Pure epoxy mortar anchor, for use in cracked and non-cracked concrete

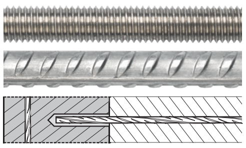
MOPURE

ETA assessed Option 1 (cracked and non-cracked concrete).

PRODUCT INFORMATION

DESCRIPTION
Pure epoxy, chemical anchor.

OFFICIAL DOCUMENTATION
- ETA 14/0156 option 1, M10 to M30 for cracked and non-cracked concrete (100 years).
- ETA 14/0325 for rebar installation (100 years).
- Declaration features DoP MOPURE.
- Certificate EVCP 1020-CPR-090-032368 for rebars.
- Certificate EVCP 1020-CPR-090-032497 for use in concrete.

VALID FOR


Stud
Rebar
Post-installed rebar

DIMENSIONS
Stud M10 - M30
Rebar as stud Ø8 - Ø32
Post-installed rebars Ø8 - Ø32

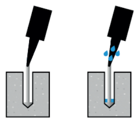
RANGE OF CACULATION LOADS
From 17.2 to 109.7 kN (non-cracked).
From 13,3 to 69,1 kN (cracked).

BASE MATERIAL
Concrete quality C20/25 to C50/60 cracked or non-cracked.

Concrete · Reinforced concrete · Cracked concrete

ASSESSMENTS
- ETA 14/0156 Option 1: Cracked and non-cracked concrete.
- ETA 14/0325 Post-installed rebars.

STRUCTURAL FIXINGS IN CRACKED & UNCRACKED CONCRETE — ETA 14/0156 · REBAR CONNECTIONS — ETA 14/0325 · ÉMISSIONS DANS L'AIR INTÉRIEUR A+ · LEED TESTED · SEISMIC C1

DRILL HOLE CONDITION


Dry · Wet

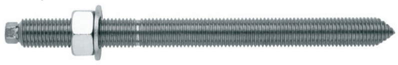
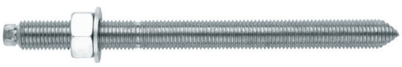
CHARACTERISTICS AND BENEFITS
- Use in cracked and non-cracked concrete.
- Pure epoxy, optimal for high temperatures and large diameter drill holes.
- Parallel cartridges of 300 + 300 ml.
- Used for high loads.
- For static or quasi-static loads and seismic applications C1.
- Temperature range -40°C to +80°C (maximum long-term temperature +40°C).
- Variety of lengths and diameter: M10-M30-assessed studs. Use of rebars as anchor from Ø8 to Ø32, assembly flexibility.
- Version in zinc plated steel, stainless steel A2 and A4.
- Available in INDEXcal.

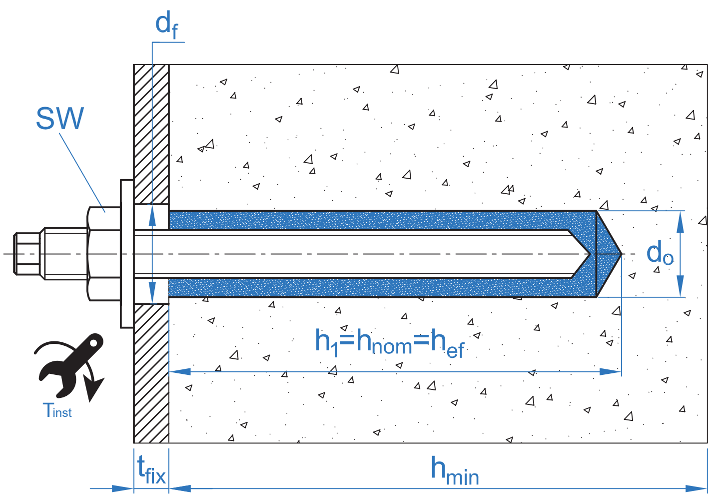
MATERIALS
Standard stud:
Carbon steel 5.8, 8.8.

Stainless standard stud:
Stainless steel A2-70 and A4-70.

APPLICATIONS
- For indoor and outdoor use.
- Structural applications and elements subject to vibrations.
- Rebars and start rebars.
- Applications at high temperature.
- Safety barriers, retaining walls, heavy machinery, etc.
- Large metric sizes, retaining walls.

CONCRETE INSTALLATION PARAMETERS

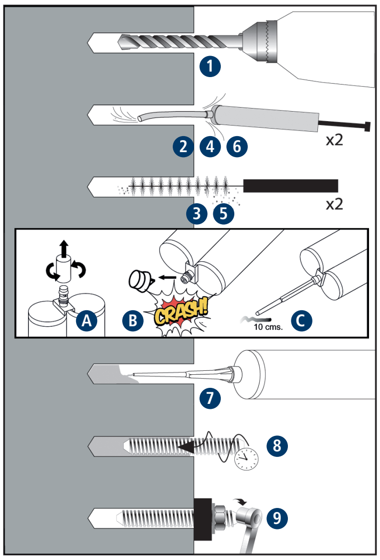
METRIC			M10	M12	M16	M20	M24	M30
d_0	nominal diameter	[mm]	12	14	18	22	26	35
d_f	diameter in anchor plate ≤	[mm]	12	14	18	22	26	33
T_{inst}	tightening torque ≤	[Nm]	20	40	80	135	200	270
Circular cleaning brush			Ø14	Ø20		Ø29		-
$h_{ef,min}$ = 8d								
h_1	depth of the drill hole	[mm]	60	70	80	90	96	120
$s_{cr,N}$	critical distance between anchors	[mm]	180	210	240	270	288	360
$c_{cr,N}$	critical distance from the edge	[mm]	90	105	120	135	144	180
c_{min}	minimum distance from the edge	[mm]	40	40	45	50	55	65
s_{min}	minimum distance between anchors	[mm]	40	40	45	50	55	65
h_{min}	minimum concrete thickness	[mm]	100	100	115	130	160	200
Standard stud								
h_1	depth of the drill hole	[mm]	90	110	128	170	210	280
$s_{cr,N}$	critical distance between anchors	[mm]	270	330	384	510	630	840
$c_{cr,N}$	critical distance from the edge	[mm]	135	165	192	255	315	420
c_{min}	minimum distance from the edge	[mm]	45	56	65	85	105	140
s_{min}	minimum distance between anchors	[mm]	45	56	65	85	105	140
h_{min}	minimum concrete thickness	[mm]	115	140	165	220	270	350
$h_{ef,max}$ = 20d								
h_1	depth of the drill hole	[mm]	200	240	320	400	480	600
$s_{cr,N}$	critical distance between anchors	[mm]	600	720	940	1200	1440	1800
$c_{cr,N}$	critical distance from the edge	[mm]	300	360	470	600	720	900
c_{min}	minimum distance from the edge	[mm]	40	40	45	50	55	65
s_{min}	minimum distance between anchors	[mm]	40	40	45	50	55	65
h_{min}	minimum concrete thickness	[mm]	224	268	336	444	532	670
Zinc-plated stud code 5.8 / 8.8 			EQAC10130 EQ8810130	EQAC12160 EQ8812160	EQAC16190 EQ8816190	EQAC20260 EQ8820260	EQAC24300 EQ8824300	EQAC30330 EQ8830330
Stainless steel stud code A2 / A4 			EQA210130 EQA410130	EQA212160 EQA412160	EQA216190 EQA416190	EQA220260 EQA420260	EQA224300 EQA424300	EQA230330 EQA430330



INSTALLATION ACCESSORIES		
CODE	PRODUCT	MATERIAL
MOPISPUR6	APPLICATION GUNS	Gun for 600 ml parallel cartridges (300+300)
EQ-AC **EQ-8.8** **EQ-A2** **EQ-A4**	STUD	Studs threaded steel, class 5.8 ISO 898-1 Studs threaded steel, class 8.8 ISO 898-1 Studs stainless steel A2-70 Studs stainless steel A4-70
MORCEPKIT	CLEANING BRUSHES	Kit with 3 cleaning brushes measuring ø14, ø20 and ø29 mm
MOBOMBA	CLEANING PUMP	Pump for cleaning leftover dust and fragments in the drill hole
MORCAPU	MIXING TUBE	Plastic. Static labyrinth mixture

INSTALLATION PROCEDURE

CONCRETE



MINIMUM CURING TIME			
TYPE	BASE MATERIAL TEMPERATURE [ºC]	HANDLING TIME [min]	CURING TIME [hours]
MOPURE	+5 a +10	20	24
	+10 a +15	20	12
	+15 a +20	15	8
	+20 a +25	11	7
	+25 a +30	8	6
	+30 a +35	6	5
	+35 a +40	4	4
	40	3	3

Resistance in concrete C20/25 for an insulated anchor, without effects of distance from the edge or spacing between anchors, with a standard stud EQ-AC, EQ-8.8, EQ-A2 or EQ-A4.

Characteristic tensile strength N_{Rk}								
	Metric		M10	M12	M16	M20	M24	M30
N_{Rk}	Non-cracked concrete	[kN]	31,1	45,6	69,1	109	149,7	230,4
	Cracked concrete	[kN]	24	35,2	48,1	58,7	87,1	145,1
Calculated tensile strength N_{Rd}								
	Metric		M10	M12	M16	M20	M24	M30
N_{Rd}	Non-cracked concrete	[kN]	17,2	21,7	32,9	51,9	71,2	109,7
	Cracked concrete	[kN]	13,3	16,7	22,9	27,9	41,4	69,1
Maximum recommended tensile load N_{rec}								
	Metric		M10	M12	M16	M20	M24	M30
N_{rec}	Non-cracked concrete	[kN]	12,3	15,5	23,5	37,1	50,9	78,4
	Cracked concrete	[kN]	9,5	11,9	16,3	19,9	29,6	49,3
Characteristic resistance to shear stress V_{Rk}								
	Metric		M10	M12	M16	M20	M24	M30
V_{Rk}	Zinc-plated stud 5.8	[kN]	*15,0*	*21,0*	*39,0*	*61,0*	*88,0*	*140,0*
	Zinc-plated stud 8.8	[kN]	*23,0*	*34,0*	*63,0*	*98,0*	*141,0*	*224,0*
	Stainless steel stud (A2/A4)	[kN]	*20,0*	*30,0*	*55,0*	*86,0*	*124,0*	*196,0*
Calculated resistance to shearing V_{Rd}								
	Metric		M10	M12	M16	M20	M24	M30
V_{Rd}	Zinc-plated stud 5.8	[kN]	*12,0*	*16,8*	*31,2*	*48,8*	*70,4*	*112,0*
	Zinc-plated stud 8.8	[kN]	*18,4*	*27,2*	*50,4*	*78,4*	*112,8*	*179,2*
	Stainless steel stud (A2/A4)	[kN]	*12,8*	*19,2*	*35,2*	*55,1*	*79,4*	*125,4*
Maximum recommended load to shear stress V_{rec}								
	Metric		M10	M12	M16	M20	M24	M30
V_{rec}	Zinc-plated stud 5.8	[kN]	*8,5*	*12*	*22,2*	*34,8*	*50,2*	*80*
	Zinc-plated stud 8.8	[kN]	*13,1*	*19,4*	*36*	*56*	*80,5*	*128*
	Stainless steel stud (A2/A4)	[kN]	*9,1*	*13,7*	*25,1*	*39,3*	*56,7*	*89,7*
Effective depth of studs EQ-AC / EQ-A2 / EQ-A4								
	Metric		M10	M12	M16	M20	M24	M30
	Effective depth	[mm]	90	110	128	170	210	280

The values underlined and in italics indicate steel failure

Simplified calculation method. European Technical Assessment ETA 14/0156

Simplified version of the calculation method according to Eurocode 2 EN 1992-4. Resistance is calculated according to the data shown in assessment ETA 14/0156.

- Influence of concrete resistance.
- Influence of the distance from the edge of the concrete.
- Influence of the spacing between anchors.
- Influence of rebars.
- Influence of the base material thickness.
- Influence of the load application angle.
- Influence of the effective depth.
- Valid for a group of two anchors.
- Valid for dry or wet drill holes.

The calculation method is based on the following simplification:
No different loads act on individual anchors, without eccentricity.

INDEXcal

For a more precise calculation and taking into account more constructive arrangements we recommend the use of our INDEXcal calculation program. It can be downloaded free from our website **www.indexfix.com**

MOPURE

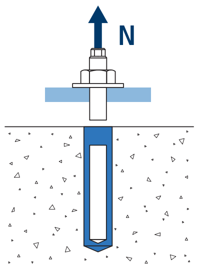
TENSILE LOADS

- Calculated steel resistance: $N_{Rd,s}$
- Calculated extraction resistance: $N_{Rd,p} = N^{o}_{Rd,p} \cdot \Psi_{c} \cdot \Psi_{hef,p}$
- Calculated concrete cone resistance: $N_{Rd,c} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N} \cdot \Psi_{hef,N}$
- Calculated concrete cracking resistance: $N_{Rd,sp} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp} \cdot \Psi_{hef,N}$

Calculated steel resistance

$N_{Rd,s}$

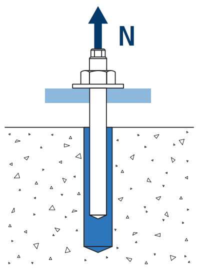
Metric			M10	M12	M16	M20	M24	M30
$N^{o}_{Rd,s}$	Steel class 5.8	[kN]	19,3	28	52,7	82	118	187,3
	Steel class 8.8	[kN]	30,7	44,7	84	130,7	188	299,3
	Steel class 10.9	[kN]	43,6	63,2	118	184,2	265,4	421,8
	Stainless steel Class A2-70, A4-70	[kN]	21,9	31,6	58,8	92	132,1	210,2



Calculated extraction resistance

$N_{Rd,p} = N^{o}_{Rd,p} \cdot \Psi_{c} \cdot \Psi_{hef,p}$

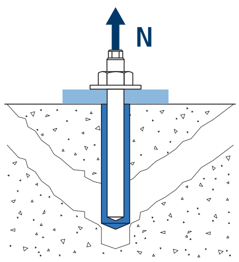
Metric			M10	M12	M16	M20	M24	M30
$N^{o}_{Rd,p}$	Non-cracked concrete, -40 °C to +40 °C	[kN]	17,3	21,7	33,7	56,0	90,5	125,7
	Non-cracked concrete, -40 °C to +70 °C	[kN]	7,9	9,9	15,3	25,4	41,5	56,5
	Non-cracked concrete, -40 °C to +80 °C	[kN]	7,1	7,9	12,3	20,3	33,9	50,3
	Cracked concrete, -40 °C to +40 °C	[kN]	13,4	16,8	26,0	28,0	41,5	69,1
	Cracked concrete, -40 °C to +70 °C	[kN]	5,5	6,9	12,3	10,2	15,1	25,1
	Cracked concrete, -40 °C to +80 °C	[kN]	4,7	5,9	9,2	10,2	15,1	25,1



Calculated concrete cone resistance

$N_{Rd,c} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N} \cdot \Psi_{hef,N}$

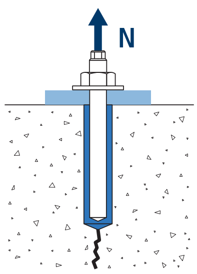
Metric			M10	M12	M16	M20	M24	M30
$N^{o}_{Rd,c}$	Non-cracked concrete	[kN]	23,3	27,0	32,7	51,9	71,3	109,8
	Cracked concrete	[kN]	16,3	18,9	22,9	36,4	49,9	76,8



Calculated concrete cracking resistance

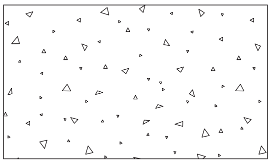
$N_{Rd,sp} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp} \cdot \Psi_{hef,N}$

Metric			M10	M12	M16	M20	M24	M30
$N^{o}_{Rd,sp}$	Non-cracked concrete	[kN]	23,3	27,0	32,7	51,9	71,3	109,8



MOPURE

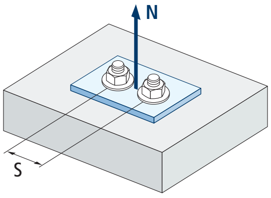
Influence coefficients



Influence of concrete resistance for extraction Ψ_c					
	Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_c	Non-cracked concrete	1.00	1.04	1.07	1.09

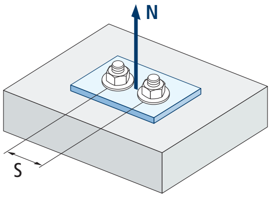
$$\Psi_b = \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$

Influence of concrete resistance for concrete cone and concrete cracking Ψ_b					
	Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_b		1.00	1.22	1.41	1.55



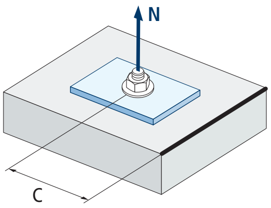
Influence of spacing between anchors (concrete cone) $\Psi_{s,N}$										
$s/s_{cr,N}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$\Psi_{s,N}$	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00

$$\Psi_{s,N} = 0.5\left(1 + \frac{s}{s_{cr,N}}\right) \leq 1$$



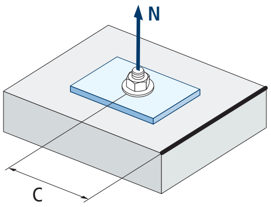
Influence of spacing between anchors (cracking) $\Psi_{s,N}$										
$s/s_{cr,sp}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$\Psi_{s,sp}$	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00

$$\Psi_{s,sp} = 0.5\left(1 + \frac{s}{s_{cr,sp}}\right) \leq 1$$



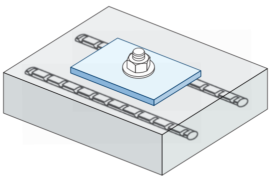
Influence of the distance from the edge of the concrete (concrete cone) $\Psi_{c,N}$												
$c/C_{cr,N}$	0.1	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.6
$\Psi_{c,N}$	0.40	0.46	0.51	0.45	0.49	0.55	0.61	0.67	0.75	0.83	0.91	1.00

$$\Psi_{c,N} = 0.35 + \frac{0.5 \cdot c}{C_{cr,N}} + \frac{0.15 \cdot c^2}{C_{cr,N}^{\,2}} \leq 1$$



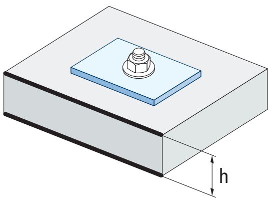
Influence of the distance from the edge of the concrete (cracking) $\Psi_{c,sp}$												
$c/C_{cr,sp}$	0.1	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.6
$\Psi_{c,sp}$	0.40	0.46	0.51	0.45	0.49	0.55	0.61	0.67	0.75	0.83	0.91	1.00

$$\Psi_{c,sp} = 0.35 + \frac{0.5 \cdot c}{C_{cr,sp}} + \frac{0.15 \cdot c^2}{C_{cr,sp}^{\,2}} \leq 1$$



Influence of the rebars $\Psi_{re,N}$					
h_{ef} (mm)	64	70	80	90	100
$\Psi_{re,N}$	0.82	0.85	0.90	0.95	1.00

$$\Psi_{re,N} = 0.5 + \frac{h_{ef}}{200} \leq 1$$

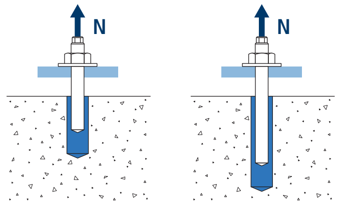


Influence of the base material thickness $\Psi_{h,sp}$											
$\Psi_{h,sp}$	h/h_{ef}	2.00	2.20	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.68
	fh	1.00	1.07	1.13	1.19	1.25	1.31	1.37	1.42	1.48	1.50

$$\Psi_{h,sp} = \left(\frac{h}{2 \cdot h_{ef}}\right)^{2/3} \leq 1.5$$

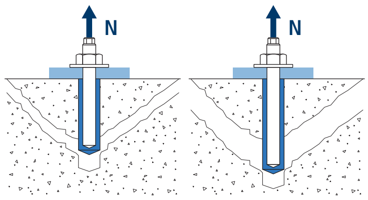
MOPURE

Influence of the effective depth for the extraction combination $\Psi_{hef,p}$						
Metric h_{ef}	M10	M12	M16	M20	M24	M30
80	0.89					
90	1.00					
96	1.07	0.87		**Value not permitted**		
110	1.22	1.00				
128	1.42	1.16	1.00			
160	1.78	1.45	1.25	0.94		
170	1.89	1.55	1.33	1.00		
192	2.13	1.75	1.50	1.13	0.91	
200	2.22	1.82	1.56	1.18	0.95	
210		1.91	1.64	1.24	1.00	
240		2.18	1.88	1.41	1.14	0.86
280			2.19	1.65	1.33	1.00
320			2.50	1.88	1.52	1.14
400				2.35	1.90	1.43
480		**Value not permitted**			2.29	1.71
600						2.14



$$\Psi_{hef,p} = \frac{h_{ef}}{h_{stand}}$$

Influence of the effective depth for the concrete cone $\Psi_{hef,N}$						
Metric h_{ef}	M10	M12	M16	M20	M24	M30
80	0.84					
90	1.00					
96	1.10	0.82		**Value not permitted**		
110	1.35	1.00				
128	1.70	1.26	1.00			
160	2.37	1.75	1.40	0.91		
170	2.60	1.92	1.53	1.00		
192	3.12	2.31	1.84	1.20	0.87	
200	3.31	2.45	1.95	1.28	0.93	
210		2.64	2.10	1.37	1.00	
240		3.22	2.57	1.68	1.22	0.79
280			3.24	2.11	1.54	1.00
320			3.95	2.58	1.88	1.22
400				3.61	2.63	1.71
480		**Value not permitted**			3.46	2.24
600						3.14

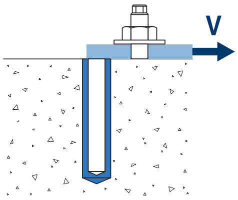


$$\Psi_{hef,N} = \left(\frac{h_{ef}}{h_{stand}}\right)^{1.5}$$

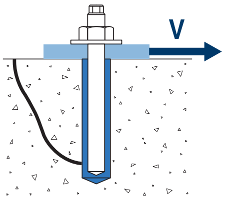
MOPURE

SHEARING LOADS

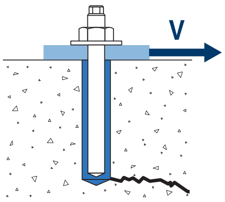
- Calculated steel resistance without lever arm: $V_{Rd,s}$
- Calculated spalling resistance: $V_{Rd,cp} = k \cdot N^o_{Rd,c}$
- Calculated concrete edge resistance: $V_{Rd,c} = V^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$



Calculated steel resistance to shearing								
$V_{Rd,s}$								
Metric			M10	M12	M16	M20	M24	M30
$V^o_{Rd,s}$	Steel class 5.8	[kN]	12	16.8	31.2	48.8	70.4	112
	Steel class 8.8	[kN]	18.4	27.2	50.4	78.4	112.8	179.2
	Steel class 10.9	[kN]	19.3	28	52.7	82	118	187.3
	Stainless steel Class A2-70, A4-70	[kN]	12.8	19.2	35.3	55.1	79.5	125.6

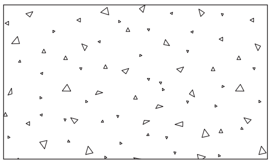


Calculated spalling resistance						
$V_{Rd,cp} = k \cdot N^o_{Rd,c}$						
Metric	M10	M12	M16	M20	M24	M30
k	2					



Calculated concrete edge resistance								
$V_{Rd,c} = V^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$								
Metric			M10	M12	M16	M20	M24	M30
$V^o_{Rd,c}$	Non-cracked concrete	[kN]	8.6	11.8	19.0	28.3	36.4	55.5
	Cracked concrete	[kN]	6.1	8.4	13.4	20.1	25.8	39.5

Influence coefficients



$$\Psi_b = \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$

Influence of concrete resistance for concrete cone and concrete cracking Ψ_b				
Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_b	1.00	1.22	1.41	1.55

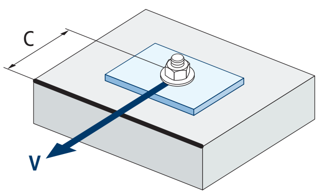
Influence of the distance from the edge and spacing between anchors $\Psi_{se,V}$

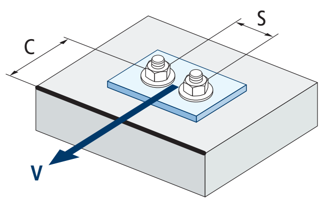
For one anchor

c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
Insulated	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18

For two anchors

s/c	c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
	1.0	0.24	0.43	0.67	0.93	1.22	1.54	1.89	2.25	2.64	3.04	3.46	3.91	4.37	4.84	5.33	6.36	7.45
	1.5	0.27	0.49	0.75	1.05	1.38	1.74	2.12	2.53	2.96	3.42	3.90	4.39	4.91	5.45	6.00	7.16	8.39
	2.0	0.29	0.54	0.83	1.16	1.53	1.93	2.36	2.81	3.29	3.80	4.33	4.88	5.46	6.05	6.67	7.95	9.32
	2.5	0.32	0.60	0.92	1.28	1.68	2.12	2.59	3.09	3.62	4.18	4.76	5.37	6.00	6.66	7.33	8.75	10.25
	≥ 3.0	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18





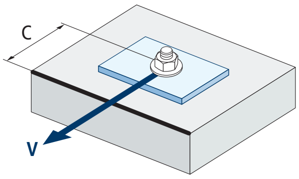
$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5}$$

$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5} \cdot \left(1 + \frac{s}{3 \cdot c}\right) \cdot 0.5 \leq \left(\frac{c}{h_{ef}}\right)^{1.5}$$

MOPURE

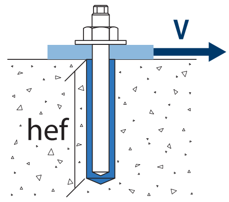
Influence of the distance from the edge of the concrete $\Psi_{c,V}$								
c/d	4	5	7	10	15	20	25	30
$\Psi_{c,V}$	0.76	0.72	0.68	0.63	0.58	0.55	0.53	0.51

$$\Psi_{c,V} = \left(\frac{d}{c}\right)^{0.20}$$

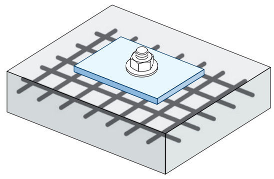


Influence of the effective depth $\Psi_{hef,V}$													
h_{ef}/d	8	9	10	11	12	13	14	15	16	17	18	19	20
$\Psi_{hef,V}$	1.65	2.04	2.47	2.93	3.42	3.94	4.50	5.10	5.72	6.38	7.06	7.78	8.53

$$\Psi_{hef,V} = 0.04 \cdot \left(\frac{h_{ef}}{d}\right)^{1.79}$$

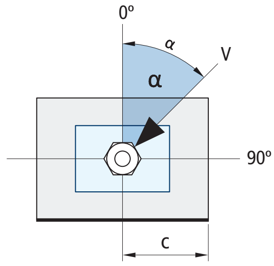


Influence of the rebars $\Psi_{re,v}$				
		Without perimeter rebar	Perimeter rebar ≥Ø12mm	Perimeter rebar with abutments at≤100mm
$\Psi_{re,v}$	Non-cracked concrete	1	1	1
	Cracked concrete	1	1.2	1.4



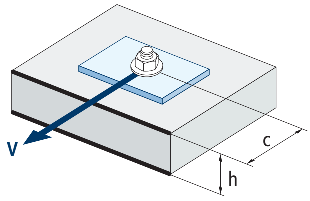
Influence of the load application angle $\Psi_{\alpha,v}$										
Angle, α(º)	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
$\Psi_{\alpha,v}$	1.00	1.01	1.05	1.13	1.24	1.40	1.64	1.97	2.32	2.50

$$\Psi_{\alpha,V} = \sqrt{\frac{1}{(\cos\alpha_v)^2 + \left(\frac{\sin\alpha_v}{2.5}\right)^2}} \geq 1$$



Influence of the base material thickness $\Psi_{h,V}$										
h/c	0.15	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	≥ 1.5
$\Psi_{h,V}$	0.32	0.45	0.55	0.63	0.71	0.77	0.84	0.89	0.95	1.00

$$\Psi_{h,V} = \left(\frac{h}{1.5 \cdot c}\right)^{0.5} \geq 1.0$$



MOPURE

RETROFITTED REBAR CONNECTIONS

This technical document covers post-installed rebar connections in non-carbonate concrete under the assumption that post-installed rebar connections are generally calculated according to Eurocode 2. The rebar anchor system comprises the bonding of the material and a straight, recessed reinforcement rebar with the properties specified in Eurocode 2, Annex C; classes B and C.

Dynamic, fatigue or seismic loads on post-installed rebar connections are not covered by this technical document.

Intended use

This technical document covers application in non-carbonate concrete only from C12/15 to C50/60 (EN 206) for the following applications:

- Overlapping bond with an existing rebar in a building component **(Figures 1 and 4).**
- Fixing of rebar in a slab or in a support. Support at one end of a slab calculated as simply supported as well as its rebars for retention forces **(Figure 2).**
- Fixing of rebar of construction components mainly subjected to compression **(Figure 3).**
- Fixing of rebar to cover the action line of the tensile force **(Figure 5).**

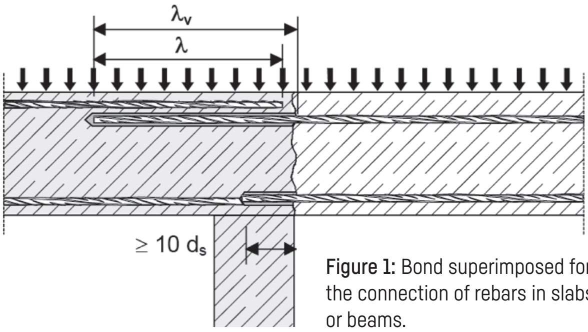


Figure 1: Bond superimposed for the connection of rebars in slabs or beams.

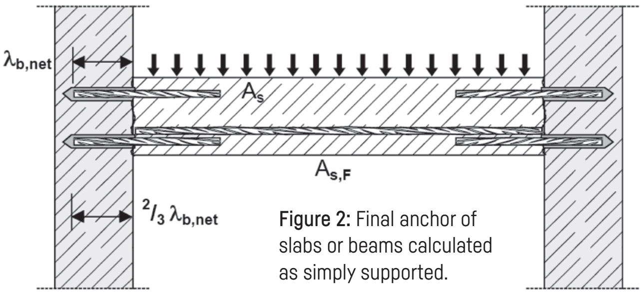


Figure 2: Final anchor of slabs or beams calculated as simply supported.

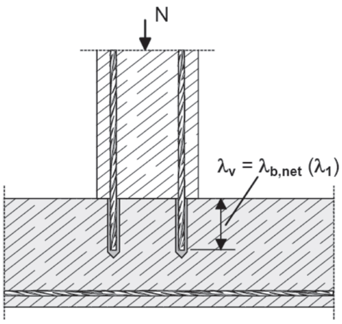


Figure 3: Rebar connections for items primarily subjected to compression. The rebars are subjected to compression.

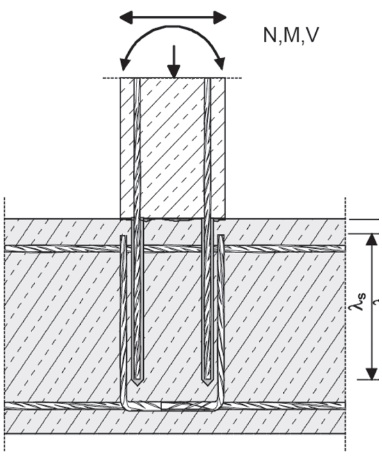


Figure 4: Bond superimposed to a foundation of a column or a wall where the rebars is subjected to tensile force.

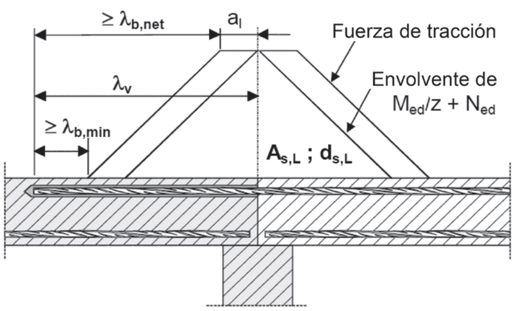


Figure 5: Reinforcement anchor to cover the action line of the tensile force.

* **Note for Figure 1 and 5:** In the figures the transversal reinforcements have not been represented, the transversal reinforcements as required by the Eurocode 2 must be present. The shear stress transferred between the anterior and posterior concrete must be calculated according to Eurocode 2.

MOPURE

The tables shown below refer to the standard EN 1992-1-1 Anexo C, Table C.1 and C2N, rebar properties.

Properties of the start rebars			
Product form		Rebars and unwound rods	
Class		B	C
Characteristic yield stress f_{yk} or $f_{0.2k}$ (MPa)		400 to 600	
Minimum value of $k = (f_t / f_y)_k$		≥ 1.08	≥ 1.15 < 1.35
Characteristic maximum tensile deformation ε_{uk} (%)		≥ 5.0	≥ 7.5
Flexibility		Bending/folding test	
Maximum deviation from the nominal weight (individual bar or wire) (%)	Nominal size of the rebar (mm) ≤ 8 > 8	± 6.0 ± 4.5	
Bonding: Minimum relative corrugated area, $f_{R,min}$	Nominal size of the rebar (mm) 8 to 12 > 12	0.040 0.056	

Minimum / maximum installation length ℓ_{max}				
Corrugated bars		Minimum		Maximum
		Anchor $\ell_{b,min}$	Overlapped connection $\ell_{0,min}$	ℓ_{max}
$Ød_s$ [mm]	fy,k [N/mm²]	[mm]	[mm]	[mm]
8	500	170	300	400
10	500	212	300	500
12	500	255	300	600
14	500	298	315	700
16	500	340	360	800
20	500	425	450	1000
25	500	532	563	1000
28	500	595	630	1000
32	500	681	720	1000

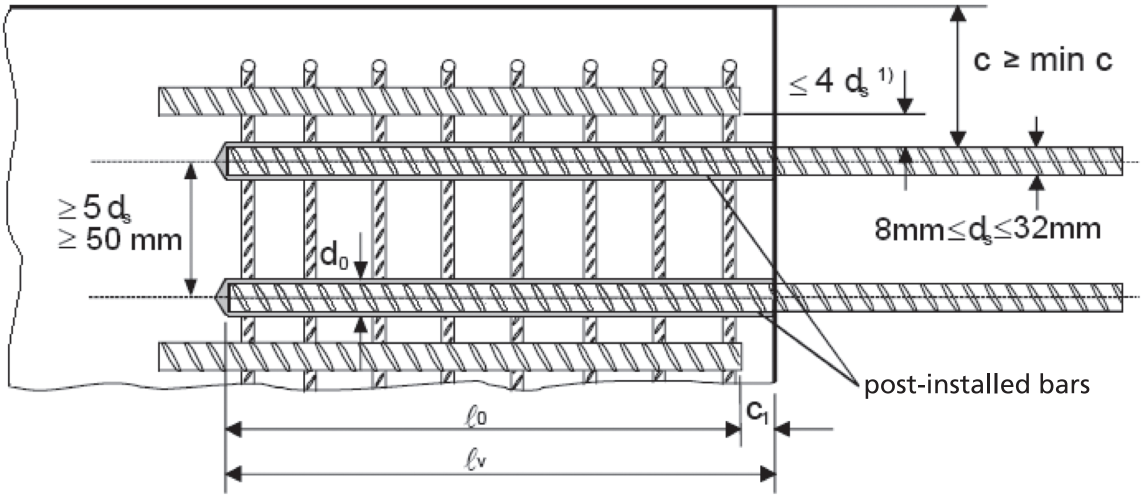
<table>
<tr><th colspan="10">Calculated bonding resistance [N/mm²] f_{bd}</th></tr>
<tr><th rowspan="2">Bar Ø
d_s [mm]</th><th colspan="9">Concrete class</th></tr>
<tr><th>C12/15</th><th>C16/20</th><th>C20/25</th><th>C25/30</th><th>C30/37</th><th>C35/45</th><th>C40/50</th><th>C45/55</th><th>C50/60</th></tr>
<tr><td>8 to 25</td><td rowspan="3">1.6</td><td rowspan="3">2.0</td><td rowspan="3">2.3</td><td rowspan="3">2.7</td><td rowspan="2">3.0</td><td rowspan="2">3.4</td><td rowspan="2">3.7</td><td>4.0</td><td>4.3</td></tr>
<tr><td>28</td><td colspan="2">3.7</td></tr>
<tr><td>30</td><td colspan="5">2.7</td></tr>
</table>

$$N = f_{bd} \cdot \Phi \cdot L_b \cdot \pi$$

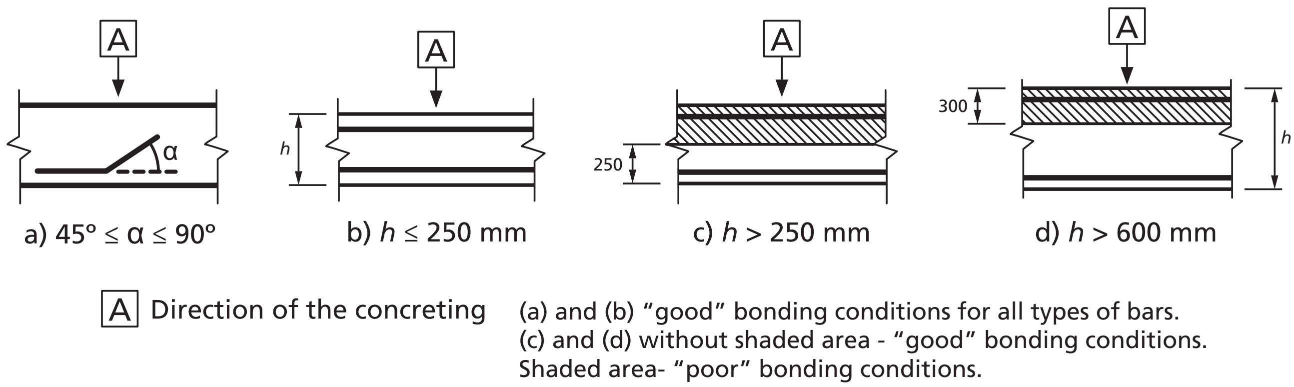
MOPURE

Calculated load values according to Eurocode 2 and EOTA technical report TR 023.

- Information according to ETA 14/0325.
- Non-cracked concrete, conditions in dry or wet conditions.
- Temperature range: -40°C to +80°C (maximum long-term temperature +50°C).
- Minimum spacing conditions between bars ≥5d_s, min. 50 mm:



- Minimum concrete coating:
  - drilling with compressed air ≥ 50 + 0.06 Lb
  - drilling in percussion mode ≥ 30 + 0.08 Lb ≥ 2Φ
- Good bonding conditions:



* In case of poor bonding conditions, multiply values by 0.7.

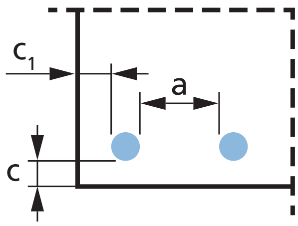
MOPURE

Resistance values may increase in the following situations:
- With transverse tension/compression pressure (α_2)
- In case of concrete coating (α_5)
- In case of overlapping rebars (α_6)

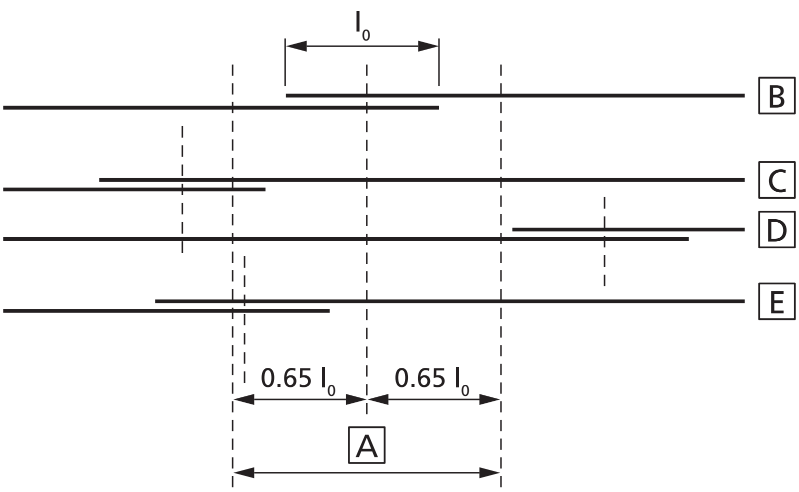
Values for α_2, α_5 and α_6		
Influence factor	Reinforcement bar	
	A tension	A compression
Concrete coating	$\alpha_2 = 1 - 0.15\ (cd - Ø)/Ø$ ≥ 0.7 ≤ 1.0	$\alpha_2 = 1.0$
Transverse pressure confinement	$\alpha_5 = 1 - 0.004p$ ≥ 0.7 ≤ 1.0	$\alpha_5 = 1.0$
Overlapping length	$\alpha_6 = (p_1/25)^{0.25}$ ≥ 1.0 ≤ 1.5	

Where:

$c_d = \min(a/_2, c_1, c)$



p: transverse pressure [MPa] in the ultimate limit state l_{bd}
p_1 is the percentage of the overlapped reinforcement bar within $0.65 \cdot l_0$ from the centre of the length of the overlap considered



A Section considered B Bar I C Bar II D Bar III E Bar IV

MOPURE

TABLES OF PRECALCULATED VALUES

Concrete class 20/25											
Resistance to concrete compression [$f_{ck,cube}$]: 25 N/mm²											
Bar Ø	d_s	[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
Bar size	d_s	[mm]	8	10	12	14	16	20	25	28	32
Cross-sectional area	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	804.2
Yield stress of the steel	f_{yd}	[kN]	500	500	500	500	500	500	500	500	500
Safety factor	$\gamma_{M,s}$	[mm²]	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Calculated steel resistance	$N_{Rd,s}$	[kN]	21.9	34.1	49.2	66.9	87.4	136.6	213.4	267.7	349.7
Calculated bonding resistance	f_{bd}	[N/mm²]	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Diameter of the drilled hole	d_h	[mm]	12	14	16	18	20	25	32	35	40
Spacing between bars ≥	s	[mm]	50	50	60	70	80	100	125	140	160
Distance from the edge (drilled using compressed air) ≥	c	[mm]	50 + 0.06 L_b								
Distance from the edge (drilled in percussion mode) ≥	c	[mm]	30 + 0.08 L_b ≥ 2Φ								
Anchor length, L_b [mm]			Calculated extraction resistance by bonding*, N_{Rd} [kN]								
170			9.8								
212			12.3	15.3							
255			14.7	18.4	22.1				Area not permitted		
298			17.2	21.5	25.8	30.1					
300			17.3	21.7	26.0	30.3					
315			18.2	22.8	27.3	31.9					
340			19.7	24.6	29.5	34.4	39.3				
360			20.8	26.0	31.2	36.4	41.6				
400			**21.9**	28.9	34.7	40.5	46.2				
425				30.7	36.9	43.0	49.1	61.4			
450				32.5	39.0	45.5	52.0	65.0			
500				**34.1**	43.4	50.6	57.8	72.3			
532					46.1	53.8	61.5	76.9	96.1		
563					48.8	57.0	65.1	81.4	101.7		
595					**49.2**	60.2	68.8	86.0	107.5	120.4	
600					**49.2**	60.7	69.4	86.7	108.4	121.4	
630						63.7	72.8	91.0	113.8	127.5	
681						**66.9**	78.7	98.4	123.0	137.8	157.5
700						**66.9**	80.9	101.2	126.4	141.6	161.9
720							83.2	104.0	130.1	145.7	166.5
800				Yield stress area of the bar			**87.4**	115.6	144.5	161.9	185.0
1000								**136.6**	180.6	202.3	231.2
Length for reaching the yield stress of the steel, $L_{b,rqd}$ [mm]			378	473	567	662	756	945	1,181	1,323	1,512

Values shaded in blue are not valid for overlap bonds

* For C20/25 concrete (f_{bd} = 2,3 N/mm²), good bond conditions, α_6=1 and rebar (f_{yk} = 500 N/mm²)

MOPURE

TABLES OF PRECALCULATED VALUES

Concrete class 30/37											
Resistance to concrete compression [$f_{ck,cube}$]: 37 N/mm²											
Bar Ø	d_s	[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
Bar size	d_s	[mm]	8	10	12	14	16	20	25	28	32
Cross-sectional area	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	804.2
Yield stress of the steel	f_{yd}	[kN]	500	500	500	500	500	500	500	500	500
Safety factor	$\gamma_{M,s}$	[mm²]	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Calculated steel resistance	$N_{Rd,s}$	[kN]	21.9	34.1	49.2	66.9	87.4	136.6	213.4	267.7	349.7
Calculated bonding resistance	f_{bd}	[N/mm²]	3	3	3	3	3	3	2.7	2.7	2.7
Diameter of the drilled hole	d_h	[mm]	12	14	16	18	20	25	32	35	40
Spacing between bars ≥	s	[mm]	50	50	60	70	80	100	125	140	160
Distance from the edge (drilled using compressed air) ≥	c	[mm]	$50 + 0.06\ L_b$								
Distance from the edge (drilled in percussion mode) ≥	c	[mm]	$30 + 0.08\ L_b \geq 2\Phi$								
Anchor length, L_b [mm]			Calculated extraction resistance by bonding*, N_{Rd} [kN]								
113			8.5								
142			10.7	13.4							
170			12.8	16	19.2			Area not permitted			
198			14.9	18.7	22.4	26.1					
200			15.1	18.8	22.6	26.4					
210			15.8	19.8	23.8	27.7					
227			17.1	21.4	25.7	30	34.2				
24			18.1	22.6	27.1	31.7	36.2				
284			21.4	26.8	32.1	37.5	42.8				
300			**21.9**	28.3	33.9	39.6	45.2	56.5			
354			**21.9**	33.4	40.0	46.7	53.4	66.7			
375			**21.9**	**34.1**	42.4	49.5	56.5	70.7			
397			**21.9**	**34.1**	44.9	52.4	59.9	74.8	84.2		
400			**21.9**	**34.1**	45.2	52.8	60.3	75.4	84.8		
420				**34.1**	47.5	55.4	63.3	79.2	89.1	99.8	
453				**34.1**	**49.2**	59.8	68.3	85.4	96.1	107.6	
480				**34.1**	**49.2**	63.3	72.4	90.5	101.8	114.0	
500					**49.2**	**66.9**	75.4	94.2	106.0	118.8	135.7
600					**49.2**	**66.9**	**87.4**	113.1	127.2	142.5	162.9
700						**66.9**	**87.4**	131.9	148.4	166.3	190.0
800			Yield stress area of the bar				**87.4**	**136.6**	169.6	190	169.6
1000								**136.6**	212.1	237.5	271.4
Length for reaching the yield stress of the steel, $L_{b,rqd}$ [mm]			290	362	435	507	580	725	1,006	1,127	1,288

Values shaded in blue are not valid for overlap bonds

* For C30/37 concrete (f_{bd} = 2,3 N/mm²), good bond conditions, α_6=1 and rebar (f_{yk} = 500 N/mm²)

MOPURE

TABLES OF PRECALCULATED VALUES

Concrete class 40/50											
Resistance to concrete compression [$f_{ck,cube}$]: 50 N/mm²											
Bar Ø	d_s	[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
Bar size	d_s	[mm]	8	10	12	14	16	20	25	28	32
Cross-sectional area	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	804.2
Yield stress of the steel	f_{yd}	[kN]	500	500	500	500	500	500	500	500	500
Safety factor	$\gamma_{M,s}$	[mm²]	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Calculated steel resistance	$N_{Rd,s}$	[kN]	21.9	34.1	49.2	66.9	87.4	136.6	213.4	267.7	349.7
Calculated bonding resistance	f_{bd}	[N/mm²]	3.7	3.7	3.7	3.7	3.7	3.4	2.7	2.7	2.7
Diameter of the drilled hole	d_h	[mm]	12	14	16	18	20	25	32	35	40
Spacing between bars ≥	s	[mm]	50	50	60	70	80	100	125	140	160
Distance from the edge (drilled using compressed air) ≥	c	[mm]	$50 + 0.06\ L_b$								
Distance from the edge (drilled in percussion mode) ≥	c	[mm]	$30 + 0.08\ L_b \geq 2\Phi$								
Anchor length, L_b [mm]			Calculated extraction resistance by bonding*, N_{Rd} [kN]								
113			10.5								
142			13.2	16.5							
170			15.8	19.8	23.7			Area not permitted			
198			18.4	23.0	27.6	32.2					
200			18.6	23.2	27.9	32.5					
210			19.5	24.4	29.3	34.2					
227			21.1	26.4	31.7	36.9	42.2				
24			**21.9**	27.9	33.5	39.1	44.6				
284			**21.9**	33.0	39.6	46.2	52.8				
300			**21.9**	**34.1**	41.8	48.8	55.8	64.1			
354			**21.9**	**34.1**	**49.2**	57.6	65.8	75.6			
375			**21.9**	**34.1**	**49.2**	61.0	69.7	80.1			
397			**21.9**	**34.1**	**49.2**	64.6	73.8	84.8	84.2		
400			**21.9**	**34.1**	**49.2**	65.1	74.4	85.5	84.8		
420				**34.1**	**49.2**	**66.9**	78.1	89.7	89.1	99.8	
453				**34.1**	**49.2**	**66.9**	84.2	96.8	96.1	107.6	
480				**34.1**	**49.2**	**66.9**	**87.4**	102.5	101.8	114.0	
500					**49.2**	**66.9**	**87.4**	106.8	106.0	118.8	135.7
600					**49.2**	**66.9**	**87.4**	128.2	127.2	142.5	162.9
700						**66.9**	**87.4**	**136.6**	148.4	166.3	190.0
800			Yield stress area of the bar				**87.4**	**136.6**	169.6	190.0	217.1
1000								**136.6**	212.1	237.5	271.4
Length for reaching the yield stress of the steel, $L_{b,rqd}$ [mm]			235	294	352	411	470	639	1,006	1,127	1,288

Values shaded in blue are not valid for overlap bonds

* For C40/50 concrete (f_{bd} = 2,3 N/mm²), good bond conditions, α_6=1 and rebar (f_{yk} = 500 N/mm²)

MOPURE

TABLES OF PRECALCULATED VALUES

Concrete class 50/60											
Resistance to concrete compression [$f_{ck,cube}$]: 60 N/mm²											
Bar Ø	d_s	[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
Bar size	d_s	[mm]	8	10	12	14	16	20	25	28	32
Cross-sectional area	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	804.2
Yield stress of the steel	f_{yd}	[kN]	500	500	500	500	500	500	500	500	500
Safety factor	$\gamma_{M,s}$	[mm²]	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Calculated steel resistance	$N_{Rd,s}$	[kN]	21.9	34.1	49.2	66.9	87.4	136.6	213.4	267.7	349.7
Calculated bonding resistance	f_{bd}	[N/mm²]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.70	2.70
Diameter of the drilled hole	d_h	[mm]	12	14	16	18	20	25	32	35	40
Spacing between bars ≥	s	[mm]	50	50	60	70	80	100	125	140	160
Distance from the edge (drilled using compressed air) ≥	c	[mm]	$50 + 0.06\ L_b$								
Distance from the edge (drilled in percussion mode) ≥	c	[mm]	$30 + 0.08\ L_b \geq 2\Phi$								
Anchor length, L_b [mm]			Calculated extraction resistance by bonding*, N_{Rd} [kN]								
170			17.1								
212			21.3	26.6							
255			**21.9**	32.0	38.5						
298			**21.9**	**34.1**	44.9	52.4					
300			**21.9**	**34.1**	45.2	52.8					
315			**21.9**	**34.1**	47.5	55.4					
340			**21.9**	**34.1**	**49.2**	59.8	68.4				
360			**21.9**	**34.1**	**49.2**	63.3	72.4				
400			**21.9**	**34.1**	**49.2**	**66.9**	80.4				
425				**34.1**	**49.2**	**66.9**	85.5	106.8			
450				**34.1**	**49.2**	**66.9**	**87.4**	113.1			
500				**34.1**	**49.2**	**66.9**	**87.4**	125.7			
532					**49.2**	**66.9**	**87.4**	133.7	167.1		
563					**49.2**	**66.9**	**87.4**	**136.6**	176.9		
595					**49.2**	**66.9**	**87.4**	**136.6**	186.9	193.7	
600					**49.2**	**66.9**	**87.4**	**136.6**	188.5	195.3	
630						**66.9**	**87.4**	**136.6**	197.9	205.0	
681						**66.9**	**87.4**	**136.6**	**213.4**	221.6	184.8
700						**66.9**	**87.4**	**136.6**	**213.4**	227.8	190.0
720							**87.4**	**136.6**	**213.4**	234.3	195.4
800							**87.4**	**136.6**	**213.4**	260.4	217.1
1000								**136.6**	**213.4**	**267.7**	271.4
Length for reaching the yield stress of the steel, $L_{b,rqd}$ [mm]			217	272	326	380	435	543	679	822	1,288

Area not permitted

Yield stress area of the bar

Values shaded in blue are not valid for overlap bonds

* For C50/60 concrete (f_{bd} = 2,3 N/mm²), good bond conditions, α_6=1 and rebar (f_{yk} = 500 N/mm²)

MOPURE

RANGE

PURE EPOXY

STRUCTURAL FIXINGS IN CRACKED & UNCRACKED CONCRETE — ETA 14/0156
REBAR CONNECTIONS — ETA 14/0325
ÉMISSIONS DANS L'AIR INTÉRIEUR A+
LEED TESTED
SEISMIC C1

CODE	DIMENSION	
NORMAL		
MOPURE600	600 ml.	12

Concrete — Reinforced concrete — Cracked concrete

Accessories for chemical anchor cartridges

MO-PIS Application guns

CODE	MODEL
MOPISPUR6	MOPURE600 600 ml

MO-AC Cánulas mezcladoras y varios

MORCEPKIT
Kit 3 brushes (ø15, ø20, ø30)

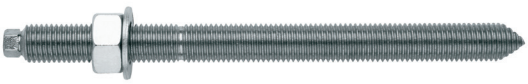
MORCAPU

MOBOMBA

CODE	MODEL
MOBOMBA	Blower pump
MORCAPU	Tube 600 ml
MORCEPKIT	Kit 3 brushes

EQ-AC Zinc-plated 5.8

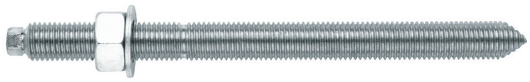
ZINC



CODE	DIMENSION
EQAC08110	M8 x 110
EQAC10130	M10 x 130
EQAC10190	M10 x 190
EQAC12160	M12 x 160
EQAC12220	M12 x 220
EQAC16190	M16 x 190
EQAC16250	M16 x 250
EQAC20260	M20 x 260
EQAC20350	M20 x 350
EQAC24300	M24 x 300
EQAC24380	M24 x 380
EQAC30330	M30 x 330

EQ-A2 Stainless steel A2

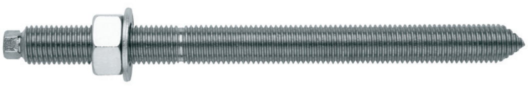
A2 INOX AISI 304



CODE	DIMENSION
EQA208110	M8 x 110
EQA210130	M10 x 130
EQA212160	M12 x 160
EQA216190	M16 x 190
EQA220260	M20 x 260
EQA224300	M24 x 300
EQA230330	M30 x 330

EQ-8.8 Zinc-plated 8.8

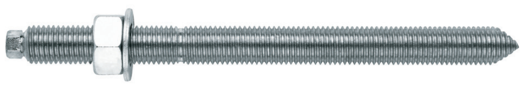
ZINC



CODE	DIMENSION
EQ8808110	M8 x 11040
EQ8810130	M10 x 130
EQ8812160	M12 x 160
EQ8816190	M16 x 190
EQ8820260	M20 x 260
EQ8824300	M24 x 300

EQ-A4 Stainless steel A4

A4 INOX AISI 316



CODE	DIMENSION
EQA408110	M8 x 110
EQA410130	M10 x 130
EQA412160	M12 x 160
EQA416190	M16 x 190
EQA420260	M20 x 260
EQA424300	M24 x 300
EQA430330	M30 x 330