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European Assessment Document for

# Variant: Metal injection anchors for use in masonry - Anchor groups under fire exposure



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## 1 SCOPE OF THE EAD

### 1.1 Description of the construction product

EAD 330076-01-0604 [1], clause 1.1, applies.

EAD 330076-01-0604 provides an assessment of single anchors under fire exposure whereas this EAD provides an assessment of anchor groups subject to tension loads under fire exposure.

### 1.2 Information on the intended use of the construction product

#### 1.2.1 Intended use

EAD 330076-01-0604 [1], clause 1.2.1, applies.

In addition, the metal injection anchor is intended to be used with requirements related to resistance to fire (only for masonry subject to dry internal conditions) including anchor groups subject to tension loads under fire exposure.

#### 1.2.2 Working life/Durability

EAD 330076-01-0604 [1], clause 1.2.2, applies.

### 1.3 Specific terms used in this EAD

EAD 330076-01-0604 [1], clause 1.3, applies.

$N_{Rk,b,fi}^g$  fire resistance of anchor groups to brick breakout failure under tension loads

## 2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

### 2.1 Essential characteristics of the product

Table 2.1.1 shows how the performance of the product is assessed in relation to the essential characteristics.

**Table 2.1.1: Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics**

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 1: Mechanical resistance and stability			
Characteristic resistance for static and quasi-static loading			
1	Characteristic resistance to steel failure of a single anchor under tension loading	EAD 330499-02-0601 [2], 2.2.1	Level $N_{Rk,s}$ [kN]
2	Characteristic resistance to steel failure of a single anchor under shear loading with and without lever arm	EAD 330076-01-0604 [1] 2.2.1	Level $V_{Rk,s}$ [kN], $M_{Rk,S}$ [Nm]
3	Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading	EAD 330076-01-0604 [1] 2.2.2	Level $N_{Rk,p}$ , $N_{Rk,b}$ [kN], $N_{Rk,p,c}$ , $N_{Rk,b,c}$ [kN], $\beta$ [-]
4	Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading	EAD 330076-01-0604 [1] 2.2.3	Level $V_{Rk,b}$ , $V_{Rk,c,II}$ , $V_{Rk,c,\perp}$ [kN]
5	Characteristic resistance to brick breakout failure of an anchor group under tension loading	EAD 330076-01-0604 [1] 2.2.4	Level $N_{Rk}^g$ [kN], $\alpha_{g,N}$ [-]
6	Characteristic resistance to local brick failure or brick edge failure of an anchor group under shear loading	EAD 330076-01-0604 [1] 2.2.5	Level $V_{Rk,b}^g$ , $V_{Rk,c,II}^g$ , $V_{Rk,c,\perp}^g$ [kN] $\alpha_{g,V,II}$ , $\alpha_{g,V,\perp}$ [-]
7	Edge distances, spacing, member thickness	EAD 330076-01-0604 [1] 2.2.6	Level $C_{cr}$ , $S_{cr}$ , $C_{min}$ , $S_{min,II}$ , $S_{min,\perp}$ , $h_{min}$ [mm]
8	Displacements under tension and shear loading	EAD 330076-01-0604 [1] 2.2.7	Level $\delta_{N0}$ , $\delta_{N\infty}$ , $\delta_{V0}$ , $\delta_{V\infty}$ [mm]

No	Essential characteristic	Assessment method	Type of expression of product performance
9	Maximum installation torque	EAD 330076-01-0604 [1] 2.2.8	Level max. $T_{inst}$ [Nm]
Characteristic resistance and displacements for seismic loading			
10	Resistance to tension load, displacements	EAD 330076-01-0604 [1] 2.2.9	Level $N_{Rk,s,eq}$ , $N_{Rk,eq}$ [kN], $\alpha_{N,seis}$ [-], $\delta_{N,eq}$ [mm]
11	Resistance to shear load, displacements	EAD 330076-01-0604 [1] 2.2.10	Level $V_{Rk,s,eq}$ , $V_{Rk,b,eq}$ [kN], $\alpha_{V,seis}$ [-], $\delta_{V,eq}$ [mm]
12	Factor for annular gap	EAD 330076-01-0604 [1] 2.2.11	Level $\alpha_{gap}$ [-]
Basic Works Requirement 2: Safety in case of fire			
13	Reaction to fire	EAD 330076-01-0604 [1] 2.2.12	Class
14	Resistance to fire under tension and shear loading with and without lever arm, minimum edge distances and spacing	2.2.1	Level $N_{Rk,s,fi}$ [kN], $N_{Rk,p,fi}$ [kN], $N_{Rk,b,fi}$ [kN], $N_{Rk,b,fi}^g$ , $V_{Rk,s,fi}$ [kN], $M_{Rk,s,fi}^0$ [Nm], $C_{cr,fi}$ , $S_{cr,fi}$ [mm]
Basic Works Requirement 3: Hygiene, health and the environment			
15	Content, emission and/or release of dangerous substances	EAD 330076-01-0604 [1] 2.2.14	Description

## 2.2. Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

### 2.2.1 Resistance to fire under tension and shear loading with and without lever arm, minimum edge distances and spacing

#### Purpose of the assessment

Determination of resistance to fire of anchors and anchor groups under tension and shear loading.

#### Assessment method

EAD 330076-01-0604 [1], clause 2.2.13, applies.

#### Steel failure under tension loading

EAD 330076-01-0604 [1], clause 2.2.13, applies.

#### Pull-out failure

EAD 330076-01-0604 [1], clause 2.2.13, applies.

#### Brick breakout failure

EAD 330076-01-0604 [1], clause 2.2.13, applies.

If no tests are performed,  $N_{Rk,b,fi}$  for a single anchor shall be calculated in accordance with following Equations:

$$N_{Rk,b,fi(90)} = 0,7 \cdot N_{Rk,b} \cdot h_{ef}/200 \quad \text{for } c_{cr,fi} = c_{min,fi} = 2 h_{nom} \quad (2.2.1.1)$$

$$N_{Rk,b,fi(120)} = 0,7 \cdot 0,8 \cdot N_{Rk,b} \cdot h_{ef}/200 \quad \text{for } c_{cr,fi} = c_{min,fi} = 2 h_{nom} \quad (2.2.1.2)$$

with:  $N_{Rk,b}$  = characteristic resistance of brick breakout failure of a single anchor in accordance with EAD 330076-01-0604 [1], clause 2.2.2

If no tests are performed,  $N_{Rk,fi}^g$  of an anchor group shall be calculated in accordance with following Equations:

$$N_{Rk,fi(90)}^g = 0,7 \cdot N_{Rk}^g \cdot h_{ef}/200 \quad \text{for } s_{cr,fi} = s_{min,fi} = s_{min} \cdot 4/3, c_{cr,fi} = c_{min,fi} = 2 h_{nom} \quad (2.2.1.3)$$

$$N_{Rk,fi(120)}^g = 0,7 \cdot 0,8 \cdot N_{Rk}^g \cdot h_{ef}/200 \quad \text{for } s_{cr,fi} = s_{min} \cdot 4/3, c_{cr,fi} = c_{min,fi} = 2 h_{nom} \quad (2.2.1.4)$$

with:  $N_{Rk}^g$  = characteristic resistance of brick breakout failure of an anchor group in accordance with EAD 330076-01-0604 [1], clause 2.2.4

*Note: The factor 0,7 considers cracks in masonry during fire exposure up to 0,3 mm.*

#### Steel failure under shear loading

EAD 330076-01-0604 [1], clause 2.2.13, applies.

#### Edge distance and spacing

If in the test no splitting occurs, following minimum edge distances and spacing and joint distances shall be assumed for the tested injection anchors and the tested bricks (defined by compression strength and geometry):

$$s_{cr,fi} = s_{min,fi} = s_{min,test,fi}, c_{cr,fi} = c_{min,fi} = c_{min,test,fi}$$

If characteristic resistances are calculated, the edge distances, spacing and joint distances are given in Equations (2.2.1.1) to (2.2.1.4).

In all other cases (also when transferring results to other screw anchor or bricks):

$$s_{cr,fi} = s_{min,fi} = 4 h_{nom}, c_{cr,fi} = c_{min,fi} = 2 h_{nom}$$

Expression of results:  $N_{Rk,s,fi}$ ,  $N_{Rk,p,fi}$ ,  $N_{Rk,b,fi}$ ,  $N_{Rk,b,fi}^g$ ,  $V_{Rk,s,fi}$  [kN],  $M_{Rk,s,fi}^0$  [Nm],  $c_{cr,fi}$  [mm],  $s_{cr,fi}$  [mm]

### **3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE**

#### **3.1 System of assessment and verification of constancy of performance to be applied**

EAD 330076-01-0604 [1], clause 3.1, applies.

#### **3.2 Tasks of the manufacturer**

EAD 330076-01-0604 [1], clause 3.2, applies.

#### **3.3 Tasks of the notified body**

EAD 330076-01-0604 [1], clause 3.3, applies.

## 4 REFERENCE DOCUMENTS

[1]	EAD 330076-01-0604	Metal injection anchors for use in masonry
[2]	EAD 330499-02-0601	Bonded fasteners for use in concrete

## **ANNEX A TEST PROGRAMME AND TEST DETAILS**

EAD 330076-01-0604 [1], Annex A, applies.

## **ANNEX B GENERAL ASPECTS OF ASSESSMENT**

EAD 330076-01-0604 [1], Annex B, applies.

## **ANNEX C DETAILS OF TESTS FOR DETERMINATION OF SEISMIC RESISTANCE AND GENERAL ASPECTS OF ASSESSMENT**

EAD 330076-01-0604 [1], Annex C, applies.