF V12-18/40*	80	40	160	M12	105	18	20	130	80	050715
E12-18/0*	80	-	160	M12	105	18	-	120	80	050669
E12-18/A*	80	-	160	M12	105	18	-	162	80	050703
E12-18/QC*	80	-	160	M12	105	18	-	178	80	050671

* Do not belong to ETA

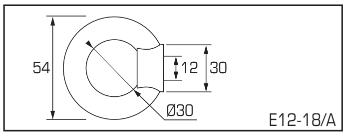
Anchor mechanical properties

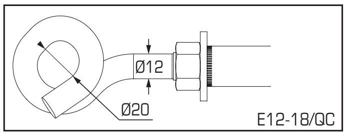
Anchor size		M6	M8	M10	M12	M16	M20
f_{uk} (N/mm^2)	Min. tensile strength	800	800	800	800	800	830
f_{yk} (N/mm^2)	Yield strength	640	640	640	640	640	660
$S_{eq,V}$ (mm^2)	Equivalent stressed cross-section bolt version	39,2	76,1	108,8	175,3	335,1	520,2
$S_{eq,E}$ (mm^2)	Equivalent stressed cross-section threaded stud version	35,2	61,8	82,0	104,1	183,3	277,3
W_{el} (mm^3)	Elastic section modulus	12,7	31,2	62,3	109,2	277,5	541,0
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	12,2	30,0	59,8	104,8	266,4	538,8
M (Nm)	Recommended bending moment	5,8	12,4	24,8	43,5	110,7	216,0

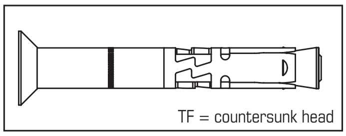
TRIGA Z XTREM

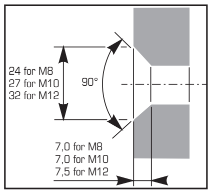


Special products









	Recommended loads in kN		
Anchor size	TENSILE ≥ C20/25	OBLIQUE ≥ C20/25	SHEAR ≥ C20/25
E12-18/A	3,4	2,4* *(30≤ α ≤45°)	Not recommended
E12-18/QC	4,0	1,0	0,5
TF V8-12/16	The resistance given for the bolt version with the same diameter can be used		
TF V8-12/26			
TF V10-15/27			
TF V12-18/40			

The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/6 to 6/6).

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	M6	M8	M10	M12	M16	M20
Non-cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
$N_{Ru,m}$	18,2	27,5	45,9	54,4	103,6	124,4
N_{Rk}	16,0	19,9	36,0	34,2	61,9	85,9
Cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
$N_{Ru,m}$	15,1	20,3	33,3	50,3	88,5	113,3
N_{Rk}	11,5	14,8	26,5	36,6	70,4	90,1

SHEAR

Anchor size		M6	M8	M10	M12	M16	M20
Cracked & non-cracked concrete							
Type V/T	$V_{Ru,m}$	29,2	41,7	68,0	95,7	159,0	228,2
	V_{Rk}	25,9	38,6	58,8	83,3	141,6	206,0
Type E	$V_{Ru,m}$	20,0	26,2	43,1	57,0	116,0	135,9
	V_{Rk}	15,7	22,0	36,4	52,0	110,0	124,9

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}{}^{*}}{\gamma_{Mc}}$$

*Derived from test results

$$V_{Rd} = \frac{V_{Rk}{}^{*}}{\gamma_{Ms}}$$

TENSILE

Anchor size	M6	M8	M10	M12	M16	M20
Non-cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
N_{Rd}	10,7	13,2	24,0	22,8	41,3	57,3
Cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
N_{Rd}	7,7	9,9	17,7	24,4	47,0	60,1

$\gamma_{Mc} = 1,5$

SHEAR

Anchor size		M6	M8	M10	M12	M16	M20
Cracked & non-cracked concrete							
Type V/T	V_{Rd}	20,7	30,8	47,0	66,6	113,3	164,8
Type E	V_{Rd}	12,6	17,6	29,1	41,6	88,0	99,9

$\gamma_{Ms} = 1,25$

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}{}^{*}}{\gamma_M \cdot \gamma_F}$$

*Derived from test results

$$V_{rec} = \frac{V_{Rk}{}^{*}}{\gamma_M \cdot \gamma_F}$$

TENSILE

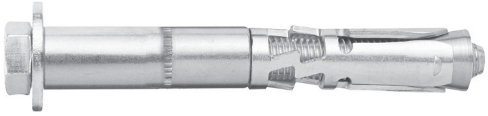
Anchor size	M6	M8	M10	M12	M16	M20
Non-cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
N_{rec}	7,6	9,5	17,1	16,3	29,5	40,9
Cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
N_{rec}	5,5	7,0	12,6	17,4	33,5	42,9

$\gamma_F = 1,4$; $\gamma_{Mc} = 1,5$

SHEAR

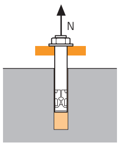
Anchor size		M6	M8	M10	M12	M16	M20
Cracked & non-cracked concrete							
Type V/T	V_{rec}	14,8	22,0	33,6	47,6	80,9	117,7
Type E	V_{rec}	9.0	12,5	20,8	29,7	62,9	71,4

$\gamma_F = 1,4$; $\gamma_{Ms} = 1,25$



SPIT CC Method (values issued from ETA)

TENSILE in kN

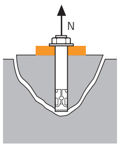


¬ Pull-out resistance

$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$						Design pull-out resistance
Anchor size	M6	M8	M10	M12	M16	M20
Non-cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
$N^0_{Rd,p}$ (C20/25)	-	13,3	-	-	-	-
Cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
$N^0_{Rd,p}$ (C20/25)	3,3	8	10,6	-	-	-

$\gamma_{Mc} = 1,5$

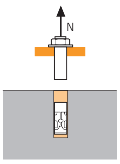


¬ Concrete cone resistance

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$						Design cone resistance
Anchor size	M6	M8	M10	M12	M16	M20
Non-cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
$N^0_{Rd,c}$ (C20/25)	11,9	15,6	19,7	24,0	33,6	47,0
Cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
$N^0_{Rd,c}$ (C20/25)	8,5	11,2	14,1	17,2	24,0	33,5

$\gamma_{Mc} = 1,5$

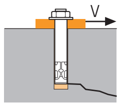


¬ Steel resistance

$N_{Rd,s}$						Steel design tensile resistance
Anchor size	M6	M8	M10	M12	M16	M20
$N_{Rd,s}$	10,7	19,5	30,9	44,9	83,7	130,7

$\gamma_{Ms} = 1,5$

SHEAR in kN

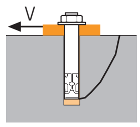


¬ Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S-C,V}$

$V^0_{Rd,c}$						Design concrete edge resistance at minimum edge distance (C_{min})
Anchor size	M6	M8	M10	M12	M16	M20
Non-cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
C_{min}	50	60	70	80	100	150
S_{min}	100	100	160	200	220	300
$V^0_{Rd,c}$ (C20/25)	3,4	4,9	6,8	9,3	13,6	26,1
Cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
C_{min}	50	60	70	80	100	150
S_{min}	100	100	160	200	220	300
$V^0_{Rd,c}$ (C20/25)	2,4	3,5	4,8	6,6	9,7	18,7

$\gamma_{Mc} = 1,5$

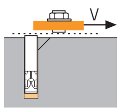


¬ Pryout failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$						Design pryout resistance
Anchor size	M6	M8	M10	M12	M16	M20
Non-cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
$V^0_{Rd,cp}$ (C20/25)	11,9	31,2	39,4	48,1	67,2	93,9
Cracked concrete						
h_{ef}	**50**	**60**	**70**	**80**	**100**	**125**
$V^0_{Rd,cp}$ (C20/25)	8,5	22,3	28,1	34,3	48,0	67,1

$\gamma_{Mcp} = 1,5$



¬ Steel resistance

$V_{Rd,s}$						Steel design shear resistance
Anchor size	M6	M8	M10	M12	M16	M20
$V_{Rd,s}$ (Type V/TF)	18,7	26,1	39,3	58,2	93,8	138,8
$V_{Rd,s}$ (Type E)	11,4	15,2	24,8	37,9	74,5	87,9

$\gamma_{Ms} = 1,25$

$$N_{Rd} = \min(N_{Rd,p} \,;\, N_{Rd,c} \,;\, N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c} \,;\, V_{Rd,cp} \,;\, V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

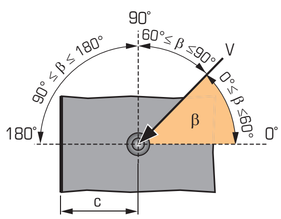
$$\beta_N + \beta_V \leq 1,2$$

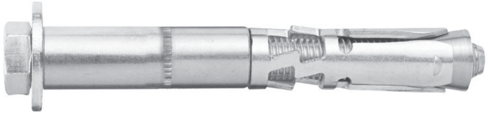
f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
C25/30	1,1	C40/50	1,41
C30/37	1,22	C45/55	1,48
C35/45	1,34	C50/60	1,55

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

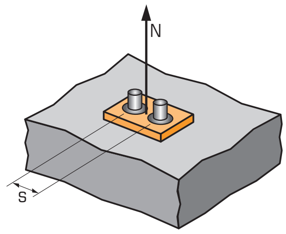
Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0,5 + \frac{s}{6.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

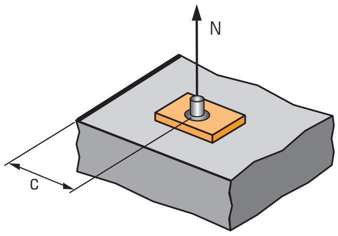
$s_{cr,N} = 3.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group.

SPACING S — **Reduction factor Ψ_s** — Cracked & non-cracked concrete

Anchor size	M6	M8	M10	M12	M16	M20
50	0,67					
60	0,70	0,67				
70	0,73	0,69	0,67			
80	0,77	0,72	0,69	0,67		
100	0,83	0,78	0,74	0,71	0,67	
125	0,92	0,85	0,80	0,76	0,71	0,67
150	1,00	0,92	0,86	0,81	0,75	0,70
180		1,00	0,93	0,88	0,80	0,74
210			1,00	0,94	0,85	0,78
240				1,00	0,90	0,82
300					1,00	0,90
375						1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0,25 + 0,5 . \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

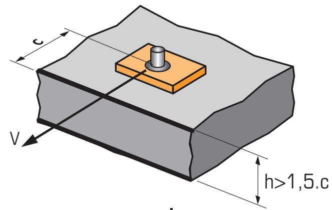
$c_{cr,N} = 1,5.h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

EDGE C — **Reduction factor $\Psi_{c,N}$** — Cracked & non-cracked concrete

Anchor size	M6	M8	M10	M12	M16	M20
50	0,75					
60	0,85	0,75				
70	0,95	0,83	0,75			
80	1,00	0,92	0,82	0,75		
90		1,00	0,89	0,81		
100			0,96	0,88	0,75	
120				1,00	0,85	
150					1,00	0,85
170						0,93
190						1,00

$\Psi_{s-c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

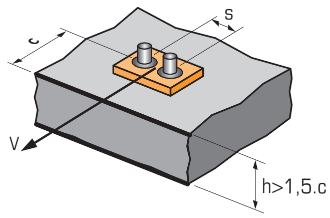


$$\Psi_{s-c,V} = \frac{c}{c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s-c,V}$ — Cracked & non-cracked concrete

c/c_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s-c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

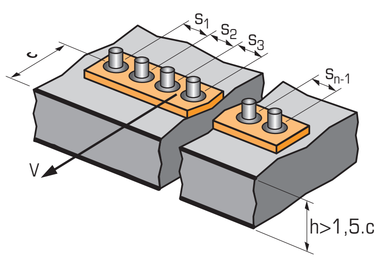


$$\Psi_{s-c,V} = \frac{3.c + s}{6.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

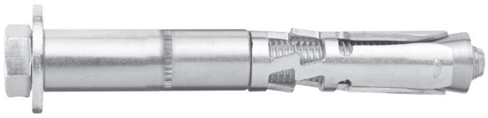
Reduction factor $\Psi_{s-c,V}$ — Cracked & non-cracked concrete

s/c_{min} \ c/c_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65



For 3 anchors fastening and more

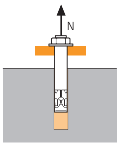
$$\Psi_{s-c,V} = \frac{3.c + s_1 + s_2 + s_3 + ... + s_{n-1}}{3.n.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$



TRIGA Z XTREM

SPIT CC Method (values issued from ETA - Seismic category C1)

TENSILE in kN



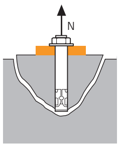
Pull-out resistance

$N_{Rd,p,C1} = N^0_{Rd,p,C1} \cdot f_b$

$N^0_{Rd,p,C1}$	Design pull-out resistance		
Anchor size	M10	M12	M16
Category C1 - Single anchor			
h_{ef}	**70**	**80**	**100**
$N^0_{Rd,p,C1}$ (C20/25)	6,1	17,2	24,0
Category C1 - Group of anchors [1]			
h_{ef}	**70**	**80**	**100**
$N^0_{Rd,p,C1}$ (C20/25)	5,2	14,6	20,4

[1] when more than one anchor of the group is submitted to tensile load

$\gamma_{Mc} = 1{,}5$



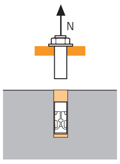
Concrete cone resistance

$N_{Rd,c,C1} = N^0_{Rd,c,C1} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c,C1}$	Design cone resistance		
Anchor size	M10	M12	M16
Category C1 - Single anchor			
h_{ef}	**70**	**80**	**100**
$N^0_{Rd,c,C1}$ (C20/25)	11,9	14,6	20,4
Category C1 - Group of anchors [1]			
h_{ef}	**70**	**80**	**100**
$N^0_{Rd,c,C1}$ (C20/25)	10,5	12,9	18,0

[1] when more than one anchor of the group is submitted to tensile load

$\gamma_{Mc} = 1{,}5$



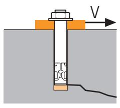
Steel resistance

$N_{Rd,s,C1}$	Steel design tensile resistance		
Anchor size	M10	M12	M16
$N_{Rd,s,C1}$	30,7	44,7	84,0

[1] when more than one anchor of the group is submitted to tensile load

$\gamma_{Ms} = 1{,}5$

SHEAR in kN



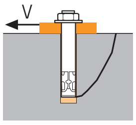
Concrete edge resistance

$V_{Rd,c,C1} = V^0_{Rd,c,C1} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c,C1}$	Design concrete edge resistance at minimum edge distance (C_{min})		
Anchor size	M10	M12	M16
Category C1 - Single anchor			
h_{ef}	**70**	**80**	**100**
C_{min}	70	80	100
S_{min}	160	200	220
$V^0_{Rd,c,C1}$ (C20/25)	4,6	6,1	9,7
Category C1 - Group of anchors [1]			
h_{ef}	**70**	**80**	**100**
C_{min}	70	80	100
S_{min}	160	200	220
$V^0_{Rd,c,C1}$ (C20/25)	3,9	5,2	8,3

[1] when more than one anchor of the group is submitted to shear load

$\gamma_{Mc} = 1{,}5$



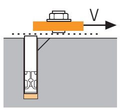
Pryout failure

$V_{Rd,cp,C1} = V^0_{Rd,cp,C1} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp,C1}$	Design pryout resistance		
Anchor size	M10	M12	M16
Category C1 - Single anchor			
h_{ef}	**70**	**80**	**100**
$V^0_{Rd,cp,C1}$ (C20/25)	23,9	29,2	40,8
Category C1 - Group of anchors [1]			
h_{ef}	**70**	**80**	**100**
$V^0_{Rd,cp,C1}$ (C20/25)	21,1	25,8	36,0

[1] when more than one anchor of the group is submitted to shear load

$\gamma_{Mc} = 1{,}5$



Steel resistance [2]

$V_{Rd,s,C1}$	Steel design shear resistance		
Anchor size	M10	M12	M16
Category C1 - Single anchor			
$V_{Rd,s,C1}$	13,7	22,7	48,4
Category C1 - Group of anchors [1]			
$V_{Rd,s,C1}$	11,6	19,3	41,2

[1] when more than one anchor of the group is submitted to shear load

[2] In case of no hole clearance between anchor and fixture

$\gamma_{Ms} = 1{,}25$

$$N_{Rd,C1} = \min(N_{Rd,p,C1}\ ;\ N_{Rd,c,C1}\ ;\ N_{Rd,s,C1})$$
$$\beta_N = N_{Sd} / N_{Rd,C1} \leq 1$$

$$V_{Rd,C1} = \min(V_{Rd,c,C1}\ ;\ V_{Rd,cp,C1}\ ;\ V_{Rd,s,C1})$$
$$\beta_V = V_{Sd} / V_{Rd,C1} \leq 1$$

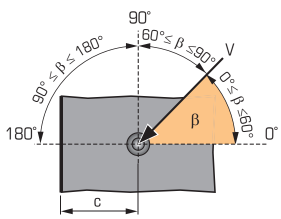
$$\beta_N + \beta_V \leq 1{,}2$$

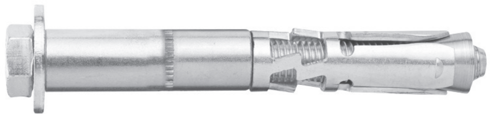
f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
C25/30	1,1	C40/50	1,41
C30/37	1,22	C45/55	1,48
C35/45	1,34	C50/60	1,55

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

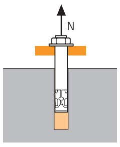
Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





SPIT CC Method (values issued from ETA - Seismic category C2)

TENSILE in kN



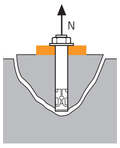
Pull-out resistance

$N_{Rd,p,C2} = N^0_{Rd,p,C2} \cdot f_b$

$N^0_{Rd,p,C2}$			Design pull-out resistance
Anchor size	M10	M12	M16
Category C2 - Single anchor			
h_{ef}	**70**	**80**	**100**
$N^0_{Rd,p,C2}$ (C20/25)	3,5	6,3	11,0
Category C2 - Group of anchors (1)			
h_{ef}	**70**	**80**	**100**
$N^0_{Rd,p,C2}$ (C20/25)	3,0	5,3	9,4

(1) when more than one anchor of the group is submitted to tensile load

$\gamma_{Mc} = 1,5$



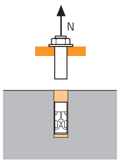
Concrete cone resistance

$N_{Rd,c,C2} = N^0_{Rd,c,C2} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c,C2}$			Design cone resistance
Anchor size	M10	M12	M16
Category C2 - Single anchor			
h_{ef}	**70**	**80**	**100**
$N^0_{Rd,c,C2}$ (C20/25)	9,5	11,9	16,0
Category C2 - Group of anchors (1)			
h_{ef}	**70**	**80**	**100**
$N^0_{Rd,c,C2}$ (C20/25)	8,4	10,5	14,1

(1) when more than one anchor of the group is submitted to tensile load

$\gamma_{Mc} = 1,5$



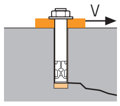
Steel resistance

$N_{Rd,s,C2}$			Steel design tensile resistance
Anchor size	M10	M12	M16
$N_{Rd,s,C2}$	30,7	44,7	84,0

(1) when more than one anchor of the group is submitted to tensile load

$\gamma_{Ms} = 1,5$

SHEAR in kN



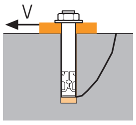
Concrete edge resistance

$V_{Rd,c,C2} = V^0_{Rd,c,C2} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c,C2}$			Design concrete edge resistance at minimum edge distance (C_{min})
Anchor size	M10	M12	M16
Category C2 - Single anchor			
h_{ef}	**70**	**80**	**100**
C_{min}	65	100	100
S_{min}	50	100	100
$V^0_{Rd,c,C2}$ (C20/25)	4,0	5,3	8,4
Category C2 - Group of anchors (1)			
h_{ef}	**70**	**80**	**100**
C_{min}	70	80	100
S_{min}	50	100	100
$V^0_{Rd,c,C2}$ (C20/25)	3,4	4,5	7,1

(1) when more than one anchor of the group is submitted to shear load

$\gamma_{Mc} = 1,5$



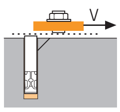
Pryout failure

$V_{Rd,cp,C2} = V^0_{Rd,cp,C2} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp,C2}$			Design pryout resistance
Anchor size	M10	M12	M16
Category C2 - Single anchor			
h_{ef}	**70**	**80**	**100**
$V^0_{Rd,cp,C2}$ (C20/25)	19,0	23,9	32,0
Category C2 - Group of anchors (1)			
h_{ef}	**70**	**80**	**100**
$V^0_{Rd,cp,C2}$ (C20/25)	16,7	21,1	28,2

(1) when more than one anchor of the group is submitted to shear load

$\gamma_{Mc} = 1,5$



Steel resistance (2)

$V_{Rd,s,C2}$			Steel design shear resistance
Anchor size	M10	M12	M16
Category C2 - Single anchor			
$V_{Rd,s,C2}$	11,6	22,7	46,5
Category C2 - Group of anchors (1)			
$V_{Rd,s,C2}$	9,9	19,3	39,5

(1) when more than one anchor of the group is submitted to shear load

(2) In case of no hole clearance between anchor and fixture

$\gamma_{Ms} = 1,25$

$$N_{Rd,C2} = \min(N_{Rd,p,C2}\ ;\ N_{Rd,c,C2}\ ;\ N_{Rd,s,C2})$$

$$\beta_N = N_{Sd} / N_{Rd,C2} \leq 1$$

$$V_{Rd,C2} = \min(V_{Rd,c,C2}\ ;\ V_{Rd,cp,C2}\ ;\ V_{Rd,s,C2})$$

$$\beta_V = V_{Sd} / V_{Rd,C2} \leq 1$$

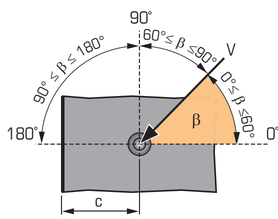
$$\beta_N + \beta_V \leq 1,2$$

f_b INFLUENCE OF CONCRETE

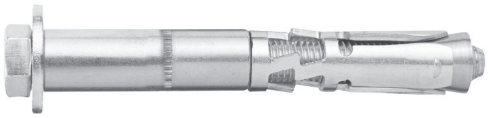
Concrete class	f_b	Concrete class	f_b
C25/30	1,1	C40/50	1,41
C30/37	1,22	C45/55	1,48
C35/45	1,34	C50/60	1,55

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2



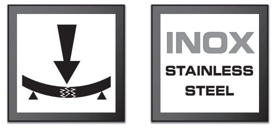
Mechanical anchors

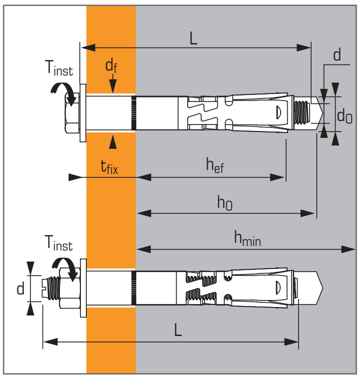


TRIGA Z - A4

stainless steel version 1/4

High security, high performance fixing for use in cracked and non-cracked concrete





Technical data

Anchor size	Min. anchor depth (mm) h_{ef}	Max. thick. of part to be fixed (mm) t_{fix}	Min. thick. of base material (mm) h_{min}	Thread diameter (mm) d	Drilling depth (mm) h_0	Drilling diameter (mm) d_0	Clearance diameter (mm) d_f	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code
V6-10/10	50	10	100	M6	70	10	12	70	10	050694
V8-12/10		10						80		050595
V8-12/30	60	30	120	M8	80	12	14	100	25	050596
E8-12/45		45						124		050598
V10-15/25		25						115		050601
E10-15/45	70	45	140	M10	90	15	17	139	50	050604
V12-18/25		25						120		050605
E12-18/15	80	15	160	M12	105	18	20	122	80	050606
E12-18/45		45						152		050608
E16-24/25	95	25	200	M16	130	24	26	157	120	052940

APPLICATION

- Safety critical loads
- Overhead crane rails
- Steel columns and walkways
- Wall plates
- Safety rail

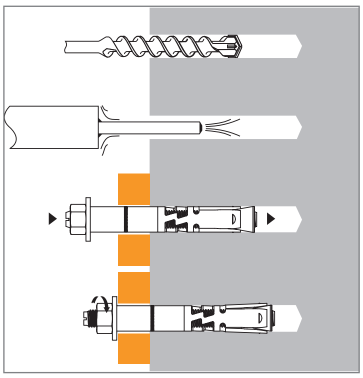
MATERIAL

- **Bolt :** class 80 NF EN ISO 3506-1
- **Threaded stud :** class 70 NF E 25100-0
- **Nut :** class 80 NF E 25100-4
- **Washer :** X5CrNiMo 17-12-2
- **Expansion cone :** X2CrNiMo 17-12-2
- **Expansion sleeve:** X2CrNiMo 17-12-2

Anchor mechanical properties

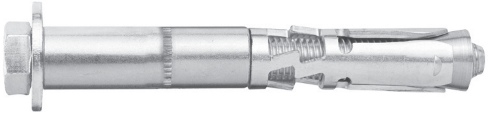
Anchor size		M6	M8	M10	M12	M16
Type V						
f_{uk} (N/mm²)	Min. tensile strength	800	800	800	800	800
f_{yk} (N/mm²)	Yield strength	600	600	600	600	600
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	12,2	30,0	59,8	104,8	266,4
M (Nm)	Recommended bending moment	5,8	12,4	24,8	43,5	110,7
Type E						
f_{uk} (N/mm²)	Min. tensile strength	700	700	700	700	700
f_{yk} (N/mm²)	Yield strength	350	350	350	350	350
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	10,6	26,2	52,3	91,7	233,1
M (Nm)	Recommended bending moment	4,4	10,9	21,8	38,2	97,1
Type V and type E						
$S_{eq,V}$ (mm²)	Equivalent stressed cross-section bolt version	39,2	76,1	108,8	175,3	335,1
$S_{eq,E}$ (mm²)	Equivalent stressed cross-section threaded stud version	35,2	61,8	82,0	104,1	183,3
W_{el} (mm³)	Elastic section modulus	12,7	31,2	62,3	109,2	277,5

INSTALLATION



TRIGA Z - A4

2/4 stainless steel version



The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/4 and 4/4).

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	M6	M8	M10	M12	M16
Non-cracked concrete (C20/25)					
h_{ef}	**50**	**60**	**70**	**80**	**95**
$N_{Ru,m}$	16,7	22,4	38,7	41,3	64,2
N_{Rk}	16	17	26	28	56
Cracked concrete (C20/25)					
h_{ef}	**50**	**60**	**70**	**80**	**95**
$N_{Ru,m}$	14,8	25,2	33,8	40,4	55,9
N_{Rk}	11	21	25	28,8	38

SHEAR

Anchor size		M6	M8	M10	M12	M16
Cracked & non-cracked concrete (C20/25)						
Type V	$V_{Ru,m}$	26,8	37,6	70,1	67,4	140,7
	V_{Rk}	21,6	31,3	58,4	60,1	117,2
Type E	$V_{Ru,m}$	17,5	22,9	37,7	49,9	101,5
	V_{Rk}	14,6	19,1	31,4	41,5	84,6

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{*}}{\gamma_{Mc}}$$

*Derived from test results

$$V_{Rd} = \frac{V_{Rk}^{*}}{\gamma_{Ms}}$$

TENSILE

Anchor size	M6	M8	M10	M12	M16
Non-cracked concrete (C20/25)					
h_{ef}	**50**	**60**	**70**	**80**	**95**
N_{Rd}	10,7	11,6	17,3	18,5	31,0
Cracked concrete (C20/25)					
h_{ef}	**50**	**60**	**70**	**80**	**95**
N_{Rd}	7,3	14,0	16,7	19,2	21,1

γ_{Mc} = 1,5 for M8-M12 and γ_{Mc} = 1,8 for M16

SHEAR

Anchor size		M6	M8	M10	M12	M16
Cracked & non-cracked concrete (C20/25)						
Type V/T	V_{Rd}	16,2	23,6	36,9	45,2	88,1
Type E	V_{Rd}	7,3	9,5	15,7	20,8	42,3

γ_{Ms} = 1,33 for Type V and γ_{Ms} = 2,0 for Type E

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

*Derived from test results

$$V_{rec} = \frac{V_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

TENSILE

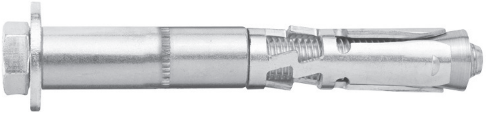
Anchor size	M6	M8	M10	M12	M16
Non-cracked concrete (C20/25)					
h_{ef}	**50**	**60**	**70**	**80**	**95**
N_{rec}	7,7	8,3	12,3	13,2	22,1
Cracked concrete (C20/25)					
h_{ef}	**50**	**60**	**70**	**80**	**95**
N_{rec}	5,2	10,0	11,9	13,7	15,1

γ_F = 1,4 ; γ_{Mc} = 1,5 for M8-M12 and γ_{Mc} = 1,8 for M16

SHEAR

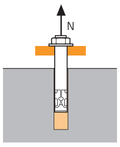
Anchor size		M6	M8	M10	M12	M16
Cracked & non-cracked concrete (C20/25)						
Type V/T	V_{rec}	11,6	16,8	26,4	32,2	63,0
Type E	V_{rec}	5,2	6,8	11,2	14,8	30,2

γ_F = 1,4 ; γ_{Ms} = 1,33 for Type V and γ_{Ms} = 2,0 for Type E



SPIT CC Method

TENSILE in kN

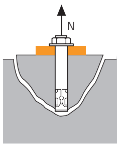


Pull-out resistance

$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$					Design pull-out resistance
Anchor size	M6	M8	M10	M12	M16
Non-cracked concrete					
h_{ef}	50	60	70	80	95
$N^0_{Rd,p}$ (C20/25)	-	10,6	13,3	16,6	-
Cracked concrete					
h_{ef}	50	60	70	80	95
$N^0_{Rd,p}$ (C20/25)	3,3	6	10,6	-	-

γ_{Mc} = 1,5 for M6-M12

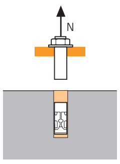


Concrete cone resistance

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$					Design cone resistance
Anchor size	M6	M8	M10	M12	M16
Non-cracked concrete					
h_{ef}	50	60	70	80	95
$N^0_{Rd,c}$ (C20/25)	11,9	15,6	19,7	24,0	25,9
Cracked concrete					
h_{ef}	50	60	70	80	95
$N^0_{Rd,c}$ (C20/25)	8,5	11,2	14,1	17,2	18,5

γ_{Mc} = 1,5 for M6-M12 and γ_{Mc} = 1,8 for M16

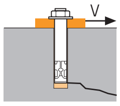


Steel resistance

$N_{Rd,s}$					Steel design tensile resistance
Anchor size	M6	M8	M10	M12	M16
$N_{Rd,s}$ (Type V)	10,0	18,2	28,8	42,0	78,9
$N_{Rd,s}$ (Type E)	5,8	10,6	16,8	24,4	45,9

γ_{Ms} = 1,6 for Type V and γ_{Ms} = 2,4 for Type E

SHEAR in kN

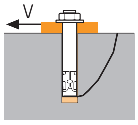


Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c}$					Design concrete edge resistance at minimum edge distance (C_{min})
Anchor size	M6	M8	M10	M12	M16
Non-cracked concrete					
h_{ef}	50	60	70	80	95
C_{min}	50	60	70	80	100
S_{min}	100	100	160	200	220
$V^0_{Rd,c}$ (C20/25)	3,4	4,9	6,8	9,3	13,6
Cracked concrete					
h_{ef}	50	60	70	80	95
C_{min}	50	60	70	80	100
S_{min}	100	100	160	200	220
$V^0_{Rd,c}$ (C20/25)	2,4	3,5	4,8	6,6	9,7

γ_{Mc} = 1,5

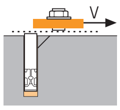


Pryout failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$					Design pryout resistance
Anchor size	M6	M8	M10	M12	M16
Non-cracked concrete					
h_{ef}	50	60	70	80	95
$V^0_{Rd,cp}$ (C20/25)	11,9	31,2	39,4	48,1	62,2
Cracked concrete					
h_{ef}	50	60	70	80	95
$V^0_{Rd,cp}$ (C20/25)	8,5	22,3	28,1	34,3	44,4

γ_{Mcp} = 1,5



Steel resistance

$V_{Rd,s}$					Steel design shear resistance
Anchor size	M6	M8	M10	M12	M16
$V_{Rd,s}$ (Type V)	16,2	23,6	36,9	45,2	88,2
$V_{Rd,s}$ (Type E)	6,3	8,3	13,6	20,7	40,7

γ_{Ms} = 1,33 for Type V and γ_{Ms} = 2,0 for Type E

$$N_{Rd} = \min(N_{Rd,p} \; ; \; N_{Rd,c} \; ; \; N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c} \; ; \; V_{Rd,cp} \; ; \; V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

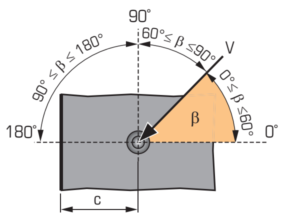
$$\beta_N + \beta_V \leq 1{,}2$$

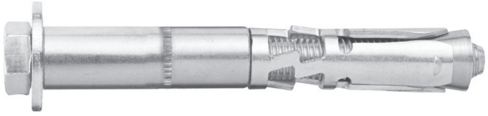
f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
C25/30	1,1	C40/50	1,41
C30/37	1,22	C45/55	1,48
C35/45	1,34	C50/60	1,55

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

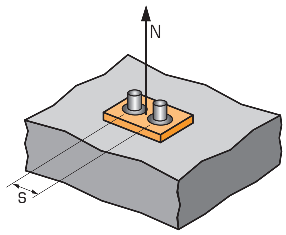
Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





SPIT CC Method

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0{,}5 + \frac{s}{6.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

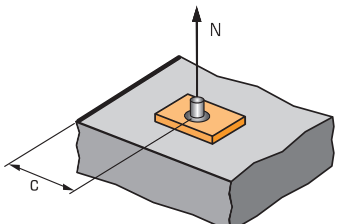
$s_{cr,N} = 3.h_{ef}$

Ψ_S must be used for each spacing influenced the anchors group.

SPACING S — Reduction factor Ψ_s — Cracked & non-cracked concrete

Anchor size	M6	M8	M10	M12	M16
50	0,67				
60	0,70	0,67			
70	0,73	0,69	0,67		
80	0,77	0,72	0,69	0,67	
100	0,83	0,78	0,74	0,71	0,67
125	0,92	0,85	0,80	0,76	0,71
150	1,00	0,92	0,86	0,81	0,75
180		1,00	0,93	0,88	0,80
210			1,00	0,94	0,85
240				1,00	0,90
300					1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0{,}25 + 0{,}5 \cdot \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

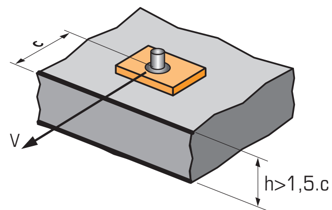
$c_{cr,N} = 1{,}5.h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

EDGE C — Reduction factor $\Psi_{c,N}$ — Cracked & non-cracked concrete

Anchor size	M6	M8	M10	M12	M16
50	0,75				
60	0,85	0,75			
70	0,95	0,83	0,75		
80	1,00	0,92	0,82	0,75	
90		1,00	0,89	0,81	
100			0,96	0,88	0,75
120				1,00	0,85
150					1,00

$\Psi_{s\text{-}c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

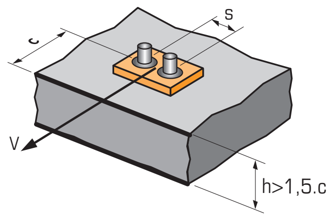


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Cracked & non-cracked concrete

C/C_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

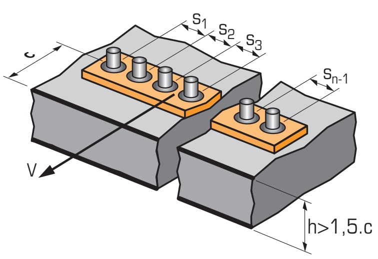


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Cracked & non-cracked concrete

S/C_{min} \ C/C_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65

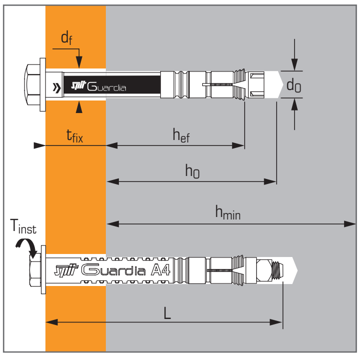


For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + ... + s_{n-1}}{3.n.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

Mechanical anchor, dedicated for safety barriers fixings

ETA Option 7- 07/0047



Technical data

Anchor size	Min. anchor depth (mm) h_{ef}	Max. thick. of part to be fixed (mm) t_{fix}	Min. thick. of base material (mm) h_{min}	Drilling depth (mm) h_0	Drilling diameter (mm) d_0	Clearance diameter (mm) d_f	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code
12X105/20	70	20	150	95	12	14	104	35	051061
12X110/20 A4	70	20	150	100	12	14	110	25	055304

APPLICATION

- Safety barriers

Anchor mechanical properties

Anchor size		12X105/20	12X110/20 A4
Cone			
f_{uk} (N/mm²)	Min. tensile strength	1000	500
Body			
f_{uk} (N/mm²)	Min. tensile strength	550	700
W_{el} (mm³)	Elastic section modulus	50	50
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	33	26
M (Nm)	Recommended bending moment	13,7	10,8

MATERIAL

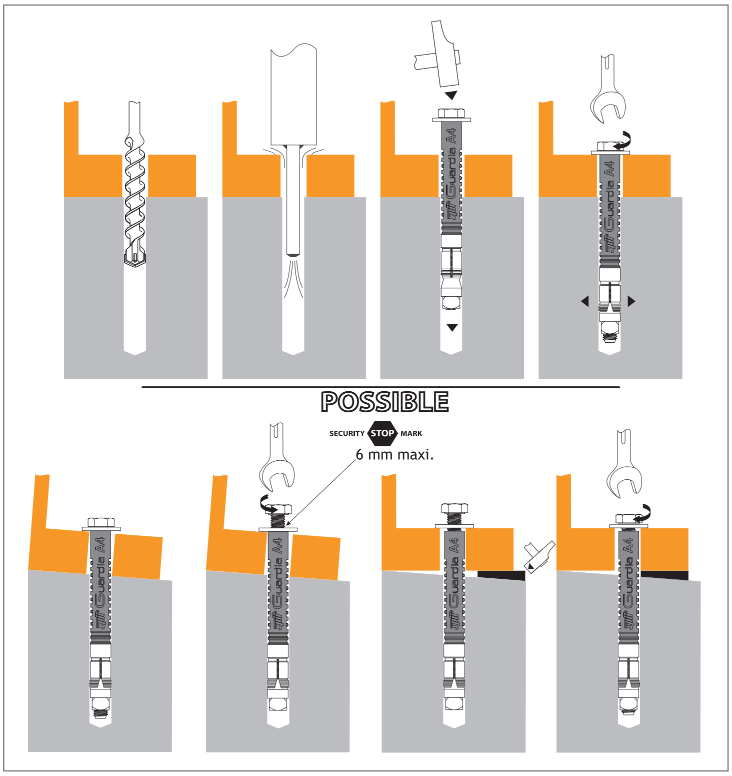
Zinc coated version:

- **Bolt :** cold formed steel NF EN 10263-2 or bar turning steel (type 1,0737) NF EN 10087
- **Cone :** cold formed steel NF A 35-557
- **Expansion sleeve :** bar turning steel (type 1,0737) NF EN 10087
- **Plastic ring :** PEHD
- **Washer :** electroplated steel NF E 25 514

Stainless steel version:

- **Bolt :** stainless steel A4-70, NF EN ISO 3506-1
- **Cone :** stainless steel A4 X2, Cr Ni Mo 17-12-2, NF EN 10 088-1
- **Expansion sleeve :** stainless steel A4 X2 Cr Ni Mo 17-12-2, NF EN 10 888-1
- **Plastic ring :** Polyacetal
- **Washer :** stainless steel A4 X5 Cr Ni Mo 17-12-2, NF EN 10 088-2

Installation



The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/4 and 4/4).

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	12X105/20	12X110/20 A4
Non-cracked concrete (C20/25)		
h_{ef}	**70**	**70**
$N_{Ru,m}$	26,2	24,4
N_{Rk}	25,6	19,5

SHEAR

Anchor size	12X105/20	12X110/20 A4
Non-cracked concrete (C20/25)		
$V_{Ru,m}$	20.2	15,3
V_{Rk}	14,6	12,8

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}{}^{*}}{\gamma_{Mc}}$$

*Derived from test results

$$V_{Rd} = \frac{V_{Rk}{}^{*}}{\gamma_{Ms}}$$

TENSILE

Anchor size	12X105/20	12X110/20 A4
Non-cracked concrete (C20/25)		
h_{ef}	**70**	**70**
N_{Rd}	17,1	13

$\gamma_{Mc} = 1,5$

SHEAR

Anchor size	12X105/20	12X110/20 A4
Non-cracked concrete (C20/25)		
V_{Rd}	9,7	8,2

$\gamma_{Ms} = 1,5$ for zinc coated steel and $\gamma_{Ms} = 1,56$ for stainless steel version

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}{}^{*}}{\gamma_M \cdot \gamma_F}$$

*Derived from test results

$$V_{rec} = \frac{V_{Rk}{}^{*}}{\gamma_M \cdot \gamma_F}$$

TENSILE

Anchor size	12X105/20	12X110/20 A4
Non-cracked concrete (C20/25)		
h_{ef}	**70**	**70**
N_{rec}	12,2	9,3

$\gamma_F = 1,4$; $\gamma_{Mc} = 1,5$

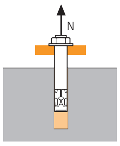
SHEAR

Anchor size	12X105/20	12X110/20 A4
Non-cracked concrete (C20/25)		
V_{rec}	7,0	5,8

$\gamma_{Ms} = 1,5$ for zinc coated steel and $\gamma_{Ms} = 1,56$ for stainless steel version

SPIT CC Method (values issued from ETA)

TENSILE in kN



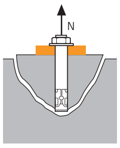
Pull-out resistance

$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$ — Design pull-out resistance

Anchor size		12X105/20	12X110/20 A4
h_{ef}		**70**	**70**
$N^0_{Rd,p}$	(C20/25)	-	13,3

$\gamma_{Mc} = 1,5$



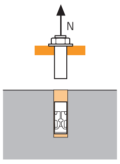
Concrete cone resistance

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$ — Design cone resistance

Anchor size		12X105/20	12X110/20 A4
h_{ef}		**70**	**70**
$N^0_{Rd,c}$	(C20/25)	19,7	19,7

$\gamma_{Mc} = 1,5$



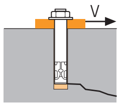
Steel resistance

$N_{Rd,s}$ — Steel design tensile resistance

Anchor size	12X105/20	12X110/20 A4
$N_{Rd,s}$	18,0	13,9

$\gamma_{Ms} = 1,4$ for zinc coated steel and $\gamma_{Ms} = 1,87$ for stainless steel version

SHEAR in kN



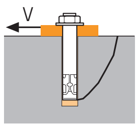
Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c}$ — Design concrete edge resistance at minimum edge distance (C_{min})

Anchor size		12X105/20	12X110/20 A4
h_{ef}		**70**	**70**
C_{min}		50	50
S_{min}		70	70
$V^0_{Rd,c}$	(C20/25)	3,1	3,1

$\gamma_{Mc} = 1,5$



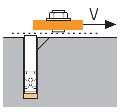
Pryout failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$ — Design pryout resistance

Anchor size		12X105/20	12X110/20 A4
h_{ef}		**70**	**70**
$V^0_{Rd,cp}$	(C20/25)	39,4	39,4

$\gamma_{Mcp} = 1,5$



Steel resistance

$V_{Rd,s}$ — Steel design shear resistance

Anchor size	12X105/20	12X110/20 A4
$V_{Rd,s}$	9,5	8,2

$\gamma_{Ms} = 1,5$ for zinc coated steel and $\gamma_{Ms} = 1,56$ for stainless steel version

$$N_{Rd} = \min(N_{Rd,p}\ ;\ N_{Rd,c}\ ;\ N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c}\ ;\ V_{Rd,cp}\ ;\ V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

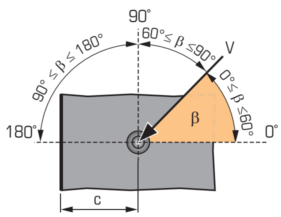
$$\beta_N + \beta_V \leq 1,2$$

f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
C25/30	1,1	C40/50	1,41
C30/37	1,22	C45/55	1,48
C35/45	1,34	C50/60	1,55

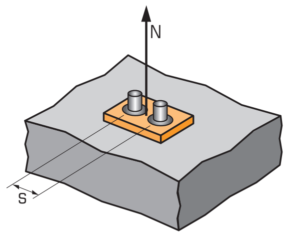
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2



SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0{,}5 + \frac{s}{6.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

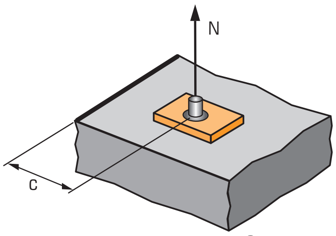
$s_{cr,N} = 3.h_{ef}$

Ψ_S must be used for each spacing influenced the anchors group

SPACING S — Reduction factor Ψ_s, Non-cracked concrete

Anchor size	12X105/20	12X110/20 A4
70	0,67	0,67
80	0,69	0,69
90	0,71	0,71
100	0,74	0,74
110	0,76	0,76
120	0,79	0,79
130	0,81	0,81
140	0,83	0,83
160	0,88	0,88
190	0,95	0,95
210	1,00	1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0{,}28 + 0{,}48 \,.\, \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

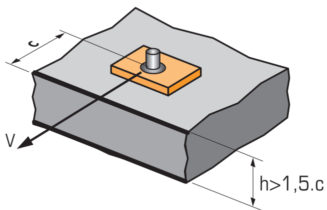
$c_{cr,N} = 1{,}5.h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

EDGE C — Reduction factor $\Psi_{c,N}$, Non-cracked concrete

Anchor size	12X105/20	12X110/20 A4
50	0,62	0,62
60	0,69	0,69
70	0,76	0,76
80	0,83	0,83
90	0,90	0,90
100	0,97	0,97
105	1,00	1,00

$\Psi_{s\text{-}c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

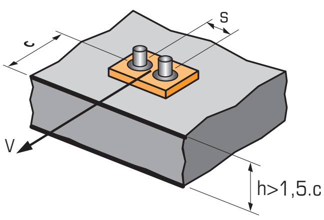


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$, Non-cracked concrete

c/c_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

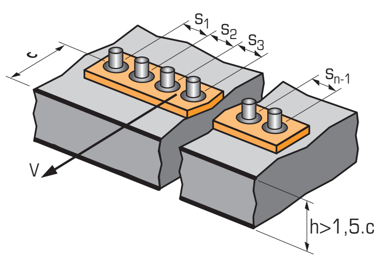


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

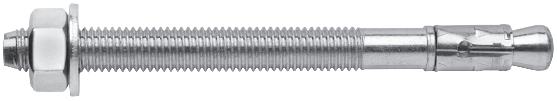
Reduction factor $\Psi_{s\text{-}c,V}$, Non-cracked concrete

s/c_{min} \ c/c_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65



For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + \ldots + s_{n-1}}{3.n.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

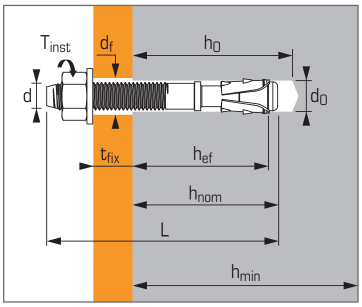


FIX Z XTREM

zinc coated steel version 1/6

Torque controlled expansion anchor, for use in cracked and non-cracked concrete

ETA Option 1- 15/0388



APPLICATION

- Steel and timber framework and beams
- Lift guide rails
- Industrial doors and gates
- Brickwork support angles
- Storage systems

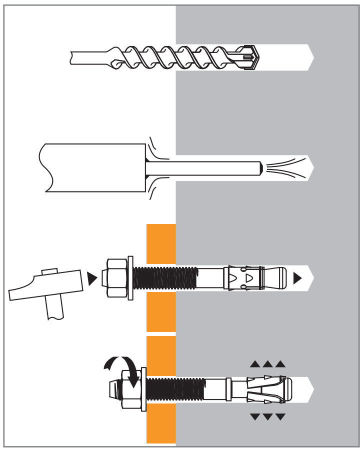
MATERIAL

- **Body :** cold formed steel, DIN 1654, part 2 or 4 / Zinc electroplated Zn5C/Fe (5 µm), NFA 91102
- **Sleeve :** S355 MC as per NF EN 10-149-2
- **Nut :** steel strength grade 6 or 8, ISO 898-2
- **Washer :** steel, NF E 25513

Technical data

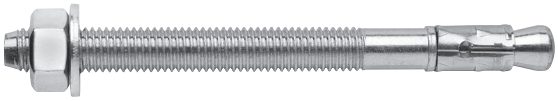
Anchor size	Letter marking	Min. anchor depth (mm) h_{ef}	Embed. depth (mm) h_{nom}	Max. thick. of part to be fixed (mm) t_{fix}	Drilling depth (mm) h_0	Min. thick. of base material (mm) h_{min}	Thread diameter (mm) d	Drilling diameter (mm) d_0	Clearance diameter (mm) d_f	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code
8X65/5	B			5						65		057763
8X75/15	D			15						75		057764
8X90/30	E	46	51	30	60	100	8	8	9	90	20	057765
8X120/60	G			60						120		057766
8X130/70	I			70						130		057788
10X85/5	D			5						85		057768
10X90/10	E			10						90		057769
10X100/20	F	60	68	20	75	120	10	10	12	100	45	057770
10X120/40	G			40						120		057771
10X140/60	I			60						140		057772
10X160/80	-			80						160		057773
12X100/5	E			5						100		057774
12X105/10	F			10						105		057775
12X115/20	G	70	80	20	90	140	12	12	14	115	60	057776
12X135/40	I			40						135		057777
12X155/60	J			60						155		057778
12X180/85	L			85						180		057779
16X145/25	I			25						145		057781
16X170/50	K	85	98	50	110	170	16	16	18	170	110	057782
16X180/60	L			60						180		057783
20X170/30	K			30						170		057785
20X200/60	M	100	113	60	130	200	20	20	22	200	160	057786
20X220/80	O			80						220		057787

INSTALLATION



Anchor mechanical properties

Anchor size		M8	M10	M12	M16	M20
Cross-section above cone						
f_{uk} (N/mm²)	Min. tensile strength	900	830	830	720	600
f_{yk} (N/mm²)	Yield strength	800	670	670	580	580
As (mm²)	Stressed cross-section	22,9	35,3	45,4	88,2	165,1
Threaded part						
f_{uk} (N/mm²)	Min. tensile strength	750	730	730	600	500
f_{yk} (N/mm²)	Yield strength	680	580	580	480	410
As (mm²)	Stressed cross-section	36,6	58	84,3	156	245
W_{el} (mm³)	Elastic section modulus	31,23	62,3	109,17	277,47	540,9
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	21	36	63	133	222
M (Nm)	Recommended bending moment	8,7	14,7	25,8	54,4	90,5



The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/6 to 6/6).

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	M8	M10	M12	M16	M20
Non-cracked concrete (C20/25)					
h_{ef}	**46**	**60**	**70**	**85**	**100**
$N_{Ru,m}$	15,8	26,1	35,5	47,5	60,1
N_{Rk}	9,1	21,2	29,8	40,3	45,0
Cracked concrete (C20/25)					
h_{ef}	**46**	**60**	**70**	**85**	**100**
$N_{Ru,m}$	10,7	16,9	25,7	38,9	60,9
N_{Rk}	6,8	13,8	20,7	28,5	52,2

SHEAR

Anchor size	M8	M10	M12	M16	M20
Cracked & non-cracked concrete					
$V_{Ru,m}$	16,1	19,6	26,6	55,4	85,0
V_{Rk}	14,9	16,6	21,2	46,7	79,2

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{*}}{\gamma_{Mc}}$$

*Derived from test results

$$V_{Rd} = \frac{V_{Rk}^{*}}{\gamma_{Ms}}$$

TENSILE

Anchor size	M8	M10	M12	M16	M20
Non-cracked concrete (C20/25)					
h_{ef}	**46**	**60**	**70**	**85**	**100**
N_{Rd}	6,1	14,1	19,9	26,9	30,0
Cracked concrete (C20/25)					
h_{ef}	**46**	**60**	**70**	**85**	**100**
N_{Rd}	4,5	9,2	13,8	19,0	34,8

$\gamma_{Mc} = 1,5$

SHEAR

Anchor size	M8	M10	M12	M16	M20
Cracked & non-cracked concrete					
V_{Rd}	11,9	13,3	16,9	37,4	52,8

$\gamma_{Ms} = 1,25$ for M8 to M16 and $\gamma_{Ms} = 1,5$ for M20

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}^{*}}{\gamma_M . \gamma_F}$$

*Derived from test results

$$V_{rec} = \frac{V_{Rk}^{*}}{\gamma_M . \gamma_F}$$

TENSILE

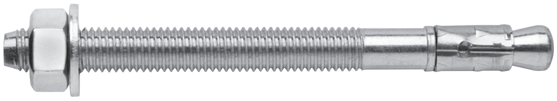
Anchor size	M8	M10	M12	M16	M20
Non-cracked concrete (C20/25)					
h_{ef}	**46**	**60**	**70**	**85**	**100**
N_{rec}	4,3	10,1	14,2	19,2	21,4
Cracked concrete (C20/25)					
h_{ef}	**46**	**60**	**70**	**85**	**100**
N_{rec}	3,5	6,6	9,9	13,6	24,9

$\gamma_{Mc} = 1,5$

SHEAR

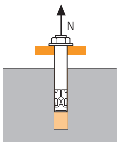
Anchor size	M8	M10	M12	M16	M20
Cracked & non-cracked concrete					
V_{rec}	8,5	9,5	12,1	26,7	37,7

$\gamma_F = 1,25$ for M8 to M16 and $\gamma_{Ms} = 1,5$ for M20



SPIT CC Method (values issued from ETA)

TENSILE in kN

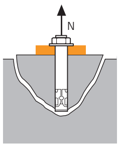


Pull-out resistance

$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$					Design pull-out resistance
Anchor size	M8	M10	M12	M16	M20
Non-cracked concrete					
h_{ef}	**46**	**60**	**70**	**85**	**100**
$N^0_{Rd,p}$ (C20/25)	6,0	13,3	20,0	26,7	-
Cracked concrete					
h_{ef}	**46**	**60**	**70**	**85**	**100**
$N^0_{Rd,p}$ (C20/25)	3,3	6,0	10,7	13,3	20,0

$\gamma_{Mc} = 1,5$

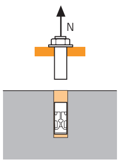


Concrete cone resistance

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$					Design cone resistance
Anchor size	M8	M10	M12	M16	M20
Non-cracked concrete					
h_{ef}	**46**	**60**	**70**	**85**	**100**
$N^0_{Rd,c}$ (C20/25)	10,5	15,6	19,7	26,3	33,6
Cracked concrete					
h_{ef}	**46**	**60**	**70**	**85**	**100**
$N^0_{Rd,c}$ (C20/25)	7,5	11,2	14,1	18,8	24,0

$\gamma_{Mc} = 1,5$

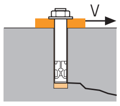


Steel resistance

$N_{Rd,s}$					Steel design tensile resistance
Anchor size	M8	M10	M12	M16	M20
$N_{Rd,s}$	11,3	19,8	25,8	43,7	66,1

$\gamma_{Ms} = 1,4$ for M8, $\gamma_{Mc} = 1,48$ for M10 to M16 and $\gamma_{Mc} = 1,5$ for M20

SHEAR in kN

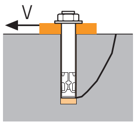


Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c}$					Design concrete edge resistance at minimum edge distance (C_{min})
Anchor size	M8	M10	M12	M16	M20
Non-cracked concrete					
h_{ef}	**46**	**60**	**70**	**85**	**100**
C_{min}	50	60	60	90	100
S_{min}	75	120	145	140	160
$V^0_{Rd,c}$ (C20/25)	3,0	4,4	4,8	10,0	13,0
Cracked concrete					
h_{ef}	**46**	**60**	**70**	**85**	**100**
C_{min}	50	55	60	80	100
S_{min}	75	90	145	110	130
$V^0_{Rd,c}$ (C20/25)	2,1	2,8	3,4	6,0	9,3

$\gamma_{Mc} = 1,5$

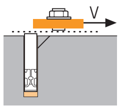


Pryout failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$					Design pryout resistance
Anchor size	M8	M10	M12	M16	M20
Non-cracked concrete					
h_{ef}	**46**	**60**	**70**	**85**	**100**
$V^0_{Rd,cp}$ (C20/25)	10,5	31,2	39,4	52,7	67,2
Cracked concrete					
h_{ef}	**46**	**60**	**70**	**85**	**100**
$V^0_{Rd,cp}$ (C20/25)	7,5	22,3	28,1	37,6	48,0

$\gamma_{Mcp} = 1,5$



Steel resistance

$V_{Rd,s}$					Steel design shear resistance
Anchor size	M8	M10	M12	M16	M20
$V_{Rd,s}$	10,8	12,6	18,1	36,0	40,7

$\gamma_{Ms} = 1,27$ for M8 to M12, $\gamma_{Mc} = 1,25$ for M16 and $\gamma_{Mc} = 1,5$ for M20

$$N_{Rd} = \min(N_{Rd,p}\ ;\ N_{Rd,c}\ ;\ N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c}\ ;\ V_{Rd,cp}\ ;\ V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

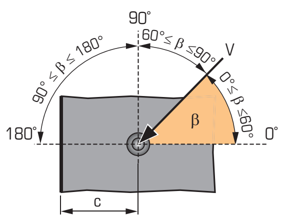
$$\beta_N + \beta_V \leq 1,2$$

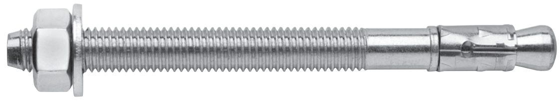
f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
C25/30	1,1	C40/50	1,41
C30/37	1,22	C45/55	1,48
C35/45	1,34	C50/60	1,55

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

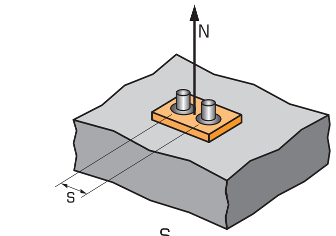
Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0,5 + \frac{s}{6.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

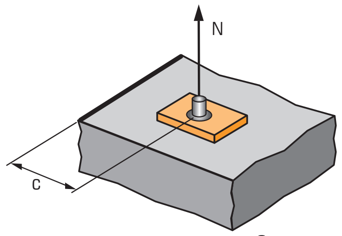
$s_{cr,N} = 3.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group

SPACING S — Reduction factor Ψ_s — Cracked & non-cracked concrete

Anchor size	M8	M10	M12	M16	M20
50	0,68				
55	0,70	0,65			
75	0,77	0,71			
100	0,86	0,78			
120	0,93	0,83	0,79	0,74	0,70
140	1,00	0,89	0,83	0,77	0,73
180		1,00	0,93	0,85	0,80
210			1,00	0,91	0,85
255				1,00	0,93
280					0,97
300					1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0,23 + 0,51 \cdot \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

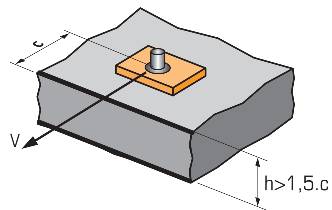
$c_{cr,N} = 1,5.h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

EDGE C — Reduction factor $\Psi_{c,N}$ — Cracked & non-cracked concrete

Anchor size	M8	M10	M12	M16	M20
50	1,00				
55		1,00			
60			1,00		
80				1,00	
100					1,00

$\Psi_{s\text{-}c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

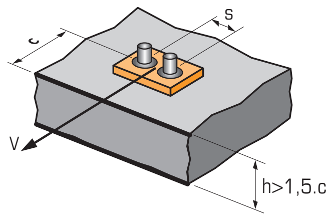


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Cracked & non-cracked concrete

$\frac{C}{C_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

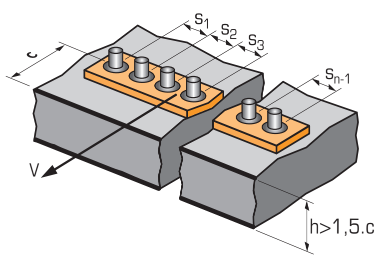


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

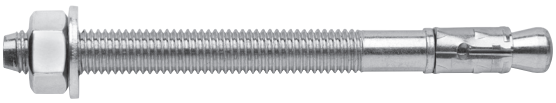
Reduction factor $\Psi_{s\text{-}c,V}$ — Cracked & non-cracked concrete

$\frac{S}{C_{min}}$ \ $\frac{C}{C_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65



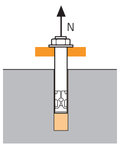
For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + ... + s_{n-1}}{3.n.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$



SPIT CC Method (values issued from ETA - Seismic category C1)

TENSILE in kN

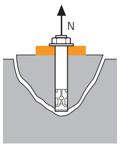


Pull-out resistance

$$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$$

$N^0_{Rd,p,C1}$	Design pull-out resistance				
Anchor size	M8	M10	M12	M16	M20
Category C1 - Single anchor					
h_{ef}	46	60	70	85	100
$N^0_{Rd,p,C1}$ (C20/25)	3,1	4,9	10,7	13,3	-
Category C1 - Group of anchors [1]					
h_{ef}	46	60	70	85	100
$N^0_{Rd,p,C1}$ (C20/25)	2,7	4,2	9,1	11,3	17,0

[1] when more than one anchor of the group is submitted to tensile load
$\gamma_{Mc} = 1,5$

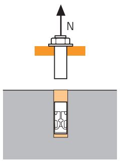


Concrete cone resistance

$$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$$

$N^0_{Rd,c,C1}$	Design cone resistance				
Anchor size	M8	M10	M12	M16	M20
Category C1 - Single anchor					
h_{ef}	46	60	70	85	100
$N^0_{Rd,c,C1}$ (C20/25)	6,2	9,5	11,9	16,0	20,4
Category C1 - Group of anchors [1]					
h_{ef}	46	60	70	85	100
$N^0_{Rd,c,C1}$ (C20/25)	5,4	8,4	10,5	14,1	18,0

[1] when more than one anchor of the group is submitted to tensile load
$\gamma_{Mc} = 1,5$

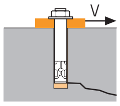


Steel resistance

$N_{Rd,s,C1}$	Steel design tensile resistance				
Anchor size	M8	M10	M12	M16	M20
$N_{Rd,s,C1}$	13,2	19,8	25,8	43,7	66,1

[1] when more than one anchor of the group is submitted to tensile load
$\gamma_{Ms} = 1,4$ for M8, $\gamma_{Mc} = 1,48$ for M10 to M16, and $\gamma_{Mc} = 1,5$ for M20

SHEAR in kN

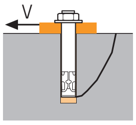


Concrete edge resistance

$$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$$

$V^0_{Rd,c,C1}$	Design concrete edge resistance at minimum edge distance (C_{min})				
Anchor size	M8	M10	M12	M16	M20
Category C1 - Single anchor					
h_{ef}	46	60	70	85	100
C_{min}	50	55	60	80	100
S_{min}	75	120	145	140	160
$V^0_{Rd,c,C1}$ (C20/25)	2,1	3,6	7,4	8,4	11,4
Category C1 - Group of anchors [1]					
h_{ef}	46	60	70	85	100
C_{min}	50	65	100	100	115
S_{min}	75	90	145	110	130
$V^0_{Rd,c,C1}$ (C20/25)	1,8	3,0	6,3	7,1	9,7

[1] when more than one anchor of the group is submitted to shear load
$\gamma_{Mc} = 1,5$

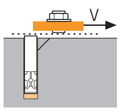


Pryout failure

$$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$$

$V^0_{Rd,cp,C1}$	Design pryout resistance				
Anchor size	M8	M10	M12	M16	M20
Category C1 - Single anchor					
h_{ef}	46	60	70	85	100
$V^0_{Rd,cp,C1}$ (C20/25)	6,2	19,0	23,9	32,0	40,8
Category C1 - Group of anchors [1]					
h_{ef}	46	60	70	85	100
$V^0_{Rd,cp,C1}$ (C20/25)	5,4	16,7	21,1	28,2	36,0

[1] when more than one anchor of the group is submitted to shear load
$\gamma_{Mc} = 1,5$



Steel resistance [2]

$V_{Rd,s,C1}$	Steel design shear resistance				
Anchor size	M8	M10	M12	M16	M20
Category C1 - Single anchor					
$V_{Rd,s,C1}$	4,8	12,6	18,1	36,0	40,7
Category C1 - Group of anchors [1]					
$V_{Rd,s,C1}$	4,1	10,7	15,4	30,6	34,6

[1] when more than one anchor of the group is submitted to shear load
[2] In case of no hole clearance between anchor and fixture
$\gamma_{Ms} = 1,25$ for M8 and M16, $\gamma_{Mc} = 1,27$ for M10 and M12, and $\gamma_{Mc} = 1,5$ for M20

$$N_{Rd,C1} = \min(N_{Rd,p,C1} \; ; \; N_{Rd,c,C1} \; ; \; N_{Rd,s,C1})$$
$$\beta_N = N_{Sd} / N_{Rd,C1} \leq 1$$

$$V_{Rd,C1} = \min(V_{Rd,c,C1} \; ; \; V_{Rd,cp,C1} \; ; \; V_{Rd,s,C1})$$
$$\beta_V = V_{Sd} / V_{Rd,C1} \leq 1$$

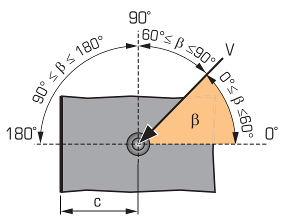
$$\beta_N + \beta_V \leq 1,2$$

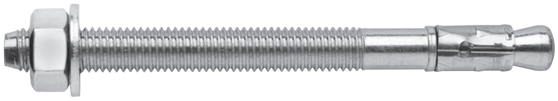
f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
C25/30	1,1	C40/50	1,41
C30/37	1,22	C45/55	1,48
C35/45	1,34	C50/60	1,55

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

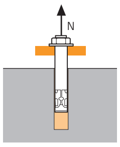
Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





SPIT CC Method (values issued from ETA - Seismic category C2)

TENSILE in kN



Pull-out resistance

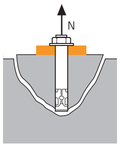
$$N_{Rd,p,C2} = N^0_{Rd,p,C2} \cdot f_b$$

$N^0_{Rd,p,C2}$ — Design pull-out resistance

Anchor size	M8	M10	M12	M16	M20
Category C2 - Single anchor					
h_{ef}	**46**	**60**	**70**	**85**	**100**
$N^0_{Rd,p,C2}$ (C20/25)	NA	1,9	4,0	12,0	17,1
Category C2 - Group of anchors [1]					
h_{ef}	**46**	**60**	**70**	**85**	**100**
$N^0_{Rd,p,C2}$ (C20/25)	NA	1,6	3,4	10,2	14,5

[1] when more than one anchor of the group is submitted to tensile load

$\gamma_{Mc} = 1,5$



Concrete cone resistance

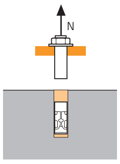
$$N_{Rd,c,C2} = N^0_{Rd,c,C2} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$$

$N^0_{Rd,c,C2}$ — Design cone resistance

Anchor size	M8	M10	M12	M16	M20
Category C2 - Single anchor					
h_{ef}	**46**	**60**	**70**	**85**	**100**
$N^0_{Rd,c,C2}$ (C20/25)	NA	9,5	11,9	16,0	20,4
Category C2 - Group of anchors [1]					
h_{ef}	**46**	**60**	**70**	**85**	**100**
$N^0_{Rd,c,C2}$ (C20/25)	NA	8,4	10,5	14,1	18,0

[1] when more than one anchor of the group is submitted to tensile load

$\gamma_{Mc} = 1,5$



Steel resistance

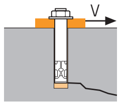
$N_{Rd,s,C2}$ — Steel design tensile resistance

Anchor size	M8	M10	M12	M16	M20
$N_{Rd,s,C2}$	NA	19,5	25,5	43,1	66,1

[1] when more than one anchor of the group is submitted to tensile load

$\gamma_{Ms} = 1,5$ for M10, $\gamma_{Mc} = 1,48$ for M12 and M16, and $\gamma_{Mc} = 1,5$ for M20

SHEAR in kN



Concrete edge resistance

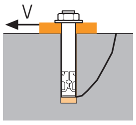
$$V_{Rd,c,C2} = V^0_{Rd,c,C2} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$$

$V^0_{Rd,c,C2}$ — Design concrete edge resistance at minimum edge distance (C_{min})

Anchor size	M8	M10	M12	M16	M20
Category C2 - Single anchor					
h_{ef}	**46**	**60**	**70**	**85**	**100**
C_{min}	50	55	60	80	100
S_{min}	40	50	100	100	100
$V^0_{Rd,c,C2}$ (C20/25)	NA	3,6	7,4	8,4	11,4
Category C2 - Group of anchors [1]					
h_{ef}	**46**	**60**	**70**	**85**	**100**
C_{min}	50	65	100	100	115
S_{min}	40	50	100	100	100
$V^0_{Rd,c,C2}$ (C20/25)	NA	3,0	6,3	7,1	9,7

[1] when more than one anchor of the group is submitted to shear load

$\gamma_{Mc} = 1,5$



Pryout failure

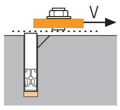
$$V_{Rd,cp,C2} = V^0_{Rd,cp,C2} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$$

$V^0_{Rd,cp,C2}$ — Design pryout resistance

Anchor size	M8	M10	M12	M16	M20
Category C2 - Single anchor					
h_{ef}	**46**	**60**	**70**	**85**	**100**
$V^0_{Rd,cp,C2}$ (C20/25)	NA	19,0	23,9	32,0	40,8
Category C2 - Group of anchors [1]					
h_{ef}	**46**	**60**	**70**	**85**	**100**
$V^0_{Rd,cp,C2}$ (C20/25)	NA	16,7	21,1	28,2	36,0

[1] when more than one anchor of the group is submitted to shear load

$\gamma_{Mc} = 1,5$



Steel resistance [2]

$V_{Rd,s,C2}$ — Steel design shear resistance

Anchor size	M8	M10	M12	M16	M20
Category C2 - Single anchor					
$V_{Rd,s,C2}$	NA	7,6	11,0	27,1	29,8
Category C2 - Group of anchors [1]					
$V_{Rd,s,C2}$	NA	6,5	9,4	23,1	25,3

[1] when more than one anchor of the group is submitted to shear load

[2] In case of no hole clearance between anchor and fixture

$\gamma_{Ms} = 1,27$ for M10 and M12, $\gamma_{Mc} = 1,25$ for M16, and $\gamma_{Mc} = 1,5$ for M20

$$N_{Rd,C2} = \min(N_{Rd,p,C2} \ ; \ N_{Rd,c,C2} \ ; \ N_{Rd,s,C2})$$
$$\beta_N = N_{Sd} / N_{Rd,C2} \leq 1$$

$$V_{Rd,C2} = \min(V_{Rd,c,C2} \ ; \ V_{Rd,cp,C2} \ ; \ V_{Rd,s,C2})$$
$$\beta_V = V_{Sd} / V_{Rd,C2} \leq 1$$

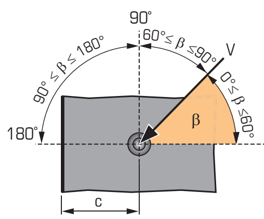
$$\beta_N + \beta_V \leq 1,2$$

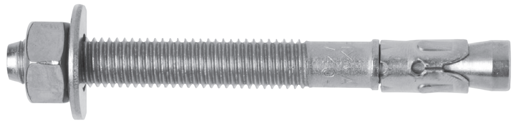
f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
C25/30	1,1	C40/50	1,41
C30/37	1,22	C45/55	1,48
C35/45	1,34	C50/60	1,55

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





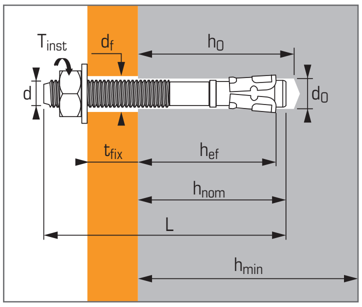
FIX Z - A4

stainless steel version 1/4

Torque controlled expansion anchor, for use in cracked and non-cracked concrete

ETA Option 1- 04/0010

FIX Z A4 M10



Technical data

Anchor size	Letter marking	Minimum anchorage depth: min. anchor depth (mm) h_{ef}	Min.: Embed. depth (mm) h_{nom}	Min.: Max. thick. of part to be fixed (mm) t_{fix}	Min.: Drilling depth (mm) h_0	Min.: Min. thick. of base material (mm) h_{min}	Maximum anchorage depth: max. anchor depth (mm) h_{ef}	Max.: Embed. depth (mm) h_{nom}	Max.: Max. thick. of part to be fixed (mm) t_{fix}	Max.: Drilling depth (mm) h_0	Max.: Min. thick. of base material (mm) h_{min}	Thread diameter (mm) d	Drilling diameter (mm) d_0	Clearance diameter (mm) d_f	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code
6X55/15*	-	25,6	35	15	41	100	35	45	5	51	100	6	6	8	55	10	054270
8X55/5	-	35	42	5	52	100	48	55	-	65	100	8	8	9	55	20	050441
8X70/20-7	C			20					7						70		054610
8X90/40-27	E			40					27						90		055343
8X130/80-67	H			80					67						130		050367
10X65/5	-	42	50	5	62	100	58	66	-	78	116	10	10	12	65	35	050466
10X75/15	C			15					-						75		054630
10X95/35-20	E			35					20						95		054640
10X120/60-45	G			60					45						120		050442
12X80/5	-	50	60	5	75	100	70	80	-	95	140	12	12	14	80	50	055344
12X100/25-6	E			25					6						100		055345
12X115/40-21	G			40					21						115		055394
12X140/65-46	I			65					46						140		054680
16X125/30-8	G	64	70	30	95	128	86	100	8	117	172	16	16	18	125	100	050443
16X150/55-33	I			55					33						150		054700
16X170/75-53	K			75					53						170		050444

* Do not belong to ETA

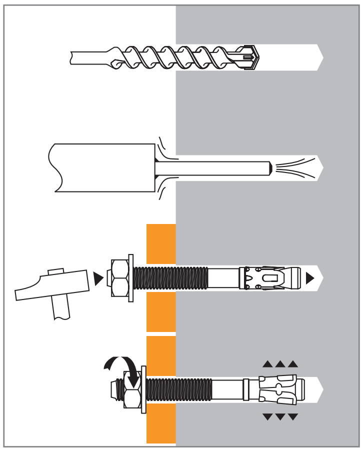
APPLICATION

- Steel and timber framework and beams
- Lift guide rails
- Industrial doors and gates
- Brickwork support angles
- Storage systems

MATERIAL

- **Body :**
steel N° 1.4404 (A4), 1.4578, NF EN 10088.3
- **Sleeve :**
cold laminated steel N° 1.4404, NF EN 10088.3
- **Nut :**
stainless steel A4-80, NF EN 20898-2
- **Washer :**
stainless steel A4, NF EN 20898

INSTALLATION

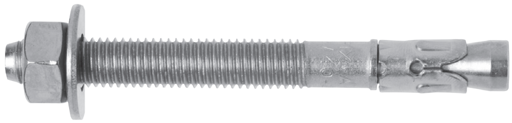


Anchor mechanical properties

Anchor size		M6	M8	M10	M12	M16
Cross-section above cone						
f_{uk} (N/mm²)	Min. tensile strength	900	900	900	900	880
f_{yk} (N/mm²)	Yield strength	780	780	780	780	750
As (mm²)	Stressed cross-section	-	24,6	41,9	58,1	107,5
Threaded part						
f_{uk} (N/mm²)	Min. tensile strength	620	620	620	620	580
f_{yk} (N/mm²)	Yield strength	420	420	420	420	330
As (mm²)	Stressed cross-section	20,1	36,6	58	84,3	157
W_{el} (mm³)	Elastic section modulus	12,71	31,23	62,3	109,17	277,47
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	9,45	23	46	81	193
M (Nm)	Recommended bending moment	3,7	9,4	18,8	33,1	78,8

FIX Z - A4

2/4 stainless steel version



The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/4 and 4/4).

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	M6	M8	M10	M12	M16
Non-cracked concrete (C20/25)					
$h_{ef,min}$	**25,6**	**35**	**42**	**50**	**64**
$N_{Ru,m}$	4,5	8,0	9,9	13,6	24,1
N_{Rk}	4,5	8,0	9,9	13,6	24,1
$h_{ef,max}$	**35**	**48**	**58**	**70**	**86**
$N_{Ru,m}$	9,4	22,0	23,0	26,3	53,6
N_{Rk}	7,0	17,2	19,2	25,1	44,1
Cracked concrete (C20/25)					
$h_{ef,min}$	**-**	**35**	**42**	**50**	**64**
$N_{Ru,m}$	-	12,5	13,1	18,6	29,6
N_{Rk}	-	7,5	9,1	14,2	24,8
$h_{ef,max}$	**-**	**48**	**58**	**70**	**86**
$N_{Ru,m}$	-	15,9	20,3	29,2	54,2
N_{Rk}	-	14,7	18,8	27,0	49,5

SHEAR

Anchor size	M6	M8	M10	M12	M16
Cracked & non-cracked concrete					
$V_{Ru,m}$	7,4	18,2	29,2	43,2	69,1
V_{Rk}	6,2	17,3	25	36,1	51,3

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{*}}{\gamma_{Mc}}$$

*Derived from test results

$$V_{Rd} = \frac{V_{Rk}^{*}}{\gamma_{Ms}}$$

TENSILE

Anchor size	M6	M8	M10	M12	M16
Non-cracked concrete (C20/25)					
$h_{ef,min}$	**25,6**	**35**	**42**	**50**	**64**
N_{Rd}	2,5	5,3	6,6	9,1	16,1
$h_{ef,max}$	**35**	**48**	**58**	**70**	**86**
N_{Rd}	3,8	11,5	12,8	14,3	29,4
Cracked concrete (C20/25)					
$h_{ef,min}$	**-**	**35**	**42**	**50**	**64**
N_{Rd}	-	5,0	6,1	9,5	16,5
$h_{ef,max}$	**-**	**48**	**58**	**70**	**86**
N_{Rd}	-	9,8	12,5	18,0	33,0

$\gamma_{Mc} = 1,5$

SHEAR

Anchor size	M6	M8	M10	M12	M16
Cracked & non-cracked concrete					
V_{Rd}	4,1	11,5	16,7	24,1	28,5

$\gamma_{Ms} = 1,5$ for M6 to M12 and $\gamma_{Ms} = 1,8$ for M16

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}^{*}}{\gamma_M . \gamma_F}$$

*Derived from test results

$$V_{rec} = \frac{V_{Rk}^{*}}{\gamma_M . \gamma_F}$$

TENSILE

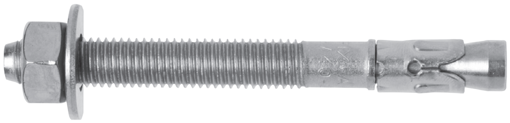
Anchor size	M6	M8	M10	M12	M16
Non-cracked concrete (C20/25)					
$h_{ef,min}$	**25,6**	**35**	**42**	**50**	**64**
N_{rec}	1,7	3,8	4,7	6,5	11,5
$h_{ef,max}$	**35**	**48**	**58**	**70**	**86**
N_{rec}	2,7	8,2	9,1	10,2	21,0
Cracked concrete (C20/25)					
$h_{ef,min}$	**-**	**35**	**42**	**50**	**64**
N_{rec}	-	3,6	4,3	6,8	11,8
$h_{ef,max}$	**-**	**48**	**58**	**70**	**86**
N_{rec}	-	7,0	9,0	12,8	23,6

$\gamma_F = 1,4$; $\gamma_{Mc} = 1,5$

SHEAR

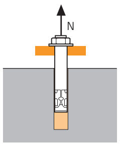
Anchor size	M6	M8	M10	M12	M16
Cracked & non-cracked concrete					
V_{rec}	2,9	8,2	11,9	17,2	20,4

$\gamma_F = 1,5$ for M6 to M12 and $\gamma_{Ms} = 1,8$ for M16



SPIT CC Method (values issued from ETA)

TENSILE in kN



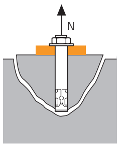
Pull-out resistance

$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$ — Design pull-out resistance

Anchor size		M8	M10	M12	M16
$h_{ef,min}$		**35**	**42**	**50**	**64**
$h_{ef,max}$		**48**	**58**	**70**	**86**
Non-cracked concrete (C20/25)					
$N^0_{Rd,p}$	$(h_{ef,min})$	6,0	6,0	8,0	13,3
$N^0_{Rd,p}$	$(h_{ef,max})$	8,0	10,7	10,7	20,0
Cracked concrete (C20/25)					
$N^0_{Rd,p}$	$(h_{ef,min})$	2,0	4,0	5,0	8,0
$N^0_{Rd,p}$	$(h_{ef,max})$	2,7	5,0	6,0	10,7

$\gamma_{Mc} = 1,5$



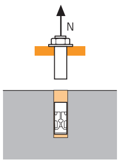
Concrete cone resistance

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$ — Design cone resistance

Anchor size		M8	M10	M12	M16
$h_{ef,min}$		**35**	**42**	**50**	**64**
$h_{ef,max}$		**48**	**58**	**70**	**86**
Non-cracked concrete (C20/25)					
$N^0_{Rd,c}$	$(h_{ef,min})$	7,0	9,1	11,9	17,2
$N^0_{Rd,c}$	$(h_{ef,max})$	11,2	14,8	19,7	26,8
Cracked concrete (C20/25)					
$N^0_{Rd,c}$	$(h_{ef,min})$	5,0	6,5	8,5	12,3
$N^0_{Rd,c}$	$(h_{ef,max})$	8,0	10,6	14,1	19,1

$\gamma_{Mc} = 1,5$



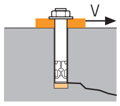
Steel resistance

$N_{Rd,s}$ — Steel design tensile resistance

Anchor size	M8	M10	M12	M16
$N_{Rd,s}$	8,5	14,4	20,0	29,7

$\gamma_{Ms} = 1,8$ for M8 to M12 and $\gamma_{Ms} = 2,1$ for M16

SHEAR in kN



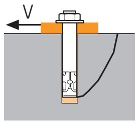
Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S-C,V}$

$V^0_{Rd,c}$ — Design concrete edge resistance at minimum edge distance (C_{min})

Anchor size		M8	M10	M12	M16
Minimum anchorage depth					
$h_{ef,min}$		**35**	**42**	**50**	**64**
C_{min}		60	65	100	100
S_{min}		60	75	170	150
$V^0_{Rd,c}$	(C20/25)	3,3	4,1	8,7	10,1
Maximum anchorage depth					
$h_{ef,max}$		**48**	**58**	**70**	**86**
C_{min}		60	65	90	105
S_{min}		50	55	75	90
$V^0_{Rd,c}$	(C20/25)	3,7	4,4	8,2	11,8

$\gamma_{Mc} = 1,5$



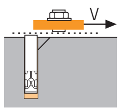
Pryout failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$ — Design pryout resistance

Anchor size	M8	M10	M12	M16
Non-cracked concrete C20/25)				
$h_{ef,min}$	**35**	**42**	**50**	**64**
$V^0_{Rd,cp}$	7,0	9,1	11,9	34,4
$h_{ef,\ max}$	**48**	**58**	**70**	**86**
$V^0_{Rd,cp}$	11,2	14,8	39,4	53,6
Cracked concrete C20/25)				
$h_{ef,min}$	**35**	**42**	**50**	**64**
$V^0_{Rd,cp}$	5,0	6,5	8,5	24,6
$h_{ef,\ max}$	**48**	**58**	**70**	**86**
$V^0_{Rd,cp}$	8,0	10,6	28,1	38,3

$\gamma_{Mcp} = 1,5$



Steel resistance

$V_{Rd,s}$ — Steel design shear resistance

Anchor size	M8	M10	M12	M16
$V_{Rd,s}$	8,2	13,1	18,9	25,8

$\gamma_{Ms} = 1,5$ for M8 to M12 and $\gamma_{Ms} = 1,8$ for M16

$$N_{Rd} = \min(N_{Rd,p}\ ;\ N_{Rd,c}\ ;\ N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c}\ ;\ V_{Rd,cp}\ ;\ V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

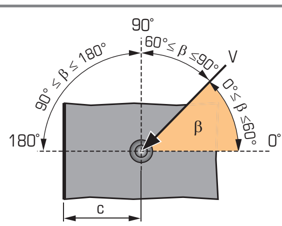
$$\beta_N + \beta_V \leq 1,2$$

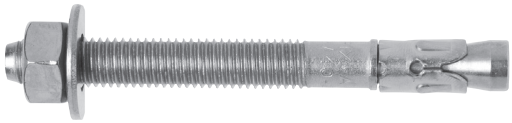
f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
C25/30	1,1	C40/50	1,41
C30/37	1,22	C45/55	1,48
C35/45	1,34	C50/60	1,55

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

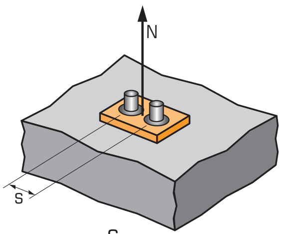
Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0,5 + \frac{s}{6.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

$s_{cr,N} = 3.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group

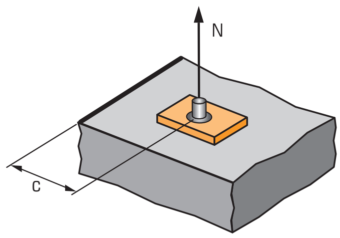
SPACING S — Reduction factor Ψ_s — Minimum anchorage depth

Anchor size	M8	M10	M12	M16
60	0,78			
75	0,86	0,80		
100	0,98	0,90	0,83	0,76
105	1,00	0,92	0,85	0,77
110		0,94	0,87	0,79
125		1,00	0,92	0,83
150			1,00	0,89
170				0,94
192				1,00

SPACING S — Reduction factor Ψ_s — Maximum anchorage depth

Anchor size	M8	M10	M12	M16
50	0,67			
55	0,69	0,66		
75	0,76	0,72	0,68	
90	0,81	0,76	0,71	0,67
110	0,88	0,82	0,76	0,71
130	0,95	0,87	0,81	0,75
145	1,00	0,92	0,85	0,78
155		0,95	0,87	0,80
175		1,00	0,92	0,84
205			0,99	0,90
210			1,00	0,91
258				1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0,5 + 0,33 . \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

$c_{cr,N} = 1,5.h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

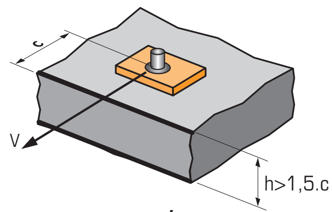
EDGE C — Reduction factor $\Psi_{c,N}$ — Minimum anchorage depth

Anchor size	M8	M10	M12	M16
60	1,00			
65		1,00		
100			1,00	
100				1,00

EDGE C — Reduction factor $\Psi_{c,N}$ — Maximum anchorage depth

Anchor size	M8	M10	M12	M16
60	0,91			
65	0,95	0,91		
72	1,00	0,96		
80		1,00		
90			0,94	
105			1,00	0,90
130				1,00

$\Psi_{s\text{-}c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

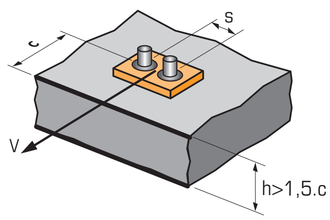


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Cracked & non-cracked concrete

$\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

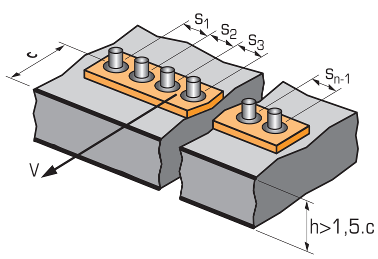


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

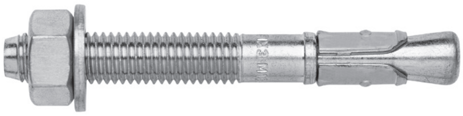
Reduction factor $\Psi_{s\text{-}c,V}$ — Cracked & non-cracked concrete

$\frac{s}{c_{min}}$ \ $\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65



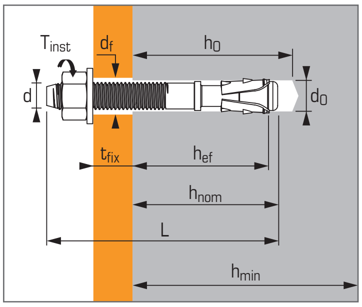
For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + ... + s_{n-1}}{3.n.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$



Torque controlled expansion anchor, for use in non-cracked concrete

ETA European Technical Assessment
ETA Option 7- 13/0005



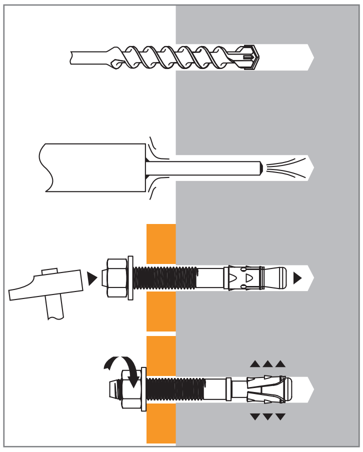
APPLICATION

- Steel and timber framework and beams
- Lift guide rails
- Industrial doors and gates
- Brickwork support angles
- Storage systems

MATERIAL

- **Body M6-M20 :** cold formed steel, NFA 35-053 / zinc electroplated (5 µm)
- **Sleeve :** cold formed steel, NFA 35-231
- **Nut :** steel strength grade 6 or 8, ISO 898-2
- **Washer :** steel, NF E 25513

INSTALLATION



Technical data

Anchor size	Letter marking	Minimum anchorage depth: min. anchor depth (mm) h_{ef}	Embed. depth (mm) h_{nom}	Max. thick. of part to be fixed (mm) t_{fix}	Drilling depth (mm) h_0	Min. thick. of base material (mm) h_{min}	Maximum anchorage depth: max. anchor depth (mm) h_{ef}	Embed. depth (mm) h_{nom}	Max. thick. of part to be fixed (mm) t_{fix}	Drilling depth (mm) h_0	Min. thick. of base material (mm) h_{min}	Thread diameter (mm) d	Drilling diameter (mm) d_0	Clearance diameter (mm) d_f	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code
6X45/5*	-			5					-						45		050510
6X55/15*	-	25,6	35	20	41	100	35	45	15	51	100	6	6	8	55	10	050520
6X85/45*	-			50					45						85		050530
6X64 percée*	-			-					-						64		056100
8X55/5	-		-	5					-						55		057450
8X70/20-10	C			20					10						70		057451
8X90/40-30	E			40					30						90		057452
8X100/50-40	F	30	38	50	50	80	40	48	40	60	80	8	8	9	100	15	057453
8X115/65-55	G			65					55						115		057454
8X130/80-70	H			80					70						130		057455
8X160/110-100	J			110					100						160		057456
10X65/5	-			5					-						65		057460
10X75/15-5	C			15					5						75		057461
10X85/25-15	D			25					15						85		057462
10X95/36-26	E	40	50	36	60	100	50	60	26	70	100	10	10	12	95	30	057463
10X110/50-40	F			50					40						110		057464
10X125/65-55	G			65					55						125		057465
10X140/80-70	I			80					70						140		057466
10X160/100-90	J			100					90						160		057467
12X80/5	-			5					-						80		057470
12X100/25-10	F			25					10						100		057471
12x115/40-25	G			40					25						115		057472
12x125/50-35	H			50					35						125		057473
12X140/65-50	I	50	62	65	75	100	65	77	50	90	130	12	12	14	140	50	057474
12X160/85-70	J			85					70						160		057475
12X180/105-90	L			105					90						180		057576
12X220/145-130	O			145					130						220		057477
12X290/215-200*	-			215					200						290		057478
16X100/5	-			5					-						100		057480
16X125/30-15	G			30					15						125		057481
16X150/55-40	I			55					40						150		057482
16X170/75-60	K	65	80	75	95	130	80	95	60	110	160	16	16	18	170	100	057483
16X185/90-75	L			90					75						185		057484
16X235/140-125*	-			140					125						235		057485
16X300/205-190*	-			205					190						300		057486
20X125/10	-			10					-						125		057490
20X165/50-25	J	75	93	50	110	150	100	118	25	135	200	20	20	22	165	160	057491
20X220/105-80	N			105					80						220		057492

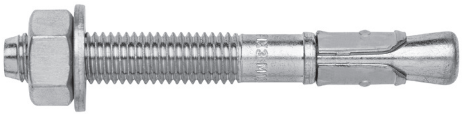
* Do not belong to ETA

Anchor mechanical properties

Anchor size		M6	M8	M10	M12	M16	M20
Cross-section above cone							
f_{uk} (N/mm²)	Min. tensile strength	700	750	750	750	700	600
f_{yk} (N/mm²)	Yield strength	580	600	600	600	570	570
As (mm²)	Stressed cross-section	-	23,8	34,7	56,1	103,9	172
Threaded part							
f_{uk} (N/mm²)	Min. tensile strength	600	650	650	650	600	580
f_{yk} (N/mm²)	Yield strength	420	420	420	420	480	330
As (mm²)	Stressed cross-section	20,1	36,6	58	84,3	157	245
W_{el} (mm³)	Elastic section modulus	12,71	31,23	62,3	109,17	277,47	540,9
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	9	24	49	85	200	376
M (Nm)	Recommended bending moment	3,7	9,8	20,0	34,7	81,6	153,5

FIX3

2/4 zinc coated steel version



The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/4 and 4/4).

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	M6	M8	M10	M12	M16	M20
Minimum anchorage depth						
h_{ef}	**25**	**30**	**40**	**50**	**65**	**75**
$N_{Ru,m}$	6,0	11,5	17,3	26,1	43,6	45,4
N_{Rk}	4,5	8,7	12,3	21,5	35,1	37,7
Maximum anchorage depth						
h_{ef}	**35**	**40**	**50**	**65**	**80**	**100**
$N_{Ru,m}$	9,4	17,4	24,6	37,8	52,7	77,1
N_{Rk}	7,0	15,7	20,2	31,7	47,0	62,8

SHEAR

Anchor size	M6	M8	M10	M12	M16	M20
$V_{Ru,m}$	6,8	14,3	22,6	32,8	56,5	85,2
V_{Rk}	2,9	10,0	13,7	27,4	36,5	71,1

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{*}}{\gamma_{Mc}}$$

*Derived from test results

$$V_{Rd} = \frac{V_{Rk}^{*}}{\gamma_{Ms}}$$

TENSILE

Anchor size	M6	M8	M10	M12	M16	M20
Minimum anchorage depth						
h_{ef}	**25**	**30**	**40**	**50**	**65**	**75**
N_{Rd}	2,5	5,8	8,2	14,3	23,4	25,1
Maximum anchorage depth						
h_{ef}	**35**	**40**	**50**	**65**	**80**	**100**
N_{Rd}	3,8	10,5	13,5	21,1	31,3	41,8

$\gamma_{Mc} = 1,5$

SHEAR

Anchor size	M6	M8	M10	M12	M16	M20
V_{Rd}	2,3	8,0	11,0	21,9	29,2	47,4

$\gamma_{Ms} = 1,25$ for M6 to M16 and $\gamma_{Ms} = 1,5$ for M20

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

*Derived from test results

$$V_{rec} = \frac{V_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

TENSILE

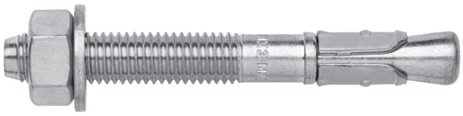
Anchor size	M6	M8	M10	M12	M16	M20
Minimum anchorage depth						
h_{ef}	**25**	**30**	**40**	**50**	**65**	**75**
N_{rec}	1,7	4,2	5,9	10,2	16,7	18,0
Maximum anchorage depth						
h_{ef}	**35**	**40**	**50**	**65**	**80**	**100**
N_{rec}	2,7	7,5	9,6	15,1	22,4	29,9

$\gamma_F = 1,4$; $\gamma_{Mc} = 1,5$

SHEAR

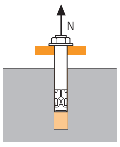
Anchor size	M6	M8	M10	M12	M16	M20
V_{rec}	1,7	5,7	7,8	15,7	20,9	33,9

$\gamma_F = 1,25$



SPIT CC Method (values issued from ETA)

TENSILE in kN

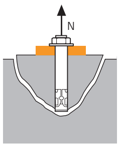


Pull-out resistance

$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$						Design pull-out resistance
Anchor size		M8	M10	M12	M16	M20
Minimum anchorage depth						
h_{ef}		30	40	50	65	75
$N^0_{Rd,p}$	(C20/25)	5,0	-	-	-	-
Maximum anchorage depth						
h_{ef}		40	50	65	80	100
$N^0_{Rd,p}$	(C20/25)	-	-	-	-	-

$\gamma_{Mc} = 1,5$

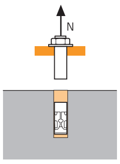


Concrete cone resistance

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$						Design cone resistance
Anchor size		M8	M10	M12	M16	M20
Minimum anchorage depth						
h_{ef}		30	40	50	65	75
$N^0_{Rd,c}$	(C20/25)	5,5	8,5	11,9	17,6	21,8
Maximum anchorage depth						
h_{ef}		40	50	65	80	100
$N^0_{Rd,c}$	(C20/25)	8,5	11,9	17,6	24,0	33,6

$\gamma_{Mc} = 1,5$

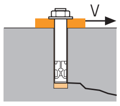


Steel resistance

$V_{Rd,s}$					Steel design tensile resistance
Anchor size	M8	M10	M12	M16	M20
$V_{Rd,s}$	11,9	17,3	28,1	48,5	73,7

$\gamma_{Ms} = 1,5$ for M8 to M16 and $\gamma_{Ms} = 1,4$ for M20

SHEAR in kN

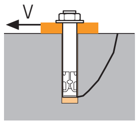


Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c}$						Design concrete edge resistance at minimum edge distance (C_{min})
Anchor size		M8	M10	M12	M16	M20
Minimum anchorage depth						
h_{ef}		30	40	50	65	75
C_{min}		50	65	100	100	115
S_{min}		40	50	100	100	100
$V^0_{Rd,c}$	(C20/25)	2,7	4,6	9,7	11,1	15,1
Maximum anchorage depth						
h_{ef}		40	50	65	80	100
C_{min}		55	65	70	105	120
S_{min}		45	60	70	90	100
$V^0_{Rd,c}$	(C20/25)	3,3	4,8	6,0	12,5	17,0

$\gamma_{Mc} = 1,5$

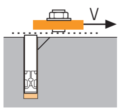


Pryout failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$						Design pryout resistance
Anchor size		M8	M10	M12	M16	M20
Minimum anchorage depth						
h_{ef}		30	40	50	65	75
$V^0_{Rd,cp}$	(C20/25)	5,5	8,5	11,9	35,2	43,6
Maximum anchorage depth						
h_{ef}		40	50	65	80	100
$V^0_{Rd,cp}$	(C20/25)	8,5	11,9	35,2	48,0	67,2

$\gamma_{Mcp} = 1,5$



Steel resistance

$V_{Rd,s}$					Steel design shear resistance
Anchor size	M8	M10	M12	M16	M20
$V_{Rd,s}$	8,0	11,0	21,9	29,2	47,4

$\gamma_{Ms} = 1,25$ for M8 to M16 and $\gamma_{Ms} = 1,5$ for M20

$$N_{Rd} = \min(N_{Rd,p}\ ;\ N_{Rd,c}\ ;\ N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c}\ ;\ V_{Rd,cp}\ ;\ V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

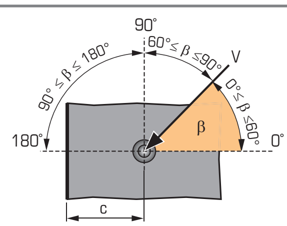
$$\beta_N + \beta_V \leq 1,2$$

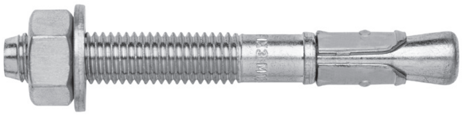
f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
C25/30	1,1	C40/50	1,41
C30/37	1,22	C45/55	1,48
C35/45	1,34	C50/60	1,55

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

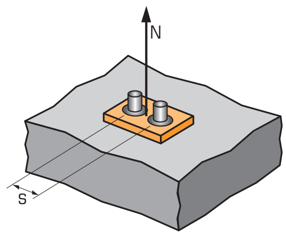
Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0{,}5 + \frac{s}{6.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

$s_{cr,N} = 3.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group

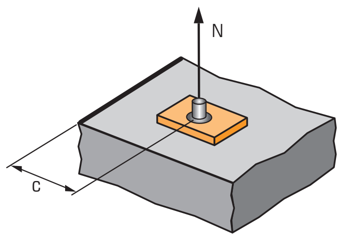
SPACING S — Reduction factor Ψ_s — Minimum anchorage depth

Anchor size	M8	M10	M12	M16	M20
40	0,72				
50	0,78	0,71			
65	0,86	0,77			
90	1,00	0,88			
100		0,92	0,83	0,76	0,72
120		1,00	0,90	0,81	0,77
150			1,00	0,88	0,83
180				0,96	0,90
195				1,00	0,93
225					1,00

SPACING S — Reduction factor Ψ_s — Maximum anchorage depth

Anchor size	M8	M10	M12	M16	M20
45	0,69				
60	0,75	0,70			
70	0,79	0,73	0,68		
90	0,88	0,80	0,73	0,69	
100	0,92	0,83	0,76	0,71	0,67
120	1,00	0,90	0,81	0,75	0,70
150		1,00	0,88	0,81	0,75
195			1,00	0,91	0,83
220				0,96	0,87
240				1,00	0,90
300					1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0{,}23 + 0{,}51 \cdot \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

$c_{cr,N} = 1{,}5.h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

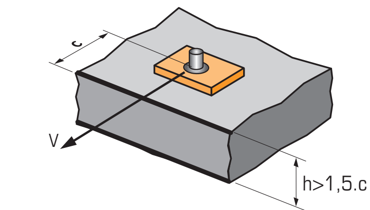
EDGE C — Reduction factor $\Psi_{c,N}$ — Minimum anchorage depth

Anchor size	M8	M10	M12	M16	M20
50	1,00				
65		1,00			
100			1,00		
100				1,00	
115					1,00

EDGE C — Reduction factor $\Psi_{c,N}$ — Maximum anchorage depth

Anchor size	M8	M10	M12	M16	M20
55	0,93				
60	1,00				
65		0,89			
70		0,94	0,78		
75		1,00	0,82		
100			1,00		
105				0,90	
110				0,93	
120				1,00	0,84
130					0,89
150					1,00

$\Psi_{s\text{-}c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

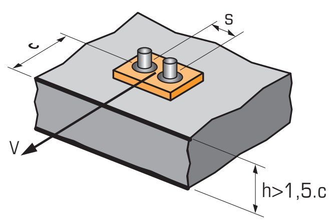


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

c/c_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

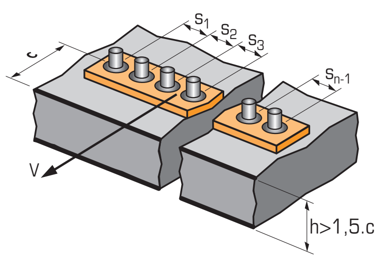


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

s/c_{min} \ c/c_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65

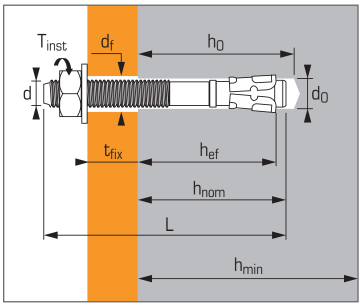


For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + \ldots + s_{n-1}}{3.n.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

FIX II - HDG

Torque controlled expansion anchor, for use in non-cracked concrete



APPLICATION

- Steel and timber framework and beams
- Lift guide rails
- Industrial doors and gates
- Brickwork support angles
- Storage systems

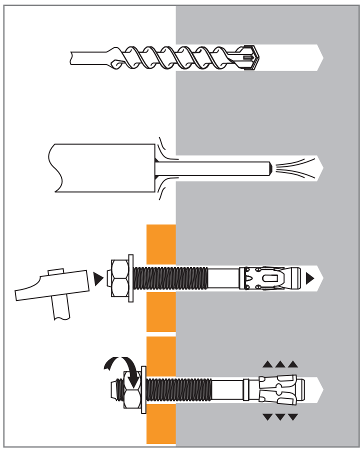
MATERIAL

- Hot dip galvanised: 45 µm
  NF EN ISO 1460 -1461
  Salt spray: >350 hours

Technical data

Anchor size	Letter marking	Minimum anchorage depth					Maximum anchorage depth					Thread diameter	Drilling diameter	Clearance diameter	Total anchor length	Tighten torque	Code
		min. anchor depth (mm)	Embed. depth (mm)	Max. thick. of part to be fixed (mm)	Drilling depth (mm)	Min. thick. of base material (mm)	max. anchor depth (mm)	Embed. depth (mm)	Max. thick. of part to be fixed (mm)	Drilling depth (mm)	Min. thick. of base material (mm)	(mm)	(mm)	(mm)	(mm)	(Nm)	
		h_{ef}	h_{nom}	t_{fix}	h_0	h_{min}	h_{ef}	h_{nom}	t_{fix}	h_0	h_{min}	d	d_0	d_f	L	T_{inst}	
8X70/20-7	C			20					7						70		050310
8X90/40-27	E	35	42	40	52	100	48	55	27	65	100	8	8	9	90	15	050320
8X110/60-47	F			60					47						110		050329
8X130/80-67	H			80					67						130		050330
10X75/15-5	C			15					5						75		050350
10X95/36-26	E			36					26						96		050360
10X120/60-50	G	42	50	60	62	100	52	60	50	72	104	10	10	12	120	30	050340
10X140/80-70	I			80					70						140		050370
10X160/100-90	J			100					90						160		050341
12X80/5	-			5					-						80		055351
12X100/25-8	E			25					8						100		055352
12X115/40-23	G	50	60	40	75	100	68	78	23	93	136	12	12	14	115	50	055395
12X140/65-48	I			65					48						140		050400
12X180//105-88	L			105					88						180		050410
16X125/30-8	G			30					8						125		050440
16X150/55-33	I	64	78	55	95	128	86	100	33	117	172	16	16	18	150	100	050354
16X170/75-53	K			75					53						170		050450

INSTALLATION



Anchor mechanical properties

Anchor size		M8	M10	M12	M16
Cross-section above cone					
f_{uk} (N/mm²)	Min. tensile strength	700	700	700	600
f_{yk} (N/mm²)	Yield strength	580	580	580	500
As (mm²)	Stressed cross-section	23,76	40,72	55,42	103,87
Threaded part					
f_{uk} (N/mm²)	Min. tensile strength	600	600	600	500
f_{yk} (N/mm²)	Yield strength	480	480	480	400
As (mm²)	Stressed cross-section	36,6	58	84,3	157
W_{el} (mm³)	Elastic section modulus	31,23	62,3	109,17	277,47
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	22	45	79	166
M (Nm)	Recommended bending moment	9,0	18,4	32,2	67,8

FIX II - HDG

 hot dip galvanised version

The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/4 and 4/4).

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	M8	M10	M12	M16
Minimum anchorage depth				
h_{ef}	**35**	**42**	**50**	**64**
$N_{Ru,m}$	13,4	14,0	23,6	30,6
N_{Rk}	8,1	9,9	15,9	22,9
Maximum anchorage depth				
h_{ef}	**48**	**52**	**68**	**86**
$N_{Ru,m}$	17,8	18,7	32,7	51,0
N_{Rk}	15,1	15,5	26,0	39,9

SHEAR

Anchor size	M8	M10	M12	M16
$V_{Ru,m}$	10,8	18,2	30,8	44,7
V_{Rk}	5,3	15,6	25,6	30,4

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{*}}{\gamma_{Mc}}$$

*Derived from test results

$$V_{Rd} = \frac{V_{Rk}^{*}}{\gamma_{Ms}}$$

TENSILE

Anchor size	M8	M10	M12	M16
Minimum anchorage depth				
h_{ef}	**35**	**42**	**50**	**60**
N_{Rd}	4,5	5,5	8,8	12,7
Maximum anchorage depth				
h_{ef}	**48**	**52**	**68**	**86**
N_{Rd}	8,4	8,6	14,4	22,1

γ_{Mc} = 1,8

SHEAR

Anchor size	M8	M10	M12	M16
V_{Rd}	5,8	9,2	13,3	24,8

γ_{Ms} = 1,25

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

*Derived from test results

$$V_{rec} = \frac{V_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

TENSILE

Anchor size	M8	M10	M12	M16
Minimum anchorage depth				
h_{ef}	**35**	**42**	**50**	**64**
N_{rec}	3,2	3,9	6,3	9,0
Maximum anchorage depth				
h_{ef}	**48**	**52**	**68**	**86**
N_{rec}	6,0	6,1	10,3	15,8

γ_F = 1,4 ; γ_{Mc} = 1,8

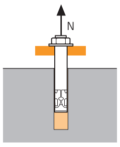
SHEAR

Anchor size	M8	M10	M12	M16
V_{rec}	3,0	8,9	14,6	17,4

γ_F = 1,25

SPIT CC Method

TENSILE in kN

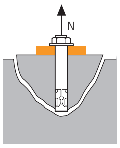


Pull-out resistance

$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$		Design pull-out resistance			
Anchor size		M8	M10	M12	M16
Minimum anchorage depth					
h_{ef}		**35**	**42**	**50**	**64**
$N^0_{Rd,p}$	(C20/25)	3,3	5,0	8,9	13,9
Maximum anchorage depth					
h_{ef}		**48**	**52**	**68**	**86**
$N^0_{Rd,p}$	(C20/25)	5,0	6,7	11,1	22,2

$\gamma_{Mc} = 1,8$

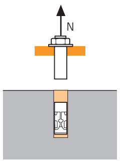


Concrete cone resistance

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$		Design cone resistance			
Anchor size		M8	M10	M12	M16
Minimum anchorage depth					
h_{ef}		**35**	**42**	**50**	**64**
$N^0_{Rd,c}$	(C20/25)	5,8	7,6	9,9	14,3
Maximum anchorage depth					
h_{ef}		**48**	**52**	**68**	**86**
$N^0_{Rd,c}$	(C20/25)	9,3	10,5	15,7	22,3

$\gamma_{Mc} = 1,8$

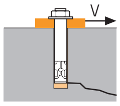


Steel resistance

$V_{Rd,s}$	Steel design tensile resistance			
Anchor size	M8	M10	M12	M16
$V_{Rd,s}$	9,3	16	22	34

$\gamma_{Ms} = 1,5$

SHEAR in kN

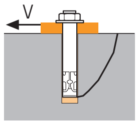


Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S-C,V}$

$V^0_{Rd,c}$		Design concrete edge resistance at minimum edge distance (C_{min})			
Anchor size		M8	M10	M12	M16
Minimum anchorage depth					
h_{ef}		**35**	**42**	**50**	**64**
C_{min}		55	75	100	100
S_{min}		45	65	100	100
$V^0_{Rd,c}$	(C20/25)	2,9	5,1	8,7	10,1
Maximum anchorage depth					
h_{ef}		**48**	**52**	**68**	**86**
C_{min}		60	65	90	105
S_{min}		50	55	75	90
$V^0_{Rd,c}$	(C20/25)	3,7	4,4	8,2	11,8

$\gamma_{Mc} = 1,5$

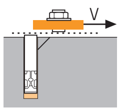


Pryout failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$		Design pryout resistance			
Anchor size		M8	M10	M12	M16
Minimum anchorage depth					
h_{ef}		**35**	**42**	**50**	**64**
$V^0_{Rd,cp}$	(C20/25)	7,0	9,1	11,9	34,4
Maximum anchorage depth					
h_{ef}		**48**	**52**	**68**	**86**
$V^0_{Rd,cp}$	(C20/25)	11,2	12,6	37,7	53,6

$\gamma_{Mcp} = 1,5$



Steel resistance

$V_{Rd,s}$	Steel design shear resistance			
Anchor size	M8	M10	M12	M16
$V_{Rd,s}$	3,8	11,2	18,2	18,9

$\gamma_{Ms} = 1,25$

$$N_{Rd} = \min(N_{Rd,p}\ ;\ N_{Rd,c}\ ;\ N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c}\ ;\ V_{Rd,cp}\ ;\ V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

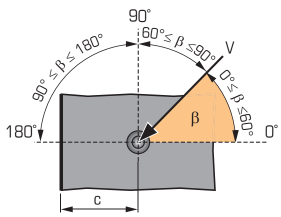
$$\beta_N + \beta_V \leq 1,2$$

f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
C25/30	1,1	C40/50	1,41
C30/37	1,22	C45/55	1,48
C35/45	1,34	C50/60	1,55

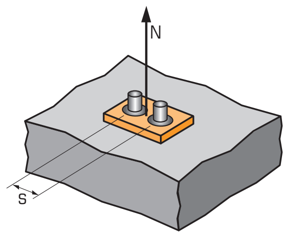
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2



SPIT CC Method

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0{,}5 + \frac{s}{6.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

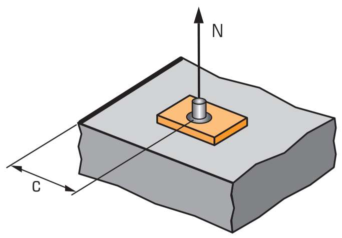
$s_{cr,N} = 3.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group

SPACING S		Reduction factor Ψ_s Minimum anchorage depth		
Anchor size	**M8**	**M10**	**M12**	**M16**
45	0,71			
65	0,81	0,76		
100	0,98	0,90	0,83	0,76
110	1,00	0,94	0,87	0,79
125		1,00	0,92	0,83
150			1,00	0,89
180				0,97
192				1,00

SPACING S		Reduction factor Ψ_s Maximum anchorage depth		
Anchor size	**M8**	**M10**	**M12**	**M16**
50	0,67			
55	0,69	0,68		
75	0,76	0,74	0,68	
90	0,81	0,79	0,72	0,67
105	0,86	0,84	0,76	0,70
145	1,00	0,96	0,86	0,78
180		1,00	0,94	0,85
205			1,00	0,90
240				0,97
280				1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0{,}23 + 0{,}51 \cdot \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

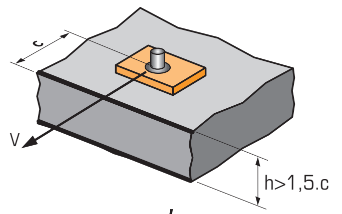
$c_{cr,N} = 1{,}5.h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

EDGE C		Reduction factor $\Psi_{c,N}$ Minimum anchorage depth		
Anchor size	**M8**	**M10**	**M12**	**M16**
55	1,00			
65		1,00		
100			1,00	
100				1,00

EDGE C		Reduction factor $\Psi_{c,N}$ Maximum anchorage depth		
Anchor size	**M8**	**M10**	**M12**	**M16**
60	0,87			
65	0,92	0,87		
70	0,97	0,92		
90	1,00	0,97	0,90	
100		1,00	0,98	0,82
125			1,00	0,97
130				1,00

$\Psi_{s\text{-}c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

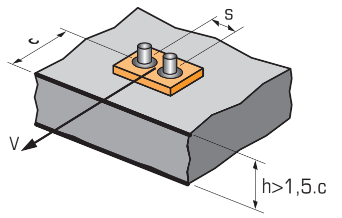


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ Non-cracked concrete

$\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

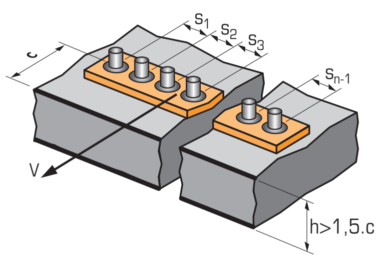


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

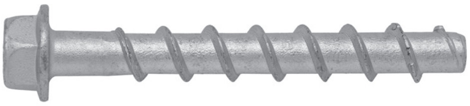
Reduction factor $\Psi_{s\text{-}c,V}$ Non-cracked concrete

$\frac{s}{c_{min}}$ \ $\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65



For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + \ldots + s_{n-1}}{3.n.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$



TAPCON II & III

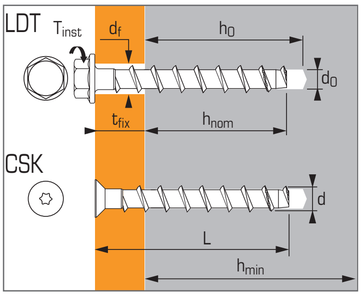
zinc coated & stainless steel version

Concrete screw anchor for use in cracked and non-cracked concrete

ETAG 001-6 - 01/0071

ETA Option 1 - 01/0073

INOX STAINLESS STEEL



APPLICATION

- Channel, cable tray
- Brackets
- E-Clips, cowhorn
- TRH clip, rod hanging
- Trunking
- Push-pull bars
- Formwork / shuttering

MATERIAL

Zinc coated version:

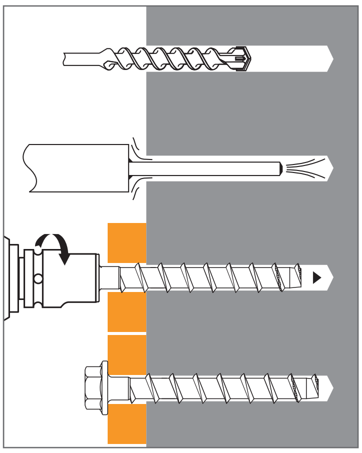
- **Body :**

Min. zinc coated steel 5 µm ;
min. tensile strength: 1000 N/mm²

Stainless steel version:

- **Body :** stainless steel A4

INSTALLATION



Technical data

Versions	Anchor size	Embed. depth (mm) h_{nom}	Max. thick. of part to be fixed (mm) t_{fix}	Drilling depth (mm) h_0	Min. thick. of base material (mm) h_{min}	Thread diameter (mm) d	Drilling diameter (mm) d_0	Clearance diameter (mm) d_f	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code
	Zinc coated versions										
	6X60/5	40	5	65	100	7,5	6	9	60		055654
	8X70/5	40	5	75	120	10,5	8	12	70	*	055655
	8X90/25	40	25	75					90		055656
	10X65/15**	40	15	60					65		055657
	10X90/5	45	5	95	130	12,5	10	14	90	*	055658
	10X100/15	50	15	95					100		055659
	10X120/35	50	35	95					120		055661
	10X150/65	50	65	95					150		055662
	10X170/85	55	85	95					170		055663
	10X220/135	55	135	95					220		055664
	Stainless steel A4 versions										
CSK	8X80/15	65	15	75	120	10,5	8	12	80	*	055674
LDT	8X80/15	65	15	75	120	10,5	8	12	80	*	055676
LDT	10X100/15	85	15	95	130	12,5	10	14	100	*	055676

* Stop tightening immediately when it meets the part to be fixed

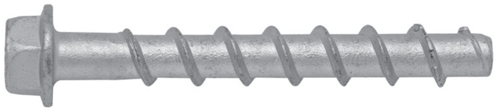
** Do not belong to ETA

Anchor mechanical properties

Anchor size		Zinc coated steel Ø6	Zinc coated steel Ø8	Zinc coated steel Ø10	Stainless steel A4 Ø8	Stainless steel A4 Ø10
As (mm²)	Stressed cross-section	19,6	36,3	60,8	36,3	60,8
W_{el} (mm³)	Elastic section modulus	12,3	30,8	66,9	30,8	66,9
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	11,0	26,0	56,0	29,0	64,0
M (Nm)	Recommended bending moment	5,5	13,0	28,0	14,5	32,0

TAPCON II & III

2/4 zinc coated & stainless steel version



The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/4 and 4/4).

Characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	Zinc coated steel			Stainless steel A4	
	Ø6	Ø8	Ø10	Ø8	Ø10
Non-cracked concrete					
h_{nom}	**55**	**65**	**85**	**65**	**85**
N_{Rk}	9,0	12,0	28,3	12,0	28,3
Cracked concrete					
h_{nom}	**55**	**65**	**85**	**65**	**85**
N_{Rk}	3,0	9,0	16,0	9,0	16,0

SHEAR

Anchor size	Zinc coated steel			Stainless steel A4	
	Ø6	Ø8	Ø10	Ø8	Ø10
V_{Rk}	7,0	18,0	34,0	21,0	40,0

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{*}}{\gamma_{Mc}}$$

*Derived from test results

$$V_{Rd} = \frac{V_{Rk}^{*}}{\gamma_{Ms}}$$

TENSILE

Anchor size	Zinc coated steel			Stainless steel A4	
	Ø6	Ø8	Ø10	Ø8	Ø10
Non-cracked concrete					
h_{nom}	**55**	**65**	**85**	**65**	**85**
N_{Rd}	6,0	8,0	18,9	8,0	18,9
Cracked concrete					
h_{nom}	**55**	**65**	**85**	**65**	**85**
N_{Rd}	2,0	6,0	10,7	6,0	10,7

$\gamma_{Mc} = 1,5$

SHEAR

Anchor size	Zinc coated steel			Stainless steel A4	
	Ø6	Ø8	Ø10	Ø8	Ø10
V_{Rd}	4,7	12,0	22,7	14,0	26,7

$\gamma_{Ms} = 1,5$

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

*Derived from test results

$$V_{rec} = \frac{V_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

TENSILE

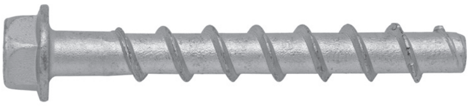
Anchor size	Zinc coated steel			Stainless steel A4	
	Ø6	Ø8	Ø10	Ø8	Ø10
Non-cracked concrete					
h_{nom}	**55**	**65**	**85**	**65**	**85**
N_{rec}	4,3	5,7	13,5	5,7	13,5
Cracked concrete					
h_{nom}	**55**	**65**	**85**	**65**	**85**
N_{rec}	1,4	4,3	7,6	4,3	7,6

$\gamma_{Mc} = 1,5$

SHEAR

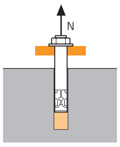
Anchor size	Zinc coated steel			Stainless steel A4	
	Ø6	Ø8	Ø10	Ø8	Ø10
V_{rec}	3,3	8,6	16,2	10,0	19,0

$\gamma_{Ms} = 1,5$



SPIT CC Method

TENSILE in kN

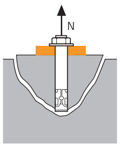


Pull-out resistance

$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$	Design pull-out resistance				
Anchor size	Zinc coated steel Ø6	Zinc coated steel Ø8	Zinc coated steel Ø10	Stainless steel A4 Ø8	Stainless steel A4 Ø10
Non-cracked concrete					
h_{nom}	**55**	**65**	**85**	**65**	**85**
$N^0_{Rd,p}$ (C20/25)	6,0	8,0	-	8,0	-
Cracked concrete					
h_{nom}	**55**	**65**	**85**	**65**	**85**
$N^0_{Rd,p}$ (C20/25)	2,0	6,0	10,7	6,0	10,7

$\gamma_{Mc} = 1,5$

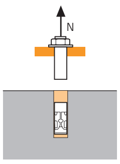


Concrete cone resistance

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$	Design cone resistance				
Anchor size	Zinc coated steel Ø6	Zinc coated steel Ø8	Zinc coated steel Ø10	Stainless steel A4 Ø8	Stainless steel A4 Ø10
Non-cracked concrete					
h_{nom}	**55**	**65**	**85**	**65**	**85**
$N^0_{Rd,c}$ (C20/25)	9,8	12,3	18,9	12,3	18,9
Cracked concrete					
h_{nom}	**55**	**65**	**85**	**65**	**85**
$N^0_{Rd,c}$ (C20/25)	7,0	8,7	13,5	8,7	13,5

$\gamma_{Mc} = 1,5$

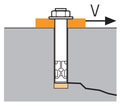


Steel resistance

$N_{Rd,s}$	Steel design tensile resistance				
Anchor size	Zinc coated steel Ø6	Zinc coated steel Ø8	Zinc coated steel Ø10	Stainless steel A4 Ø8	Stainless steel A4 Ø10
$N_{Rd,s}$	9,8	17,9	30,0	20,7	34,3

$\gamma_{Ms} = 1,4$

SHEAR in kN

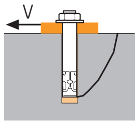


Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S-C,V}$

$V^0_{Rd,c}$	Design concrete edge resistance at minimum edge distance (C_{min})				
Anchor size	Zinc coated steel Ø6	Zinc coated steel Ø8	Zinc coated steel Ø10	Stainless steel A4 Ø8	Stainless steel A4 Ø10
Non-cracked concrete					
h_{nom}	**55**	**65**	**85**	**65**	**85**
C_{min}	40	50	70	50	70
S_{min}	40	50	70	50	70
$V^0_{Rd,c}$ (C20/25)	1,9	3,0	5,7	3,0	5,7
Cracked concrete					
h_{nom}	**55**	**65**	**85**	**65**	**85**
C_{min}	40	50	70	50	70
S_{min}	40	50	70	50	70
$V^0_{Rd,c}$ (C20/25)	1,4	2,2	4,1	2,2	4,1

$\gamma_{Mc} = 1,5$

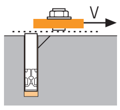


Pryout failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$	Design pryout resistance				
Anchor size	Zinc coated steel Ø6	Zinc coated steel Ø8	Zinc coated steel Ø10	Stainless steel A4 Ø8	Stainless steel A4 Ø10
Non-cracked concrete					
h_{nom}	**55**	**65**	**85**	**65**	**85**
$V^0_{Rd,cp}$ (C20/25)	9,8	24,5	37,8	24,5	37,8
Cracked concrete					
h_{nom}	**55**	**65**	**85**	**65**	**85**
$V^0_{Rd,cp}$ (C20/25)	7,0	17,5	26,9	17,5	26,9

$\gamma_{Mcp} = 1,5$



Steel resistance

$V_{Rd,s}$	Steel design shear resistance				
Anchor size	Zinc coated steel Ø6	Zinc coated steel Ø8	Zinc coated steel Ø10	Stainless steel A4 Ø8	Stainless steel A4 Ø10
$V_{Rd,s}$	4,7	12,0	22,7	14,0	26,7

$\gamma_{Ms} = 1,5$

$N_{Rd} = \min(N_{Rd,p} \; ; \; N_{Rd,c} \; ; \; N_{Rd,s})$

$\beta_N = N_{Sd} / N_{Rd} \leq 1$

$V_{Rd} = \min(V_{Rd,c} \; ; \; V_{Rd,cp} \; ; \; V_{Rd,s})$

$\beta_V = V_{Sd} / V_{Rd} \leq 1$

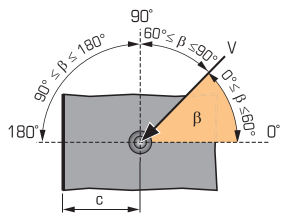
$$\beta_N + \beta_V \leq 1,2$$

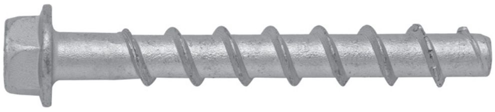
f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
C25/30	1,1	C40/50	1,41
C30/37	1,22	C45/55	1,48
C35/45	1,34	C50/60	1,55

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

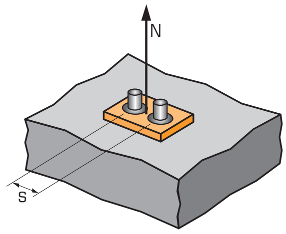
Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





SPIT CC Method

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0,5 + \frac{s}{6.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

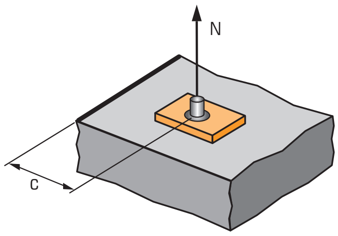
$s_{cr,N} = 3.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group

SPACING S — Reduction factor Ψ_s — Cracked & non-cracked concrete

Anchor size	Ø6	Ø8	Ø10
40	0,65		
50	0,69	0,66	
70	0,77	0,73	0,67
100	0,88	0,83	0,75
135	1,00	0,94	0,83
155		1,00	0,88
205			1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0,48 + 0,27 . \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

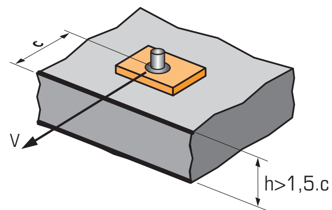
$c_{cr,N} = 1,5.h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

EDGE C — Reduction factor $\Psi_{c,N}$ — Cracked & non-cracked concrete

Anchor size	Ø6	Ø8	Ø10
40	0,71		
50	0,82	0,74	
66	1,00	0,89	0,74
70		0,93	0,76
77		1,00	0,81
100			1,00

$\Psi_{s-c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

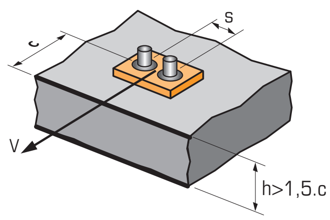


$$\Psi_{s-c,V} = \frac{c}{c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s-c,V}$ — Cracked & non-cracked concrete

$\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s-c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

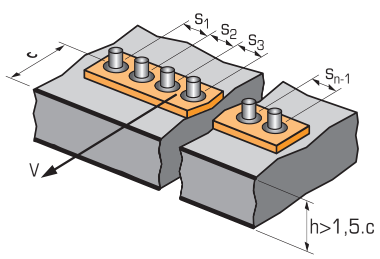


$$\Psi_{s-c,V} = \frac{3.c + s}{6.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

Reduction factor $\Psi_{s-c,V}$ — Cracked & non-cracked concrete

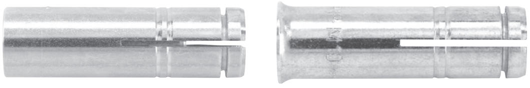
$\frac{s}{c_{min}}$ \ $\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65



For 3 anchors fastening and more

$$\Psi_{s-c,V} = \frac{3.c + s_1 + s_2 + s_3 + ... + s_{n-1}}{3.n.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

Mechanical anchors

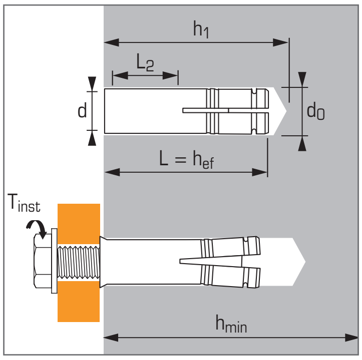


GRIP & GRIP L

Deformation-controlled expansion female anchor for use in non-cracked concrete

ETA Option 7- 05/0053

FM APPROVED GRIP & GRIP L M10/M12



Technical data

Anchor size	Min. anchor depth (mm) h_{ef}	Thread diameter (mm) d	Thread length (mm) L_2	Drilling depth (mm) h_0	Drilling diameter (mm) d_0	Min. thick. of base material (mm) h_{min}	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code without collar version	Code collar version	Setting tool reference	Setting tool code
M6X25*	25	6	10	28	8	100	25	5	050788	-	ST-M M6x25	050921
M6X30	30	6	13	32	8	100	30	5	062040	050789	ST-M M6x30	050922
M7X30*	30	7	13	33	10	100	30	10	061980	-	ST-M M7x30	050932
M8X30	30	8	12	33	10	100	30	10	062050	050790	ST-M M8x30	050923
M10X30	30	10	11	33	12	100	30	22	-	050799	ST-M M10x30	051015
M10X40	40	10	15	43	12	100	40	22	062060	050791	ST-M M10x40	050924
M12X50	50	12	21	54	15	100	50	36	062070	050792	ST-M M12x50	050925
M16X65	65	16	28	70	20	130	65	80	062080	050793	ST-M M16x65	050926

* Do not belong to ETA

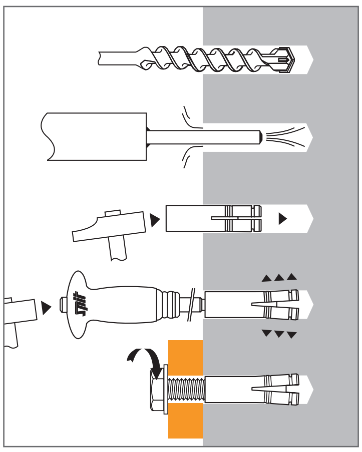
APPLICATION

- Ventilation ducts
- Suspended ceilings
- Cable tray

MATERIAL

- **Sleeve :** steel, 11 SMnPb30
- **Expansion cone:** Fb10, NF A 35-053
- **Protection :** galvanised 5 µm min.

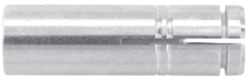
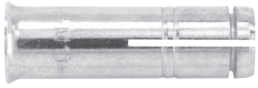
INSTALLATION



Anchor mechanical properties

Anchor size		M6	M8	M10	M12	M16
f_{uk} (N/mm²)	Min. tensile strength	570	570	570	570	550
f_{yk} (N/mm²)	Yield strength	420	375	375	345	345
As (mm²)	Stressed cross-section	26,34	36,22	47,15	80	138,74

GRIP & GRIP L

The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/4 and 4/4).

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	M6	M6	M8	M10	M10	M12	M16
Screw grade 8.8							
$h_{ef,min}$	**25**	**30**	**30**	**30**	**40**	**50**	**65**
$N_{Ru,m}$	7,8	10,5	13,4	14,9	18,4	31,2	37,1
N_{Rk}	5,6	8,5	9,4	8,5	14,5	26,2	29,8

SHEAR

Anchor size	M6	M8	M10	M12	M16
Screw grade 8.8					
$V_{Ru,m}$	9	14,8	22,3	27,1	58,3
V_{Rk}	4,5	8,7	13,2	14,8	45,8

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}\,^{*}}{\gamma_{Mc}}$$

*Derived from test results

$$V_{Rd} = \frac{V_{Rk}\,^{*}}{\gamma_{Ms}}$$

TENSILE

Anchor size	M6	M6	M8	M10	M10	M12	M16
Screw grade 8.8							
$h_{ef,min}$	**25**	**30**	**30**	**30**	**40**	**50**	**65**
N_{Rd}	3,1	4,7	5,2	4,7	8,1	14,6	16,6

$\gamma_{Mc} = 1{,}8$

SHEAR

Anchor size	M6	M8	M10	M12	M16
Screw grade 8.8					
V_{Rd}	3,3	5,7	8,7	9,0	28,8

$\gamma_{Ms} = 1{,}25$

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}\,^{*}}{\gamma_M \cdot \gamma_F}$$

*Derived from test results

$$V_{rec} = \frac{V_{Rk}\,^{*}}{\gamma_M \cdot \gamma_F}$$

TENSILE

Anchor size	M6	M6	M8	M10	M10	M12	M16
Screw grade 8.8							
$h_{ef,min}$	**25**	**30**	**30**	**30**	**40**	**50**	**65**
N_{rec}	2,2	3,4	3,7	3,4	5,8	10,4	11,8

$\gamma_F = 1{,}4$; $\gamma_{Mc} = 1{,}8$

SHEAR

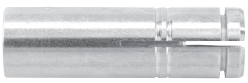
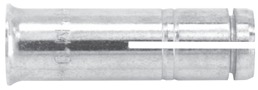
Anchor size	M6	M8	M10	M12	M16
Screw grade 8.8					
V_{rec}	2,4	4,1	6,2	6,4	20,6

$\gamma_{Ms} = 1{,}25$

Recommended loads (N_{rec}, V_{rec}) in beam slab in kN

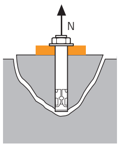
	Hollow concrete slab TYPE DSL 20* (wall thickness: 25 mm)			Hollow concrete slab TYPE DSL 27* (wall thickness : 30 mm)			
	N_{rec}	V_{rec}		N_{rec}		V_{rec}	
Min. steel quality of screw	**5.6**	**5.6**	**8.8**	**5.6**	**8.8**	**5.6**	**8.8**
GRIP L M6X30	2,10	1,25	2,00	2,50	2,70	1,25	2,20
GRIP L M8X30	2,10	2,30	3,10	2,70	2,70	2,30	3,10
GRIP L M10X30	2,10	3,60	4,60	2,70	2,70	3,60	4,60

* kp1 trade mark (supplier for hollow concrete slab)

SPIT CC Method (values issued from ETA)

TENSILE in kN

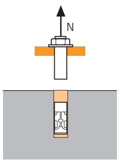


Concrete cone resistance

$N_{Rd,c} = N^{0}_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$						Design cone resistance
Anchor size	M6	M8	M10	M10	M12	M16
h_{ef}	30	30	30	40	50	65
$N^0_{Rd,c}$ (C20/25)	4,6	4,6	4,6	7,1	9,9	14,7

γ_{Mc} = 1,8

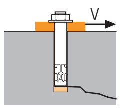


Steel resistance

$N_{Rd,s}$						Steel design tensile resistance
Anchor size	M6	M8	M10	M10	M12	M16
Screw grade 4.6						
$N_{Rd,s}$	4,0	7,3	11,6	11,6	16,9	31,4
Screw grade 5.6						
$N_{Rd,s}$	5,1	9,2	14,5	14,5	21,1	39,3
Screw grade 5.8						
$N_{Rd,s}$	6,7	11,3	14,8	14,8	23,0	39,9
Screw grade 8.8						
$N_{Rd,s}$	9,2	11,3	14,8	14,8	23,0	39,9

γ_{Ms} = 2 for screw grade 4.6 and 5.6
1,5 < γ_{Ms} < 1,98 for screw grade 5.8 and 8.8 (cf. ETA)

SHEAR in kN

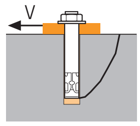


Concrete edge resistance

$V_{Rd,c} = V^{0}_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c}$						Design concrete edge resistance at minimum edge distance (C_{min})
Anchor size	M6	M8	M10	M10	M12	M16
h_{ef}	30	30	30	40	50	65
C_{min}	105	105	140	140	195	227
S_{min}	60	70	80	95	125	130
$V^0_{Rd,c}$ (C20/25)	8,3	8,9	14,5	15,3	28,1	40,5

γ_{Mc} = 1,5

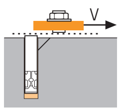


Pryout failure

$V_{Rd,cp} = V^{0}_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$						Design pryout resistance
Anchor size	M6	M8	M10	M10	M12	M16
h_{ef}	30	30	30	40	50	65
$V^0_{Rd,cp}$ (C20/25)	5,5	5,5	5,5	8,5	11,9	35,2

γ_{Mcp} = 1,5



Steel resistance

$V_{Rd,s}$						Steel design shear resistance
Anchor size	M6	M8	M10	M10	M12	M16
Screw grade 4.6						
$V_{Rd,s}$	2,4	4,4	6,9	6,9	10,1	18,8
Screw grade 5.6						
$V_{Rd,s}$	3,0	5,5	8,7	8,7	12,6	23,5
Screw grade > 5.8						
$V_{Rd,s}$	3,1	6,8	8,8	8,8	13,8	24,0

γ_{Ms} = 1,67 for screw grade 4.6 and 5.6
1,36 < γ_{Ms} < 1,65 for screw grade 5.8 (cf. ETA)

$$N_{Rd} = \min(N_{Rd,p}\ ;\ N_{Rd,c}\ ;\ N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c}\ ;\ V_{Rd,cp}\ ;\ V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

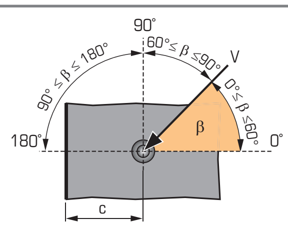
$$\beta_N + \beta_V \leq 1{,}2$$

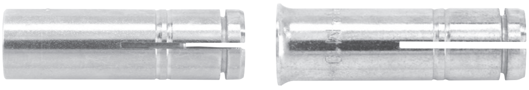
f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
C25/30	1,1	C40/50	1,41
C30/37	1,22	C45/55	1,48
C35/45	1,34	C50/60	1,55

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

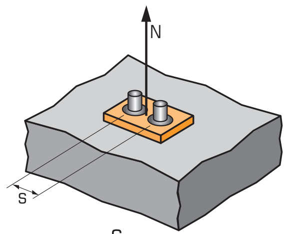
Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0{,}5 + \frac{s}{6.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

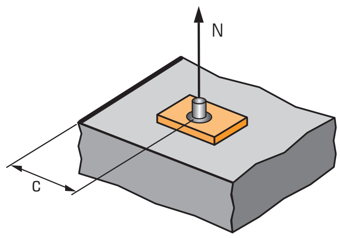
$s_{cr,N} = 3.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group

SPACING S — Reduction factor Ψ_s — Non-cracked concrete

Anchor size	M6	M8	M10	M10	M12	M16
h_{ef}	30	30	30	40	50	65
60	0,83					
70	0,89	0,89				
80	0,94	0,94	0,94			
95	1,00	1,00	1,00	0,90		
110				0,96		
125				1,00	0,92	
130					0,93	0,83
150					1,00	0,88
180						0,96
195						1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$\Psi_c \leq 1$

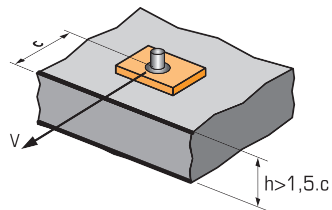
$c \geq c_{min}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

EDGE C — Reduction factor $\Psi_{c,N}$ — Non-cracked concrete

Anchor size	M6	M8	M10	M10	M12	M16
h_{ef}	30	30	30	40	50	65
105	1,00	1 00				
140			1,00	1,00		
195					1,00	
227						1,00

$\Psi_{s-c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

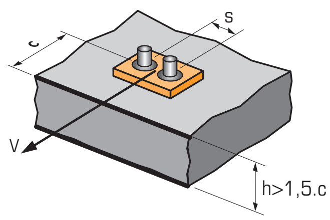


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

$\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

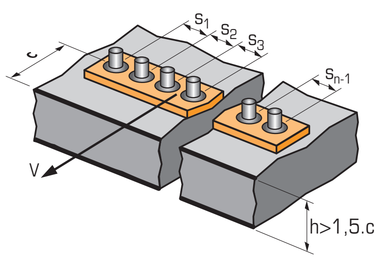


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

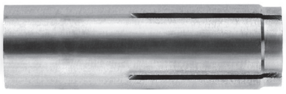
Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

$\frac{s}{c_{min}}$ \ $\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65



For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + ... + s_{n-1}}{3.n.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

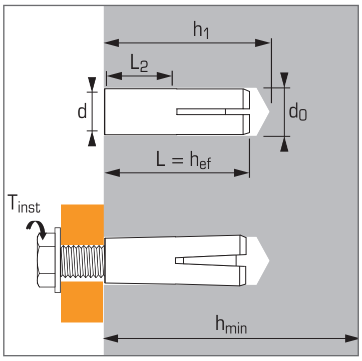


GRIP SA - A4

stainless steel version 1/4

Deformation-controlled expansion female anchor for use in non-cracked concrete

ETA Option 7- 06/0268



Technical data

Anchor size	Min. anchor depth (mm) h_{ef}	Thread diameter (mm) d	Thread length (mm) L_2	Drilling depth (mm) h_0	Drilling diameter (mm) d_0	Min. thick. of base material (mm) h_{min}	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code	Setting tool reference	Setting tool code
M6X30	30	6	13	32	8	100	30	5	062240	ST-M M6x30	050214
M8X30	30	8	13	32	10	100	30	10	062250	ST-M M8x30	050215
M10X40	40	10	15	42	12	100	40	22	062260	ST-M M10x40	050216
M12X50	50	12	18	53	15	100	50	36	062270	ST-M M12x50	050217
M16X65	65	16	23	70	20	100	65	80	062280	ST-M M16x65	050218

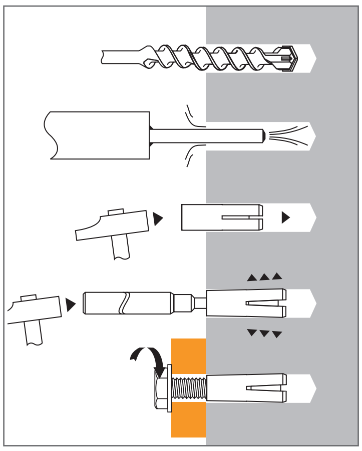
APPLICATION

- Ventilation ducts
- Suspended ceilings
- Cable tray

MATERIAL

- **Sleeve :**
  stainless steel X2CrNiMo17-12-2
- **Expansion cone :**
  stainless steel X2CrNiMo17-12-23

INSTALLATION

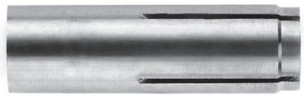


Anchor mechanical properties

Anchor size		M6	M8	M10	M12	M16
f_{uk} (N/mm²)	Min. tensile strength	610	610	610	610	610
f_{yk} (N/mm²)	Yield strength	360	360	360	360	360
As (mm²)	Stressed cross-section	26,34	36,22	47,15	80	138,74

GRIP SA - A4

2/4 stainless steel version



The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/4 and 4/4).

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	M6	M8	M10	M12	M16
Screw grade A4-70					
$h_{ef,min}$	**30**	**30**	**40**	**50**	**65**
$N_{Ru,m}$	8,75	12,3	17,8	25,4	37,3
N_{Rk}	6,6	9,3	13,8	19,05	28,05

SHEAR

Anchor size	M6	M8	M10	M12	M16
Screw grade A4-70					
$V_{Ru,m}$	8,4	12	15,6	31	50,4
V_{Rk}	7,0	10	13	26	42

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{*}}{\gamma_{Mc}}$$

*Derived from test results

$$V_{Rd} = \frac{V_{Rk}^{*}}{\gamma_{Ms}}$$

TENSILE

Anchor size	M6	M8	M10	M12	M16
Screw grade A4-70					
$h_{ef,min}$	**30**	**30**	**40**	**50**	**65**
N_{Rd}	3,7	5,2	7,7	10,6	15,6

$\gamma_{Mc} = 1,8$

SHEAR

Anchor size	M6	M8	M10	M12	M16
Screw grade A4-70					
V_{Rd}	4,5	6,4	8,3	16,6	26,9

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

*Derived from test results

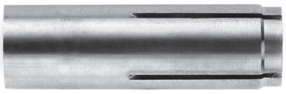
$$V_{rec} = \frac{V_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

TENSILE

Anchor size	M6	M8	M10	M12	M16
Screw grade A4-70					
$h_{ef,min}$	**30**	**30**	**40**	**50**	**65**
N_{rec}	2,6	3,7	5,5	7,6	11,1

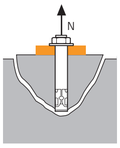
SHEAR

Anchor size	M6	M8	M10	M12	M16
Screw grade A4-70					
V_{rec}	3,2	4,5	5,9	11,8	19,2



SPIT CC Method (values issued from ETA)

TENSILE in kN

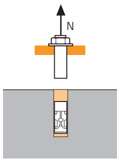


Concrete cone resistance

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$			Design cone resistance		
Anchor size	M6	M8	M10	M12	M16
h_{ef}	**30**	**30**	**40**	**50**	**65**
$N^0_{Rd,c}$ (C20/25)	5,5	5,5	8,5	11,8	17,6

γ_{Mc} = 1,5

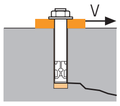


Steel resistance

$N_{Rd,s}$			Steel design tensile resistance		
Anchor size	M6	M8	M10	M12	M16
Screw grade A4-70					
$N_{Rd,s}$	7,5	12,3	15,5	27,8	44,9

γ_{Ms} = 1,87

SHEAR in kN

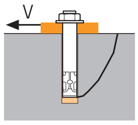


Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c}$			Design concrete edge resistance at minimum edge distance (C_{min})		
Anchor size	M6	M8	M10	M12	M16
h_{ef}	**30**	**30**	**40**	**50**	**65**
C_{min}	80	95	135	165	200
S_{min}	50	60	100	120	150
$V^0_{Rd,c}$ (C20/25)	5,5	7,6	14,4	21,8	33,5

γ_{Mc} = 1,5

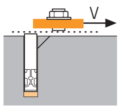


Pryout failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$					Design pryout resistance
Anchor size	M6	M8	M10	M12	M16
h_{ef}	**30**	**30**	**40**	**50**	**65**
$V^0_{Rd,cp}$ (C20/25)	5,5	9,3	14,4	20,2	35,2

γ_{Mcp} = 1,5



Steel resistance

$V_{Rd,s}$				Steel design shear resistance	
Anchor size	M6	M8	M10	M12	M16
Screw grade A4-70					
$V_{Rd,s}$	4,5	6,4	8,3	16,6	26,9

γ_{Ms} = 1,56

$N_{Rd} = \min(N_{Rd,p}\ ;\ N_{Rd,c}\ ;\ N_{Rd,s})$

$\beta_N = N_{Sd} / N_{Rd} \leq 1$

$V_{Rd} = \min(V_{Rd,c}\ ;\ V_{Rd,cp}\ ;\ V_{Rd,s})$

$\beta_V = V_{Sd} / V_{Rd} \leq 1$

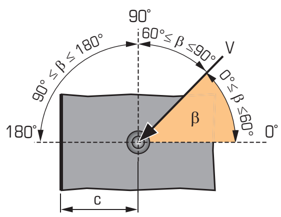
$$\beta_N + \beta_V \leq 1{,}2$$

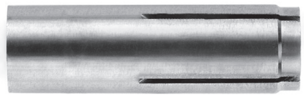
f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
C25/30	1,1	C40/50	1,41
C30/37	1,22	C45/55	1,48
C35/45	1,34	C50/60	1,55

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

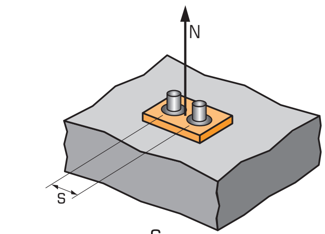
Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0,5 + \frac{s}{6.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

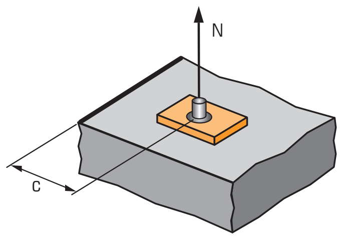
$s_{cr,N} = 3.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group

SPACING S — Reduction factor Ψ_s — Non-cracked concrete

Anchor size	M6	M8	M10	M12	M16
h_{ef}	30	30	40	50	65
60	0,83				
70	0,89	0,89			
80	0,94	0,94			
100	1,00	1,00	0,90		
110			0,96		
120			1,00	0,92	
130				0,93	
160				1,00	0,88
180					0,96
195					1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$\Psi_c \leq 1$

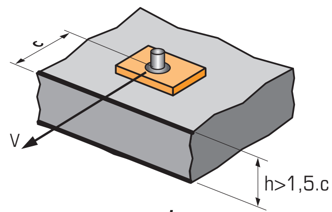
$c \geq c_{min}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

EDGE C — Reduction factor $\Psi_{c,N}$ — Non-cracked concrete

Anchor size	M6	M8	M10	M12	M16
h_{ef}	30	30	40	50	65
80	1,00				
95		1 00			
135			1,00		
165				1,00	
200					1,00

$\Psi_{s\text{-}c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

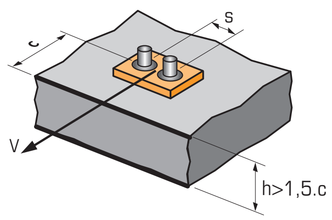


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

$\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

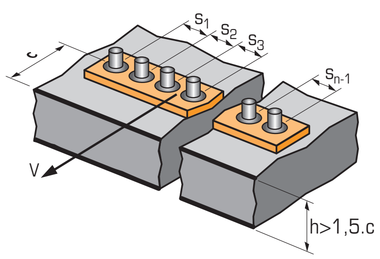


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

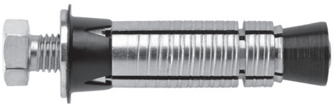
Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

$\frac{s}{c_{min}}$ \ $\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65



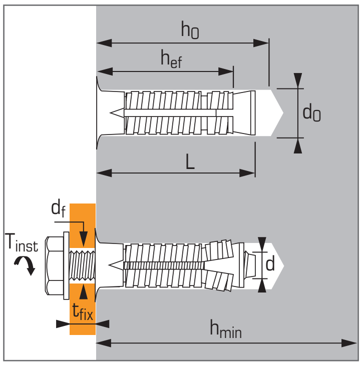
For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + ... + s_{n-1}}{3.n.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$



High expansion shield anchor, for use in concrete and solid & hollow masonries

Technical Assessment SOCOTEC
N° KX 0827



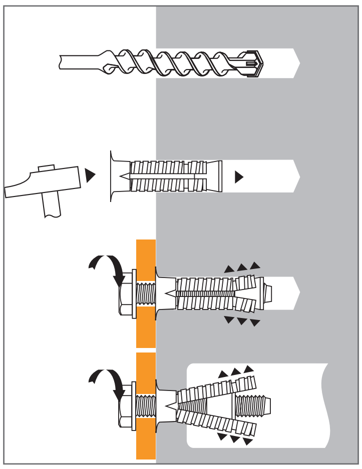
APPLICATION

- Industrial doors
- Storage racking
- Signs
- Security shutters
- Gate & fence posts
- Spiral staircase

MATERIAL

- **Sleeve :** S300Pb NFA 35561
- **Expansion cone :** S300Pb NFA 35561
- **Screw :** class 8.8 NF EN 20898-1
- **Washer :** Fe 360, NF EN 10025
- **Protection :** Zinc coating NFE 25009, passivation NFA 91472

INSTALLATION



Technical data

Anchor size	Min. anchor depth (mm) h_{ef}	Max. thick. of part to be fixed (mm) t_{fix}	Thread diameter (mm) d	Drilling depth (mm) h_0	Drilling diameter (mm) d_0	Min. thick. of base material (mm) h_{min}	Clearance diameter (mm) d_f	Total anchor length (mm) L	Tighten torque concrete screw 5.8 (Nm) T_{inst}	Tighten torque concrete screw 8.8 (Nm) T_{inst}	Tighten torque bricks (Nm) T_{inst}	Code
Shield only												
M6X50	37	–	M6	60	12	100	8	50	8	10	5	050399
M8X55	42	–	M8	65	14	100	10	55	15	25	7,5	050401
M10X65	52	–	M10	75	16	100	12	65	30	50	13	050402
M12X80	62	–	M12	90	20	125	14	80	50	80	23	073560
Type B (supplied with screw grade 8.8 and premounted washer)												
M6X50/10 B	37	10	M6	60	12	100	8	60	-	10	5	050404
M6X50/25 B		25						70				050405
M8X55/10 B	42	10	M8	65	14	100	10	60	-	25	7,5	050406
M8X55/25 B		25						80				050407
M8X55/40 B		40						90				050408
M10X65/10 B	52	10	M10	75	16	100	12	75	-	50	13	073640
M10X65/25 B		25						90				073650
M10X65/50 B		50						110				073660
M12X80/10 B	62	10	M12	90	20	125	14	90	-	80	23	073680
M12X80/25 B		25						110				073690

Anchor mechanical properties

Anchor size		M6	M8	M10	M12
Screw grade 5.8					
f_{uk} (N/mm²)	Min. tensile strength	520	520	520	520
f_{yk} (N/mm²)	Yield strength	420	420	420	420
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	7,9	19,5	38,9	68,1
M (Nm)	Recommended bending moment	3,2	7,8	15,6	28,4
Screw grade 8.8					
f_{uk} (N/mm²)	Min. tensile strength	800	800	800	800
f_{yk} (N/mm²)	Yield strength	640	640	640	640
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	12,2	30,0	59,8	104,8
M (Nm)	Recommended bending moment	5,0	12,4	24,8	43,7
As (mm²)	Stressed cross-section	20,1	36,6	58	84,3
W_{el} (mm²)	Elastic section modulus	12,7	31,2	62,3	109,2

Recommended loads (N_{rec}, V_{rec}) in masonries in kN

TENSILE

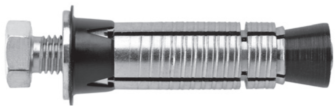
Base material / Anchor size	M6	M8	M10	M12
Engineering clay bricks BP 300 (fc > 30 N/mm²)				
N_{rec}	1,9	2,4	3,0	3,0
Clay bricks (fc = 11 N/mm²)				
N_{rec}	0,7	1,1	1,1	2,0
Solid concrete blocks B 120 (fc = 13,5 N/mm²)				
N_{rec}	0,4	0,95	1,25	1,9
Hollow clay bricks not rendered				
N_{rec}	0,15	0,15	*	*
Hollow clay bricks rendered				
N_{rec}	1,2	1,2	1,2	1,2
Hollow concrete blocks not rendered				
N_{rec}	0,2	0,2	*	*
Hollow concrete blocks rendered				
N_{rec}	1,25	1,75	1,85	2,2

*not recommended

SHEAR

Base material / Anchor size	M6	M8	M10	M12
Engineering clay bricks BP 300 (fc > 30 N/mm²)				
V_{rec}	1,0	1,9	3,0	4,4
Clay bricks (fc = 11 N/mm²)				
V_{rec}	0,85	1,9	3,0	4,4
Solid concrete blocks B 120 (fc = 13,5 N/mm²)				
V_{rec}	0,5	1,75	2,2	3,15
Hollow clay bricks not rendered				
V_{rec}	0,5	0,5	*	*
Hollow clay bricks rendered				
V_{rec}	1,6	2,0	2,5	3,0
Hollow concrete blocks not rendered				
V_{rec}	0,8	0,8	*	*
Hollow concrete blocks rendered				
V_{rec}	1,6	2,0	2,5	3,0

*not recommended



The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/4 and 4/4).

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	M6	M8	M10	M12
Screw grade 5.8				
h_{ef}	**37**	**42**	**52**	**62**
$N_{Ru,m}$	11,6	18,7	28,5	36,1
N_{Rk}	10,4	14	21,4	27,1
Screw grade 8.8				
h_{ef}	**37**	**42**	**52**	**62**
$N_{Ru,m}$	14,4	18,7	28,5	36,1
N_{Rk}	10,8	14	21,4	27,1

SHEAR

Anchor size	M6	M8	M10	M12
Screw grade 5.8				
$V_{Ru,m}$	6,2	11,4	18,1	26,3
V_{Rk}	5,2	9,5	15,1	21,9
Screw grade 8.8				
$V_{Ru,m}$	9,7	17,5	27,8	39,6
V_{Rk}	8,1	14,6	23,2	33,0

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{*}}{\gamma_{Mc}}$$

*Derived from test results

$$V_{Rd} = \frac{V_{Rk}^{*}}{\gamma_{Ms}}$$

TENSILE

Anchor size	M6	M8	M10	M12
Screw grade 5.8				
h_{ef}	**37**	**42**	**52**	**62**
N_{Rd}	5,0	6,7	10,2	12,9
Screw grade 8.8				
h_{ef}	**37**	**42**	**52**	**62**
N_{Rd}	5,1	6,7	10,2	12,9

$\gamma_{Mc} = 2,1$

SHEAR

Anchor size	M6	M8	M10	M12
Screw grade 5.8				
V_{Rd}	4,2	7,6	12,1	17,5
Screw grade 8.8				
V_{Rd}	6,5	11,7	18,6	26,4

$\gamma_{Ms} = 1,25$

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}^{*}}{\gamma_{M} . \gamma_{F}}$$

*Derived from test results

$$V_{rec} = \frac{V_{Rk}^{*}}{\gamma_{M} . \gamma_{F}}$$

TENSILE

Anchor size	M6	M8	M10	M12
Screw grade 5.8				
h_{ef}	**37**	**42**	**52**	**62**
N_{rec}	3,5	4,8	7,3	9,2
Screw grade 8.8				
h_{ef}	**37**	**42**	**52**	**62**
N_{rec}	3,7	4,8	7,3	9,2

$\gamma_F = 1,4$; $\gamma_{Mc} = 2,1$

SHEAR

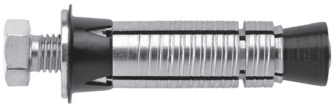
Anchor size	M6	M8	M10	M12
Screw grade 5.8				
V_{rec}	2,5	4,5	7,2	10,4
Screw grade 8.8				
V_{rec}	4,6	8,3	13,3	18,9

$\gamma_{Ms} = 1,5$ for srew grade 5.8 and $\gamma_{Ms} = 1,25$ for srew grade 8.8

Recommended loads (N_{rec}, V_{rec}) dans dalles alvéolaires in kN

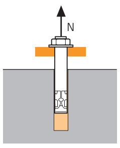
Anchor size	Hollow concrete slab TYPE DSL 20* (wall thickness : 25 mm)		
	N_{rec}	V_{rec}	
Min. steel quality of screw	**5.6**	**5.6**	**8.8**
PRIMA M6	2,5	1,25	2,10
PRIMA M8	2,75	2,30	3,90
PRIMA M10	2,75	2,30	3,90
PRIMA M12	3,75	5,20	9,0

*kp1 trade mark (supplier for hollow concrete slab)



SPIT CC Method

TENSILE in kN

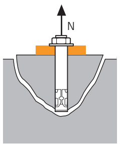


¬ Pull-out resistance

$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$			Design pull-out resistance	
Anchor size	**M6**	**M8**	**M10**	**M12**
h_{ef}	**37**	**42**	**52**	**62**
$N^0_{Rd,p}$ (C20/25)	5,0	-	-	-

$\gamma_{Mc} = 2,1$

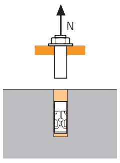


¬ Concrete cone resistance

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$			Design cone resistance	
Anchor size	**M6**	**M8**	**M10**	**M12**
h_{ef}	**37**	**42**	**52**	**62**
$N^0_{Rd,c}$ (C20/25)	5,4	6,5	9,0	11,7

$\gamma_{Mc} = 2,1$

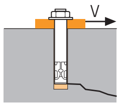


¬ Steel resistance

$N_{Rd,s}$			Steel design tensile resistance	
Anchor size	**M6**	**M8**	**M10**	**M12**
Screw grade 5.8				
$N_{Rd,s}$	4,0	7,3	11,6	16,9
Screw grade 8.8				
$N_{Rd,s}$	5,1	9,2	14,5	21,1

$\gamma_{Ms} = 1,5$

SHEAR in kN

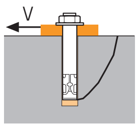


¬ Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c}$			Design concrete edge resistance at minimum edge distance (C_{min})	
Anchor size	**M6**	**M8**	**M10**	**M12**
h_{ef}	**37**	**42**	**52**	**62**
C_{min}	50	55	60	65
S_{min}	60	70	80	110
$V^0_{Rd,c}$ (C20/25)	3,2	4,0	4,9	6,2

$\gamma_{Mc} = 1,5$

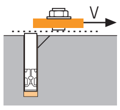


¬ Pryout failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$			Design pryout resistance	
Anchor size	**M6**	**M8**	**M10**	**M12**
h_{ef}	**37**	**42**	**52**	**62**
$V^0_{Rd,cp}$ (C20/25)	7,6	9,1	12,6	32,8

$\gamma_{Mcp} = 1,5$



¬ Steel resistance

$V_{Rd,s}$			Steel design shear resistance	
Anchor size	**M6**	**M8**	**M10**	**M12**
Screw grade 5.8				
$V_{Rd,s}$	4,2	7,6	12,1	17,5
Screw grade 8.8				
$V_{Rd,s}$	6,5	11,7	18,6	26,4

$\gamma_{Ms} = 1,25$

$$N_{Rd} = \min(N_{Rd,p}\ ;\ N_{Rd,c}\ ;\ N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c}\ ;\ V_{Rd,cp}\ ;\ V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

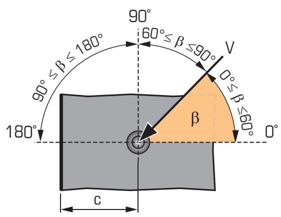
$$\beta_N + \beta_V \leq 1,2$$

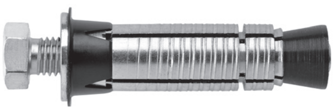
f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
C25/30	1,1	C40/50	1,41
C30/37	1,22	C45/55	1,48
C35/45	1,34	C50/60	1,55

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

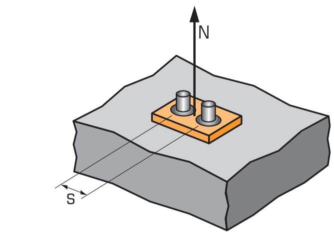
Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2





SPIT CC Method

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0{,}5 + \frac{s}{6.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

$s_{cr,N} = 3.h_{ef}$

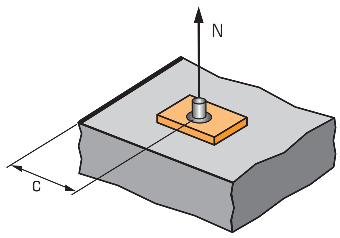
Ψ_s must be used for each spacing influenced the anchors group

SPACING S — Reduction factor Ψ_s — Non-cracked concrete

Anchor size	M6	M8	M10	M12
60	0,77			
70	0,82	0,78		
80	0,86	0,82	0,76	
90	0,91	0,86	0,79	
100	0,95	0,90	0,82	
110	1,00	0,94	0,85	0,80
125		1,00	0,90	0,84
155			1,00	0,92
185				1,00

Mechanical anchors

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0{,}24 + 0{,}5 \, . \, \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

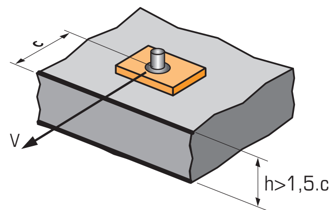
$c_{cr,N} = 1{,}5.h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

EDGE C — Reduction factor $\Psi_{c,N}$ — Non-cracked concrete

Anchor size	M6	M8	M10	M12
50	0,92			
55	0,98	0,89		
60	1,00	0,95	0,82	
65		1,00	0,87	0,76
80			1,00	0,89
95				1,00

$\Psi_{s\text{-}c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

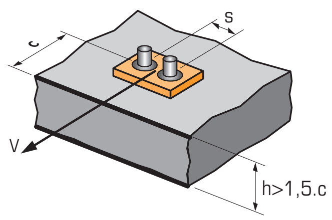


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

$\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

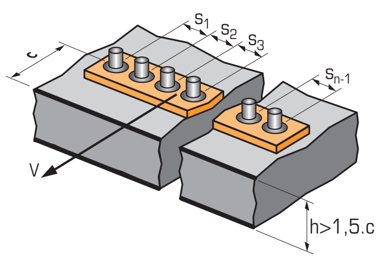


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

$\frac{s}{c_{min}}$ \ $\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65

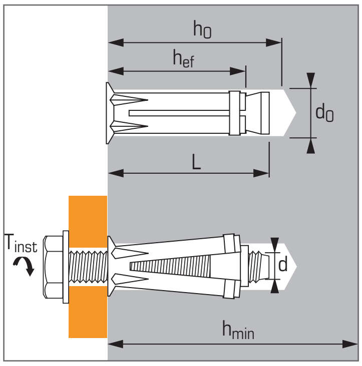


For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + ... + s_{n-1}}{3.n.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

Universal female anchor for use in concrete and masonries

Technical Assessment SOCOTEC
N° NPO 088



Technical data

Anchor size	Min. anchor depth (mm) h_{ef}	Thread diameter (mm) d	Drilling depth (mm) h_0	Drilling diameter (mm) d_0	Min. thick. of base material (mm) h_{min}	Total anchor length (mm) L	Tighten torque plein (Nm) T_{inst}	Tighten torque creux (Nm) T_{inst}	Code
M6X40	35	6	50	10	85	42	8	5	053100
M8X45	40	8	55	12	95	47	15	10	053110
M10X55	45	10	60	15	105	53	30	20	053120
M12X70	58	12	75	18	140	68	50	22	053130
M6X40 + TH 6X50									053150
M6X40 + QDC A2									053170
M8X45 + TH 8X55									053200
M12X70 + QDC GAL									053140

APPLICATION

- Fixing on hollow or solid materials
- Steel cupboards
- Overhead fixings

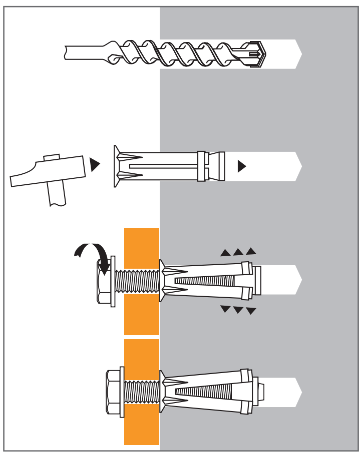
Bending moments

Anchor size	M6	M8	M10	M12
Screw grade 6.8				
Recommended bending moment (Nm)	2,5	6,0	12,5	22

MATERIAL

- **Sleeve :** lead alloy
- **Cone :** S300Pb

INSTALLATION



Ultimate loads ($N_{Ru,m}$, $V_{Ru,m}$) in kN

TENSILE

Base material \ Anchor size	M6	M8	M10	M12	M6 QDC	M12 QDC
Concrete (C20/25)						
$N_{Ru,m}$	4,8	11,4	16,5	28,5	1,5	24,0
Concrete (C30/37)						
$N_{Ru,m}$	5,4	15,6	20,1	35,4	1,5	24,0
Solid concrete blocks B 120 (fc = 13,5 Mpa)						
$N_{Ru,m}$	2,4	5,7	7,5	11,4	1,5	11,4
Solid clay bricks (fc = 55 Mpa)						
$N_{Ru,m}$	4,2	11,4	14,4	24,6	1,5	24,0
Hollow concrete blocks B40 not rendered (fc = 6,5 Mpa)						
$N_{Ru,m}$	1,8	1,8	1,8	1,8	1,8	1,8
Hollow clay bricks eco-30 not rendered (fc = 4,5 Mpa)						
$N_{Ru,m}$	1,1	1,3	1,75	2,2	1,1	2,2

SHEAR

Base material \ Anchor size	M6	M8	M10	M12
$V_{Ru,m}$	3,6	12,6	18,6	30,6
$V_{Ru,m}$	3,6	12,6	18,6	30,6
$V_{Ru,m}$	3,0	10,5	13,2	18,9
$V_{Ru,m}$	3,3	11,4	18,0	24,0
$V_{Ru,m}$	4,45	5,65	6,55	6,85
$V_{Ru,m}$	4,2	5,05	6,75	9,55

UNI

2/2

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$N_{Rd} = \frac{N_{Rum}}{4,3}$ *

*Derived from test results

$V_{Rd} = \frac{V_{Rum}}{4,3}$ *

TENSILE

Base material \ Anchor size	M6	M8	M10	M12	M6 QDC	M12 QDC
Concrete (C20/25)						
N_{Rd}	1,12	2,66	3,85	6,85	0,84	5,60
Concrete (C30/37)						
N_{Rd}	1,26	3,64	4,69	8,26	0,84	5,60
Solid concrete blocks B 120 (fc = 13,5 Mpa)						
N_{Rd}	0,56	1,33	1,75	2,66	0,84	5,60
Solid clay bricks (fc = 55 Mpa)						
N_{Rd}	0,98	2,66	3,36	5,74	0,56	2,66
Hollow concrete blocks B40 not rendered (fc = 6,5 Mpa)						
N_{Rd}	0,42	0,42	0,42	0,42	0,42	0,42
Hollow clay bricks eco-30 not rendered (fc = 4,5 Mpa)						
N_{Rd}	0,26	0,30	0,41	0,51	0,26	0,51

SHEAR

Base material \ Anchor size	M6	M8	M10	M12
Concrete (C20/25)				
V_{Rd}	0,84	2,94	4,34	7,14
Concrete (C30/37)				
V_{Rd}	0,84	2,94	4,34	7,14
Solid concrete blocks B 120 (fc = 13,5 Mpa)				
V_{Rd}	0,70	2,45	3,08	4,41
Solid clay bricks (fc = 55 Mpa)				
V_{Rd}	0,77	2,66	4,2	5,60
Hollow concrete blocks B40 not rendered (fc = 6,5 Mpa)				
V_{Rd}	1,04	1,32	1,53	1,60
Hollow clay bricks eco-30 not rendered (fc = 4,5 Mpa)				
V_{Rd}	0,98	1,18	1,58	2,23

Mechanical anchors

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$N_{rec} = \frac{N_{Rum}}{6}$ *

*Derived from test results

$V_{rec} = \frac{V_{Rum}}{6}$ *

TENSILE

Base material \ Anchor size	M6	M8	M10	M12	M6 QDC	M12 QDC
Concrete (C20/25)						
N_{rec}	0,80	1,90	2,75	4,75	0,60	4,00
Concrete (C30/37)						
N_{rec}	0,90	2,60	3,35	5,90	0,60	4,00
Solid concrete blocks B 120 (fc = 13,5 Mpa)						
N_{rec}	0,40	0,95	1,25	1,90	0,60	4,00
Solid clay bricks (fc = 55 Mpa)						
N_{rec}	0,70	1,90	2,40	4,10	0,40	1,90
Hollow concrete blocks B40 not rendered (fc = 6,5 Mpa)						
N_{rec}	0,30	0,30	0,30	0,30	0,30	0,30
Hollow clay bricks eco-30 not rendered (fc = 4,5 Mpa)						
N_{rec}	0,18	0,22	0,29	0,37	0,18	0,37

SHEAR

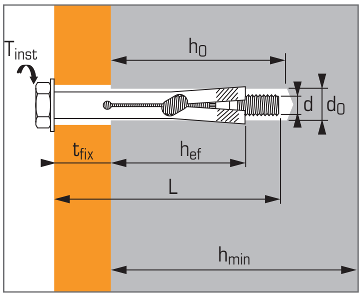
Base material \ Anchor size	M6	M8	M10	M12
Concrete (C20/25)				
V_{rec}	0,60	2,10	3,10	5,10
Concrete (C30/37)				
V_{rec}	0,60	2,10	3,10	5,10
Solid concrete blocks B 120 (fc = 13,5 Mpa)				
V_{rec}	0,50	1,75	2,20	3,15
Solid clay bricks (fc = 55 Mpa)				
V_{rec}	0,55	1,90	3,00	4,00
Hollow concrete blocks B40 not rendered (fc = 6,5 Mpa)				
V_{rec}	0,74	0,94	1,09	1,14
Hollow clay bricks eco-30 not rendered (fc = 4,5 Mpa)				
V_{rec}	0,70	0,84	1,13	1,59

Spacing data

IN CONCRETE AND SOLID MASONRIES

Anchor size	Minimum distance between anchors and from edges (mm)		
	$S_{cr,1\ mini}$ without edge influence	$C_{cr,N\ mini}$	$C_{cr,V\ mini}$
M6	90	70	70
M8	100	80	80
M10	115	90	90
M12	150	115	115

Sleeve type expansion anchor for use in concrete, solid masonries and in beam slab



APPLICATION

- Wall plates,
- Porches,
- Signs,
- Angle rion, hand rails.

Technical data

Anchor size	Min. anchor depth (mm) h_{ef}	Max. thick. of part to be fixed (mm) t_{fix}	Thread diameter (mm) d	Drilling depth (mm) h_0	Drilling diameter (mm) d_0	Min. thick. of base material (mm) h_{min}	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code
M6X45/8 HB	25	8	6	45	8	55	45	9	050252
M6X70/30 HB	30	30	6	45	8	55	70	9	050253
M6X95/55 HB	30	56	6	45	8	55	95	9	050254
M8X55/10 HB	28	8	8	50	10	65	55	20	050255
M8X80/35 HB	34	35	8	50	10	65	80	20	050256
M8X105/60 HB	34	62	8	50	10	65	105	20	050257
M10X75/20 HB	44	18	10	65	12	80	75	40	050259
M10X105/45 HB	44	46	10	65	12	80	105	40	050260
M12X110/50 HB	44	49	12	65	16	95	110	70	050262
Special products									
Hook version	30	-	55	-	45	8	-	-	050272
Eye version	30	-	55	-	45	8	-	-	050273

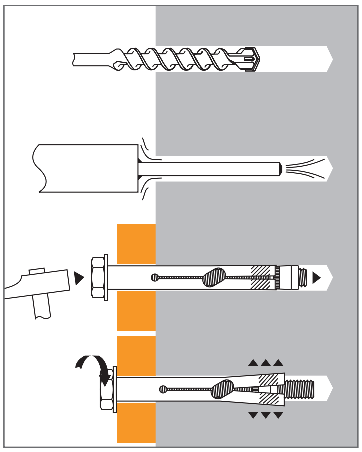
MATERIAL

- **Screw :** class 6.8

Anchor mechanical properties

Anchor size		M6	M8	M10	M12
Threaded part					
f_{uk} (N/mm²)	Min. tensile strength	600	600	600	600
f_{yk} (N/mm²)	Yield strength	480	480	480	480
W_{el} (mm³)	Elastic section modulus	12,7	31,2	62,3	109,2
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	9,15	22,5	44,8	72
M (Nm)	Recommended bending moment	4,5	11,2	22,4	36,0

INSTALLATION



Special products - Recommended loads (N_{rec}) in kN

Anchor size	Tensile concrete ≥ C20/25	Diameter
Hook version	0,6	11
Eye version	0,6	8

DYNABOLT

2/4

The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/4 and 4/4).

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	M6	M8	M10	M12
h_{ef}	**30**	**34**	**44**	**46**
$N_{Ru,m}$	7,6	10,8	17,2	18,2
N_{Rk}	5,7	8,1	12,9	13,7

SHEAR

Anchor size	M6	M8	M10	M12
$V_{Ru,m}$	7,3	13,2	20,9	30,4
V_{Rk}	6,1	11,0	17,4	25,3

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{*}}{\gamma_{Mc}}$$

*Derived from test results

$$V_{Rd} = \frac{V_{Rk}^{*}}{\gamma_{Ms}}$$

TENSILE

Anchor size	M6	M8	M10	M12
h_{ef}	**30**	**34**	**44**	**46**
N_{Rd}	2,7	3,9	6,1	6,5

$\gamma_{Mc} = 2,1$

SHEAR

Anchor size	M6	M8	M10	M12
V_{Rd}	3,8	6,9	10,9	15,8

$\gamma_{Ms} = 1,6$

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

*Derived from test results

$$V_{rec} = \frac{V_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

TENSILE

Anchor size	M6	M8	M10	M12
h_{ef}	**30**	**34**	**44**	**46**
N_{rec}	1,9	2,8	4,4	4,7

$\gamma_F = 1,4$; $\gamma_{Mc} = 2,1$

SHEAR

Anchor size	M6	M8	M10	M12
V_{rec}	2,7	4,9	7,8	11,3

$\gamma_F = 1,4$; $\gamma_{Ms} = 1,6$

Recommended loads (N_{rec}, V_{rec}) in engineering clay bricks BP 400 (fc > 40 N/mm²) in kN

TENSILE

Anchor size	M6	M8	M10	M12
h_{ef}	**30**	**34**	**44**	**46**
N_{rec}	2,2	2,9	5,3	5,9

$\gamma_M = 2,1$

SHEAR

Anchor size	M6	M8	M10	M12
V_{rec}	2,8	5,1	8,1	11,8

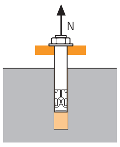
Design loads (N_{Rd}, V_{Rd}) in beam slab in kN

Hollow concrete slab (wall thickness : 30 mm)	Edge distance > 50 mm Minimum spacing : 125 mm		Edge distance > 100 mm Minimum spacing : 125 mm		Edge distance > 200 mm Minimum spacing : 125 mm	
	N_{Rd}	V_{Rd}	N_{Rd}	V_{Rd}	N_{Rd}	V_{Rd}
M12	4.1	4.1	4.5	4.5	6.7	6.7

$\gamma_M = 2,1$

SPIT CC Method

TENSILE in kN



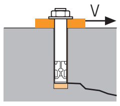
Pull-out resistance

$$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$$

$N^0_{Rd,p}$					Design pull-out resistance
Anchor size		M6	M8	M10	M12
h_{ef}		30	34	44	46
$N^0_{Rd,p}$	(C20/25)	2,7	3,9	6,1	6,5

$\gamma_{Mc} = 2{,}1$

SHEAR in kN

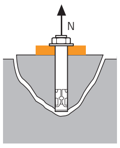


Concrete edge resistance

$$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$$

$V^0_{Rd,c}$					Design concrete edge resistance at minimum edge distance (C_{min})
Anchor size		M6	M8	M10	M12
h_{ef}		30	34	44	46
C_{min}		50	60	75	100
S_{min}		50	60	70	90
$V^0_{Rd,c}$	(C20/25)	2,7	3,9	6,1	10,4

$\gamma_{Mc} = 1{,}5$

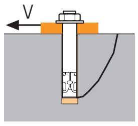


Concrete cone resistance

$$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$$

$N^0_{Rd,c}$					Design cone resistance
Anchor size		M6	M8	M10	M12
h_{ef}		30	34	44	46
$N^0_{Rd,c}$	(C20/25)	3,9	4,8	7,0	7,5

$\gamma_{Mc} = 2{,}1$

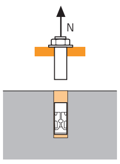


Pryout failure

$$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$$

$V^0_{Rd,cp}$					Design pryout resistance
Anchor size		M6	M8	M10	M12
h_{ef}		30	34	44	46
$V^0_{Rd,cp}$	(C20/25)	5,5	6,7	9,8	10,5

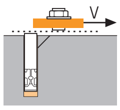
$\gamma_{Mcp} = 1{,}5$



Steel resistance

$N_{Rd,s}$				Steel design tensile resistance
Anchor size	M6	M8	M10	M12
$N_{Rd,s}$	6,3	11,5	18,1	26,4

$\gamma_{Ms} = 2$



Steel resistance

$V_{Rd,s}$				Steel design shear resistance
Anchor size	M6	M8	M10	M12
$V_{Rd,s}$	3,8	6,9	10,9	15,8

$\gamma_{Ms} = 1{,}6$

$$N_{Rd} = \min(N_{Rd,p}\ ;\ N_{Rd,c}\ ;\ N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c}\ ;\ V_{Rd,cp}\ ;\ V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

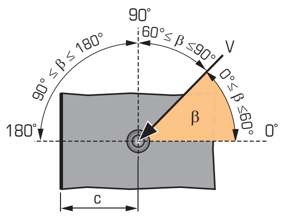
$$\beta_N + \beta_V \leq 1{,}2$$

f_b INFLUENCE OF CONCRETE

Concrete class	f_b	Concrete class	f_b
C25/30	1,1	C40/50	1,41
C30/37	1,22	C45/55	1,48
C35/45	1,34	C50/60	1,55

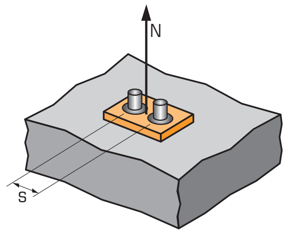
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2



SPIT CC Method

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0,5 + \frac{s}{6.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

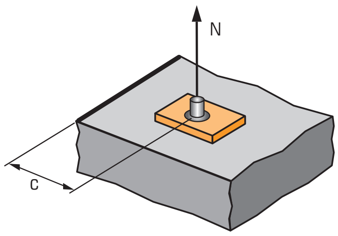
$s_{cr,N} = 3.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group

SPACING S — Reduction factor Ψ_s — Non-cracked concrete

Anchor size	M6	M8	M10	M12
50	0,78			
60	0,83	0,80		
70	0,89	0,85	0,77	
80	0,94	0,90	0,80	
90	1,00	0,95	0,84	0,83
100		1,00	0,88	0,86
120			0,95	0,93
130			1,00	0,97
140				1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0,23 + 0,51 \cdot \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

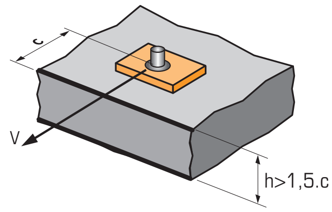
$c_{cr,N} = 1,5.h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

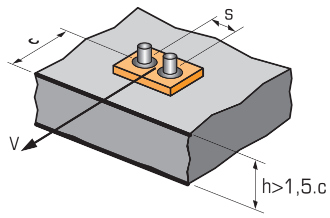
EDGE C — Reduction factor $\Psi_{c,N}$ — Non-cracked concrete

Anchor size	M6	M8	M10	M12
50	1,00			
60		1,00		
75			1,00	
100				1,00

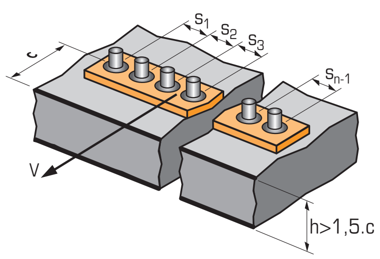
$\Psi_{s\text{-}c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD



$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$



$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$



For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

$\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

For 2 anchors fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

$\frac{s}{c_{min}}$ \ $\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65

For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + ... + s_{n-1}}{3.n.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

Mechanical anchors

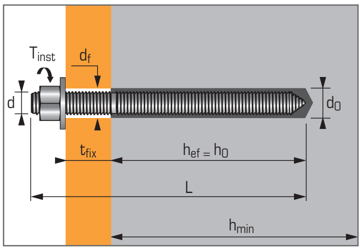
EPCON C8 XTREM

Epoxy resin - High performance for use in cracked and non-cracked concrete

ETA European Technical Assessment
ETA Option 1- 10/0309

XTREM

INOX STAINLESS STEEL



APPLICATION

- Steel profiles
- Fixing machinery (resistant to vibration)
- Storage tanks, pipes
- Signs
- Guard rails
- Electrical insulated fixings

MATERIAL

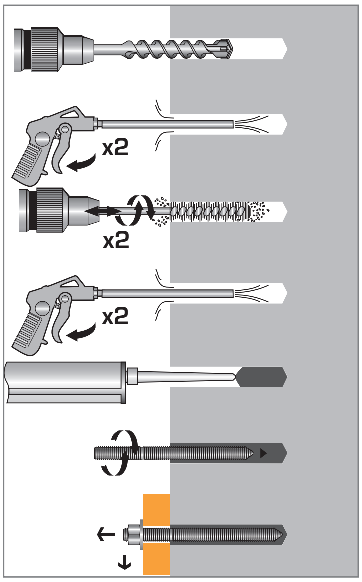
Zinc coated steel version :

- **Stud M8-M16 :** Steel cold form steel NF A35-053
- **Stud M20-M30 :** 11 SMnPb37 - NFA 35-561
- **Nut :** Steel grade 6 or 8 NF EN 20898-2
- **Washer :** Steel DIN 513
- **Protection :** zinc coated 5 µm min. NF E25-009

Stainless steel version :

- **Stud :** A4-70 as per ISO 3506-1
- **Nut :** Stainless steel A4-80, NF EN 10088-3
- **Washer :** Stainless steel A4, NF EN 20898-2

INSTALLATION*



***Premium cleaning :**

- 2 blowing with compressed air
- 2 brushing with brushed fitted on a drilling machine
- 2 blowing with compressed air

Technical data

Anchor size	Min. anchor depth (mm) h_{ef}	Max. thick. of part to be fixed (mm) t_{fix}	Min. thick. of base material (mm) h_{min}	Thread diameter (mm) d	Drilling depth (mm) h_0	Drilling diameter (mm) d_0	Clearance diameter (mm) d_f	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code* MAXIMA stud zinc coated st.	stainless steel A4
M8X110	80	15	110	8	80	10	9	110	10	050950	052400
M10X130	90	20	120	10	90	12	12	130	20	050960	052410
M12X160	110	25	140	12	110	14	14	160	30	050970	052420
M16X190	125	35	160	16	125	18	18	190	60	050980	052440
M20X260	170	65	220	20	170	25	22	260	120	655220	052450
M24X300	210	63	265	24	210	28	26	300	200	655240	052470
M30X380	280	70	350	30	280	35	33	380	400	050940	-
EPCON C8 Epoxy resin, dual component cartridge 450 ml										055887	
EPCON C8 Epoxy resin, dual component cartridge 900 ml										055829	

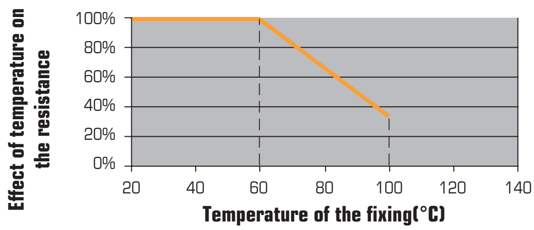
* These are Maxima studs, for standard studs (zinc coated or stainless steel versions) see catalogue.

Anchor mechanical properties

Anchor size		M8	M10	M12	M16	M20	M24	M30
MAXIMA stud - zinc coated steel version								
f_{uk} (N/mm²)	Min. tensile strength	600	600	600	600	520	520	520
f_{yk} (N/mm²)	Yield strength	420	420	420	420	420	420	420
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	22	45	79	200	301	520	1052
M (Nm)	Recommended bending moment	11,0	22,5	39,5	100	150	160	525
MAXIMA stud - stainless steel A4 version								
f_{uk} (N/mm²)	Min. tensile strength	700	700	700	700	700	700	-
f_{yk} (N/mm²)	Yield strength	350	350	350	350	350	350	-
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	26	52	92	233	454	786	-
M (Nm)	Recommended bending moment	12	23	42	122	206	357	-
As (mm²)	Stressed cross-section	36,6	58	84,3	157	227	326,9	-
W_{el} (mm³)	Elastic section modulus	31,2	62,3	109,2	277,5	482,4	833,7	-

Setting time

Ambient temperature	Max. time for installation (min)	Waiting time for 45 % load (h)	Curing time (h)
40°C	5	3	6
30°C	8	5	8
20°C	14	6	12
10°C	20	12	23
5°C	26	15	26



Chemical resistance of the SPIT EPCON C8 resin

Chemical substances	Concentration (%)	Resistance
Sulfuric acid	10	(o)
Hydrochloric acid	10	(o)
Nitric acid	10	(o)
Acetic acid	10	(o)
Ammonium hydroxide	10	(o)
Sodium Hypochlorite	5	(o)
Sodium hydroxide	50	(o)
Acetone		(-)

Chemical substances	Concentration (%)	Resistance
Toluene		(o)
Ethanol		(o)
Methyl-ethyl-ketone (MEK)		(-)
Methanol		(-)
Demineralized water		(+)
Sea water	100	(+)
Engine Petrol	100	(+)
Motor oil	100	(+)

Resistant (+): the samples in contact with the substances did not show any Screwible damage such as cracks, attacked surfaces, burst corners nor large swelling. **Sensitive (o):** use with care regarding exposure of the field of usage, precautions to be taken. The samples in contact with the substance slightly attacked the material.

EPCON C8 XTREM

 STANDARD EMBEDMENT - Zinc coated & stainless steel studs

The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/10 to 10/10).

Number of sealings per cartridge

Anchor size	M8	M10	M12	M16	M20	M24	M30
Drilling diameter (mm)	10	12	14	18	25	28	35
Drilling depth (mm)	80	90	110	125	170	210	280
Number of sealings per cartridge							
EPCON C8 450 ml	166	121	83	56	12	11	5
EPCON C8 900 ml	331	241	167	112	25	22	10

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	M8	M10	M12	M16	M20	M24	M30
Non-cracked concrete							
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
$N_{Ru,m}$	39,4	55,5	81,2	115,0	183,5	257,7	403,8
N_{Rk}	32,1	45,2	66,2	93,8	149,8	211,4	330,5
Cracked concrete							
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
$N_{Ru,m}$	27,0	37,7	55,1	82,5	139,4	205,4	340,4
N_{Rk}	20,8	29,1	42,3	63,6	107,3	157,9	261,3

SHEAR

Anchor size	M8	M10	M12	M16	M20	M24	M30
$V_{Ru,m}$	15,9	22,75	32,8	56,2	73,6	115,0	177,7
V_{Rk}	11,0	18,9	25,3	46,8	59,02	95,8	135,9

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{\ *}}{\gamma_{Mc}}$$

*Derived from test results (stud grade 10.9)

$$V_{Rd} = \frac{V_{Rk}^{\ *}}{\gamma_{Ms}}$$

TENSILE

Anchor size	M8	M10	M12	M16	M20	M24	M30
Non-cracked concrete							
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
N_{Rd}	17,8	25,1	36,8	52,1	83,2	117,4	183,6
Cracked concrete							
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
N_{Rd}	11,6	16,1	23,5	35,3	59,6	87,7	145,1

$\gamma_{Mc} = 1,8$

SHEAR

Anchor size	M8	M10	M12	M16	M20	M24	M30
V_{Rd}	7,7	13,2	17,7	32,7	39,3	63,9	90,6

$\gamma_{Ms} = 1,43$ for M8 to M16 and $\gamma_{Ms} = 1,5$ for M20 to M30

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}^{\ *}}{\gamma_M \cdot \gamma_F}$$

*Derived from test results (stud grade 10.9)

$$V_{rec} = \frac{V_{Rk}^{\ *}}{\gamma_M \cdot \gamma_F}$$

TENSILE

Anchor size	M8	M10	M12	M16	M20	M24	M30
Non-cracked concrete							
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
N_{rec}	12,7	17,9	26,3	37,2	59,4	83,8	131,1
Cracked concrete							
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
N_{rec}	8,3	11,5	16,7	25,2	42,5	62,6	103,6

$\gamma_{Mc} = 1,8$

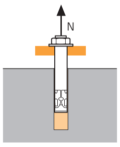
SHEAR

Anchor size	M8	M10	M12	M16	M20	M24	M30
V_{rec}	5,5	9,4	12,6	23,4	28,1	45,6	64,7

$\gamma_F = 1,4$; $\gamma_{Ms} = 1,43$ for M8 to M16 and $\gamma_{Ms} = 1,5$ for M20 to M30

SPIT CC Method (values issued from ETA)

TENSILE in kN



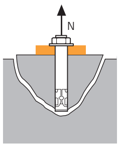
Pull-out resistance for dry and wet concrete [1]

$$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$$

$N^0_{Rd,p}$ — **Design pull-out resistance**

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
Non-cracked concrete	17,9	25,1	36,9	52,4	83,1	114,4	190,6
Cracked concrete	10,6	14,9	20,7	29,7	50,4	74,8	102,6

$\gamma_{Mc} = 1,8$



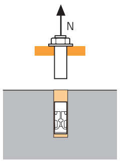
Concrete cone resistance for dry and wet concrete [1]

$$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$$

$N^0_{Rd,c}$ — **Design cone resistance**

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
Non-cracked concrete	20,0	23,9	32,3	39,1	62,1	85,2	131,2
Cracked concrete	14,3	17,1	23,1	28,0	44,3	60,9	93,7

$\gamma_{Mc} = 1,8$



Steel resistance

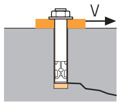
$N_{Rd,s}$ — **Steel design tensile resistance**

Anchor size	M8	M10	M12	M16	M20	M24	M30
MAXIMA stud Zn.	12,9	20,5	29,8	55,6	79,2	114,1	182,6
MAXIMA stud A4	12,3	19,8	28,9	54,5	85,0	122,5	-
Std. stud grade 5.8*	12,0	19,3	28,0	52,0	81,3	118,0	186,7
Std. stud grade 8.8*	19,3	30,7	44,7	84,0	130,7	188,0	299,3
Std. stud grade 10.9*	26,4	41,4	60,0	112,1	175,0	252,1	400,7

MAXIMA stud Zn. : $\gamma_{Ms} = 1,71$ for M8 to M16 and $\gamma_{Ms} = 2,49$ for M20 to M30
MAXIMA stud A4 : $\gamma_{Ms} = 1,87$
Std. stud grade 5.8 and 8.8 : $\gamma_{Ms} = 1,5$ and grade 10.9 : $\gamma_{Ms} = 1,4$
* Special grade available on request.

[1] The concrete in the area of the anchorage is water statured. The anchor may be installed in flooded holes, but the figures above cannot be used, you must use the values given in the ETA for the category 2.

SHEAR in kN



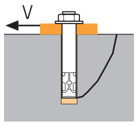
Concrete edge resistance

$$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$$

$V^0_{Rd,c}$ — **Design concrete edge resistance at minimum edge distance (C_{min})**

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
C_{min}	40	50	60	80	100	120	150
S_{min}	40	50	60	80	100	120	150
Non-cracked concrete	2,5	3,8	5,5	9,4	15,4	21,9	34,6
Cracked concrete	1,8	2,7	3,9	6,7	11	15,6	24,7

$\gamma_{Mc} = 1,5$



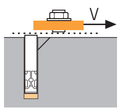
Pryout failure

$$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$$

$V^0_{Rd,cp}$ — **Design pryout resistance**

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
Non-cracked concrete	35,7	47,8	64,6	78,3	124,1	170,4	262,4
Cracked concrete	21,2	29,8	41,5	55,9	88,7	121,7	187,4

$\gamma_{Mcp} = 1,5$



Steel resistance

$V_{Rd,s}$ — **Steel design shear resistance**

Anchor size	M8	M10	M12	M16	M20	M24	M30
MAXIMA stud Zn.	7,7	12,2	17,7	32,9	39,3	56,7	90,7
MAXIMA stud A4	7,3	11,9	17,3	32,7	51,3	73,1	-
Std. stud grade 5.8*	7,4	11,6	16,9	31,2	48,8	70,4	112,0
Std. stud grade 8.8*	11,7	18,6	27,0	50,4	78,4	112,8	179,2
Std. stud grade 10.9*	12,2	19,3	28,1	52,0	81,3	117,3	186,7

MAXIMA stud Zn. : $\gamma_{Ms} = 1,43$ for M8 to M16 and $\gamma_{Ms} = 1,5$ for M20 to M30
MAXIMA stud A4 : $\gamma_{Ms} = 1,56$
Std. stud grade 5.8 and 8.8 : $\gamma_{Ms} = 1,25$ and grade 10.9 : $\gamma_{Ms} = 1,5$
* Special grade available on request.

$$N_{Rd} = \min(N_{Rd,c}\ ;\ N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c}\ ;\ V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

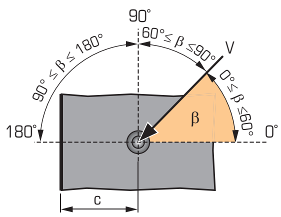
$$\beta_N + \beta_V \leq 1,2$$

f_b INFLUENCE OF CONCRETE

Concrete class	f_b
C25/30	1,02
C30/40	1,08
C40/60	1,10
C50/60	1,12

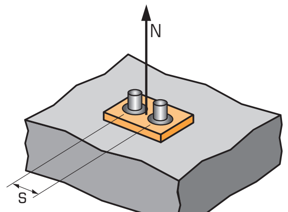
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2



SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0{,}5 + \frac{s}{6.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

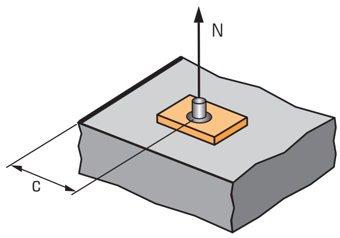
$s_{cr,N} = 3.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group.

SPACING S	Reduction factor Ψ_s Cracked & non-cracked concrete			
Anchor size	M8	M10	M12	M16
40	0,58			
50	0,60	0,59		
60	0,63	0,61	0,59	0,58
80	0,67	0,65	0,62	0,61
100	0,71	0,69	0,65	0,63
150	0,81	0,78	0,73	0,70
200	0,92	0,87	0,80	0,77
250	1,00	0,96	0,88	0,83
300		1,00	0,95	0,90
330			1,00	0,94
375				1,00

SPACING S	Reduction factor Ψ_s Cracked & non-cracked concrete		
Anchor size	M20	M24	M30
100	0,60		
120	0,62	0,60	
150	0,65	0,62	0,59
180	0,68	0,64	0,61
200	0,70	0,66	0,62
250	0,75	0,70	0,65
350	0,84	0,78	0,71
450	0,94	0,86	0,77
510	1,00	0,90	0,80
630		1,00	0,88
750		1,00	0,95
840			1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0{,}25 + 0{,}5 \,.\, \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

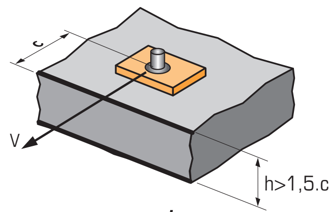
$c_{cr,N} = 1{,}5.h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

EDGE C	Reduction factor $\Psi_{c,N}$ Cracked & non-cracked concrete			
Anchor size	M8	M10	M12	M16
40	0,50			
50	0,56	0,53		
60	0,63	0,58	0,52	
80	0,75	0,69	0,61	0,57
120	1,00	0,92	0,80	0,73
135		1,00	0,86	0,79
165			1,00	0,91
190				1,00

EDGE C	Reduction factor $\Psi_{c,N}$ Cracked & non-cracked concrete		
Anchor size	M20	M24	M30
100	0,54		
120	0,60	0,54	
150	0,69	0,61	0,52
180	0,78	0,68	0,57
200	0,84	0,73	0,61
255	1,00	0,86	0,71
315		1,00	0,81
420			1,00

$\Psi_{s-c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

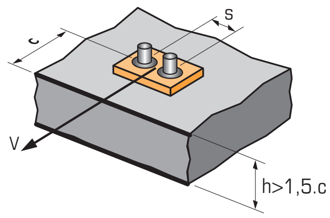


$$\Psi_{s-c,V} = \frac{c}{c_{min}} \,.\, \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s-c,V}$ Cracked & non-cracked concrete

$\frac{C}{C_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s-c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

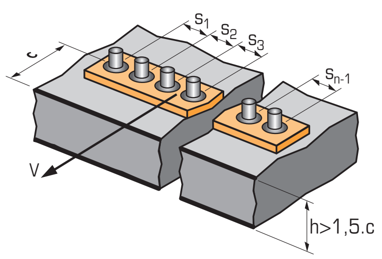


$$\Psi_{s-c,V} = \frac{3.c + s}{6.c_{min}} \,.\, \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

Reduction factor $\Psi_{s-c,V}$ Cracked & non-cracked concrete

$\frac{S}{C_{min}}$ \ $\frac{C}{C_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65

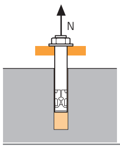


For 3 anchors fastening and more

$$\Psi_{s-c,V} = \frac{3.c + s_1 + s_2 + s_3 + \ldots + s_{n-1}}{3.n.c_{min}} \,.\, \sqrt{\frac{c}{c_{min}}}$$

SPIT CC Method (values issued from ETA - Seismic category C1)

TENSILE in kN

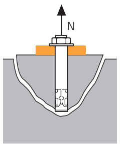


Pull-out resistance

$$N_{Rd,p,C1} = N^{0}_{Rd,p,C1} \cdot f_b$$

$N^0_{Rd,p,C1}$			Design pull-out resistance
Anchor size	**M10**	**M12**	**M16**
Category C1 - Single anchor			
h_{ef}	**90**	**110**	**125**
$N^0_{Rd,p,C1}$ (C20/25)	9,7	13,1	23,7
Category C1 - Group of anchors (1)			
h_{ef}	**90**	**110**	**125**
$N^0_{Rd,p,C1}$ (C20/25)	8,2	11,1	20,2

(1) when more than one anchor of the group is submitted to tensile load
$\gamma_{Mc} = 1{,}8$

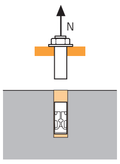


Concrete cone resistance

$$N_{Rd,c,C1} = N^{0}_{Rd,c,C1} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$$

$N^0_{Rd,c,C1}$			Design cone resistance
Anchor size	**M10**	**M12**	**M16**
Category C1 - Single anchor			
h_{ef}	**90**	**110**	**125**
$N^0_{Rd,c,C1}$ (C20/25)	9,4	12,4	19,0
Category C1 - Group of anchors (1)			
h_{ef}	**90**	**110**	**125**
$N^0_{Rd,c,C1}$ (C20/25)	8,3	10,9	16,8

(1) when more than one anchor of the group is submitted to tensile load
$\gamma_{Mc} = 1{,}8$

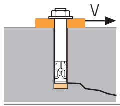


Steel resistance

$N_{Rd,s,C1}$			Steel design tensile resistance
Anchor size	**M10**	**M12**	**M16**
MAXIMA stud Zn.	20,5	29,8	55,6
MAXIMA stud A4	21,9	31,6	58,8
Std. stud grade 5.8	19,3	28,0	52,0
Std. stud grade 8.8	30,7	44,7	84,0

(1) when more than one anchor of the group is submitted to tensile load
MAXIMA stud Zn. : $\gamma_{Ms} = 1{,}8$ and MAXIMA stud A4: $\gamma_{Ms} = 1{,}87$
Std. stud grade 5.8 and 8.8 : $\gamma_{Ms} = 1{,}5$

SHEAR in kN

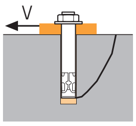


Concrete edge resistance

$$V_{Rd,c,C1} = V^{0}_{Rd,c,C1} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$$

$V^0_{Rd,c,C1}$			Design concrete edge resistance at minimum edge distance (C_{min})
Anchor size	**M10**	**M12**	**M16**
Category C1 - Single anchor			
h_{ef}	**90**	**110**	**125**
C_{min}	50	60	80
S_{min}	45	55	65
$V^0_{Rd,c,C1}$ (C20/25)	3,8	5,5	9,4
Category C1 - Group of anchors (1)			
h_{ef}	**90**	**110**	**125**
C_{min}	50	60	80
S_{min}	45	55	65
$V^0_{Rd,c,C1}$ (C20/25)	3,3	4,7	8,0

(1) when more than one anchor of the group is submitted to shear load
$\gamma_{Mc} = 1{,}5$

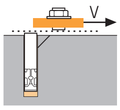


Pryout failure

$$V_{Rd,cp,C1} = V^{0}_{Rd,cp,C1} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$$

$V^0_{Rd,cp,C1}$			Design pryout resistance
Anchor size	**M10**	**M12**	**M16**
Category C1 - Single anchor			
h_{ef}	**90**	**110**	**125**
$V^0_{Rd,cp,C1}$ (C20/25)	22,6	29,7	45,6
Category C1 - Group of anchors (1)			
h_{ef}	**90**	**110**	**125**
$V^0_{Rd,cp,C1}$ (C20/25)	20,0	26,2	40,2

(1) when more than one anchor of the group is submitted to shear load
$\gamma_{Mc} = 1{,}5$



Steel resistance (2)

$V_{Rd,s,C1}$			Steel design shear resistance
Anchor size	**M10**	**M12**	**M16**
Category C1 - Single anchor			
MAXIMA stud Zn.	8,5	12,4	23,0
MAXIMA stud A4	12,8	19,2	35,3
Std. stud grade 5.8	8,1	11,8	21,8
Std. stud grade 8.8	18,6	27,0	50,4
Category C1 - Group of anchors (1)			
MAXIMA stud Zn.	7,2	10,5	19,6
MAXIMA stud A4	10,9	16,3	30,0
Std. stud grade 5.8	6,9	10,0	18,6
Std. stud grade 8.8	15,8	22,9	42,8

(1) when more than one anchor of the group is submitted to shear load
(2) In case of no hole clearance between anchor and fixture.
MAXIMA stud Zn. : $\gamma_{Ms} = 1{,}43$ and MAXIMA stud A4 : $\gamma_{Ms} = 1{,}56$
Std. stud grade 5.8 and 8.8 : $\gamma_{Ms} = 1{,}25$

$$N_{Rd,C1} = \min(N_{Rd,p,C1} \; ; \; N_{Rd,c,C1} \; ; \; N_{Rd,s,C1})$$
$$\beta_N = N_{Sd} / N_{Rd,C1} \leq 1$$

$$V_{Rd,C1} = \min(V_{Rd,c,C1} \; ; \; V_{Rd,cp,C1} \; ; \; V_{Rd,s,C1})$$
$$\beta_V = V_{Sd} / V_{Rd,C1} \leq 1$$

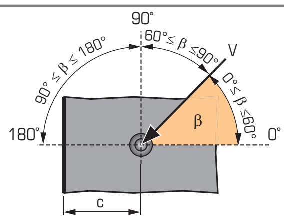
$$\beta_N + \beta_V \leq 1{,}2$$

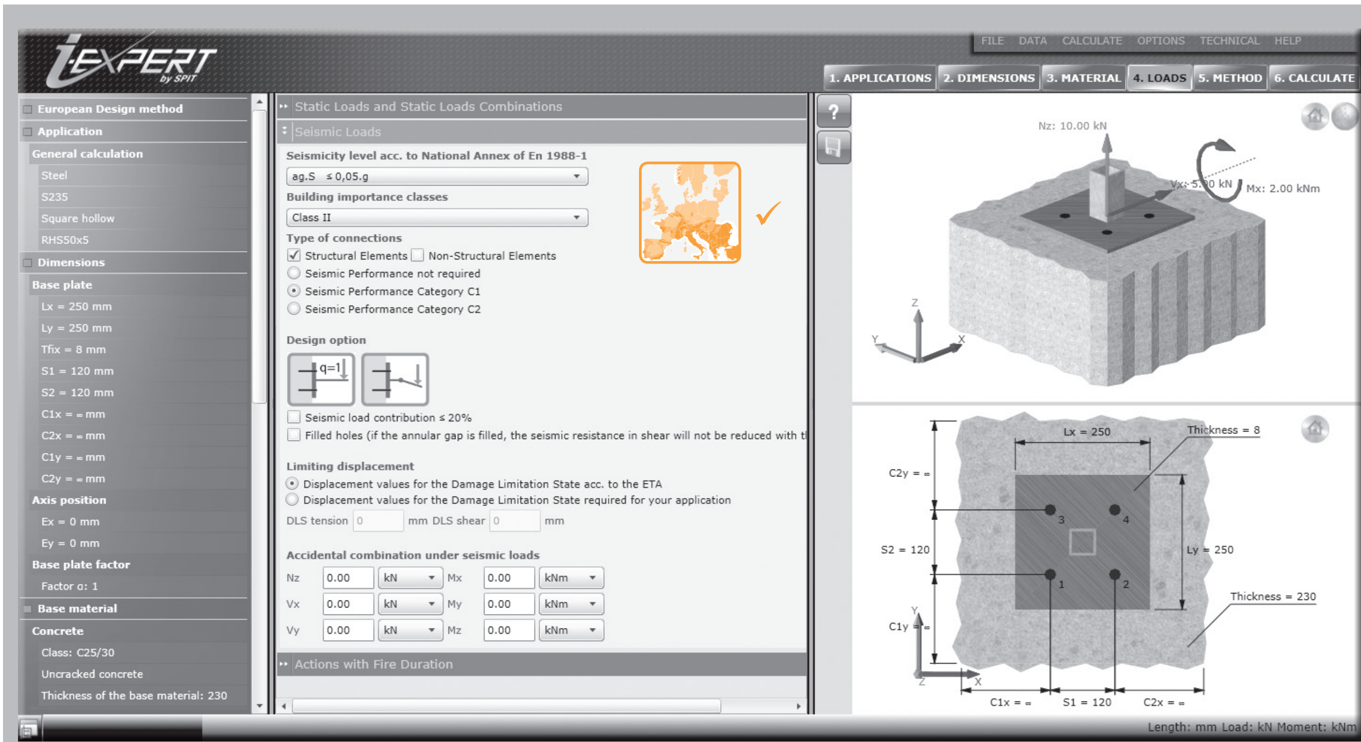
f_b INFLUENCE OF CONCRETE

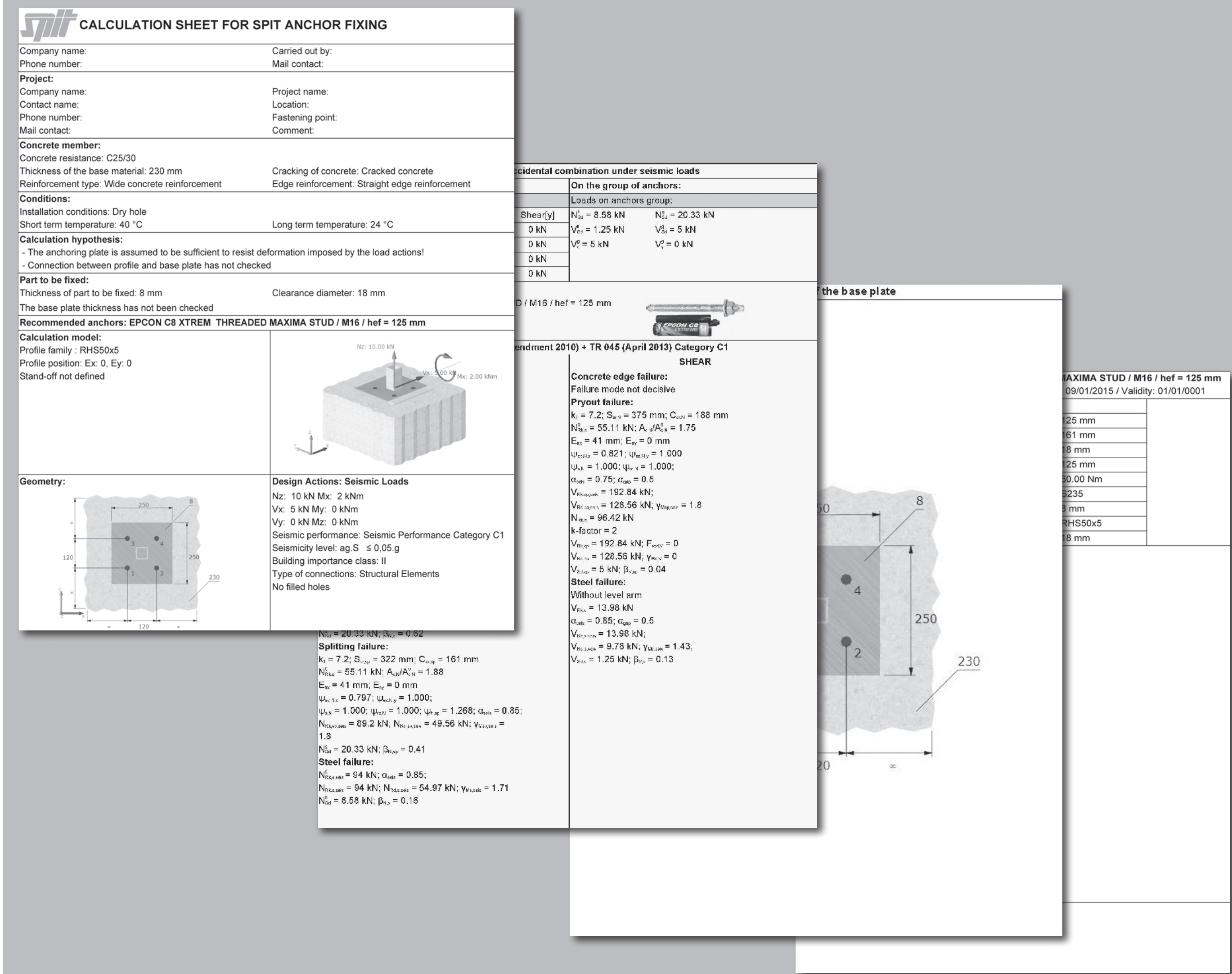
Concrete class	f_b
C25/30	1,02
C30/40	1,08
C40/60	1,10
C50/60	1,12

$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2







CALCULATION SHEET FOR SPIT ANCHOR FIXING

Company name:	Carried out by:
Phone number:	Mail contact:
Project:	
Company name:	Project name:
Contact name:	Location:
Phone number:	Fastening point:
Mail contact:	Comment:
Concrete member:	
Concrete resistance: C25/30	
Thickness of the base material: 230 mm	Cracking of concrete: Cracked concrete
Reinforcement type: Wide concrete reinforcement	Edge reinforcement: Straight edge reinforcement
Conditions:	
Installation conditions: Dry hole	
Short term temperature: 40 °C	Long term temperature: 24 °C
Calculation hypothesis:	
- The anchoring plate is assumed to be sufficient to resist deformation imposed by the load actions!	
- Connection between profile and base plate has not checked	
Part to be fixed:	
Thickness of part to be fixed: 8 mm	Clearance diameter: 18 mm
The base plate thickness has not been checked	
Recommended anchors: EPCON C8 XTREM THREADED MAXIMA STUD / M16 / hef = 125 mm	
Calculation model:	
Profile family : RHS50x5	
Profile position: Ex: 0, Ey: 0	
Stand-off not defined	
Geometry:	**Design Actions: Seismic Loads**
	Nz: 10 kN Mx: 2 kNm
	Vx: 5 kN My: 0 kNm
	Vy: 0 kN Mz: 0 kNm
	Seismic performance: Seismic Performance Category C1
	Seismicity level: ag.S ≤ 0,05.g
	Building importance class: II
	Type of connections: Structural Elements
	No filled holes

ccidental combination under seismic loads

On the group of anchors:

Loads on anchors group:

Shear[y]: 0 kN; 0 kN; 0 kN; 0 kN

N^h_{Sd} = 8.58 kN; N^g_{Sd} = 20.33 kN

V^h_{Sd} = 1.25 kN; V^g_{Sd} = 5 kN

V^g_{t} = 5 kN; V^g_{t} = 0 kN

D / M16 / hef = 125 mm

endment 2010) + TR 045 (April 2013) Category C1

SHEAR

Concrete edge failure:
Failure mode not decisive

Pryout failure:
k_1 = 7.2; $S_{cr,N}$ = 375 mm; $C_{cr,N}$ = 188 mm
$N^0_{Rk,c}$ = 55.11 kN; $A_{c,N}/A^0_{c,N}$ = 1.75
E_{cx} = 41 mm; E_{cy} = 0 mm
$\psi_{ec,N,x}$ = 0.821; $\psi_{ec,N,y}$ = 1.000
$\psi_{s,N}$ = 1.000; $\psi_{re,N}$ = 1.000;
α_{seis} = 0.75; α_{gap} = 0.5
$V_{Rk,cp,seis}$ = 192.84 kN;
$V_{Rd,cp,seis}$ = 128.56 kN; $\gamma_{Mcp,seis}$ = 1.8
$N_{Rk,c}$ = 96.42 kN
k-factor = 2
$V_{Rk,cp}$ = 192.84 kN; F_{ecV} = 0
$V_{Rd,cp}$ = 128.56 kN; $\gamma_{Mc,V}$ = 0
$V_{Sd,cp}$ = 5 kN; $\beta_{V,cp}$ = 0.04

Steel failure:
Without level arm
$V_{Rk,s}$ = 13.98 kN
α_{seis} = 0.85; α_{gap} = 0.5
$V_{Rk,s,seis}$ = 13.98 kN;
$V_{Rd,s,seis}$ = 9.78 kN; $\gamma_{Ms,seis}$ = 1.43;
$V_{Sd,s}$ = 1.25 kN; $\beta_{V,s}$ = 0.13

N_{Sd} = 20.33 kN; $\beta_{N,c}$ = 0.62

Splitting failure:
k_1 = 7.2; $S_{cr,sp}$ = 322 mm; $C_{cr,sp}$ = 161 mm
$N^0_{Rk,c}$ = 55.11 kN; $A_{c,N}/A^0_{c,N}$ = 1.88
E_{cx} = 41 mm; E_{cy} = 0 mm
$\psi_{ec,N,x}$ = 0.797; $\psi_{ec,N,y}$ = 1.000;
$\psi_{s,N}$ = 1.000; $\psi_{re,N}$ = 1.000; $\psi_{h,sp}$ = 1.268; α_{seis} = 0.85;
$N_{Rk,sp,seis}$ = 89.2 kN; $N_{Rd,sp,seis}$ = 49.56 kN; $\gamma_{Msp,seis}$ = 1.8
N^g_{Sd} = 20.33 kN; $\beta_{N,sp}$ = 0.41

Steel failure:
$N^0_{Rk,s,seis}$ = 94 kN; α_{seis} = 0.85;
$N_{Rk,s,seis}$ = 94 kN; $N_{Rd,s,seis}$ = 54.97 kN; $\gamma_{Ms,seis}$ = 1.71
N^h_{Sd} = 8.58 kN; $\beta_{N,s}$ = 0.16

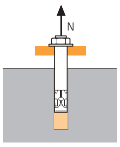
f the base plate

AXIMA STUD / M16 / hef = 125 mm
09/01/2015 / Validity: 01/01/0001

25 mm
161 mm
18 mm
25 mm
0.00 Nm
S235
3 mm
RHS50x5
18 mm

SPIT CC Method (values issued from ETA)

TENSILE in kN

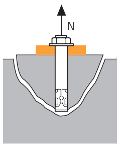


Pull-out resistance for dry and wet concrete [1]

$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$						Design pull-out resistance	
Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	95	120	144	192	220	280	330
Non-cracked concrete	21,2	33,5	48,3	80,4	107,5	152,5	224,6
Cracked concrete	12,6	19,9	27,1	45,6	65,3	99,7	121,0

$\gamma_{Mc} = 1{,}8$

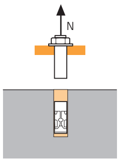


Concrete cone resistance for dry and wet concrete [1]

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$						Design cone resistance	
Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	95	120	144	192	220	280	330
Non-cracked concrete	25,9	36,8	48,4	74,5	91,4	131,2	167,9
Cracked concrete	18,5	26,3	34,6	53,2	65,3	93,7	119,9

$\gamma_{Mc} = 1{,}8$



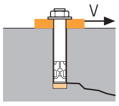
Steel resistance

$N_{Rd,s}$						Steel design tensile resistance	
Anchor size	M8	M10	M12	M16	M20	M24	M30
MAXIMA stud Zn.	12,9	20,5	29,8	55,6	79,2	114,1	182,6
MAXIMA stud A4	12,3	19,8	28,9	54,5	85,0	122,5	-
Std. stud grade 5.8*	12,0	19,3	28,0	52,0	81,3	118,0	186,7
Std. stud grade 8.8*	19,3	30,7	44,7	84,0	130,7	188,0	299,3
Std. stud grade 10.9*	26,4	41,4	60,0	112,1	175,0	252,1	400,7

MAXIMA stud Zn. : $\gamma_{Ms} = 1{,}71$ for M8 to M16 and $\gamma_{Ms} = 2{,}49$ for M20 to M30
MAXIMA stud A4 : $\gamma_{Ms} = 1{,}87$
Std. stud grade 5.8 and 8.8 : $\gamma_{Ms} = 1{,}5$ and grade 10.9 : $\gamma_{Ms} = 1{,}4$
* Special grade available on request.

[1] The concrete in the area of the anchorage is water statured. The anchor may be installed in flooded holes, but the figures above cannot be used, you must use the values given in the ETA for the category 2.

SHEAR in kN

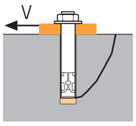


Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c}$						Design concrete edge resistance at minimum edge distance (C_{min})	
Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	95	120	144	192	220	280	330
C_{min}	40	50	60	80	100	120	150
S_{min}	40	50	60	80	100	120	150
Non-cracked concrete	2,6	3,5	5,1	7,5	12,7	18,9	32,2
Cracked concrete	1,8	2,5	3,6	5,3	9	13,5	23

$\gamma_{Mc} = 1{,}5$

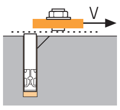


Pryout failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$						Design pryout resistance	
Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	95	120	144	192	220	280	330
Non-cracked concrete	42,4	67,0	96,5	149,0	182,7	262,4	335,7
Cracked concrete	25,2	39,8	54,3	91,1	130,5	187,4	239,8

$\gamma_{Mcp} = 1{,}5$



Steel resistance

$V_{Rd,s}$						Steel design shear resistance	
Anchor size	M8	M10	M12	M16	M20	M24	M30
MAXIMA stud Zn.	7,7	12,2	17,7	32,9	39,3	56,7	90,7
MAXIMA stud A4	7,3	11,9	17,3	32,7	51,3	73,1	-
Std. stud grade 5.8*	7,4	11,6	16,9	31,2	48,8	70,4	112,0
Std. stud grade 8.8*	11,7	18,6	27,0	50,4	78,4	112,8	179,2
Std. stud grade 10.9*	12,2	19,3	28,1	52,0	81,3	117,3	186,7

MAXIMA stud Zn. : $\gamma_{Ms} = 1{,}43$ for M8 to M16 and $\gamma_{Ms} = 1{,}5$ for M20 to M30
MAXIMA stud A4 : $\gamma_{Ms} = 1{,}56$
Std. stud grade 5.8 and 8.8 : $\gamma_{Ms} = 1{,}25$ and grade 10.9 : $\gamma_{Ms} = 1{,}5$
* Special grade available on request.

$$N_{Rd} = \min(N_{Rd,p}\ ;\ N_{Rd,c}\ ;\ N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c}\ ;\ V_{Rd,cp}\ ;\ V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

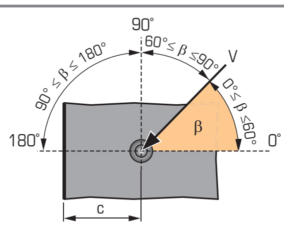
$$\beta_N + \beta_V \leq 1{,}2$$

f_b INFLUENCE OF CONCRETE

Concrete class	f_b
C25/30	1,02
C30/40	1,08
C40/60	1,10
C50/60	1,12

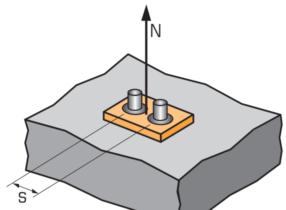
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2



SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0{,}5 + \frac{s}{6.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

$s_{cr,N} = 3.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group.

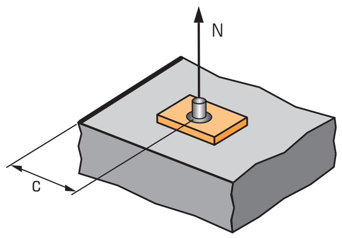
SPACING S — Reduction factor Ψ_s — Cracked & non-cracked concrete

Anchor size	M8	M10	M12	M16
40	0,57			
50	0,59	0,57		
60	0,61	0,58	0,57	0,55
80	0,64	0,61	0,59	0,57
100	0,68	0,64	0,62	0,59
150	0,76	0,71	0,67	0,63
200	0,85	0,78	0,73	0,67
290	1,00	0,90	0,84	0,75
360		1,00	0,92	0,81
435			1,00	0,88
580				1,00

SPACING S — Reduction factor Ψ_s — Cracked & non-cracked concrete

Anchor size	M20	M24	M30
100	0,58		
120	0,59	0,57	
150	0,61	0,59	0,58
180	0,64	0,61	0,59
200	0,65	0,62	0,60
250	0,69	0,65	0,63
300	0,73	0,68	0,65
400	0,80	0,74	0,70
500	0,88	0,80	0,75
660	1,00	0,89	0,83
840		1,00	0,92
990			1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0{,}25 + 0{,}5 \cdot \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

$c_{cr,N} = 1{,}5.h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

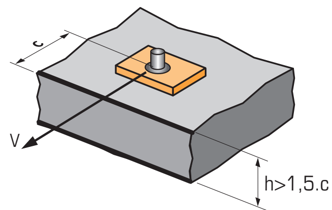
EDGE C — Reduction factor $\Psi_{c,N}$ — Cracked & non-cracked concrete

Anchor size	M8	M10	M12	M16
40	0,46			
50	0,51	0,46		
60	0,57	0,50	0,46	
80	0,67	0,58	0,53	0,46
145	1,00	0,85	0,75	0,63
180		1,00	0,88	0,72
215			1,00	0,81
290				1,00

EDGE C — Reduction factor $\Psi_{c,N}$ — Cracked & non-cracked concrete

Anchor size	M20	M24	M30
100	0,48		
120	0,52	0,46	
150	0,59	0,52	0,48
200	0,70	0,61	0,55
250	0,82	0,70	0,63
330	1,00	0,84	0,75
420		1,00	0,89
500			1,00

$\Psi_{s\text{-}c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

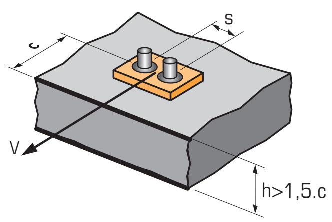


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Cracked & non-cracked concrete

c/c_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

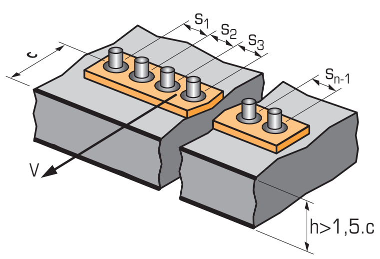


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Cracked & non-cracked concrete

s/c_{min} \ c/c_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65

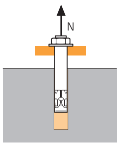


For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + ... + s_{n-1}}{3.n.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

SPIT CC Method (values issued from ETA)

TENSILE in kN



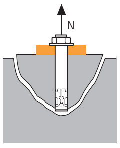
Pull-out resistance for dry and wet concrete [1]

$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$ — Design pull-out resistance

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**128**	**160**	**192**	**256**	**320**	**384**	**480**
Non-cracked concrete	28,6	44,7	64,3	107,2	156,4	209,1	326,7
Cracked concrete	17,0	26,5	36,2	60,8	94,9	136,7	175,9

$\gamma_{Mc} = 1,8$



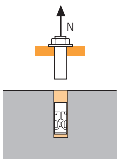
Concrete cone resistance for dry and wet concrete [1]

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$ — Design cone resistance

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**128**	**160**	**192**	**256**	**320**	**384**	**480**
Non-cracked concrete	40,5	56,7	74,5	114,7	160,3	210,7	294,5
Cracked concrete	29,0	40,5	53,2	81,9	114,5	150,5	210,3

$\gamma_{Mc} = 1,8$



Steel resistance

$N_{Rd,s}$ — Steel design tensile resistance

Anchor size	M8	M10	M12	M16	M20	M24	M30
Std. stud grade 5.8*	12,0	19,3	28,0	52,0	81,3	118,0	186,7
Std. stud grade 8.8*	19,3	30,7	44,7	84,0	130,7	188,0	299,3
Std. stud grade 10.9*	26,4	41,4	60,0	112,1	175,0	252,1	400,7

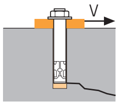
Std. stud grade 5.8 and 8.8 : $\gamma_{Ms} = 1,5$

Std. stud grade 10.9 : $\gamma_{Ms} = 1,4$

* Special grade available on request.

[1] The concrete in the area of the anchorage is water statured. The anchor may be installed in flooded holes, but the figures above cannot be used, you must use the values given in the ETA for the category 2.

SHEAR in kN



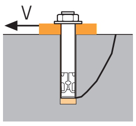
Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c}$ — Design concrete edge resistance at minimum edge distance (C_{min})

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**128**	**160**	**192**	**256**	**320**	**384**	**480**
C_{min}	40	50	60	80	100	120	150
S_{min}	40	50	60	80	100	120	150
Non-cracked concrete	2,8	3,7	5,4	7,9	13,7	20,2	34,7
Cracked concrete	2,0	2,6	3,8	5,6	9,7	14,4	24,7

$\gamma_{Mc} = 1,5$



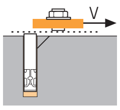
Pryout failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$ — Design pryout resistance

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**128**	**160**	**192**	**256**	**320**	**384**	**480**
Non-cracked concrete	57,2	89,4	128,7	214,5	312,8	418,2	588,9
Cracked concrete	34,0	53,1	72,4	121,5	189,9	273,4	351,9

$\gamma_{Mcp} = 1,5$



Steel resistance

$V_{Rd,s}$ — Steel design shear resistance

Anchor size	M8	M10	M12	M16	M20	M24	M30
Std. stud grade 5.8*	7,4	11,6	16,9	31,2	48,8	70,4	112,0
Std. stud grade 8.8*	11,7	18,6	27,0	50,4	78,4	112,8	179,2
Std. stud grade 10.9*	12,2	19,3	28,1	52,0	81,3	117,3	186,7

Std. stud grade 5.8 and 8.8 : $\gamma_{Ms} = 1,25$

Std. stud grade 10.9 : $\gamma_{Ms} = 1,5$

* Special grade available on request.

$$N_{Rd} = \min(N_{Rd,p} \ ; \ N_{Rd,c} \ ; \ N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c} \ ; \ V_{Rd,cp} \ ; \ V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

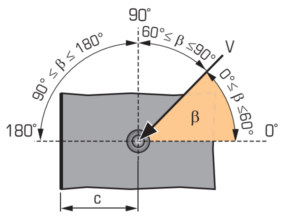
$$\beta_N + \beta_V \leq 1,2$$

f_b INFLUENCE OF CONCRETE

Concrete class	f_b
C25/30	1,02
C30/40	1,08
C40/60	1,10
C50/60	1,12

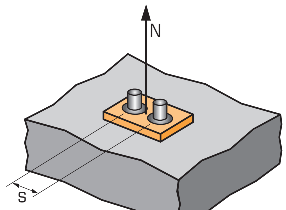
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2



SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0,5 + \frac{s}{6.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

$s_{cr,N} = 3.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group.

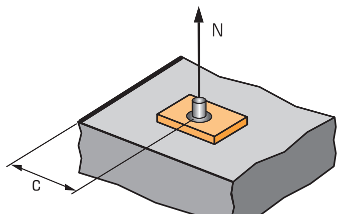
SPACING S — Reduction factor Ψ_s — Cracked & non-cracked concrete

Anchor size	M8	M10	M12	M16
40	0,55			
50	0,57	0,55		
60	0,58	0,56	0,55	0,54
80	0,60	0,58	0,57	0,55
120	0,66	0,63	0,60	0,58
200	0,76	0,71	0,67	0,63
250	0,83	0,76	0,72	0,66
385	1,00	0,90	0,83	0,75
480		1,00	0,92	0,81
580			1,00	0,88
770				1,00

SPACING S — Reduction factor Ψ_s — Cracked & non-cracked concrete

Anchor size	M20	M24	M30
100	0,55		
120	0,56	0,55	
150	0,58	0,57	0,55
250	0,63	0,61	0,59
350	0,68	0,65	0,62
550	0,79	0,74	0,69
650	0,84	0,78	0,73
750	0,89	0,83	0,76
850	0,94	0,87	0,80
960	1,00	0,92	0,83
1150		1,00	0,90
1440			1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0,25 + 0,5 . \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

$c_{cr,N} = 1,5.h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

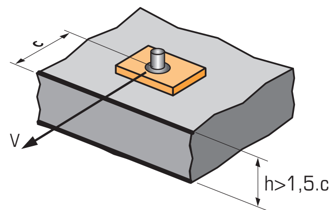
EDGE C — Reduction factor $\Psi_{c,N}$ — Cracked & non-cracked concrete

Anchor size	M8	M10	M12	M16
40	0,41			
50	0,45	0,41		
60	0,48	0,44	0,41	
80	0,56	0,50	0,46	0,41
190	0,99	0,84	0,74	0,62
240		1,00	0,88	0,72
290			1,00	0,82
385				1,00

EDGE C — Reduction factor $\Psi_{c,N}$ — Cracked & non-cracked concrete

Anchor size	M20	M24	M30
100	0,41		
120	0,44	0,41	
150	0,48	0,45	0,41
250	0,64	0,58	0,51
300	0,72	0,64	0,56
480	1,00	0,88	0,75
580		1,00	0,85
720			1,00

$\Psi_{s\text{-}c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

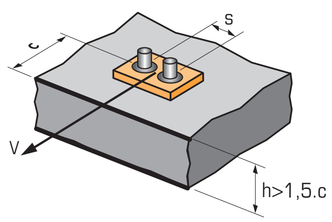


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Cracked & non-cracked concrete

c/c_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

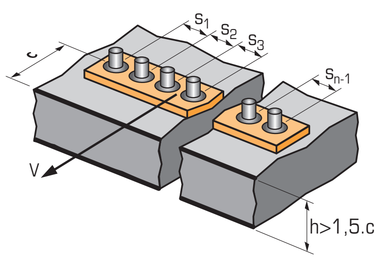


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Cracked & non-cracked concrete

s/c_{min} \ c/c_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65



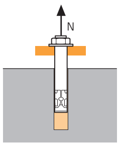
For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + ... + s_{n-1}}{3.n.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

Chemical anchors

SPIT CC Method (values issued from ETA)

TENSILE in kN



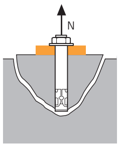
Pull-out resistance for dry and wet concrete [(1)]

$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$ — Design pull-out resistance

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**160**	**200**	**240**	**320**	**400**	**480**	**600**
Non-cracked concrete	35,7	55,9	80,4	134,0	195,5	261,4	408,4
Cracked concrete	21,2	33,2	45,2	76,0	118,7	170,9	219,9

$\gamma_{Mc} = 1,8$



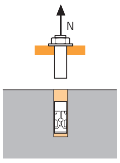
Concrete cone resistance for dry and wet concrete [(1)]

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$ — Design cone resistance

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**160**	**200**	**240**	**320**	**400**	**480**	**600**
Non-cracked concrete	56,7	79,2	104,1	160,3	224,0	294,5	411,5
Cracked concrete	40,5	56,6	74,4	114,5	160,0	210,3	293,9

$\gamma_{Mc} = 1,8$



Steel resistance

$N_{Rd,s}$ — Steel design tensile resistance

Anchor size	M8	M10	M12	M16	M20	M24	M30
Std. stud grade 5.8*	12,0	19,3	28,0	52,0	81,3	118,0	186,7
Std. stud grade 8.8*	19,3	30,7	44,7	84,0	130,7	188,0	299,3
Std. stud grade 10.9*	26,4	41,4	60,0	112,1	175,0	252,1	400,7

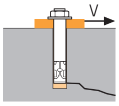
Std. stud grade 5.8 and 8.8 : $\gamma_{Ms} = 1,5$

Std. stud grade 10.9 : $\gamma_{Ms} = 1,4$

* Special grade available on request.

[(1)] The concrete in the area of the anchorage is water statured. The anchor may be installed in flooded holes, but the figures above cannot be used, you must use the values given in the ETA for the category 2.

SHEAR in kN



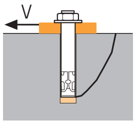
Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c}$ — Design concrete edge resistance at minimum edge distance (C_{min})

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**160**	**200**	**240**	**320**	**400**	**480**	**600**
C_{min}	40	50	60	80	100	120	150
S_{min}	40	50	60	80	100	120	150
Non-cracked concrete	2,9	3,9	5,7	8,3	14,3	21,1	36,3
Cracked concrete	2,0	2,7	4	5,9	10,2	15	25,9

$\gamma_{Mc} = 1,5$



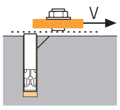
Pryout failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$ — Design pryout resistance

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**160**	**200**	**240**	**320**	**400**	**480**	**600**
Non-cracked concrete	71,5	111,7	160,8	268,1	391,0	522,8	816,8
Cracked concrete	42,4	66,3	90,5	151,9	237,4	341,8	439,8

$\gamma_{Mcp} = 1,5$



Steel resistance

$V_{Rd,s}$ — Steel design shear resistance

Anchor size	M8	M10	M12	M16	M20	M24	M30
Std. stud grade 5.8*	7,4	11,6	16,9	31,2	48,8	70,4	112,0
Std. stud grade 8.8*	11,7	18,6	27,0	50,4	78,4	112,8	179,2
Std. stud grade 10.9*	12,2	19,3	28,1	52,0	81,3	117,3	186,7

Std. stud grade 5.8 and 8.8 : $\gamma_{Ms} = 1,25$

Std. stud grade 10.9 : $\gamma_{Ms} = 1,5$

* Special grade available on request.

$$N_{Rd} = \min(N_{Rd,p}\ ;\ N_{Rd,c}\ ;\ N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \le 1$$

$$V_{Rd} = \min(V_{Rd,c}\ ;\ V_{Rd,cp}\ ;\ V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \le 1$$

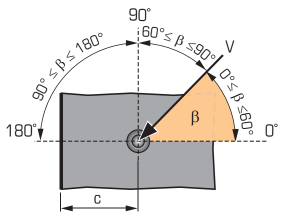
$$\beta_N + \beta_V \le 1,2$$

f_b INFLUENCE OF CONCRETE

Concrete class	f_b
C25/30	1,02
C30/40	1,08
C40/60	1,10
C50/60	1,12

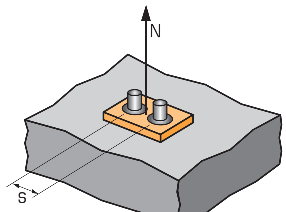
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2



SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0,5 + \frac{s}{6.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

$s_{cr,N} = 3.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group.

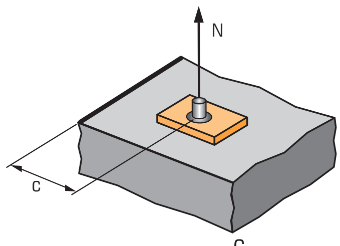
SPACING S — Reduction factor Ψ_s — Cracked & non-cracked concrete

Anchor size	M8	M10	M12	M16
40	0,54			
50	0,55	0,54		
60	0,56	0,55	0,54	0,53
80	0,58	0,57	0,56	0,54
150	0,66	0,63	0,60	0,58
250	0,76	0,71	0,67	0,63
350	0,86	0,79	0,74	0,68
480	1,00	0,90	0,83	0,75
600		1,00	0,92	0,81
720			1,00	0,88
960				1,00

SPACING S — Reduction factor Ψ_s — Cracked & non-cracked concrete

Anchor size	M20	M24	M30
100	0,54		
120	0,55	0,54	
150	0,56	0,55	0,54
250	0,60	0,59	0,57
350	0,65	0,62	0,60
450	0,69	0,66	0,63
600	0,75	0,71	0,67
800	0,83	0,78	0,72
1000	0,92	0,85	0,78
1200	1,00	0,92	0,83
1450		1,00	0,90
1800			1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0,25 + 0,5 . \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

$c_{cr,N} = 1,5.h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

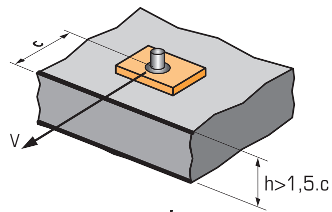
EDGE C — Reduction factor $\Psi_{c,N}$ — Cracked & non-cracked concrete

Anchor size	M8	M10	M12	M16
40	0,38			
50	0,41	0,38		
60	0,44	0,40	0,38	
80	0,50	0,45	0,42	0,38
240	1,00	0,85	0,75	0,63
300		1,00	0,88	0,72
360			1,00	0,81
480				1,00

EDGE C — Reduction factor $\Psi_{c,N}$ — Cracked & non-cracked concrete

Anchor size	M20	M24	M30
100	0,38		
120	0,40	0,38	
150	0,44	0,41	0,38
250	0,56	0,51	0,46
400	0,75	0,67	0,58
600	1,00	0,88	0,75
720		1,00	0,85
900			1,00

$\Psi_{s\text{-}c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

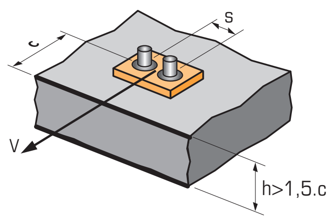


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Cracked & non-cracked concrete

$\frac{C}{C_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

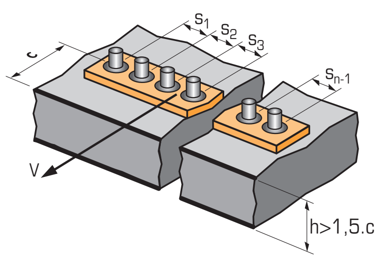


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Cracked & non-cracked concrete

$\frac{S}{C_{min}}$ \ $\frac{C}{C_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65

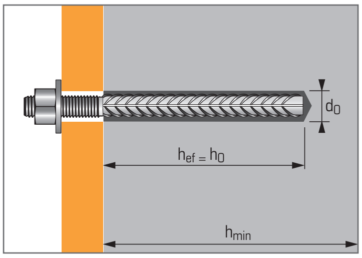


For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + ... + s_{n-1}}{3.n.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

Epoxy resin - High performance for starter bar fastenings

ETA Option 1- 10/0309



APPLICATION

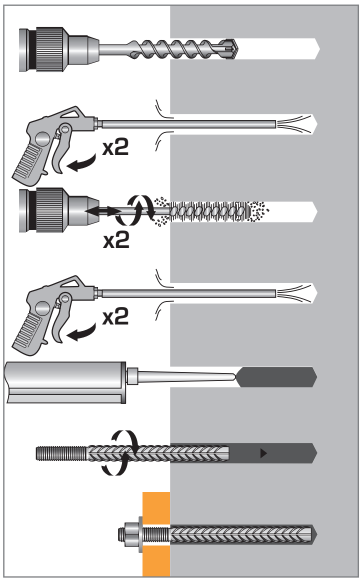
- Starter bar fastenings in non-reinforced concrete

Technical data

Anchor size	Min. anchor depth (mm) **h_{ef}**	Min. thick. of base material (mm) **h_{min}**	Drilling depth (mm) **h_0**	Drilling diameter (mm) **d_0**
Ø8	80	110	80	10
Ø10	90	120	90	12
Ø12	110	140	110	15
Ø14	125	170	125	18
Ø16	125	170	125	18
Ø20	170	220	170	25
Ø25	210	270	210	30
Ø30	300	380	300	40

EPCON C8 Epoxy resin, dual component cartridge 450 ml	Code : 055887
EPCON C8 Epoxy resin, dual component cartridge 900 ml	Code : 055829

INSTALLATION*



***Premium cleaning :**
- 2 blowing with compressed air
- 2 brushing with brushed fitted on a drilling machine
- 2 blowing with compressed air

Mechanical characteristics

Nominal steel bar diameter		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32	Ø40
Sections (cm^2)		0,503	0,785	1,13	1,54	2,01	3,14	4,91	8,04	12,57
Min. resistance to failure (kN)	Fe E400	21,13	32,97	47,46	64,68	84,42	131,88	206,22	337,68	527,94
	Fe E500	25,90	40,43	58,20	79,31	103,52	161,71	252,87	414,06	647,36
Ultimate limit load N_{Rd} (kN)	Fe E500	21,85	34,15	49,17	66,93	87,42	136,59	213,43	349,56	546,36

The mechanical characteristics of the high adhesion rebars are defined in the NFA 35-016 and NFA 35-017 standards.

Setting time

Ambient temperature	**Max. time for installation (min)**	**Waiting time for 45 % load (h)**	**Curing time (h)**
40°C	5	3	6
30°C	8	5	8
20°C	14	6	12
10°C	20	12	23
5°C	26	15	26

EPCON C8 XTREM

2/4 Starter bar fastenings

The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/4 and 4/4).

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
h_{ef}	**80**	**90**	**110**	**125**	**125**	**170**	**210**	**230**
$N_{Ru,m}$	33,4	46,9	68,8	91,3	104,3	177,3	273,8	407,2
N_{Rk}	25,1	35,3	51,8	68,7	78,5	133,5	206,2	304,6

SHEAR

Anchor size	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
$V_{Ru,m}$	18,4	28,8	41,4	56,5	73,7	115,1	180,0	294,8
V_{Rk}	16,6	25,9	37,3	50,8	66,3	103,6	162,0	265,3

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{*}}{\gamma_{Mc}}$$

*Derived from test results

$$V_{Rd} = \frac{V_{Rk}^{*}}{\gamma_{Ms}}$$

TENSILE

Anchor size	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
h_{ef}	**80**	**90**	**110**	**125**	**125**	**170**	**210**	**230**
N_{Rd}	14,0	19,6	28,8	38,2	43,6	74,2	114,5	169,2

$\gamma_{Mc} = 1,8$

SHEAR

Anchor size	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
V_{Rd}	11,1	17,3	24,9	33,9	44,2	39,1	108,0	176,9

$\gamma_{Ms} = 1,5$

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

*Derived from test results

$$V_{rec} = \frac{V_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

TENSILE

Anchor size	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
h_{ef}	**80**	**90**	**110**	**125**	**125**	**170**	**210**	**230**
N_{rec}	-	14,0	20,6	27,3	31,2	53,0	81,8	120,9

$\gamma_{Mc} = 1,8$

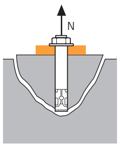
SHEAR

Anchor size	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
V_{rec}	7,9	12,3	17,8	24,2	31,6	49,3	77,2	126,3

$\gamma_{Ms} = 1,5$

SPIT CC Method (values issued from ETA)

TENSILE in kN



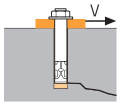
¬ Concrete cone resistance for béton sec

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$								Design cone resistance
Anchor size	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
h_{ef}	**80**	**90**	**110**	**125**	**125**	**170**	**210**	**230**
$N^0_{Rd,c}$	14,0	19,6	28,8	38,2	43,6	74,2	114,5	169,2

γ_{Mc} = 1,8

SHEAR in kN

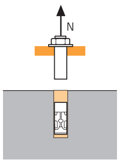


¬ Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c}$								Design concrete edge resistance at minimum edge distance (C_{min})
Anchor size	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
h_{ef}	**80**	**90**	**110**	**125**	**125**	**170**	**210**	**230**
C_{min}	40	45	55	65	65	85	105	150
S_{min}	40	45	55	65	65	85	105	150
$V^0_{Rd,c}$	2,4	3,1	4,6	6,4	6,6	11,3	17,3	34,1

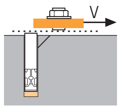
γ_{Mc} = 1,5



¬ Resistance to la rupture des rebars Fe E500

$N_{Rd,s}$								Steel design tensile resistance
Anchor size	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
h_{ef}	**80**	**90**	**110**	**125**	**125**	**170**	**210**	**230**
$N_{Rd,s}$	21,0	32,7	47,1	64,2	83,8	130,8	204,6	335,0

γ_{Ms} Fe E500 = 1,4



¬ Steel resistance

$V_{Rd,s}$								Steel design shear resistance
Anchor size	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
h_{ef}	**80**	**90**	**110**	**125**	**125**	**170**	**210**	**230**
$V_{Rd,s}$	11,1	17,3	24,9	33,9	44,2	69,1	108,0	176,9

γ_{Ms} Fe E500 = 1,5

$N_{Rd} = \min(N_{Rd,c} \,;\, N_{Rd,s})$

$\beta_N = N_{Sd} / N_{Rd} \leq 1$

$V_{Rd} = \min(V_{Rd,c} \,;\, V_{Rd,s})$

$\beta_V = V_{Sd} / V_{Rd} \leq 1$

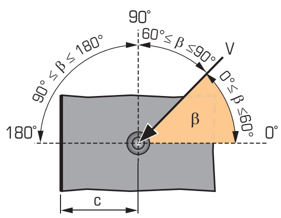
$$\beta_N + \beta_V \leq 1,2$$

f_b INFLUENCE OF CONCRETE

Concrete class	f_b
C20/25	1,00
C30/40	1,14
C40/60	1,26
C50/60	1,34

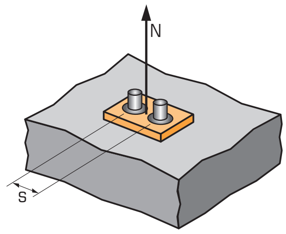
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2



SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0{,}5 + \frac{s}{4.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

$s_{cr,N} = 2.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group.

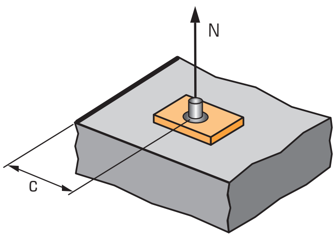
SPACING S — Reduction factor Ψ_s — Cracked & non-cracked concrete

Anchor size	Ø8	Ø10	Ø12	Ø14
40	0,63			
45	0,64	0,63		
55	0,67	0,65	0,63	0,61
65	0,70	0,68	0,65	0,63
85	0,77	0,74	0,69	0,67
105	0,83	0,79	0,74	0,71
140	0,94	0,89	0,82	0,78
160	1,00	0,94	0,86	0,82
180		1,00	0,91	0,86
220			1,00	0,94
250				1,00

SPACING S — Reduction factor Ψ_s — Cracked & non-cracked concrete

Anchor size	Ø16	Ø20	Ø25	Ø32
65	0,63			
85	0,67	0,63		
105	0,71	0,65	0,63	
120	0,74	0,68	0,64	
150	0,80	0,72	0,68	0,63
200	0,90	0,79	0,74	0,67
250	1,00	0,87	0,80	0,71
320		0,97	0,88	0,77
340		1,00	0,90	0,78
420			1,00	0,85
500				0,92
600				1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0{,}27 + 0{,}725 \cdot \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

$c_{cr,N} = h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

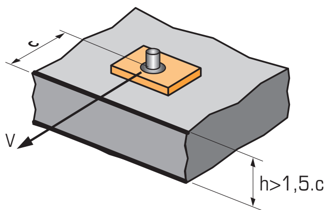
EDGE C — Reduction factor $\Psi_{c,N}$ — Cracked & non-cracked concrete

Anchor size	Ø8	Ø10	Ø12	Ø14
40	0,63			
45	0,68	0,63		
55	0,77	0,71	0,63	
65	0,86	0,79	0,70	0,65
80	1,00	0,91	0,80	0,73
90		1,00	0,86	0,79
110			1,00	0,91
125				1,00

EDGE C — Reduction factor $\Psi_{c,N}$ — Cracked & non-cracked concrete

Anchor size	Ø16	Ø20	Ø25	Ø32
65	0,65			
85	0,76	0,63		
105	0,88	0,72	0,63	
125	1,00	0,80	0,70	
150		0,91	0,79	0,63
170		1,00	0,86	0,68
210			1,00	0,78
300				1,00

$\Psi_{s\text{-}c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

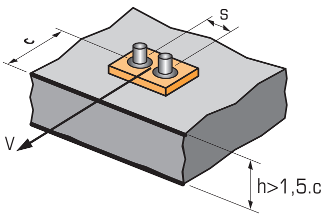


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Cracked & non-cracked concrete

c/c_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

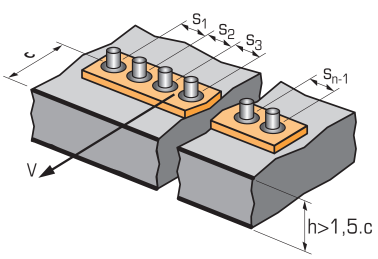


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Cracked & non-cracked concrete

s/c_{min} \ c/c_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65



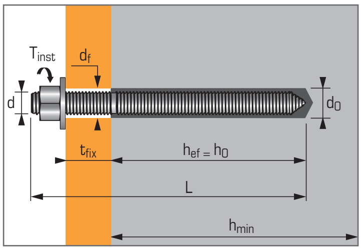
For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + \ldots + s_{n-1}}{3.n.c_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$

Vinylester resin - High performance for use in non-cracked concrete

ETA European Technical Assessment CE
INOX STAINLESS STEEL

ETA Option 7- 05/0111



APPLICATION

- Fixing steel framed structures
- Fixing machinery (resistant to vibration)
- Fixing of storage silos, refinery pipework supports
- Fixing motorway signs
- Fixing safety barriers

MATERIAL

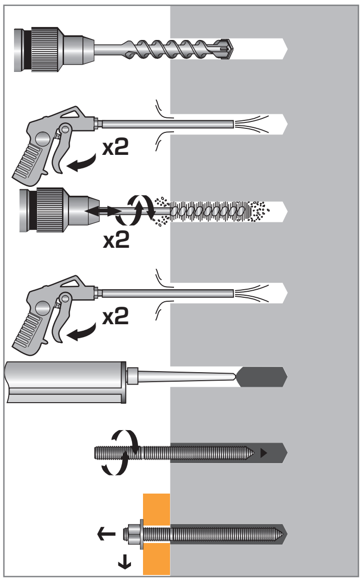
Zinc coated steel version :

- **Stud M8-M16 :** Steel cold form steel NF A35-053
- **Stud M20-M30 :** 11 SMnPb37 - NFA 35-561
- **Nut :** Steel grade 6 or 8 NF EN 20898-2
- **Washer :** Steel DIN 513
- **Protection :** zinc coated 5 µm min. NF E25-009

Stainless steel version :

- **Stud :** A4-70 as per ISO 3506-1
- **Nut :** Stainless steel A4-80, NF EN 10088-3
- **Washer :** Stainless steel A4, NF EN 20898-2

INSTALLATION*



***Premium cleaning :**

- 2 blowing with compressed air
- 2 brushing with brushed fitted on a drilling machine
- 2 blowing with compressed air

Technical data

Anchor size	Min. anchor depth (mm) h_{ef}	Max. thick. of part to be fixed (mm) t_{fix}	Min. thick. of base material (mm) h_{min}	Thread diameter (mm) d	Drilling depth (mm) h_0	Drilling diameter (mm) d_0	Clearance diameter (mm) d_f	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code* MAXIMA stud zinc coated st.	Code* MAXIMA stud stainless steel A4
M8X110	80	15	110	8	80	10	9	110	10	050950	052400
M10X130	90	20	120	10	90	12	12	130	20	050960	052410
M12X160	110	25	140	12	110	14	14	160	30	050970	052420
M16X190	125	35	160	16	125	18	18	190	60	050980	052440
M20X260	170	65	220	20	170	25	22	260	120	655220	052450
M24X300	210	63	265	24	210	28	26	300	200	655240	052470
M30X380	280	70	350	30	280	35	33	380	400	050940	-
EPOMAX Vinylester resin, dual component cartridge 380 ml										055883	
EPOMAX Vinylester resin, dual component cartridge 150 ml										055885	

* These are Maxima studs, for standard studs (zinc coated or stainless steel versions) see catalogue.

Anchor mechanical properties

Anchor size		M8	M10	M12	M16	M20	M24	M30
MAXIMA stud - zinc coated steel version								
f_{uk} (N/mm²)	Min. tensile strength	600	600	600	600	520	520	520
f_{yk} (N/mm²)	Yield strength	420	420	420	420	420	420	420
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	22	45	79	200	301	520	1052
M (Nm)	Recommended bending moment	11,0	22,5	39,5	100	150	160	525
MAXIMA stud - stainless steel A4 version								
f_{uk} (N/mm²)	Min. tensile strength	700	700	700	700	700	700	-
f_{yk} (N/mm²)	Yield strength	350	350	350	350	350	350	-
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	26	52	92	233	454	786	-
M (Nm)	Recommended bending moment	12	23	42	122	206	357	-
As (mm²)	Stressed cross-section	36,6	58	84,3	157	227	326,9	-
W_{el} (mm³)	Elastic section modulus	31,2	62,3	109,2	277,5	482,4	833,7	-

Ambient temperature	Max. time for installation	Curing time	
		Dry concrete	Wet concrete
40°C	1 min	30 min	60 min
30°C	3 min	35 min	1 h 10 min
20°C	6 min	40 min	1 h 20 min
10°C	11 min	60 min	2 hours
0°C	22 min	3 h 30 min	7 hours
-5°C	75 min	12 hours	24 hours

Chemical resistance of the SPIT EPOMAX resin

Chemical substances	Concentration (%)	Resistance
Acetic acid	50-75	(o)
Acetic acid	0-50	(+)
Acetone	10	(+)
Ammonium hydroxide or Ammoniac	20	(o)
Ammonium hydroxide or Ammoniac	5	(+)
Bromine water	5	(+)
Chlorine water	0-100	(+)
Citric acid	0-100	(+)
Concentrated phosphoric acid	100	(+)
Deionized water	0-100	(+)
Demineralized water		(+)
Diesel fuel	0-100	(+)
Ethyl alcohol (Ethanol)	10	(o)
Ethylene glycol	0-100	(+)
Formic acid	10	(+)
Fuel	100	(+)
Heavy motor oil	100	(+)

Chemical substances	Concentration (%)	Resistance
Heptane	100	(+)
Hexane	100	(o)
Hydrochloric acid	25	(o)
Hydrochloric acid	15	(+)
Lactic acid	0-100	(+)
Nitric acid	feb-15	(o)
Phosphoric acid	80	(+)
Phosphoric acid, vapor and condensed		(+)
Sea water	0-100	(+)
Sodium carbonate	10	(+)
Sodium chloride	0-100	(+)
Sodium hydroxide (or Caustic soda)	25	(o)
Sulfuric acid	71-75	(o)
Sulfuric acid	0-70	(+)
Sulfuric acid	Fumes	(+)
Sulfuric acid / Phosphoric acid	10:20	(+)
Turpentine (oil)		(o)

Resistant (+): the samples in contact with the substances did not show any Screwible damage such as cracks, attacked surfaces, burst corners nor large swelling. **Sensitive (o):** use with care regarding exposure of the field of usage, precautions to be taken. The samples in contact with the substance slightly attacked the material.

The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/6 to 6/6).

Number of sealings per cartridge

Anchor size	M8	M10	M12	M16	M20	M24	M30
Drilling diameter (mm)	10	12	14	18	25	28	35
Drilling depth (mm)	80	90	110	125	170	210	280
Number of sealings per cartridge							
EPOMAX 380 ml	140	102	70	47	11	9	4
EPOMAX 150 ml	55	40	28	19	4	4	2

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
$N_{Ru,m}$	29,9	42,5	57,8	79,5	90,8	175,3	219,2
N_{Rk}	22,1	31,1	45,6	61,6	73,7	109,3	147,8

SHEAR

Anchor size	M8	M10	M12	M16	M20	M24	M30
$V_{Ru,m}$	15,92	22,75	32,8	56,2	73,6	115,0	177,7
V_{Rk}	10,98	18,9	25,3	46,8	59,02	95,8	135,9

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}{}^{*}}{\gamma_{Mc}}$$

*Derived from test results (stud grade 10.9)

$$V_{Rd} = \frac{V_{Rk}{}^{*}}{\gamma_{Ms}}$$

TENSILE

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
N_{Rd}	14,7	20,7	30,4	41,1	49,1	72,8	98,5

$\gamma_{Mc} = 1,5$

SHEAR

Anchor size	M8	M10	M12	M16	M20	M24	M30
V_{Rd}	7,7	13,2	17,7	32,7	39,3	63,9	90,6

$\gamma_{Ms} = 1,43$ for M8 to M16 and $\gamma_{Ms} = 1,5$ for M20 to M30

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}{}^{*}}{\gamma_M . \gamma_F}$$

*Derived from test results (stud grade 10.9)

$$V_{rec} = \frac{V_{Rk}{}^{*}}{\gamma_M . \gamma_F}$$

TENSILE

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
N_{rec}	10,5	14,8	21,7	29,3	35,1	52,0	70,4

$\gamma_F = 1,4$; $\gamma_{Mc} = 1,5$

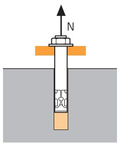
SHEAR

Anchor size	M8	M10	M12	M16	M20	M24	M30
V_{rec}	5,5	9,4	12,6	23,4	28,1	45,6	64,7

$\gamma_F = 1,4$; $\gamma_{Ms} = 1,43$ for M8 to M16 and $\gamma_{Ms} = 1,5$ for M20 to M30

SPIT CC Method (values issued from ETA)

TENSILE in kN



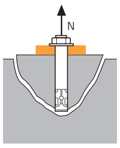
Pull-out resistance
for dry and wet concrete [1] with premium cleaning

$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$ — **Design pull-out resistance**

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
-40°C to +40°C	14,7	20,7	30,4	41,9	49,8	73,9	96,8
-40°C to +80°C	12,1	17,0	24,9	33,5	39,2	58,1	79,2
-40°C to +120°C	9,4	13,2	19,4	25,1	32,0	47,5	61,6

$\gamma_{Mc} = 1,5$



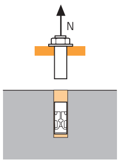
Concrete cone resistance
for dry and wet concrete [1] with premium cleaning

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$ — **Design cone resistance**

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
-40°C to +120°C	24,0	28,7	38,8	47,0	74,5	102,3	157,4

$\gamma_{Mc} = 1,5$



Steel resistance

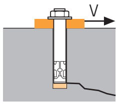
$N_{Rd,s}$ — **Steel design tensile resistance**

Anchor size	M8	M10	M12	M16	M20	M24	M30
MAXIMA stud Zn.	12,9	20,5	29,8	55,6	79,2	114,1	182,6
MAXIMA stud A4	12,3	19,8	28,9	54,5	85,0	122,5	-
Std. stud grade 5.8*	12,0	19,3	28,0	52,0	81,3	118,0	186,7
Std. stud grade 8.8*	19,3	30,7	44,7	84,0	130,7	188,0	299,3
Std. stud grade 10.9*	26,4	41,4	60,0	112,1	175,0	252,1	400,7

MAXIMA stud Zn. : $\gamma_{Ms} = 1,71$ for M8 to M16 and $\gamma_{Ms} = 2,49$ for M20 to M30
MAXIMA stud A4 : $\gamma_{Ms} = 1,87$
Std. stud grade 5.8 and 8.8 : $\gamma_{Ms} = 1,5$ and grade 10.9 : $\gamma_{Ms} = 1,4$
* Special grade available on request.

[1] The concrete in the area of the anchorage is water statured. The anchor may be installed in flooded holes, but the figures above cannot be used, you must use the values given in the ETA for the category 2.

SHEAR in kN



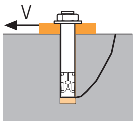
Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S-C,V}$

$V^0_{Rd,c}$ — **Design concrete edge resistance at minimum edge distance (C_{min})**

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
C_{min}	40	45	55	65	85	105	140
S_{min}	40	45	55	65	85	105	140
$V^0_{Rd,c}$	2,5	3,3	4,8	6,9	12,1	17,9	31,2

$\gamma_{Mc} = 1,5$



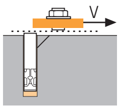
Pryout failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$ — **Design pryout resistance**

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
-40°C to +40°C	29,5	41,5	60,8	83,8	99,7	147,8	193,5
-40°C to +80°C	24,1	33,9	49,8	67,0	78,3	116,1	158,3
-40°C to +120°C	18,8	26,4	38,7	50,3	64,1	95,0	123,2

$\gamma_{Mcp} = 1,5$



Steel resistance

$V_{Rd,s}$ — **Steel design shear resistance**

Anchor size	M8	M10	M12	M16	M20	M24	M30
MAXIMA stud Zn.	7,7	12,2	17,7	32,9	39,3	56,7	90,7
MAXIMA stud A4	7,3	11,9	17,3	32,7	51,3	73,1	-
Std. stud grade 5.8*	7,4	11,6	16,9	31,2	48,8	70,4	112,0
Std. stud grade 8.8*	11,7	18,6	27,0	50,4	78,4	112,8	179,2
Std. stud grade 10.9*	12,2	19,3	28,1	52,0	81,3	117,3	186,7

MAXIMA stud Zn. : $\gamma_{Ms} = 1,43$ for M8 to M16 and $\gamma_{Ms} = 1,5$ for M20 to M30
MAXIMA stud A4 : $\gamma_{Ms} = 1,56$
Std. stud grade 5.8 and 8.8 : $\gamma_{Ms} = 1,25$ and grade 10.9 : $\gamma_{Ms} = 1,5$
* Special grade available on request.

$$N_{Rd} = \min(N_{Rd,p} \; ; \; N_{Rd,c} \; ; \; N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c} \; ; \; V_{Rd,cp} \; ; \; V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

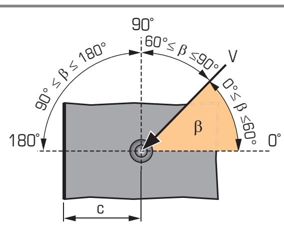
$$\beta_N + \beta_V \leq 1,2$$

f_b INFLUENCE OF CONCRETE

Concrete class	f_b
C25/30	1,06
C30/40	1,17
C40/60	1,26
C50/60	1,34

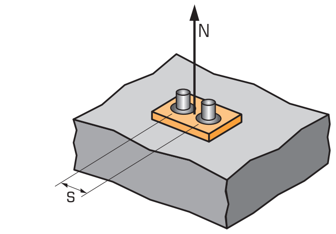
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2



SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0,5 + \frac{s}{4.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

$s_{cr,N} = 2.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group.

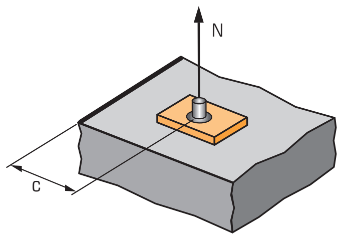
SPACING S — Reduction factor Ψ_s — Non-cracked concrete

Anchor size	M8	M10	M12	M16
40	0,58			
50	0,60	0,59		
60	0,63	0,61	0,59	0,58
80	0,67	0,65	0,62	0,61
100	0,71	0,69	0,65	0,63
150	0,81	0,78	0,73	0,70
200	0,92	0,87	0,80	0,77
250	1,00	0,96	0,88	0,83
300		1,00	0,95	0,90
330			1,00	0,94
375				1,00

SPACING S — Reduction factor Ψ_s — Non-cracked concrete

Anchor size	M20	M24	M30
100	0,60		
120	0,62	0,60	
150	0,65	0,62	0,59
180	0,68	0,64	0,61
200	0,70	0,66	0,62
250	0,75	0,70	0,65
350	0,84	0,78	0,71
450	0,94	0,86	0,77
510	1,00	0,90	0,80
630		1,00	0,88
750		1,00	0,95
840			1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0,27 + 0,725 . \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

$c_{cr,N} = h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

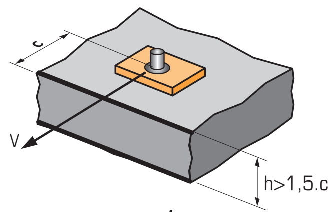
EDGE C — Reduction factor $\Psi_{c,N}$ — Non-cracked concrete

Anchor size	M8	M10	M12	M16
40	0,50			
50	0,56	0,53		
60	0,63	0,58	0,52	
80	0,75	0,69	0,61	0,57
120	1,00	0,92	0,80	0,73
135		1,00	0,86	0,79
165			1,00	0,91
190				1,00

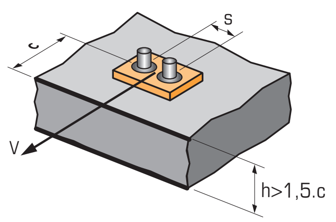
EDGE C — Reduction factor $\Psi_{c,N}$ — Non-cracked concrete

Anchor size	M20	M24	M30
100	0,54		
120	0,60	0,54	
150	0,69	0,61	0,52
180	0,78	0,68	0,57
200	0,84	0,73	0,61
255	1,00	0,86	0,71
315		1,00	0,81
420			1,00

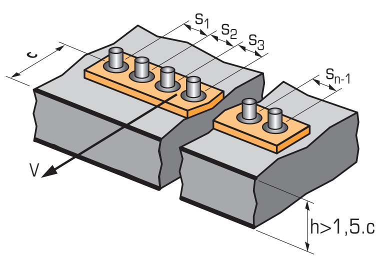
$\Psi_{s-c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD



$$\Psi_{s-c,V} = \frac{c}{c_{min}} . \sqrt{\frac{c}{c_{min}}}$$



$$\Psi_{s-c,V} = \frac{3.c + s}{6.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$



For single anchor fastening

Reduction factor $\Psi_{s-c,V}$ — Non-cracked concrete

c/c_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s-c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

For 2 anchors fastening

Reduction factor $\Psi_{s-c,V}$ — Non-cracked concrete

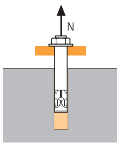
s/c_{min} \ c/c_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65

For 3 anchors fastening and more

$$\Psi_{s-c,V} = \frac{3.c + s_1 + s_2 + s_3 + ... + s_{n-1}}{3.n.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

SPIT CC Method (values issued from ETA)

TENSILE in kN



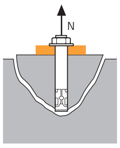
Pull-out resistance
for dry and wet concrete [1] with premium cleaning

$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$ — **Design pull-out resistance**

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**95**	**120**	**144**	**192**	**220**	**280**	**330**
-40°C to +40°C	17,5	27,6	39,8	64,3	64,5	98,5	114,0
-40°C to +80°C	14,3	22,6	32,6	51,5	50,7	77,4	93,3
-40°C to +120°C	11,1	17,6	25,3	38,6	41,5	63,3	72,6

$\gamma_{Mc} = 1{,}5$



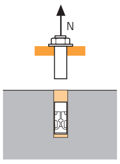
Concrete cone resistance
for dry and wet concrete [1] with premium cleaning

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$ — **Design cone resistance**

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**95**	**120**	**144**	**192**	**220**	**280**	**330**
-40°C to +120°C	31,1	44,2	58,1	89,4	109,6	157,4	201,4

$\gamma_{Mc} = 1{,}5$



Steel resistance

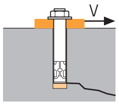
$N_{Rd,s}$ — **Steel design tensile resistance**

Anchor size	M8	M10	M12	M16	M20	M24	M30
MAXIMA stud Zn.	12,9	20,5	29,8	55,6	79,2	114,1	182,6
MAXIMA stud A4	12,3	19,8	28,9	54,5	85,0	122,5	-
Std. stud grade 5.8*	12,0	19,3	28,0	52,0	81,3	118,0	186,7
Std. stud grade 8.8*	19,3	30,7	44,7	84,0	130,7	188,0	299,3
Std. stud grade 10.9*	26,4	41,4	60,0	112,1	175,0	252,1	400,7

MAXIMA stud Zn. : $\gamma_{Ms} = 1{,}71$ for M8 to M16 and $\gamma_{Ms} = 2{,}49$ for M20 to M30
MAXIMA stud A4 : $\gamma_{Ms} = 1{,}87$
Std. stud grade 5.8 and 8.8 : $\gamma_{Ms} = 1{,}5$ and grade 10.9 : $\gamma_{Ms} = 1{,}4$
* Special grade available on request.

[1] The concrete in the area of the anchorage is water statured. The anchor may be installed in flooded holes, but the figures above cannot be used, you must use the values given in the ETA for the category 2.

SHEAR in kN



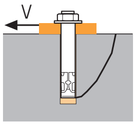
Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c}$ — **Design concrete edge resistance at minimum edge distance (C_{min})**

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**95**	**120**	**144**	**192**	**220**	**280**	**330**
C_{min}	40	45	55	65	85	105	140
S_{min}	40	45	55	65	85	105	140
$V^0_{Rd,c}$	2,6	3,5	5,1	7,5	12,7	18,9	32,2

$\gamma_{Mc} = 1{,}5$



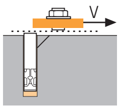
Pryout failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$ — **Design pryout resistance**

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**95**	**120**	**144**	**192**	**220**	**280**	**330**
-40°C to +40°C	35,0	55,3	79,6	128,7	129,0	197,0	228,1
-40°C to +80°C	28,7	45,2	65,1	102,9	101,4	154,8	186,6
-40°C to +120°C	22,3	35,2	50,7	77,2	82,9	126,7	145,1

$\gamma_{Mcp} = 1{,}5$



Steel resistance

$V_{Rd,s}$ — **Steel design shear resistance**

Anchor size	M8	M10	M12	M16	M20	M24	M30
MAXIMA stud Zn.	7,7	12,2	17,7	32,9	39,3	56,7	90,7
MAXIMA stud A4	7,3	11,9	17,3	32,7	51,3	73,1	-
Std. stud grade 5.8*	7,4	11,6	16,9	31,2	48,8	70,4	112,0
Std. stud grade 8.8*	11,7	18,6	27,0	50,4	78,4	112,8	179,2
Std. stud grade 10.9*	12,2	19,3	28,1	52,0	81,3	117,3	186,7

MAXIMA stud Zn. : $\gamma_{Ms} = 1{,}43$ for M8 to M16 and $\gamma_{Ms} = 1{,}5$ for M20 to M30
MAXIMA stud A4 : $\gamma_{Ms} = 1{,}56$
Std. stud grade 5.8 and 8.8 : $\gamma_{Ms} = 1{,}25$ and grade 10.9 : $\gamma_{Ms} = 1{,}5$
* Special grade available on request.

$$N_{Rd} = \min(N_{Rd,p}\ ;\ N_{Rd,c}\ ;\ N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c}\ ;\ V_{Rd,cp}\ ;\ V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

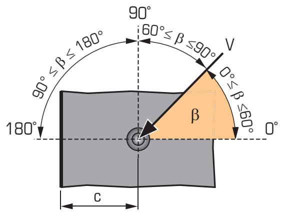
$$\beta_N + \beta_V \leq 1{,}2$$

f_b INFLUENCE OF CONCRETE

Concrete class	f_b
C25/30	1,1
C30/37	1,22
C35/45	1,34

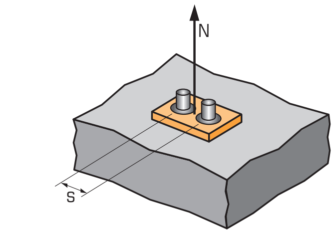
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2



SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0{,}5 + \frac{s}{6.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

$s_{cr,N} = 2.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group.

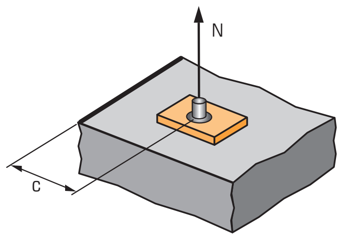
SPACING S — Reduction factor Ψ_s — Non-cracked concrete

Anchor size	M8	M10	M12	M16
40	0,57			
50	0,59	0,57		
60	0,61	0,58	0,57	0,55
80	0,64	0,61	0,59	0,57
100	0,68	0,64	0,62	0,59
150	0,76	0,71	0,67	0,63
200	0,85	0,78	0,73	0,67
290	1,00	0,90	0,84	0,75
360		1,00	0,92	0,81
435			1,00	0,88
580				1,00

SPACING S — Reduction factor Ψ_s — Non-cracked concrete

Anchor size	M20	M24	M30
100	0,58		
120	0,59	0,57	
150	0,61	0,59	0,58
180	0,64	0,61	0,59
200	0,65	0,62	0,60
250	0,69	0,65	0,63
300	0,73	0,68	0,65
400	0,80	0,74	0,70
500	0,88	0,80	0,75
660	1,00	0,89	0,83
840		1,00	0,92
990			1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0{,}25 + 0{,}5 \,.\, \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

$c_{cr,N} = h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

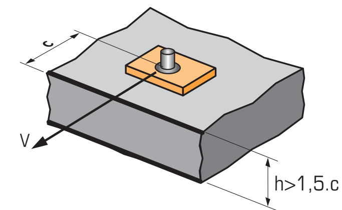
EDGE C — Reduction factor $\Psi_{c,N}$ — Non-cracked concrete

Anchor size	M8	M10	M12	M16
40	0,46			
50	0,51	0,46		
60	0,57	0,50	0,46	
80	0,67	0,58	0,53	0,46
145	1,00	0,85	0,75	0,63
180		1,00	0,88	0,72
215			1,00	0,81
290				1,00

EDGE C — Reduction factor $\Psi_{c,N}$ — Non-cracked concrete

Anchor size	M20	M24	M30
100	0,48		
120	0,52	0,46	
150	0,59	0,52	0,48
200	0,70	0,61	0,55
250	0,82	0,70	0,63
330	1,00	0,84	0,75
420		1,00	0,89
500			1,00

$\Psi_{s\text{-}c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

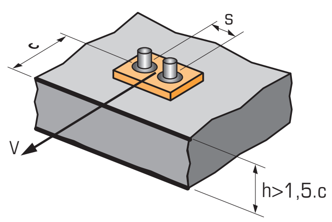


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} \,.\, \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

$\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

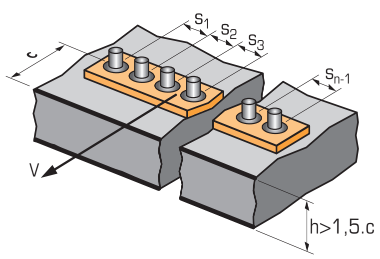


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} \,.\, \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

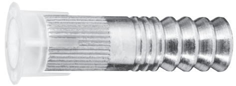
$\frac{s}{c_{min}}$ \ $\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65



For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + ... + s_{n-1}}{3.n.c_{min}} \,.\, \sqrt{\frac{c}{c_{min}}}$$

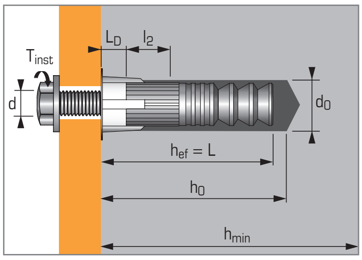
Chemical anchors



Female chemical anchoring - Heavy loads for use in non-cracked concrete

ETA Option 7- 05/0111 (EPOMAX)

INOX STAINLESS STEEL



APPLICATION

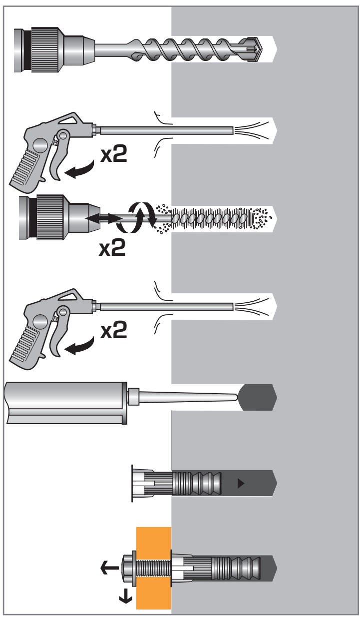
- Fixing steel framed structures
- Fixing machinery (resistant to vibration)
- Insulation fixings (public lighting, cable trays, etc)
- Waterproof fixings (dams, etc.)
- Fixings for protective barriers, safety rails

MATERIAL

- **body :**
  zinc coated steel version :
  S 300 pb NFA 35561
  stainless steel A4 version:
  X2Cr Ni Mo 17-12-2

- **Centering cap:**
  high density PE

INSTALLATION*



***Premium cleaning :**
- 2 blowing with compressed air
- 2 brushing with brushed fitted on a drilling machine
- 2 blowing with compressed air

Technical data

Anchor size	Min. anchor depth (mm) h_{ef}	Min. thick. of base material (mm) h_{min}	Thread length (mm) l_2	Depth of threaded start (mm) LD	Thread diameter (mm) d	Drilling depth (mm) h_0	Drilling diameter (mm) d_0	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code zinc coated st.	Code stainless steel A4
M8X60	60	100	20	4,5	8	65	14	60	10	062770	062860
M10X65	65	100	25	7	10	70	20	65	20	062480	062960
M12X75	75	125	30	8	12	75	24	75	30	062760	063100
M12X120*	120	180	38	5	12	125	18	120	60	062500	-
M16X125	125	180	40	9,5	16	130	25	125	120	052800	-
M20X170	170	225	50	12,5	20	175	28	170	200	062810	-

Nota : EPCON C8 resin could be used with ATP female studs

* Do not belong to ETA

Anchor mechanical properties

Anchor size		M8	M10	M12	M16	M20
ATP - zinc coated steel version						
f_{uk} (N/mm²)	Min. tensile strength	520	520	520	520	520
f_{yk} (N/mm²)	Yield strength	420	420	420	420	420
ATP - stainless steel A4 version						
f_{uk} (N/mm²)	Min. tensile strength	650	650	650	-	-
f_{yk} (N/mm²)	Yield strength	350	350	350	-	-

Setting time

EPOMAX resin

Ambient temperature	Max. time for installation	Curing time	
		Dry concrete	Wet concrete
40°C	1 min	30 min	60 min
30°C	3 min	35 min	1 h 10 min
20°C	6 min	40 min	1 h 20 min
10°C	11 min	60 min	2 hours
0°C	22 min	3 h 30 min	7 hours
-5°C	75 min	12 hours	24 hours

Chemical resistance of the SPIT EPOMAX resin

Chemical substances	Concentration (%)	Resistance
Acetic acid	50-75	(o)
Acetic acid	0-50	(+)
Acetone	10	(+)
Ammonium hydroxide or Ammoniac	20	(o)
Ammonium hydroxide or Ammoniac	5	(+)
Bromine water	5	(+)
Chlorine water	0-100	(+)
Citric acid	0-100	(+)
Concentrated phosphoric acid	100	(+)
Deionized water	0-100	(+)
Demineralized water		(+)
Diesel fuel	0-100	(+)
Ethyl alcohol (Ethanol)	10	(o)
Ethylene glycol	0-100	(+)
Formic acid	10	(+)
Fuel	100	(+)
Heavy motor oil	100	(+)

Chemical substances	Concentration (%)	Resistance
Heptane	100	(+)
Hexane	100	(o)
Hydrochloric acid	25	(o)
Hydrochloric acid	15	(+)
Lactic acid	0-100	(+)
Nitric acid	feb-15	(o)
Phosphoric acid	80	(+)
Phosphoric acid, vapor and condensed		(+)
Sea water	0-100	(+)
Sodium carbonate	10	(+)
Sodium chloride	0-100	(+)
Sodium hydroxide (or Caustic soda)	25	(o)
Sulfuric acid	71-75	(o)
Sulfuric acid	0-70	(+)
Sulfuric acid	Fumes	(+)
Sulfuric acid / Phosphoric acid	10:20	(+)
Turpentine (oil)		(o)

Resistant (+): the samples in contact with the substances did not show any Screwible damage such as cracks, attacked surfaces, burst corners nor large swelling. **Sensitive (o):** use with care regarding exposure of the field of usage, precautions to be taken. The samples in contact with the substance slightly attacked the material.

ATP

2/4 zinc coated & stainless steel versions

The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/4 and 4/4).

Number of sealings per cartridge

Anchor size	M8X60	M10X65	M12X75	M12X120	M16X125
Drilling diameter (mm)	10	12	14	18	25
Drilling depth (mm)	14	20	24	18	28
Number of sealings per cartridge					
EPOMAX 380 ml	80	30	21	24	8
EPOMAX 150 ml	31	11	8	9	3

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	M8	M10	M12	M12	M16	M20
Screw grade 5.8 / A4-70						
h_{ef}	**60**	**65**	**75**	**120**	**125**	**170**
$N_{Ru,m}$	20,3	32,2	46,8	46,8	87,2	136,1
N_{Rk}	18,3	29	42,2	42,2	78,5	122,5
Screw grade 8.8						
h_{ef}	**60**	**65**	**75**	**120**	**125**	**170**
$N_{Ru,m}$	26,6	41,2	57,1	91,3	111,0	188,8
N_{Rk}	16,7	25,8	35,8	57,3	69,6	118,5

SHEAR

Anchor size	M8	M10	M12	M12	M16	M20
Screw grade 5.8						
$V_{Ru,m}$	11,34	18,18	26,28	26,28	48,96	76,14
V_{Rk}	9,45	15,15	21,9	21,9	40,8	63,45
Screw grade 8.8						
$V_{Ru,m}$	17,46	27,9	40,5	40,5	55,26	121,86
V_{Rk}	14,55	23,25	33,75	33,75	46,05	101,55
Screw grade A4-70						
$V_{Ru,m}$	15,27	24,47	35,38	35,38	65,91	-
V_{Rk}	12,72	20,39	29,48	29,48	54,92	-

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{*}}{\gamma_{Mc}}$$

*Derived from test results

$$V_{Rd} = \frac{V_{Rk}^{*}}{\gamma_{Ms}}$$

TENSILE

Anchor size	M8	M10	M12	M12	M16	M20
Screw grade 5.8 / A4-70						
h_{ef}	**60**	**65**	**75**	**120**	**125**	**170**
N_{Rd}	12,2	19,3	28,1	28,1	52,3	81,7
Screw grade 8.8						
h_{ef}	**60**	**65**	**75**	**120**	**125**	**170**
N_{Rd}	11,1	17,2	23,9	38,2	46,4	79,0

$\gamma_{Mc} = 1,5$

SHEAR

Anchor size	M8	M10	M12	M12	M16	M20
Screw grade 5.8						
V_{Rd}	7,6	12,1	17,5	17,5	32,6	50,8
Screw grade 8.8						
V_{Rd}	11,6	18,6	27,0	27,0	30,7	67,7
Screw grade A4-70						
V_{Rd}	8,2	13,1	18,9	18,9	35,2	-

Screw grade 5.8: $\gamma_{Ms} = 1,25$
Screw grade 8.8: $\gamma_{Ms} = 1,25$ for M8 to M12 and $\gamma_{Ms} = 1,5$ for M16 and M20
Screw grade A4-70: $\gamma_{Ms} = 1,56$

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

*Derived from test results

$$V_{rec} = \frac{V_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

TENSILE

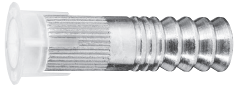
Anchor size	M8	M10	M12	M12	M16	M20
Screw grade 5.8 / A4-70						
h_{ef}	**60**	**65**	**75**	**120**	**125**	**170**
N_{rec}	8,7	13,8	20,1	20,1	37,4	58,3
Screw grade 8.8						
h_{ef}	**60**	**65**	**75**	**120**	**125**	**170**
N_{rec}	8,0	12,3	17,0	27,3	33,1	56,4

$\gamma_{Mc} = 1,5$

SHEAR

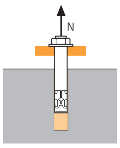
Anchor size	M8	M10	M12	M12	M16	M20
Screw grade 5.8						
V_{rec}	5,4	8,7	12,5	12,5	23,3	36,3
Screw grade 8.8						
V_{rec}	8,3	13,3	19,3	19,3	21,9	48,4
Screw grade A4-70						
V_{rec}	5,8	9,3	13,5	13,5	25,1	-

Screw grade 5.8: $\gamma_{Ms} = 1,25$
Screw grade 8.8: $\gamma_{Ms} = 1,25$ for M8 to M12 and $\gamma_{Ms} = 1,5$ for M16 and M20
Screw grade A4-70: $\gamma_{Ms} = 1,56$



SPIT CC Method (valeurs issues de l'ETA)

TENSILE in kN

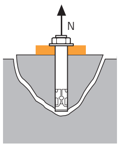


Pull-out resistance - Premium cleaning

$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$						Design pull-out resistance
Anchor size	M8	M10	M12	M12	M16	M20
h_{ef}	60	65	75	120	125	170
$N^0_{Rd,p}$ (C20/25)	10,7	13,3	20,0	30,0	40,0	63,3

$\gamma_{Mc} = 1,5$

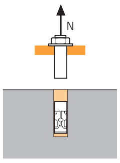


Concrete cone resistance - Premium cleaning

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$						Design cone resistance
Anchor size	M8	M10	M12	M12	M16	M20
h_{ef}	60	65	75	120	125	170
$N^0_{Rd,c}$ (C20/25)	10,7	13,3	20,0	30,0	40,0	63,3

$\gamma_{Mc} = 1,5$

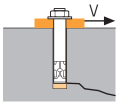


Steel resistance

$N_{Rd,s}$						Steel design tensile resistance
Anchor size	M8	M10	M12	M12	M16	M20
Screw grade 5.8						
$N_{Rd,s}$	12,0	19,3	28,0	28,0	52,0	81,2
Screw grade 8.8						
$N_{Rd,s}$	19,3	30,7	44,7	44,70	73,3	122,0
Screw grade A4-70						
$N_{Rd,s}$	12,4	19,9	29,0	29,0	54,8	-

Screw grade 5.8 and 8.8 : $\gamma_{Ms} = 1,5$
Screw grade A4-70 : $\gamma_{Ms} = 1,86$

SHEAR in kN

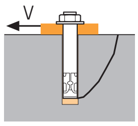


Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c}$						Design concrete edge resistance at minimum edge distance (C_{min})
Anchor size	M8	M10	M12	M12	M16	M20
h_{ef}	60	65	75	120	125	170
C_{min}	40	45	55	65	65	85
S_{min}	40	45	55	65	65	85
$V^0_{Rd,c}$ (C20/25)	2,5	3,4	5,0	6,5	7,3	12,5

$\gamma_{Mc} = 1,5$

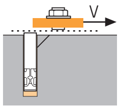


Pryout failure

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$						Design pryout resistance
Anchor size	M8	M10	M12	M12	M16	M20
h_{ef}	60	65	75	120	125	170
$V^0_{Rd,cp}$ (C20/25)	21,3	26,7	40,0	60,0	80,0	126,7

$\gamma_{Mcp} = 1,5$



Steel resistance

$V_{Rd,s}$						Steel design shear resistance
Anchor size	M8	M10	M12	M12	M16	M20
Screw grade 5.8						
$V_{Rd,s}$	7,4	11,6	16,9	16,9	31,2	48,8
Screw grade 8.8						
$V_{Rd,s}$	11,7	18,6	27,0	27,0	36,7	60,7
Screw grade A4-70						
$V_{Rd,s}$	7,3	11,9	17,3	17,3	32,7	-

Screw grade 5.8 : $\gamma_{Ms} = 1,25$
Screw grade 8.8 : $\gamma_{Ms} = 1,25$ for M8 to M12 and $\gamma_{Ms} = 1,5$ for M16 and M20
Screw grade A4-70 : $\gamma_{Ms} = 1,56$

$$N_{Rd} = \min(N_{Rd,p} \ ; \ N_{Rd,c} \ ; \ N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c} \ ; \ V_{Rd,cp} \ ; \ V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

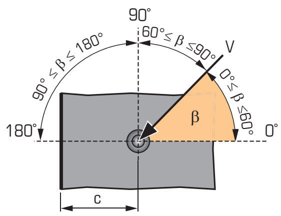
$$\beta_N + \beta_V \leq 1,2$$

f_b INFLUENCE OF CONCRETE

Concrete class	f_b
C25/30	1,06
C30/40	1,17
C40/60	1,26
C50/60	1,34

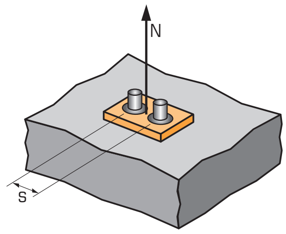
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2



SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0{,}5 + \frac{s}{4.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

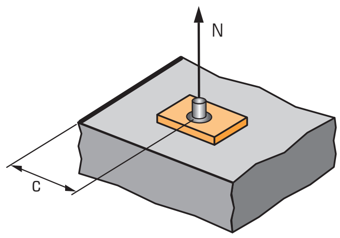
$s_{cr,N} = 2.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group.

SPACING S — Reduction factor Ψ_s — Non-cracked concrete

Anchor size	M8	M10	M12	M12	M16	M20
40	0,67					
45	0,69	0,67				
55	0,73	0,71	0,68			
65	0,77	0,75	0,72	0,64	0,63	
85	0,85	0,83	0,78	0,65	0,67	0,60
100	0,92	0,88	0,83	0,71	0,70	0,65
120	1,00	0,96	0,90	0,75	0,74	0,68
130		1,00	0,93	0,77	0,76	0,69
150			1,00	0,81	0,80	0,72
200				0,92	0,90	0,79
250				1,00	1,00	0,87
300						0,94
340						1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0{,}27 + 0{,}725 \, . \, \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

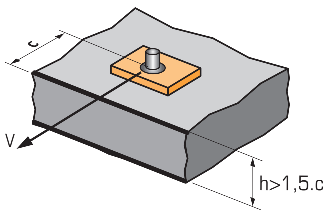
$c_{cr,N} = h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

EDGE C — Reduction factor $\Psi_{c,N}$ — Non-cracked concrete

Anchor size	M8	M10	M12	M12	M16	M20
40	0,75					
45	0,81	0,77				
55	0,93	0,88	0,80			
65	1,00	1,00	0,90	0,66	0,65	0,55
85			1,00	0,68	0,76	0,63
90				0,81	0,79	0,65
100				0,87	0,85	0,70
125				1,00	1,00	0,80
150						0,91
170						1,00

$\Psi_{s\text{-}c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

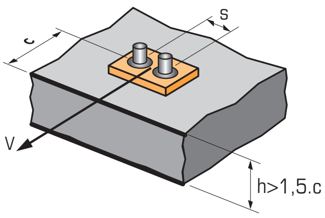


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

c/c_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

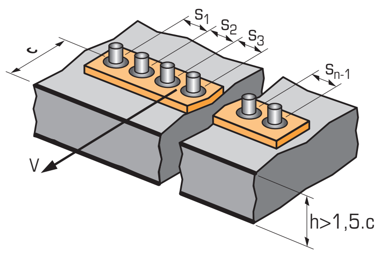


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

s/c_{min} \ c/c_{min}	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65



For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + ... + s_{n-1}}{3.n.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

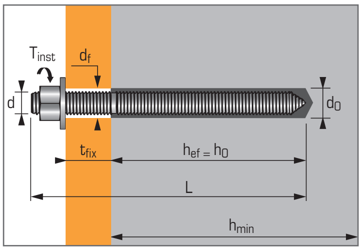
MULTI-MAX

Threaded stud zinc coated & stainless steel versions

Methacrylate chemical resin for use in non-cracked concrete

ETA Option 7- 13/0435

INOX STAINLESS STEEL



APPLICATION

- Fixing steel framed structures
- Fixing machinery (resistant to vibration)
- Fixing of storage silos, refinery pipework supports
- Fixing motorway signs
- Fixing safety barriers

Technical data

Anchor size	Min. anchor depth (mm) **h_{ef}**	Min. thick. of base material (mm) **h_{min}**	Thread diameter (mm) **d**	Drilling depth (mm) **h_0**	Drilling diameter (mm) **d_0**	Clearance diameter (mm) **d_f**	Tighten torque (Nm) **T_{inst}**
M8	80	110	8	80	10	9	10
M10	90	120	10	90	12	12	20
M12	110	140	12	110	14	14	30
M16	125	160	16	125	18	18	60
M20	170	220	20	170	25	22	120
M24	210	265	24	210	28	26	200
MULTI-MAX Vinylester resin dual component cartridge 410 ml						Code :	060047
MULTI-MAX Vinylester resin dual component cartridge 280 ml						Code :	060040

MATERIAL

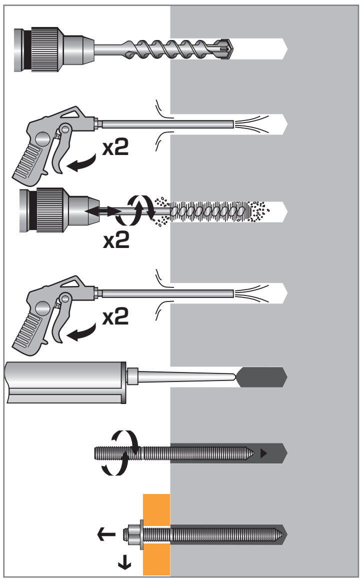
- **Threaded stud M8-M24**

zinc coated steel version :
steel grade 5.8, 8.8 and 10.9
cold form steel NF A35-053
stainless steel A4 version :
stainless steel A4

Anchor mechanical properties

Anchor size		M8	M10	M12	M16	M20	M24
f_{uk} (N/mm²)	Min. tensile strength	520	520	520	520	520	520
f_{yk} (N/mm²)	Yield strength	420	420	420	420	420	420
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	19,5	38,8	68,1	173,1	337,5	583,7
M (Nm)	Recommended bending moment	9,75	19,4	34,0	86,5	168,7	291,8
As (mm²)	Stressed cross-section	36,6	58	84,3	157	227	326,9
W_{el} (mm³)	Elastic section modulus	31,2	62,3	109,2	277,5	482,4	833,7

INSTALLATION*



***Premium cleaning :**
- 2 blowing with compressed air
- 2 brushing with brushed fitted on a drilling machine
- 2 blowing with compressed air

Setting time

Ambient temperature	Max. time for installation	Curing time
30°C > T ≥ 40°C	2 min	35 min
20°C > T ≥ 30°C	4 min	45 min
10°C > T ≥ 20°C	6 min	60 min
5°C > T ≥ 10°C	12 min	90 min
0°C > T ≥ 5°C	18 min	180 min
-5°C > T ≥ 0°C	-	360 min

The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/4 and 4/4).

Number of sealings per cartridge

Anchor size	M8	M10	M12	M16	M20	M24
Drilling diameter (mm)	10	12	14	18	25	28
Drilling depth (mm)	80	90	110	125	170	210
Number of sealings per cartridge						
MULTI-MAX 410 ml	151	110	76	51	12	10
MULTI-MAX 280 ml	103	75	52	35	8	7

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	M8	M10	M12	M16	M20	M24
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**
$N_{Ru,m}$	21,1	29,6	41,1	58,5	99,5	138,3
N_{Rk}	18,1	25,4	35,2	50,3	85,5	118,8

SHEAR

Anchor size	M8	M10	M12	M16	M20	M24
$V_{Ru,m}$	15,92	22,75	32,8	56,2	73,6	115,0
V_{Rk}	10,98	18,9	25,3	46,8	59,02	95,8

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{*}}{\gamma_{Mc}}$$

*Derived from test results (stud grade 10.9)

$$V_{Rd} = \frac{V_{Rk}^{*}}{\gamma_{Ms}}$$

TENSILE

Anchor size	M8	M10	M12	M16	M20	M24
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**
N_{Rd}	12,1	14,1	19,6	27,9	47,5	66,0

γ_{Mc} = 1,5 for M8 and γ_{Mc} = 1,8 for M10 to M24

SHEAR

Anchor size	M8	M10	M12	M16	M20	M24
V_{Rd}	7,7	13,2	17,7	32,7	39,3	63,9

γ_{Ms} = 1,43 for M8 to M16 and γ_{Ms} = 1,5 for M20 to M24

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}^{*}}{\gamma_{M} \cdot \gamma_{F}}$$

*Derived from test results (stud grade 10.9)

$$V_{rec} = \frac{V_{Rk}^{*}}{\gamma_{M} \cdot \gamma_{F}}$$

TENSILE

Anchor size	M8	M10	M12	M16	M20	M24
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**
N_{rec}	8,6	10,1	14,0	19,9	33,9	47,1

γ_F = 1,4 ; γ_{Mc} = 1,5 for M8 and γ_{Mc} = 1,8 for M10 to M24

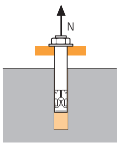
SHEAR

Anchor size	M8	M10	M12	M16	M20	M24
V_{rec}	5,5	9,4	12,6	23,4	28,1	45,6

γ_F = 1,4 ; γ_{Ms} = 1,43 for M8 to M16 and γ_{Ms} = 1,5 for M20 to M24

SPIT CC Method (values issued from ETA)

TENSILE in kN

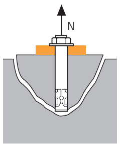


Pull-out resistance for dry and wet concrete [1]

$N_{Rd,p} = N^{0}_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$						Design pull-out resistance
Anchor size	M8	M10	M12	M16	M20	M24
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**
-40°C to +40°C	12,1	14,1	19,6	27,9	47,5	66,0

γ_{Mc} = 1,5 for M8 and γ_{Mc} = 1,8 for M10 to M24

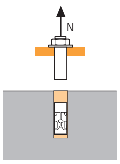


Concrete cone resistance for dry and wet concrete [1]

$N_{Rd,c} = N^{0}_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,p}$						Design cone resistance
Anchor size	M8	M10	M12	M16	M20	M24
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**
-40°C to +120°C	24,0	23,9	32,3	39,1	62,1	85,2

γ_{Mc} = 1,5 for M8 and γ_{Mc} = 1,8 for M10 to M24



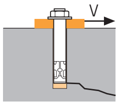
Steel resistance

$N_{Rd,s}$						Steel design tensile resistance
Anchor size	M8	M10	M12	M16	M20	M24
Std. stud grade 5.8*	12,0	19,3	28,0	52,0	81,3	118,0
Std. stud grade 8.8*	19,3	30,7	44,7	84,0	130,7	188,0
Std. stud grade 10.9*	26,4	41,4	60,0	112,1	175,0	252,1
Stud stainless steel A4	13,7	21,7	31,6	58,8	91,7	132,1

Std. stud grade 5.8 and 8.8 : γ_{Ms} = 1,5
Std. stud grade 10.9 : γ_{Ms} = 1,4
Stud standard stainless steel A4 : γ_{Ms} = 1,87

[1] The concrete in the area of the anchorage is water statured. The anchor may be installed in flooded holes, but the figures above cannot be used, you must use the values given in the ETA for the category 2.

SHEAR in kN

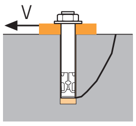


Concrete edge resistance

$V_{Rd,c} = V^{0}_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c}$						Design concrete edge resistance at minimum edge distance (C_{min})
Anchor size	M8	M10	M12	M16	M20	M24
h_{ef}	**80**	**80**	**90**	**110**	**125**	**170**
C_{min}	40	50	60	80	100	120
S_{min}	40	50	60	80	100	120
$V^0_{Rd,c}$	2,5	3,8	5,5	9,4	15,4	21,9

γ_{Mc} = 1,5

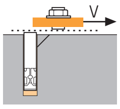


Pryout failure

$V_{Rd,cp} = V^{0}_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$						Design pryout resistance
Anchor size	M8	M10	M12	M16	M20	M24
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**
-40°C to +40°C	24,1	33,9	47,0	67,0	113,9	158,3

γ_{Mcp} = 1,5



Steel resistance

$V_{Rd,s}$						Steel design shear resistance
Anchor size	M8	M10	M12	M16	M20	M24
Std. stud grade 5.8*	7,36	11,6	16,9	31,2	48,8	70,4
Std. stud grade 8.8*	11,68	18,6	27,0	50,4	78,4	112,8
Std. stud grade 10.9*	12,2	19,3	28,1	52,0	81,3	117,3
Stud stainless steel A4	7,3	11,9	17,3	32,7	51,3	73,1

Std. stud grade 5.8 and 8.8 : γ_{Ms} = 1,25
Std. stud grade 10.9 : γ_{Ms} = 1,5
Stud standard stainless steel A4 : γ_{Ms} = 1,56

$$N_{Rd} = \min(N_{Rd,p}\ ;\ N_{Rd,c}\ ;\ N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c}\ ;\ V_{Rd,cp}\ ;\ V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

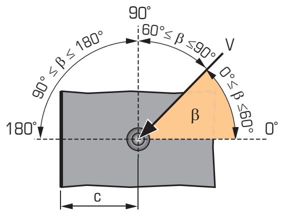
$$\beta_N + \beta_V \leq 1,2$$

f_b INFLUENCE OF CONCRETE

Concrete class	f_b
C25/30	1,02
C30/37	1,04
C40/50	1,07
C50/60	1,09

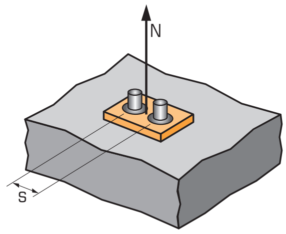
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2



SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0,5 + \frac{s}{4.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

$s_{cr,N} = 2.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group.

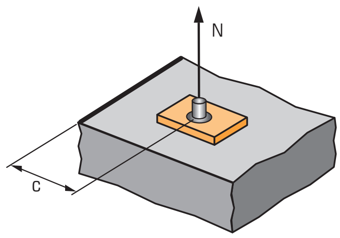
SPACING S — Reduction factor Ψ_s — Non-cracked concrete

Anchor size	M8	M10	M12	M16
40	0,58			
50	0,60	0,59		
60	0,63	0,61	0,59	0,58
80	0,67	0,65	0,62	0,61
100	0,71	0,69	0,65	0,63
150	0,81	0,78	0,73	0,70
200	0,92	0,87	0,80	0,77
250	1,00	0,96	0,88	0,83
300		1,00	0,95	0,90
330			1,00	0,94
375				1,00

SPACING S — Reduction factor Ψ_s — Non-cracked concrete

Anchor size	M20	M24
100	0,60	
120	0,62	0,60
150	0,65	0,62
180	0,68	0,64
200	0,70	0,66
250	0,75	0,70
350	0,84	0,78
450	0,94	0,86
510	1,00	0,90
630		1,00
750		1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0,27 + 0,725 . \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

$c_{cr,N} = h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

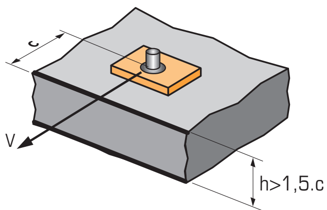
EDGE C — Reduction factor $\Psi_{c,N}$ — Non-cracked concrete

Anchor size	M8	M10	M12	M16
40	0,50			
50	0,56	0,53		
60	0,63	0,58	0,52	
80	0,75	0,69	0,61	0,57
120	1,00	0,92	0,80	0,73
135		1,00	0,86	0,79
165			1,00	0,91
190				1,00

EDGE C — Reduction factor $\Psi_{c,N}$ — Non-cracked concrete

Anchor size	M20	M24
100	0,54	
120	0,60	0,54
150	0,69	0,61
180	0,78	0,68
200	0,84	0,73
255	1,00	0,86
315		1,00

$\Psi_{s\text{-}c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

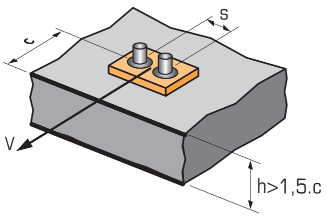


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

$\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

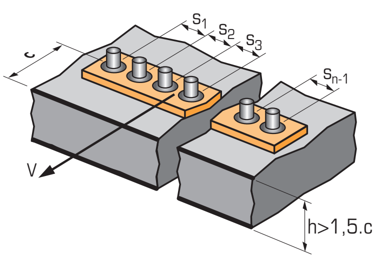


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

$\frac{s}{c_{min}}$ \ $\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65

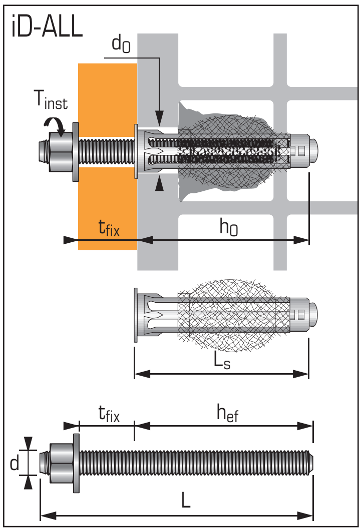


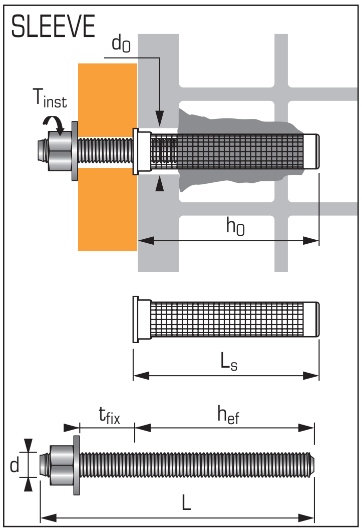
For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + ... + s_{n-1}}{3.n.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

Methacrylate resin for fixing in hollow masonry

European Technical Assessment
ETAG 029- 13/0437





APPLICATION

- Signs
- Scaffolding
- Electrical switchboards
- Radiators
- Air conditioning ducts
- Rail guard returns
- Blinds
- Climbing walls
- Metal scale
- Hand rails
- Pole and ducts
- Demountable partitions
- Kitchen furniture
- Decorations

Technical data

Anchor size	Min. anchor depth (mm) h_{ef}	Drilling diameter (mm) d_0	Drilling depth (mm) h_0	Thread diameter (mm) d	Min. stud length (mm) L	External iD-ALL/Sleeve diameter (mm) d_{nom}	Total iD-ALL/Sleeve length (mm) L_s	Tighten torque (Nm) T_{inst}
iD-ALL + stud M8	65	16	70	8	76 + t_{fix}	16	70	3 [1]
iD-ALL + stud M10	65	16	70	10	78 + t_{fix}	16	70	3 [1]
Sleeve Ø20 + stud M12	85	20	90	12	98 + t_{fix}	20	85	3 [1]
Sleeve Ø15 + stud M8	130	15	135	8	138 + t_{fix}	15	130	3 [1]
Sleeve Ø15 + stud M10	130	15	135	10	140 + t_{fix}	15	130	3 [1]

MULTI-MAX Vinylester resin dual component cartridge 410 ml — Code : 060047

MULTI-MAX Vinylester resin dual component cartridge 280 ml — Code : 060040

For Sleeves and studs code numbers see catalogue

[1] 2 Nm Clay masonry OPTIBRIC PV 3+ and in hollow concrete block.

Setting time

Ambient temperature	Max. time for installation	Curing time
20°C > T ≥ 30°C	4 min	45 min
10°C > T ≥ 20°C	6 min	60 min
5°C > T ≥ 10°C	12 min	90 min
0°C > T ≥ 5°C	18 min	180 min
-5°C > T ≥ 0°C	-	360 min

Recommended loads (N_{rec}, V_{rec}) in kN

$$N_{rec} = \frac{N_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

$$V_{rec} = \frac{V_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

TENSILE

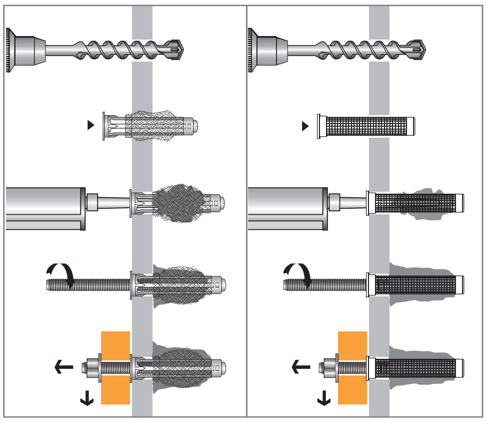
Anchor size	iD-ALL M8	iD-ALL M10	Sleeve Ø20X85 M12	Sleeve Ø15X130 M8	Sleeve Ø15X130 M10
Solid concrete blocks B 40 ($f_b \geq 6.0$ N/mm²)					
N_{rec}	0,57		0,43	0,43	
Hollow clay bricks OPTIBRIC PV 3+ ($f_b \geq 9.0$ N/mm²)					
N_{rec}	0,43		0,71	0,43	
Clay masonries POROTHE RM GF R20 Th+ ($f_b \geq 9.0$ N/mm²)					
N_{rec}	0,25		0,71	0,34	
Clay masonries POROTHE RM GF R37 Th+ ($f_b \geq 9.0$ N/mm²)					
N_{rec}	0,34		0,25	0,57	
Calcium silicate masonries KSL-R (P) 240 ($f_b \geq 9.0$ N/mm²)					
N_{rec}	0,43		1,0	0,86	

$\gamma_F = 1,4$; $\gamma_M = 2,5$

SHEAR

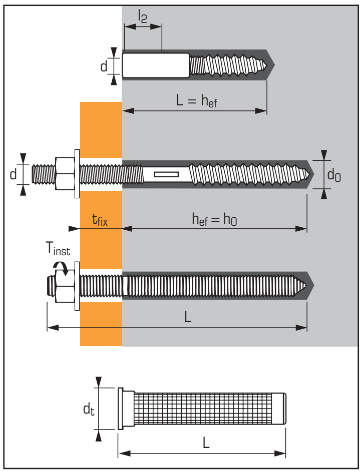
	iD-ALL M8	iD-ALL M10	Sleeve Ø20X85 M12	Sleeve Ø15X130 M8	Sleeve Ø15X130 M10
V_{rec}	0,71		0,57	0,86	
V_{rec}	0.43		1,00	0,34	
V_{rec}	1,14		0,86	1,00	
V_{rec}	0,25		1,14	0,43	
V_{rec}	2,57	3,14	2,85	2,57	3,43

Installation



Polyester resin for fixing in concrete and hollow and solid masonries

Technical Assessment SOCOTEC
N° YX 0006



APPLICATION

- Signs
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- Electrical switchboards
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- Hand rails
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- Demountable partitions
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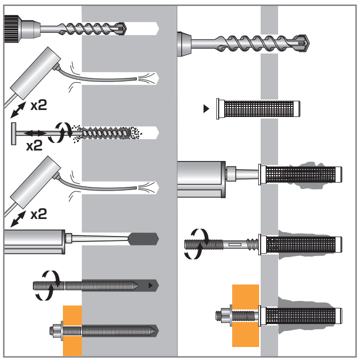
- Decorations

INSTALLATION



Technical data

	Anchor size	Min. anchor depth (mm) h_{ef}	Max. thick. part to be fixed (mm) t_{fix}	Thread Ø (mm) d	Thread length (mm) l_2	Sleeve Ø (mm) d_t	Thread Ø (mm) d_0 hollow	Thread Ø (mm) d_0 solid	Drilling depth (mm) h_0 hollow	Drilling depth (mm) h_0 solid	Total anchor length (mm) L	Tighten torque (Nm) T_{inst}	Code
Male stud	M8X100	75	12	8	-	-	15	10	80	75	100	5	061650
	M10X100	75	20	10	-	-	15	12	80	75	100	8	061660
	M12X100	75	20	12	-	-	20	14	80	75	100	8	061670
Female stud	M8X58	58	-	8	20	-	20	14	80	58	58	8	061740
	M10X58	58	-	10	23	-	20	14	80	58	58	8	061750
	M12X75	75	-	12	23	-	20	20	100	75	75	8	061760
Sleeve (1)	Ø15X85	-	-	-	-	15	15	-	85	-	85	-	061600
	Ø20X85	-	-	-	-	20	20	-	90	-	85	-	061490
	Ø15X130	-	-	-	-	15	20	-	135	-	130	-	557080
Threaded stud	M8X110	80	15	8	-	-	-	10	-	80	110	10	050950
	M10X130	90	20	10	-	-	-	12	-	90	130	20	050960
	M12X160	110	25	12	-	-	-	14	-	110	160	30	050970
	M16X190	125	35	16	-	-	-	18	-	125	190	60	050980

CMIX PLUS Polyester resin (grey) 410 ml	059541
CMIX PLUS Polyester resin (grey) 380 ml	055881
CMIX PLUS Polyester resin (stone) 380 ml	055882
CMIX PLUS Polyester resin (grey) 300 ml	055866
CMIX PLUS Polyester resin (stone) 300 ml	055865

(1) Plastic sleeve Ø15X85 for male studs M8 and M10 in hollow material.
Plastic sleeve Ø20X80 and Ø20X85 for male studs M12 and female studs M8, M10 and M12 in hollow material.
Plastic sleeve Ø15X130 for threaded stud M8X170 - Using standard threaded rods.

Recommended loads (N_{rec}, V_{rec}) in concrete C20/25 in kN

$$N_{rec} = \frac{N_{Rk}^{*}}{\gamma_M . \gamma_F} \qquad V_{rec} = \frac{V_{Rk}^{*}}{\gamma_M . \gamma_F}$$

TENSILE

Anchor size	M8*	M10*	M12*	M16*
N_{rec}	4,48	6,30	9,25	14,00

* threaded stud

SHEAR

Anchor size	M8*	M10*	M12*	M16*
V_{rec}	2,85	4,60	6,65	12,60

* threaded stud

Anchor size	M8*	M10*	M12*	M16*
Minimum spacing distances (mm)				
S_{min}	160	180	220	250
C_{min}	80	90	110	125

* threaded stud

Recommended loads (N_{rec}, V_{rec}) in masonries in kN

TENSILE

Anchor size	Sleeve + male stud M8	M10	M12	Sleeve + female stud M8	M10	M12	Sleeve Ø15X130 + Stud* M8
Solid clay bricks BP 400							
N_{rec}	1,3			1,3			-
Solid concrete blocks B 80							
N_{rec}	5,0			5,0			-
Hollow clay bricks C 40 rendered							
N_{rec}	1,0			1,0			0,6
Hollow clay bricks C 40 not rendered							
N_{rec}	0,6			0,6			0,6
Hollow concrete blocks B 40 rendered							
N_{rec}	1,6			1,6			1,0
Hollow concrete blocks B 40 not rendered							
N_{rec}	0,9			0,9			0,9

* Sleeve Ø15X130 + threaded stud M8X170

SHEAR

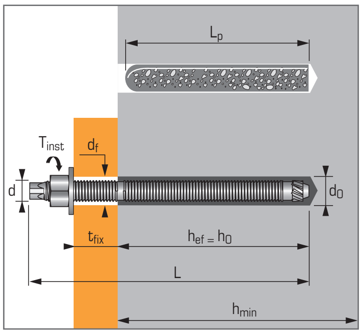
	Sleeve + male stud M8	M10	M12	Sleeve + female stud M8	M10	M12	Sleeve Ø15X130 +Stud* M8
V_{rec}	1,8	2,5	4,0	2,0	2,5	4,0	-
V_{rec}	1,8	2,2	3,2	1,8	2,2	3,2	-
V_{rec}	2,0			2,0			2,0
V_{rec}	1,3			1,3			1,3
V_{rec}	2,0			2,0			2,0
V_{rec}	1,8			1,8			1,8

* Sleeve Ø15X130 + threaded stud M8X170

Bonded anchor in glass capsule - heavy loads, for use in non-cracked concrete

European Technical Assessment
ETA Option 7- 03/0008

INOX STAINLESS STEEL



APPLICATION

- Fixing steel framed structures
- Fixing machinery
- Fixing of storage silos, refinery pipework supports
- Fixing motorway signs
- Fixing safety barriers

MATERIAL

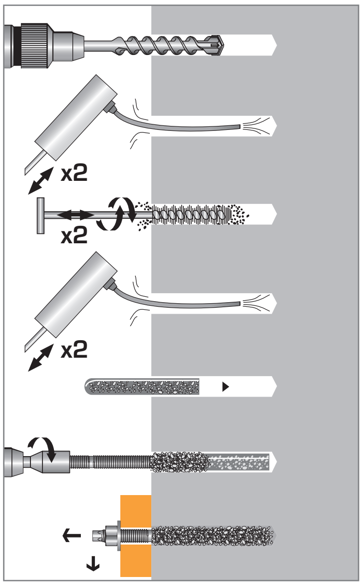
Zinc coated steel version :

- **Stud M8-M16 :** Steel cold form steel NF A35-053
- **Stud M20-M30 :** 11 SMnPb37 - NFA 35-561
- **Nut :** Steel grade 6 or 8 NF EN 20898-2
- **Washer :** Steel DIN 513
- **Protection :** zinc coated 5 µm min. NF E25-009

Stainless steel version :

- **Stud :** A4-70 as per ISO 3506-1
- **Nut :** Stainless steel A4-80, NF EN 10088-3
- **Washer :** Stainless steel A4, NF EN 20898-2

INSTALLATION



Technical data

Anchor size	Min. anchor depth (mm) h_{ef}	Max. thick. of part to be fixed (mm) t_{fix}	Min. thick. of base material (mm) h_{min}	Thread Ø (mm) d	Drilling depth (mm) h_0	Drilling Ø (mm) d_0	Clearance Ø (mm) d_f	Total stud length (mm) L	Total capsule length (mm) L_p	Tighten torque (Nm) T_{inst}	Code threaded studs zinc coated st.	Code threaded studs stainless st. A4	Code capsules
M8X110	80	15	110	8	80	10	9	110	80	10	050950	052400	051500
M10X130	90	20	120	10	90	12	12	130	85	20	050960	052410	051510
M12X160	110	25	140	12	110	14	14	160	107	30	050970	052420	051520
M16X190	125	35	160	16	125	18	18	190	107	60	050980	052440	051530
M20X260	170	65	220	20	170	25	22	260	162	120	655220	052450	051540
M24X300	210	63	265	24	210	28	26	300	200	200	655240	052470	051550
M30X380	280	70	350	30	280	35	33	380	260	400	050940	-	051560

Anchor mechanical properties

Anchor size		M8	M10	M12	M16	M20	M24	M30
MAXIMA stud - zinc coated steel version								
f_{uk} (N/mm²)	Min. tensile strength	600	600	600	600	520	520	520
f_{yk} (N/mm²)	Yield strength	420	420	420	420	420	420	420
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	22	45	79	200	301	520	1052
M (Nm)	Recommended bending moment	11,0	22,5	39,5	100	150	160	525
MAXIMA stud - stainless steel A4 version								
f_{uk} (N/mm²)	Min. tensile strength	700	700	700	700	700	700	-
f_{yk} (N/mm²)	Yield strength	350	350	350	350	350	350	-
$M^0_{rk,s}$ (Nm)	Characteristic bending moment	26	52	92	233	454	786	-
M (Nm)	Recommended bending moment	12	23	42	122	206	357	-
As (mm²)	Stressed cross-section	36,6	58	84,3	157	227	326,9	-
W_{el} (mm³)	Elastic section modulus	31,2	62,3	109,2	277,5	482,4	833,7	-

Setting time

Ambient temperature	Curing time	
	Dry concrete	Wet concrete
T ≥ 20°C	20 min	40 min
10°C < T < 20°C	30 min	60 min
0°C < T ≤ 10°C	1 hour	2 hours
-5°C < T ≤ 0°C	5 hours	10 hours

Chemical resistance of the SPIT MAXIMA glass capsules

Chemical substances	Concentration (%)	Resistance
Nitric acid	< 20	(+)
Nitric acid	20 - 70	(o)
Phosphoric acid	< 10	(+)
Sulphurous acid	100	(o)
Sulphuric acid	≤ 30	(+)
Ethyl alcohol	≤ 15	(+)
Beer	100	(+)
Carbon dioxide	100	(+)
Engine petrol without benzene		100
Hydrogen fluoride	≤ 20	(+)

Chemical substances	Concentration (%)	Resistance
Ammonia	100	(+)
Ethylene glycol	100	(+)
Heptane	100	(o)
Hexane	100	(o)
Methanol	≤ 15	(o)
Carbon monoxide	100	(+)
Washing powder	100	(+)
Perchloroethylene	100	(o)
Hydrogen peroxide	≤ 40	(o)
Caustic potash	100	(+)
Cement in suspension	saturated solution	(+)

Resistant (+): the samples in contact with the substances did not show any Screwible damage such as cracks, attacked surfaces, burst corners nor large swelling. **Sensitive (o):** use with care regarding exposure of the field of usage, precautions to be taken. The samples in contact with the substance slightly attacked the material.

MAXIMA

2/4 Threaded stud zinc coated & stainless steel versions

The loads specified on this page allow judging the product's performances, but cannot be used for the designing.
The data given in the pages "CC method" have to be applied (3/4 and 4/4).

Ultimate ($N_{Ru,m}$, $V_{Ru,m}$) and characteristic loads (N_{Rk}, V_{Rk}) in kN

Mean Ultimate loads are derived from test results in admissible service conditions, and characteristic loads are statistically determined.

TENSILE

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
$N_{Ru,m}$	25,9	44,1	67,2	93,2	105,4	237,6	297,7
N_{Rk}	18,3	25,7	37,7	57,1	80,8	119,7	151,9

SHEAR

Anchor size	M8	M10	M12	M16	M20	M24	M30
$V_{Ru,m}$	13,1	21,7	23,32	45,2	73,7	114,7	168,3
V_{Rk}	10,8	15,8	19,6	37,2	69,5	96,6	146,5

Design loads (N_{Rd}, V_{Rd}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{*}}{\gamma_{Mc}}$$

*Derived from test results

$$V_{Rd} = \frac{V_{Rk}^{*}}{\gamma_{Ms}}$$

TENSILE

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
N_{Rd}	10,2	14,3	20,9	31,7	44,9	66,5	84,4

$\gamma_{Mc} = 1{,}8$

SHEAR

Anchor size	M8	M10	M12	M16	M20	M24	M30
V_{Rd}	7,6	11,0	13,7	26,0	46,3	64,4	97,7

$\gamma_{Ms} = 1{,}43$ for M8 to M16 and $\gamma_{Ms} = 1{,}5$ for M20 to M30

Recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{rec} = \frac{N_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

*Derived from test results

$$V_{rec} = \frac{V_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

TENSILE

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
N_{rec}	7,3	10,2	14,9	22,7	32,0	47,5	60,3

$\gamma_F = 1{,}4$; $\gamma_{Mc} = 1{,}8$

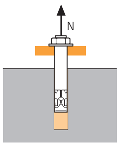
SHEAR

Anchor size	M8	M10	M12	M16	M20	M24	M30
V_{rec}	5,4	7,9	9,8	18,6	33,1	46,0	69,8

$\gamma_F = 1{,}4$; $\gamma_{Ms} = 1{,}43$ for M8 to M16 and $\gamma_{Ms} = 1{,}5$ for M20 to M30

SPIT CC Method (values issued from ETA)

TENSILE in kN



Pull-out resistance

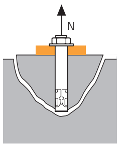
for dry, wet [(1)] and flooded [(2)] concrete

$N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

$N^0_{Rd,p}$ — Design pull-out resistance for dry and wet concrete

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
-40°C to +40°C	8,9	13,9	22,2	33,3	41,7	63,9	77,8
-40°C to +80°C	5,0	8,9	13,9	22,2	27,8	41,7	52,8
							Design pull-out resistance for flooded concrete
-40°C to +40°C	-	-	19,0	28,6	35,7	54,8	66,7
-40°C to +80°C	-	-	11,9	19,0	23,8	35,7	45,2

γ_{Mc} = 1,8 (wet) and γ_{Mc} = 2,1 flooded)



Concrete cone resistance

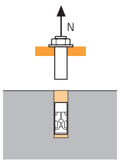
for dry, wet [(1)] and flooded [(2)] concrete

$N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$N^0_{Rd,c}$ — Design pull-out resistance for dry and wet concrete

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
-40°C to +40°C	8,9	13,9	22,2	33,3	41,7	63,9	77,8
-40°C to +80°C	5,0	8,9	13,9	22,2	27,8	41,7	52,8
							Design pull-out resistance for flooded concrete
-40°C to +40°C	-	-	19,0	28,6	35,7	54,8	66,7
-40°C to +80°C	-	-	11,9	19,0	23,8	35,7	45,2

γ_{Mc} = 1,8 (wet) and γ_{Mc} = 2,1 (flooded)



Steel resistance

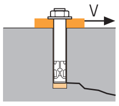
$N_{Rd,s}$ — Steel design tensile resistance

Anchor size	M8	M10	M12	M16	M20	M24	M30
MAXIMA stud Zn.	12,9	20,5	29,8	55,6	79,2	114,1	182,6
MAXIMA stud A4	12,3	19,8	28,9	54,5	85,0	122,5	-

MAXIMA stud Zn. : γ_{Ms} = 1,71 for M8 to M16 and γ_{Ms} = 2,49 for M20 to M30
MAXIMA stud A4 : γ_{Ms} = 1,87

[(1)] The concrete in the area of the anchorage is water statured.
[(2)] The concrete is wet, and the hole is full of water. The resin can be injected without remove water.

SHEAR in kN



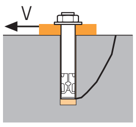
Concrete edge resistance

$V_{Rd,c} = V^0_{Rd,c} \cdot f_b \cdot f_{\beta,V} \cdot \Psi_{S\text{-}C,V}$

$V^0_{Rd,c}$ — Design concrete edge resistance at minimum edge distance (C_{min})

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
C_{min}	40	45	55	65	85	105	140
S_{min}	40	45	55	65	85	105	140
$V^0_{Rd,c}$	2,5	3,3	4,8	6,9	12,1	17,9	31,2

γ_{Mc} = 1,5



Pryout failure

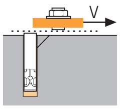
for dry, wet [(1)] and flooded [(2)] concrete

$V_{Rd,cp} = V^0_{Rd,cp} \cdot f_b \cdot \Psi_s \cdot \Psi_{c,N}$

$V^0_{Rd,cp}$ — Design pryout resistance for dry and wet concrete

Anchor size	M8	M10	M12	M16	M20	M24	M30
h_{ef}	**80**	**90**	**110**	**125**	**170**	**210**	**280**
-40°C to +40°C	21,3	33,3	53,3	80,0	100,0	153,3	186,7
-40°C to +80°C	12,0	21,3	33,3	53,3	66,7	100,0	126,7
							Design pyrout resistance for flooded concrete
-40°C to +40°C	-	-	45,5	68,6	85,7	131,5	160,0
-40°C to +80°C	-	-	33,3	53,3	66,7	100,0	126,7

γ_{Mcp} = 1,5



Steel resistance

$V_{Rd,s}$ — Steel design shear resistance

Anchor size	M8	M10	M12	M16	M20	M24	M30
MAXIMA stud Zn.	7,7	12,2	17,7	32,9	39,3	56,7	90,7
MAXIMA stud A4	7,3	11,9	17,3	32,7	51,3	73,1	-

MAXIMA stud Zn. : γ_{Ms} = 1,43 for M8 to M16 and γ_{Ms} = 1,5 for M20 to M30
MAXIMA stud A4 : γ_{Ms} = 1,56

$$N_{Rd} = \min(N_{Rd,p}\ ;\ N_{Rd,c}\ ;\ N_{Rd,s})$$
$$\beta_N = N_{Sd} / N_{Rd} \leq 1$$

$$V_{Rd} = \min(V_{Rd,c}\ ;\ V_{Rd,cp}\ ;\ V_{Rd,s})$$
$$\beta_V = V_{Sd} / V_{Rd} \leq 1$$

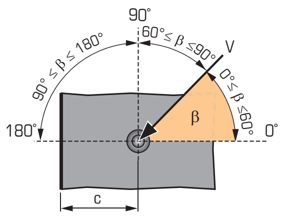
$$\beta_N + \beta_V \leq 1,2$$

f_b INFLUENCE OF CONCRETE

Anchor size	M8	M10	M12	M16	M20	M24	M30
C20/25	1	1	1	1	1	1	1
C30/37	1	1	1	1	1,18	1,07	1,2
C50/60	1	1	1	1	1,53	1,22	1,79

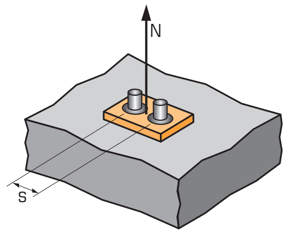
$f_{\beta,V}$ INFLUENCE OF SHEAR LOADING DIRECTION

Angle β [°]	$f_{\beta,V}$
0 to 55	1
60	1,1
70	1,2
80	1,5
90 to 180	2



SPIT CC Method (values issued from ETA)

Ψ_s INFLUENCE OF SPACING FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_s = 0,5 + \frac{s}{4.h_{ef}}$$

$s_{min} < s < s_{cr,N}$

$s_{cr,N} = 2.h_{ef}$

Ψ_s must be used for each spacing influenced the anchors group.

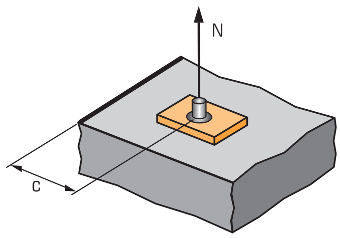
SPACING S — Reduction factor Ψ_s — Non-cracked concrete

Anchor size	M8	M10	M12	M16
40	0,63			
45	0,64	0,63		
55	0,67	0,65	0,63	0,61
65	0,70	0,68	0,65	0,63
85	0,77	0,74	0,69	0,67
105	0,83	0,79	0,74	0,71
140	0,94	0,89	0,82	0,78
160	1,00	0,94	0,86	0,82
180		1,00	0,91	0,86
220			1,00	0,94
250				1,00

SPACING S — Reduction factor Ψ_s — Non-cracked concrete

Anchor size	M20	M24	M30
85	0,63		
105	0,65	0,63	
140	0,71	0,67	0,63
160	0,74	0,69	0,64
180	0,76	0,71	0,66
220	0,82	0,76	0,70
250	0,87	0,80	0,72
300	0,94	0,86	0,77
340	1,00	0,90	0,80
370		0,94	0,83
450		1,00	0,90
560			1,00

$\Psi_{c,N}$ INFLUENCE OF EDGE FOR CONCRETE CONE RESISTANCE IN TENSILE LOAD



$$\Psi_{c,N} = 0,27 + 0,725 . \frac{c}{h_{ef}}$$

$c_{min} < c < c_{cr,N}$

$c_{cr,N} = h_{ef}$

$\Psi_{c,N}$ must be used for each distance influenced the anchors group.

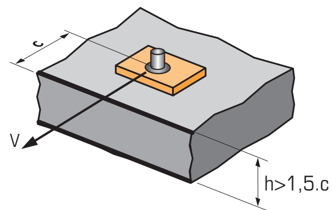
EDGE C — Reduction factor $\Psi_{c,N}$ — Non-cracked concrete

Anchor size	M8	M10	M12	M16
40	0,63			
45	0,68	0,63		
55	0,77	0,71	0,63	
65	0,86	0,79	0,70	0,66
85	1,00	0,95	0,83	0,76
90		1,00	0,86	0,79
110			1,00	0,91
125				1,00

EDGE C — Reduction factor $\Psi_{c,N}$ — Non-cracked concrete

Anchor size	M20	M24	M30
85	0,63		
105	0,72	0,63	
120	0,78	0,68	
140	0,87	0,75	0,63
170	1,00	0,86	0,71
210		1,00	0,81
250			0,92
280			1,00

$\Psi_{s\text{-}c,V}$ INFLUENCE OF SPACING AND EDGE DISTANCE FOR CONCRETE EDGE RESISTANCE IN SHEAR LOAD

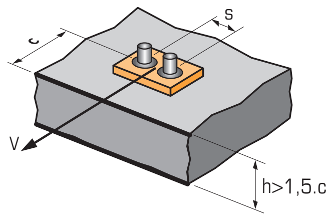


$$\Psi_{s\text{-}c,V} = \frac{c}{c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For single anchor fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

$\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
$\Psi_{s\text{-}c,V}$	1,00	1,31	1,66	2,02	2,41	2,83	3,26	3,72	4,19	4,69	5,20	5,72

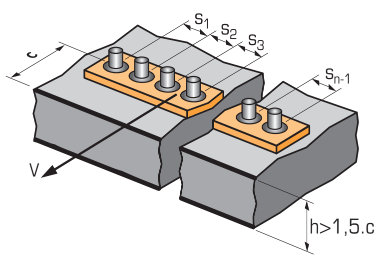


$$\Psi_{s\text{-}c,V} = \frac{3.c + s}{6.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

For 2 anchors fastening

Reduction factor $\Psi_{s\text{-}c,V}$ — Non-cracked concrete

$\frac{s}{c_{min}}$ \ $\frac{c}{c_{min}}$	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2
1,0	0,67	0,84	1,03	1,22	1,43	1,65	1,88	2,12	2,36	2,62	2,89	3,16
1,5	0,75	0,93	1,12	1,33	1,54	1,77	2,00	2,25	2,50	2,76	3,03	3,31
2,0	0,83	1,02	1,22	1,43	1,65	1,89	2,12	2,38	2,63	2,90	3,18	3,46
2,5	0,92	1,11	1,32	1,54	1,77	2,00	2,25	2,50	2,77	3,04	3,32	3,61
3,0	1,00	1,20	1,42	1,64	1,88	2,12	2,37	2,63	2,90	3,18	3,46	3,76
3,5		1,30	1,52	1,75	1,99	2,24	2,50	2,76	3,04	3,32	3,61	3,91
4,0			1,62	1,86	2,10	2,36	2,62	2,89	3,17	3,46	3,75	4,05
4,5				1,96	2,21	2,47	2,74	3,02	3,31	3,60	3,90	4,20
5,0					2,33	2,59	2,87	3,15	3,44	3,74	4,04	4,35
5,5						2,71	2,99	3,28	3,71	4,02	4,33	4,65
6,0						2,83	3,11	3,41	3,71	4,02	4,33	4,65



For 3 anchors fastening and more

$$\Psi_{s\text{-}c,V} = \frac{3.c + s_1 + s_2 + s_3 + ... + s_{n-1}}{3.n.c_{min}} . \sqrt{\frac{c}{c_{min}}}$$

EPCON C8 XTREM

Post-installed rebar

Rebar anchoring system

European Technical Assessment

ETA TR 023- 07/0189

DTA 3/11-684

EPCON C8

- EPOXY resin
- Slow drying time
- Storage time: 3 years
- Usable in wet environments
- Performance in diamond drilling
- Good fire performance
- Odour-free
- Easy injection
- No shrinkage after hardening
- NF mark overhead position
- Usable for concrete to -20°C

FIRE BEHAVIOUR

- see page 122 to 125

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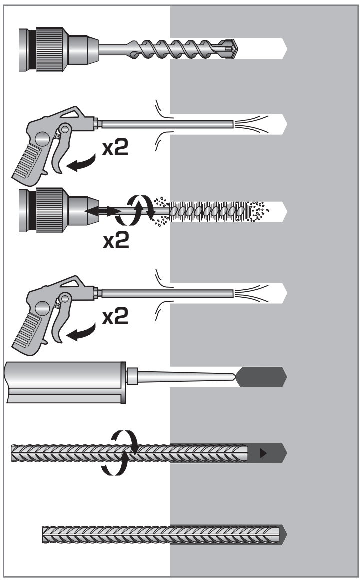
INSTALLATION*



***Premium cleaning :**

- 2 blowing with compressed air
- 2 brushing with brushed fitted on a drilling machine
- 2 blowing with compressed air

Mechanical characteristics of rebars

Nominal steel rebar Ø		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32	Ø40
Sections (cm²)		0,503	0,785	1,13	1,54	2,01	3,14	4,91	8,04	12,57
Min. resistances to failure (kN)	Fe E400	21,13	32,97	47,46	64,68	84,42	131,88	206,22	337,68	527,94
	Fe E500	25,90	40,43	58,20	79,31	103,52	161,71	252,87	414,06	647,36
Ultimate limit load N_{Rd} (kN)	Fe E500	21,85	34,15	49,17	66,93	87,42	136,59	213,43	349,56	546,36

The mechanical characteristics of the high adhesion rebars are defined in the NFA 35-016 and NFA 35-017 standards.

Setting time

Ambient temperature (°C)	Max. time for installation (min)	Waiting time for 45 % load (h)	Curing time (h)
40°C	5	3	6
30°C	8	5	8
20°C	14	6	12
10°C	20	12	23
5°C	26	15	26

Chemical resistance of the SPIT EPCON C8 resin

Chemical substances	Concentration (%)	Resistance
Sulfuric acid	10	(o)
Hydrochloric acid	10	(o)
Nitric acid	10	(o)
Acetic acid	10	(o)
Ammonium hydroxide	10	(o)
Sodium Hypochlorite	5	(o)
Sodium hydroxide	50	(o)
Acetone		(-)

Chemical substances	Concentration (%)	Resistance
Toluene		(o)
Ethanol		(o)
Methyl-ethyl-ketone (MEK)		(-)
Methanol		(-)
Demineralized water		(+)
Sea water	100	(+)
Engine Petrol	100	(+)
Motor oil	100	(+)

Resistant (+): the samples in contact with the substances did not show any Screwible damage such as cracks, attacked surfaces, burst corners nor large swelling. **Sensitive (o):** use with care regarding exposure of the field of usage, precautions to be taken. The samples in contact with the substance slightly attacked the material.

Sizing rules for steel reinforcement fixings for concrete according to eurocode 2 regulations and ETA 07/0189

The basic anchorage length $L_{b,rqd}$ (mm) for the ultimate limit load for rebar F_{Rd} (N) is given by following equation:

$$L_{b,rqd} = \frac{F_{Rd}}{\Pi \cdot Ø \cdot \eta_1 \cdot \eta_2 \cdot f_{bd}}$$

The design anchorage length L_{bd} (mm) is determined as follow:

$$L_{bd} = L_{b,rqd} \cdot \alpha_2 \cdot \alpha_5$$

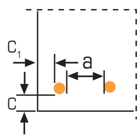
Concrete class	f_{ck} (Mpa)	f_{bd} (Mpa)
C20/25	20	2,3
C25/30	25	2,7
C30/37	30	3,0
C35/45	35	3,4
C40/50	40	3,7
C45/55	45	4,0
C50/60	50	4,3

F_{Rd} : Design ultimate load (N)
f_{bd} : Design value of the bond strength in N/mm²
Ø : Rebar diameter (mm)
η : depends on bond conditions - $\eta_1 = 1$ ("good bond" conditions). See § 8.4.2 (EN 1992-1-1)
η_2 : depends on rebar diameter - $\eta_2 = 1$ for Ørebar ≤ 32 mm

with α_2 : **Influence of concrete minimum cover**

$$\alpha_2 = 1 - 0{,}15\ (Cd - Ø_{rebar}) / Ø_{rebar} \geq 0{,}7$$

$$Cd = \min\left(C \,;\, C_1 \,;\, \frac{a}{2}\right)$$



with α_5 : **Influence of the confinement by transverse pressure**

The factor α_5 take into account of the effect of the pressure transverse to the plane of splitting along the design length.

$$\alpha_5 = 1 - 0{,}04 \cdot p \geq 0{,}7$$

where p is the transverse pressure at the ultimate limit state along L_{bd} in MPa.

p (Mpa)	α_5
3	0,88
5	0,8
7	0,72

Limit of this formula

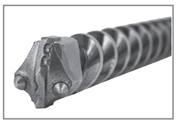
The max. anchor depth will be limited to 1500 mm with pneumatic injection tool.

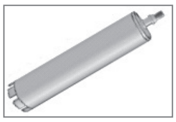
EPCON C8 XTREM

Post-installed rebar

Eurocode 2 table for straight rebar anchoring

CONCRETE C25/30 - HAMMER DRILLING/DIAMOND CORING





Rebar Ø (mm)	Drilling Ø d_0 (mm)	Length of anchor L_{bd} (mm)	Ultimate limit load (daN) without influence of center distance and/or edge [1] (α2 = 0,7)	Ultimate limit load (daN) with influence of center distance and/or edge [2] (α2 = 1)	Number of sealings per SPIT EPCON C8 cartridge [3]	
					450 ml	900 ml
8	10	100	969	679	132,6	265,3
		190	1842	1289	69,8	139,6
		225	2185	1530	58,8	117,7
		322	-	2185	41,2	82,4
10	12	121	1466	1026	89,7	179,4
		230	2787	1951	47,2	94,4
		282	3415	2391	38,5	77,0
		403		3415	27,0	53,9
12	15	145	2108	1476	40,7	81,3
		280	4072	2850	21,1	42,1
		338	4917	3442	17,4	34,9
		483	-	4917	12,2	24,4
14	18	169	2867	2007	22,1	44,1
		330	5598	3919	11,3	22,6
		395	6693	4685	9,5	18,9
		564	-	6693	6,6	13,2
16	20	193	3742	2619	17,2	34,4
		370	7174	5022	9,0	17,9
		451	8742	6119	7,4	14,7
		644	-	8742	5,1	10,3
20	25	242	5865	4105	8,8	17,5
		470	11391	7973	4,5	9,0
		564	13659	9561	3,8	7,5
		805	-	13659	2,6	5,3
25	32	302	9149	6404	4,0	7,9
		550	16662	11663	2,2	4,4
		704	21342	14939	1,7	3,4
		1006	-	21342	1,2	2,4
28	35	338	11468	8028	3,2	6,4
		600	20358	14250	1,8	3,6
		789	26770	18739	1,4	2,7
		1127	-	26770	1,0	1,9
32	40	386	14968	10477	2,1	4,3
		750	29082	20358	1,1	2,2
		901	34956	24469	0,9	1,8
		1288	-	34956	0,6	1,3
40	50	483	23411	16388	1,1	2,2
		800	38776	27143	0,7	1,3
		1127	54636	38245	0,5	0,9
		1500	-	50894	0,4	0,7

(1) Absence of edge distances greater than or equal to 7.Ø

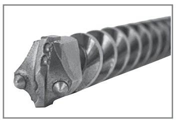
(2) Presence of edge distances and/or centre distances less than 7.Ø

(3) The number of fixings per cartridge is calculated taking into account an increasing by 20% the real volume of sealing.

$1,2 \times (d_0^2 - Ø_{rebar}^2) \times \Pi \times L_{bd}/4$

Eurocode 2 & Eurocode 8 table for straight rebar anchoring in seismic zone

CONCRETE C25/30 - HAMMER DRILLING



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DTA 3/11-684

Rebar Ø (mm)	Drilling Ø d_0 (mm)	Length of anchor L_{bd} (mm)	Ultimate limit load (daN) without influence of center distance and/or edge [1] (α2 = 0,7)	Ultimate limit load (daN) with influence of center distance and/or edge [2] (α2 = 1)	Number of sealings per SPIT EPCON C8 cartridge[3] 450 ml	Number of sealings per SPIT EPCON C8 cartridge[3] 900 ml
8	10	111	1076	753	119,5	239
		190	1842	1289	69,8	139,6
		259	2511	1758	51,2	102,4
		370	-	2511	35,8	71,7
10	12	139	1684	1179	78,1	156,1
		230	2787	1951	47,2	94,4
		324	3926	2748	33,5	67
		463		3927	23,4	46,9
12	15	167	2428	1700	35,3	70,6
		280	4072	2850	21,1	42,1
		389	5656	3960	15,2	30,3
		389	-	5655	15,2	30,3
14	18	194	3291	2304	19,2	38,5
		330	5598	3919	11,3	22,6
		453	7685	5379	8,2	16,5
		648	-	7697	5,8	11,5
16	20	222	4304	3013	14,9	29,9
		370	7174	5022	9	17,9
		518	10043	7030	6,4	12,8
		741	-	10053	4,5	9
20	25	278	6737	4716	7,6	15,3
		470	11391	7973	4,5	9
		648	15704	10993	3,3	6,5
		926		15708	2,3	4,6
25	32	347	10512	7358	3,4	6,9
		550	16662	11663	2,2	4,4
		810	24538	17177	1,5	3
		1157	-	24544	1	2,1
28	35	389	13198	9239	2,8	5,6
		650	22054	15438	1,7	3,3
		906	30740	21518	1,2	2,4
		1296	-	30781	0,8	1,7
32	40	444	17217	12052	1,9	3,7
		690	26756	18729	1,2	2,4
		1036	40172	28121	0,8	1,6
		1481	-	40199	0,6	1,1
40	50	556	26949	18865	1	1,9
		690	33444	23411	0,8	1,5
		900	43623	30536	0,6	1,2
		1500	-	50894	0,4	0,7

[1] Absence of edge distances greater than or equal to 7.Ø

[2] Presence of edge distances and/or centre distances less than 7.Ø

[3] The number of fixings per cartridge is calculated taking into account an increasing by 20% the real volume of sealing.

EPCON C8 XTREM

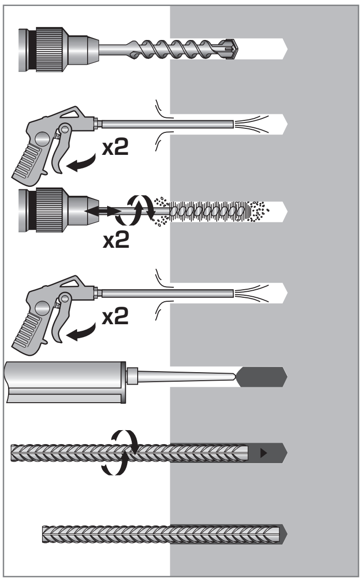
Rebar anchoring

Rebar anchoring system

EPCON C8

- EPOXY resin
- Slow drying time
- Storage time: 3 years
- Usable in wet environments
- Performance in diamond drilling
- Good fire performance
- Odour-free
- Easy injection
- No shrinkage after hardening
- NF mark overhead position
- Usable for concrete to -20°C

INSTALLATION*



***Premium cleaning :**
- 2 blowing with compressed air
- 2 brushing with brushed fitted on a drilling machine
- 2 blowing with compressed air

Sizing rules for steel reinforcement fixings for concrete using the bond strength

With SPIT EPCON C8 resin, the adhesion design calculations can be used to determine the anchoring lengths in the case of application without influence of edge or spacing distances.

Tensile tests are generally performed on site to validate the minimum anchoring lengths.

Mechanical characteristics of rebars

Nominal steel rebar Ø		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32	Ø40
Sections (cm^2)		0,503	0,785	1,13	1,54	2,01	3,14	4,91	8,04	12,57
Min. resistances to failure (kN)	Fe E400	21,13	32,97	47,46	64,68	84,42	131,88	206,22	337,68	527,94
	Fe E500	25,90	40,43	58,20	79,31	103,52	161,71	252,87	414,06	647,36
Ultimate limit load N_{Rd} (kN)	Fe E500	21,85	34,15	49,17	66,93	87,42	136,59	213,43	349,56	546,36

The mechanical characteristics of the high adhesion rebars are defined in the NFA 35-016 and NFA 35-017 standards.

Anchorage length calculated from the bond strength

From the bond strength of the SPIT EPCON Resin, the table below gives the minimum anchorage length for rebar Fe E500, in concrete class ≥ C20/25.

Nominal steel rebar Ø	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32	Ø40
Drilling Ø (mm)	10	12	15	18	20	25	32	40	50
Minimum anchorage length(mm)	120	150	180	210	245	305	380	485	605
Ultimate limit N_{Rd} (kN)	21,85	34,15	49,17	66,93	87,42	136,59	213,43	349,56	546,36
Nb. of sealing/cart. 450 ml	110	72	33	18	13	7	3	1,7	0,8

Calculation method

- **Characteristic bond strength :**

τ_{Rk} : 17,85 N/mm^2 issues from tests and from the calculation using the rebar dimater (available for rebar diameter Ø8 to Ø40 mm) [$\tau_{Rk} = \tau_{Ru,m}$ x 0,75].

- **Design bond strength τ_{Rd} :**

$$\tau_{Rk} = \frac{\tau_{Rk}}{\gamma_M = 2{,}16}$$

(γ_M : safety partial factor)

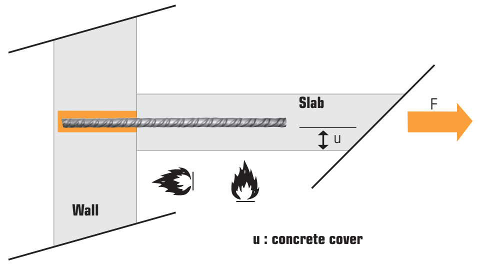
- **Calculation of the minimum anchorage length of the rebar :**

$$l_s = \frac{A_s \,.\, f_{yk}}{\Pi \,.\, Ø_{rebar} \,.\, \tau_{Rd}}$$

SPIT EPCON C8 injection systems in wall to slab connection with concrete reinforcing bar and subjected to fire exposure according the TEST REPORT n° 26007642/b from CSTB

CSTB Le futur en construction

Resistance to fire for steel reinforcement wall/slab



The present table is aimed at supplying data for the design of the injection anchoring system when exposed to fire. This study does not deal with the mechanical design at ambient temperature, neither does it deal with the design according to other accidental solicitations, these shall be done is addition.

The table below gives performance subjected to fire exposure in wall to slab connection with concrete reinforcing bar, with SPIT EPCON C8 resin, in concrete C20/25.

The values in white character specified the proof of requirements to fire is satisfied with η_{fi} = 0,7 in concrete class C20/25 (see method below).

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 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 L_s anchorage depth (ambiant temperature condition)

η_{fi} : Reduction factor for design load level in the fire situation η_{fi} equal to 0,7

Rebar Ø (mm)	Drilling Ø (mm)	L_s (mm)	Design resistance F_{Rdu} (kN) for Fe E500 rebar according to ETA in concrete class C20/25	Maximum load (kN) for Fe E500 rebar in case of fire	Design resistancel Rd,fi (kN) in case of fire according to Eurocode 2 for fire duration of 30 to 240 minutes — Fire duration (minutes)					
					R30	R60	R90	R120	R180	R240
Concrete cover (1) (mm)					10	20	25	35	50	70
8	10	120	5,8	16,2	4,1	1,4	0,8	0,6	0,5	0,6
		160	9,2		14,7	7,4	4,4	3,0	1,7	1,6
		200	11,6			14,6	9,5	7,0	4,4	3,6
		220	12,7				12,9	9,8	6,3	5,0
		260	15,0					16,2	11,4	8,5
		295	17,1						16,2	12,5
		325	18,8							16,2
Concrete cover (1) (mm)					10	20	25	35	50	70
10	12	120	8,7	25,3	7,2	3,0	1,7	1,2	1,0	0,9
		160	11,6		16,7	8,9	5,4	3,6	1,9	1,7
		190	13,7		25,3	14,9	9,7	6,9	3,8	3,3
		220	15,9			22,2	15,4	11,3	6,9	5,7
		240	17,3				19,9	15,0	9,6	7,8
		265	19,1				25,3	20,4	13,6	11,0
		290	21,0					25,3	18,4	14,8
		300	21,7						20,5	16,5
		350	25,3							25,3
Concrete cover (1) (mm)					12	20	25	35	50	70
12	16	120	10,4	36,4	7,6	3,2	2,1	1,7	1,5	1,4
		160	13,9		19,0	9,4	5,5	3,5	2,4	2,0
		180	15,6		25,6	13,7	8,6	5,4	3,6	2,7
		200	17,3		32,8	18,7	12,4	7,9	5,4	4,0
		220	19,1			24,4	16,8	14,8	7,8	5,7
		240	20,8			30,8	21,9	24,3	10,8	8,0
		280	24,3				34,0	30,0	18,6	14,1
		300	26,0					36,4	23,4	17,9
		320	27,7						28,8	22,3
		350	30,3						36,4	27,9
		375	32,5							36,4
Concrete cover (1) (mm)					14	20	25	35	50	70
14	18	140	14,2	49,6	13,7	5,7	3,6	3,0	2,4	2,3
		180	18,2		28,1	14,9	9,6	7,2	4,2	3,3
		200	20,2		36,5	20,9	14,5	11,7	7,1	5,2
		220	22,3		45,7	27,4	19,8	16,6	10,5	7,6
		240	24,3			34,5	25,7	21,8	14,3	10,5
		260	26,3			42,1	32,0	27,4	18,6	13,9
		300	30,3				46,1	39,7	28,4	22,0
		310	31,4				49,6	43,0	31,2	24,4
		330	33,4					49,6	37,0	29,4
		370	37,4						49,6	40,9
		400	40,5							49,5

(1) : Minimum concrete cover according Eurocode 2 - part 1.2

EPCON C8 XTREM

Fire resistance for post-installed rebar

Resistance to fire for steel reinforcement wall/slab

Rebar Ø (mm)	Drilling Ø (mm)	L_s (mm)	Design resistance F_{Rdu} (kN) for Fe E500 rebar according to ETA in concrete class C20/25	Maximum load (kN) for Fe E500 rebar in case of fire	Design resistance $R_{d,fi}$ (kN) in case of fire according to Eurocode 2 for fire duration of 30 to 240 minutes — Fire duration (minutes) R30	R60	R90	R120	R180	R240
Concrete cover [1] (mm)					16	20	25	35	50	70
16	20	160	18,5	64,8	22,6	10,5	5,8	4,8	3,6	3,4
		200	20,8		31,7	15,4	8,9	6,9	4,6	4,1
		220	25,4		51,2	28,6	19,0	14,7	9,3	7,1
		240	27,7		61,5	36,3	25,2	19,9	12,8	9,7
		280	32,4			54,2	40,1	32,6	22,2	16,9
		300	34,7			64,2	48,7	40,2	28,0	21,6
		320	37,0				58,1	48,6	34,6	26,9
		335	38,7				64,8	55,4	40,0	31,4
		355	41,0					64,8	48,0	37,9
		395	45,7						64,8	53,0
		425	49,1							64,8
Concrete cover [1] (mm)					20	20	25	35	50	70
20	25	160	23,1	101,2	48,6	20,6	13,4	10,7	7,9	6,9
		180	26,0		61,0	29,5	19,5	15,2	10,4	8,1
		200	28,9		73,8	39,4	27,5	21,9	15,0	11,4
		220	31,8		87,0	49,8	36,1	29,1	20,2	15,4
		240	34,7		100,4	60,8	45,3	37,1	26,1	20,1
		250	36,1		101,2	63,7	47,7	39,1	27,7	21,4
		280	40,5			84,4	65,6	54,8	39,9	31,5
		305	44,1			101,2	82,5	69,9	52,1	42,0
		340	49,1				101,2	89,2	68,2	56,1
		360	52,0					101,2	80,9	67,4
		400	57,8						101,2	87,9
		425	61,4							101,2
Concrete cover [1] (mm)					25	25	25	35	50	70
25	30	250	45,2	158,1	104,3	50,0	30,6	24,5	17,7	15,1
		290	52,4		140,2	78,6	53,2	45,8	31,1	24,9
		310	56,0		157,4	93,5	65,8	57,4	39,7	32,0
		315	56,9		158,1	97,3	69,1	60,3	42,0	33,9
		350	63,2			124,6	92,8	82,1	59,4	48,5
		395	71,4			158,1	126,0	112,7	85,1	70,7
		440	79,5				158,1	146,0	114,7	96,7
		460	83,1					158,1	129,1	109,5
		470	84,9						136,6	116,2
		500	90,3						158,1	137,4
		530	95,7							158,1
Concrete cover [1] (mm)					32	32	32	35	50	70
32	40	320	74,0	259,0	218,2	127,2	79,6	59,7	44,5	37,3
		340	78,6		240,5	148,5	98,5	75,1	58,2	48,8
		360	83,2		259,0	169,8	117,7	92,1	72,5	61,1
		440	101,7			255,9	197,0	164,4	135,5	116,8
		445	102,9			259,0	202,1	169,1	139,7	120,6
		500	115,9				259,0	223,0	188,7	165,2
		505	116,8					228,1	193,3	169,4
		540	129,9					259,0	226,9	200,5
		575	133,0						259,0	233,4
		605	139,9							259,0
Concrete cover [1] (mm)					40	40	40	40	50	70
40	50	400	115,6	404,7	400,5	268,8	194,6	143,5	102,4	88,7
		430	124,3			314,0	234,4	179,4	137,9	112,2
		490	141,6			402,1	316,0	255,1	206,8	175,5
		495	143,1			404,7	322,8	261,5	212,7	181,1
		555	160,4				404,7	339,0	284,1	248,2
		605	174,9					404,7	345,4	306,8
		610	176,3						351,6	312,8
		640	185,0						404,7	377,1
		655	189,3						389,3	349,2
		685	198,0							404,7

(1) : Minimum concrete cover according Eurocode 2 - part 1.2

Example :

- **Application:**
  - Design of works for Ø20 in park
  - Requirement : fire duation 3 hours
  - Ultimate load : 110 kN
- **Ambient temperature:** Anchoring depth according to EC2 rules for ultimate load of 110 kN in concrete class C25/30

$$L_s = \frac{F_{Rdu}}{\pi \cdot f_{bd} \cdot ø\ rebar} = \frac{110}{\pi \times 2{,}7 \times 20}$$

L_s = 648 mm

- **Fire proof :** fire duration 3 hours for one anchoring depth equal to 648 mm

$R_{d,fi\ (240\ min)}$ = 101,2 kN > 77 kN (=0,7 x 110 kN)

SPIT EPCON C8 injection systems in wall to beam connection with concrete reinforcing bar and subjected to fire exposure according the TEST REPORT n° 26007642/b from CSTB

Le futur en construction

Reinforcement frame with 3 layers of reinforcement

The table below gives performance subjected to fire exposure in wall to beam connection (width 20, 30 and «40 cm and more») with concrete reinforcing bar, with SPIT EPCON C8 resin, in concrete C20/25, in take into account the exposure on 3 sides.

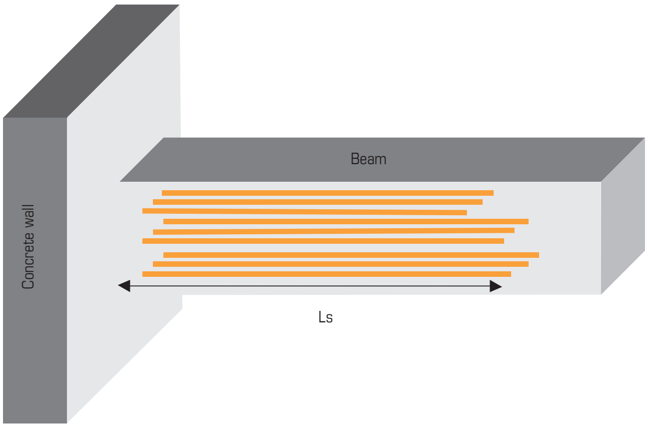
Design method for resistance to fire according to Eurocode 2: Fire proof using design resistance $R_{d,fi} \leq E_{d,fi}$

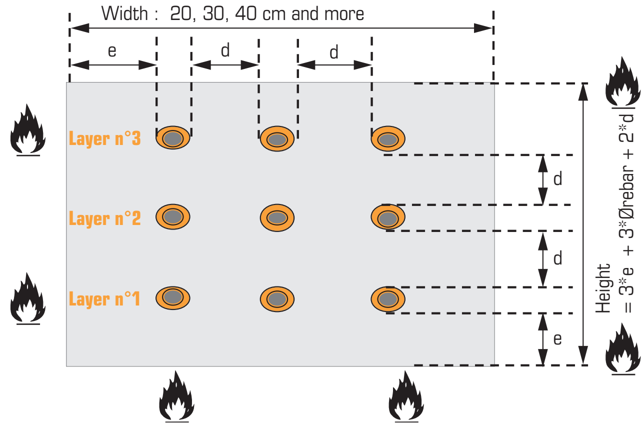
$R_{d,fi}$: Design resistance in the fire situation

$E_{d,fi}$: Design effect of actions in the fire situation. This value could be calculated from the 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 L_s anchorage depth (ambiant temperature condition)

η_{fi} : Reduction factor for design load level in the fire situation η_{fi} equal to 0,7





Beam's width = 40 cm and more

Rebar Ø (mm)	Drilling Ø (mm)	Distance between layers (mm)	Rebar maximum load $R_{d,fi}$ in case of fire (kN)	Layers identification	Rebar anchorage depth (L_s in mm) for layers 1, 2 and 3 for the rebar maximum load in case of fire (rebar Fe E500) — Fire duration (minutes) R30	R60	R90	R120	R180	R240
Concrete cover (e) (mm)					28	52	70	85	110	136
8	**10**	60	16,2	layer n°1	157	194	221	243	280	309
				layer n°2	147	181	206	227	263	293
				layer n°3	145	176	199	219	253	283
10	**12**	60	25,3	layer n°1	172	211	239	263	301	333
				layer n°2	162	198	224	247	285	317
				layer n°3	161	193	218	239	276	308
12	**16**	60	36,4	layer n°1	187	227	256	280	321	355
				layer n°2	177	214	241	265	305	339
				layer n°3	175	209	235	257	296	330
14	**18**	60	49,6	layer n°1	202	242	272	297	339	374
				layer n°2	192	229	258	282	323	359
				layer n°3	190	225	251	274	314	350
16	**20**	60	64,8	layer n°1	217	242	287	313	356	392
				layer n°2	207	229	273	298	341	378
				layer n°3	205	225	251	290	331	369
20	**25**	75	101,2	layer n°1	246	286	317	344	388	427
				layer n°2	235	271	300	325	369	408
				layer n°3	234	269	296	319	361	399
25	**30**	90	158,1	layer n°1	282	323	354	381	427	466
				layer n°2	270	306	335	360	405	446
				layer n°3	270	305	332	355	398	438
32	**40**	120	259,0	layer n°1	333	373	405	432	479	516
				layer n°2	321	356	384	409	454	493
				layer n°3	321	356	383	406	449	487
40	**47**	141	404,7	layer n°1	400	431	463	490	537	574
				layer n°2	400	414	442	466	510	550
				layer n°3	400	414	441	464	505	542

EPCON C8 XTREM

Fire resistance for post-installed rebar

Beam's width = 30 cm

Rebar Ø (mm)	Drilling Ø (mm)	Distance between layers (mm)	Rebar maximum load $R_{d,fi}$ in case of fire (kN)	Layers identification	Rebar anchorage depth (L_s in mm) for layers 1, 2 and 3 for the rebar maximum load in case of fire (rebar Fe E500) — Fire duration (minutes): R30	R60	R90	R120	R180 [1]	R240 [1]
Concrete cover (e) (mm)					30	55	80	85		
8	**10**	60	16,2	layer n°1	156	193	216	245		
				layer n°2	146	179	201	231		
				layer n°3	144	175	195	224		
10	**12**	60	25,3	layer n°1	172	209	235	265		
				layer n°2	161	196	219	250		
				layer n°3	159	192	213	244		
12	**16**	60	36,4	layer n°1	187	225	251	282		
				layer n°2	176	196	237	268		
				layer n°3	159	192	231	262		
14	**18**	60	49,6	layer n°1	201	241	267	299		
				layer n°2	191	227	253	285		
				layer n°3	189	223	262	279		
16	**20**	60	64,8	layer n°1	216	256	283	315		
				layer n°2	206	242	268	301		
				layer n°3	204	238	262	295		
20	**25**	75	101,2	layer n°1	204	238	262	295		
				layer n°2	234	269	295	329		
				layer n°3	233	267	291	324		
25	**30**	90	158,1	layer n°1	281	321	350	382		
				layer n°2	269	305	331	364		
				layer n°3	269	303	328	364		
32	**40**	120	259,0	layer n°1	332	372	401	433		
				layer n°2	320	355	380	413		
				layer n°3	320	354	379	411		
40	**47**	141	404,7	layer n°1	400	430	459	492		
				layer n°2	400	412	437	471		
				layer n°3	400	412	437	469		

Beam's width = 20 cm

Rebar Ø (mm)	Drilling Ø (mm)	Distance between layers (mm)	Rebar maximum load $R_{d,fi}$ in case of fire (kN)	Layers identification	Rebar anchorage depth (L_s in mm) for layers 1, 2 and 3 for the rebar maximum load in case of fire (rebar Fe E500) — Fire duration (minutes): R30	R60	R90	R120 [1]	R180 [1]	R240 [1]
Concrete cover (e) (mm)					30	55	80			
8	**10**	60	16,2	layer n°1	156	194	224			
				layer n°2	146	183	214			
				layer n°3	144	179	211			
10	**12**	60	25,3	layer n°1	172	211	242			
				layer n°2	161	200	232			
				layer n°3	160	196	229			
12	**16**	60	36,4	layer n°1	187	227	259			
				layer n°2	177	200	249			
				layer n°3	175	212	246			
14	**18**	60	49,6	layer n°1	201	242	275			
				layer n°2	191	231	266			
				layer n°3	189	228	262			
16	**20**	60	64,8	layer n°1	216	257	290			
				layer n°2	206	246	281			
				layer n°3	204	243	278			
20	**25**	75	101,2	layer n°1	245	287	320			
				layer n°2	234	274	309			
				layer n°3	233	272	307			
25	**30**	90	158,1	layer n°1	281	323	357			
				layer n°2	270	309	345			
				layer n°3	269	308	344			
32	**40**	120	259,0	layer n°1	332	374	408			
				layer n°2	320	359	395			
				layer n°3	320	359	395			
40	**47**	141	404,7	layer n°1	400	432	466			
				layer n°2	400	417	453			
				layer n°3	400	417	453			

[1] The fire duration are limited in accordance with beams' widths, according to Eurocode 2 part 1.2.

EPOBAR/EPOMAX

Post-installed rebar

Rebar anchoring system

ETA TR 023- 08/0201

EPOBAR/EPOMAX

- EPOXY acrylate resin
- Fast cure time
- Storage time 16 months
- Usable in wet environments
- Good fire performance
- Cartridge compatible with standard injection gun
- Usable with XTD dust free drill bit

FIRE BEHAVIOUR

- see page 130 to 133

CSTB
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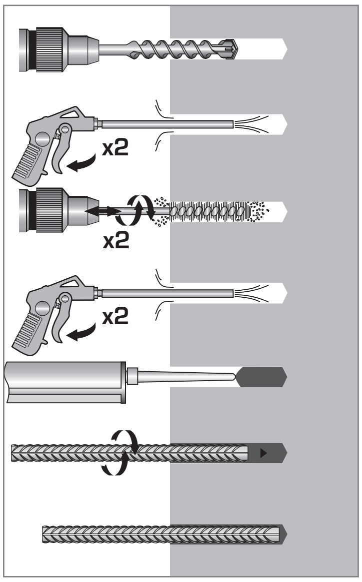
PV 553030516
PV 26007642-a

INSTALLATION*



***Premium cleaning :**
- 2 blowing with compressed air
- 2 brushing with brushed fitted on a drilling machine
- 2 blowing with compressed air

Mechanical characteristics of rebars

Nominal steel rebar Ø		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32	Ø40
Sections (cm²)		0,503	0,785	1,13	1,54	2,01	3,14	4,91	8,04	12,57
Min. resistances to failure (kN)	Fe E400	21,13	32,97	47,46	64,68	84,42	131,88	206,22	337,68	527,94
	Fe E500	25,90	40,43	58,20	79,31	103,52	161,71	252,87	414,06	647,36
Ultimate limit load N_{Rd} (kN)	Fe E500	21,85	34,15	49,17	66,93	87,42	136,59	213,43	349,56	546,36

The mechanical characteristics of the high adhesion rebars are defined in the NFA 35-016 and NFA 35-017 standards.

Setting time

EPOBAR resin

Ambient temperature	Max. time for installation	Curing time	
		Dry concrete	Wet concrete
40°C	3 min	50 min.	1 h 40 min.
30°C to 39°C	3 min.	1 h 5 min.	2 h 10 min.
20°C to 29°C	6 min.	1 h 50 min.	3 h 40 min.
10°C to 19°C	11 min.	3 h 10 min.	6 h 20 min.
5°C to 9°C	22 min.	4 h 10 min.	8 h 20 min.
0°C to 4°C (1)	48 min.	5 h 15 min.	10 h 30 min.
-5°C to -1°C (1)	120 min.	6 h 40 min.	13 h 20 min.

(1) the cartridge temperature must be ≥ to 5°C

EPOMAX resin

Ambient temperature	Max. time for installation	Curing time	
		Dry concrete	Wet concrete
40°C	1 min	30 min	60 min
30°C	3 min	35 min	1 h 10 min
20°C	6 min	40 min	1 h 20 min
10°C	11 min	60 min	2 hours
0°C	22 min	3 h 30 min	7 hours
-5°C	75 min	12 hours	24 hours

Sizing rules for steel reinforcement fixings for concrete according to eurocode 2 regulations and ETA 08/0201

The basic anchorage length $L_{b,rqd}$ (mm) for the ultimate limit load for rebar F_{Rd} (N) is given by following equation:

$$L_{b,rqd} = \frac{F_{Rd}}{\Pi \cdot Ø \cdot \eta_1 \cdot \eta_2 \cdot f_{bd}}$$

The design anchorage length L_{bd} (mm) is determined as follow:

$L_{bd} = L_{b,rqd} \cdot \alpha_2 \cdot \alpha_5$

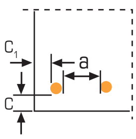
Concrete class	f_{ck} (Mpa)	f_{bd} (Mpa)
C20/25	20	2,3
C25/30	25	2,7
C30/37	30	3,0
C35/45	35	3,4
C40/50	40	3,7
C45/55	45	4,0
C50/60	50	4,3

F_{Rd} : Design ultimate load (N)
f_{bd} : Design value of the bond strength in N/mm²
Ø : Rebar diameter (mm)
η : depends on bond conditions - η_1 =1 ("good bond" conditions). See § 8.4.2 (EN 1992-1-1)
η_2 : depends on rebar diameter - η_2 = 1 for Ørebar ≤ 32 mm

with α_2 : **Influence of concrete minimum cover**

$\alpha_2 = 1 - 0,15 \, (Cd - Ø_{rebar}) / Ø_{rebar} \geq 0,7$

$Cd = \min\left(C \, ; \, C_1 \, ; \frac{a}{2}\right)$



with α_5 : **Influence of the confinement by transverse pressure**

The factor α_5 take into account of the effect of the pressure transverse to the plane of splitting along the design length.

$\alpha_5 = 1 - 0,04 \, . \, p \geq 0,7$
where p is the transverse pressure at the ultimate limit state along L_{bd} in MPa.

p (Mpa)	α_5
3	0,88
5	0,8
7	0,72

Limit of this formula

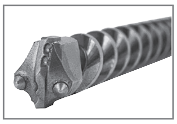
The max. anchor depth will be limited to 900 mm with pneumatic injection tool.

EPOBAR

Post-installed rebar

Eurocode 2 table for straight rebar anchoring

CONCRETE C25/30 - HAMMER DRILLING



Rebar Ø (mm)	Drilling Ø d_0 (mm)	Length of anchor L_{bd} (mm)	Ultimate limit load (daN) without influence of center distance and/or edge [1] (α2 = 0,7)	Ultimate limit load (daN) with influence of center distance and/or edge [2] (α2 = 1)	Number of sealings per SPIT EPOBAR cartridge [3] 410 ml	Number of sealings per SPIT EPOBAR cartridge [3] 825 ml
8	10	100	969	679	120,8	243,2
		190	1842	1289	63,6	128,0
		225	2185	1530	53,6	107,9
		322	-	2185	37,5	75,5
10	12	121	1466	1026	81,7	164,4
		230	2787	1951	43,0	86,5
		282	3415	2391	35,1	70,6
		403	-	3415	24,6	49,4
12	15	145	2108	1476	37,0	74,5
		280	4072	2850	19,2	38,6
		338	4917	3442	15,9	32,0
		483	-	4917	11,1	22,4
14	18	169	2867	2007	20,1	40,5
		330	5598	3919	10,3	20,7
		395	6693	4685	8,6	17,3
		564	-	6693	6,0	12,1
16	20	193	3742	2619	15,7	31,5
		370	7174	5022	8,2	16,4
		451	8742	6119	6,7	13,5
		644	-	8742	4,7	9,4
20	25	242	5865	4105	8,0	16,1
		470	11391	7973	4,1	8,3
		564	13659	9561	3,4	6,9
		805	-	13659	2,4	4,8
25	32	302	9149	6404	3,6	7,3
		550	16662	11663	2,0	4,0
		704	21342	14939	1,5	3,1
		1006	-	21342	1,1	2,2
28	35	338	11468	8028	2,9	5,9
		600	20358	14250	1,6	3,3
		789	26770	18739	1,3	2,5
		1127	-	26770	0,9	1,8
32	40	386	14968	10477	2,0	3,9
		750	29082	20358	1,0	2,0
		900	34956	24469	0,8	1,7
		1200	-	32572	0,6	1,3

[1] Absence of edge distances greater than or equal to 7.Ø

[2] Presence of edge distances and/or centre distances less than 7.Ø

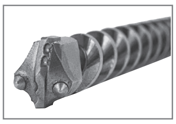
[3] The number of fixings per cartridge is calculated taking into account an increasing by 20% the real volume of sealing.

$1{,}2 \times (d_0^2 - Ø_{rebar}^2) \times \Pi \times L_{bd}/4$

Chemical rebars

Eurocode 2 table for straight rebar anchoring

CONCRETE C25/30 - HAMMER DRILLING



Rebar Ø (mm)	Drilling Ø d_0 (mm)	Length of anchor L_{bd} (mm)	Ultimate limit load (daN) without influence of center distance and/or edge [1] (α2 = 0,7)	Ultimate limit load (daN) with influence of center distance and/or edge [2] (α2 = 1)	Number of sealings per SPIT EPOMAX cartridge[3] 380 ml
8	10	100	969	679	112,0
		190	1842	1289	58,9
		225	2185	1530	49,7
		322	-	2185	34,8
10	12	121	1466	1026	75,7
		230	2787	1951	39,8
		282	3415	2391	32,5
		403		3415	22,8
12	15	145	2108	1476	34,3
		280	4072	2850	17,8
		338	4917	3442	14,7
		483	-	4917	10,3
14	18	169	2867	2007	18,6
		330	5598	3919	9,5
		395	6693	4685	8,0
		564		6693	5,6
16	20	193	3742	2619	14,5
		370	7174	5022	7,6
		451	8742	6119	6,2
		644	-	8742	4,3
20	25	242	5865	4105	7,4
		470	11391	7973	3,8
		564	13659	9561	3,2
		805		13659	2,2
25	32	302	9149	6404	3,3
		550	16662	11663	1,8
		704	21342	14939	1,4
		900	-	19085	1,1
28	35	338	11468	8028	2,7
		650	22054	15438	1,4
		750	25447	17813	1,2
		900	-	21375	1,0
32	40	386	14968	10477	1,8
		550	21327	14929	1,3
		700	27143	19000	1,0
		900	-	24429	0,8

[1] Absence of edge distances greater than or equal to 7.Ø

[2] Presence of edge distances and/or centre distances less than 7.Ø

[3] The number of fixings per cartridge is calculated taking into account an increasing by 20% the real volume of sealing.

EPOMAX/EPOBAR

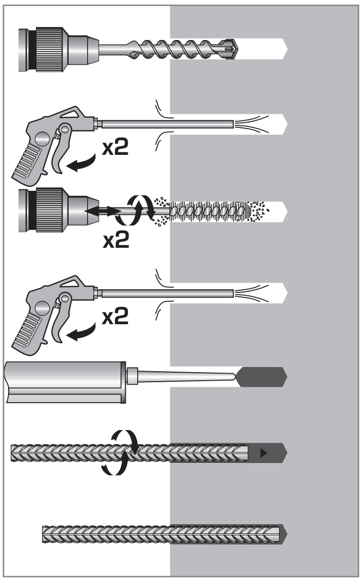
Rebar anchoring

Rebar anchoring system

EPOBAR/EPOMAX

- EPOXY acrylate resin
- Quick drying time
- Storage time 16 months
- Usable in wet environments
- Good fire performance
- Cartridge compatible with standard injection gun

INSTALLATION*



***Premium cleaning :**
- 2 blowing with compressed air
- 2 brushing with brushed fitted on a drilling machine
- 2 blowing with compressed air

Sizing rules for steel reinforcement fixings for concrete using the bond strength

With SPIT EPOBAR/EPOMAX resins, the adhesion design calculations can be used to determine the anchoring lengths in the case of application without influence of edge or spacing distances.

Tensile tests are generally performed on site to validate the minimum anchoring lengths.

Mechanical characteristics of rebars

Nominal steel rebar Ø		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32	Ø40
Sections (cm^2)		0,503	0,785	1,13	1,54	2,01	3,14	4,91	8,04	12,57
Min. resistances to failure (kN)	Fe E400	21,13	32,97	47,46	64,68	84,42	131,88	206,22	337,68	527,94
	Fe E500	25,90	40,43	58,20	79,31	103,52	161,71	252,87	414,06	647,36
Ultimate limit load N_{Rd} (kN)	Fe E500	21,85	34,15	49,17	66,93	87,42	136,59	213,43	349,56	546,36

The mechanical characteristics of the high adhesion rebars are defined in the NFA 35-016 and NFA 35-017 standards.

Anchorage length calculated from the bond strength

From the bond strength of the SPIT EPOBAR/EPOMAX Resins, the table below gives the minimum anchorage length for rebar Fe E500, in concrete class ≥ C20/25.

Nominal steel rebar Ø	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32	Ø40
Drilling Ø (mm)	10	12	15	18	20	25	32	40	50
Minimum anchorage length (mm)	120	150	180	210	245	305	380	485	605
Ultimate limit N_{Rd} (kN)	21,85	34,15	49,17	66,93	87,42	136,59	213,43	349,56	546,36
Nb. of sealing/cart. 380 ml	110	72	33	18	13	7	3	1,7	0,8
Nb. of sealing/cart. 410 ml	100	66	30	16	12	6	3	1,6	0,8
Nb. of sealing/cart. 825 ml	202	132	60	32	25	13	6	3,1	1,6

Calculation method

- **Characteristic bond strength :**

τ_{Rk} : 17,85 N/mm² issues from tests and from the calculation using the rebar dimater (available for rebar diameter Ø8 to Ø40 mm) [$\tau_{Rk} = \tau_{Ru,m} \times 0,75$].

- **Design bond strength τ_{Rd} :**

$$\tau_{Rk} = \frac{\tau_{Rk}}{\gamma_M = 2,16}$$

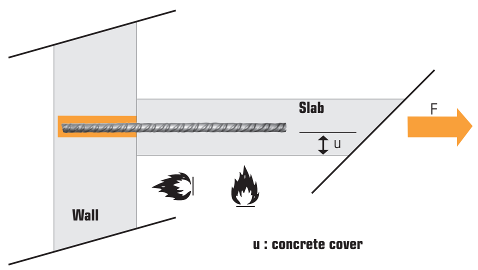
(γ_M : safety partial factor)

- **Calculation of the minimum anchorage length of the rebar :**

$$l_s = \frac{A_s \, . \, f_{yk}}{\Pi \, . \, Ø_{rebar} \, . \tau_{Rd}}$$

SPIT EPOBAR injection systems in wall to slab connection with concrete reinforcing bar and subjected to fire exposure according to the TEST REPORT ref. 26007642/a

Resistance to fire for steel reinforcement wall/slab



The present table is aimed at supplying data for the design of the injection anchoring system when exposed to fire. This study does not deal with the mechanical design at ambient temperature, neither does it deal with the design according to other accidental solicitations, these shall be done is addition.

The table below gives performance subjected to fire exposure in wall to slab connection with concrete reinforcing bar, with SPIT EPOBAR resin, in concrete C20/25.

The values in white character specified the proof of requirements to fire is satisfied with η_{fi} = 0,7 in concrete class C20/25 (see method below).

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 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 L_s anchorage depth (ambiant temperature condition)

η_{fi} : Reduction factor for design load level in the fire situation η_{fi} equal to 0,7

Rebar Ø (mm)	Drilling Ø (mm)	L_s (mm)	Design resistance F_{Rdu} (kN) for Fe E500 rebar according to ETA in concrete class C20/25	Maximum load (kN) for Fe E500 rebar in case of fire	Design resistancel $R_{d,fi}$ (kN) in case of fire according to Eurocode 2 for fire duration of 30 to 240 minutes					
					Fire duration (minutes)					
					R30	R60	R90	R120	R180	R240
Concrete cover [1] (mm)					10	20	25	35	50	70
		120	6,9		6,3	2,7	1,6	1,2	0,8	0,9
		185	10,7		16,2	10,1	6,7	5,1	3,3	2,9
		220	12,7			16,2	11,3	8,8	6,0	4,9
8	10	250	14,5	16,2			16,2	12,8	9,0	7,1
		275	15,9					16,2	12,1	9,3
		305	17,6						16,2	12,4
		340	19,7							16,2
Concrete cover [1] (mm)					10	20	25	35	50	70
		140	10,1		10,1	5,3	3,4	2,4	1,5	1,4
		180	13,0		19,1	11,3	7,6	5,5	3,4	3,1
		205	14,8		25,3	15,8	11,1	8,3	5,3	4,7
10	12	250	18,1	25,3		25,3	19,2	15,0	10,3	8,7
		280	20,2				25,3	20,7	14,6	12,2
		305	22,0					25,3	18,9	15,6
		340	24,6						25,3	21,2
		365	26,4							25,3
Concrete cover [1] (mm)					12	20	25	35	50	70
		160	13,9		16,4	8,6	5,5	3,8	2,8	2,4
		230	19,9		36,4	23,3	17,0	11,9	9,0	7,0
		260	22,5			31,6	23,8	17,2	13,4	10,5
		280	24,3			36,4	28,9	21,4	16,9	13,3
		300	26,0				34,5	26,0	20,8	16,5
12	16	310	26,9	36,4			36,4	28,5	22,9	18,2
		320	27,7					31,1	25,2	20,0
		340	29,5					36,04	30,1	24,0
		365	31,6						36,4	29,5
		380	32,9							33,1
		395	34,2							36,4
Concrete cover [1] (mm)					14	20	25	35	50	70
		180	18,2		24,0	13,5	9,1	7,1	4,6	3,8
		250	25,3		49,6	32,5	25,0	21,6	15,1	11,8
		280	28,3			42,1	33,1	28,8	20,9	16,5
14	18	305	30,9	49,6		49,6	40,0	35,3	26,3	21,1
		335	33,9				49,6	43,7	33,4	27,4
		360	36,4					49,6	39,9	33,2
		380	38,4						49,6	42,2
		425	43,0							49,6

(1) : Minimum concrete cover according Eurocode 2 - part 1.2

Resistance to fire for steel reinforcement wall/slab

Rebar Ø (mm)	Drilling Ø (mm)	L_s (mm)	Design resistance F_{Rdu} (kN) for Fe E500 rebar according to ETA in concrete class C20/25	Maximum load (kN) for Fe E500 rebar in case of fire	Design resistancel $R_{d,fi}$ (kN) in case of fire according to Eurocode 2 for fire duration of 30 to 240 minutes					
					Fire duration (minutes)					
					R30	R60	R90	R120	R180	R240
Concrete cover (1) (mm)					10	20	25	35	50	70
		160	18,5		19,9	9,9	5,9	4,9	3,9	3,6
		200	23,1		34,8	19,2	12,7	10,1	6,9	5,8
		220	25,4		42,7	25,0	17,3	13,9	9,4	7,6
		240	27,7		50,9	31,3	22,5	18,2	12,5	10,0
		275	31,8		64,8	43,7	33,0	27,3	19,3	15,4
		300	34,7			53,6	41,5	34,9	25,3	20,2
16	**20**	330	38,2	64,8		64,8	53,1	45,3	33,6	27,1
		340	39,3				57,2	49,0	36,7	29,6
		360	41,6				64,8	57,0	43,3	35,1
		380	43,9					64,8	50,4	41,2
		400	46,2						58,2	47,7
		420	48,6						64,8	54,8
		450	52,0							64,8
Concrete cover (1) (mm)					20	20	25	35	50	70
		200	28,9		41,4	19,0	13,0	10,7	8,2	7,2
		240	34,7		61,5	34,4	24,9	20,3	14,6	11,7
		280	40,5		82,5	51,8	39,5	33,0	24,2	19,4
		315	45,5		101,2	68,1	53,9	45,7	34,3	27,8
20	**25**	380	54,9	101,2		101,2	84,1	73,0	57,0	47,7
		415	60,0				101,2	89,8	71,4	60,7
		440	63,6					101,2	82,7	70,9
		480	69,4						101,2	89,0
		505	73,0							101,2
Concrete cover (1) (mm)					25	25	25	35	50	70
		250	45,2		86,6	44,2	28,4	23,3	17,5	15,2
		310	56,0		128,3	79,1	57,3	50,5	36,5	30,3
		360	65,0		158,1	110,2	84,8	75,9	57,3	48,1
		400	72,3			136,3	108,6	98,1	76,4	64,9
25	**30**	435	78,6	158,1		158,1	130,9	118,8	95,0	81,4
		480	86,7				158,1	147,2	121,4	105,1
		500	90,3					158,1	134,1	116,6
		540	97,5						158,1	140,9
		570	103,0							158,1
Concrete cover (1) (mm)					32	32	32	35	50	70
		320	74,0		177,9	108,0	70,4	54,4	41,8	35,9
		350	80,9		204,1	133,2	93,2	73,8	59,1	50,7
		380	87,9		230,4	158,5	116,5	94,8	77,3	66,8
		415	96,0		259,0	188,2	144,1	120,2	99,6	86,8
32	**40**	500	115,6	259		259,0	213,2	185,6	159,1	141,1
		555	128,3				259,0	230,8	201,5	180,6
		590	136,4					259,0	230,1	207,5
		625	144,5						259,0	235,8
		655	151,4							259,0
Concrete cover (1) (mm)					40	40	40	40	50	70
		400	115,6		322,5	222,5	165,3	125,2	92,3	80,9
		430	124,3		359,3	257,9	196,8	153,9	121,1	101,0
		460	133,0		395,2	292,8	228,9	183,9	148,5	126,4
		470	135,8		404,7	304,3	239,7	193,9	157,8	135,0
40	**50**	560	161,9	404,7		404,7	336,5	285,8	242,9	215,4
		625	180,6				404,7	361,2	312,2	284,0
		675	195,1					404,7	357,2	326,1
		725	209,5						404,7	377,1
		755	218,2							404,7

(1) : Minimum concrete cover according Eurocode 2 - part 1.2

Example :

- **Application :**
  - Design of works for Ø16 rebar in park
  - Requirement : fire duration 3 hours
  - Ultimate load : 46 kN
- **Ambient temperature :** Anchoring depth according to EC2 rules for ultimate load of 46 kN in concrete class C20/25

$$L_s = \frac{F_{Rdu}}{\pi \cdot f_{bd} \cdot ø\ rebar} = \frac{46{,}10^3}{\pi \times 2{,}3 \times 16}$$

$$L_s = 397\ mm$$

- **Fire proof :** fire duration 3 hours for one anchoring depth equal to 397 mm

$R_{d,fi(180\ min)}$ = 58,2 kN > 32,2 kN [=0,7 x 46 kN]

SPIT EPOBAR injection systems in wall to beam connection with concrete reinforcing bar and subjected to fire exposure according the TEST REPORT n° 26007642/a from CSTB

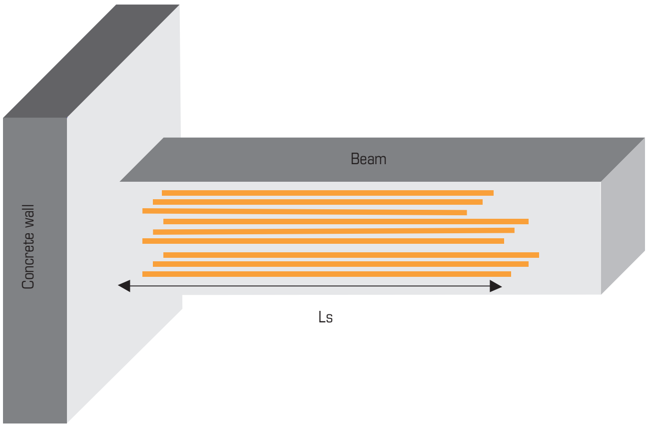
CSTB
Le futur en construction

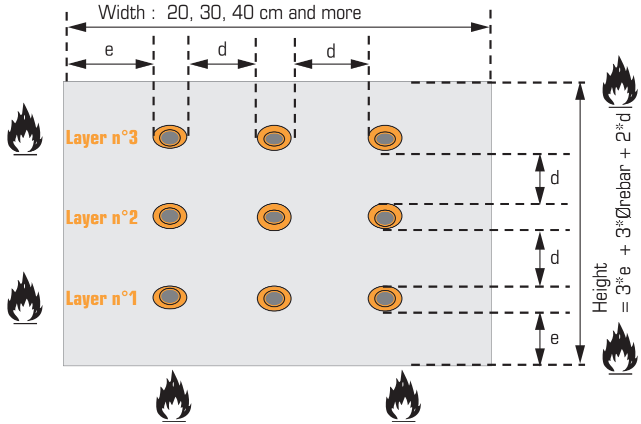
Reinforcement frame with 3 layers of reinforcement

The table below gives performance subjected to fire exposure in wall to beam connection (width 20, 30 and «40 cm and more») with concrete reinforcing bar, with SPIT EPOBAR resin, in concrete C20/25, in take into account the exposure on 3 sides.

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 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 L_s anchorage depth (ambiant temperature condition)
η_{fi} : Reduction factor for design load level in the fire situation η_{fi} equal to 0,7





Beam's width = 40 cm and more

Rebar Ø (mm)	Drilling Ø (mm)	Distance between layers (mm)	Rebar maximum load $R_{d,fi}$ in case of fire (kN)	Layers identification	Rebar anchorage depth (L_s in mm) for layers 1, 2 and 3 for the rebar maximum load in case of fire (rebar Fe E500) — Fire duration (minutes)					
					R30	**R60**	**R90**	**R120**	**R180**	**R240**
Concrete cover (e) (mm)					**28**	**52**	**70**	**85**	**110**	**136**
8	**10**	60	16,2	layer n°1	169	206	233	255	292	321
				layer n°2	160	193	218	239	275	305
				layer n°3	158	189	212	231	266	296
10	**12**	60	25,3	layer n°1	189	226	255	278	316	348
				layer n°2	179	213	240	262	300	332
				layer n°3	177	209	233	254	291	323
12	**16**	60	36,4	layer n°1	207	246	275	299	339	373
				layer n°2	197	233	260	283	323	358
				layer n°3	195	228	254	276	314	348
14	**18**	60	49,6	layer n°1	226	265	294	319	361	395
				layer n°2	216	252	280	303	345	380
				layer n°3	214	247	273	296	336	372
16	**20**	60	64,8	layer n°1	244	283	313	338	381	417
				layer n°2	234	270	299	323	365	402
				layer n°3	233	266	292	315	356	393
20	**25**	75	101,2	layer n°1	281	320	350	376	420	457
				layer n°2	270	305	333	357	400	439
				layer n°3	269	303	329	351	392	431
25	**30**	90	158,1	layer n°1	327	366	397	423	467	503
				layer n°2	316	350	378	402	445	484
				layer n°3	315	349	375	397	439	476
32	**40**	120	259,0	layer n°1	392	431	461	487	532	568
				layer n°2	380	414	440	464	507	545
				layer n°3	380	413	439	461	502	538
40	**47**	141	404,7	layer n°1	466	505	535	561	606	642
				layer n°2	454	487	513	537	579	617
				layer n°3	454	487	513	535	574	609

EPOBAR

Fire resistance for post-installed rebar

Beam's width = 30 cm

Rebar Ø (mm)	Drilling Ø (mm)	Distance between layers (mm)	Rebar maximum load $R_{d,fi}$ in case of fire (kN)	Layers identification	Rebar anchorage depth (L_s in mm) for layers 1, 2 and 3 for the rebar maximum load in case of fire (rebar Fe E500) – Fire duration (minutes): R30	R60	R90	R120	R180 [(1)]	R240 [(1)]
Concrete cover (e) (mm)					30	55	80	85		
8	10	60	16,2	layer n°1	169	205	228	257		
				layer n°2	158	191	213	243		
				layer n°3	157	187	207	236		
10	12	60	25,3	layer n°1	188	225	250	280		
				layer n°2	178	212	235	266		
				layer n°3	176	207	229	259		
12	16	60	36,4	layer n°1	207	244	270	300		
				layer n°2	196	231	255	287		
				layer n°3	194	227	249	280		
14	18	60	49,6	layer n°1	225	263	289	320		
				layer n°2	215	250	275	307		
				layer n°3	215	250	275	307		
16	20	60	64,8	layer n°1	244	282	308	340		
				layer n°2	233	269	294	326		
				layer n°3	232	265	288	320		
20	25	75	101,2	layer n°1	280	319	346	378		
				layer n°2	269	303	328	361		
				layer n°3	268	301	324	356		
25	30	90	158,1	layer n°1	327	365	392	424		
				layer n°2	315	348	373	406		
				layer n°3	314	347	370	402		
32	40	120	259,0	layer n°1	391	430	457	489		
				layer n°2	379	412	436	468		
				layer n°3	379	412	435	467		
40	47	141	404,7	layer n°1	465	503	530	562		
				layer n°2	453	486	509	541		
				layer n°3	453	485	508	540		

Beam's width = 20 cm

Rebar Ø (mm)	Drilling Ø (mm)	Distance between layers (mm)	Rebar maximum load $R_{d,fi}$ in case of fire (kN)	Layers identification	Rebar anchorage depth (L_s in mm) for layers 1, 2 and 3 for the rebar maximum load in case of fire (rebar Fe E500) – Fire duration (minutes): R30	R60	R90	R120 [(1)]	R180 [(1)]	R240 [(1)]
Concrete cover (e) (mm)					30	55	80			
8	10	60	16,2	layer n°1	169	207	236			
				layer n°2	159	195	226			
				layer n°3	157	192	223			
10	12	60	25,3	layer n°1	188	227	257			
				layer n°2	178	215	248			
				layer n°3	176	212	245			
12	16	60	36,4	layer n°1	207	246	277			
				layer n°2	196	235	268			
				layer n°3	195	231	265			
14	18	60	49,6	layer n°1	225	265	297			
				layer n°2	215	254	287			
				layer n°3	213	250	284			
16	20	60	64,8	layer n°1	244	284	316			
				layer n°2	233	272	306			
				layer n°3	232	269	303			
20	25	75	101,2	layer n°1	281	321	353			
				layer n°2	269	307	342			
				layer n°3	269	306	340			
25	30	90	158,1	layer n°1	327	367	399			
				layer n°2	315	353	388			
				layer n°3	315	352	386			
32	40	120	259,0	layer n°1	391	431	464			
				layer n°2	379	417	451			
				layer n°3	379	416	451			
40	47	141	404,7	layer n°1	465	505	538			
				layer n°2	453	490	525			
				layer n°3	453	490	525			

(1) The fire duration are limited in accordance with beams' widths, according to Eurocode 2 part 1.2.

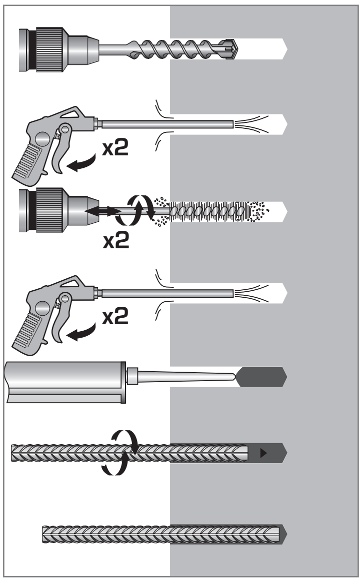
Post-installed rebar

ETA TR 023- 13/0436

MULTI-MAX

- Methacrylate resin
- Fast cure time
- Storage time 18 mois
- Usable in wet environments
- Styrene free
- Volatile Organic Compounds free (VOCs)
- Cartridge compatible with standard injection gun

INSTALLATION*



***Premium cleaning :**
- 2 blowing with compressed air
- 2 brushing with brushed fitted on a drilling machine
- 2 blowing with compressed air

Mechanical characteristics of rebars

Nominal steel rebar Ø		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20
Sections (cm^2)		0,503	0,785	1,13	1,54	2,01	3,14
Min. resistances to failure (kN)	Fe E400	21,13	32,97	47,46	64,68	84,42	131,88
	Fe E500	25,90	40,43	58,20	79,31	103,52	161,71
Ultimate limit load N_{Rd} (kN)	Fe E500	21,85	34,15	49,17	66,93	87,42	136,59

The mechanical characteristics of the high adhesion rebars are defined in the NFA 35-016 and NFA 35-017 standards.

Setting time

Ambient temperature	Max. time for installation	Curing time
30°C > T ≥ 40°C	2 min.	35 min.
20°C > T ≥ 30°C	4 min.	45 min.
10°C > T ≥ 20°C	6 min.	1 hour
5°C > T ≥ 10°C	12 min.	2 h 30 min.
0°C > T ≥ 5°C	18 min.	3 hours
-5°C > T ≥ 0°C	-	6 hours

Sizing rules for steel reinforcement fixings for concrete according to eurocode 2 regulations and ETA 13/0436

The basic anchorage length $L_{b,rqd}$ (mm) for the ultimate limit load for rebar F_{Rd} (N) is given by following equation:

$$L_{b,rqd} = \frac{F_{Rd}}{\Pi \cdot Ø \cdot \eta_1 \cdot \eta_2 \cdot f_{bd}}$$

The design anchorage length L_{bd} (mm) is determined as follow:

$L_{bd} = L_{b,rqd} \cdot \alpha_2 \cdot \alpha_5$

F_{Rd} : Design ultimate load (N)
f_{bd} : Design value of the bond strength in N/mm²
Ø : Rebar diameter (mm)
η : depends on bond conditions - $\eta_1 = 1$ ("good bond" conditions). See § 8.4.2 (EN 1992-1-1)
η_2 : depends on rebar diameter - $\eta_2 = 1$ for Ørebar ≤ 32 mm

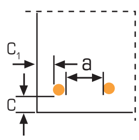
Design value of the bond strength f_{bd} according to EN 1992-1-1

Ø rebar	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
Ø8	1.6	2.0	2.3	2.7	3.0	3.4	3.4	3.7	3.7
Ø10	1.6	2.0	2.3	2.7	3.0	3.4	3.4	3.4	3.4
Ø12	1.6	2.0	2.3	2.7	3.0	3.0	3.0	3.0	3.4
Ø14	1.6	2.0	2.3	2.7	3.0	3.0	3.0	3.0	3.0
Ø16	1.6	2.0	2.3	2.7	2.7	2.7	2.7	2.7	3.0
Ø20	1.6	2.0	2.3	2.3	2.3	2.3	2.3	2.3	2.7

with α_2 : **Influence of concrete minimum cover**

$\alpha_2 = 1 - 0{,}15\ (C_d - Ø_{rebar}) / Ø_{rebar} \geq 0{,}7$

$C_d = \min\left(C\ ;\ C_1\ ;\ \frac{a}{2}\right)$



with α_5 : **Influence of the confinement by transverse pressure**

The factor α_5 take into account of the effect of the pressure transverse to the plane of splitting along the design length.

$\alpha_5 = 1 - 0{,}04 \cdot p \geq 0{,}7$
where p is the transverse pressure at the ultimate limit state along L_{bd} in MPa.

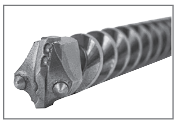
p (Mpa)	α_5
3	0,88
5	0,8
7	0,72

Limit of this formula

The max. anchor depth will be limited to 900 mm with pneumatic injection tool.

Eurocode 2 table for straight rebar anchoring

CONCRETE C25/30 - HAMMER DRILLING



Rebar Ø (mm)	Drilling Ø d_0 (mm)	Length of anchor L_{bd} (mm)	Ultimate limit load (daN) without influence of center distance and/or edge (1) ($\alpha 2 = 0{,}7$)	Ultimate limit load (daN) with influence of center distance and/or edge (2) ($\alpha 2 = 1$)	Number of sealings per SPIT MULTI-MAX cartridge (3)	
					280 ml	410 ml
8	10	170	1648	1154	48,5	71,1
		190	1842	1289	43,4	63,6
		225	2185	1530	36,6	53,6
		322	-	2185	25,6	37,5
10	12	213	2577	1804	31,7	46,5
		240	2908	2036	28,1	41,2
		282	3415	2391	24,0	35,1
		403	-	3415	16,8	24,6
12	15	255	3711	2597	14,4	21,0
		290	4217	2952	12,6	18,5
		338	4917	3442	10,8	15,9
		483	-	4917	7,6	11,1
14	18	298	5051	3536	7,8	11,4
		340	5768	4038	6,8	10,0
		395	6693	4685	5,9	8,6
		564	-	6693	4,1	6,0
16	20	340	6597	4618	6,1	8,9
		380	7367	5157	5,4	7,9
		451	8742	6119	4,6	6,7
		644	-	8742	3,2	4,7
20	25	425	8781	6147	3,1	4,5
		490	10116	7081	2,7	3,9
		662	13659	9561	2,0	2,9
		900	-	13006	1,5	2,1

(1) Absence of edge distances greater than or equal to 7.Ø

(2) Presence of edge distances and/or centre distances less than 7.Ø

(3) The number of fixings per cartridge is calculated taking into account an increasing by 20% the real volume of sealing.

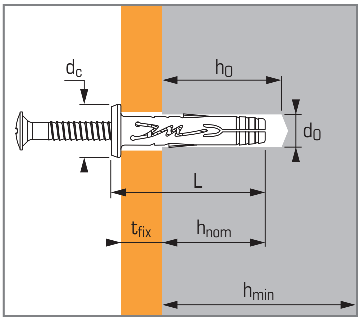
$1{,}2 \times (d_0^2 - Ø_{rebar}^2) \times \Pi \times L_{bd}/4$

HIT M & HIT M-A2

zinc coated & stainless steel version

Hammer-set anchor for light duty fixings for concrete and all materials types

ETAG 014 - 06/0032



APPLICATION

- Insulation cladding
- Profiles for thin coat external
- Insulation systems
- Drywall track
- Wood
- Flashing
- Electrical accessories
- Collar

Use the ETA figures to design ETICS application.

MATERIAL

- **Body:** polyamid 6
- **Expansion nail:**
  Zinc coated steel: FR 15 (5 µm)
  Stainless steel: A2
- **Screw head type:** PZ2/PZ3

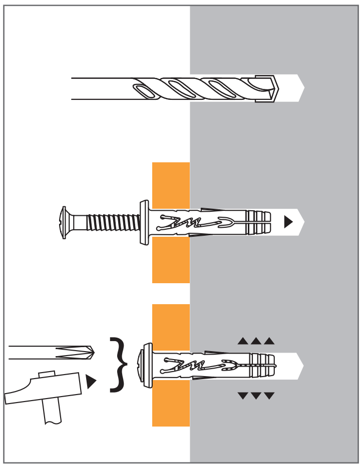
Technical data

Anchor size	Embedment depth (mm) h_{nom}	Max. thickness of part to be fixed (mm) t_{fix}	Drilling depth through part to be fixed (mm) L+8	Drilling depth in base material (mm) h_0	Drilling diameter (mm) d_0	Min. thickness of base material (mm) h_{min}	Cylinder head diameter (mm) d_c	Total anchor length (mm) L	Type of nail	Code Zinc coated steel nail	Code Stainless steel A2 nail
5X25/5 P	20	5	35	30	5	100	9	27	PZ2	050116	-
5X35/15 P		15	45					37		050117	-
6X30/5 P	25	5	40	35	6	100	11	32	PZ2	050118	060104
6X40/12 P		12	47					39		050119	-
6X50/25 P		25	60					52		050121	060105
6X65/40 P		40	75					67		050122	060106
6X40/12 V	25	12	47	35	6	100	10	39	PZ2	050129	-
6X50/25 V		25	60					52		050131	-
6X65/40 V		40	75					67		050132	-
6X30/5 M7X150	30	-	-	40	6	100	11	32	M7	050142	
8X40/10 P	30	10	50	40	8	100	13	42	PZ2	060090	060107
8X40/10 P20		10	50					42		055378	-
8X60/30 P		30	70					62		060091	060108
8X90/60 P		60	100					92		060092	060109
8X110/80 P		80	120					112		060093	-
8X130/100 P		100	140					132		060094	-
8X60/30 V	30	30	70	40	8	100	11,5	62	PZ2	060095	-
8X90/60 V		60	100					92		060096	-
8X110/80 V		80	120					112		060097	-
8X130/100 V		100	140					132		060098	-
8X160/125 P	30	165	206	40	8	100	15	198	PZ3	057601	-
8X180/145 P		125	166					158		057602	-
8X200/165 P		165	206					198		057603	-

(1) In masonry, the thickness of part to be fixed could be fluctuate to ± 5 mm from t_{fix} for Ø5 and Ø6 mm, and to ± 10 mm for Ø8 mm, to ensure a good contact between collar and the part to be fixed.

Characteristics loads (N_{Rk}, V_{Rk}) in kN

INSTALLATION



WARNING:
For anchor sizes 8X160/125P, 8X180/145P & 8X200/165P, setting only by screwing

TENSILE

Base material \ Anchor size	Ø5	Ø6	Ø8
Concrete (C20/25)			
N_{Rk}	0,60	0,90	1,2
Solid concrete blocks B120 (fc = 13,5 N/mm²)			
N_{Rk}	0,30	0,40	0,50
Clay bricks (fc = 55 N/mm²)			
N_{Rk}	0,20	0,80	1,2
Hollow concrete blocks B40 not rendered (fc = 6,5 N/mm²)			
N_{Rk}	0,20	0,30	1,2
Hollow concrete blocks B40 rendered (fc = 6,5 N/mm²)			
N_{Rk}	0,95	1,70	2,25
Hollow clay bricks Eco-30 not rendered (fc = 4,5 N/mm²)			
N_{Rk}	0,30	0,40	0,50
Hollow clay bricks Eco-30 rendered (fc = 4,5 N/mm²)			
N_{Rk}	0,95	1,30	1,70
Engineering clay bricks not rendered (fc = 14,5 N/mm²)			
N_{Rk}	0,55	0,75	0,95
Engineering clay bricks rendered (fc = 14,5 N/mm²)			
N_{Rk}	0,95	1,30	1,70
Aerated concrete (Mvn = 500 kg/m³)			
N_{Rk}	0,15	0,2	0,3
Plasterboard BA13			
N_{Rk}	0,15	0,15	0,18
Plasterboard BA10 + polystyren			
N_{Rk}	0,18	0,18	0,2

SHEAR

	5X25/5 5X35/15	6X30/5 6X40/12 6X50/25	6X65/40	8X40/10 to 8X90/60	8X110/80 to 8X200/165
V_{Rk}	1,9	2,8	2,25	4,3	3,55
V_{Rk}	1,9	2,8	2,25	4,3	3,55
V_{Rk}	1,9	2,8	2,25	4,3	3,55
V_{Rk}	1,9	2,25	2,25	2,8	2,8
V_{Rk}	1,9	2,25	2,25	2,8	2,8
V_{Rk}	0,55	0,75	0,75	0,9	0,9
V_{Rk}	0,9	1,1	1,3	1,7	1,7
V_{Rk}	1,9	2,25	2,25	2,8	2,8
V_{Rk}	1,9	2,8	2,25	4,3	3,55
V_{Rk}	0,15	0,2	0,2	0,3	0,3
V_{Rk}	0,15	0,15	0,15	0,18	0,18
V_{Rk}	0,18	0,18	0,18	0,2	0,2

HIT M & HIT M-A2

zinc coated & stainless steel version

Design loads (N_{Rd}, V_{Rd}) and recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{(1)}}{\gamma_M} \qquad N_{rec} = \frac{N_{Rk}^{(1)}}{\gamma_M \cdot \gamma_F} \qquad V_{Rd} = \frac{V_{Rk}^{(2)}}{2,68} \qquad V_{rec} = \frac{V_{Rk}^{(2)}}{3,75}$$

(1) Issue from ETA

(2) Derived from tests results

TENSILE

Anchor size / Base material	Ø5	Ø6	Ø8
Concrete (C20/25)			
N_{Rd}	0,3	0,45	0,6
N_{rec}	0,21	0,32	0,42
Solid concrete blocks B120 (fc = 13,5 N/mm²)			
N_{Rd}	0,15	0,2	0,25
N_{rec}	0,11	0,14	0,18
Clay bricks (fc = 55 N/mm²)			
N_{Rd}	0,1	0,4	0,6
N_{rec}	0,07	0,28	0,43
Hollow concrete blocks B40 not rendered (fc = 6,5 N/mm²)			
N_{Rd}	0,1	0,15	0,6
N_{rec}	0,7	0,11	0,43
Hollow concrete blocks B40 rendered (fc = 6,5 N/mm²)*			
N_{Rd}	0,35	0,63	0,84
N_{rec}	0,25	0,45	0,6
Hollow clay bricks Eco-30 not rendered (fc = 4,5 N/mm²)			
N_{Rd}	0,21	0,28	0,35
N_{rec}	0,15	0,2	0,25
Hollow clay bricks Eco-30 rendered (fc = 4,5 N/mm²)*			
N_{Rd}	0,35	0,49	0,63
N_{rec}	0,25	0,35	0,45
Engineering clay bricks not rendered (fc = 14,5 N/mm²)*			
N_{Rd}	0,21	0,28	0,35
N_{rec}	0,15	0,2	0,25
Engineering clay bricks rendered (fc = 14,5 N/mm²)*			
N_{Rd}	0,35	0,49	0,63
N_{rec}	0,25	0,35	0,45
Aerated concrete (Mvn = 500 kg/m³)*			
N_{Rd}	0,06	0,08	0,12
N_{rec}	0,04	0,06	0,08
Plasterboard BA13*			
N_{Rd}	0,06	0,06	0,07
N_{rec}	0,04	0,04	0,05
Plasterboard BA10 + polystyren*			
N_{Rd}	0,07	0,07	0,08
N_{rec}	0,05	0,05	0,06

SHEAR

	5X25/5 5X35/15	6X30/5 6X40/12 6X50/25	6X65/40	8X40/10 to 8X90/60	8X110/80 to 8X200/165
Concrete (C20/25)					
V_{Rd}	0,7	1,05	0,84	1,61	1,33
V_{rec}	0,5	0,75	0,6	1,15	0,95
Solid concrete blocks B120					
V_{Rd}	0,7	1,05	0,84	1,61	1,33
V_{rec}	0,5	0,75	0,6	1,15	0,95
Clay bricks					
V_{Rd}	0,7	1,05	0,84	1,05	1,33
V_{rec}	0,5	0,75	0,6	0,75	0,95
Hollow concrete blocks B40 not rendered					
V_{Rd}	0,7	0,84	0,84	0,63	1,05
V_{rec}	0,5	0,6	0,6	0,45	0,75
Hollow concrete blocks B40 rendered					
V_{Rd}	0,7	0,84	0,84	1,33	1,05
V_{rec}	0,5	0,6	0,6	0,95	0,75
Hollow clay bricks Eco-30 not rendered					
V_{Rd}	0,21	0,28	0,28	0,07	0,35
V_{rec}	0,15	0,2	0,2	0,05	0,25
Hollow clay bricks Eco-30 rendered					
V_{Rd}	0,35	0,42	0,49	0,63	0,63
V_{rec}	0,25	0,3	0,35	0,45	0,45
Engineering clay bricks not rendered					
V_{Rd}	0,7	0,84	0,84	0,32	1,05
V_{rec}	0,5	0,6	0,6	0,23	0,75
Engineering clay bricks rendered					
V_{Rd}	0,7	1,05	0,84	0,32	1,33
V_{rec}	0,5	0,75	0,6	0,23	0,95
Aerated concrete					
V_{Rd}	0,06	0,08	0,08	0,21	0,12
V_{rec}	0,04	0,06	0,06	0,15	0,08
Plasterboard BA13					
V_{Rd}	0,06	0,06	0,06	0,13	0,07
V_{rec}	0,04	0,04	0,04	0,09	0,05
Plasterboard BA10 + polystyren					
V_{Rd}	0,07	0,07	0,07	0,27	0,08
V_{rec}	0,05	0,05	0,05	0,19	0,06

$\gamma_M = 2$; $\gamma_F = 1,4$

* Base materials not submitted to ETA

Spacing data

IN CONCRETE

Minimum distance between anchors and from edges (mm)

Anchor size	$C_{cr,N\ mini}$	$C_{cr,V\ mini}$
Ø5	100	100
Ø6	100	100
Ø8	100	100

B-LONG
zinc coated & stainless steel version

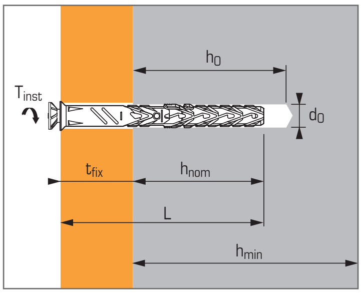
Frame anchor for fixings in concrete, solid masonry, hollow block and aerated concrete

European Technical Assessment
ETAG 020 - 13/1068

XTREM

INOX STAINLESS STEEL

B-LONG is included in ITW Seismic Research Program
http://seismic.spit.it



APPLICATION

- Roofing clamps
- Sanitary equipement
- Fixing wall plates
- Timbers
- Insulation
- Facade bracketing

MATERIAL

- **Body:** polyamid 6
- **Screw:**

Zinc coated steel: grade 6.8 (5 µm)
Stainless steel: A4-80

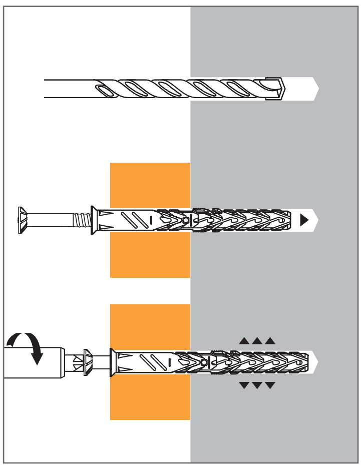
- **Head type:**

F : countersunk head

TORX 30 (Ø8)
TORX 40 (Ø10)

HS : hexagonal head
+ integrated washer


INSTALLATION



Technical data

Anchor size	Concrete		Structural clay block		Hollow clay brick/ Aerated concrete		Setting data and Anchor size					Code			
	Embed. depth (mm) h_{nom}	Max. thickness to fix (mm) t_{fix}	Embed. depth (mm) h_{nom}	Max. thickness to fix (mm) t_{fix}	Embed. depth (mm) h_{nom}	Max. thickness to fix (mm) t_{fix}	Base material thickness (mm) h_{min}	Drilling depth (mm) h_0	Drilling diameter (mm) d_0	Total anchor length (mm) L	Tighten torque T_{inst}	Head version F	Head version HS	Head version F - A4	Head version HS - A4
8X60/10		10		10		10				60		567950	-	-	-
8X80/30		30		30		30				80		567951	-	567942	-
8X100/50	50	50	50	50	50	50	100	60	8	100	12	567952	-	567943	-
8X120/70		70		70		70				120		567953	-	-	-
8X150/100		100		100		100				150		567954	-	-	-
10X60/10		20		10		-				60		-	567969	-	567986
10X80/30		40		30		10				80		567957	567970	567981	567987
10X100/50		60		50		30				100		567958	567971	567982	567988
10X120/70		80		70		50				120		567959	567972	567983	567989
10X140/90		100		90		70				140		567960	567973	567984	-
10X160/110	40	120	50	110	70	90	h_{nom} X2	h_{nom} +10 mm	10	160	16*	567961	567974	-	-
10X180/130		140		130		110				180		567962	567975	-	-
10X200/150		160		150		130				200		567963	567976	-	-
10X230/180		190		180		160				230		567964	567977	-	-
10X260/210		220		210		190				260		567965	567978	-	-
10X280/230		240		230		210				280		567966	567979	-	-
10X300/250		260		250		230				300		567967	567980	-	-

* In aereted concrete apply torque at 50% of nominal value

Products on special orders

B-LONG

zinc coated & stainless steel version

Characteristic loads (N_{Rk}, V_{Rk}) in kN

TENSILE (Temperature : -40°C < T < +50°C[2])

Base material[1] / Anchor size / h_{nom}	Ø8 50	Ø10 40	Ø10 50	Ø10 70
Concrete (C20/25)				
N_{Rk}	3,0	3,5	5,5	-
Solid clay brick Wienerberger MZ 28-1,8 (fck = 20 Mpa)[1]				
N_{Rk}	3,0	-	3,0	-
Hollow clay brick Wienerberger Porotherm BIOPLAN (fbk = 12 Mpa) [1]				
N_{Rk}	2,0	-	2,0	-
Hollow concrete block B40 (fbk = 4 Mpa) [1]				
N_{Rk}	1,5	-	1,2	-
Autoclaved aerated concrete type low strength YTONG «Clima» Block (fbk = 2,4 Mpa)				
N_{Rk}	-	-	0,6	0,6
Autoclaved aerated concrete type high strength YTONG «Sismico» Block (fbk = 5 Mpa)				
N_{Rk}	-	-	1,5	2,0

SHEAR

Base material[1] / Anchor size / h_{nom}	Ø8 50	Ø10 40	Ø10 50	Ø10 70
Concrete (C20/25)				
V_{Rk}	6,9	9,1	9,1	9,1
Solid clay brick Wienerberger MZ 28-1,8 (fck = 20 Mpa) [1]				
V_{Rk}	3,0	-	3,0	-
Hollow clay brick Wienerberger Porotherm BIOPLAN (fbk = 12 Mpa) [1]				
V_{Rk}	2,0	-	2,0	-
Hollow concrete block B40 (fbk = 4 Mpa) [1]				
V_{Rk}	1,5	-	1,2	-
Autoclaved aerated concrete type low strength YTONG «Clima» Block (fbk = 2,4 Mpa)				
V_{Rk}	-	-	0,6	0,6
Autoclaved aerated concrete type high strength YTONG «Sismico» Block (fbk = 5 Mpa)				
V_{Rk}	-	-	1,5	2,0

Design loads (N_{Rd}, V_{Rd}) and recommended loads (N_{rec}, V_{rec}) in kN

TENSILE (Temperature : -40°C < T < +50°C[2])

Base material[1] / Anchor size / h_{nom}	Ø8 50	Ø10 40	Ø10 50	Ø10 70
Concrete (C20/25)				
N_{Rd}	1,7	1,9	3,1	-
N_{rec}	1,2	1,4	2,2	-
Solid clay brick Wienerberger MZ 28-1,8 (fck = 20 Mpa) [1]				
N_{Rd}	1,2	-	1,2	-
N_{rec}	0,9	-	0,9	-
Hollow clay brick Wienerberger Porotherm BIOPLAN (fbk = 12 Mpa) [1]				
N_{Rd}	0,8	-	0,8	-
N_{rec}	0,6	-	0,6	-
Hollow concrete block B40 (fbk = 4 Mpa) [1]				
N_{Rd}	0,6	-	0,5	-
N_{rec}	0,4	-	0,3	-
Autoclaved aerated concrete type low strength YTONG «Clima» Block (fbk = 2,4 Mpa)				
N_{Rd}	-	-	0,30	0,30
N_{rec}	-	-	0,21	0,21
Autoclaved aerated concrete type high strength YTONG «Sismico» Block (fbk = 5 Mpa)				
N_{Rd}	-	-	0,75	1,00
N_{rec}	-	-	0,54	0,71

SHEAR

Base material[1] / Anchor size / h_{nom}	Ø8 50	Ø10 40	Ø10 50	Ø10 70
Concrete(C20/25)				
V_{Rd}	4,6	6,0	6,0	6,0
V_{rec}	3,3	4,3	4,3	4,3
Solid clay brick Wienerberger MZ 28-1,8 (fck = 20 Mpa) [1]				
V_{Rd}	1,1	-	1,2	-
V_{rec}	0,8	-	0,9	-
Hollow clay brick Wienerberger Porotherm BIOPLAN (fbk = 12 Mpa) [1]				
V_{Rd}	0,8	-	0,8	-
V_{rec}	0,6	-	0,6	-
Hollow concrete block B40 (fbk = 4 Mpa) [1]				
V_{Rd}	0,6	-	0,5	-
V_{rec}	0,4	-	0,3	-
Autoclaved aerated concrete type low strength YTONG «Clima» Block (fbk = 2,4 Mpa)				
V_{Rd}	-	-	0,30	0,30
V_{rec}	-	-	0,21	0,21
Autoclaved aerated concrete type high strength YTONG «Sismico» Block (fbk = 5 Mpa)				
V_{Rd}	-	-	0,75	1,00
V_{rec}	-	-	0,54	0,71

[1] Other material references are specified in the ETA
[2] Suitable for «range b» temperatures (-40°C <T <+80°C) : figures above must be reduced, refer to ETA for data.

Spacing data

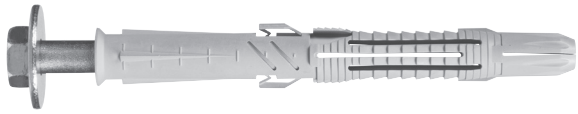
IN CONCRETE

	Minimum distance between anchors and from edges (mm)				
	h_{nom}	$S_{cr,N}$	$C_{cr,N}$	S_{min}	C_{min}
Ø8	50	60	50	50	50
Ø10	40	65	80	60	50
Ø10	50	90	100	70	60

IN HOLLOW MASONRIES

The anchor must be installed at the minimum distance of:
- 100 mm from one edge.
- 200 mm from another anchor with spacing parallel to the edge.
- 400 mm from another anchor with spacing perpendicular to the edge.

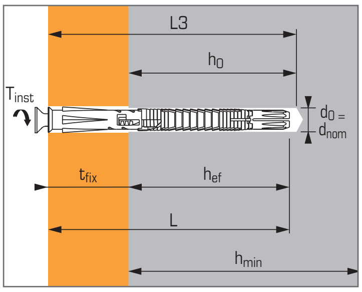
PROLONG



Universal frame fixing for concrete, in hollow and solid masonries

European Technical Assessment

ETAG 020 - 11/0035
PROLONG Ø10



APPLICATION

- Roofing clamps
- Sanitary equipement
- Fixing wall plates
- Timbers

MATERIAL

- **Body :** polyamid 6 (halogene free)
- **Screw :** zinc coated steel 5.8 (5 µm)
- **Head type:**

F : countersunk head for Ø10

TORX 40

H: hexagonal head + large washer for Ø12 and Ø16

Ø10 : Sw = 13 mm
Ø12: Sw = 17 mm
Ø16: Sw = 19 mm

Technical data

Anchor size	Anchor depth (mm) h_{ef}	Max. thickness of part to be fixed (mm) t_{fix}	Anchor external diameter (mm) d_{nom}	Base material thickness (mm) h_{min}	Drilling diameter (mm) d_0	Drilling depth (mm) h_0	Min. drilling depth through part to be fixed (mm) L3	Total sleeve length (mm) L	Tighten torque (Nm) T_{inst}	Code Head version F	Code Head version H
10X80/10	70	10	10	180	10	80	80	80	10	566653	-
10X100/30		30					110	100		566654	
10X115/45		45					125	115		566655	
10X145/75		75					155	145		566656	
10X160/90		90					170	160		566657	
10X185/115		115					195	185		566658	
10X210/140		140					220	210		566659	
12X120/50	70	50	12	200	12	85	135	120	10	-	566675
12X145/75		75					160	145			566676
12X165/95		95					180	165			566677
12X185/115		115					200	185			566678
12X210/140		140					225	210			566679
16X145/55	90	55	16	200	16	110	165	145	20	-	566680
16X165/75		75					185	165			566681
16X185/95		95					205	185			566682
16X200/110		110					220	200			566683
16X240/150		150					260	240			566428
16X270180		180					290	270			566484

Ultimate loads ($N_{Ru,m}$, $V_{Ru,m}$) in kN

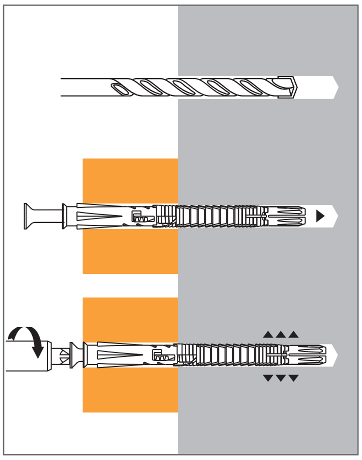
TENSILE

Base material \ Anchor size	Ø10	Ø12	Ø16
Concrete (C20/25)			
$N_{Ru,m}$	5,0	7,8	11,0
Clay bricks			
$N_{Ru,m}$	5,75	7,4	10,4
Hollow concrete blocks not rendered			
$N_{Ru,m}$	1,4	2,2	4,2
Hollow clay bricks not rendered			
$N_{Ru,m}$	1,4	1,2	1,2
Aerated concrete			
$N_{Ru,m}$	1,25	1,9	2,6

SHEAR

Base material \ Anchor size	Ø10	Ø12	Ø16
Concrete (C20/25)			
$V_{Ru,m}$	5,0	12,5	27,0
Clay bricks			
$V_{Ru,m}$	5,75	11,2	24,3
Hollow concrete blocks not rendered			
$V_{Ru,m}$	1,4	3,4	4,8
Hollow clay bricks not rendered			
$V_{Ru,m}$	1,4	3,5	5,1
Aerated concrete			
$V_{Ru,m}$	-	-	-

INSTALLATION



Spacing data

IN CONCRETE AND SOLID MASONRIES

Mini. distance between anchors and from edge (mm)

	$S_{cr,N}$	$C_{cr,N}$	$C_{cr,V}$	S_{min}	C_{min}
Ø10	140	70	70	50	60
Ø12	140	70	90	50	60
Ø16	140	70	105	50	60

IN HOLLOW MASONRIES

The anchor must be installed at the minimum distance of:
- 200 mm from another anchor,
- 105 mm from one edge.

Design loads (N_{Rd}, V_{Rd}) and recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

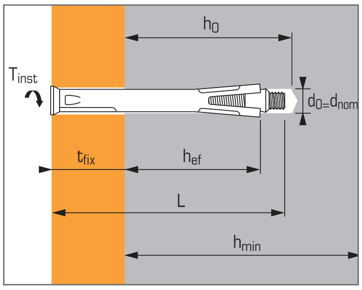
TENSILE

Base material \ Anchor size	Ø10	Ø12	Ø16
Concrete (C20/25)			
N_{Rd}	1,4	2,23	3,14
N_{rec}	1,0	1,56	2,2
Clay bricks			
N_{Rd}	1,6	2,11	2,97
N_{rec}	1,15	1,48	2,08
Hollow concrete blocks not rendered			
N_{Rd}	0,4	0,63	1,2
N_{rec}	0,28	0,44	0,84
Hollow clay bricks not rendered			
N_{Rd}	0,4	0,3	0,3
N_{rec}	0,28	0,24	0,24
Aerated concrete			
N_{Rd}	0,35	0,54	0,74
N_{rec}	0,25	0,38	0,52

SHEAR

Base material \ Anchor size	Ø10	Ø12	Ø16
Concrete (C20/25)			
V_{Rd}	1,4	3,57	7,71
V_{rec}	1,0	2,5	5,4
Clay bricks			
V_{Rd}	1,6	3,2	6,94
V_{rec}	1,15	2,24	4,86
Hollow concrete blocks not rendered			
V_{Rd}	0,4	0,97	1,37
V_{rec}	0,28	0,7	0,96
Hollow clay bricks not rendered			
V_{Rd}	0,4	1	1,45
V_{rec}	0,28	0,7	1,02
Aerated concrete			
V_{Rd}	-	-	-
V_{rec}	-	-	-

Deep embedment anchor for all frame types



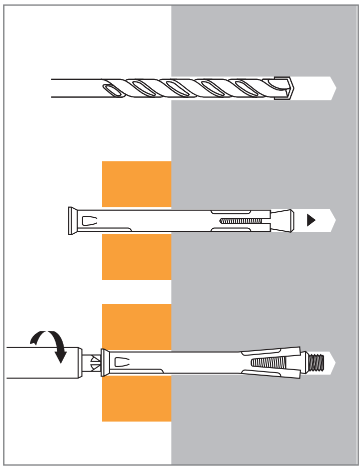
APPLICATION

- Fixing sub-frames
- Fixing doors and windows (wood, aluminium)
- Fixing other joinery products

MATERIAL

- **Screw :** M6 zinc coated grade 5.8
- **Head :** type PZ3
- **Sleeve :** galvanised sheet
- **Cone :** steel

INSTALLATION



WARNING:
For aerated concrete, drill with a drill bit diameter equal to 9 mm

Technical data

Anchor size	Anchor depth (mm) h_{ef}	Max. thick. of part to be fixed (mm) t_{fix}	Anchor external diameter (mm) d_{nom}	Min. base material thickness (mm) h_{min}	Drilling diameter (mm) d_0	Drilling depth (mm) h_0	Total anchor length (mm) L	Code
10X85/20	50	20	10	90	10	70	85	059650
10X105/40		40					105	059660
10X125/60		60					125	059670
10X145/80		80					145	059680
10X165/100		100					165	059690

Ultimate loads ($N_{Ru,m}$, $V_{Ru,m}$) in kN

TENSILE

Base material / Anchor size	Ø10
Concrete (C20/25)	
$N_{Ru,m}$	7,0
Clay bricks (fc = 55 Mpa)	
$N_{Ru,m}$	5,4
Aerated concrete (Mvn = 500 kg/m³)	
$N_{Ru,m}$	1,35

SHEAR

Base material / Anchor size	Ø10
Concrete(C20/25)	
$V_{Ru,m}$	3,5
Clay bricks (fc = 55 Mpa)	
$V_{Ru,m}$	3,5
Aerated concrete (Mvn = 500 kg/m³)	
$V_{Ru,m}$	2,5

Design loads (N_{Rd}, V_{Rd}) and recommended loads (N_{rec}, V_{rec}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Ru,m}^{(1)}}{\gamma_M} \qquad N_{rec} = \frac{N_{Ru,m}^{(1)}}{\gamma_M \cdot \gamma_F} \qquad V_{Rd} = \frac{V_{Ru,m}^{(1)}}{\gamma_M} \qquad V_{rec} = \frac{V_{Ru,m}^{(1)}}{\gamma_M \cdot \gamma_F}$$

(1) Derived from tests results

(1) Derived from tests results

TENSILE

Base material / Anchor size	Ø10
Concrete (C20/25)	
N_{Rd}	2,4
N_{rec}	1,7
Clay bricks (fc = 55 Mpa)	
N_{Rd}	1,25
N_{rec}	0,9
Aerated concrete (Mvn = 500 kg/m³)	
N_{Rd}	0,28
N_{rec}	0,2

γ_M = 2,85 for concrete ; γ_F = 1,4
γ_M = 4,3 for clay bricks and aerated concrete ; γ_F = 1,4

SHEAR

Base material / Anchor size	Ø10
Concrete (C20/25)	
V_{Rd}	0,7
V_{rec}	0,5
Clay bricks (fc = 55 Mpa)	
V_{Rd}	0,7
V_{rec}	0,5
Aerated concrete (Mvn = 500 kg/m³)	
V_{Rd}	0,56
V_{rec}	0,4

Spacing data

IN CONCRETE

Minimum distance between anchors and from edges (mm)

	$S_{cr,N}$	$C_{cr,N}$	S_{min}
Ø10	50	50	50

IN MASONRIES

The anchor must be installed at the minimum distance of 100 mm from another anchor and near one edge.

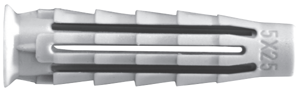
Fire behaviour

Maximum tensile service loads recommended on concrete for stability (kN).

Fire duration	**30 min.**	**1 h**	**1 h 30 min.**	**2 h**
Ø10	0,5	0,35	0,25	0,2

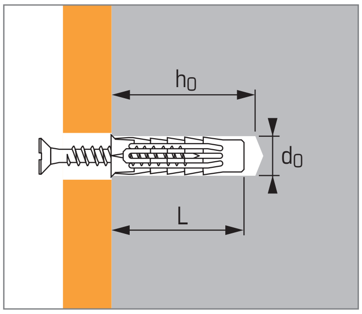
Fire tests perfomed by IBMB (N° 3005/0054).

Light weight anchors



PRO6

Nylon anchor
for hollow and solid material



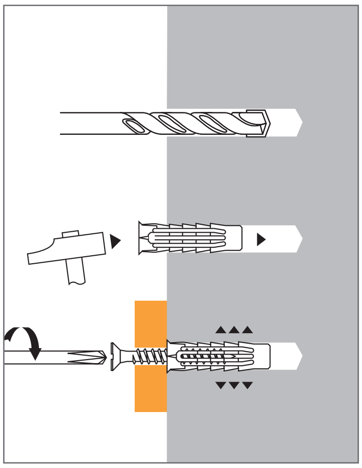
APPLICATION

- Lightweight fixing in all base material
- Small electrical accessories, small light fittings, fuse boxes, etc...

MATERIAL

- **Body:** polyamid 6
  Suitable temperature -20° + 40°C

INSTALLATION



Technical data

Anchor size	Screw diameter (mm)	Drilling depth (mm) **h0**	Drilling diameter (mm) **d0**	Total anchor length (mm) **L**	Code without screw	Code with VBA screw
5X25	3 - 4	35	5	25	565642	565646
6X30	4 - 5	40	6	30	565643	565647
8X40	4,5 - 6	50	8	40	565644	565648
10X50	6 - 8	65	10	50	565645	565649
12X60	8- 10	75	12	60	565617	-
14X70	10 - 12	85	14	70	565618	-

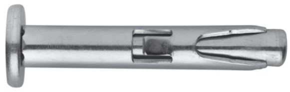
Recommended loads (N_{rec}) and ultimate loads ($N_{Ru,m}$) in kN with wood screw

TENSILE

Base material / **Anchor size** / Screw Ø	**Ø5** 4	**Ø6** 5	**Ø8** 6	**Ø10** 8
Concrete (≥C20/25)				
N_{rec}*	0,28	0,45	0,70	1,20
$N_{Ru,m}$*	1,40	2,25	3,50	6,00
Hollow concrete blocks B 40				
N_{rec}*	0,23	0,3	0,43	0,46
$N_{Ru,m}$*	1,15	1,5	2,15	2,30
Clay bricks BP 400				
N_{rec}*	0,20	0,26	0,35	0,60
$N_{Ru,m}$*	1,00	1,30	1,75	3,00
Hollow clay bricks Eco 40				
N_{rec}*	0,17	0,19	0,23	0,25
$N_{Ru,m}$*	0,85	0,95	1,15	1,25

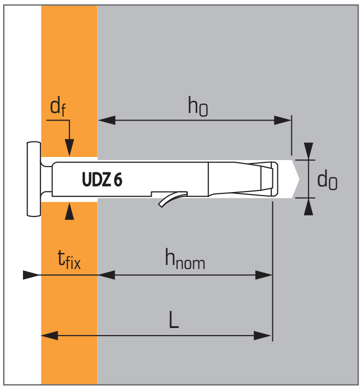
* Indicative values : depending on the type of screw used, the loads must be reduce by 50 %

UDZ 6



Wedge anchor for multiple use of non-structural applications

ETAG 001-6 - 05/0038



Technical data

Anchor size	Anchor depth (mm) **h_{ef}**	Max. thickness of part to be fixed (mm) **t_{fix}**	Drilling depth (mm) **h_0**	Drilling diameter (mm) **d_0**	Total anchor length (mm) **L**	Clearance diameter (mm) **d_f**	Code
6X40/5	30	5	50	6	40	7	060084

APPLICATION

- Fixing on ceiling
- Fixing only for multiple use of non-structural applications

Characteristic resistance (N_{Rk}) in kN

TENSILE

Anchor size / **Base material**	**6X40/5**
Concrete (C20/25 to C50/60)	
N_{Rk}	1,5

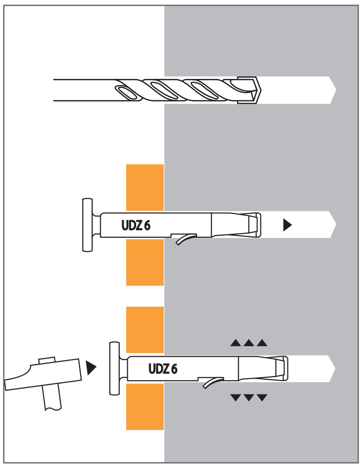
Design loads (N_{Rd}) and recommended loads (N_{rec}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{*}}{\gamma_M}$$

* Derived from tests results

$$N_{rec} = \frac{N_{Rk}^{*}}{\gamma_M \cdot \gamma_F}$$

INSTALLATION



TENSILE

Anchor size / **Base material**	**6X40/5**
Concrete (C20/25 to C50/60)	
N_{Rd}	1,00
N_{rec}	0,71

$\gamma_M = 1{,}5$; $\gamma_F = 1{,}4$

Fire behaviour

Design loads in kN

Fire duration	**30 min.**	**1 h**	**1 h 30 min.**	**2 h**
$F_{Rd,fi}$	0,45	0,36	0,26	0,26

$\gamma_M = 1{,}0$

Spacing data

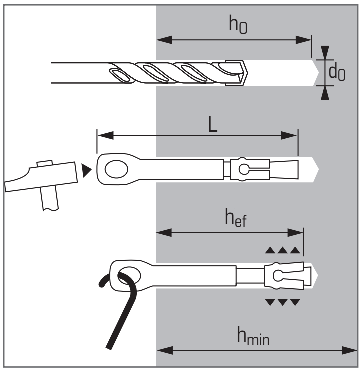
IN CONCRETE

Characteristic distance between anchors and from edges and minimum thickness of concrete member (mm)

	S_{min}	C_{min}	h_{min}
6X40/5	200	100	80

FIX P6

Wirehanger



APPLICATION

- Suspended ceiling
- Light

Fire behaviour

Fire duration	60 min.	120 min.
6X65P	0,085*	0,045*

*Values calculated according to the technical report TR 020 published by EOTA "Evaluation of anchorages in concrete concerning resistance to fire".

Technical data

Anchor size	Anchor depth (mm) **h_{ef}**	Min. base material thickness (mm) **h_{min}**	Drilling depth (mm) **h_0**	Drilling diameter (mm) **d_0**	Total anchor length (mm) **L**	Code
6X65P	25	50	35	6	64	056100

Anchors mechanical properties

Anchor size		**6X65P**
f_{uk} (N/mm²)	Min. tensile strength	450
f_{yk} (N/mm²)	Yield strength	400

Recommended loads (N_{rec}, V_{rec}) and ultimate loads ($N_{Ru,m}$, $V_{Ru,m}$) in kN

TENSILE

Anchor size / **Base material** h_{ef}	**6X65P** 25
Concrete (C20/25)	
N_{rec}	1,5
$N_{Ru,m}$	6,0
Concrete (C30/37)	
N_{rec}	1,8
$N_{Ru,m}$	7,0
Concrete (≥C40/50)	
N_{rec}	2,2
$N_{Ru,m}$	8,6

Concrete rendered (max 5 mm): recommended load reduced to 50%

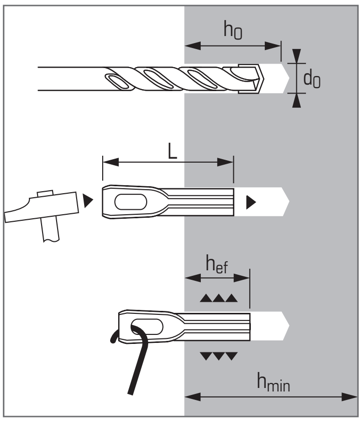
SHEAR

Anchor size / **Base material** h_{ef}	**6X65P** 25
Concrete (C20/25)	
V_{rec}	1,4
$V_{Ru,m}$	5,6
Concrete (C30/37)	
V_{rec}	1,7
$V_{Ru,m}$	6,8
Concrete (≥C40/50)	
V_{rec}	1,7
$V_{Ru,m}$	6,8

Concrete rendered (max 5 mm): recommended load reduced to 50%

G8

Ceiling anchor



APPLICATION

- Suspended ceiling

INSTALLATION

- Drilling ø 8, depth 25 mm.
- Push the anchor home into the hole and hit with the hammer to obtain the embendement of the anchor only reaching the wide part.

Technical data

Anchor size	Anchor depth (mm) **h_{ef}**	Min. base material thickness (mm) **h_{min}**	Drilling depth (mm) **h_0**	Drilling diameter (mm) **d_0**	Total anchor length (mm) **L**	Code
8X40	21	40	25	8	43	050015

Anchors mechanical properties

Anchor size		**8X40**
f_{uk} (N/mm²)	Min. tensile strength.	450
f_{yk} (N/mm²)	Yield strength	400

Recommended loads (N_{rec}) and ultimate loads ($N_{Ru,m}$) in kN

TENSILE

Anchor size / **Base material** h_{ef}	**8X40** 21
Concrete (C20/25 and C30/37)	
N_{rec}	0,6
$N_{Ru,m}$	3,2
Concrete (≥C40/50)	
N_{rec}	0,7
$N_{Ru,m}$	4,0

Concrete rendered (max 5 mm): recommended load reduced to 50%

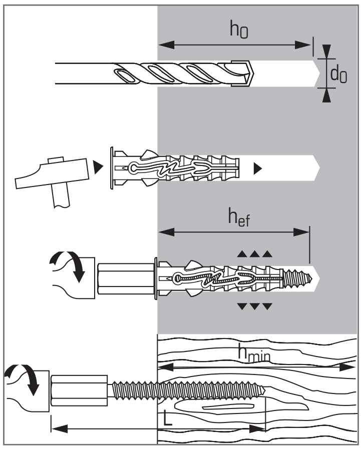
Fire behaviour

Fire duration	**60 min.**	**120 min.**
8X40	0,035*	0,017*

*Characteristic resistance (kN). Values calculated according to thetechnical report TR 020 published by EOTA "Evaluation of anchorages in concrete concerning resistance to fire".

RM6

Female anchor with torque controlled expansion



APPLICATION

- Suspended ceiling
- Lights
- Studs

INSTALLATION

- **On concrete and masonry:**
drilling Ø8, put the NYL anchor in the hole, and install the RM6 anchor with the setting tool,
- **On wood:**
screw it directly with the setting tool.

Technical data

Anchor size	Anchor depth (mm) **h_{ef}**	Min. base material thickness (mm) **h_{min}**	Drilling depth (mm) **h_0**	Drilling diameter (mm) **d_0**	Total anchor length (mm) **L**	Code
6X70	40	70	45	8	68	050059

Anchors mechanical properties

Anchor size		**6X70**
Threaded part		
f_{uk} (N/mm^2)	Min. tensile strength	450
f_{yk} (N/mm^2)	Yield strength	400

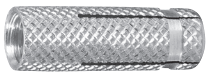
Recommended loads (N_{rec}) and ultimate loads ($N_{Ru,m}$) in kN

TENSILE

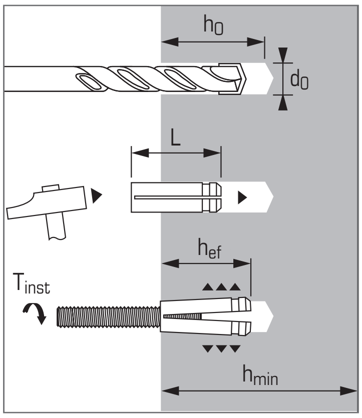
Base material / **Anchor size** h_{ef}	**6X70** 40
Concrete (C20/25 et C30/37)	
N_{rec}	0,8
$N_{Ru,m}$	4,0
Clay bricks BP 400	
N_{rec}	0,8
$N_{Ru,m}$	4,0
Hollow clay bricks C 40	
N_{rec}*	0,35
$N_{Ru,m}$*	2,0
Wood	
N_{rec}*	0,5
$N_{Ru,m}$*	2,0

*Using SPIT NYL 8 for RM6 in concrete and brick. Concrete rendered (max 5 mm): recommended load reduced by 50%

LAITON



Female anchor with torque controlled expansion



APPLICATION

- Suspended system
- Threaded studs

Technical data

Anchor size	Anchor depth (mm) **h_{ef}**	Min. base material thick. (mm) **h_{min}**	Drilling depth (mm) **h_0**	Drilling diameter (mm) **d_0**	Total anchor length (mm) **L**	Tighten torque (Nm) **T_{inst}**	Code
M4X15	15	50	22	5	15	4	052469
M6X20	20	60	30	8	20	9	062450
M8X30	30	70	35	10	30	20	062460

Recommended loads (N_{rec}) in kN

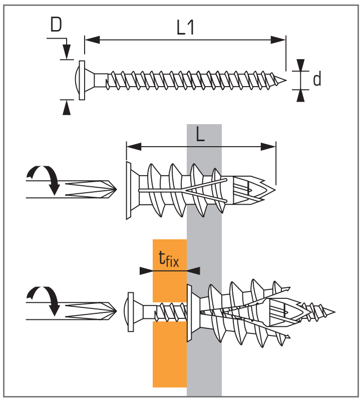
TENSILE

Base material / **Anchor size** h_{ef}	**M4** 15	**M6** 23	**M8** 28
Concrete (C20/25 to C40/50)			
N_{rec}	0,05	0,40	0,60
Hollow clay bricks BP 400			
N_{rec}	0,04	0,35	0,50

Concrete rendered (max 5 mm): recommended load reduced by 50%

DRIVA CLICK

Self drilling anchor for plasterboard & aerated concrete



Technical data

Anchor size	Max. thick. of part to be fixed (mm) t_{fix}	Screw threaded diameter (mm) d	Screw head diameter (mm) D	Total screw length (mm) L1	Anchor head diameter (mm) d	Total anchor length (mm) L	Code
TP10	10	4,5	9,0	45	13	38	565806

Nota : Predrilling with HSS drill bit is required in aerated concrete : Ø8 mm

Recommended loads (N_{rec}) and ultimate loads ($N_{Ru,m}$) in kN

TENSILE

Base material / Anchor size	TP10
Aerated concrete	
N_{rec}	0,095
$N_{Ru,m}$	0,49
Plasterboard BA13	
N_{rec}	0,09
$N_{Ru,m}$	0,45
Plasterboard BA10	
N_{rec}	0,06
$N_{Ru,m}$	0,29

SHEAR

Base material / Anchor size	TP10
Aerated concrete	
V_{rec}	0,25
$V_{Ru,m}$	1,40
Plasterboard BA13	
V_{rec}	0,24
$V_{Ru,m}$	1,10
Plasterboard BA10	
V_{rec}	0,15
$V_{Ru,m}$	0,75

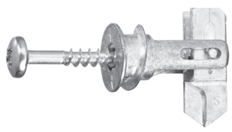
APPLICATION

- Fittings
- Bathroom accessories
- Wall heaters
- Electrical switch boxes
- Trunking
- Conduit

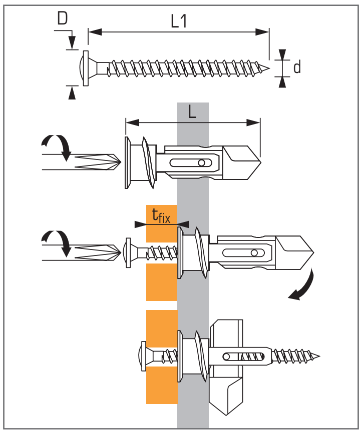
MATERIAL

- **Body :** reinforced polyamid
- **Screw :** Flat head screw supplied

DRIVA PLUS



Special fixing for plasterboard : double anchorage



Technical data

Anchor size	Max. thick. of part to be fixed (mm) t_{fix}	Screw threaded diameter (mm) d	Screw head diameter (mm) D	Total screw length (mm) L1	Anchor head diameter (mm) d	Total anchor length (mm) L	Code
TP12	12	4,5	9,2	45	16	39	061190

Recommended loads (N_{rec}) and ultimate loads ($N_{Ru,m}$) in kN

TENSILE

Base material / Anchor size	TP12
Plasterboard BA13	
N_{rec}	0,12
$N_{Ru,m}$	0,60
Plasterboard BA10	
N_{rec}	0,084
$N_{Ru,m}$	0,42

SHEAR

Base material / Anchor size	TP12
Plasterboard BA13	
V_{rec}	0,28
$V_{Ru,m}$	1,40
Plasterboard BA10	
V_{rec}	0,23
$V_{Ru,m}$	1,15

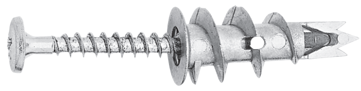
APPLICATION

- Self-drilling, double anchorage fixing for plasterboard: thickness 10 to 13 mm with or without insulation (polystyren, etc...)
- Bathroom accessories
- Kitchen cabinets
- Radiators
- Fuse boxes

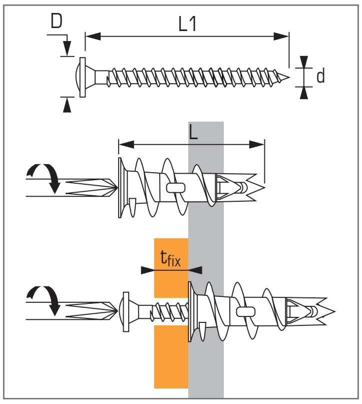
MATERIAL

- **Body :** zamak 3, NFA 55.010
- **Screw :** Special screw supplied, head type PZ2

DRIVA



Self drilling anchor for plasterboard & aerated concrete



Technical data

Anchor size	Max. thick. of part to be fixed (mm) t_{fix}	Screw threaded diameter (mm) d	Screw head diameter (mm) D	Total screw length (mm) L1	Anchor head diameter (mm) d	Total anchor length (mm) L	Code
TF5	5	4,5	8,2	25	13	31	059370
TP12	12	4,5	9,2	35	13	31	059360
TF27	27	4,5	8,8	50	13	31	059380
C7	M7X150	4,5	-	37	13	31	059390
SV (sans vis)	-	4,5	-	-	13	31	060083
Mini DRIVA [(1)]	-	-	-	-	7,5	26	059430

Nota : Predrilling with HSS drill bit is required:
in laminated plasterboard or gypsum block : Ø10 mm / in aerated concrete : Ø6 mm

APPLICATION

- Bathroom accessories, wall heaters,
- Electrical switch boxes, trunking, conduit,
- Curtain track.
- [(1)] **Mini DRIVA** : for fixing trunking to plasterboard

Recommended loads (N_{rec}, V_{rec}) and ultimate loads ($N_{Ru,m}$, $V_{Ru,m}$) in kN

TENSILE

Base material \ Anchor size	DRIVA TP/TF/C7	DRIV' AIR	Mini DRIVA
Aerated concrete			
N_{rec}	0,06	0,06	-
$N_{Ru,m}$	0,3	0,3	-
Plasterboard BA13			
N_{rec}	0,06	0,06	0,03
$N_{Ru,m}$	0,3	0,3	0,16

SHEAR

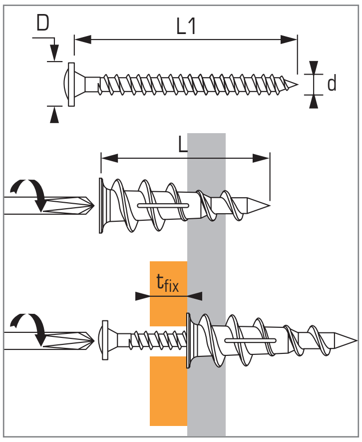
Base material \ Anchor size	DRIVA TP/TF/C7	DRIV' AIR
Aerated concrete		
V_{rec}	0,18	0,18
$V_{Ru,m}$	0,9	0,9
Plasterboard BA13		
V_{rec}	0,18	0,18
$V_{Ru,m}$	0,9	0,9

MATERIAL

- **Body :** zamak 3 NFA 55.010
- **Screw :** Special screw supplied, head type PZ2

DRILL

Self drilling anchor for plasterboard & aerated concrete



Technical data

Anchor size	Max. thick. of part to be fixed (mm) t_{fix}	Screw threaded diameter (mm) d	Screw head diameter (mm) D	Total screw length (mm) L1	Anchor head diameter (mm) d	Total anchor length (mm) L	Code
TF12	12	3,0	8,6	25	9,5	30	061630

Nota : Predrilling with HSS drill bit is required:
in laminated plasterboard or gypsum block : Ø5 mm / in aerated concrete : Ø 5 mm

APPLICATION

- Fixing in all soft materials
- Small electrical accessories

Recommended loads (N_{rec}, V_{rec}) and ultimate loads ($N_{Ru,m}$, $V_{Ru,m}$) in kN

TENSILE

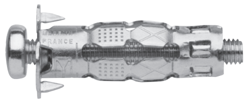
Base material \ Anchor size	TP12
Aerated concrete	
N_{rec}	0,046
$N_{Ru,m}$	0,23
Plasterboard BA13	
N_{rec}	0,044
$N_{Ru,m}$	0,22

SHEAR

Base material \ Anchor size	TP12
Aerated concrete	
V_{rec}	0,15
$V_{Ru,m}$	0,75
Plasterboard BA13	
V_{rec}	0,16
$V_{Ru,m}$	0,80

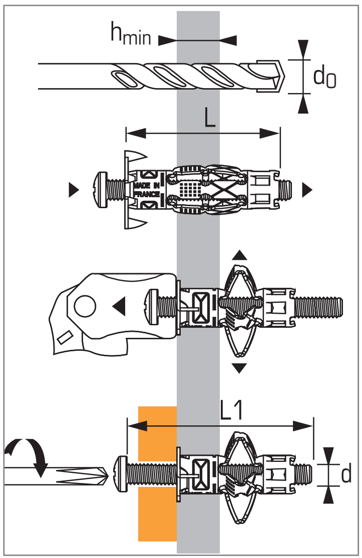
MATERIAL

- **Body :** reinforced polyamid 6.6
- **Screw :** Special screw supplied, head type PH1



ZENTECH

Anchor for hollow base materials



Technical data

Anchor size	Screw threaded diameter (mm) d	Base thickness min.-max. (mm) h_{min}	Drilling diameter plasterboard (mm) d_0	Drilling diameter masonry (mm) d_0	Total screw length (mm) L1	Total anchor length (mm) L	Code with mount. screw	Code without screw
4X34/13	4	6 - 13	8 - (9)*	10	40	34	061040	-
5X34/13	5	6 - 13	10 - (11)*	12	40	34	061070	057800
6X35/13	6	6 - 13	12 - (13)*	12	40	35	061110	057830

* ( ) Drilling diameter in plasterboard with HSS drill bit

Recommended loads (N_{rec}, V_{rec}) and ultimate loads ($N_{Ru,m}$, $V_{Ru,m}$) in kN

TENSILE

Base material / Anchor size	Ø4	Ø5
Plasterboard BA13		
N_{rec}*	0,2	0,2
$N_{Ru,m}$*	0,6	0,6
Hollow clay bricks		
N_{rec}*	0,2	0,2
$N_{Ru,m}$*	1,2	1,2
Hollow concrete blocks		
N_{rec}*	0,2	0,2
$N_{Ru,m}$*	1,2	1,2

* indicative values

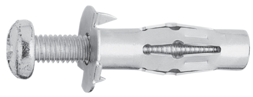
SHEAR

Base material / Anchor size	Ø4	Ø5
Plasterboard BA13		
V_{rec}*	0,15	0,2
$V_{Ru,m}$*	1,0	1,2
Hollow clay bricks		
V_{rec}*	0,35	0,55
$V_{Ru,m}$*	2,1	3,3
Hollow concrete blocks		
V_{rec}*	0,35	0,55
$V_{Ru,m}$*	2,1	3,3

* indicative values

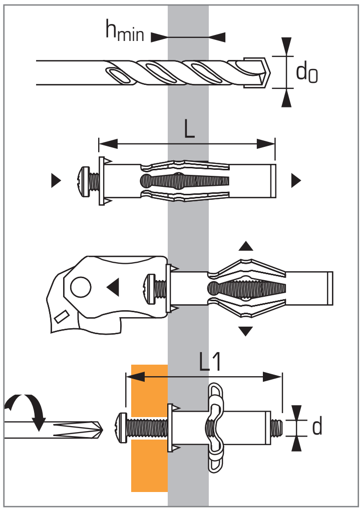
APPLICATION

- Light duty clamps
- Radiators
- Inside lighting
- Bathroom fixtures
- Kitchen fixtures
- Inside air conditioning units
- Electrical accessories



CC

Anchor for hollow base materials



Technical data

Anchor size	Screw threaded diameter (mm) d	Base mat. thick. min.-max. (mm) h_{min}	Drilling diameter (mm) d_0	Total screw length (mm) L1	Total anchor length (mm) L	Code with mounted screw
4X46/24	4	12 - 24	8	50	46	061050
5X45/16	5	3 - 16	8	50	45	061080
5X59/32	5	14 - 32	8	65	59	061090
6X46/16	6	4 - 16	10	50	46	061120
6X59/30	6	16 - 30	10	65	59	061130

Recommended loads (N_{rec}, V_{rec}) and ultimate loads ($N_{Ru,m}$, $V_{Ru,m}$) in kN

TENSILE

Base material / Anchor size	Ø4	Ø5	Ø6
Plasterboard BA10			
$N_{Ru,m}$*	0,6	0,7	0,7
Plasterboard BA13			
$N_{Ru,m}$*	0,7	0,9	0,9
Hollow clay bricks			
N_{rec}*	0,18	0,18	0,18
$N_{Ru,m}$*	1,1	1,1	1,1
Hollow concrete blocks			
N_{rec}*	0,23	0,3	0,3
$N_{Ru,m}$*	2,3	3,9	4,4

* indicative values

SHEAR

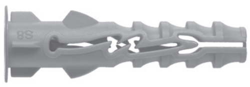
Base material / Anchor size	Ø4	Ø5	Ø6
Plasterboard BA10			
$V_{Ru,m}$*	1,0	1,0	1,0
Plasterboard BA13			
$V_{Ru,m}$*	1,35	1,35	1,35
Hollow clay bricks			
V_{rec}*	0,36	0,48	0,48
$V_{Ru,m}$*	2,2	2,9	2,9
Hollow concrete blocks			
V_{rec}*	0,38	0,65	0,73
$V_{Ru,m}$*	1,4	1,8	1,8

* indicative values

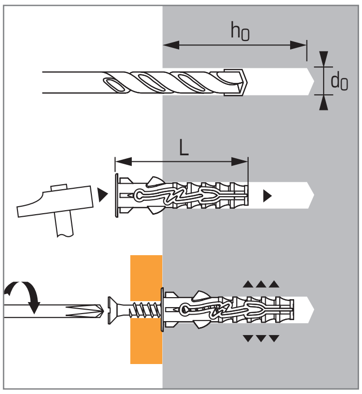
APPLICATION

- Fixing to plasterboard and hollow materials
- Bathroom accessories
- Pipework, trunking
- Slotted screw head type PZ2

NYL

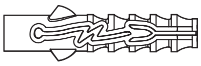


Universal nylon lightweight anchor



Version with collar

Version without collar



APPLICATION

- All lightweight fixings
- Bathroom accessories
- Electrical installations
- Plastic trunking

MATERIAL

- **Body:** Polyamid 6

Technical data

Anchor size	Wood screw diameter (mm) **d**	Drilling depth (mm) **h0**	Drilling diameter (mm) **d0**	Total anchor length (mm) **L**	Code	
					with collar	without collar
5X25	2,5 - 4	40	5	25	057070	-
6X30	3,5 - 5	40	6	30	057080	057140
8X40	5 - 7	40	8	40	057090	057020
10X50	6 - 8	60	10	50	-	057030
12X60	8 - 10	70	12	60	-	057150
14X70	10 - 12	80	14	70	-	057050

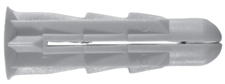
Recommended loads (N_{rec}, V_{rec}) and ultimate loads ($N_{Ru,m}$, $V_{Ru,m}$) in kN

TENSILE & SHEAR

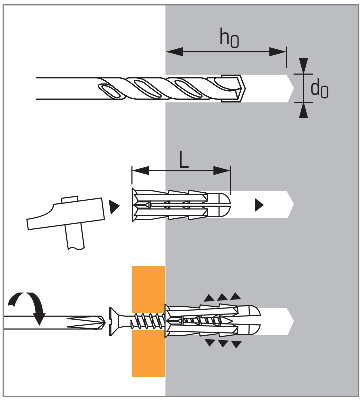
Anchor size / **Base material** / Screw Ø	**5X25** 4	**6X30** 5	**8X40** 7	**10X50** 8	**12X60** 10	**14X70** 12
Concrete (≥C20/25)						
N_{rec}*	0,3	0,5	0,8	1,2	1,8	2,8
$N_{Ru,m}$*	1,5	2,5	4,0	6,0	9,0	14,0
V_{rec}*	0,3	0,8	1,0	1,2	2,8	3,0
$V_{Ru,m}$*	3,1	4,9	5,8	7,3	22,3	24,0
Clay bricks BP 400						
N_{rec}*	0,3	0,5	0,8	1,1	1,5	1,8
$N_{Ru,m}$*	1,5	2,5	4,0	5,5	7,5	9,0
Hollow clay bricks C 40						
N_{rec}*	0,2	0,25	0,35	0,45	0,55	0,7
$N_{Ru,m}$*	1,0	1,3	1,8(1)	2,3(1)	2,8(1)	3,5(1)
Aerated concrete NFP 14-306						
$N_{Ru,m}$*	0,22	0,44	0,65	0,91	1,33	1,5
$V_{Ru,m}$*	0,16	0,23	0,42	0,71	0,96	1,1

* indicative values
(1) only for hollow clay bricks rendered

ARPON



Universal polyethylene lightweight anchor



APPLICATION

- Lightweight fixing in all base material
- Small electrical accessories, small light fittings, fuse boxes, etc…

MATERIAL

- **Body:** Polyethylene

Technical data

Anchor size	Screw threaded diameter (mm) **d**	Drilling depth (mm) **h0**	Drilling diameter (mm) **d0**	Total anchor length (mm) **L**	Code
6X25	3 - 5	30	6	25	198160
8X30	4 - 7	40	8	30	198180
8X30 PAV*	-	40	8	30	198190

*PAV : version with threaded head M7x150

Recommended loads (N_{rec}) and ultimate loads ($N_{Ru,m}$) in kN

TENSILE

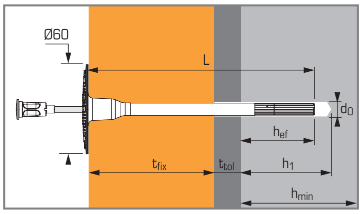
Anchor size / **Base material** / screw Ø	**6X25** 5	**8X30** 6
Concrete (≥C20/25)		
N_{rec}*	0,25	0,25
$N_{Ru,m}$*	1,5	1,5
Hollow concrete blocks B 40		
N_{rec}*	0,20	0,22
$N_{Ru,m}$*	1,2	1,3
Hollow clay bricks RJ 40 rendered		
N_{rec}*	0,26	0,26
$N_{Ru,m}$*	1,6	1,6

* indicative values

ISO N

Steel nail hammer-in anchor for fixing expanded polystyrene (EPS) and mineral wool insulation boards in external wall system (ETICS)

ETAG 014 - 13/0994
(cat. A, B, C, D)



APPLICATION

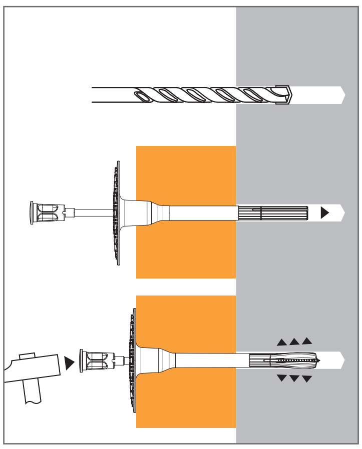
- Fixing all rigid insulation on solid or hollow material

MATERIAL

- **Anchor body:** polypropylene[1]
- **Steel nail:** 5 µm zinc coated
- **Thermal transmittance:** 0.002 W/k
- **Plate stiffness :** 0,7 kN/mm
- **Temperature range in use:** ≥0°C

[1]Caution: the anchor must be protected from UV rays by a screen (rendering, panelling, etc.)

INSTALLATION



Technical data

Anchor size	Anchor depth (mm) h_{ef}	Insulation thickness (mm) t_{fix}	Base material thickness (mm) h_{min}	Drilling depth (mm) $h_1 + t_{tol}$	Drilling diameter (mm) d_0	Total anchor lenght (mm) L	Code Head Ø60
8X115/80	25	80	100	35	8	115	012591
8X135/100		100				135	012592
8X155/120		120				155	012590
8X175/140		140				175	012593
8X195/160		160				195	012594
8X215/180		180				215	012595
8X235/200		200				235	012596
Plastic washer PA 6.6 Ø90							055705
Plastic washer PA 6.6 Ø140							054929

Characteristic loads (N_{Rk}) in kN

TENSILE

Base material / Anchor size Ø8, h_{ef} : 25 mm	N_{Rk}
Concrete (C12/15)	0,7
Concrete (C20/25 to C50/60)	0,9
Solid clay brick - EN 771-1 (fbk = 20 Mpa [1]	0,9
Calcium silicate solid units - EN 771-2 - fbk = 12 Mpa [1]	0,9
Lightweight concrete solid block - EN 771-3 - fbk = 7 Mpa [1]	0,9
Lightweight concrete hollow block - EN 771-3 - fbk = 4 Mpa [1]	0,9
Lightweight aggregate concrete- EN 771-3 (LAC) - fbk = 4 Mpa [1]	0,9
Perforated clay bricks - EN 771-1 - fbk = 10 Mpa [1]	0,3
Vertically perforated clay bricks - NORM B6124 - fbk = 10 Mpa [1]	0,5

[1] For others masonry types, jobsite tests could be performed.

Design loads (N_{Rd}) and recommended loads (N_{rec}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{(1)}}{\gamma_M}$$

(1) Issue from ETA

$$N_{rec} = \frac{N_{Rk}^{(1)}}{\gamma_M \cdot \gamma_F}$$

TENSILE

Base material / Anchor size Ø8, h_{ef} : 25 mm	N_{Rd}	N_{rec}
Concrete (C12/15)	0,35	0,25
Concrete (C20/25 to C50/60)	0,45	0,32
Solid clay brick - EN 771-1 (fbk = 20 Mpa [1]	0,45	0,32
Calcium silicate solid units - EN 771-2 - fbk = 12 Mpa [1]	0,45	0,32
Lightweight concrete solid block - EN 771-3 - fbk = 7 Mpa [1]	0,45	0,32
Lightweight concrete hollow block - EN 771-3 - fbk = 4 Mpa [1]	0,45	0,32
Lightweight aggregate concrete- EN 771-3 (LAC) - fbk = 4 Mpa [1]	0,45	0,32
Perforated clay bricks - EN 771-1 - fbk = 10 Mpa [1]	0,15	0,11
Vertically perforated clay bricks - NORM B6124 - fbk = 10 Mpa [1]	0,25	0,18

$\gamma_M = 2$; $\gamma_F = 1,4$

[1] For others masonry types, jobsite tests could be performed.

Spacing data

IN CONCRETE

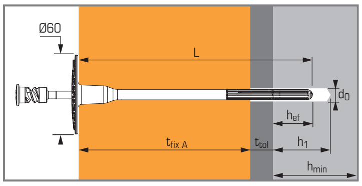
Minimum distance between anchors and from edges and minimum thickness of concrete member (mm)

S_{min}	C_{min}	h_{min}
100	100	100

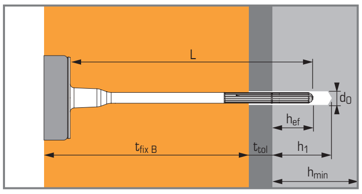
ISO S

Screw-in anchor with steel screw for mechanical fixing of the most common insulation materials, suitable for ETICS, for surface and countersunk installation

ETA
European Technical Assessment
ETAG 014 - 13/0560
(cat. A, B, C, D, E)



A instruction : flush mounting



B instruction : deep mounting with cap

- **Deep mounting with cap:** (cf. B inst.)
  Setting tool : code 054901
  White EPS cap: code 054897
  Grey EPS cap: code 054898
  Mineral wool cap: code 054899

APPLICATION

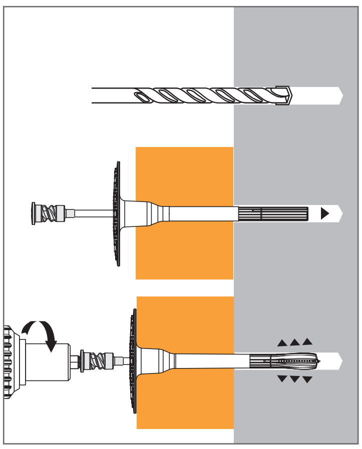
- Fixing all rigid insulation on solid or hollow material
- Removable fixing

MATERIAL

- **Anchor body:** polypropylene[1]
- **Steel nail:** 5 µm zinc coated 5.8 socket wrench Torx T30
- **Thermal transmittance:** 0.002 W/k
- **Plate stiffness :** 0,9 kN/mm
- **Temperature range in use:** -30°C to +80°C

[1]Caution: the anchor must be protected from UV rays by a screen (rendering, panelling, etc.)

INSTALLATION



Technical data

Anchor size	Anchor depth (mm) h_{ef}	Insulation thickness (mm) t_{fix} A	Insulation thickness (mm) t_{fix} B	Base material thickness (mm) h_{min}	Drilling depth (mm) $h_1 + t_{tol}$	Drilling diameter (mm) d_0	Total anchor lenght (mm) L	Code Head Ø60
8X95/60	25*	60	80	100	35	8	95	012566
8X115/80		80	100				115	012567
8X135/100		100	120				135	012568
8X155/120		120	140				155	012569
8X175/140		140	160				175	012572
8X195/160		160	180				195	012573
8X215/180		180	200				215	012574
8X235/200		200	220				235	012575
8X255/220		220	240				255	012576
8X275/240		240	240				275	012577
8X295/260		260	280				295	012578
8X315/280		280	300				315	012579
8X335/300		300	320				335	012580
8X355/320		320	340				355	012581
8X375/340		340	360				375	012582
Plastic washer PA 6.6 Ø90								055705
Plastic washer PA 6.6 Ø100 (countersunk)								054900
Plastic washer PA 6.6 Ø140								054929

*hef = 65 mm for E category material

Characteristic loads (N_{Rk}) in kN

TENSILE

Base material / **Anchor size** **Ø8** h_{ef} : 25 mm	N_{Rk}
Concrete (C12/15 to C50/60)	1,5
Solid clay brick - EN 771-1- fbk = 20 Mpa [1]	1,5
Calcium silicate solid units - EN 771-2 - fbk = 12 Mpa [1]	1,2
Lightweight concrete hollow block - EN 771-3 - fbk = 4 Mpa [1]	1,5
Lightweight aggregate concrete - EN 771-3 (LAC) - fbk = 4 Mpa [1]	1
Perforated clay bricks - EN 771-1 - fbk = 10 Mpa [1]	0,75
Vertically perforated clay bricks - NORM B6124 - fbk = 10 Mpa [1]	0,6
Autoclaved aerated concrete P2-400 - EN 771-4 - fbk = 2 Mpa [1]	0,6

[1] For others masonry types, jobsite tests could be performed.

Design loads (N_{Rd}) and recommended loads (N_{rec}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{(1)}}{\gamma_M}$$

(1) Issue from ETA

$$N_{rec} = \frac{N_{Rk}^{(1)}}{\gamma_M \cdot \gamma_F}$$

TENSILE

Base material / **Anchor size** **Ø8** h_{ef} : 25 mm	N_{Rd}	N_{rec}
Concrete (C12/15 to C50/60)	0,75	0,54
Solid clay brick - EN 771-1- fbk = 20 Mpa [1]	0,45	0,54
Calcium silicate solid units - EN 771-2 - fbk = 12 Mpa [1]	0,6	0,43
Lightweight concrete hollow block - EN 771-3 - fbk = 4 Mpa [1]	0,75	0,54
Lightweight aggregate concrete - EN 771-3 (LAC) - fbk = 4 Mpa [1]	0,5	0,36
Perforated clay bricks - EN 771-1 - fbk = 10 Mpa [1]	0,375	0,27
Vertically perforated clay bricks - NORM B6124 - fbk = 10 Mpa [1]	0,3	0,21
Autoclaved aerated concrete P2-400 - EN 771-4 - fbk = 2 Mpa [1]	0,3	0,21

$\gamma_M = 2$; $\gamma_F = 1,4$

[1] For others masonry types, jobsite tests could be performed.

Spacing data

IN CONCRETE

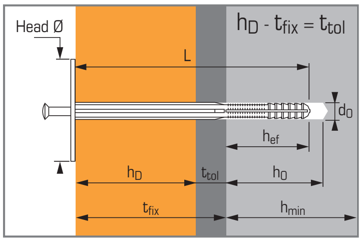
Minimum distance between anchors and from edges and minimum thickness of concrete member (mm)

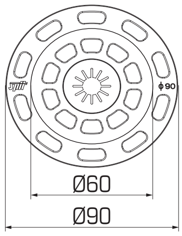
S_{min}	C_{min}	h_{min}
100	100	100

ISO

Expanding insulation anchor
for fixing all rigid or flexible insulation

ETAG 014 - 04/0076





Technical data

Anchor size	Anchor depth (mm) h_{ef}	Insulation thickness (mm) t_{fix}	Drilling depth (mm) h_0	Drilling diameter (mm) d_0	Total anchor lenght (mm) L	Code Head Ø50	Code Head Ø60
10X60/10-30		10-30			60	057599	-
10X95/45-65		45-65			95	-	057611
10X115/75-85		75-85			115	-	060001
10X135/95-105		95-105			135	-	057630
10X155/115-125	30	115-125	50	10	155	-	057640
10X175/135-145		135-145			175	-	057650
10X195/155-165		155-165			195	-	057651
10X215/175-185		175-185			215	-	057652
10X235/195-205		195-205			235	-	057653
Plastic washer Ø90							057655

APPLICATION

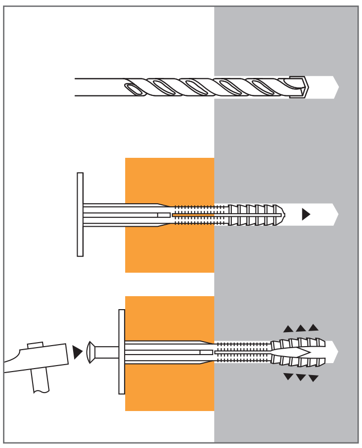
- Fixing all rigid insulation or flexible insulation (using the plastic washer Ø90) on solid or hollow material

MATERIAL

- **Anchor body:** polypropylene[1]
- **Expansion nail:** glass-fibre reinforced polyamid 6*[2]
- **Temperature range in use:** -30°C to +80°C

[1]Caution: the anchor must be protected from UV rays by a screen (rendering, panelling, etc.)
[2]Except ISO 10X60/10-30 : polypropylene nail

INSTALLATION



Characteristic resistance (N_{Rk}) in kN

TENSILE

Base material / Anchor size	10X60/10-30	10X95/45-65 → 10X235/195-205
Concrete (C15/20)		
N_{Rk}	0,2	0,6
Concrete (C20/25 to C50/60)		
N_{Rk}	0,3	0,75
Clay bricks (fc = 55 Mpa, bending test: 4,7 55 N/mm²)		
N_{Rk}	0,3	0,75
Hollow concrete blocks not rendered (fc = 12,5 N/mm²)		
N_{Rk}	0,15	0,3
Hollow clay bricks type Eco-30 not rendered (fc = 5,9 N/mm²)		
N_{Rk}	0,1	0,4

Design loads (N_{Rd}) and recommended loads (N_{rec}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Rk}^{(1)}}{\gamma_M}$$

(1) Issue from ETA

$$N_{rec} = \frac{N_{Rk}^{(1)}}{\gamma_M \cdot \gamma_F}$$

TENSILE

Base material / Anchor size	10X60/10-30	10X95/45-65 → 10X235/195-205
Concrete (C15/20)		
N_{Rd}	0,10	0,30
N_{rec}	0,07	0,21
Concrete (C20/25 to C50/60)		
N_{Rd}	0,15	0,375
N_{rec}	0,11	0,27
Clay bricks (fc = 55 Mpa, bending test: 4,7 N/mm²)		
N_{Rd}	0,15	0,375
N_{rec}	0,11	0,27
Hollow concrete blocks not rendered (fc = 12,5 N/mm²)		
N_{Rd}	0,075	0,15
N_{rec}	0,05	0,10
Hollow clay bricks type Eco-30 not rendered (fc = 5,9 N/mm²)		
N_{Rd}	0,05	0,20
N_{rec}	0,035	0,14

$\gamma_M = 2$; $\gamma_F = 1,4$

Spacing data

IN CONCRETE

Minimum distance between anchors and from edges & minimum thickness of concrete (mm)

S_{min}	C_{min}	h_{min}
100	100	100

Characteristic resistance according to the technical reports TR025 and TR026

Thermal transmittance

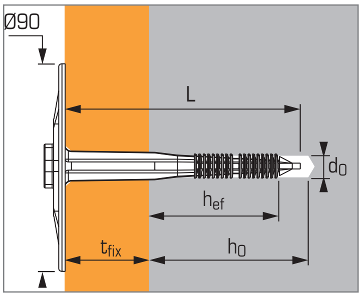
Insulation thickness (h_D) mm	Thermal transmittance (X) (W/K)
<150	0,001
150	0,000

Plate stiffness

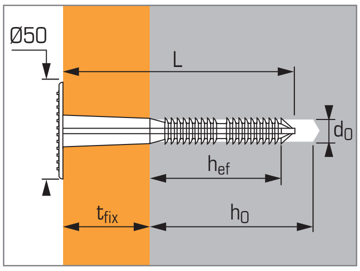
Head Ø	Plate Resistance (kN)	Plate stiffness (kN/mm)
50	1,00	0,3
60	1,00	0,5
60 + washer Ø90	1,10	0,5

CB - BR

Anchor for fixing semi-rigid insulation



CB anchor



BR anchor

APPLICATION

- **SPIT CB :** Fixing semi-rigid insulation on solid materials
- **SPIT BR :** Fixing rigid insulation on solid materials

MATERIAL

- **CB anchor body:** polypropylene (anti U.V.) black
- **BR anchor body:** polypropylene

Technical data

Anchor size	Anchor depth (mm) h_{ef}	Insulation thickness (mm) t_{fix}	Drilling depth (mm) h_0	Drilling diameter (mm) d_0	Total anchor lenght (mm) L	Code **CB** Head Ø90	Code **BR** Head Ø50
8X85/40-50	20-30	40 - 50	50	8	85/80	057690	057704
8X95/50-60		50 - 60			95/90	057691	057705
8X115/70-80		70 - 80			115/110	055720	057706
8X135/90-100		90 - 100			135/130	055730	057707
8X155/110-120		110 - 120			155/150	055740	057708
8X165/140		140			165	054864	-
8X185/160		160			185	054865	-
8X205/180		180			205	054866	-
8X225/200		200			225	054867	-
8X245/220		220			245	054868	

Ultimate loads ($N_{Ru,m}$) in kN

TENSILE

Base material / Anchor size	CB 8X85/40-50 → 8X155/110-120	CB 8X165/140 → 8X245/220	BR 8X85/40-50 → 8X155/110-120
Concrete (C20/25)			
$N_{Ru,m}$	0,5	0,25	0,5
Clay bricks (fc = 55 N/mm²)			
$N_{Ru,m}$	0,4	0,20	0,4
Solid concrete blocks B120 (fc = 13,5 N/mm²)			
$N_{Ru,m}$	0,3	0,15	0,3
Aerated concrete (Mvn = 500 kg/m³)			
$N_{Ru,m}$	0,15	0,075	0,15

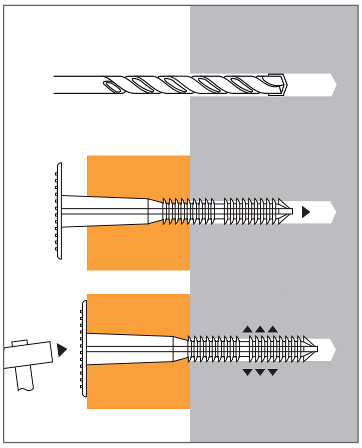
Design loads (N_{Rd}) and recommended loads (N_{rec}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Ru,m}{}^{(1)}}{3,5}$$

(1) Derived from test results

$$N_{rec} = \frac{N_{Ru,m}{}^{(1)}}{5}$$

INSTALLATION

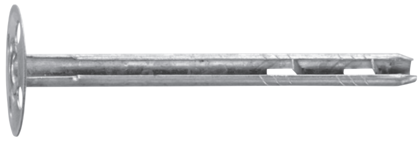


TENSILE

Base material / Anchor size	CB 8X85/40-50 → 8X155/110-120	CB 8X165/140 → 8X245/220	BR 8X85/40-50 → 8X155/110-120
Concrete (C20/25)			
N_{Rd}	0,14	0,071	0,14
N_{rec}	0,1	0,05	0,1
Clay bricks (fc = 55 N/mm²)			
N_{Rd}	0,11	0,055	0,11
N_{rec}	0,08	0,04	0,08
Solid concrete blocks B120 (fc = 13,5 N/mm²)			
N_{Rd}	0,08	0,04	0,08
N_{rec}	0,06	0,03	0,06
Aerated concrete (Mvn = 500 kg/m³)			
N_{Rd}	0,04	0,02	0,04
N_{rec}	0,03	0,015	0,03

ISOMET

Galvanised & Stainless steel versions

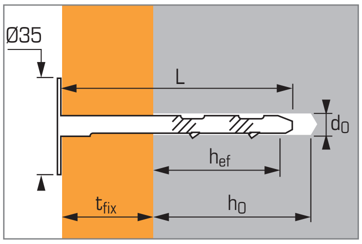


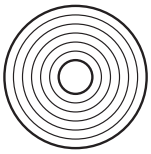
Fire resistant insulation anchor

Technical Assessment SOCOTEC

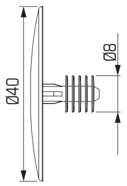
N° PT 3043

INOX STAINLESS STEEL





Washer Ø 11X70
Code 064 000



Head cap
Codes:
White 780350
Beige 780360
Grey 051799

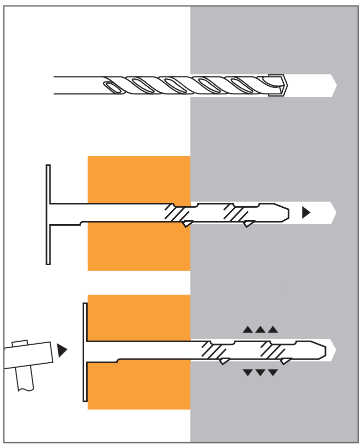
APPLICATION

- Fixing all types of insulation where a fire resistant anchor is required

MATERIAL

- **Galvanised version:** body Z275, NF EN 10142
- **Stainless steel A4 version:** body Z6 CN 18-09

INSTALLATION



Technical data

Anchor size	Anchor depth (mm) h_{ef}	Insulation thickness (mm) t_{fix}	Drilling depth (mm) h_0	Drilling diameter (mm) d_0	Total anchor lenght (mm) L	Code: Galvanised version	Code: Stainless st. A4 version
8X80/30		30			80	059730	059700
8X110/60		60			110	059740	059710
8X120/70		70			120	059880	-
8X140/90	50	90	60	8	140	059750	059720
8X170/120		120			170	059760	-
8X200/150		150			200	059770	-
8X250/200		200			250	055291	-
8X300/250		250			300	055643	-

Ultimate loads ($N_{Ru,m}$) in kN

TENSILE

Base material / Anchor size	Galvanised version	Stainless steel A4 version
Concrete (C20/25)		
$N_{Ru,m}$	0,75	1,0
Clay bricks (fc = 55 N/mm²)		
$N_{Ru,m}$	0,5	0,5
Solid concrete blocks B120 (fc = 13,5 N/mm²)		
$N_{Ru,m}$	0,5	0,5

Design loads (N_{Rd}) and recommended loads (N_{rec}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Ru,m}^{(1)}}{4}$$

(1) Derived from test results

$$N_{rec} = \frac{N_{Ru,m}^{(1)}}{5}$$

TENSILE

Base material / Anchor size	Galvanised version	Stainless steel A4 version
Concrete (C20/25)		
N_{Rd}	0,21	0,42
N_{rec}	0,15	0,20
Clay bricks (fc = 55 N/mm²)		
N_{Rd}	0,14	0,21
N_{rec}	0,10	0,10
Solid concrete blocks B120 (fc = 13,5 N/mm²)		
N_{Rd}	0,14	0,21
N_{rec}	0,10	0,10

Fire behaviour for insulation fixed to soffits

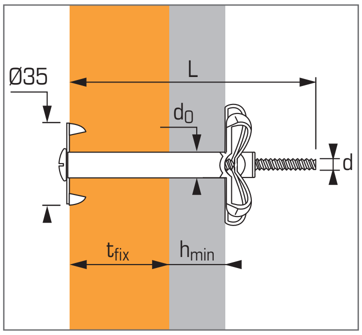
Maximum tensile service loads recommended on concrete for stability (kN).

Exposure time	30 min.	1 h	1 h 30 min.	2 h	3 h
Galvanised version	0,13	0,07	0,07	0,07	0,035
Stainless steel A4 version	0,20	0,20	0,20	0,20	0,10

The summary of fire tests performed by CSTB (No. 86.24642) is available on request.

ISOMET CC

Fire resistant insulation anchor for hollow base materials



Technical data

Anchor size	Screw diameter (mm) d	Insulation thickness (mm) t_{fix}	Base material thickness min. - max. (mm) h_{min}	Drilling diameter (mm) d_0	Total anchor lenght (mm) L	Code
12X110/60	6	60	10 - 34	12	113	059800
12X130/80		80			133	059810
12X150/100		100			153	059820

APPLICATION

- Fixing all type of insulation for hollow base material where a fire resistant anchor is required

Recommended load (N_{rec}) and ultimate loads ($N_{Ru,m}$) in kN

TENSILE

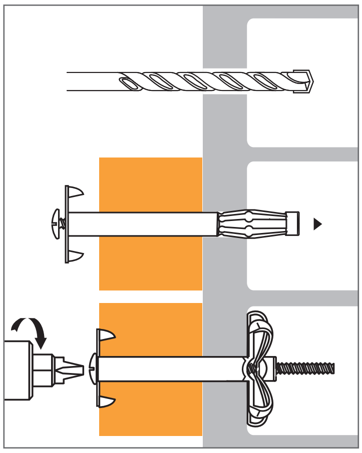
Supports / Dimensions	ISOMET CC
Hollow concrete beam	
N_{rec}*	0,15
$N_{Ru,m}$*	0,75
Hollow concrete block	
N_{rec}*	0,30
$N_{Ru,m}$*	1,50
Hollow clay brick	
N_{rec}*	0,20
$N_{Ru,m}$*	1,00

*Indicative values

MATERIAL

- Slotted screw head type PZ2

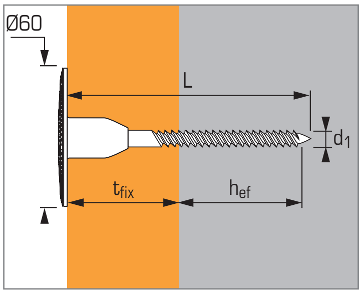
INSTALLATION



Fire behaviour

Fire tests on insulation fixed to soffits built in hollow concrete block or in hollow concrete beam have been done in the CTICM laboratory. The test results (report n° 96-4-374) obtained guarantee the performance of the anchor ISOMET CC for an exposure time higher than 2 hours.

Anchor for fixing insulation on wood



APPLICATION

- Fixing all rigid insulation on wood
- Caps included to avoid thermal transmittance
- Setting by srewing

Technical data

Anchor size	Anchor depth (mm) h_{ef}	Insulation thickness (mm) t_{fix}	Screw diameter (mm) d_1	Total screw lenght (mm) L	Code
6X80/40	30 - 40	40	6	80	055737
6X100/60		60		100	055738
6X120/80		80		120	055739
6X140/100		100		140	055741
6X160/120		120		160	055742
6X180/140		140		180	055743
6X200/160		160		200	055744
6X220/180		180		220	055745
6X240/200		200		240	055746
6X260/220		220		260	055747

Ultimate loads ($N_{Ru,m}$) in kN

TENSILE

Insulation + wood* / **Anchor size**	**ISOWOOD** --
Insulation density 190 kg/m³	
$N_{Ru,m}$	0,76
Insulation density 265 kg/m³	
$N_{Ru,m}$	1,75

*Jobsite tests could be performed to validate the base material.

MATERIAL

- **Anchor head:** polypropylene[(1)]
- **Screw:** steel, 5 µm,
Screw head Torx N° 25
- **Temperature range in use:** ≥0°C

[(1)]Caution: the anchor must be protected from UV rays by a screen (rendering, panelling, etc.)

Design loads (N_{Rd}) and recommended loads (N_{rec}) for one anchor without edge or spacing influence in kN

$$N_{Rd} = \frac{N_{Ru,m}^{(1)}}{4}$$

(1) Derived from test results

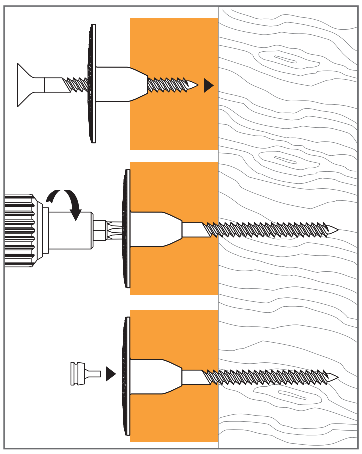
$$N_{rec} = \frac{N_{Ru,m}^{(1)}}{5}$$

TENSILE

Insulation + wood* / **Anchor size**	**ISOWOOD** --
Insulation density 190 kg/m³	
N_{Rd}	0,19
N_{rec}	0,15
Insulation density 265 kg/m³	
N_{Rd}	0,44
N_{rec}	0,35

*Jobsite tests could be performed to validate the base material.

INSTALLATION



Spacing data

ON WOOD

Minimum distance between anchors and from edges and minimum thickness of wood (mm)

	S_{min}	C_{min}	h_{min}
ISOWOOD	100	100	100

Notes

Notes

Internet

I-Expert is an application accessible from one internet browser ie Internet Explorer, Firefox, Safari, Chrome to find your fixing solution from any computer connected to internet, in total confidentiality and security.

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