EJOT®

EJOT® Through Bolts BA Plus

High performance through bolts for fixing in cracked and non-cracked concrete

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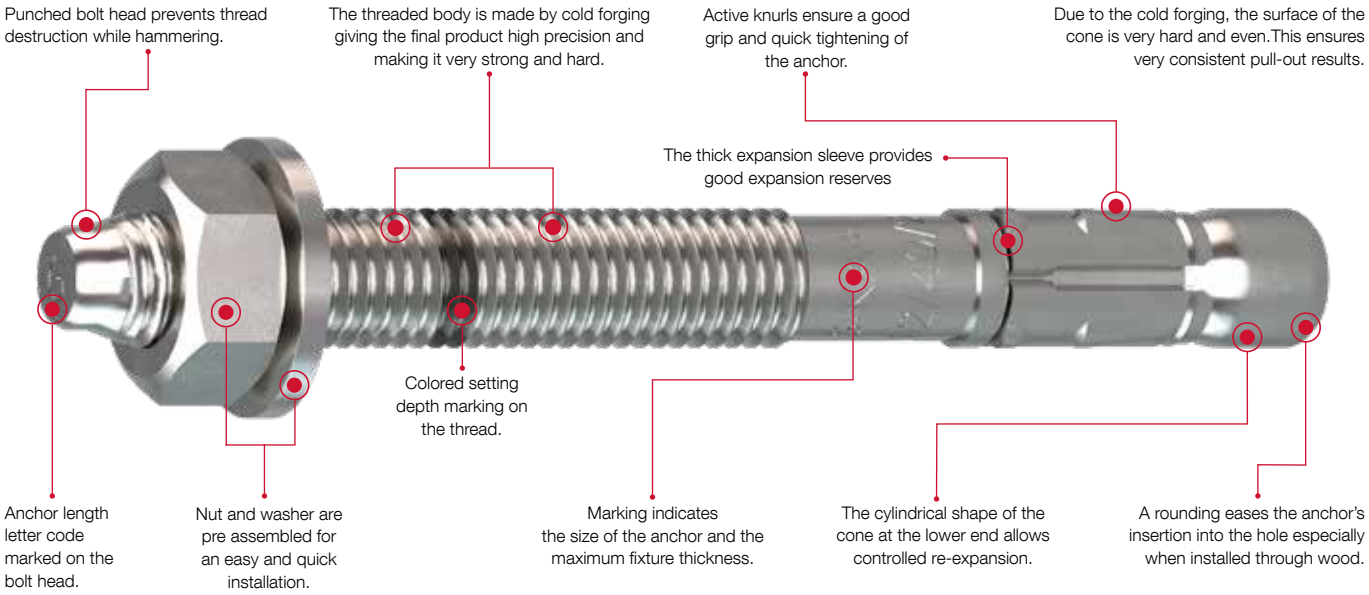


Through Bolt BA Plus

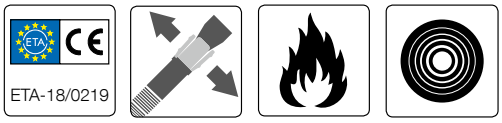
The through bolt is a torque-controlled expansion anchor for use in cracked and non-cracked concrete. The anchor is preassembled and can be installed directly through the fixture.

It is available

- In zinc electroplated steel for indoor and dry applications.
- In hot dip galvanized steel for damp interiors with occasional exposure to condensation and in non-safety-relevant slightly corrosive outside environments, when corrosion is inspected regurarly.
- In stainless steel for outdoor applications subject to humidity, as well as installation in industrial and maritime environments.
- In HCR stainless steel for aggressive conditions, chloride atmosphere and atmosphere with chemical pollution such as tunnels, swimming pools etc.

Benefits

- Fixing in cracked and non-cracked concrete, also suitable for natural stone
- Torque-controlled expansion anchors for pre-, push-through and distance installations
- When torque is applied the expansion clip expands developing frictional grip into the hole.
- Anchor diameter and max. fixture thickness marked on the body.
- Anchor length letter code marked on the bolt head.
- Colored setting depth marking for the deeper anchorage depth on the thread.
- Variable range of coatings and materials such as ZP, HDG, A4 and HCR 1.4529/4.4565 which supports for anchor selecting in different applications



BA-V Plus carbon steel

Zinc electroplated acc. EN ISO 4042, t ≥ 5 µm

Dry indoor conditions, indoor with temporary condensation

BA-F Plus carbon steel

Hot dip galvanized acc. EN ISO 10684, t ≥ 40 µm

Humid indoor use, outdoor inland rural areas only in not safety relevant applications

BA-E Plus A4 stainless steel

A4 for indoor, outdoor, industrial use and maritime climate

BA-E Plus A4 recommended when fire or corrosion resistance is required.

BA-E Plus HCR

HCR for extremely corrosive conditions,

such as high chlorine concentrations (swimming halls) road tunnels and desulphurization plants.

Base materials

Approved for

- Cracked concrete
- Non-cracked concrete

Also suitable for

- Natural stone

Approvals / Cerfications / Applications

Description of document		Authority/ Laboratory	ID	Additional info
European Technical Assessment		ZAG -National Building and Civil Engineering Institute, Slovenia	ETA-18/0219	EAD 330232-00-0601
Fire resistance		ZAG -National Building and Civil Engineering Institute, Slovenia / MFPA Institute for Materials Research and Testing, Leipzig, Germany	ETA-18/0219	EOTA TR 020 / EN 1992-4
Seismic resistance		ZAG -National Building and Civil Engineering Institute, Slovenia / Fobatec GmbH, Dortmund, Germany	ETA-18/0219	EOTA TR 045 BA-V Plus / BA-E Plus anchor size M8: C1 anchor size M10, M12, M16: C2
EJOT Anchor Fix calculation software		EJOT software		Free download: www.ejot.com/construction/anchorfix

Additional information concerning all given data in the product data sheet

1. Load figures include the partial safety factors as per approvals and a partial safety factor on the action of γ_F= 1.4. Load figures apply for a rebar spacing s ≥ 15 cm or alternatively for a rebar spacing s ≥ 10 cm in combination with a rebar diameter of d_s ≤ 10 mm.

2. If spacings or edge distances become smaller than the characteristic figures ($s_{cr,N}$ / $c_{cr,N}$) a calculation as per EOTA TR 055 needs to be carried out. For more details, see ETA-18/0219.

3. Concrete is considered non-cracked when the value of tension within the concrete is $\sigma_L + \sigma_R \leq 0$. In the absence of detailed verification σ_R = 3 N/mm² can be assumed (σ_L equals the tension within the concrete as a result of external loads, forces on anchor included; σ_R equals the tension coming from shrinkage or creep of the concrete, as well as displacements of supports or temperature variations).

4. Shear load figures apply for an anchor without influence of a concrete edge. For shear loads close to an edge (c ≤ 10 x h_{ef}), concrete edge failure has to be checked as per EOTA TR 055.

Static and quasi-static loads

The data of these tables is based on:

- Concrete C20/25, $f_{ck,cube}$ = 25 N/mm².
- Installation has been done correctly (see page 10).
- No influence of edge distances and spacings.
- Respect of minimum base material thickness (see page 11).

Characteristic resistances

Anchor size		M8	M10		M12		M16
Effective anchorage depth h_{ef}	[mm]	48	40	60	50	70	85
Non-cracked concrete							
Tensile N_{Rk}							
BA-V Plus / BA-F Plus	[kN]	11.0	12.0	19.0	17.9	25.0	36.0
BA-E Plus / BA-E Plus HCR	[kN]	11.0	12.0	19.0	17.9	25.0	36.0
Shear V_{Rk}							
BA-V Plus / BA-F Plus	[kN]	12.6*	12.8	18.4*	17.9	28.7*	54.1
BA-E Plus / BA-E Plus HCR	[kN]	16.8	12.8	18.4*	17.9	28.7*	79.1
Cracked concrete							
Tensile N_{Rk}							
BA-V Plus / BA-F Plus	[kN]	8.5	9.1	12.0	12.7	16.0	24.0
BA-E Plus / BA-E Plus HCR	[kN]	8.5	9.1	12.0	12.7	16.0	24.0
Shear V_{Rk}							
BA-V Plus / BA-F Plus	[kN]	12.0	9.1	18.4*	12.7	28.7*	56.4
BA-E Plus / BA-E Plus HCR	[kN]	12.0	9.1	18.4*	12.7	28.7*	56.4
* Failure mode = steel							

Design resistances

Anchor size		M8	M10		M12		M16
Effective anchorage depth h_{ef}	[mm]	48	40	60	50	70	85
Non-cracked concrete							
Tensile N_{Rd}							
BA-V Plus / BA-F Plus	[kN]	7.3	8.0	12.7	11.9	16.7	24.0
BA-E Plus / BA-E Plus HCR	[kN]	7.3	8.0	12.7	11.9	16.7	24.0
Shear V_{Rd}							
BA-V Plus / BA-F Plus	[kN]	10.1	8.5	14.7*	11.9	23.0*	43.3*
BA-E Plus / BA-E Plus HCR	[kN]	11.2	8.5	14.7*	11.9	23.0*	52.7
Cracked concrete							
Tensile N_{Rd}							
BA-V Plus / BA-F Plus	[kN]	5.7	6.1	8.0	8.5	10.7	16.0
BA-E Plus / BA-E Plus HCR	[kN]	5.7	6.1	8.0	8.5	10.7	16.0
Shear V_{Rd}							
BA-V Plus / BA-F Plus	[kN]	8.0	6.1	14.7*	8.5	23.0*	37.6
BA-E Plus / BA-E Plus HCR	[kN]	8.0	6.1	14.7*	8.5	23.0*	37.6
* Failure mode = steel							

Static and quasi-static loads

The data of these tables is based on:

- Concrete C20/25, $f_{ck,cube}$ = 25 N/mm².
- Installation has been done correctly (see page 10).
- No influence of edge distances and spacings.
- Respect of minimum base material thickness (see page 11).

Recommended loads

Anchor size			M8	M10		M12		M16
Effective anchorage depth h_{ef}		[mm]	48	40	60	50	70	85
Non-cracked concrete								
Tensile N_{Rec}	BA-V Plus / BA-F Plus	[kN]	5.2	5.7	9.0	8.5	11.9	17.1
	BA-E Plus / BA-E Plus HCR	[kN]	5.2	5.7	9.0	8.5	11.9	17.1
Shear V_{Rec}	BA-V Plus / BA-F Plus	[kN]	7.2*	6.1	10.5*	8.5	16.4*	30.9
	BA-E Plus / BA-E Plus HCR	[kN]	8.0	6.1	10.5*	8.5	16.4*	37.7
Cracked concrete								
Tensile N_{Rec}	BA-V Plus / BA-F Plus	[kN]	4.0	4.3	5.7	6.1	7.6	11.4
	BA-E Plus / BA-E Plus HCR	[kN]	4.0	4.3	5.7	6.1	7.6	11.4
Shear V_{Rec}	BA-V Plus / BA-F Plus	[kN]	5.7	4.3	10.5*	6.1	16.4*	26.9
	BA-E Plus / BA-E Plus HCR	[kN]	5.7	4.3	10.5*	6.1	16.4*	26.9
* Failure mode = steel								

Fire resistance

The data of these tables is based on:

- In the absence of other national regulations the partial safety factor or resistance under fire exposure $\gamma M,fi = 1,0$ is recommended
- Concrete C20/25, $f_{ck,cube} = 25$ N/mm²
- Installation has been done correctly (see page 10).
- No influence of edge distances and spacings.
- Respect of minimum base material thickness (see page 11).

Characteristic resistances

Anchor size			M8	M10		M12		M16
Effective anchorage depth h_{ef}		[mm]	48	40	60	50	70	85
R30								
Tensile $N_{Rk,fi}$	BA-V Plus / BA-F Plus	[kN]	0.22	0.56	0.56	1.12	1.12	2.11
	BA-E Plus / BA-E Plus HCR	[kN]	0.45	0.93	0.93	1.73	1.73	3.17
Shear $V_{Rk,fi}$	BA-V Plus / BA-F Plus	[kN]	0.22	0.56	0.56	1.12	1.12	2.11
	BA-E Plus / BA-E Plus HCR	[kN]	0.45	0.93	0.93	1.73	1.73	3.17
R60								
Tensile $N_{Rk,fi}$	BA-V Plus / BA-F Plus	[kN]	0.20	0.48	0.48	0.84	0.84	1.58
	BA-E Plus / BA-E Plus HCR	[kN]	0.36	0.74	0.74	1.45	1.45	2.64
Shear $V_{Rk,fi}$	BA-V Plus / BA-F Plus	[kN]	0.20	0.48	0.48	0.84	0.84	1.58
	BA-E Plus / BA-E Plus HCR	[kN]	0.36	0.74	0.74	1.45	1.45	2.64
R90								
Tensile $N_{Rk,fi}$	BA-V Plus / BA-F Plus	[kN]	0.16	0.37	0.37	0.73	0.73	1.37
	BA-E Plus / BA-E Plus HCR	[kN]	0.27	0.59	0.59	1.16	1.16	2.11
Shear $V_{Rk,fi}$	BA-V Plus / BA-F Plus	[kN]	0.16	0.37	0.37	0.73	0.73	1.37
	BA-E Plus / BA-E Plus HCR	[kN]	0.27	0.59	0.59	1.16	1.16	2.11
R120								
Tensile $N_{Rk,fi}$	BA-V Plus / BA-F Plus	[kN]	0.11	0.30	0.30	0.56	0.56	1.06
	BA-E Plus / BA-E Plus HCR	[kN]	0.22	0.52	0.52	0.93	0.93	1.69
Shear $V_{Rk,fi}$	BA-V Plus / BA-F Plus	[kN]	0.11	0.30	0.30	0.56	0.56	1.06
	BA-E Plus / BA-E Plus HCR	[kN]	0.22	0.52	0.52	0.93	0.93	1.69

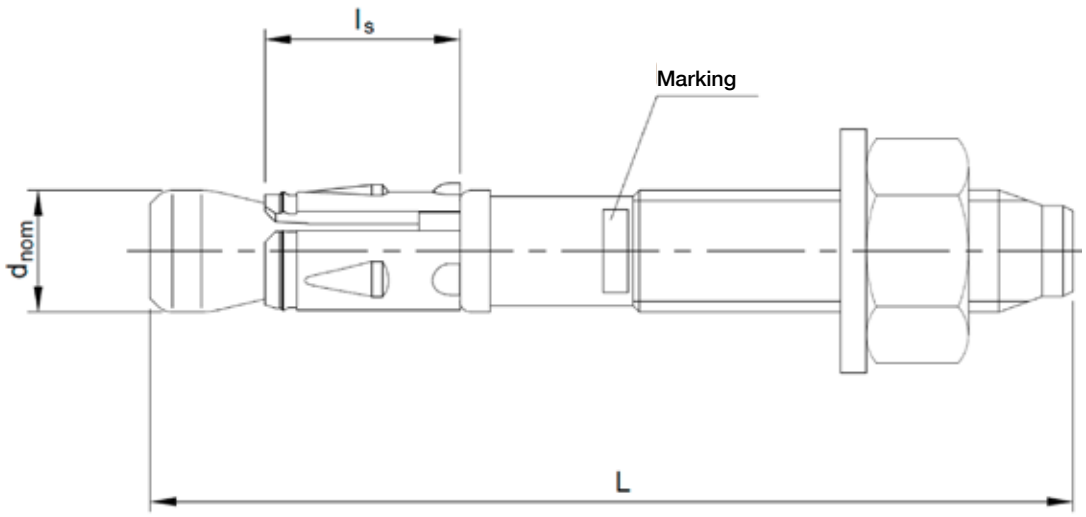
Recommended loads

Anchor size			M8	M10		M12		M16
Effective anchorage depth h_{ef}		[mm]	48	40	60	50	70	85
R30								
Tensile $N_{Rec,fi}$	BA-V Plus / BA-F Plus	[kN]	0.22	0.56	0.56	1.12	1.12	2.11
	BA-E Plus / BA-E Plus HCR	[kN]	0.45	0.93	0.93	1.73	1.73	3.17
Shear $V_{Rec,fi}$	BA-V Plus / BA-F Plus	[kN]	0.22	0.56	0.56	1.12	1.12	2.11
	BA-E Plus / BA-E Plus HCR	[kN]	0.45	0.93	0.93	1.73	1.73	3.17
R60								
Tensile $N_{Rec,fi}$	BA-V Plus / BA-F Plus		0.20	0.48	0.48	0.84	0.84	1.58
	BA-E Plus / BA-E Plus HCR	[kN]	0.36	0.74	0.74	1.45	1.45	2.64
Shear $V_{Rec,fi}$	BA-V Plus / BA-F Plus	[kN]	0.20	0.48	0.48	0.84	0.84	1.58
	BA-E Plus / BA-E Plus HCR	[kN]	0.36	0.74	0.74	1.45	1.45	2.64
R90								
Tensile $N_{Rec,fi}$	BA-V Plus / BA-F Plus	[kN]	0.16	0.37	0.37	0.73	0.73	1.37
	BA-E Plus / BA-E Plus HCR	[kN]	0.27	0.59	0.59	1.16	1.16	2.11
Shear $V_{Rec,fi}$	BA-V Plus / BA-F Plus	[kN]	0.16	0.37	0.37	0.73	0.73	1.37
	BA-E Plus / BA-E Plus HCR	[kN]	0.27	0.59	0.59	1.16	1.16	2.11
R120								
Tensile $N_{Rec,fi}$	BA-V Plus / BA-F Plus	[kN]	0.11	0.30	0.30	0.56	0.56	1.06
	BA-E Plus / BA-E Plus HCR	[kN]	0.22	0.52	0.52	0.93	0.93	1.69
Shear $V_{Rec,fi}$	BA-V Plus / BA-F Plus	[kN]	0.11	0.30	0.30	0.56	0.56	1.06
	BA-E Plus / BA-E Plus HCR	[kN]	0.22	0.52	0.52	0.93	0.93	1.69

Materials and dimensions

Anchor dimensions

Anchor size		M8	M10	M12	M16
Total length	L [mm]	62...420	62...420	78...420	118..420
Sleeve length	L_s [mm]	14.8	17.9	19.1	26.0
Cone bolt	d_{nom} [mm]	8	10	12	16
Hexagonal nut	SW [mm]	13	17	19	24
	m	≥ 6.5	≥ 8.0	≥ 10.0	≥ 13.0



Mechanical properties

Specification	Anchor/size		M8	M10	M12	M16
Nominal tensile strength $f_{uk,thread}$	BA-V Plus / BA-F Plus	[N/mm²]	700	680	660	660
	BA-E Plus / BA-E Plus HCR	[N/mm²]	670	680	660	660
Char. bending resistance $M^0_{Rk,s}$	BA-V Plus / BA-F Plus	[Nm]	26.2	50	86	219.8
	BA-E Plus / BA-E Plus HCR	[Nm]	25.1	50	86	214.8
Design bending resistance $M_{Rd,s}$	BA-V Plus / BA-F Plus	[Nm]	21.0	40	68.8	175.8
	BA-E Plus / BA-E Plus HCR	[Nm]	20.1	40	68.8	171.8
Recommended bending resistance M_{Rec}	BA-V Plus / BA-F Plus	[Nm]	15.0	28.6	49.1	125.6
	BA-E Plus / BA-E Plus HCR	[Nm]	14.3	28.6	49.1	122.7

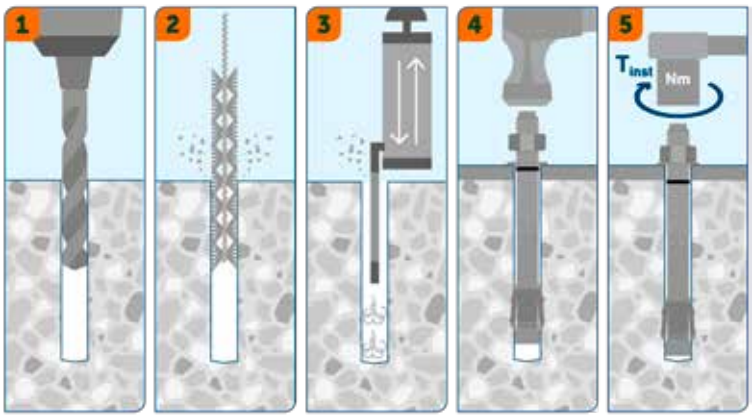
Material quality

Part of anchor		Material
Bolt	BA-V Plus	Carbon steel, zinc electroplated EN ISO 4042, min. 5 µm
	BA-F Plus	Carbon steel, hot dip galvanized EN ISO 10684, min. 40 µm
	BA-E Plus	Stainless steel A4
	BA-E Plus HCR	Stainless steel HCR 1.4529 / 1.4565

Setting instructions

Installation equipment

Specification	M8	M10	M12	M16
Rotary hammer (reccomendation)	720...1200 r.p.m / 1.8...3.3 J			360…550 4.9...11.5 J
Setting tool (optional)	BA-V 6-10 SDS+		BA-V 12-20 SDS+	
Drill bit	SDS+ 2-CUT/4-CUT 8 mm…16 mm			
Additional tools	brush, air pump/compressor, hammer, torque wrench			



Installation

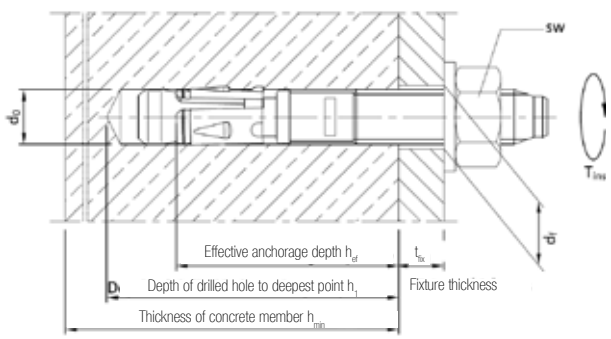
1. Drill a hole according to the product data.
2.-3. Clean the hole using a metal brush and a blow-out pump.
4. Install anchor with a hammer or a setting tool.
5. Tighten the anchor to the specified installation torque.

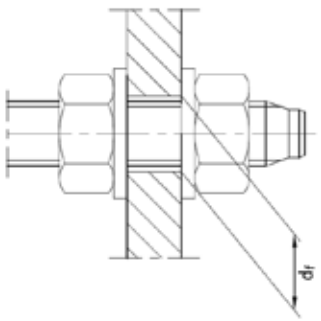
Installation data

Parameters and anchors sizes				M8	M10	M12	M16
Drill hole diameter		d_0	[mm]	8	10	12	16
Cutting diameter at the upper tolerance limit (max. diam. bit)		$d_{cut,max} \leq$	[mm]	8.45	10.45	12.50	16.50
Depth of drilled hole to deepest point		$h_1 \geq$	[mm]	60	55 75	70 90	110
Effective anchorage depth		h_{ef}	[mm]	48	40 60	50 70	85
Nominal anchorage depth		h_{nom}	[mm]	53	48 68	61 81	97
Diameter of clearance hole in the fixture		$d_f \geq$	[mm]	9	12	14	18
Width across flats		SW	[mm]	13	17	19	24
Required torque	BA-V Plus / BA-F Plus	T_{inst}	[Nm]	15	30	60	110
	BA-E Plus / BA-E Plus HCR			20	45	60	110

Installation methods

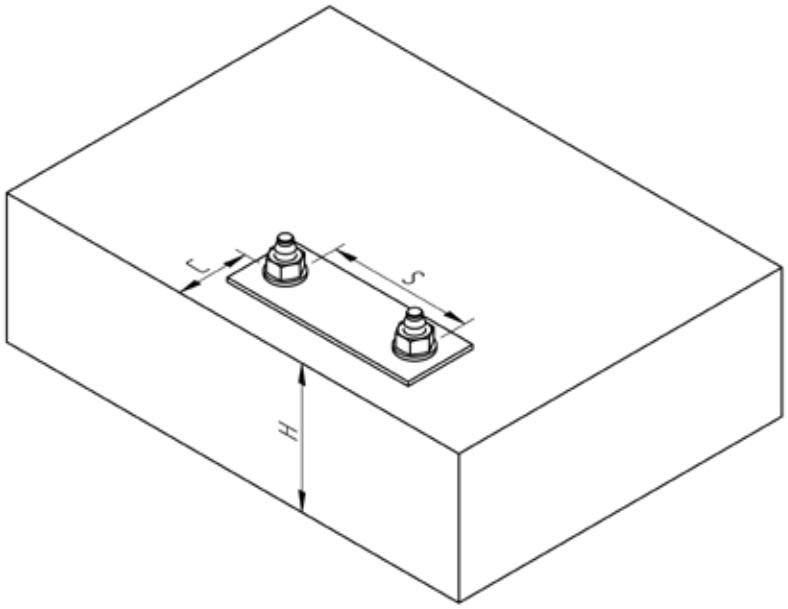
Through installation	Distance installation





Minimum thickness of concrete member, spacing and edge distance

Cracked and non-cracked concrete			M8	M10		M12		M16
Effective anchorage depth	h_{ef}	[mm]	48	40	60	50	70	85
Minimum thickness of base material	h_{min}	[mm]	100	100	120	100	140	170
	$h_{min\ red}$	[mm]	80	-	100	-	-	-
Minimum spacing for h_{min}	s_{min}	[mm]	35	50	40	55	60	65
	c ≥	[mm]	50	95	60	110	70	95
Minimum edge distance for h_{min}	c_{min}	[mm]	40	50	50	60	55	65
	s ≥	[mm]	55	190	100	215	110	150
Minimum spacing for $h_{min-red}$	s_{min}	[mm]	35	-	40	-	-	-
	c ≥	[mm]	55	-	100	-	-	-
Minimum edge distance for $h_{min-red}$	c_{min}	[mm]	40	-	60	-	-	-
	s ≥		60	-	90	-	-	-
Critical spacing for splitting failure and concrete cone failure (in case characteristic loading affects)	$s_{cr,sp}$	[mm]	192	160	240	200	280	340
	$s_{cr,N}$	[mm]	144	120	180	150	210	254
Critical edge distance for splitting failure and concrete cone failure (in case characteristic loading affects)	$c_{cr,sp}$	[mm]	96	80	120	100	140	170
	$c_{cr,N}$	[mm]	72	60	90	75	105	127



Setting tool BA

Hammering tool to make through bolt installation quicker and smoother

- Original EJOT through bolts setting tool with designed head that does not damage the head of the anchor and keep the head from slipping.
- Besides ensuring most efficient and safe through bolt installation in general, the setting tool also significantly saves time and energy in serial installation.
- Compatible with all SDS+ chuck machines.

Through Bolts BA Plus

Delivery program				BA-V Plus	BA-F Plus	BA-E Plus	BA-E Plus HCR
							
Thread size	**Type**	**t_{fix}**	**Length**	**Zinc**	**Hot dip**	**Stainless A4**	**HCR**
M8	M8/10	10	75	●	●	●	●
	M8/30	30	95	●	●	●	●
	M8/50	50	115	●	●	●	●
	M8/85	85	150	●	●	●	●
M10	M10/10/-	10/-	72	●	●	●	●
	M10/30/10	30/10	92	●	●	●	●
	M10/40/20	40/20	102	●	●	●	●
	M10/50/30	50/30	112	●	●	●	●
	M10/70/50	70/50	132	●	●	●	●
	M10/100/80	100/80	162	●	●	●	●
M12	M12/10/-	10/-	88	●	●	●	●
	M12/25/5	25/5	103	●	●	●	●
	M12/40/20	40/20	118	●	●	●	●
	M12/50/30	50/30	128	●	●	●	●
	M12/70/50	70/50	148	●	●	●	●
	M12/85/65	85/65	163	●	●	●	●
	M12/100/80	100/80	178	●	●	●	●
M16	M16/5	5	123	●	●	●	●
	M16/20	20	138	●	●	●	●
	M16/50	50	168	●	●	●	●
	M16/60	60	178	●	●	●	●

● On request

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