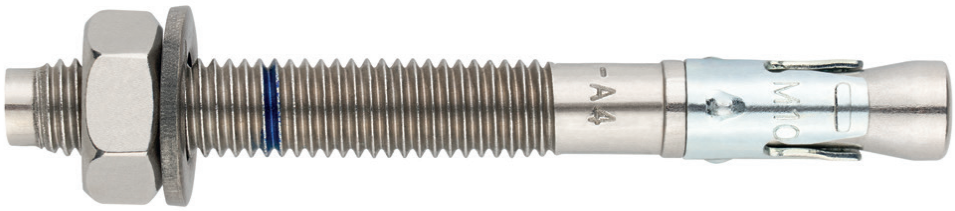
Through-bolt expansion anchor with controlled torque, for use in cracked and non cracked concrete

MTP-A4

ETA Assessed Option 1. A4 Stainless shaft. A4 Stainless clip.



PRODUCT INFORMATION

DESCRIPTION
Metallic anchor, with male thread, expansion by controlled torque.

OFFICIAL DOCUMENTATION
- AVCP-1210-CPR-0053.
- ETA 12/0397 option 1.
- Declaration of Performance DoP MTP.

SIZES
M8x75 to M20x285.

DESIGN LOAD RANGE
Desde 8,00 to 27,33 kN (non-cracked).
Desde 5,67 to 19,13 kN (cracked).

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

ASSESSMENTS
- Option 1 (cracked concrete).
- Fire Resistance R30-120.
- VdS Certificate CEA 4001.

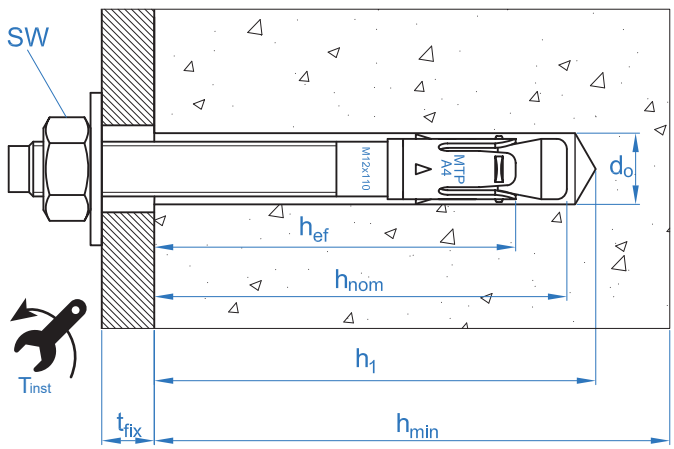
CARACTERÍSTICAS Y BENEFICIOS
· CHARACTERISTICS AND BENEFITS
- Easy installation.
- Use in cracked and non-craked concrete.
- Pre-installation or through the drill-hole of the fixture.
- Variety of lengths and diameters: flexibility in assembly.
- For static and quasi-static loads.
- Friction operation. Installation by controlled torque
- Use for high loads.
- Assessed for fire resistance RF30 to RF120.
- A4 Stainless steel (AISI 316).
- Available at INDEXcal.

MATERIALS
Shaft: A4 Stainless steel.
Washer: DIN 125, A4 Stainless steel.
Nut: DIN 934, A4 Stainless steel.
Clip: A4 Stainless steel.

APPLICATIONS
- Structural fixings in cracked and non cracked concrete, including industrial and marine environments
- Safety barriers.
- Fixings of steel beams, perforated bracker guides, machinery, boilers, signage, staium seating, facade substructures, etc.
- Fixing of wood structures to concrete.

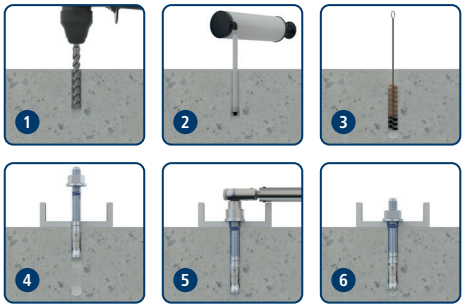
MECHANICAL PROPERTIES							
			M8	M10	M12	M16	M20
Cone area section							
A_s	(mm^2)	Cone area section	26,5	43,4	62,4	82,0	148,8
$F_{u,s}$	(N/mm^2)	Chracteristic tension resistance	700	700	700	700	700
$F_{y,s}$	(N/mm^2)	Yield strength	602	602	602	602	602
Threaded area section							
A_s	(mm^2)	Cone area section	36,6	58,0	84,3	157,0	245,0
$F_{u,s}$	(N/mm^2)	Chracteristic tension resistance	650	650	650	700	700
$F_{y,s}$	(N/mm^2)	Yield Strength	559	559	559	602	602

INSTALLATION DATA							
SIZE			M8	M10	M12	M16	M20
Code			APA408XXX	APA410XXX	APA412XXX	APA416XXX	APA420XXX
d_0	Nominal diameter of drill bit	[mm]	8	10	12	16	20
T_{ins}	Installation torque moment	[Nm]	15	30	60	100	200
d_f	Diameter of clearance hole in the fixture	[mm]	9	12	14	18	22
h_1	Minimum drill hole depth	[mm]	60	75	85	105	125
h_{nom}	Installation depth	[mm]	55	68	80	97	114
h_{ef}	Effective embedment depth	[mm]	48	60	70	85	100
h_{min}	Minimum base material thickness	[mm]	100	120	140	170	200
t_{fix}	Maximum thickness of fixture	[mm]	L-66	L-80	L-96	L-117	L-138
$S_{cr,N}$	Critical spacing	[mm]	144	180	210	255	300
$C_{cr,N}$	Critical edge distance	[mm]	72	90	105	127,5	150
$S_{cr,sp}$	Critical distance (splitting)	[mm]	164	204	238	290	380
$C_{cr,sp}$	Critical edge distance (splitting)	[mm]	82	102	119	145	190
S_{min}	Minimum spacing	[mm]	42	47	57	75	100
C_{min}	Minimum edge distance	[mm]	47	52	62	75	90
SW	Installation wrench		13	17	19	24	30



Code	INSTALLATION PRODUCTS
	Hammer drill
BHDSXXXXX	Concrete Drill bits
MOBOMBA	Blow pump
MORCEPKIT	Cleaning Brush
DOMTAXX	Installation hammering tool
	Torque wrench
	Hexagonal socket

INSTALLATION



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Resistances in C20/25 concrete for an isolated anchor, without effects of edge distance or spacing

Characteristic Resistance N_{Rk} and V_{Rk}

TENSION								SHEAR							
Size			M8	M10	M12	M16	M20	Size			M8	M10	M12	M16	M20
N_{Rk}	Non-cracked concrete	[kN]	12,00	16,00	22,00	38,60	49,20	V_{Rk}	Non-cracked concrete	[kN]	11,90	18,90	27,40	55,00	98,39
N_{Rk}	Cracked concrete	[kN]	8,50	14,00	19,00	26,99	34,44	V_{Rk}	Cracked concrete	[kN]	11,45	18,90	27,40	53,97	68,87

Design Resistance N_{Rd} and V_{Rd}

TENSION								SHEAR							
Size			M8	M10	M12	M16	M20	Size			M8	M10	M12	M16	M20
N_{Rd}	Non-cracked concrete	[kN]	8,00	10,67	12,22	21,44	27,33	V_{Rd}	Non-cracked concrete	[kN]	9,50	15,10	21,90	44,00	78,70
N_{Rd}	Cracked concrete	[kN]	5,67	9,33	10,56	14,99	19,13	V_{Rd}	Cracked concrete	[kN]	9,20	15,10	21,90	43,20	55,10

Maximum Loads Recommended N_{rec} and V_{rec}

TENSION								SHEAR							
Size			M8	M10	M12	M16	M20	Size			M8	M10	M12	M16	M20
N_{rec}	Non-cracked concrete	[kN]	5,71	7,62	8,73	15,32	19,52	V_{rec}	Non-cracked concrete	[kN]	7,60	12,10	17,50	35,20	52,50
N_{rec}	Cracked concrete	[kN]	4,05	6,67	7,54	10,71	13,67	V_{rec}	Cracked concrete	[kN]	6,10	12,10	17,50	28,80	44,10

Simplified calculation method

European Technical Assessment ETA 12/0397

Simplified version of the calculation method according to Eurocode 2 EN 1992-4. Resistance is calculated according to the data shown in assessment 12/0397.

- Influence of concrete strength.
- Influence of edge distance.
- Influence of spacing between anchors.
- Influence of reinforcements.
- Influence of base material thickness.
- Influence of load application angle.
- Valid for a group of two anchors.

The calculation method is based on the following simplification: **Different loads do not act on individual anchors, without eccentricity.**

INDEXcal

For a more accurate calculation and to take more constructive provisions into account, we recommend using our calculation program INDEXcal. It may be easily downloaded from our website **www.indexfix.com**

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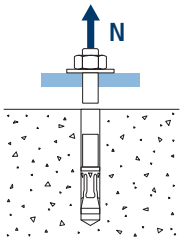
TENSION LOADS

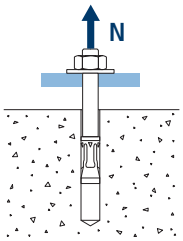
- Steel design resistance: $N_{Rd,s}$
- Pull-out design resistance: $N_{Rd,p} = N^{o}_{Rd,p} \cdot \Psi_{c}$
- Concrete cone design resistance: $N_{Rd,c} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N}$
- Concrete splitting design resistance: $N_{Rd,sp} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp}$

Steel Design resistance							
$N_{Rd,s}$							
Size			M8	M10	M12	M16	M20
N^{o}_{Rd}	Non-cracked concrete	[kN]	13,21	20,60	30,33	47,67	81,67

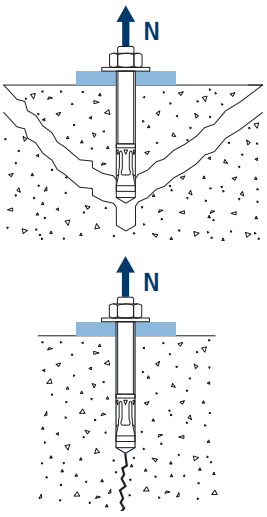


Pull-out design resistance							
$N_{Rd,p} = N^{o}_{Rd,p} \cdot \Psi_{c}$							
Size			M8	M10	M12	M16	M20
$N^{o}_{Rd,p}$	Non-cracked concrete	[kN]	8,00	10,67	12,22	--*	--*
$N^{o}_{Rd,p}$	Cracked concrete	[kN]	2,78	6,00	8,00	--*	--*

*Pull-out failure is not decisive



Concrete cone design resistance							
$N_{Rd,c} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N}$							
Concrete splitting design resistance*							
$N_{Rd,sp} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp}$							
Size			M8	M10	M12	M16	M20
$N^{o}_{Rd,c}$	Non-cracked concrete	[kN]	10,91	15,24	16,01	21,42	27,33
$N^{o}_{Rd,c}$	Cracked concrete	[kN]	7,63	10,67	11,20	14,99	19,13



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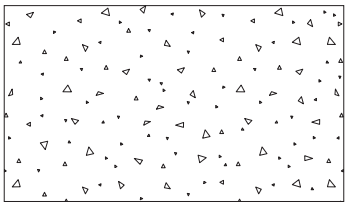
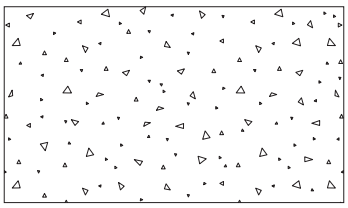
Coefficients of influence

Influence of concrete strength resistance in pul-out failure Ψ_c						
		M8	M10	M12	M16	M20
Ψ_c	C 20/25			1,00		
	C 30/37	1,01	1,00	1,09	1,09	1,17
	C 40/50	1,02	1,00	1,15	1,16	1,32
	C 50/60	1,02	1,00	1,20	1,22	1,44



Influence of concrete strength in concret cone and splitting failure Ψ_b						
		M8	M10	M12	M16	M20
Ψ_b	C 20/25			1,00		
	C 30/37			1,22		
	C 40/50			1,41		
	C 50/60			1,55		



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

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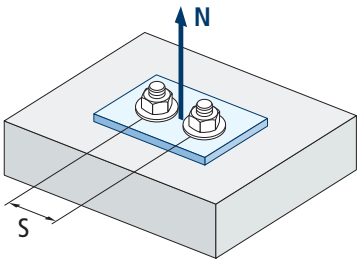

$$\Psi_{s,N} = 0{,}5 + \frac{s}{2 \cdot S_{cr,N}} \leq 1$$

Influence of spacing (concrete cone) $\Psi_{s,N}$					
s [mm]	MTP-A4				
	M8	M10	M12	M16	M20
42	0,65				
47	0,66	0,63			
50	0,67	0,64			
55	0,69	0,65			
57	0,70	0,66	0,64		
60	0,71	0,67	0,64		
65	0,73	0,68	0,65		
70	0,74	0,69	0,67		
80	0,78	0,72	0,69		
85	0,80	0,74	0,70	0,67	
90	0,81	0,75	0,71	0,68	
100	0,85	0,78	0,74	0,70	0,67
105	0,86	0,79	0,75	0,71	0,68
110	0,88	0,81	0,76	0,72	0,68
120	0,92	0,83	0,79	0,74	0,70
125	0,93	0,85	0,80	0,75	0,71
126	0,94	0,85	0,80	0,75	0,71
128	0,94	0,86	0,80	0,75	0,71
130	0,95	0,86	0,81	0,75	0,72
135	0,97	0,88	0,82	0,76	0,73
144	1,00	0,90	0,84	0,78	0,74
150		0,92	0,86	0,79	0,75
164		0,96	0,89	0,82	0,77
170		0,97	0,90	0,83	0,78
180		1,00	0,93	0,85	0,80
195			0,96	0,88	0,83
200			0,98	0,89	0,83
204			0,99	0,90	0,84
210			1,00	0,91	0,85
220				0,93	0,87
238				0,97	0,90
252				0,99	0,92
255				1,00	0,93
290					0,98
300					1,00

Invalid value

Value without reduction = 1

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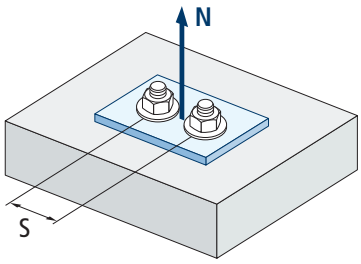
Influence of spacing (concrete splitting) $\Psi_{s,sp}$					
s [mm]	MTP-A4				
	M8	M10	M12	M16	M20
42	0,63				
47	0,64	0,62			
50	0,65	0,62			
55	0,67	0,63			
57	0,67	0,64	0,62		
60	0,68	0,65	0,63		
65	0,70	0,66	0,64		
70	0,71	0,67	0,65		
80	0,74	0,70	0,67		
85	0,76	0,71	0,68	0,65	
90	0,77	0,72	0,69	0,66	
100	0,80	0,75	0,71	0,67	0,63
105	0,82	0,76	0,72	0,68	0,64
110	0,84	0,77	0,73	0,69	0,64
120	0,87	0,79	0,75	0,71	0,66
125	0,88	0,81	0,76	0,72	0,66
126	0,88	0,81	0,76	0,72	0,67
128	0,89	0,81	0,77	0,72	0,67
130	0,90	0,82	0,77	0,72	0,67
135	0,91	0,83	0,78	0,73	0,68
144	0,94	0,85	0,80	0,75	0,69
150	0,96	0,87	0,82	0,76	0,70
164	1,00	0,90	0,84	0,78	0,72
170		0,92	0,86	0,79	0,72
180		0,94	0,88	0,81	0,74
195		0,98	0,91	0,84	0,76
200		0,99	0,92	0,84	0,76
204		1,00	0,93	0,85	0,77
210			0,94	0,86	0,78
220			0,96	0,88	0,79
238			1,00	0,91	0,81
252				0,93	0,83
255				0,94	0,84
290				1,00	0,88
300					0,89
380					1,00

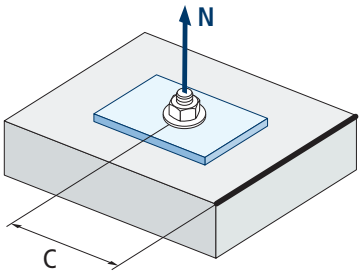
Invalid value

Value without reduction = 1



$$\Psi_{s,sp} = 0{,}5 + \frac{s}{2 \cdot s_{cr,sp}} \leq 1$$

MTP-A4



$$\Psi_{c,sp} = 0{,}35 + \frac{0{,}5 \cdot c}{C_{cr,sp}} + \frac{0{,}15 \cdot c^2}{C_{cr,sp}^{\ 2}} \leq 1$$

Influence of concrete edge distance (splitting) $\Psi_{c,sp}$					
c [mm]	MTP-A4				
	M8	M10	M12	M16	M20
47	0,69				
50	0,71				
52	0,73	0,64			
60	0,80	0,70			
62	0,81	0,71	0,65		
65	0,84	0,73	0,67		
70	0,89	0,76	0,70		
72	0,90	0,78	0,71		
75	0,93	0,80	0,72	0,65	
80	0,98	0,83	0,75	0,67	
82	1,00	0,85	0,77	0,68	
85		0,87	0,78	0,69	
90		0,91	0,81	0,72	0,62
100		0,98	0,88	0,77	0,65
102		1,00	0,89	0,78	0,66
105			0,91	0,79	0,67
110			0,94	0,82	0,69
119			1,00	0,86	0,72
125				0,89	0,74
127,5				0,91	0,75
135				0,95	0,78
145				1,00	0,82
150					0,84
155					0,86
190					1,00

Invalid value

Value without reduction = 1

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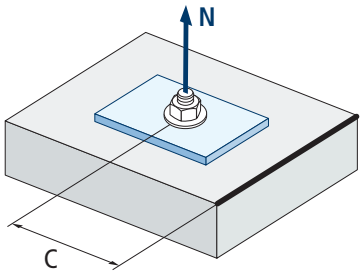
Influence of concrete edge distance (concrete cone) $\Psi_{c,N}$

c [mm]	MTP-A4				
	M8	M10	M12	M16	M20
47	0,74				
50	0,77				
52	0,79	0,69			
60	0,87	0,75			
62	0,89	0,77	0,70		
65	0,92	0,79	0,72		
70	0,98	0,83	0,75		
72	1,00	0,85	0,76		
75		0,87	0,78	0,70	
80		0,91	0,82	0,72	
82		0,93	0,83	0,73	
85		0,96	0,85	0,75	
90		1,00	0,89	0,78	0,70
100			0,96	0,83	0,75
102			0,98	0,85	0,76
105			1,00	0,86	0,77
110				0,89	0,80
119				0,95	0,84
125				0,98	0,87
127,5				1,00	0,88
135					0,92
145					0,97
150					1,00

Invalid value

Value without reduction = 1

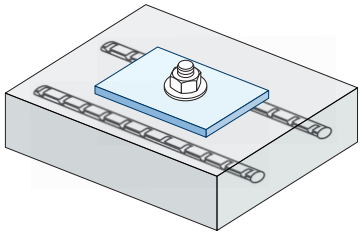


$$\Psi_{c,N} = 0,35 + \frac{0,5 \cdot c}{C_{cr,N}} + \frac{0,15 \cdot c^2}{C_{cr,N}^2} \leq 1$$

Influence of reinforcements $\Psi_{re,N}$

$\Psi_{re,N}$	MTP-A4				
	M8	M10	M12	M16	M20
	0,74	0,8	0,85	1,00	1,00

*This factor only applies for a high density of reinforcements. If in the area of the anchor there are reinforcements with a distancing of ≥ 150 mm (any diameter) or with a diameter ≤ 10 mm and a distancing of ≥ 100 mm, a $f_{re,N}$ = 1 factor may be applied.

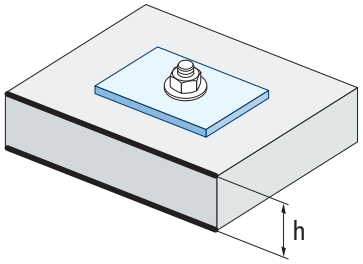


$$\Psi_{re,N} = 0,5 + \frac{h_{ef}}{200} \leq 1$$

Influence of base material thickness $\Psi_{h,sp}$

$\Psi_{h,sp}$	MTP-A4									
h/hef	2,00	2,20	2,40	2,60	2,80	3,00	3,20	3,40	3,60	≥3,68
$\Psi_{h,sp}$	1,00	1,07	1,13	1,19	1,25	1,31	1,37	1,42	1,48	1,50

$$\Psi_{h,sp} = \left(\frac{h}{2 \cdot h_{ef}}\right)^{2/3} \leq 1,5$$

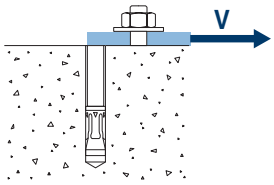


MTP-A4

SHEAR LOADS

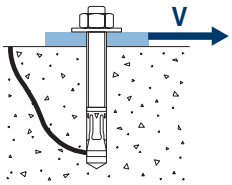
- Steel design resistance without lever arm: $V_{Rd,s}$
- Pry-out design resistance: $V_{Rd,cp} = k \cdot N^{o}_{Rd,c}$
- Concrete edge design resistance: $V_{Rd,c} = V^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$

Steel design resistance						
$V_{Rd,s}$						
Size		M8	M10	M12	M16	M20
$V_{Rd,s}$	[kN]	13,21	22,07	32,50	51,07	87,50

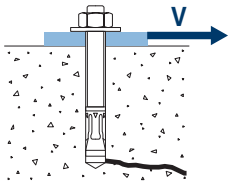


Pry-out design resistance*					
$V_{Rd,cp} = k \cdot N^{o}_{Rd,c}$					
Size	M8	M10	M12	M16	M20
k	1	2	2	2	2

* $N^{o}_{Rd,c}$ Concrete cone design resistance for tension loads



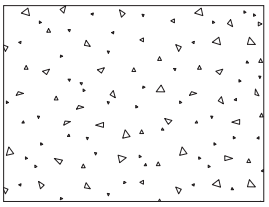
Concrete edge resistance							
$V_{Rd,c} = V^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$							
Size			M8	M10	M12	M16	M20
$V^{o}_{Rd,c}$	Non-cracked concrete	[kN]	6,2	8,9	9,6	13,2	17,4
	Cracked concrete	[kN]	4,4	6,4	6,9	9,4	12,4



MTP-A4

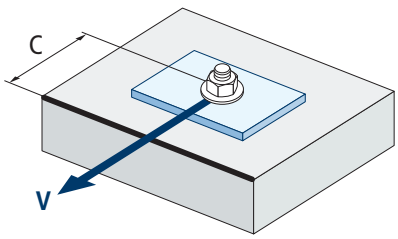
Coeficientes de influencia

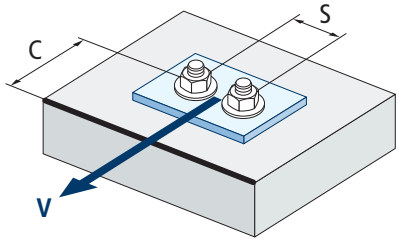
Influence of concrete strength in concrete edge failure Ψ_b						
		M8	M10	M12	M16	M20
Ψ_b	C 20/25	1,00				
	C 30/37	1,22				
	C 40/50	1,41				
	C 50/60	1,55				



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

Influence of edge distance and spacing $\Psi_{se,V}$																	
FOR ONE ANCHOR ONLY																	
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
Isolated	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

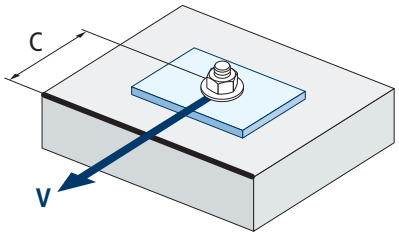




$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1,5}$$

$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1,5} \cdot \left(1 + \frac{s}{3 \cdot c}\right) \cdot 0,5 \leq \left(\frac{c}{h_{ef}}\right)^{1,5}$$

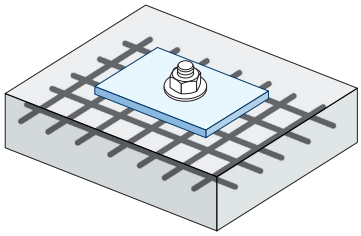
MTP-A4



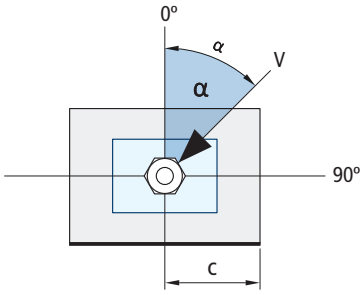
$$\psi_{c,V} = \left(\frac{d}{c}\right)^{0,20}$$

Influence of concrete edge distance $\psi_{c,V}$					
c [mm]	MTP-A4				
	M8	M10	M12	M16	M20
50	0,69				
55	0,68				
60	0,67	0,70		Invalid value	
70	0,65	0,68	0,70		
80	0,63	0,66	0,68		
85	0,62	0,65	0,68	0,72	
90	0,62	0,64	0,67	0,71	
100	0,60	0,63	0,65	0,69	0,72
105	0,60	0,62	0,65	0,69	0,72
110	0,59	0,62	0,64	0,68	0,71
120	0,58	0,61	0,63	0,67	0,70
125	0,58	0,60	0,63	0,66	0,69
128	0,57	0,60	0,62	0,66	0,69
130	0,57	0,60	0,62	0,66	0,69
135	0,57	0,59	0,62	0,65	0,68
140	0,56	0,59	0,61	0,65	0,68
150	0,56	0,58	0,60	0,64	0,67
160	0,55	0,57	0,60	0,63	0,66
170	0,54	0,57	0,59	0,62	0,65
175	0,54	0,56	0,59	0,62	0,65
180	0,54	0,56	0,58	0,62	0,64
190	0,53	0,55	0,58	0,61	0,64
200	0,53	0,55	0,57	0,60	0,63
210	0,52	0,54	0,56	0,60	0,62
220	0,52	0,54	0,56	0,59	0,62
230	0,51	0,53	0,55	0,59	0,61
240	0,51	0,53	0,55	0,58	0,61
250	0,50	0,53	0,54	0,58	0,60
260	0,50	0,52	0,54	0,57	0,60
270	0,49	0,52	0,54	0,57	0,59
280	0,49	0,51	0,53	0,56	0,59
290	0,49	0,51	0,53	0,56	0,59
300	0,48	0,51	0,53	0,56	0,58

Influence of reinforcements $\Psi_{re,V}$			
	Without perimetral reinforcements	Perimetral reinforcements ≥ Ø12 mm	Perimetral reinforcements with brackets ≤ 100 mm
Non-cracked concrete	1	1	1
Cracked concrete	1	1,2	1,4

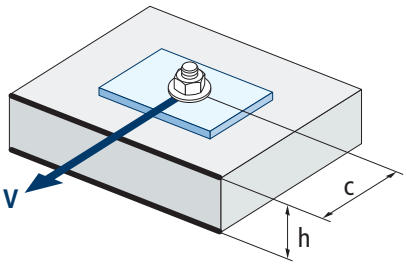


Influence of load application angle $\Psi_{\alpha,V}$										
Angle, α(°)	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
$\Psi_{\alpha,V}$	1,00	1,01	1,05	1,13	1,24	1,40	1,64	1,97	2,32	2,50



$$\Psi_{\alpha,V} = \sqrt{\frac{1}{(\cos \alpha_v)^2 + \left(\frac{\sin \alpha_v}{2,5}\right)^2}} \geq 1$$

Influence of base material thickness $\Psi_{h,V}$										
MTP-A4										
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



$$\Psi_{h,V} = \left(\frac{h}{1,5 \cdot c}\right)^{0,5} \geq 1,0$$

MTP-A4

FIRE RESISTANCE

Characteristic Resistance*										
	TENSION					SHEAR				
	M8	M10	M12	M16	M20	M8	M10	M12	M16	M20
RF30	0,70	1,50	2,50	4,70	7,40	0,70	1,50	2,50	4,70	7,40
RF60	0,60	1,20	2,10	3,90	6,10	0,60	1,20	2,10	3,90	6,10
RF90	0,40	0,90	1,70	3,10	4,90	0,40	0,90	1,70	3,10	4,90
RF120	0,40	0,80	1,30	2,50	3,90	0,40	0,80	1,30	2,50	3,90

*The safety factor for design resistance under fire exposure is $\gamma_{M,fi}$=1 (in abscence of other national regulations). As a eresult the Characteristic Resistance is the same as Design Resistance.

Maximum Load Recommended										
	TENSION					SHEAR				
	M8	M10	M12	M16	M20	M8	M10	M12	M16	M20
RF30	0,50	1,07	1,79	3,36	5,29	0,50	1,07	1,79	3,36	5,29
RF60	0,43	0,86	1,50	2,79	4,36	0,43	0,86	1,50	2,79	4,36
RF90	0,29	0,64	1,21	2,21	3,50	0,29	0,64	1,21	2,21	3,50
RF120	0,29	0,57	0,93	1,79	2,79	0,29	0,57	0,93	1,79	2,79

RANGE

Code	Size	Maximum thickness of fixture	Axle letter (length)			Code	Size	Maximum thickness of fixture	Axle letter (length)		
APA408075	M8 x 75 Ø8	9	C	100	600	APA412130	M12 x 130 Ø12	34	H	50	200
APA408095	M8 x 95 Ø8	29	E	100	600	APA412150	M12 x 150 Ø12	54	I	50	100
APA408115	M8 x 115 Ø8	49	G	100	400	APA412180	M12 x 180 Ø12	84	L	50	150
APA408135	M8 x 135 Ø8	69	H	100	400	APA412200	M12 x 200 Ø12	104	M	50	150
APA410090	M10 x 90 Ø10	10	E	100	400	APA416125	M16 x 125 Ø16	8	G	25	100
APA410105	M10 x 105 Ø10	25	F	50	300	APA416145	M16 x 145 Ø16	28	I	25	100
APA410115	M10 x 115 Ø10	35	G	50	200	APA416175	M16 x 175 Ø16	58	K	25	50
APA410135	M10 x 135 Ø10	55	H	50	200	APA416190	M16 x 190 Ø16	73	L	25	50
APA410165	M10 x 165 Ø10	85	K	50	200	APA416220	M16 x 220 Ø16	103	O	25	50
APA410185	M10 x 185 Ø10	105	L	50	150	APA420200	M20 x 200 Ø20	62	M	10	40
APA412110	M12 x 110 Ø12	14	F	50	200	APA420240	M20 x 240 Ø20	102	P	10	30
APA412120	M12 x 120 Ø12	24	G	50	200	APA420285	M20 x 285 Ø20	147	S	10	20