Skarpa

TECHNICAL DATA SHEET

V-PLUS

Product for structural applications

ETAG 001 Part 5 OPTION 1
ETA - 09/0140
Option 1 - Option 7

ETAG 001 TR023
ETA-09/0246
Rebar

FIXING IN SEISMIC
CSTB
V-PLUS
DTA

V-PLUS
ETAG - 001

BCR-825* V-PLUS

Shuttle cartridge
825 ml
cod. 747285

6

BCR-400 V-PLUS

Coaxial cartridge
400 ml
cod. 747280

12

BCR-345 V-PLUS

Shuttle cartridge
345 ml
cod. 747270

15

BCR-300 V-PLUS

Foil cartridge
300 ml
cod. 747260

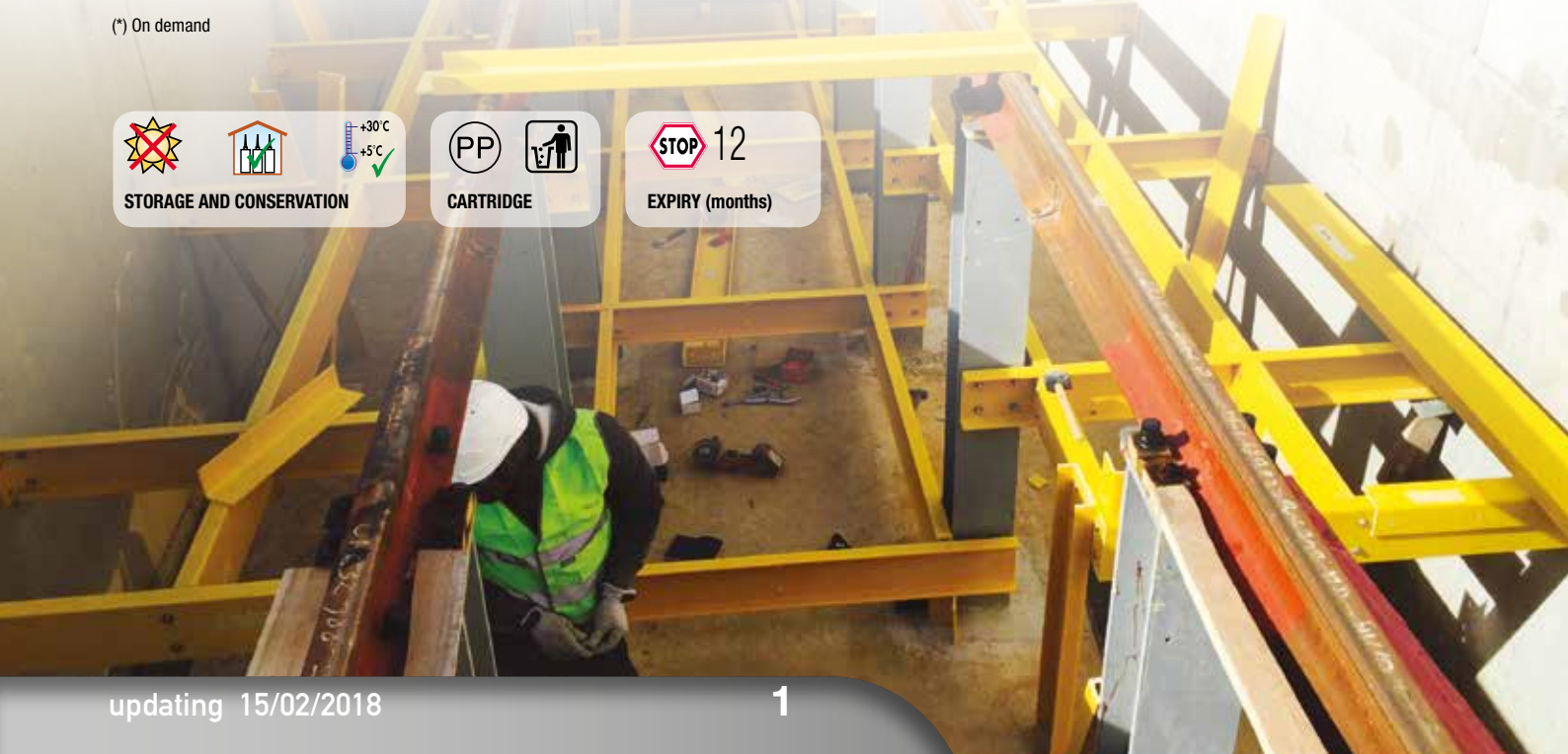
15

BCR-165 V-PLUS

Foil cartridge
165 ml
cod. 747250

15

(*) On demand



+30°C
+5°C
STORAGE AND CONSERVATION

PP
CARTRIDGE

STOP 12
EXPIRY (months)

TECHNICAL DATA SHEET

Skarpa

VINYLESTER RESIN STYRENE FREE V-PLUS

V-PLUS

ETAG 001 Part 5 OPTION 1
ETA - 09/0140

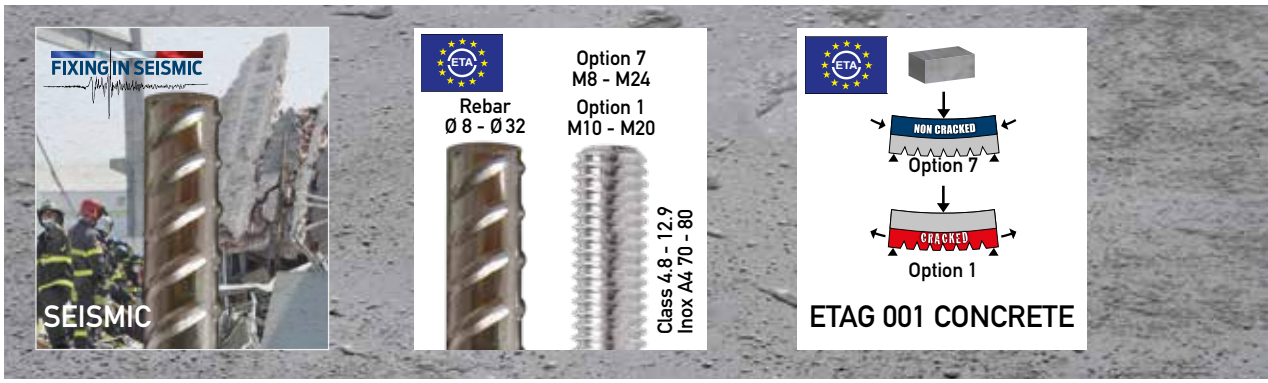
ETAG 001 TR023
ETA-09/0246

GREEN LIFE

LEED TESTED

ÉMISSIONS DANS L'AIR INTÉRIEUR
A+ A B C

STYRENE FREE
CLP Classification



ETA (European Technical Assessments) updated according to the new Construction Prod-uct Regulation 305/2011. DoP Declarations of Performance available . According to CE-ETA load data, it is one of the best vinylester resins in the European market with double approval. ETA-09/0140 Option 7 from M8 to M24 for non-cracked concrete and **OPTION 1 FOR INSTALLATION IN CRACKED CONCRETE** with rods from M10 to M20. It is certified for fixing with variable anchorage depths. This means that the project engineer has with this product a considerable flexibility in the design phase. Maximum embedment depth up to 20 times nominal threaded rod diameter.
ETA-09/0246 Rebar (diameter from 8mm to 32mm) for post installed rebar connections in reinforced concrete. Reduction of minimum embedment depth for the realization of post installed rebar connections. Fire resistance evaluation report. Approved 825 ml Jumbo version, ideal for large jobs. Possibility of using the product in dry and wet concrete and flooded hole (the latter approved only for threaded rods). The product hardening reaction takes place even in presence of water.

BETA

The BETA registration means that we can verify that this product meets agreed properties criteria regarding properties hazardous to the environment and health. See www.bastaonline.se

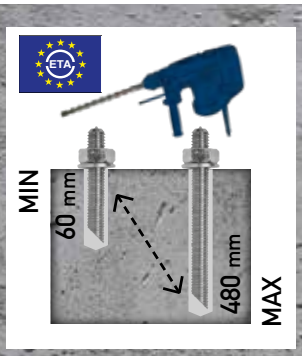
Tiefbauamt Graubünden / Abt. Kunstbauten
Liste genehmigter Ankerkleber

AIT Asian Institute of Technology

ACCREDITÉ PAR INPP > TESTED BY INPP > inpp

SASO

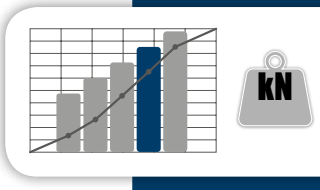
MANUFACTURED BY SIKA SPA
RESIN MADE IN
SINCE 1983



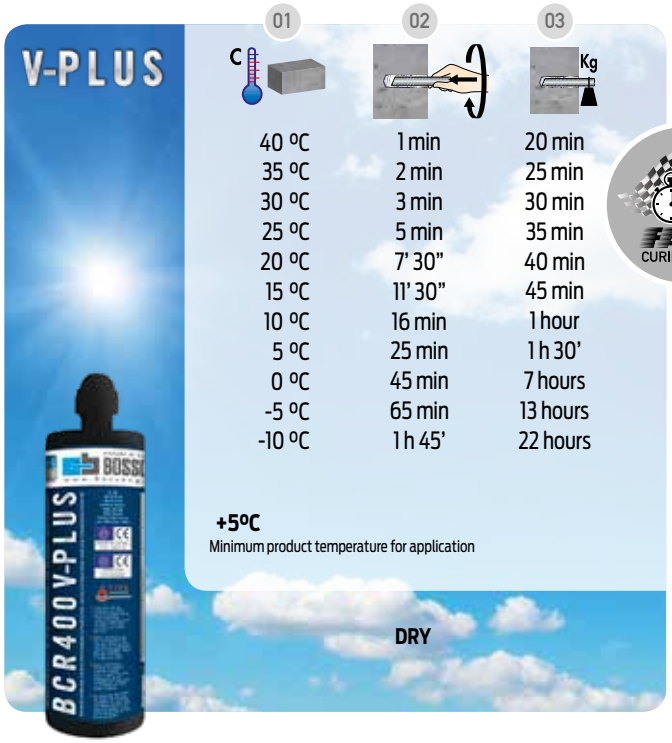
CARTRIDGE
300 - 165 ml:
Plastic foil opening system

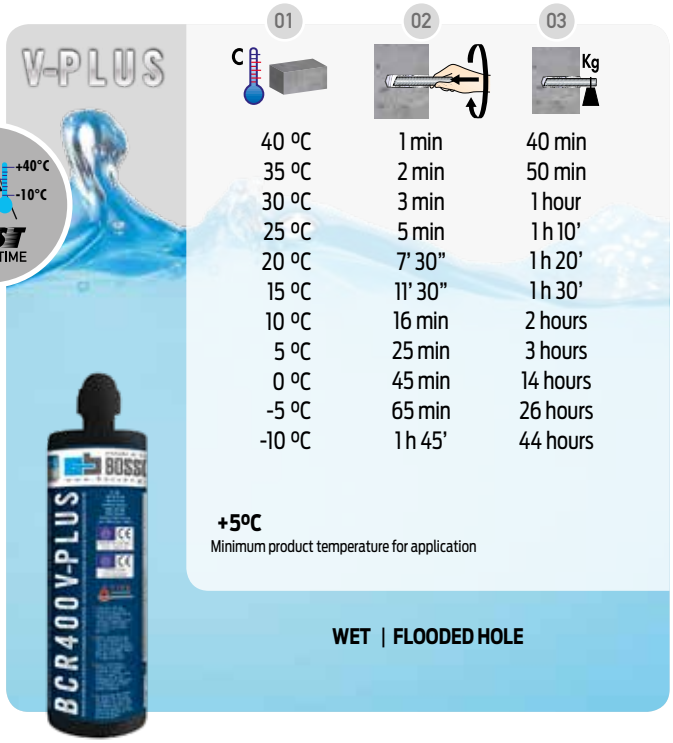
Certified service temperatures are in the ranges:
-40ºC/+40ºC (Tº max long period = 24ºC)
-40ºC/+80ºC (Tº max long period = 50ºC)
-40ºC/+120ºC (Tº max long period = 72ºC).
Reduced curing time for base material temperatures from -10ºC to +40ºC.
VOC according to the French Decree nr. 2011-321 and the Norm ISO 16000.

Applicazioni | Applications | Applications | Anwendungen



Setting times





Number of fixings

Fixings in solid materials

THREADED STUD	HOLE	BCR 165	BCR 300	BCR 345	BCR 400	BCR 825
	d_0 [mm] x h_1 [mm]	Nr. Fixings	Nr. Fixings	Nr. Fixings	Nr. Fixings	Nr. Fixings
M 8	10 x 90	± 30	± 54	± 61	± 72	± 147
M 10	12 x 95	± 21	± 39	± 44	± 52	± 106
M 12	14 x 115	± 14	± 25	± 30	± 34	± 70
M 16	18 x 130	± 9	± 16	± 18	± 21	± 43
M 20	24 x 175	± 3	± 6	± 6,5	± 7	± 15
M 24	28 x 215	± 2	± 4	± 4,5	± 5	± 10

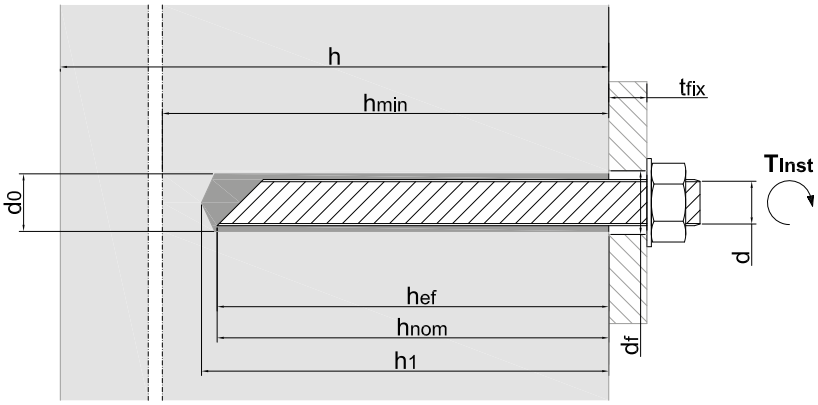
Fixings in hollow materials

THREADED STUD	BCR 165	BCR 300	BCR 400	SLEEVE
d_{nom} [mm]	Nr. Fixings	Nr. Fixings	Nr. Fixings	d_{nom} [mm] x L [mm]
M 8	± 15	± 27	± 35	GC 12 x 80
M 8	± 9	± 16	± 21	GC 15 x 85
M 10	± 9	± 16	± 21	GC 15 x 85
M 12	± 9	± 16	± 21	GC 15 x 85
M 12	± 5	± 9	± 12	GC 20 x 85
M 16	± 5	± 9	± 12	GC 20 x 85

WARNING: The number of fixings above mentioned has been calculated according to the theoretical volume needed to fill the hole (or sleeve) excluded the volume of the inserted metal rod. In the theoretical volume it is included a standard extra quantity but the real quantity of the product may be different than it in function of the real application of the product.

Installation data

D		Material
	d [mm]	Rod diameter
		Type of rod
N		Plastic sleeve
	h_{min} [mm]	Minimum thickness of base material
	d_0 [mm]	Hole diameter
E	h_1 [mm]	Hole depth
	h_{nom} [mm]	Embedment depth
	h_{ef} [mm]	Effective anchorage depth
	S_{cr} [mm]	Characteristic spacing
G	C_{cr} [mm]	Characteristic edge distance
	S_{min} [mm]	Minimum allowable spacing
	C_{min} [mm]	Minimum allowable edge distance
E	t_{fix} [mm]	Fixture thickness
	d_f [mm]	Diameter of clearence hole in the fixture
	S_w [mm]	Key
L	T_{inst} [Nm]	Installation torque



WARNING: Before use see this section and the complete procedure of installation reported in the next pages. We assume no liability for the not correct use of the product.

ETAG 001 Part 5 OPTION 1
ETA - 09/0140

Option 1
M10 ... M20

Option 7
M8 ... M24

MATERIAL	ROD DIAMETER	TYPE OF ROD	MIN. THICKNESS BASE MATERIAL			HOLE DIAMETER	HOLE DEPTH			EMBEDMENT DEPTH			EFFECTIVE ANCHORAGE DEPTH			CHARACTERISTIC SPACING			CHARACTERISTIC EDGE DISTANCE		
	d [mm]		h_{min} [mm]			d_0 [mm]	h_1 [mm]			h_{nom} [mm]			h_{ef} [mm]			$S_{cr,N}$ [mm]			$C_{cr,N}$ [mm]		
			min	med	max		min	med	max	min	med	max	min	med	max	min	med	max	min	med	max
M8-M24 Non cracked Concrete M10-M20 Cracked Concrete	M8	⩾ 5.8 A4-70	100	110	190	10	65	85	165	60	80	160	60	80	160	180	230	230	90	115	115
	M10	⩾ 5.8 A4-70	100	120	230	12	75	95	205	70	90	200	70	90	200	210	248	248	105	124	124
	M12	⩾ 5.8 A4-70	110	140	270	14	85	115	245	80	110	240	80	110	240	240	297	297	120	149	149
	M16	⩾ 5.8 A4-70	136	161	356	18	105	130	325	100	125	320	100	125	320	300	375	396	150	188	198
	M20	⩾ 5.8 A4-70	168	218	448	24	125	175	405	120	170	400	120	170	400	360	450	450	180	225	225
	M24	⩾ 5.8 A4-70	201	266	536	28	150	215	485	145	210	480	145	210	480	435	540	540	218	270	270

TECHNICAL DATA SHEET

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ETAG 001 Part 5 OPTION 1
ETA - 09/0140

Option 1
M10 ... M20

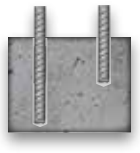
Option 7
M8 ... M24

MATERIAL	ROD DIAMETER	TYPE OF ROD	ALLOWABLE SPACING	MIN. ALLOWABLE EDGE DISTANCE	FIXTURE THICKNESS	DIAMETER OF CLEARENCE HOLE IN THE FIXTURE	KEY	INSTALLATION TORQUE
V PLUS	d [mm]		S_{min} [mm]	C_{min} [mm]	t_{fix} [mm]	d_f [mm]	S_w [mm]	T_{inst} [Nm]
					min ÷ max			
M8-M24 M16-M24 Non cracked Concrete M10-M20 Cracked Concrete	M8	⩾ 5.8 A4-70	40	40	0 ÷ 1500	9	13	10
	M10	⩾ 5.8 A4-70	40	40	0 ÷ 1500	12	17	20
	M12	⩾ 5.8 A4-70	40	40	0 ÷ 1500	14	19	40
	M16	⩾ 5.8 A4-70	50	50	0 ÷ 1500	18	24	80
	M20	⩾ 5.8 A4-70	60	60	0 ÷ 1500	22	30	130
	M24	⩾ 5.8 A4-70	80	80	0 ÷ 1500	26	36	200

> To avoid splitting failure, the thickness of the concrete member shall be h ⩾ $2h_{ef}$

ETAG 001 TR023
ETA - 09/0246

Ø 8 ... 32 mm



MATERIAL	ROD DIAMETER	TYPE OF ROD	HOLE DIAMETER	ANCHORAGE LENGTH (**)			MIN. ALLOWABLE SPACING	MIN. ALLOWABLE EDGE DISTANCE		
V PLUS	d [mm]		d_0 [mm]	lv [mm]			S_{min} [mm]	C_{min} [mm]		
				MIN lb	MIN lo	MAX lb		MIN lb	MIN lo	MAX lb
C20/25 Concrete	Ø 8	Rebar (*)	12	115	200	400	40	37	42	54
	Ø 10	Rebar (*)	14	145	200	500	40	39	42	60
	Ø 12	Rebar (*)	16	170	200	600	48	40	42	66
	Ø 14	Rebar (*)	18	200	210	700	56	42	43	72
	Ø 16	Rebar (*)	20	230	240	800	64	44	45	78
	Ø 20	Rebar (*)	25	285	300	1000	80	47	48	90
	Ø 25	Rebar (*)	30	355	375	1000	100	61	63	100
	Ø 28	Rebar (*)	35	400	420	1000	112	64	65	100
	Ø 32	Rebar (*)	40	455	480	1000	128	67	69	100

(*) Rebar = FeB44k; B450C; BST 500

(**) Anchorage lengths according to EC2 and TR023. lb = anchorage length lo = overlap joint length

MATERIAL	ROD DIAMETER	TYPE OF ROD		MIN. THICKNESS BASE MATERIAL			HOLE DIAMETER	HOLE DEPTH			EMBEDMENT DEPTH			ANCHORAGE DEPTH			CHARACTERISTIC SPACING			CHARACTERISTIC EDGE DISTANCE			ALLOWABLE SPACING	MIN. ALLOWABLE EDGE DISTANCE
	d [mm]			h_{min} [mm]			d_0 [mm]	h_1 [mm]			h_{nom} [mm]			h_{ef} [mm]			S_{cr} [mm]			C_{cr} [mm]			S_{min} [mm]	C_{min} [mm]
				min	med	max		min	med	max	min	med	max	min	med	max	min	med	max	min	med	max		
Non cracked Concrete	Ø 8	Rebar (*)		100	110	190	12	65	85	165	60	80	160	60	80	160	120	160	320	60	80	160	40	40
	Ø 10	Rebar (*)		100	120	230	14	65	95	205	60	90	200	60	90	200	120	180	400	60	90	200	45	45
	Ø 12	Rebar (*)		102	142	275	16	75	115	245	70	110	240	70	110	240	140	220	480	70	110	240	55	55
	Ø 14	Rebar (*)		116	161	316	18	85	130	285	80	125	280	80	125	280	160	250	560	80	125	280	63	63
	Ø 16	Rebar (*)		120	180	360	20	85	145	325	80	140	320	80	140	320	160	280	640	80	140	320	70	70
	Ø 20	Rebar (*)		140	220	450	25	95	175	405	90	170	400	90	170	400	180	340	800	90	170	400	85	85
	Ø 25	Rebar (*)		160	270	560	30	105	215	505	100	210	500	100	210	500	200	420	1000	100	210	500	105	105
	Ø 28	Rebar (*)		182	340	630	35	117	275	565	112	270	560	112	270	560	224	540	1120	112	270	560	135	135
	Ø 32	Rebar (*)		208	380	720	40	133	305	645	128	300	640	128	300	640	256	600	1280	128	300	640	150	150

(*) Rebar = B450C; BST 500

> Installation parameters suitable for application according to the anchors theory

MATERIAL	ROD DIAMETER	TYPE OF ROD	MIN. THICKNESS BASE MATERIAL	HOLE DIAMETER	HOLE DEPTH	EMBEDMENT DEPTH	EFFECTIVE ANCHORAGE DEPTH	CHARACTERISTIC SPACING	CHARACTERISTIC EDGE DISTANCE	MIN. ALLOWABLE SPACING	MIN. ALLOWABLE EDGE DISTANCE	MAX FIXTURE THICKNESS	DIAMETER OF CLEARENCE HOLE IN THE FIXTURE	KEY	INSTALLATION TORQUE
	d [mm]		h_{min} [mm]	d_0 [mm]	h_1 [mm]	h_{nom} [mm]	h_{ef} [mm]	S_{cr} [mm]	C_{cr} [mm]	S_{min} [mm]	C_{min} [mm]	t_{fix} [mm]	d_f [mm]	S_w [mm]	T_{inst} [Nm]
Solid Brick	M8	⩾ 4.6 A2-70 A4-70	200	10	85	80	80	160	200	100	100	10	9	13	7
	M10	⩾ 4.6 A2-70 A4-70	250	12	90	85	85	200	200	100	100	20	12	17	15
	M12	⩾ 4.6 A2-70 A4-70	300	14	100	95	95	240	200	100	100	30	14	19	25
	M16	⩾ 4.6 A2-70 A4-70	350	18	130	125	125	320	200	100	100	35	18	24	30

MATERIAL	ROD DIAMETER	TYPE OF ROD	PLASTIC SLEEVE	MIN. THICKNESS BASE MATERIAL	HOLE DIAMETER	HOLE DEPTH	EMBEDMENT DEPTH	EFFECTIVE ANCHORAGE DEPTH	CHARACTERISTIC SPACING	CHARACTERISTIC EDGE DISTANCE	MIN. ALLOWABLE SPACING	MIN. ALLOWABLE EDGE DISTANCE	MAX FIXTURE THICKNESS	DIAMETER OF CLEARENCE HOLE IN THE FIXTURE	KEY	INSTALLATION TORQUE
	d [mm]		(*)	h_{min} [mm]	d_0 [mm]	h_1 [mm]	h_{nom} [mm]	h_{ef} [mm]	S_{cr} [mm]	C_{cr} [mm]	S_{min} [mm]	C_{min} [mm]	t_{fix} [mm]	d_f [mm]	S_w [mm]	T_{inst} [Nm]
Hollow Brick	M8	⩾ 4.6 A2-70 A4-70	GC 12x80	100	12	85	80	80	$l_{unit,max}$	0,5 x $l_{unit,max}$	100	100	10	9	13	3
	M10	⩾ 4.6 A2-70 A4-70	GC 15x85	100	16	90	85	85	$l_{unit,max}$	0,5 x $l_{unit,max}$	100	100	20	12	17	4
	M12	⩾ 4.6 A2-70 A4-70	GC 20x85	100	20	90	85	85	$l_{unit,max}$	0,5 x $l_{unit,max}$	120	120	30	14	19	6

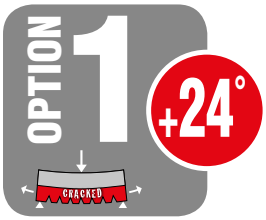
(*) Other lenghts available see catalogue

$l_{unit,max}$ = Max length of masonry unit

MATERIAL	ROD DIAMETER	TYPE OF ROD	MIN. THICKNESS BASE MATERIAL	HOLE DIAMETER	PROFONDITÀ DEL FORO HOLE DEPTH	EMBEDMENT DEPTH	EFFECTIVE ANCHORAGE DEPTH	CHARACTERISTIC SPACING	CHARACTERISTIC EDGE DISTANCE	MIN. ALLOWABLE SPACING	MIN. ALLOWABLE EDGE DISTANCE	MAX FIXTURE THICKNESS	DIAMETER OF CLEARENCE HOLE IN THE FIXTURE	KEY	INSTALLATION TORQUE
	d [mm]		h_{min} [mm]	d_0 [mm]	h_1 [mm]	h_{nom} [mm]	h_{ef} [mm]	S_{cr} [mm]	C_{cr} [mm]	S_{min} [mm]	C_{min} [mm]	t_{fix} [mm]	d_f [mm]	S_w [mm]	T_{inst} [Nm]
Laminated	M8	⩾ 4.6 A2-70 A4-70	160	10	85	80	80	100	80	50	50	10	9	13	7
	M10	⩾ 4.6 A2-70 A4-70	200	12	105	100	100	125	100	50	50	20	12	17	15
	M12	⩾ 4.6 A2-70 A4-70	240	14	125	120	120	150	120	60	60	30	14	19	25
	M16	⩾ 4.6 A2-70 A4-70	320	18	165	160	160	200	160	80	80	35	18	24	30

Load data

LEGEND		
	N_{Rum} [kN]	Average ultimate tension load
	V_{Rum} [kN]	Average ultimate shear load
	N_{RK} [kN]	Characteristic tension load
	V_{RK} [kN]	Characteristic shear load
	N_{rec} [kN]	Admissible tensile load
	V_{rec} [kN]	Admissible shear load



> Loads for single anchor with no influence of spacing and edge distance and with h ⩾ 2hef

> 1kN = 100 Kg

> Shear directed away from the edge

> General safety factor included

> Load increasing safety coefficient used = 1,4

With flooded hole, reduction of the recommended load of 20%

MIN Load data with MINIMUM effective anchorage depth

MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\,MIN}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Cracked Concrete	⩾ 5.8	M 10	70	27,8	18,1	19,1	15,1	9,1	8,6
	⩾ 5.8	M 12	80	33,9	26,3	25,8	21,9	12,2	12,5
C20/25 ⩾ 5.8	⩾ 5.8	M 16	100	47,5	48,9	36,0	40,8	17,1	23,3
	⩾ 5.8	M 20	120	62,4	76,2	47,3	63,5	22,5	34,3

MED Load data with MEDIUM effective anchorage depth

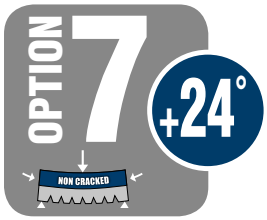
MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\,MED}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Cracked Concrete	⩾ 5.8	M 10	90	30,2	18,1	24,6	15,1	11,7	8,6
	⩾ 5.8	M 12	110	43,8	26,3	37,5	21,9	17,8	12,5
C20/25 ⩾ 5.8	⩾ 5.8	M 16	125	66,3	48,9	50,3	40,8	23,9	23,3
	⩾ 5.8	M 20	170	104,4	76,2	71,0	63,5	33,8	36,2

MAX Load data with MAXIMUM effective anchorage depth

MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\,MAX}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Cracked Concrete	8.8	M 10	200	46,4	27,8	46,4	23,2	22,1	13,2
	8.8	M 12	240	67,4	40,4	67,4	33,7	32,1	19,2
C20/25 8.8	8.8	M 16	320	125,0	75,0	125,0	62,5	59,5	35,7
	8.8	M 20	400	203,0	121,8	167,0	101,5	79,5	58,0

Load data

LEGEND		
	N_{Rum} [kN]	Average ultimate tension load
	V_{Rum} [kN]	Average ultimate shear load
	N_{Rk} [kN]	Characteristic tension load
	V_{Rk} [kN]	Characteristic shear load
	N_{rec} [kN]	Admissible tensile load
	V_{rec} [kN]	Admissible shear load



> Loads for single anchor with no influence of spacing and edge distance and with h ⩾ 2hef

> General safety factor included

> 1kN = 100 Kg

> Load increasing safety coefficient used = 1,4

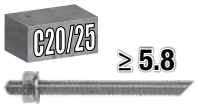
With flooded hole, reduction
of the recommended load of 20%

MIN Load data with MINIMUM effective anchorage depth

MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\ MIN}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	⩾ 5.8	M 8	60	19,0	11,4	19,0	9,5	9,0	5,4
	⩾ 5.8	M 10	70	30,2	18,1	25,2	15,1	12,0	8,6
	⩾ 5.8	M 12	80	43,8	26,3	35,7	21,9	17,0	12,5
	⩾ 5.8	M 16	100	67,5	48,9	50,5	40,8	24,0	23,3
	⩾ 5.8	M 20	120	88,7	76,2	66,3	63,5	31,6	36,3
	⩾ 5.8	M 24	145	117,8	110,4	88,1	92,0	41,9	52,5

MED Load data with MEDIUM effective anchorage depth

MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\ MED}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	⩾ 5.8	M 8	80	19,0	11,4	19,0	9,5	9,0	5,4
	⩾ 5.8	M 10	90	30,2	18,1	30,2	15,1	14,3	8,6
	⩾ 5.8	M 12	110	43,8	26,3	43,8	21,9	20,8	12,5
	⩾ 5.8	M 16	125	81,6	48,9	70,5	40,8	33,6	23,3
	⩾ 5.8	M 20	170	127,0	76,2	104,7	63,5	49,8	36,3
	⩾ 5.8	M 24	210	184,0	110,4	153,2	92,0	72,9	52,5



MAX Load data with MAXIMUM effective anchorage depth

MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\ MAX}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	8.8	M 8	160	29,2	17,5	29,2	14,6	13,9	8,3
	8.8	M 10	200	46,4	27,8	46,4	23,2	22,1	13,2
	8.8	M 12	240	67,4	40,4	67,4	33,7	32,1	19,2
	8.8	M 16	320	125,0	75,0	125,0	62,5	59,5	35,7
	8.8	M 20	400	203,0	121,8	203,0	101,5	96,6	58,0
	8.8	M 24	480	293,0	175,8	293,0	146,5	139,5	83,7

Load data

LEGEND		
	N_{Rum} [kN]	Average ultimate tension load
	V_{Rum} [kN]	Average ultimate shear load
	N_{RK} [kN]	Characteristic tension load
	V_{RK} [kN]	Characteristic shear load
	N_{rec} [kN]	Admissible tensile load
	V_{rec} [kN]	Admissible shear load

> Loads for single anchor with no influence of spacing and edge distance and with h ⩾ 2hef

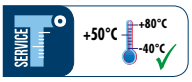
> 1kN = 100 Kg

> **Shear directed away from the edge**

> General safety factor included

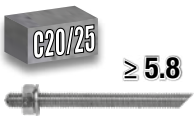
> Load increasing safety coefficient used = 1,4

With flooded hole, reduction
of the recommended load of 20%



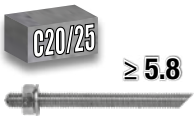
MIN Load data with MINIMUM effective anchorage depth

MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\,MIN}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	⩾ 5.8	M 10	70	27,8	18,1	13,8	15,1	6,5	8,6
	⩾ 5.8	M 12	80	33,9	26,3	19,6	21,9	9,3	12,5
	⩾ 5.8	M 16	100	47,5	48,9	29,5	40,8	14,0	23,3
	⩾ 5.8	M 20	120	62,4	76,2	36,0	63,5	17,1	34,3



MED Load data with MEDIUM effective anchorage depth

MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\,MED}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	⩾ 5.8	M 10	90	30,2	18,1	17,7	15,1	8,4	8,6
	⩾ 5.8	M 12	110	43,8	26,3	27,0	21,9	12,8	12,5
	⩾ 5.8	M 16	125	66,3	48,9	36,9	40,8	17,6	23,3
	⩾ 5.8	M 20	170	104,4	76,2	51,1	63,5	24,3	36,2

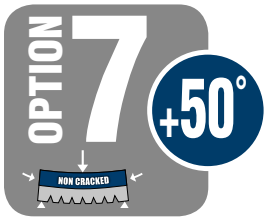


MAX Load data with MAXIMUM effective anchorage depth

MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\,MAX}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	8.8	M 10	200	46,4	27,8	39,4	23,2	18,7	13,2
	8.8	M 12	240	67,4	40,4	58,9	33,7	28,0	19,2
	8.8	M 16	320	125,0	75,0	94,6	62,5	45,0	35,7
	8.8	M 20	400	203,0	121,8	120,2	101,5	57,2	58,0

Load data

LEGEND		
	N_{Rum} [kN]	Average ultimate tension load
	V_{Rum} [kN]	Average ultimate shear load
	N_{Rk} [kN]	Characteristic tension load
	V_{Rk} [kN]	Characteristic shear load
	N_{rec} [kN]	Admissible tensile load
	V_{rec} [kN]	Admissible shear load



> Loads for single anchor with no influence of spacing and edge distance and with h ⩾ 2hef

> 1kN = 100 Kg

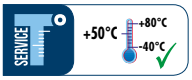
> Shear directed away from the edge

> General safety factor included

> Load increasing safety coefficient used = 1,4

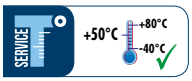
With flooded hole, reduction
of the recommended load of 20%

MIN Load data with MINIMUM effective anchorage depth



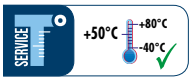
MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\ MIN}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	⩾ 5.8	M 8	60	19,0	11,4	17,2	9,5	8,2	5,4
	⩾ 5.8	M 10	70	30,2	18,1	18,1	15,1	8,6	8,6
	⩾ 5.8	M 12	80	43,8	26,3	25,7	21,9	12,2	12,5
	⩾ 5.8	M 16	100	67,5	48,9	42,6	40,8	20,3	23,3
	⩾ 5.8	M 20	120	88,7	76,2	53,2	63,5	25,3	36,3
	⩾ 5.8	M 24	145	117,8	110,4	76,1	92,0	36,2	52,5

MED Load data with MEDIUM effective anchorage depth



MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\ MED}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	⩾ 5.8	M 8	80	19,0	11,4	19,0	9,5	9,0	5,4
	⩾ 5.8	M 10	90	30,2	18,1	23,3	15,1	11,1	8,6
	⩾ 5.8	M 12	110	43,8	26,3	35,4	21,9	16,8	12,5
	⩾ 5.8	M 16	125	81,6	48,9	53,3	40,8	25,3	23,3
	⩾ 5.8	M 20	170	127,0	76,2	75,3	63,5	35,9	36,3
	⩾ 5.8	M 24	210	184,0	110,4	110,3	92,0	52,5	52,5

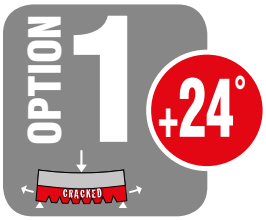
MAX Load data with MAXIMUM effective anchorage depth



MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\ MAX}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	8.8	M 8	160	29,2	17,5	29,2	14,6	13,9	8,3
	8.8	M 10	200	46,4	27,8	46,4	23,2	22,1	13,2
	8.8	M 12	240	67,4	40,4	67,4	33,7	32,1	19,2
	8.8	M 16	320	125,0	75,0	125,0	62,5	59,5	35,7
	8.8	M 20	400	203,0	121,8	177,3	101,5	84,4	58,0
	8.8	M 24	480	293,0	175,8	252,1	146,5	120,0	83,7

Load data

LEGEND		
	N_{Rum} [kN]	Average ultimate tension load
	V_{Rum} [kN]	Average ultimate shear load
	N_{RK} [kN]	Characteristic tension load
	V_{RK} [kN]	Characteristic shear load
	N_{rec} [kN]	Admissible tensile load
	V_{rec} [kN]	Admissible shear load



> Loads for single anchor with no influence of spacing and edge distance and with h ⩾ 2hef

> 1kN = 100 Kg

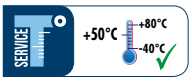
> **Shear directed away from the edge**

> General safety factor included

> Load increasing safety coefficient used = 1,4

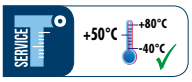
With flooded hole, reduction
of the recommended load of 20%

MIN Load data with MINIMUM effective anchorage depth



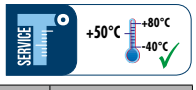
V-PLUS MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\,MIN}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	A4-70	M10	70	27,8	24,3	19,1	20,3	9,1	9,2
	A4-70	M12	80	33,9	35,4	25,7	29,5	12,2	13,5
C20/25 A4-70	A4-70	M16	100	47,5	65,9	36,0	54,9	17,1	25,1
	A4-70	M20	120	62,4	102,9	47,3	72,1	22,5	34,3

MED Load data with MEDIUM effective anchorage depth



V-PLUS MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\,MED}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	A4-70	M10	90	40,5	24,3	24,6	20,3	11,7	9,2
	A4-70	M12	110	54,8	35,4	37,5	29,5	17,8	13,5
C20/25 A4-70	A4-70	M16	125	66,3	65,9	50,3	54,9	23,9	25,1
	A4-70	M20	170	104,4	102,9	71,0	85,7	33,8	39,2

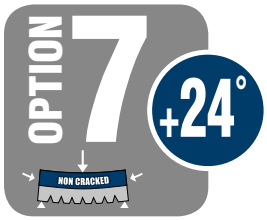
MAX Load data with MAXIMUM effective anchorage depth



V-PLUS MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\,MAX}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	A4-70	M10	200	40,6	24,3	40,6	20,3	15,5	9,2
	A4-70	M12	240	59,0	35,4	59,0	29,5	22,5	13,5
C20/25 A4-70	A4-70	M16	320	109,9	65,9	109,9	54,9	41,9	25,1
	A4-70	M20	400	171,5	102,9	167,0	85,7	65,5	39,2

Load data

LEGEND		
	N_{Rum} [kN]	Average ultimate tension load
	V_{Rum} [kN]	Average ultimate shear load
	N_{Rk} [kN]	Characteristic tension load
	V_{Rk} [kN]	Characteristic shear load
	N_{rec} [kN]	Admissible tensile load
	V_{rec} [kN]	Admissible shear load



> Loads for single anchor with no influence of spacing and edge distance and with h ⩾ 2hef

> 1kN = 100 Kg

> Shear directed away from the edge

> General safety factor included

> Load increasing safety coefficient used = 1,4

With flooded hole, reduction
of the recommended load of 20%

MIN Load data with MINIMUM effective anchorage depth

MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\ MIN}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	A4-70	M8	60	25,6	15,3	23,4	12,8	9,7	5,8
	A4-70	M10	70	37,5	24,3	25,2	20,3	12,0	9,2
	A4-70	M12	80	45,3	35,4	35,7	29,5	17,0	13,5
	A4-70	M16	100	67,5	65,9	50,5	54,9	24,0	25,1
	A4-70	M20	120	88,7	102,9	66,3	85,7	31,6	39,2
	A4-70	M24	145	117,8	148,2	88,1	123,5	41,9	56,5

MED Load data with MEDIUM effective anchorage depth

MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\ MED}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	A4-70	M8	80	25,6	15,3	25,6	12,8	9,7	5,8
	A4-70	M10	90	40,6	24,3	32,4	20,3	15,4	9,2
	A4-70	M12	110	59,0	35,4	49,1	29,5	22,5	13,5
	A4-70	M16	125	87,5	65,9	70,5	54,9	33,6	25,1
	A4-70	M20	170	130,6	102,9	104,6	85,7	49,8	39,2
	A4-70	M24	210	196,1	148,2	153,1	123,5	72,9	56,5

MAX Load data with MAXIMUM effective anchorage depth

MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\ MAX}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	A4-70	M8	160	25,6	15,3	25,6	12,8	9,7	5,8
	A4-70	M10	200	40,6	24,3	40,6	20,3	15,5	9,2
	A4-70	M12	240	59,0	35,4	59,0	29,5	22,5	13,5
	A4-70	M16	320	109,9	65,9	109,9	54,9	41,9	25,1
	A4-70	M20	400	171,5	102,9	171,5	85,7	65,5	39,2
	A4-70	M24	480	247,1	148,2	247,1	123,5	94,3	56,5

Load data

LEGEND		
	N_{Rum} [kN]	Average ultimate tension load
	V_{Rum} [kN]	Average ultimate shear load
	N_{RK} [kN]	Characteristic tension load
	V_{RK} [kN]	Characteristic shear load
	N_{rec} [kN]	Admissible tensile load
	V_{rec} [kN]	Admissible shear load

> Loads for single anchor with no influence of spacing and edge distance and with h ⩾ 2hef

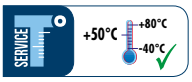
> 1kN = 100 Kg

> **Shear directed away from the edge**

> General safety factor included

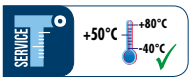
> Load increasing safety coefficient used = 1,4

With flooded hole, reduction
of the recommended load of 20%



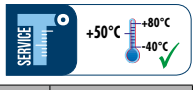
MIN Load data with MINIMUM effective anchorage depth

MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\,MIN}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	A4-70	M10	70	27,8	24,3	13,8	20,3	6,5	9,2
	A4-70	M12	80	33,9	35,4	19,6	29,5	9,3	13,5
C20/25 A4-70	A4-70	M16	100	47,5	65,9	29,5	54,9	14,0	25,1
	A4-70	M20	120	62,4	102,9	36,0	72,1	17,1	34,3



MED Load data with MEDIUM effective anchorage depth

MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\,MED}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	A4-70	M10	90	40,5	24,3	17,7	20,3	8,4	9,2
	A4-70	M12	110	54,8	35,4	27,0	29,5	12,8	13,5
C20/25 A4-70	A4-70	M16	125	66,3	65,9	36,9	54,9	17,6	25,1
	A4-70	M20	170	104,4	102,9	51,1	85,7	24,3	39,2

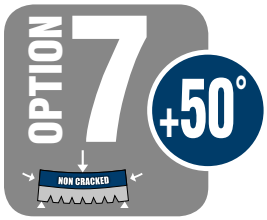


MAX Load data with MAXIMUM effective anchorage depth

MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\,MAX}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	A4-70	M10	200	40,6	24,3	39,4	20,3	15,5	9,2
	A4-70	M12	240	59,0	35,4	58,9	29,5	22,5	13,5
C20/25 A4-70	A4-70	M16	320	109,9	65,9	94,6	54,9	41,9	25,1
	A4-70	M20	400	171,5	102,9	120,2	85,7	57,2	39,2

Load data

LEGEND		
	N_{Rum} [kN]	Average ultimate tension load
	V_{Rum} [kN]	Average ultimate shear load
	N_{Rk} [kN]	Characteristic tension load
	V_{Rk} [kN]	Characteristic shear load
	N_{rec} [kN]	Admissible tensile load
	V_{rec} [kN]	Admissible shear load



> Loads for single anchor with no influence of spacing and edge distance and with h ⩾ 2hef

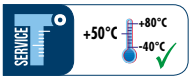
> 1kN = 100 Kg

> Shear directed away from the edge

> General safety factor included

> Load increasing safety coefficient used = 1,4

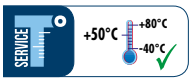
With flooded hole, reduction
of the recommended load of 20%



MIN Load data with MINIMUM effective anchorage depth

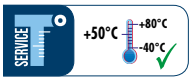
V-PLUS MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\ MIN}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	A4-70	M8	60	25,6	15,3	17,2	12,8	8,2	5,8
	A4-70	M10	70	37,5	24,3	18,1	20,3	8,6	9,2
	A4-70	M12	80	45,3	35,4	25,7	29,5	12,2	13,5
	A4-70	M16	100	67,5	65,9	42,6	54,9	20,3	25,1
	A4-70	M20	120	88,7	102,9	53,2	85,7	25,3	39,2
	A4-70	M24	145	117,8	148,2	76,1	123,5	36,2	56,5

MED Load data with MEDIUM effective anchorage depth



V-PLUS MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\ MED}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	A4-70	M8	80	25,6	15,3	23,0	12,8	9,7	5,8
	A4-70	M10	90	40,6	24,3	23,3	20,3	11,1	9,2
	A4-70	M12	110	59,0	35,4	35,4	29,5	16,8	13,5
	A4-70	M16	125	87,5	65,9	53,3	54,9	25,3	25,1
	A4-70	M20	170	130,6	102,9	75,3	85,7	35,8	39,2
	A4-70	M24	210	196,1	148,2	110,3	123,5	52,5	56,5

MAX Load data with MAXIMUM effective anchorage depth



V-PLUS MATERIALE	ROD	ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
		d [mm]	$h_{ef\ MAX}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	A4-70	M8	160	25,6	15,3	25,6	12,8	9,7	5,8
	A4-70	M10	200	40,6	24,3	40,6	20,3	15,5	9,2
	A4-70	M12	240	59,0	35,4	59,0	29,5	22,5	13,5
	A4-70	M16	320	109,9	65,9	109,9	54,9	41,9	25,1
	A4-70	M20	400	171,5	102,9	171,5	85,7	65,5	39,2
	A4-70	M24	480	247,1	148,2	247,1	123,5	94,3	56,5

Skarpa

REBAR EC2 +50°

Load data

POST-INSTALLED REBAR CONNECTIONS

Design value of bond strength fbd suitable for all anchorage lengths

SERVICE +50°C +80°C -40°C

MATERIAL	TYPE OF ROD	ROD DIAMETER	BOND RESISTANCE fbd [N/mm²]								
		d [mm]	C 12/15	C 16/20	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
Concrete	Rebar (*)	Ø 8	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
	Rebar (*)	Ø 10	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
	Rebar (*)	Ø 12	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
	Rebar (*)	Ø 14	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
	Rebar (*)	Ø 16	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,0
	Rebar (*)	Ø 20	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,0
	Rebar (*)	Ø 25	1,6	2,0	2,3	2,7	3,0	3,4	3,7	3,7	3,7
	Rebar (*)	Ø 28	1,6	2,0	2,3	2,7	3,0	3,4	3,4	3,4	3,4
	Rebar (*)	Ø 32	1,6	2,0	2,3	2,7	2,7	2,7	2,7	2,7	2,7

ETAG 001 TR023
ETA-09/0246

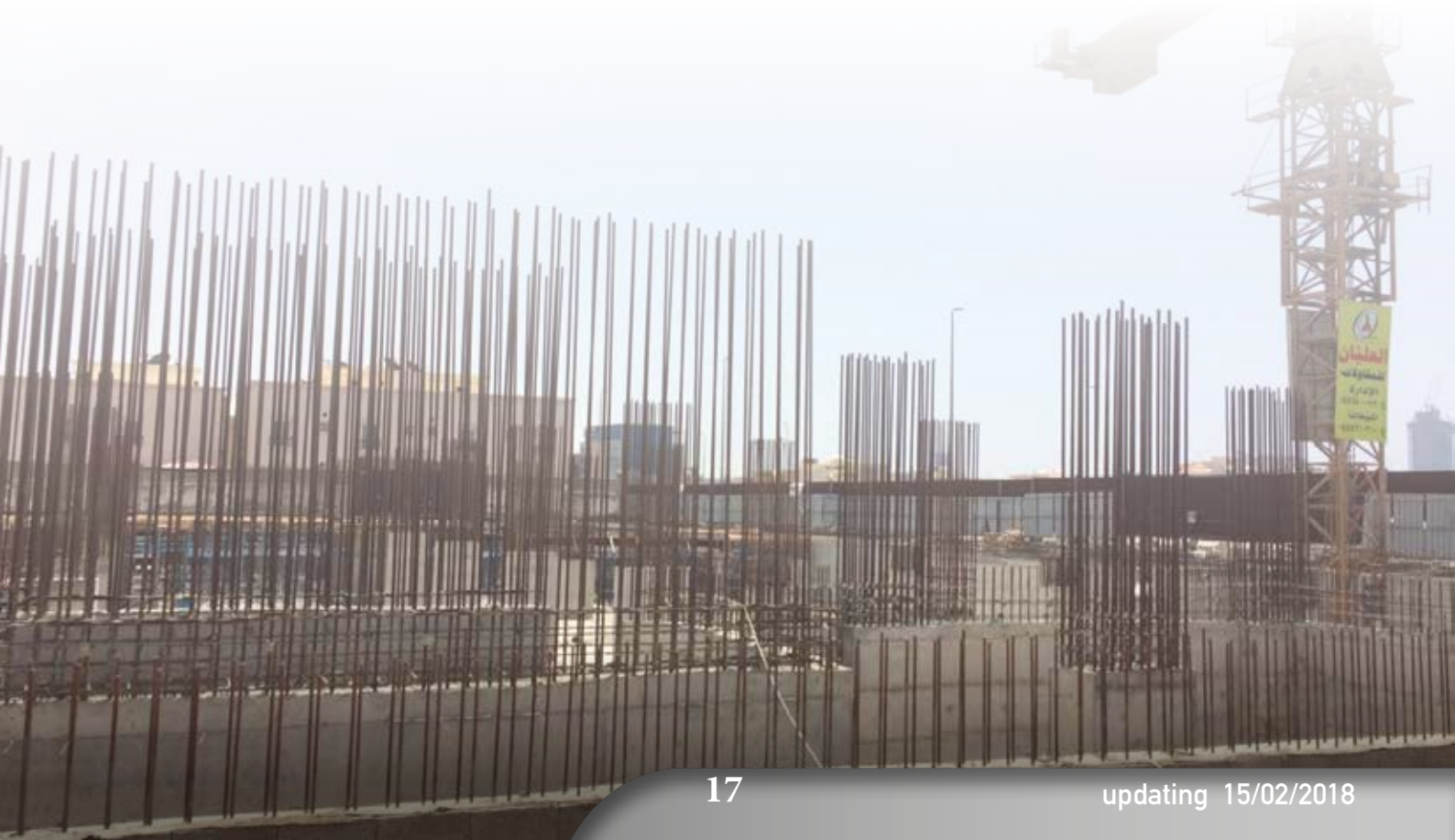
(*) Rebar = B450C; BST 500

FIXING IN SEISMIC

CSTB
V-PLUS
Document Technique d'Application
n° 3/16-857 publié le 25/7/2016

DTA DOCUMENT TECHNIQUE D'APPLICATION

> For data load in seismic area refer to DTA



Load data

LEGEND		
	N_{Rum} [kN]	Average ultimate tension load
	V_{Rum} [kN]	Average ultimate shear load
	N_{Rk} [kN]	Characteristic tension load
	V_{Rk} [kN]	Characteristic shear load
	N_{rec} [kN]	Admissible tensile load
	V_{rec} [kN]	Admissible shear load

REBAR TRO29 +24°

> Loads for single anchor with no influence of spacing and edge distance and with h ⩾ 2hef

> Shear directed away from the edge

> General safety factor included

> 1kN = 100 Kg

> Load increasing safety coefficient used = 1,4

With flooded hole, reduction of the recommended load of 20%

MIN Load data with MINIMUM effective anchorage depth

MATERIALE MATERIAL	DIAMETRO BARRA ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CARICO CARATTERISTICO A TAGLIO CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
	d [mm]	$h_{ef\ MIN}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	Ø8	60	21,6	16,2	18,2	13,5	8,7	7,7
	Ø10	60	27,0	25,4	22,8	21,2	10,8	12,1
	Ø12	70	37,9	36,6	29,5	30,5	14,0	17,4
	Ø14	80	48,3	49,8	36,1	41,5	17,2	23,7
	Ø16	80	48,3	65,1	36,1	54,2	17,2	31,0
	Ø20	90	57,6	101,7	43,1	84,8	20,5	41,0
	Ø25	100	67,5	135,0	50,5	101,0	24,0	48,1
	Ø28	112	80,0	160,0	59,8	119,7	28,5	57,0
	Ø32	128	97,7	195,5	73,1	146,2	34,8	69,6

Rebar B450C BST500

MED Load data with MEDIUM effective anchorage depth

MATERIALE MATERIAL	DIAMETRO BARRA ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CARICO CARATTERISTICO A TAGLIO CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
	d [mm]	$h_{ef\ MED}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	Ø8	80	27,1	16,2	24,3	13,5	11,6	7,7
	Ø10	90	40,6	25,4	34,2	21,2	16,3	12,1
	Ø12	110	59,5	36,6	50,2	30,5	23,9	17,4
	Ø14	125	77,1	49,8	63,4	41,5	30,1	23,7
	Ø16	140	96,4	65,1	78,8	54,2	37,5	31,0
	Ø20	170	139,1	101,7	109,8	84,8	52,3	48,4
	Ø25	210	201,0	159,0	150,8	132,5	71,8	75,7
	Ø28	270	260,8	199,5	179,1	166,2	85,3	95,0
	Ø32	300	282,7	260,5	194,2	217,1	92,4	124,0

Rebar B450C BST500

MAX Load data with MAXIMUM effective anchorage depth

MATERIALE MATERIAL	DIAMETRO BARRA ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CARICO CARATTERISTICO A TAGLIO CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
	d [mm]	$h_{ef\ MAX}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	Ø8	160	27,1	16,2	27,1	13,5	12,9	7,7
	Ø10	200	42,4	25,4	42,4	21,2	20,2	12,1
	Ø12	240	61,0	36,6	61,0	30,5	29,0	17,4
	Ø14	280	83,1	49,8	83,1	41,5	39,5	23,7
	Ø16	320	108,5	65,1	108,5	54,2	51,7	31,0
	Ø20	400	169,6	101,7	169,6	84,8	80,7	48,4
	Ø25	500	265,0	159,0	265,0	132,5	126,2	75,7
	Ø28	560	332,5	199,5	332,5	166,2	158,3	95,0
	Ø32	640	434,2	260,5	414,3	217,1	197,3	124,0

Rebar B450C BST500

Load data

LEGEND		
	N_{Rum} [kN]	Average ultimate tension load
	V_{Rum} [kN]	Average ultimate shear load
	N_{Rk} [kN]	Characteristic tension load
	V_{Rk} [kN]	Characteristic shear load
	N_{rec} [kN]	Admissible tensile load
	V_{rec} [kN]	Admissible shear load

> Application according to the anchors theory

REBAR TRO29 +50°

> Loads for single anchor with no influence of spacing and edge distance and with h ⩾ 2hef

> 1kN = 100 Kg

> Shear directed away from the edge

> General safety factor included

> Load increasing safety coefficient used = 1,4

With flooded hole, reduction of the recommended load of 20%

MIN Load data with MINIMUM effective anchorage depth

SERVICE +50°C +80°C -40°C

MATERIALE MATERIAL	DIAMETRO BARRA ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CARICO CARATTERISTICO A TAGLIO CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
	d [mm]	$h_{ef\ MIN}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	Ø8	60	21,6	16,2	13,1	13,5	6,2	7,7
	Ø10	60	27,0	25,4	16,4	21,2	7,8	12,1
	Ø12	70	37,9	36,6	23,0	30,5	10,9	17,4
	Ø14	80	48,3	49,8	29,2	41,5	13,9	23,7
	Ø16	80	48,3	65,1	32,4	54,2	15,4	30,9
C20/25 Rebar B450C BST500	Ø20	90	57,6	101,7	41,8	83,7	19,9	39,8
	Ø25	100	67,5	135,0	50,5	101,0	24,0	48,1
	Ø28	112	80,0	160,0	53,5	107,0	25,4	50,9
	Ø32	128	97,7	195,5	59,6	119,3	28,4	56,8

MED Load data with MEDIUM effective anchorage depth

SERVICE +50°C +80°C -40°C

MATERIALE MATERIAL	DIAMETRO BARRA ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CARICO CARATTERISTICO A TAGLIO CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
	d [mm]	$h_{ef\ MED}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	Ø8	80	27,1	16,2	17,5	13,5	8,3	7,7
	Ø10	90	40,6	25,4	24,6	21,2	11,7	12,1
	Ø12	110	59,5	36,6	36,1	30,5	17,2	17,4
	Ø14	125	77,1	49,8	45,6	41,5	21,7	23,7
	Ø16	140	96,4	65,1	56,7	54,2	27,0	31,0
C20/25 Rebar B450C BST500	Ø20	170	139,1	101,7	79,1	84,8	37,6	48,4
	Ø25	210	201,0	159,0	108,6	132,5	51,7	75,7
	Ø28	270	260,8	199,5	129,0	166,2	61,4	95,0
	Ø32	300	282,7	260,5	139,8	217,1	66,6	124,0

MAX Load data with MAXIMUM effective anchorage depth

SERVICE +50°C +80°C -40°C

MATERIALE MATERIAL	DIAMETRO BARRA ROD DIAMETER	EFFECTIVE ANCHORAGE DEPTH	ULTIMATE TENSION LOAD	ULTIMATE SHEAR LOAD	CHARACTERISTIC TENSILE LOAD	CARICO CARATTERISTICO A TAGLIO CHARACTERISTIC SHEAR LOAD	ADMISSIBLE TENSILE LOAD	ADMISSIBLE SHEAR LOAD
	d [mm]	$h_{ef\ MAX}$ [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{Rk} [kN]	V_{Rk} [kN]	N_{rec} [kN]	V_{rec} [kN]
C20/25 Non cracked Concrete	Ø8	160	27,1	16,2	27,1	13,5	12,9	7,7
	Ø10	200	42,4	25,4	42,4	21,2	20,2	12,1
	Ø12	240	61,0	36,6	61,0	30,5	29,0	17,4
	Ø14	280	83,1	49,8	83,1	41,5	39,5	23,7
	Ø16	320	108,5	65,1	108,5	54,2	51,7	31,0
C20/25 Rebar B450C BST500	Ø20	400	169,6	101,7	169,6	84,8	80,7	48,4
	Ø25	500	265,0	159,0	258,6	132,5	123,1	75,7
	Ø28	560	332,5	199,5	267,5	166,2	127,4	95,0
	Ø32	640	434,2	260,5	298,3	217,1	142,0	124,0

Load data

LEGEND		
	N_{Rum} [kN]	Average ultimate tension load
	V_{Rum} [kN]	Average ultimate shear load
	N_{RK} [kN]	Characteristic tension load
	V_{RK} [kN]	Characteristic shear load
	N_{rec} [kN]	Admissible tensile load
	V_{rec} [kN]	Admissible shear load

> Application according to the anchors theory

> Loads for single anchor with no influence of spacing and edge distance and with h ⩾ 2hef

> Shear directed away from the edge

> General safety factor included

> 1kN = 100 Kg

> Load increasing safety coefficient used = 1,4

With flooded hole, reduction of the recommended load of 20%

MATERIALE MATERIAL	TIPOLOGIA DI BARRA TYPE OF ROD	DIAMETRO BARRA ROD DIAMETER	CARICO ULTIMO MEDIO A TRAZIONE ULTIMATE TENSION LOAD	CARICO ULTIMO MEDIO A TAGLIO ULTIMATE SHEAR LOAD	CARICO AMMISSIBILE A TRAZIONE ADMISSIBLE TENSILE LOAD	CARICO AMMISSIBILE A TAGLIO ADMISSIBLE SHEAR LOAD
		d [mm]	N_{Rum} [kN]	V_{Rum} [kN]	N_{rec} [kN]	V_{rec} [kN]
Solid Brick  **≥ 4.6 / A2-70 / A4-70** 	⩾ 4.6 A2-70 A4 -70	M8			2,0	3,0
	⩾ 4.6 A2-70 A4 -70	M10			2,6	3,4
	⩾ 4.6 A2-70 A4 -70	M12			2,8	3,9
	⩾ 4.6 A2-70 A4 -70	M16			4,0	4,2
Hollow Material  **≥ 4.6 / A2-70 / A4-70** 	⩾ 4.6 A2-70 A4 -70	M8			0,9	2,0
	⩾ 4.6 A2-70 A4 -70	M10			0,9	2,0
	⩾ 4.6 A2-70 A4 -70	M12			0,9	2,5
Laminated Timber  **≥ 4.6 / A2-70 / A4-70** 	⩾ 4.6 A2-70 A4 -70	M8			3,2	
	⩾ 4.6 A2-70 A4 -70	M10			4,2	> For shear loads refer to CNR-DT 206/2007 (7.10.2.3)
	⩾ 4.6 A2-70 A4 -70	M12			6,1	
	⩾ 4.6 A2-70 A4 -70	M16			10,7	

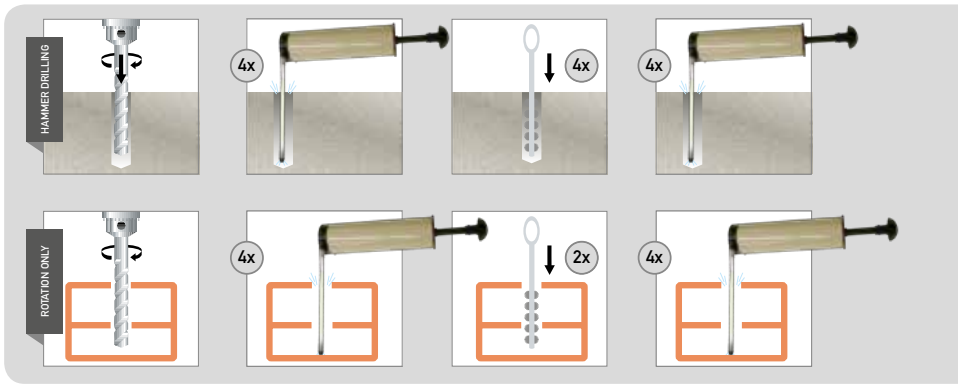
> Recommended loads for applications on base materials with medium strength characteristics.
For different masonry and/or wood base materials, load values must be obtained with in situ tests.

MASONRY & WOOD

INSTALLATION

INSTALLATION PROCEDURE

01 CLEANING



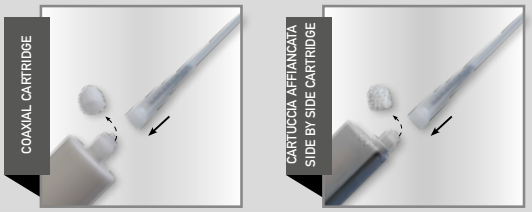
Drill the hole and check it's perpendicularity. Blow the hole with an appropriate pump blower (or compression air), clean the lateral surface of the hole with an appropriate steel brush, blow again in the hole until there is no dust and/or any residual material inside. We strongly recommend use of the steel brush to clean hole sides.

02 OPENING

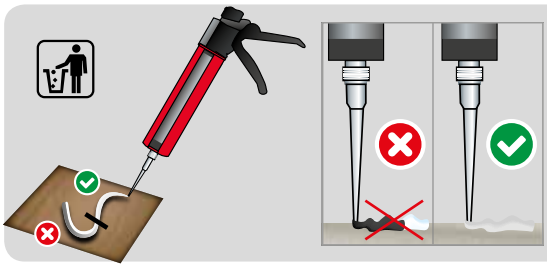
BCR 300
BCR 165

Unscrew the front cup, screw on the mixer and insert the cartridge in the gun. Use protections for hands and face. With the size 300 ml and 165 ml, unscrew the front cup, pull-out the steel closing clip according to the following operations: 1) Insert the mixer in the eye of the plastic extractor. 2) Pull the extractor to unhook the steel closing clip of the foil.
After that, screw on the mixer and insert the cartridge in the gun. Use protections for hands and face.

BCR 900 / BCR 825 / BCR 470 / BCR 400 / BCR 345 / BCR 265

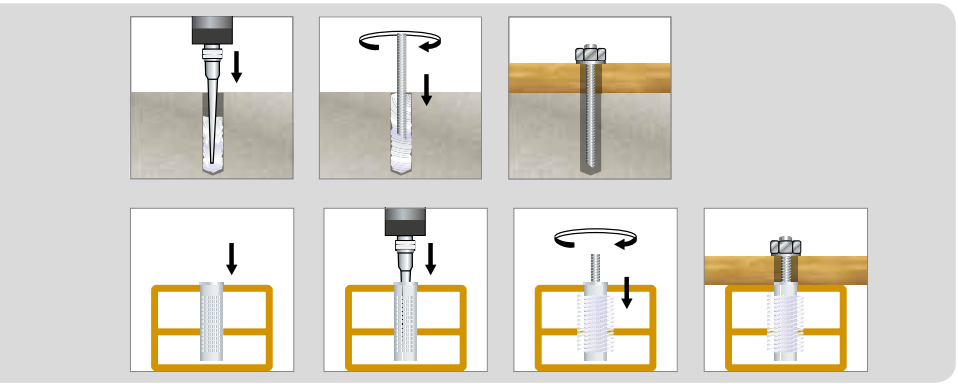


03 CARTRIDGE PREPARATION



Before starting to use the cartridge, eject a first part of the product, being sure that: 1) Trough the mixer (transparent) see that the flux of product is compound of the part A (white colour) end of part B (black colour). 2) The two components are completely mixed. The complete mixing is reached only after that the product, obtained by mixing the two component, comes out from the mixer with an uniform colour. Now the cartridge is ready to be used.

04 EXTRUSION



1) Inject resin into the hole up to fill it 2/3rds. In hollow bricks use the plastic sleeve and inject the resin inside. 2) Use a threaded stud with 45° cut in the side to the hole. Before insert the rod, verify that the element is dry and free oil and other contaminants. Insert threaded stud turning back and forth to avoid presence of air in the fitted hole. 3) For the installation and the following anchor load phase, respect the open time and curing time detailed in the technical data sheet and in the label of the product. 4) Before to load the anchor, check the hardened of the product. 5) The cartridge can be used again screwing the cup and replacing the mixer. Remember to eject a first part of the product, see point 3.