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European Technical Assessment Body
for construction products



European Technical Assessment

ETA-25/0781
of 30 March 2026

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

Metallic electrical cable fasteners

Product family
to which the construction product belongs

Power-actuated fastener in concrete and fixtures for
redundant non-structural applications

Manufacturer

Hilti Aktiengesellschaft
Feldkircherstrasse 100
9494 SCHAAN
FÜRSTENTUM LIECHTENSTEIN

Manufacturing plant

Hilti Werke

This European Technical Assessment
contains

19 pages including 3 annexes which form an integral part
of this assessment

This European Technical Assessment is
issued in accordance with Article 95(4) of
Regulation (EU) 2024/3110, on the basis of

EAD 330083-04-0601

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Specific Part

1 Technical description of the product

The Metallic electric cable fastener consists of the power-actuated fastener (Hilti X-P 20 B3, Hilti X-P 24 B3, Hilti X-P 20 B4 or Hilti X-P 24 B4) made of galvanized steel and the fixture according to Annex A1 made of galvanized steel. The power-actuated fasteners are driven in the concrete by using a mechanical fastening tool (Hilti BX3-ME or Hilti BX4-ME). They are anchored in the concrete by sintering and mechanical interlock.

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

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

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the fastener of at least 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 and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Distribution functions and reduction functions of fastenings	See Annex B5, C1 to C4
Number of fixing points – n_1	$10 \leq n_1 \leq 100$
Uniform span between the fixing points	$\leq 1,0$ m

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire of fasteners and fixtures made of metal	Class A1
Reaction to fire of fixtures made of polyamide	No performance assessed.
Resistance to fire	No performance assessed.

3.3 Aspects of durability linked with the Basic Works Requirements

Essential characteristic	Performance
Durability	See Annex B1

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with EAD No. 330083-04-0601, the applicable European legal act is: 1997/463/EC (EU).

The system to be applied is: 2+

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.


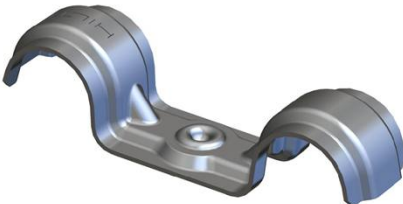


Issued in Berlin on 30 March 2026 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Baderschneider

Metallic electrical cable fastener consists of the fixture and a power-actuated fastener

Fixture

X-FB-FE MX	X-DFB-FE MX
	
X-ECC-FE MX	X-EHS-FE MX
	

Power-actuated-fastener X-P 20 B3, X-P 24 B3, X-P 20 B4, X-P 24 B4

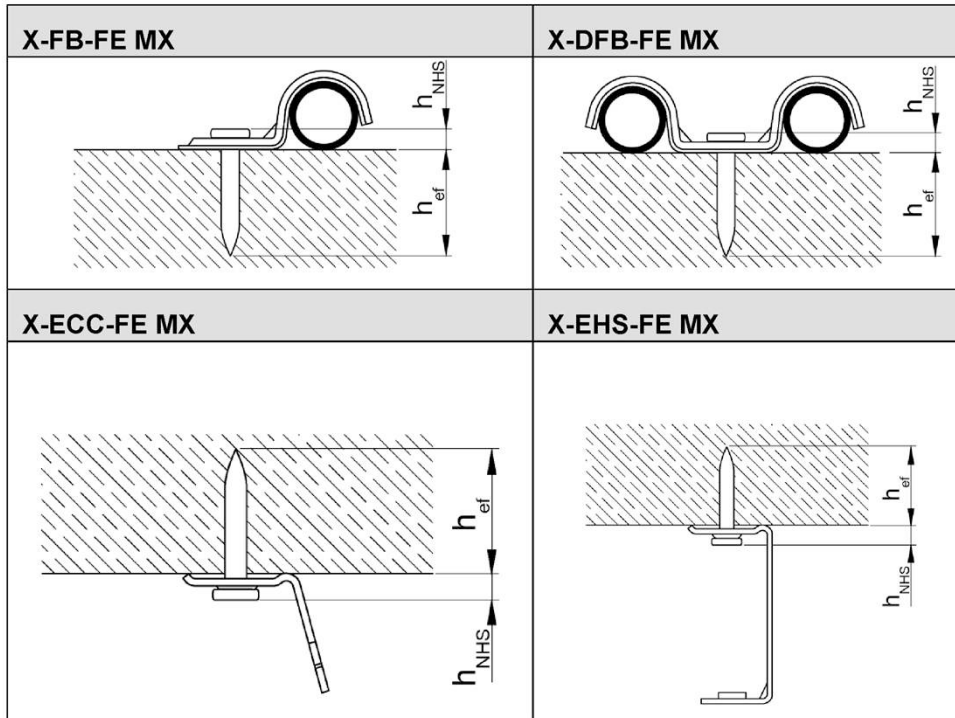


Metallic electrical cable fasteners

Product description: Products

Annex A1

Installed condition



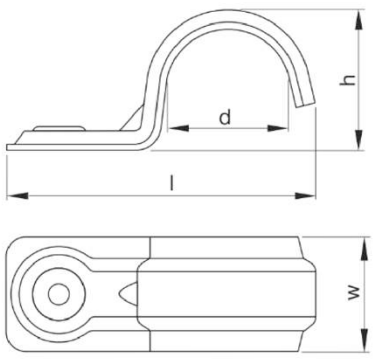
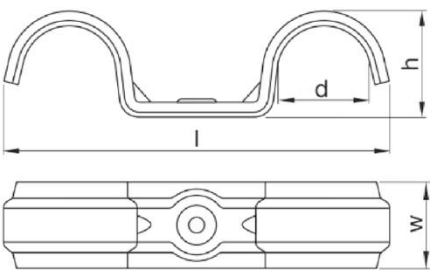
Metallic electrical cable fasteners

Product description: Installed condition

Annex A2

Dimensions and materials

Table 1: Fixture

	Designation	Dimensions [mm]			
		Material [-]			
X-FB-FE MX		l	w	h	d
	X-FB-FE 5 MX	31,2	17,7	6,5	5
	X-FB-FE 6 MX	32,4	17,7	7,3	6
	X-FB-FE 7 MX	33,6	17,7	8,3	7
	X-FB-FE 8 MX	34,7	17,7	9,1	8
	X-FB-FE 9 MX	35,8	17,7	10,1	9
	X-FB-FE 10 MX	36,8	17,7	10,6	10
	X-FB-FE 11 MX	37,9	17,7	11,6	11
	X-FB-FE 13 MX	40,0	17,7	13,6	13
	X-FB-FE 16 MX	43,2	17,7	16,6	16
	X-FB-FE 20 MX	47,5	17,7	20,6	20
	X-FB-FE 22 MX	49,6	17,7	22,1	22
	X-FB-FE 25 MX	54,0	17,7	25,1	25
	X-FB-FE 28 MX	56,0	17,7	28,1	28
	X-FB-FE 32 MX	61,8	17,7	32,1	32
	X-FB-FE 40 MX	68,4	17,7	39,5	40
All sizes	≥ 5 µm Galvanized carbon steel				
X-DFB-FE MX		l	w	h	d
	X-DFB-FE 5 MX	45,2	17,7	6,8	5
	X-DFB-FE 6 MX	48,0	17,7	7,8	6
	X-DFB-FE 7 MX	50,8	17,7	8,8	7
	X-DFB-FE 8 MX	53,0	17,7	9,3	8
	X-DFB-FE 9 MX	55,3	17,7	10,8	9
	X-DFB-FE 10 MX	57,4	17,7	11,3	10
	X-DFB-FE 11 MX	59,8	17,7	12,3	11
	X-DFB-FE 13 MX	64,1	17,7	14,3	13
	X-DFB-FE 16 MX	70,6	17,7	17,3	16
	X-DFB-FE 20 MX	77,2	17,7	21,3	20
	X-DFB-FE 22 MX	81,4	17,7	23,3	22
	X-DFB-FE 25 MX	87,6	17,7	26,3	25
	X-DFB-FE 28 MX	93,8	17,7	28,3	28
All sizes	≥ 5 µm Galvanized carbon steel				

Metallic electrical cable fasteners

Product description: Dimensions and materials

Annex A3

Table 1: Fixture (continued)

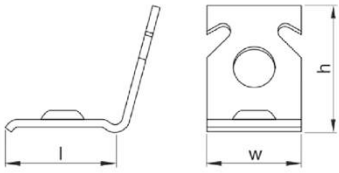
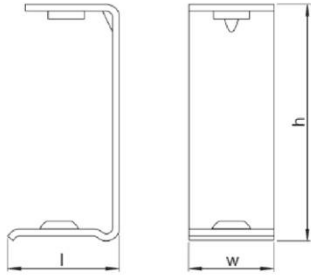
	Designation	Dimensions [mm]		
		Material [-]		
X-ECC-FE MX		l	w	h
	X-ECC-FE MX	20,8	18,0	25,0
		≥ 5 µm Galvanized carbon steel		
X-EHS-FE MX		l	w	h
	X-EHS-FE M4 MX	20	18	38
	X-EHS-FE M6 (W6) MX	20	18	38
	X-EHS-FE M8 MX	20	18	38
	X-EHS-FE W10 MX	20	18	38
	All sizes	≥ 5 µm Galvanized carbon steel		

Table 2: Power-actuated fastener

Power-actuated fastener		X-P 20 B3 MX X-P 20 B4 MX	X-P 24 B3 MX X-P 24 B4 MX
Shank length	[mm]	20	24
Total length	[mm]	21,8	25,8
Shank diameter	[mm]	3	3
Head diameter	[mm]	6,8	6,8
Material of nail	[-]	Hardened carbon steel, Rockwell hardness 57.5 HRC, galvanized ≥ 5 µm	

Metallic electrical cable fasteners

Product description: Dimensions and materials

Annex A4

Specification of intended use

Anchorage subject to:

- Dead-loads of uniaxially spanned flexible cables or conduits as well as rigid cables or conduits with a constant span.

Base materials:

- Reinforced or unreinforced compacted normal weight concrete without fibres according to EN 206:2013+A2:2021.
- Strength classes C20/25 to C35/45 according to EN 206:2013+A2:2021.
- Cracked and non-cracked concrete.
- Two-dimensional load-bearing structures (slabs and walls).

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions
- Minimum temperature: -40 °C
- Maximum temperature: +80 °C

Metallic electrical cable fasteners

Intended use: Specification of intended use

Annex B1

Calculation

The target of the assessment is to determine the maximum service load for all limit states detailed in Annex B4 by means of probabilistic calculation according to EN 1990:2023, Annex C. To do the probabilistic calculation it's recommended to use a Monte Carlo simulation for a determination of the failure probability for a given configuration of power-actuated fastener and fixture.

A configuration is built with:

- $P(R)$: Distribution function of the power-actuated fastener tension and shear resistance as shown in Annex C1.
- $P(R)_{(1-\alpha)pt,N}$ and $P(R)_{(1-\alpha)pt,V}$: Distribution function of the fixture tension or shear resistance as shown in Annex C1 and C2.
- $\alpha_{eN,5\%}$: Reduction function of the pull-out resistance in order to take the effect of eccentric tension load introduction into account as shown in Annex C3.
- $\alpha_{eV,5\%}$: Reduction function of the pull-out resistance in order to take the effect of eccentric shear load introduction into account as shown in Annex C3..

Static model

- A static system as shown in Figure 1 could be used for the situation of fixing cables with constant span.
- Cables up to an outer diameter of 12 mm are considered flexible (e.g. NYM 3x1.5 or NYM 5x1.5) with zero moment of inertia (upper case in Figure 1). Cables with a bigger outer diameter or conduits should be considered as rigid with a moment of inertia as shown on the lower part of Figure 1.

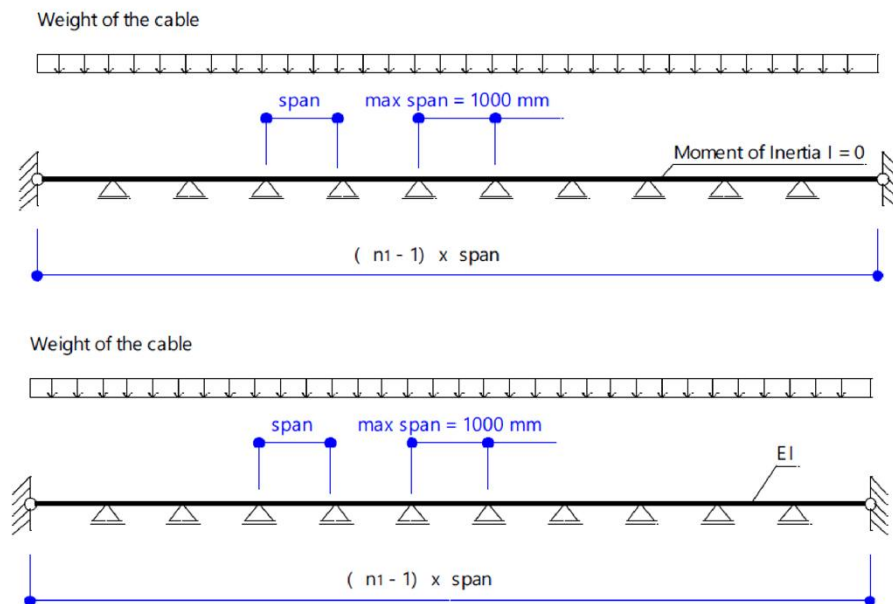


Figure 1: Static system of uniaxial spanned cables with constant span (top: flexible, bottom: rigid)

Metallic electrical cable fasteners

Annex B2

Informative: Calculation

The static calculation model should consider the following features:

- All fixtures along the fastening chain shall be considered in the calculation.
- Both ends of the chain are fixed supports (e.g. fixation in a cable-terminal box or where cables are led through interior rigid walls).
- The model allows the simultaneous occurrence of gaps along the entire length of the cable due to local overload and resulting failure of this fixture point. Therefore, every fixture is potentially affected from a gap developing from both adjacent sides of the fixture.
- The length of the gaps varies from 1, 2, 3, 4 etc. Gaps with different gap length may develop in one individual Monte Carlo simulation along the chain of fixtures.
- In case of gaps due to local overload, the forces have to be iteratively redistributed considering the changes with load redistribution according to the local stiffness situations in the static system until the system reaches equilibrium or until the chain of fixtures totally collapses.
- Number of fixing points $n_1 = 100$
- Length of the gap of failed fixtures. This length corresponds with the number of adjacent failures of fixtures (1, 2, 3, 4 etc. up to the number of failures of all fixtures of the chain) due to overload.

Monte Carlo Simulation

- For the calculation of the probability of failure for one Monte Carlo simulation, the number of occurrences of the gap under consideration need to be counted and compared with the total number of calculations runs performed in this Monte Carlo simulation. In case the gap under consideration occurs twice or more often in the simulation run of the static model, it needs only be counted once for the calculation of the probability of failure.
- As stated in EN 1990:2023 the reliability index β is defined as follows:

$$P_f = \phi(-\beta)$$

With

- β = reliability index
- P_f = calculated probability of failure
- ϕ = distribution function of standardized normal distribution

- As a recommendation for each individual parameter configuration at least 10 Monte Carlo simulations shall be done. The minimum number of calculation runs within one Monte Carlo simulation amounts to 1 million runs.
- For example, a Park-Miller random number generator could be used. Other sampling methods which allow the reduction of required calculations, like the Latin Hypercube sampling (LHS) are also recommended.

Metallic electrical cable fasteners	Annex B3
Informative: Calculation	

Limit states and reliability index

The following limit states should be observed:

- Limit state of global collapse (ULS): This limit state corresponds with the failure of all fixtures and could be verified with a reliability index $\beta \geq 3,8$ according to consequence class CC2 of EN 1990:2023, Annex C.
- Limit state of local failure: This limit state corresponds with the local failure of maximum 4 adjacent fixtures. The number of acceptable adjacent failures depends on the individual situation. The limit state of local failure could be verified with a reliability index $\beta \geq 3.3$ according to consequence class CC1 of EN 1990:2023, Annex C.
- Serviceability limit state (SLS): The number of acceptable adjacent failures depends on the individual situation. To consider limitations of cable deflections, a maximum failure of 2 adjacent fixtures is recommended. The serviceability limit state could be verified with a reliability index $\beta \geq 1,5$ according to EN 1990:2023, Annex C.

5% fractile of reliability index β

As a recommendation for every individual parameter configuration, 10 Monte Carlo simulations with a minimum of 1 million cases each should be repeated. The setting of the random simulator is selected in a way, that for each Monte Carlo simulation a new set of random numbers is generated.

The 5%-fractile of the reliability index β could be calculated according to statistical procedures for a confidence level of 90 % using a normal distribution and unknown standard deviation of the population.

$$\beta_{5\%} = \beta_m - k_s \cdot s$$

with:

- $\beta_{5\%}$ = 5 %-fractile of the calculated reliability index
- β_m = mean value of the reliability index of the 10 Monte Carlo simulations
- s = standard deviation of the calculated reliability index for the 10 Monte Carlo simulations

Metallic electrical cable fasteners

Informative: Calculation

Annex B4

Installation:

Fastener installation carried out by appropriately qualified personnel

Damages on the concrete surface, caused by setting defects, have to be repaired according to technical rules, e.g. EN 1504-3:2005. A new fastener is set at a minimum distance away of ≥ 150 mm and $\geq 3 h_{ef}$ of the edge of the damaged surface.

Table 3: Concrete parameters

Power-actuated fastener		X-P 20 B3 MX X-P 20 B4 MX	X-P 24 B3 MX X-P 24 B4 MX
Minimum concrete strength class	[-]	C20/25	
Maximum concrete strength class	[-]	C35/45	
Minimum thickness of concrete member h_{min}	[mm]	80	

Table 4: Installation parameters




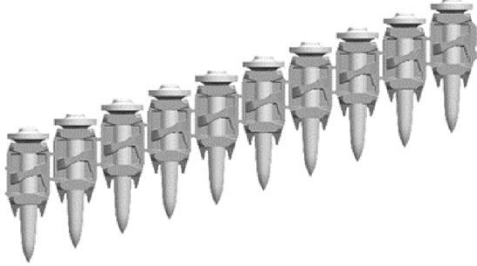
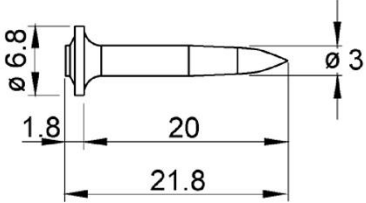
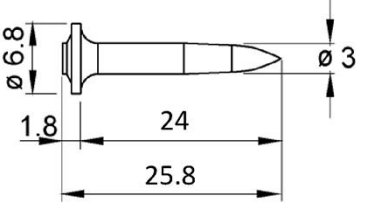
Power-actuated fastener	Fixture	Embedment depth h_{ef} [mm] (see Annex A2)	Fastener standoff h_{NHS} [mm] (see Annex A2)
X-P 20 B3 MX	X-FB-FE MX	11-18 mm	4-11 mm
X-P 20 B4 MX	X-DFB-FE MX	11-18 mm	4-11 mm
X-P 24 B3 MX	X-ECC-FE MX	11-18 mm	4-11 mm
X-P 24 B4 MX	X-EHS-FE MX	11-18 mm	4-11 mm

Metallic electrical cable fasteners

Intended use: Installation

Annex B5

Power-actuated fastening tools

<p>Fastening tool BX 3-ME with nails X-P 20 B3 MX and X-P 24 B3 MX</p>	<p>Fastening tool BX 4-ME with nails X-P 20 B4 MX and X-P 24 B4 MX</p>
 <p>Fastening tool BX3-ME fully automatic, mechanical driven</p>	 <p>Fastening tool BX 4-ME: fully automatic, mechanical driven</p>
 <p>collated nails X-P 20 B3 MX and X-P 24 B3 MX</p>	 <p>collated nails X-P 20 B4 MX and X-P 24 B4 MX</p>
 <p>X-P 20</p>	 <p>X-P 24</p>
<p>Nails X-P 20 and X-P 24</p>	

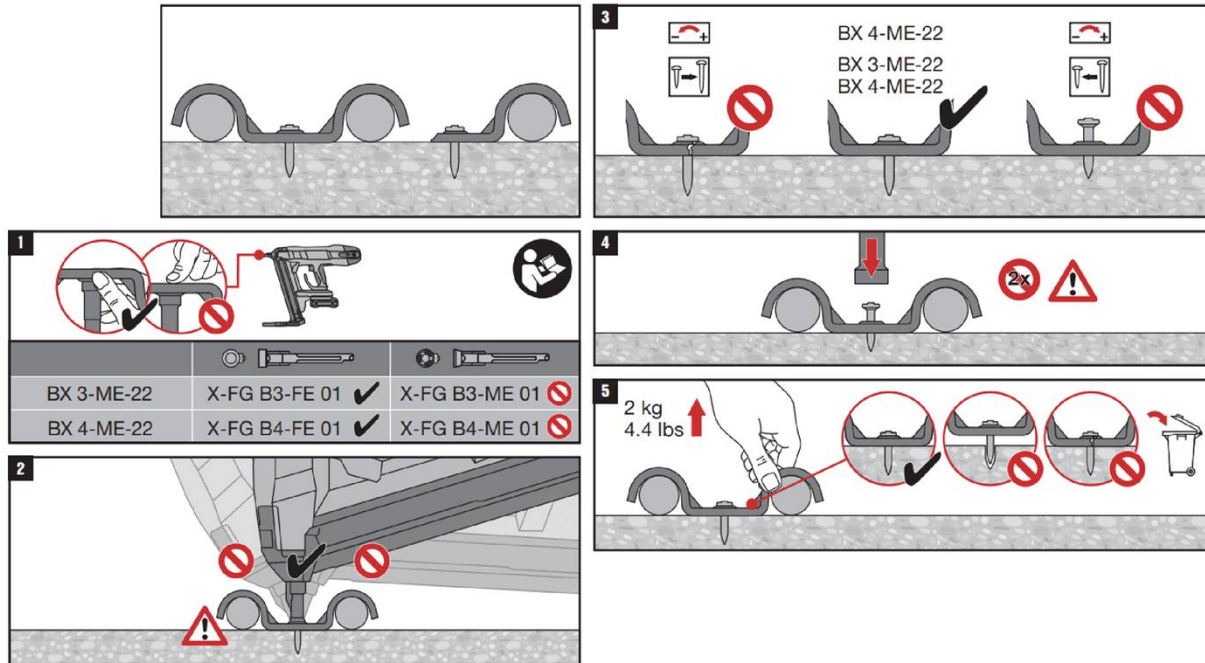
Metallic electrical cable fasteners

Intended use: Power-actuated fastening tools

Annex B6

Instructions for use

Example X-(D)FB-FE MX



Fastener inspection – fastener stand-off

For the fastener inspection a measurement of the fastener standoff h_{NHS} has to be done, as shown in Annex A2. The recommended values are given in Table 4, Annex B5.

Metallic electrical cable fasteners

Intended use: Instruction for use

Annex B7

Distribution functions – Power-actuated fastener – P(R)

Nail – X-P 20 B3, X-P 20 B4, X-P 24 B3 and X-P 24 B4 – Characteristic distribution function – Tension and Shear (in [kN])	
$P(R) = d \left(1 - \exp \left[- \left(\frac{R}{b} \right)^c \right] \right)$	
b	1,061
c	1,659
d	1,037
R	Tension and shear resistance [kN]

Note:

- Designation of formula following EAD 330083-04-0601, section 2.2.3.
- For the power-actuated fastener the same distribution function is used for all load directions.

Distribution functions – Fixture – P(R)_{(1-α)pt}

X-FB-FE MX (all dimensions) – Characteristic distribution function (in [N])		
$P(R)_{(1-\alpha)pt} = d \left(1 - \exp \left[- \left(\frac{R - a}{b} \right)^c \right] \right)$		
	Tension	Shear
a	110,61	77,840
b	10,420	21,300
c	7,1614	7,1614
d	1,0067	1,0450
R	Tension resistance [N]	Shear resistance [N]

Note:

- Designation of formula following EAD 330083-04-0601, section 2.2.3.
- For shear loads, the direction with the lowest resistance is considered and can be applied to all shear directions.

Metallic electrical cable fasteners	Annex C1
Performances: Distribution functions	

Distribution functions – Fixture – $P(R)_{(1-\alpha)pt}$ (continued)

X-ECC-FE MX – Characteristic distribution function (in [N])		
$P(R)_{(1-\alpha)pt} = d \left(1 - \exp \left[- \left(\frac{R - a}{b} \right)^c \right] \right)$		
	Tension	Shear
a	1955,4	Not applicable for shear loads
b	1095,8	
c	7,1614	
d	1,1874	
R	Tension resistance [N]	

X-EHS-FE-MX (all dimensions) – Characteristic distribution function (in [N])		
$P(R)_{(1-\alpha)pt} = d \left(1 - \exp \left[- \left(\frac{R - a}{b} \right)^c \right] \right)$		
	Tension	Shear
a	1114,2	Not applicable for shear loads
b	2174,6	
c	7,1614	
d	1,0215	
R	Tension resistance [N]	

Note:

- Designation of formula following EAD 330083-04-0601, section 2.2.3.

Metallic electrical cable fasteners	Annex C2
Performances: Distribution functions	

Reduction functions

Reduction function eccentricity – X-FB-FE MX – Tension

$$\alpha_{eN,5\%} = c_0 = 0,21$$

Reduction function eccentricity – X-FB-FE MX – Shear

$$\alpha_{eV,5\%} = c_0 = 0,46$$

Note:

- Designation of formula following EAD 330083-04-0601, section 2.2.3.
- For shear, the direction with the lower eccentricity values (higher reduction) is considered. Therefore, the reduction function applies for all shear directions.

Reduction function eccentricity – X-ECC-FE MX - Tension

$$\alpha_{eN,5\%} = c_0 = 0,42$$

Reduction function eccentricity – X-EHS-FE MX - Tension

$$\alpha_{eN,5\%} = c_0 = 0,60$$

Note:

- Designation of formula following EAD 330083-04-0601, section 2.2.3.

Metallic electrical cable fasteners

Performances: Reduction factors

Annex C3