

**Centre Scientifique et
Technique du Bâtiment**

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**European Technical
Assessment**

**ETA-19/0836
of 04/09/2020**

English translation prepared by CSTB - Original version in French language

General Part

Nom commercial
Trade name

Famille de produit
Product family

Titulaire
Manufacturer

Usine de fabrication
Manufacturing plant

Cette évaluation contient:
This assessment contains :

Base de l'ETE
Basis of ETA

Cette évaluation remplace:
This assessment replaces:

Arrow Plus Through Bolt

Cheville métallique en acier électro zingué, à expansion par vissage à couple contrôlé, pour fixation dans le béton non fissuré: diamètres M8, M10, M12 et M16.

Torque-controlled expansion anchor, made of zinc electroplated steel, for use in uncracked concrete: sizes M8, M10, M12 and M16.

**Ningbo Anchor Fasteners Industrial Co., Ltd.
No. 3 Ind. Development Zone Zhangting Yuyao, Zhejiang
China**

NINGBO ANCHOR FASTENERS INDUSTRIAL CO., LTD.

10 pages incluant 7 annexes qui font partie intégrante de cette évaluation
10 pages including 7 annexes which form an integral part of this assessment

**EAD 330232-00-601, Edition octobre 2016
EAD 330232-00-601, Edition october 2016**

Specific Part

1 Technical description of the product

The Arrow Plus Through Bolt is a torque-controlled expansion anchor made of zinc electroplated steel in the sizes of M8, M10, M12 and M16 which is placed into a drilled hole and anchored by torque controlled expansion.

The illustration and the description of the product are given in Annexes A.

2 Specification of the intended use

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annexes B.

The provisions made in this European technical assessment are based on an assumed working life of the anchor of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic tension resistance for static and quasi-static action	See Annex C1
Characteristic shear resistance for static and quasi-static action	See Annex C2
Displacements under static and quasi-static action	See Annex C3

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	[-]
Characteristic tension resistance under fire	[-]
Characteristic shear resistance under fire	[-]

3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances contained in this European Technical Assessment, there may be requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

3.4 Safety in use (BWR 4)

For Basic Requirement Safety in Use the same criteria are valid as for Basic Requirement Mechanical Resistance and Stability.

3.5 Protection against noise (BWR 5)

Not relevant.

3.6 Energy economy and heat retention (BWR 6)

Not relevant.

3.7 Sustainable use of natural resources (BWR 7)

For the sustainable use of natural resources no performance was determined for this product.

3.8 General aspects relating to fitness for use

Durability and Serviceability are only ensured if the specifications of intended use according to Annex B1 are kept.

4 Assessment and Verification of Constancy of Performance (AVCP)

According to the Decision 96/582/EC of the European Commission¹, as amended, the system of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) given in the following table apply.

Product	Intended use	Level or class	System
Metal anchors for use in concrete	For fixing and/or supporting to concrete, structural elements (which contributes to the stability of the works) or heavy units	—	1

5 Technical details necessary for the implementation of the AVCP system

Technical details necessary for the implementation of the Assessment and Verification of Constancy of Performance (AVCP) system are laid down in the control plan deposited at Centre Scientifique et Technique du Bâtiment.

The manufacturer shall, on the basis of a contract, involve a notified body approved in the field of anchors for issuing the certificate of conformity CE based on the control plan.

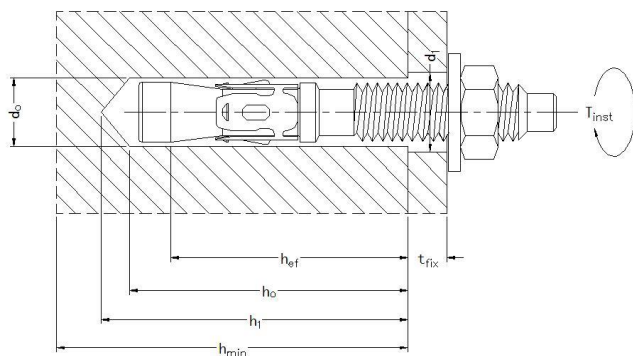
Issued in Marne La Vallée on 04/09/2020 by

Anca CRONOPOL
La Cheffe de Division

The original French version is signed

¹ Official Journal of the European Communities L 254 of 08.10.1996

Installed condition



Product description

Arrow Plus Through Bolt torque-controlled expansion anchor

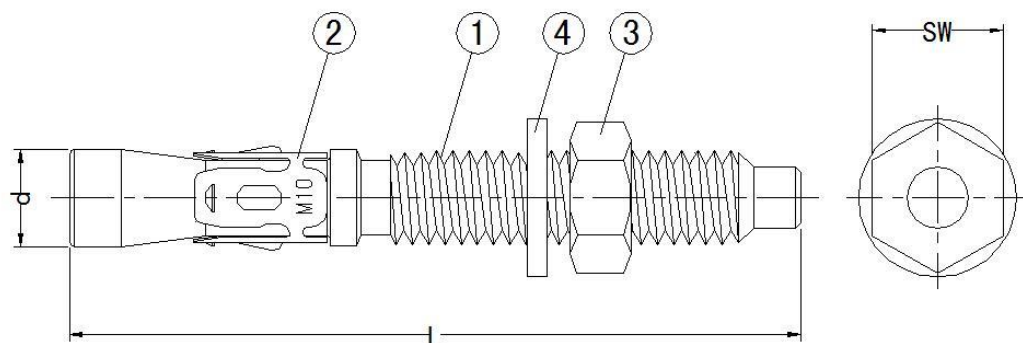


Table A1: Materials

Part	Designation	Material: zinc electroplated
1	Threaded bolt	Carbon steel class 5.8 acc. To EN 898-1. Protection: zinc plated $\geq 5\mu\text{m}$
2	Expansion sleeve	Carbon steel. Protection: zinc plated $\geq 5\mu\text{m}$ acc. to EN ISO 4092.
3	Hexagonal nut	Carbon steel class 5.8 acc. To EN 898-2. Protection: zinc plated $\geq 5\mu\text{m}$
4	Washer	Carbon steel. Protection: zinc plated $\geq 5\mu\text{m}$ acc. to EN ISO 4092.

Arrow Plus Through Bolt

Product description – Installed condition and product description

Annex A1

Specifications of intended use

Anchorage subject to:

- Static and quasi-static loading: all sizes.

Base materials:

- Uncracked concrete;
- Reinforced or unreinforced normal weight concrete according EN 206;
- Strength classes C20/25 to C50/60 according to EN 206.

Use conditions (Environmental conditions):

- Arrow Plus Through Bolt made of zinc electroplated:
Structures subject to dry internal conditions.

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work;
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports etc.);
- Anchorages under static or quasi-static loading are designed in accordance with EN 1992-4;
- Anchorages shall be positioned outside of critical regions (e.g. plastic hinges) of the concrete structure. Fastenings in stand-off installation or with a grout layer under seismic action are not covered in this European Technical Assessment (ETA);
- In case of requirements to resistance to fire local spalling of the concrete cover must be avoided.

Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site;
- Use of the anchor only as supplied by the manufacturer without exchanging any component of the anchor.
- Anchor installation in accordance with the manufacturer's specification and drawings by using the appropriate tools.
- Effective anchorage depth, edge distances and spacings not less than the specified values without minus tolerances.
- The anchor may only be set once;
- Drilling technique;
- Cleaning the hole of drilling dust;
- Application of the required installation torque by using a calibrated torque wrench.
- In case of aborted hole, drilling of new hole at a minimum distance of twice the depth of the aborted hole, or smaller distance provided the aborted drill hole is filled with high strength mortar and no shear or oblique tension loads in the direction of aborted hole.

Arrow Plus Through Bolt

Annex B1

Intended use – Specifications

Setting positions for Arrow Plus Through Bolt

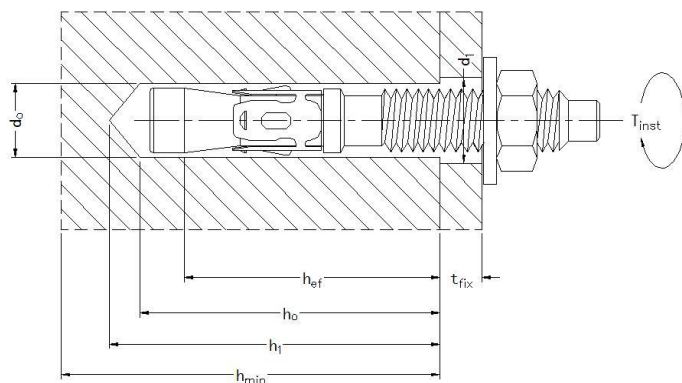


Table B1: Installation parameters


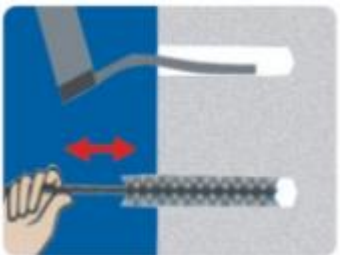
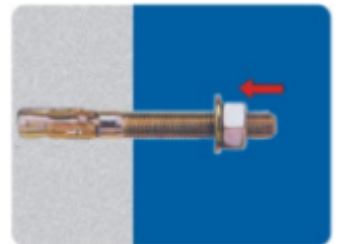
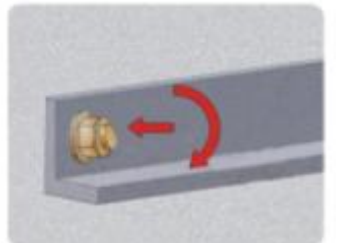
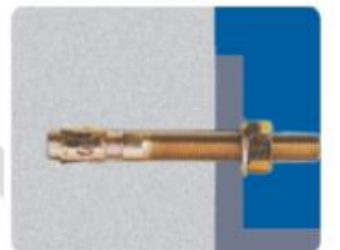
Arrow Plus Through Bolt			Anchor type			
			M8	M10	M12	M16
Drill hole diameter	d_o	[mm]	8	10	12	16
Cutting diameter of drill bit	d_{cut}	[mm]	8,25 – 8,35	10,25 – 10,35	12,25 – 12,35	16,25 – 16,35
Depth of drilled hole to deepest point	$h_1 \geq$	[mm]	55	65	75	95
Effective anchorage depth	$h_{ef} \geq$	[mm]	40	50	60	80
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	9	12	14	18
Thickness of fixture	t_{fix}	[mm]	5	5	5	5
Width across flats	SW	[mm]	13	17	19	24
Torque moment	T_{inst}	[Nm]	15	25	40	80
Minimum thickness of concrete member	h_{min}	[mm]	100	100	180	180
Minimum distance	s_{min}	[mm]	60	75	100	115
	$c \geq$	[mm]	200	150	165	225
Minimum allowable edge dist.	c_{min}	[mm]	75	75	100	115
	$s \geq$	[mm]	200	300	330	450

Arrow Plus Through Bolt

Annex B2

Intended use – Installation parameters

Installation instruction

No	Setting steps	Step	Setting details																				
	Installation equipments		hammer drilling, hammer, torque wrench, blow out pump																				
1		Hole drilling by hammer drilling	<div>Drill borehole with hammer drilling machine and standard drill bit to specified drill hole depth.</div> <table><tr><td>Anchor Size</td><td>M8</td><td>M10</td><td>M12</td><td>M16</td></tr><tr><td>Depth of drill $h_1 \geq$ [mm]</td><td>55</td><td>65</td><td>75</td><td>95</td></tr><tr><td>Nominal diameter of drill bit d_0 [mm]</td><td>8</td><td>10</td><td>12</td><td>16</td></tr><tr><td>Effective anchorage depth h_{ef} [mm]</td><td>40</td><td>50</td><td>60</td><td>80</td></tr></table>	Anchor Size	M8	M10	M12	M16	Depth of drill $h_1 \geq$ [mm]	55	65	75	95	Nominal diameter of drill bit d_0 [mm]	8	10	12	16	Effective anchorage depth h_{ef} [mm]	40	50	60	80
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Effective anchorage depth h_{ef} [mm]	40	50	60	80																			
2		Cleaning the hole	Cleaning of the hole from the drilling dust.																				
3		Install anchor	Install anchor with hammer.																				
4		Tighten the anchor	<div>Apply the required installation torque by using a calibrated torque wrench</div> <table><tr><td>Anchor size</td><td>M8</td><td>M10</td><td>M12</td><td>M16</td></tr><tr><td>Torque moment T_{inst} [Nm]</td><td>15</td><td>25</td><td>40</td><td>80</td></tr></table>	Anchor size	M8	M10	M12	M16	Torque moment T_{inst} [Nm]	15	25	40	80										
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Torque moment T_{inst} [Nm]	15	25	40	80																			
5		Inspection	<div>In case of aborted hole: new drilling at a minimum distance away of twice the depth of the aborted hole or smaller distance as the aborted drill hole is filled with high strength mortar and if under shear or oblique tension load if it is not in the direction of load application.</div>																				

Arrow Plus Through Bolt

Annex B3

Intended use – Installation instruction

Table C1: Characteristic values for tension loads in case of static and quasi static

Arrow Plus Through Bolt			Anchor type			
			M8	M10	M12	M16
Steel failure						
Characteristic resistance	N _{Rk,s}	[kN]	18,3	29,0	42,2	78,5
Partial safety factor	γ _{Ms}	[-]	1,25			
Pull-out failure						
Characteristic resistance in uncracked concrete C20/25	N _{Rk,p}	[kN]	6,5	10,0	9,5	18,0
Increasing factor for N _{Rk,p}	Ψ _C	C30/37	1,22			
		C40/50	1,41			
		C50/60	1,58			
Partial safety factor	γ _{inst}	[-]	1,0	1,2	1,2	1,0
Concrete cone failure and splitting failure						
Effective anchorage depth	h _{ef}	[mm]	40	50	60	80
Factor for non-cracked concrete	k _{ucr,N}	[-]	11,0			
Center Spacing	s _{cr,N}	[mm]	3·h _{ef}			
Edge distance	c _{cr,N}	[mm]	1,5·h _{ef}			
Center Spacing (splitting)	s _{cr,sp}	[mm]	160	200	180	320
Edge distance (splitting)	c _{cr,sp}	[mm]	80	100	90	160
Partial safety factor	γ _{inst}	[-]	1,0	1,2	1,2	1,0

Arrow Plus Through Bolt

Performances – Characteristic resistance under tension load

Annex C1

Table C2: Characteristic values for shear loads in case of static and quasi static loading

Arrow Plus Through Bolt			Anchor type			
			M8	M10	M12	M16
Steel failure without lever arm						
Characteristic resistance for In-place installation	V _{Rk,s}	[kN]	8,26	8,93	14,76	33,05
Partial safety factor	γ _{Ms}	[-]	1,25			
Factor for considering ductility	k ₇	[-]	1,0			
Steel failure with lever arm						
Characteristic resistance	M ⁰ _{Rk,s}	[Nm]	18,74	37,38	65,50	166,48
Partial safety factor	γ _{Ms}	[-]	1,25			
Concrete pry-out failure						
k-factor	k ₈	[-]	1,0	1,0	2,0	2,0
Partial safety factor	γ _{inst}	[-]	1,0	1,2	1,2	1,0
Concrete edge failure						
Effective length of anchor under shear load	ℓ _t	[mm]	40	50	60	80
Outside diameter of anchor	d _{nom}	[mm]	8	10	12	16
Partial safety factor	γ _{inst}	[-]	1,0	1,2	1,2	1,0

Arrow Plus Through Bolt

Annex C2

Performances – Characteristic resistance under shear load

Table C3: Displacements under tension loads for static and quasi-static loading

Size			M8	M10	M12	M16
Tension load in uncracked concrete	N	[kN]	2,6	4,1	4,7	9,0
Corresponding displacement	δ_{N0}	[mm]	0,05	0,28	0,46	0,14
	$\delta_{N\infty}$	[mm]	0,10	0,10	0,10	0,10

Table C4: Displacements under shear loads for static and quasi-static loading

Size			M8	M10	M12	M16
Shear load in uncracked concrete	N	[kN]	4,7	5,1	8,4	18,9
Corresponding displacement	δ_{v0}	[mm]	6,28	6,18	5,13	9,92
	$\delta_{v\infty}$	[mm]	9,42	9,27	7,70	14,87

Arrow Plus Through Bolt

Performances – Displacements

Annex C3