IZJAVA O SVOJSTVIMA

DoP 0323

za fidcher univerzalnu tiplu DuoPower ETA (Plastične tiple za korištenje u betonu i zidanim konstrukcijama) HR

1. Jedinstveni identifikator tipa proizvoda: **DoP 0323**

2. Namjena korištenja: **Plastična tipla za višestruku uporabu u betonu i zidovima za nekonstrukcijske primjene (uporaba kategorije a,b, c):, vidi dodatak, posebno priloge B1 - B4.**

3. Proizvođač: **fischerwerke GmbH & Co. KG, Klaus-Fischer-Str. 1, 72178 Waldachtal, Njemačka**

4. Ovlašteni zastupnik: **–**

5. Sistem/i od AVCP: **2+**

6. Europski dokument za ocjenjivanje: **EAD 330284-00-0604 (June 2018)**
   Europska tehnička ocjena: **ETA-22/0512; 2022-11-04**
   Tijelo za tehničko ocjenjivanje: **Kiwa Nederland B.V.**
   Prijavljeno tijelo/prijavljena tijela: **2873 TU Darmstadt**

7. Objavljena svojstva:
   Mehanička otpornost i stabilnost (BWR 4)
   Otpornost na lom čelika pri opterećenju vlakom: Prilog C1
   Otpornost na otkazivanje čelika ili polimera pri posmičnom opterećenju: Priloge C1, C2
   Otpornost na izvlačenje ili pucanje betona ili pucanje polimera pri naprezanju pod naponom (osnovna skupina materijala a): Prilog C2

   Otpornost u bilo kojem smjeru opterećenja bez poluge (skupina osnovnog materijala b, c):
   Udaljenost i razmak od ruba (skupina osnovnog materijala a): Prilog B2
   Udaljenost i razmak od ruba (skupina osnovnih materijala b, c): Prilog B3
   Pomaci pod kratkoročnim i dugoročnim opterećenjem: Prilog C2

   Trajnost: Priloge A4, B1

   Sigurnost u slučaju požara (BWR 2)
   Reakcija na vatru:Klasa A1
   Otpornost na vatru: NPD

8. Odgovarajuća tehnička dokumentacija i/ili specifična tehnička dokumentacija: **–**

Svojstva gore navedenog proizvoda su u skladu sa skupom izjava o svojstvima.Ova izjava o svojstvima se izdaje, u skladu sa Europskom regulativom (EU) Br. 305/2011, pod punom odgovornošću gore navedenog proizvođača.

Za proizvođača i u njegovo ime potpisao:

Dr.-Ing. Oliver Geibig, Generalni direktor poslovne jedinice i inženjering

Jürgen Grün, Glavni direktor za kemiju i kvalitetu

Tumlingen, 2022-11-24

Ovaj DoP je pripremljen u različitim jezicima. U slučaju da postoji spor u tumačenju, engleska verzija će uvijek prevladati.

U aneksu se nalaze dodatni podaci na engleskom jeziku, koji ne podliježu zakonskoj regulativi.

Translation guidance Essential Characteristics and Performance Parameters for Annexes
Smjernice za prijevod. Bitne karakteristike i parametri izvedbe za dodatke

Safety in case of fire (BWR 2) **Sigurnost u slučaju požara (BWR 2)**		
1	Reaction to fire: **Reakcija na vatru:**	-
2	Resistance to fire: **Otpornost na vatru:**	$N_{Rk,s,fi}$; $N_{Rk,p,fi}$; $F_{Rk,fi,90}$
Mechanical resistance and stability (BWR 4) **Mehanička otpornost i stabilnost (BWR 4)**		
3	Resistance to steel failure under tension loading: **Otpornost na lom čelika pri opterećenju vlakom:**	$N_{Rk,s}$
4	Resistance to steel or polymer failure under shear loading: **Otpornost na otkazivanje čelika ili polimera pri posmičnom opterećenju:**	$V_{Rk,s}$; $M_{Rk,s}$; $V_{Rk,pol}$
5	Resistance to pull-out or concrete failure or polymer failure under tension loading (base material group a) **Otpornost na izvlačenje ili pucanje betona ili pucanje polimera pri naprezanju pod naponom (osnovna skupina materijala a):**	$N_{Rk,p}$ / $N_{Rk,pol}$
6	Resistance in any load direction without lever arm (base material group b,c,d): **Otpornost u bilo kojem smjeru opterećenja bez poluge (skupina osnovnog materijala b, c):**	F_{Rk}
7	Edge distance and spacing (base material group a) **Udaljenost i razmak od ruba (skupina osnovnog materijala a):**	c_{cr}; s_{cr}; c_{min}; s_{min}; a; h_{min};
8	Edge distance and spacing (base material group b,c,d): **Udaljenost i razmak od ruba (skupina osnovnih materijala b, c):**	c_{min}; s_{min}; h_{min};
9	Displacements under short-term and long-term loading: **Pomaci pod kratkoročnim i dugoročnim opterećenjem:**	δ_0; δ_∞
Aspects of durability **Trajnost:**		
10	Durability: **Trajnost:**	**-**

Specific parts

1 Technical description of the product

The plastic anchor “fischer universal plug DuoPower ETA” is a plastic anchor consisting of a sleeve and a screw. The plastic sleeve is expanded by screwing in the screw which presses the sleeve against the wall of the drilled hole.

Polyamide PA6 of grey colour and polypropylene PP of red colour is used as material for the sleeve. The screws are made of galvanised steel, galvanised steel with additional organic layer or stainless steel of corrosion resistance class II or III. There are three variants of the fischer PowerFast II: a countersunk screw, a raised countersunk head screw, a pan head screw, according to ETA-19/0175. There are also three variants of the special screw: a countersunk screw, a hexagonal screw and a hexagonal screw with washer. Specific dimensions, drawings and material parameters are shown in Annex A.

2 Specification of the intended use(s) in accordance with the applicable European Assessment Document (hereinafter EAD)

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

The plastic anchor “fischer universal plug DuoPower ETA” is intended for anchorages subject to static and quasi-static loading. The applicable base material groups are “a”, “b” and “c”.

The verifications and assessment methods on which this European Technical Assessment is based on lead to the assumption of a working life of the plastic anchor ”fischer universal plug DuoPower ETA“ for the intended use of 50 years when installed in the works provided that the plastic anchor is subject to appropriate installation.

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 Basic Works Requirements 2: Safety in case of fire

Table 3.1 Basic Works Requirements 2: Safety in case of fire

Essential characteristic	Performance
Reaction to fire	Class A 1
Resistance to fire	no performance assessed

3.2 Basic Works Requirements 4: Mechanical resistance and stability

Table 3.2 Basic Works Requirements 4: Mechanical resistance and stability

Essential characteristic	Performance
Characteristic resistance to steel failure under tension loading	see Annex C 1
Characteristic resistance to steel or polymer failure under shear loading	see Annex C 1 and Annex C 2
Characteristic resistance to pull-out or concrete failure or polymer failure under tension loading (only base material group “a”)	see Annex C 2
Characteristic resistance in any load direction without lever arm (only base material group “b” and “c”)	see Annex C 3
Minimum edge distances and spacing	see Annex B 2 and Annex B 3
Displacements under short-term and long-term loading	see Annex C 2

3.3 Other essential characteristics

Table 3.3 Other essential characteristics

Essential characteristic		Performance
Durability	Corrosion of Metal parts	for screws see Annex A 4 and Annex B 1
	High alkalinity of plastic sleeve	no negative effects

3.4 Reference documents

Following standards or EADs will be referred to in this European Technical Assessment. All undated references are to be understood as references to the dated versions listed below.

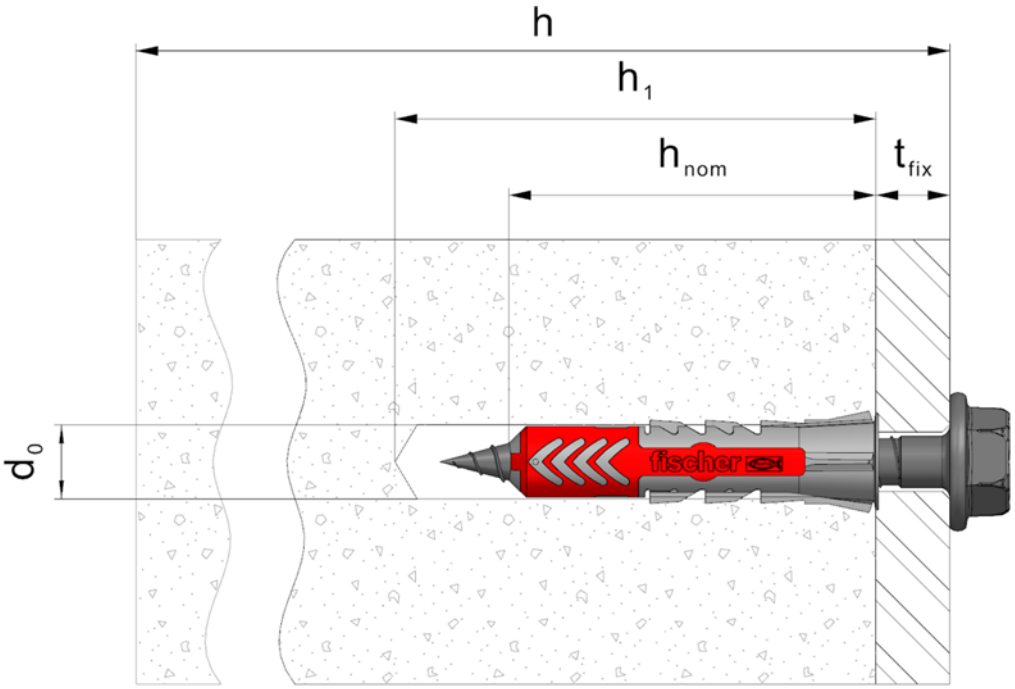
- EOTA European Assessment Document EAD 330284-00-0604, June 2018: Plastic anchors for redundant non-structural systems in concrete and masonry
- EOTA Technical Report TR 051, Edition April 2018: Job site tests of plastic anchors and screws
- EOTA Technical Report TR 064, Edition May 2018: Design of plastic anchors in conrete and masonry
- EN 206:2013+A2:2021: Concrete – Specification, performance, production and conformity
- EN 771-1:2011+A1:2015: Specification for masonry units – Part 1: Clay masonry units
- EN 771-2:2011+A1:2015: Specification for masonry units – Part 2: Calcium silicate
- EN 998-2:2017: Specification for mortar for masonry - Part 2: Masonry mortar
- EN 1993-1-4:2006+A1:2015: Eurocode 3: Design of steel structures - Part 1-4: General rules - Supplementary rules for stainless steels
- EN ISO 4042:2018: Fasteners – Electroplated coating systems

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

In accordance with European Assessment Document EAD 330284-00-0604 the applicable European legal act is: 97/463/EC.

The System to be applied is: 2+

Installed anchor DuoPower ETA, e.g. with special screw

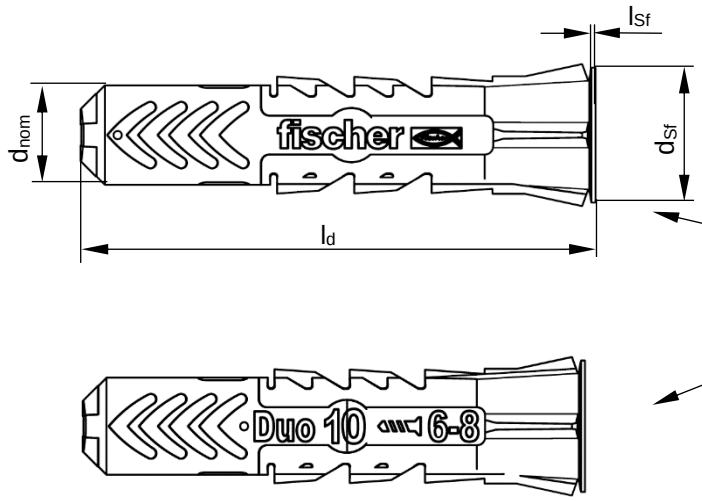


Legend

d_0	=	Nominal drill hole diameter
h_{nom}	=	Overall plastic anchor embedment depth in the base material
h_1	=	Depth of drill hole to deepest point
h	=	Thickness of member (wall)
t_{fix}	=	Thickness of fixture including non-load-bearing layer

Figure not to scale

Anchor sleeve DuoPower ETA 8 and 10



Marking:
Brand
Anchor type
Size
Screw diameter
e.g. fischer Duo 10 6-8
e.g. fischer Duo 8 4,5-6

Figures not to scale

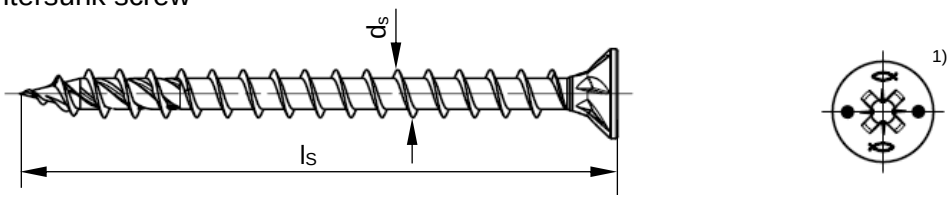
fischer universal plug DuoPower ETA

Product description
Anchor sleeve types
Marking and dimensions

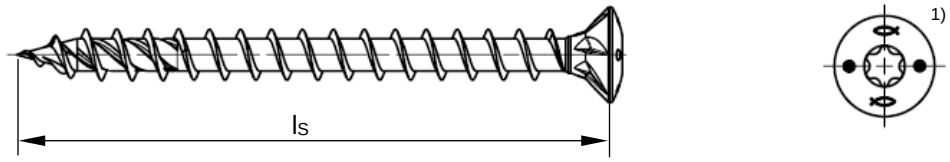
Annex A 2

fischer PowerFast II

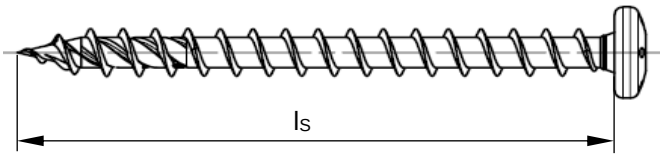
Countersunk screw



Raised countersunk head screw



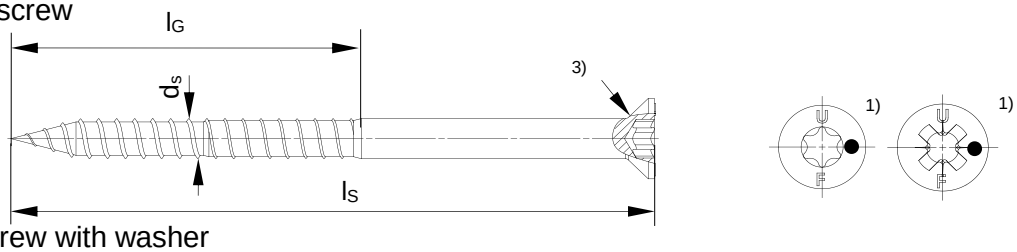
Pan head screw



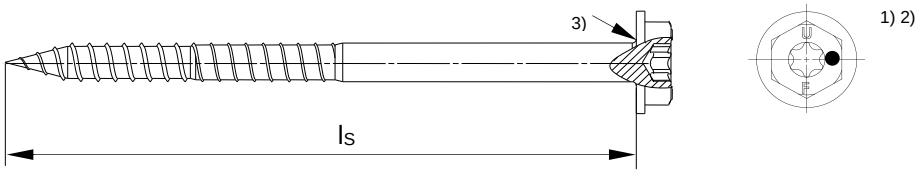
1) Internal driving feature for TX bit or cross recess bit for all head shapes.

Special screws

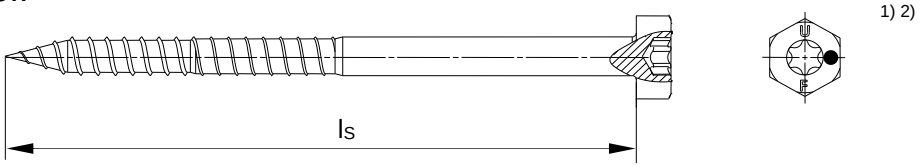
Countersunk screw



Hexagonal screw with washer



Hexagonal screw



1) Additional marking for the special screw, stainless steel version: e.g. "A4" or "R" or “A2”.
2) Internal driving feature for TX bit is optional for hexagonal screw.
3) Optional additional version with underhead ribs.

Figures not to scale

fischer universal plug DuoPower ETA	**Annex A 3** Appendix 6 / 14
Product description fischer PowerFast II and special screws Marking and dimensions	

Table A4.1: Dimensions of the anchor type with fischer PowerFast II

Anchor type	Anchor sleeve						fischer PowerFast II	
	h_{nom} [mm]	d_{nom} [mm]	t_{fix} [mm]	l_d [mm]	l_{Sf} [mm]	d_{Sf} [mm]	d [mm]	l_s [mm]
DuoPower ETA 8x40	40	8	≥ 1	40	0,4	11,0	6,0	$\geq l_d + t_{fix} + 6$

Table A4.2: Dimensions of the anchor type with special screw

Anchor type	Anchor sleeve						Special screw		
	h_{nom} [mm]	d_{nom} [mm]	t_{fix} [mm]	l_d [mm]	l_{Sf} [mm]	d_{Sf} [mm]	d [mm]	l_G [mm]	l_s [mm]
DuoPower ETA 8x40	40	8	≥ 1	40	0,4	11,0	6,0	59 77[1)]	$\geq l_d + t_{fix} + 6$
DuoPower ETA 10x50	50	10	≥ 1	50	0,4	13,0	7,0	57 77[2)]	$\geq l_d + t_{fix} + 7$

1) Screw length $l_s \geq 85$ mm.
2) Screw length $l_s \geq 87$ mm.

Table A4.3: Materials

Name	Material
Anchor sleeve	Polyamide, PA6, colour grey Polypropylene PP, colour red
fischer PowerFast II	- Galvanised steel gvz with Zn5/Ag or Zn5/An in accordance with EN ISO 4042 **or** - Galvanised steel gvz with Zn5/Ag or Zn5/An in accordance with EN ISO 4042 with additional organic layer (Zn5/Ag/T7 or Zn5/An/T7, resp.) in three layers (total layer thickness ≥ 6 µm)
Special screw	- Galvanised steel gvz with Zn5/Ag or Zn5/An in accordance with EN ISO 4042 **or** - Galvanised steel gvz with Zn5/Ag or Zn5/An in accordance with EN ISO 4042 with additional organic layer (Zn5/Ag/T7 or Zn5/An/T7, respectively) in three layers (total layer thickness ≥ 6 µm) **or** - Stainless steel “A2” of corrosion resistance class CRC II in accordance with EN 1993-1-4 **or** - Stainless steel “A4” or “R” of corrosion resistance class CRC III in accordance with EN 1993-1-4

Specifications of intended use

Anchorages subject to:

- Static and quasi-static loads.
- Multiple fastening of non-structural systems.

Base materials:

- Reinforced or unreinforced compacted normal weight concrete without fibres, strength classes ≥ C12/15, base material group “a”, in accordance with EN 206, see Annex C 2.
- Solid brick masonry, base material group “b”, as per EN 771-1 or EN 771-2, see Annex C 3.
  Note: The characteristic resistance is also valid for larger brick sizes and higher compressive strength of the masonry unit.
- Hollow or perforated brick masonry, base material group “c”, as per EN 771-1, see Annex C 3.
- Mortar strength class of masonry ≥ M2,5 in accordance with EN 998-2.
- For other comparable base materials of the base material group “a”, “b” or “c”, the characteristic resistance of the anchor may be determined by job site tests in accordance with TR 051.

Temperature Range:

- a: - 20 °C to 40 °C (max. short term temperature + 40 °C and max. long term temperature + 24 °C).

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions: fischer PowerFast II of zinc coated steel or special screw made of zinc coated steel or stainless steel.
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist: Special screw made of stainless steel of corrosion resistance class CRC III.
  Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

Design:

- The anchorages are designed in accordance with TR 064 under the responsibility of an engineer experienced in anchorages and masonry work.
- Verifiable calculation notes and drawings shall be prepared taking account of the loads to be anchored, the nature and strength of the base materials and the dimensions of the anchorage members as well as of the relevant tolerances. The position of the anchor is indicated on the design drawings.
- Fasteners are only to be used for multiple use for non-structural application in accordance with TR 064.

Installation:

- Hole drilling by the drilling method according to Annex C 2 and C 3 for base material group “a”, “b” and “c”.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Installation temperature from -5 °C to +40 °C.
- Exposure to UV due to solar radiation of the anchor not protected ≤ 6 weeks.
- No ingress of water in the borehole at temperatures < 0 °C.

Table B2.1: Installation parameters

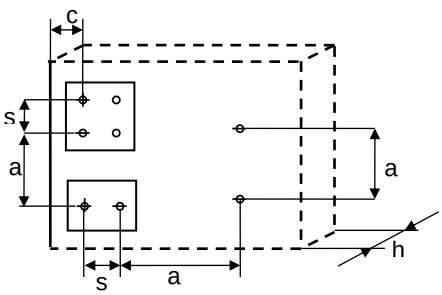
Anchor type				DuoPower ETA 8x40	DuoPower ETA 10x50
Nominal drill hole diameter	d_0	=	[mm]	8	10
Cutting diameter of drill bit	d_{cut}	≤	[mm]	8,45	10,45
Overall plastic anchor embedment depth in the base material[1)]	h_{nom}	=	[mm]	40	50
Depth of drill hole to deepest point[1)]	h_1	≥	[mm]	l_s - t_{fix} + 10	l_s - t_{fix} + 10
Diameter of clearance hole in the fixture	d_f	≤	[mm]	6,5	7,5

1) See Annex A 1.

Table B2.2: Minimum thickness of member, edge distances and spacing in concrete, base material group "a"

Anchor type	Embedment depth h_{nom} [mm]	Concrete strength class [-]	Minimum thickness of member h_{min} [mm]	Characteristic edge distance c_{cr} [mm]	Characteristic spacing s_{cr} [mm]	Minimum spacing and edge distances[1)] s_{min}, c_{min} [mm]
DuoPower ETA 8x40 with fischer PowerFast II	40	C12/15	150	80	25	s_{min}=70 for c ≥ 140 c_{min}=70 for s ≥ 140
		≥ C16/20		55	15	s_{min}=50 for c ≥ 100 c_{min}=50 for s ≥ 100
DuoPower ETA 8x40 with special screw	40	C12/15	150	130	70	s_{min}=70 for c ≥ 140 c_{min}=115 for s ≥ 230
		≥ C16/20		90	50	s_{min}=50 for c ≥ 100 c_{min}=80 for s ≥ 160
DuoPower ETA 10x50 with special screw	50	C12/15	150	115	70	s_{min}=70 for c ≥ 140 c_{min}=115 for s ≥ 230
		≥ C16/20		80	50	s_{min}=50 for c ≥ 100 c_{min}=80 for s ≥ 160

1) Intermediate values by linear interpolation.



Fixing points with a spacing a ≤ s_{cr} are considered as a group with a maximum characteristic resistance $N_{Rk,p}$ according to Table C2.1. For a spacing a > s_{cr} the anchors are considered as single anchors, each with a characteristic resistance $N_{Rk,p}$ according to Table C2.1.

Scheme of edge distances and spacing in concrete, base material group "a"

Figure not to scale

Table B3.1: Minimum thickness of member, edge distances and spacing in solid and hollow or perforated brick masonry – base material group "b" and "c"

Anchor type			DuoPower ETA 10x50
Screw type		[-]	special screw
Minimum thickness of member[1)]	h_{min}	[mm]	115
Minimum spacing between anchor groups and / or single anchors	a_{min}	[mm]	250
Single anchor			
Minimum edge distance	c_{min}	[mm]	80
Anchor group			
Minimum spacing perpendicular to free edge	$s_{1,min}$	[mm]	50
Minimum spacing parallel to free edge	$s_{2,min}$	[mm]	50
Minimum edge distance	c_{min}	[mm]	80

1) Member thickness in accordance to Annex C 3.

Scheme of edge distances and spacing in solid and hollow or perforated brick masonry, base material group "b" and "c"

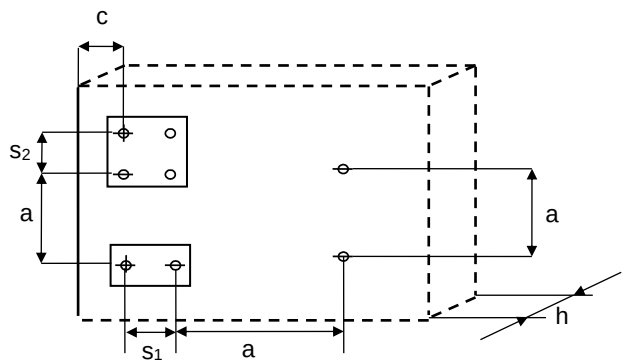


Figure not to scale

fischer universal plug DuoPower ETA

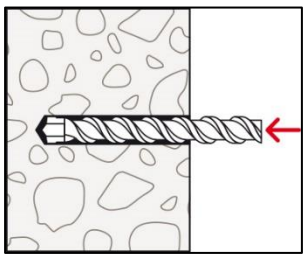
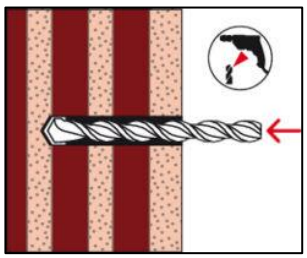
Intended use
Minimum thickness of member, edge distances and spacing for use in solid and hollow or perforated brick masonry

Annex B 3
Appendix 10 / 14

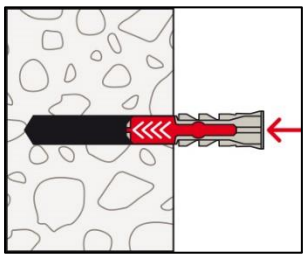
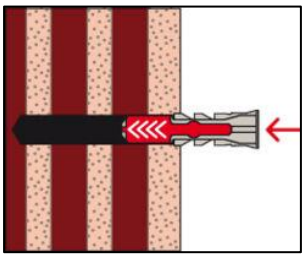
Installation instructions

The following pictures show a fastening by a timber fixture part, exemplarily on the substrate concrete for solid bricks and on the substrate perforated clay brick for hollow or perforated bricks – summary of all kind of base materials see Annex C 2 and C 3.

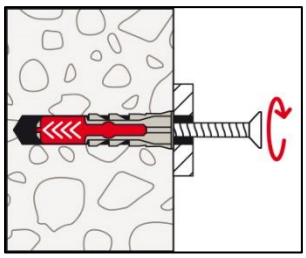
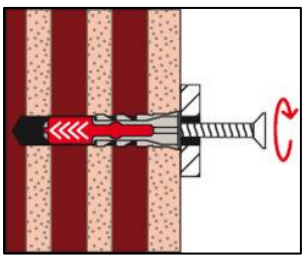
Concrete and solid bricks **hollow or perforated bricks**

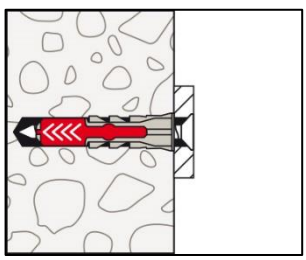
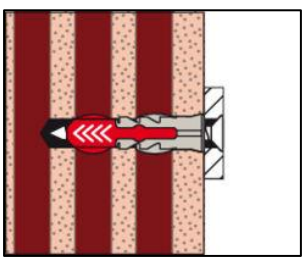
1. Drill the bore hole acc. to Table B 2.1 using the drilling method described in the corresponding Annex C 2 and C 3.

2. Insert anchor by using a hammer until the collar of the plastic sleeve is flush with the surface of the anchorage ground.

3. Attach fixture part and screw in the screw.
   The anchor is correctly mounted, when the head of the screw fits tight on the surface and cannot be screwed-in easily any further.

4. Correctly installed anchor.

Table C1.1: Characteristic resistance of the screw fischer PowerFast II

Failure of expansion element (fischer PowerFast II)			DuoPower ETA 8x40
			galvanised steel
Characteristic tension resistance	$N_{Rk,s}$	[kN]	**13,10**
Partial safety factor	γ_{Ms} 1)	[-]	**1,40**
Characteristic shear resistance	$V_{Rk,s}$	[kN]	**6,50**
Partial safety factor	γ_{Ms} 1)	[-]	**1,50**
Characteristic bending resistance of the screw			
Characteristic bending resistance	$M_{Rk,s}$	[Nm]	**8,20**
Partial safety factor	γ_{Ms} 1)	[-]	**1,50**

1) In absence of other national regulations.

Table C1.2: Characteristic resistance of the special screw

Failure of expansion element (special screw)			DuoPower ETA 8x40		DuoPower ETA 10x50	
			galvanised steel	stainless steel	galvanised steel	stainless steel
Characteristic tension resistance	$N_{Rk,s}$	[kN]	**14,80**	**14,30**	**21,70**	**21,70**
Partial safety factor	γ_{Ms} 1)	[-]	**1,50**	**1,55**	**1,55**	**1,55**
Characteristic shear resistance	$V_{Rk,s}$	[kN]	**7,40**	**7,10**	**10,80**	**10,80**
Partial safety factor	γ_{Ms} 1)	[-]	**1,25**	**1,29**	**1,29**	**1,29**
Characteristic bending resistance of the screw						
Characteristic bending resistance	$M_{Rk,s}$	[Nm]	**12,40**	**12,00**	**20,60**	**20,60**
Partial safety factor	γ_{Ms} 1)	[-]	**1,25**	**1,29**	**1,29**	**1,29**

1) In absence of other national regulations.

Table C2.1: Characteristic resistance[1)] due to pull-out failure for use in concrete, base material group "a"[2)]

Pull-out failure (plastic sleeve)			DuoPower ETA 8x40		DuoPower ETA 10x50
Screw type			fischer PowerFast II	special screw	special screw
Embedment depth h_{nom} [mm]			40	40	50
Concrete C12/15					
Characteristic tension resistance 24/40 °C	$N_{Rk,p}$	[kN]	**0,21**	**1,40**	**1,40**
Concrete ≥ C16/20					
Characteristic tension resistance 24/40 °C	$N_{Rk,p}$	[kN]	**0,30**	**2,00**	**2,00**
Partial safety factor	γ_{Mc}[3)]	[-]	**1,8**		

1) Polymer failure $N_{Rk,pol}$ and $V_{Rk,pol}$ not decisively.
2) Drilling method: hammer drilling.
3) In absence of other national regulations.

Table C2.2: Displacements under tension and shear loading in concrete

Displacements under			Tension load[1)]		Shear load[1)]	
Anchor type	h_{nom} [mm]	**F** [kN]	δ_{NO} [mm]	$\delta_{N\infty}$ [mm]	δ_{VO} [mm]	$\delta_{V\infty}$ [mm]
DuoPower ETA 8x40 with fischer PowerFast II	**40**	0,08	0,01	0,02	0,07	0,10
		0,12	0,01	0,02	0,10	0,15
DuoPower ETA 8x40 with special screw	**40**	0,56	0,09	0,15	0,47	0,70
		0,79	0,13	0,15	0,66	0,99
DuoPower ETA 10x50 with special screw	**50**	0,56	0,07	0,21	0,32	0,48
		0,79	0,10	0,21	0,45	0,68

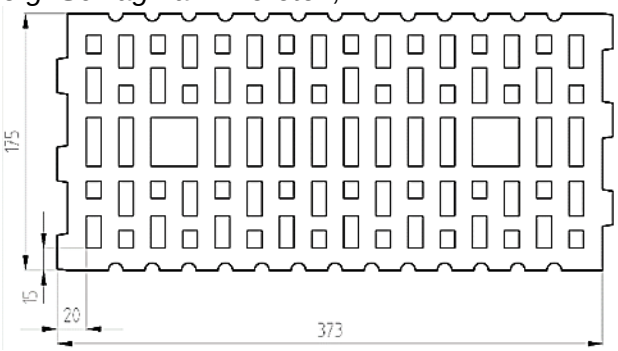
1) Intermediate values by linear interpolation.

Table C2.3: Displacements under tension and shear loading in solid and hollow or perforated bricks

Displacements under				Tension load[1)]		Shear load[1)]	
Anchor type	h_{nom} [mm]	**Base material**	**F** [kN]	δ_{NO} [mm]	$\delta_{N\infty}$ [mm]	δ_{VO} [mm]	$\delta_{V\infty}$ [mm]
DuoPower ETA 10x50 with special screw	**50**	Clay brick Mz; $\rho \geq 2{,}0$ as per EN 771-1	0,40	0,05	0,21	0,23	0,34
			0,71	0,09	0,21	0,41	0,61
		Calcium silicate solid brick KS; $\rho \geq 2{,}0$ as per EN 771-2	0,60	0,07	0,21	0,34	0,52
			0,86	0,10	0,21	0,49	0,74
		Perforated clay brick Hlz; $\rho \geq 1{,}0$ as per EN 771-1	0,17	0,06	0,21	0,10	0,15
			0,21	0,07	0,21	0,12	0,18

1) Intermediate values by linear interpolation.

Table C3.1: Characteristic resistance F_{Rk} in [kN] for use in solid and hollow or perforated bricks, base material group "b"[1] and "c"[2]

Base material; **bulk densitity [kg/dm³]** *[Supplier Title, country]* Geometry, DF or nominal size L x B x H [mm] and drilling method	Mean compressive strength as per EN 771/ Minimum compressive strength single brick[3] [N/mm²]	Characteristic resistance F_{Rk} [kN] Temperature range 24/40 °C DuoPower ETA 10x50 with special screw h_{nom} [mm] = 50
Clay brick Mz; ρ ≥ 2,0 as per EN 771-1 *e.g. Helfer, DE* **NF** (240x115x71) Hammer drilling	12,5/10	**1,40**
	15/12	**1,40**
	20/16	**2,00**
	25/20	**2,50**
Calcium silicate solid brick KS; ρ ≥ 2,0 as per EN 771-2 *e.g. Bayer, DE* **2 DF** (240x115x113) Hammer drilling	10/8	**2,10 / 2,45[5]**
	12,5/10	**2,10 / 2,45[5]**
	15/12	**2,10 / 2,45[5]**
	16,7/-	**3,00 / 3,50[5]**
Perforated clay brick Hlz; ρ ≥ 1,2 as per EN 771-1 *e.g. Schlagmann Poroton, DE*  **9 DF** (373x175x249) Rotary drilling	12,5/10	**0,60**
	15/12	**0,75**
Partial safety factor	γ_{Mm}[2] [-]	**2,5**

1) Vertically perforation ≤ 15%; cross section reduced by perforation vertically to the resting area.
2) Vertically perforation > 15 % and ≤ 50 %, cross section reduced by perforation vertically to the resting area.
3) The compressive strength of the single brick must not be less than 80% of the mean compressive strength.
4) In absence of other national regulations.
5) Only valid for c_{1min} ≥ 110 mm and c_{2min} ≥ 165 mm (c_{1min} can be perpendicular as well as parallel to the vertical edge; $c_{1min} \perp c_{2min}$).