MO-VSF

CHARACTERISTICS

- Assessed for non-carbonated concrete class from C12/15 to C50/60
- Post-installed rebar from Ø8 to Ø16.
- Use for high loads.
- Styrene free.
- Easy set up.
- Use for static or quasi-static loads.
- Temperature range: from -40ºC to + 80ºC (long term maximum temperature +50ºC)
- Suitable for dry and wet concrete holes.
- Suitable for roof installations

CERTIFICATES

CE STRUCTURAL FIXINGS IN UNCRACKED CONCRETE ETA 24/0724

CE REBAR CONNECTIONS ETA 24/0726

CE FIXINGS IN MASONRY ETA 24/0725

LEED TESTED

ÉMISSIONS DANS L'AIR INTÉRIEUR A+ A+ A B C

APPLICATIONS

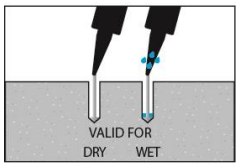
- Overlapping joints with existing reinforcement in a building component.
- Anchoring of the reinforcement at a slab or beam support, end support/bearing of a slab designed as simply supported as well as its reinforcement for restraint forces.
- Anchoring of reinforcement of building components stressed primarily in compression.
- Anchoring of reinforcement to cover the line of acting tensile force.

BASE MATERIAL

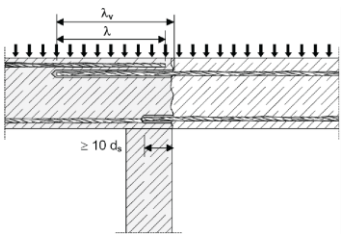
VALID FOR

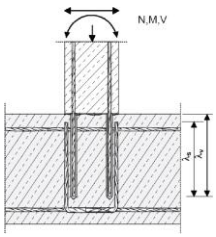
ø8 – ø16 Rebar

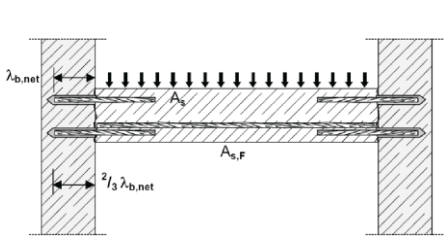
DRILL HOLE CONDITION

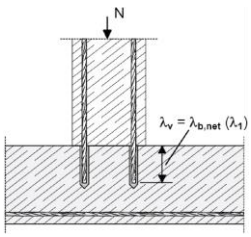


APPLICATION EXAMPLES









1. RANGE

ITEM	CODE	SIZE	PHOTO	COMPONENT	MATERIAL	
1	**MOVSF300** **MOVSF410**	300 ml. 410 ml.		STYRENE FREE VINYLESTER MORTAR	Styrene free vinylester resin Format: cartridges of 300 and 410 ml	12

2. ACCESORIES

ITEM	CODE	PHOTO	COMPONENT	MATERIAL
1	**MOPISSI**		APPLICATION GUNS	Gun for 300 ml cartridges
	MOPISTO			Gun for 410 ml coaxial cartridges
2	**MORCEPKIT**		CLEANING BRUSHES	3 Cleaning brushes kit of ø14, ø20 and ø29 mm.
3	**MOBOMBA**		CLEANING PUMP	Pump for cleaning dust and drill hole fragments
4	**MORCANU**		MIXING NOZZLE	Plastic. Helix static mixer

3. PRODUCT SET UP

3.1. SETTING PROCEDURE

0. PROTECT YOURSELF

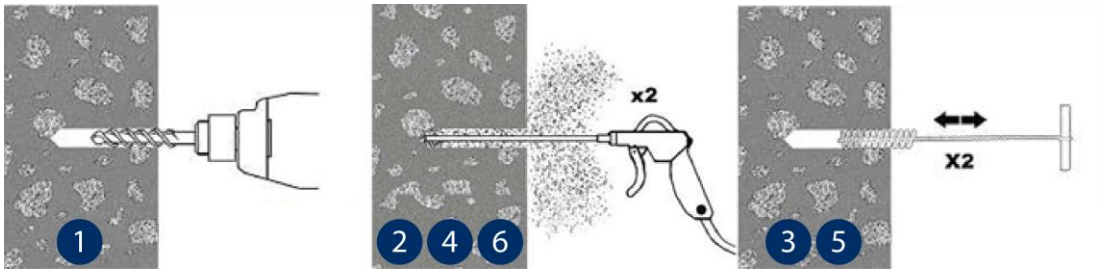
Always use and wear your personal protective equipment.

1. DRILLING THE HOLE

Check the concrete base is compact and porosity is insignificant. Suitable for wet or dry drill holes.
Cartridge installation temperature: ≥ 5 ºC.
Base material installation temperature: MO-VSF≥ +5 ºC.
Use drill in hammer mode.
Drill to the specified diameter and depth values.

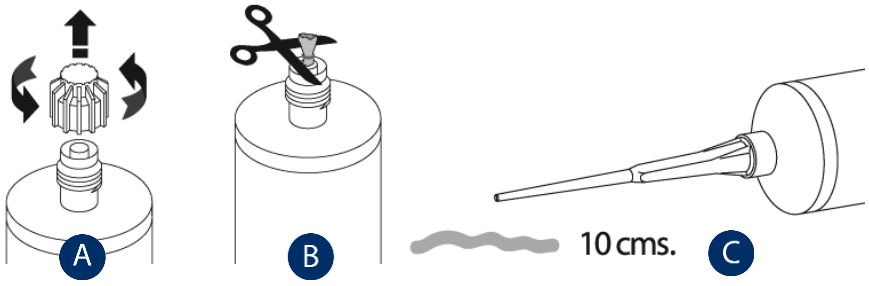
2 - 6. BLOW AND CLEAN

Clear the drill holes completely of dust and fragments by following the procedure shown in the picture. If the drill hole is flooded, the water must be removed before mortar is injected.



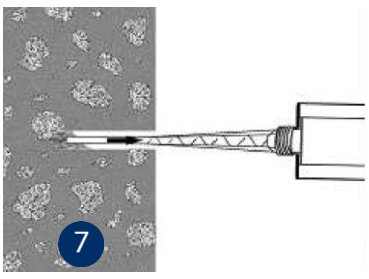
A – B* – C. OPEN CARTRIDG

Screw the nozzle into the cartridge and place the assembly in the application gun. Squeeze on the trigger repeatedly until the mortar comes out of the nozzle in a uniform grey color. Any iridescence indicates improper mixing. Always discard the first two doses of each cartridge: these are never to be used for fixing.***In the 300 ml cartridges cut the end of the bag, behind the locking hook.**



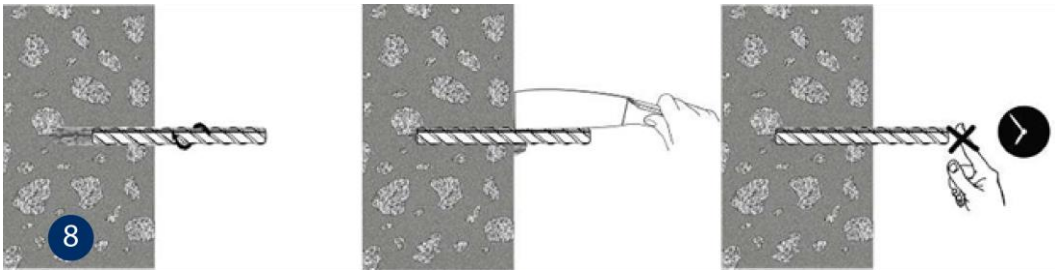
7. INJECT MORTAR

Insert the nozzle to the bottom of the drill hole and apply mortar: gradually remove the nozzle, ensuring there are no air bubbles.
Fill the hole to ½ and ¾ of its depth.
In the event of not fully using the cartridge, leave nozzle attached. Only change if using again and handling time has expired, remembering to discard the first two doses of mortar.



8. INSERT THE REBAR

Introduce the rebar to be installed by screwing it lightly down to the installation depth value manually; ensuring the mortar covers the rebar rivet. The introduction of the anchor must take place within the handling time. The mortar must seep from the top of the drill hole to ensure it is completely full and there are no gaps between the rebar and the drill hole.

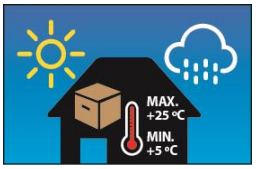


3.2 TEMPERATURE AND CURING TIME

TYPE	Cartridge temperature [°C]	Handling time [min]	Base material temperature [°C]	Curing time [min]
MO-VSF	Min +5	18	Min +5	145
	+5 to +10	10	+5 to +10	145
	+10 to +20	6	+10 to +20	85
	+20 to +25	5	+20 to +25	50
	+25 to +30	4	+25 to +30	40
	+30	4	+30	35

4. STORAGE CONDITIONS

Keep the product stored in a cool, dry place, away from direct sunlight and heat sources, at an average temperature between +5 ºC and +25 ºC.



Shelf life of unopened cartridge: 18 months from the date of manufacture. The expiration date is indicated on the cartridge.

The tables below are referred to EN 1992-1-1 Annex C Table C.1 and C.2N Properties of reinforcement:

5. REBAR PROPERTIES

Product form		Bars and de-coiled rods	
Class		B	C
Characteristic yield strength 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
Characteristics strain at maximum force ε_{uk} (%)		≥ 5,0	≥ 7,5
Bendability		Bend / Rebend test	
Maximum deviation from nominal mass (individual bar) (%)	Nominal bar size (mm) ≤ 8 > 8	± 6,0 ± 4,5	
Bond: Minimum relative rib area, $f_{R,min}$	Nominal bar size (mm) 8 to 12 > 12	0,040 0,056	

6. MINIMUM/MAXIMUM LENGTHS*

Rebar		Minimum		Maximum
Ød$_s$ [mm]	$f_{y,k}$ [N/mm2]	Anchorage $\ell_{b,min}$ [mm]	Overlap $\ell_{0,min}$ [mm]	ℓ_{max} [mm]
8	500	114	200	400
10	500	142	200	500
12	500	171	200	600
14	500	199	210	700
16	500	227	240	800

* For C20/25 concrete (f_{bd} = 2, 3 N/mm^2), good bond conditions, rebar (f_{yk} = 500 N/mm^2)

7. DESIGN BOND RESISTANCE ($f_{bd,PIR}$) [N/mm2] AND REDUCTION FACTOR (k_b)

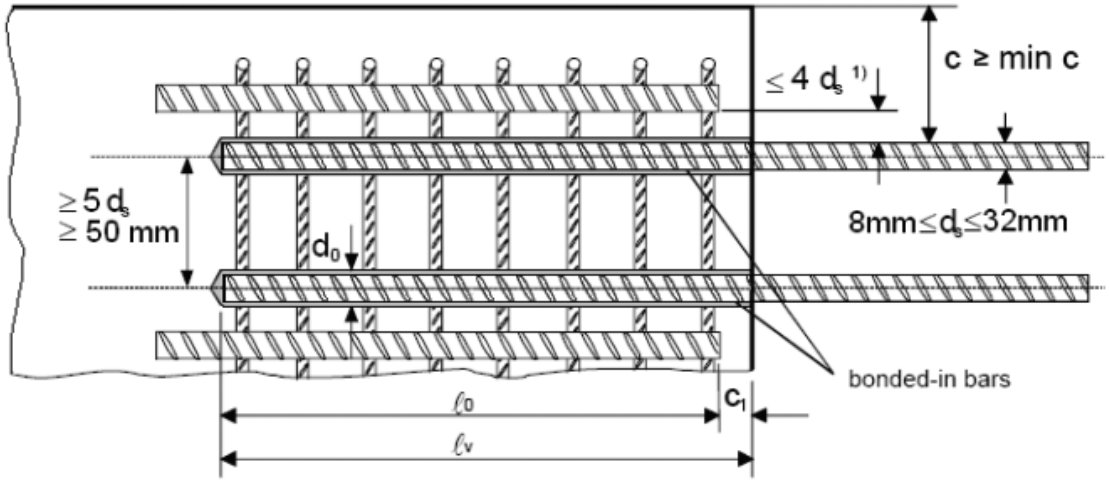
Rebar Ø d$_s$ [mm]	Resistance and factor	Concrete Strength								
		C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8	k_{b*}	1,0	1,0	1,0	0,86	0,76	0,69	0,63	0,58	0,54
	$f_{bd,PIR}$	1,6	2,0	2,3						
10 a 16	k_{b*}	1,0	1,0	1,0	1,0	0,89	0,80	0,73	0,67	0,63
	$f_{bd,PIR}$	1,6	2,0	2,3	2,7					

Rebar Ø d$_s$ [mm]	Amplification factor	Concrete strength C12/15 to C50/60
8 a 16	α_{lb}	1,5

*For all drilling methods with Good bond conditions

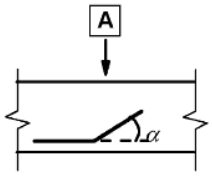
8. PRECALCULATED VALUE TABLES

- Design Load Approach according to Eurocode 2 and EOTA technical report 023.
- Data information according to ETA 24/0726.
- Non-cracked concrete, dry or wet conditions
- Temperature range: -40ºC to +80ºC (long term maximum temperature +50ºC).
- Minimum spacing conditions ≥5ds, min 50 mm:

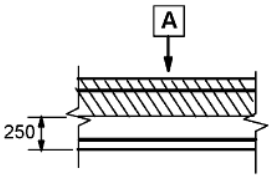


- Minimum concrete covering
  - compressed air drilling ≥ 50 + 0,06 L_b
  - hammer drilling ≥ 30 + 0,08 L_b ≥ 2ϕ

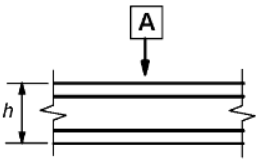
- Good bond Conditions (EU2, figure 8.2):



a) 45º ≤ α ≤ 90º

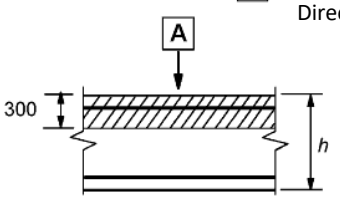


c) *h* > 250 mm



b) *h* ≤ 250 mm

a) and b) "good" bond conditions for all types of rebar



d) *h* > 600 mm

c) and d) no shaded area – "good" bond conditions
Shaded area – "poor" bond conditions

Concreting Direction

* For other bond conditions, multiply resistance by 0, 7.

Resistances values can be increased in the following scenarios:

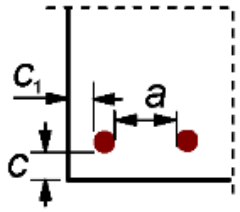
- In case of transverse tension / compression pressure (α_2)
- In case of concreting cover (α_5)
- In case of overlapping (α_6)

VALUES FOR α_2 , α_5 AND α_6

INFLUENCE FACTOR	REINFORCEENT BAR	
	IN TENSION	IN COMPRESSION
Concrete Cover	$\alpha_2 = 1 - 0{,}15\ (c_d - Ø)/Ø$ $\geq 0{,}7$ $\leq 1{,}0$	$\alpha_2 = 1{,}0$
Confinement by transverse pressure	$\alpha_5 = 1 - 0{,}004p$ $\geq 0{,}7$ $\leq 1{,}0$	$\alpha_5 = 1$
Overlapping length	$\alpha_6 = (p_1/25)^{0{,}25}$ $\geq 1{,}0$ $\leq 1{,}5$	

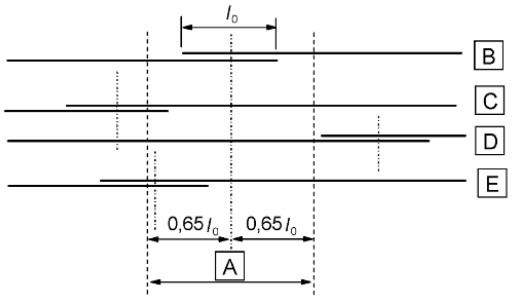
Where:

c_d = min (a/2, c_1, c)



p: transverse pressure [MPa] at ultimate limit state along l_{bd}

p_1 is the percentage of reinforcement lapped within 0,65 10 from the center of the lap length considered



A Considered section B Rebar I C Rebar II D Rebar III E Rebar IV

CONCRETE STRENGTH 20/25

Concrete compressive strength [$f_{ck,cube}$]: 25 N/mm²

Rebar Ø	d_s	[mm]	**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**
Rebar Size	d_s	[mm]	8	10	12	14	16
Cross-sectional area	A_s	[mm²]	50,3	78,5	113,1	153,9	201,1
Characteristic yield strength of rebar	f_{yk}	[N/mm²]	500	500	500	500	500
Partial safety factor	$\gamma_{M,s}$	[--]	1,15	1,15	1,15	1,15	1,15
Design yield strength of rebar	f_{yd}	[N/mm²]	434,78	434,78	434,78	434,78	434,78
Design steel resistance	$N_{Rd,s}$	[kN]	21,9	34,1	49,2	66,9	87,4
Bond stress	f_{bd}	[N/mm²]	2,30	2,30	2,30	2,30	2,30
Amplification factor for minimum anchorage length	α_{lb}	[--]	1,00	1,00	1,00	1,00	1,00
Basic Anchorage Length - Applied	$l_{b,rqd}$	[mm]	0,00	0,00	0,00	0,00	0,00
Basic Anchorage Length - Yield	$l_{b,rqd,fyd}$	[mm]	378,07	472,59	567,11	661,63	756,14
Minimum anchorage Length	$l_{b,min}$	[mm]	113,42	141,78	170,13	198,49	226,84
Minimum lap length	$l_{0,min}$	[mm]	200,00	200,00	200,00	210,00	240,00
Max permissible embedment depth	$l_{v,max}$	[mm]	400,00	500,00	600,00	700,00	800,00
Drilled hole diameter	d_h	[mm]	12	14	16	18	20
Bar spacing ≥	s	[mm]	50	50	60	70	80
Edge distance (compressed air drilling) ≥	c	[mm]	50 + 0,06 L_b				
Edge distance (hammer drilling) ≥	c	[mm]	30 + 0,08 L_b ≥ 2ϕ				

Anchorage Length, L_b [mm]	**Design tensile pull-out bond resistance, N_{Rd}**				
114	6,6				
142	8,2	10,3		**NOT ALLOWED AREA**	
171	9,9	12,4	14,8		
199	11,5	14,4	17,3	20,1	
200	11,6	14,5	17,3	20,2	
210	12,1	15,2	18,2	21,2	
227	13,1	16,4	19,7	23,0	26,2
240	13,9	17,3	20,8	24,3	27,7
300	17,3	21,7	26,0	30,3	34,7
350	20,2	25,3	30,3	35,4	40,5
400	**21,9**	28,9	34,7	40,5	46,2
450		32,5	39,0	45,5	52,0
500		**34,1**	43,4	50,6	57,8
550			47,7	55,6	63,6
600			**49,2**	60,7	69,4
650				65,8	75,1
700				**66,9**	80,9
750					86,7
800		**REBAR YIELDING AREA**			**87,4**
900					
1000					
Length to develop steel yield, $L_{b,rqd}$ [mm]	**378**	**473**	**567**	**662**	**756**

Values shaded in blue are not allowed for overlapping joints

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

CONCRETE STRENGTH 30/37

Concrete compressive strength [$f_{ck,cube}$]: 37 N/mm²

Rebar Ø	d_s	[mm]	**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**
Rebar Size	d_s	[mm]	8	10	12	14	16
Cross-sectional area	A_s	[mm²]	50,3	78,5	113,1	153,9	201,1
Characteristic yield strength of rebar	f_{yk}	[N/mm²]	500	500	500	500	500
Partial safety factor	$\gamma_{M,s}$	[--]	1,15	1,15	1,15	1,15	1,15
Design yield strength of rebar	f_{yd}	[N/mm²]	434,78	434,78	434,78	434,78	434,78
Design steel resistance	$N_{Rd,s}$	[kN]	21,9	34,1	49,2	66,9	87,4
Bond stress	f_{bd}	[N/mm²]	2,30	3,00	3,00	3,00	3,00
Amplification factor for minimum anchorage length	α_{lb}	[--]	0,76	0,89	0,89	0,89	0,89
Basic Anchorage Length - Applied	$l_{b,rqd}$	[mm]	0,00	0,00	0,00	0,00	0,00
Basic Anchorage Length - Yield	$l_{b,rqd,fyd}$	[mm]	378,07	362,32	434,78	507,25	579,71
Minimum anchorage Length	$l_{b,min}$	[mm]	86,20	96,74	116,09	135,43	154,78
Minimum lap length	$l_{0,min}$	[mm]	152,00	178,00	178,00	186,90	213,60
Max permissible embedment depth	$l_{v,max}$	[mm]	400,00	500,00	600,00	700,00	800,00
Drilled hole diameter	d_h	[mm]	12	14	16	18	20
Bar spacing ≥	s	[mm]	50	50	60	70	80
Edge distance (compressed air drilling) ≥	c	[mm]	50 + 0,06 L_b				
Edge distance (hammer drilling) ≥	c	[mm]	30 + 0,08 L_b ≥ 2ϕ				

Anchorage Length, L_b [mm]	**Design tensile pull-out bond resistance, N_{Rd}**				
87	5,0				
97	5,6	9,1		**NOT ALLOWED AREA**	
117	6,8	11,0	13,2		
136	7,9	12,8	15,4	17,9	
152	8,8	14,3	17,2	20,1	
155	9,0	14,6	17,5	20,5	23,4
178	10,3	16,8	20,1	23,5	26,8
187	10,8	17,6	21,1	24,7	28,2
214	12,4	20,2	24,2	28,2	32,3
250	14,5	23,6	28,3	33,0	37,7
300	17,3	28,3	33,9	39,6	45,2
350	20,2	33,0	39,6	46,2	52,8
400	**21,9**	**34,1**	45,2	52,8	60,3
450		**34,1**	**49,2**	59,4	67,9
500		**34,1**	**49,2**	66,0	75,4
550			**49,2**	**66,9**	82,9
600			**49,2**	**66,9**	**87,4**
650				**66,9**	**87,4**
700				**66,9**	**87,4**
750					**87,4**
800		**REBAR YIELDING AREA**			**87,4**
900					
1000					
Length to develop steel yield, $L_{b,rqd}$ [mm]	**378**	**362**	**435**	**507**	**580**

Values shaded in blue are not allowed for overlapping joints

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

CONCRETE STRENGTH 40/50

Concrete compressive strength [$f_{ck,cube}$]: 50 N/mm²

Rebar Ø	d_s	[mm]	**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**
Rebar Size	d_s	[mm]	8	10	12	14	16
Cross-sectional area	A_s	[mm²]	50,3	78,5	113,1	153,9	201,1
Characteristic yield strength of rebar	f_{yk}	[N/mm²]	500	500	500	500	500
Partial safety factor	$\gamma_{M,s}$	[--]	1,15	1,15	1,15	1,15	1,15
Design yield strength of rebar	f_{yd}	[N/mm²]	434,78	434,78	434,78	434,78	434,78
Design steel resistance	$N_{Rd,s}$	[kN]	21,9	34,1	49,2	66,9	87,4
Bond stress	f_{bd}	[N/mm²]	2,30	3,70	3,70	3,70	3,70
Amplification factor for minimum anchorage length	α_{lb}	[--]	0,63	0,73	0,73	0,73	0,73
Basic Anchorage Length - Applied	$l_{b,rqd}$	[mm]	0,00	0,00	0,00	0,00	0,00
Basic Anchorage Length - Yield	$l_{b,rqd,fyd}$	[mm]	378,07	293,77	352,53	411,28	470,04
Minimum anchorage Length	$l_{b,min}$	[mm]	71,46	73,00	87,60	102,20	116,80
Minimum lap length	$l_{0,min}$	[mm]	126,00	146,00	146,00	153,30	175,20
Max permissible embedment depth	$l_{v,max}$	[mm]	400,00	500,00	600,00	700,00	800,00
Drilled hole diameter	d_h	[mm]	12	14	16	18	20
Bar spacing ≥	s	[mm]	50	50	60	70	80
Edge distance (compressed air drilling) ≥	c	[mm]	50 + 0,06 L_b				
Edge distance (hammer drilling) ≥	c	[mm]	30 + 0,08 L_b ≥ 2ϕ				

Anchorage Length, L_b [mm]	**Design tensile pull-out bond resistance, N_{Rd}**				
72	4,2				
73	4,2	8,5		**NOT ALLOWED AREA**	
88	5,1	10,2	12,3		
103	6,0	12,0	14,4	16,8	
117	6,8	13,6	16,3	19,0	21,8
126	7,3	14,6	17,6	20,5	23,4
146	8,4	17,0	20,4	23,8	27,2
154	8,9	17,9	21,5	25,1	28,6
176	10,2	20,5	24,5	28,6	32,7
400	**21,9**	**34,1**	**49,2**	65,1	74,4
450		**34,1**	**49,2**	**66,9**	83,7
500		**34,1**	**49,2**	**66,9**	**87,4**
550			**49,2**	**66,9**	**87,4**
600			**49,2**	**66,9**	**87,4**
650				**66,9**	**87,4**
700				**66,9**	**87,4**
750					**87,4**
800		**REBAR YIELDING AREA**			**87,4**
900					
1000					
Length to develop steel yield, $L_{b,rqd}$ [mm]	**378**	**294**	**353**	**411**	**470**

Values shaded in blue are not allowed for overlapping joints

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

CONCRETE STRENGTH 50/60

Concrete compressive strength [$f_{ck,cube}$]: 60 N/mm²

Rebar Ø	d_s	[mm]	**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**
Rebar Size	d_s	[mm]	8	10	12	14	16
Cross-sectional area	A_s	[mm²]	50,3	78,5	113,1	153,9	201,1
Characteristic yield strength of rebar	f_{yk}	[N/mm²]	500	500	500	500	500
Partial safety factor	$\gamma_{M,s}$	[--]	1,15	1,15	1,15	1,15	1,15
Design yield strength of rebar	f_{yd}	[N/mm²]	434,78	434,78	434,78	434,78	434,78
Design steel resistance	$N_{Rd,s}$	[kN]	21,9	34,1	49,2	66,9	87,4
Bond stress	f_{bd}	[N/mm²]	2,30	4,30	4,30	4,30	4,30
Amplification factor for minimum anchorage length	α_{lb}	[--]	0,54	0,63	0,63	0,63	0,63
Basic Anchorage Length - Applied	$l_{b,rqd}$	[mm]	0,00	0,00	0,00	0,00	0,00
Basic Anchorage Length - Yield	$l_{b,rqd,fyd}$	[mm]	378,07	252,78	303,34	353,89	404,45
Minimum anchorage Length	$l_{b,min}$	[mm]	61,25	63,00	75,60	88,20	100,80
Minimum lap length	$l_{0,min}$	[mm]	108,00	126,00	126,00	132,30	151,20
Max permissible embedment depth	$l_{v,max}$	[mm]	400,00	500,00	600,00	700,00	800,00
Drilled hole diameter	d_h	[mm]	12	14	16	18	20
Bar spacing ≥	s	[mm]	50	50	60	70	80
Edge distance (compressed air drilling) ≥	c	[mm]	50 + 0,06 L_b				
Edge distance (hammer drilling) ≥	c	[mm]	30 + 0,08 L_b ≥ 2ϕ				

Anchorage Length, L_b [mm]	**Design tensile pull-out bond resistance, N_{Rd}**				
62	3,6				
63	3,6	8,5		**NOT ALLOWED AREA**	
76	4,4	10,3	12,3		
89	5,1	12,0	14,4	16,8	
101	5,8	13,6	16,4	19,1	21,8
108	6,2	14,6	17,5	20,4	23,3
126	7,3	17,0	20,4	23,8	27,2
133	7,7	18,0	21,6	25,2	28,7
152	8,8	20,5	24,6	28,7	32,9
400	**21,9**	**34,1**	**49,2**	**66,9**	86,5
450		**34,1**	**49,2**	**66,9**	**87,4**
500		**34,1**	**49,2**	**66,9**	**87,4**
550			**49,2**	**66,9**	**87,4**
600			**49,2**	**66,9**	**87,4**
650				**66,9**	**87,4**
700				**66,9**	**87,4**
750					**87,4**
800		**REBAR YIELDING AREA**			**87,4**
900					
1000					
Length to develop steel yield, $L_{b,rqd}$ [mm]	**378**	**253**	**303**	**354**	**404**

Values shaded in blue are not allowed for overlapping joints

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

9. DOCUMENTACION OFICIAL

The following documents are available through our Sales Department or on our official website: www.indexfix.com:

- MOVSF Safety Data Sheet.
- European Technical Assessment ETA 24/0724 for use in non-cracked concrete according to EAD 330499-01-0601 guide, option 7, for M8 to M24.
- European Technical Assessment ETA 24/0726 for the installation of post-installed rebar connections according to EAD 330087-01-0601 guide, with diameters from Ø8 to Ø16
- European Technical Assessment ETA 24/0725 for the use in masonry according to EAD 330076-01-0604 guide
- Classified A+ according to French Regulation DEVL11044875A relative to the emission of volatile pollutants for indoor use.
- Certificate LEED_MO-VSF_en_rev0
- Declaration of Performance DoP MOVSF
- INDEXcal anchor calculation software.
- INDEXmor cartridge calculation needs software.