Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment

ETA-05/0266 of 20 February 2017

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	fischer-Zykon-panel anchor FZP(-W)
Product family to which the construction product belongs	Fastener for the rear fixing of façade panels made of selected natural stones according to EN 1469:2015
Manufacturer	fischerwerke GmbH & Co. KG Klaus-Fischer-Straße 1 72178 Waldachtal DEUTSCHLAND
Manufacturing plant	fischerwerke
This European Technical Assessment contains	16 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 330030-00-0601

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Specific Part

1 Technical description of the product

The fischer-Zykon-panel anchor FZP (-W) is a special anchor of sizes M6 and M8 which consists of a cone bolt (with external thread or internal thread), an expansion ring (with three (FZP) or four (FZP-W) convolutions), a sleeve and, if need be, a nut. Cone bolt and expansion ring are made of stainless steel. The sleeve is made of stainless steel or carbon-fiber-reinforced polymer (CFRP). The nut SW 19 is made of stainless steel or aluminium. The anchor is put into an undercut drill hole and by driving-in of the sleeve it is placed form-fit.

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 anchor 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 anchors 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
Characteristic resistance for tension and shear loads	See Annex C 1
Anchor distances and spacing	See Annex C 1

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	No performance assessed

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

In accordance with EAD No. 330030-00-0601 the applicable European legal act is: [97/161/EG].

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.

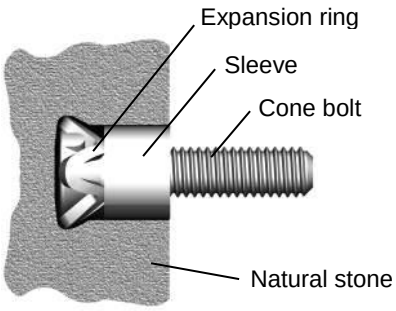
Issued in Berlin on 20 February 2017 by Deutsches Institut für Bautechnik

Dipl.-Ing. Andreas Kummerow
p. p. Head of Department

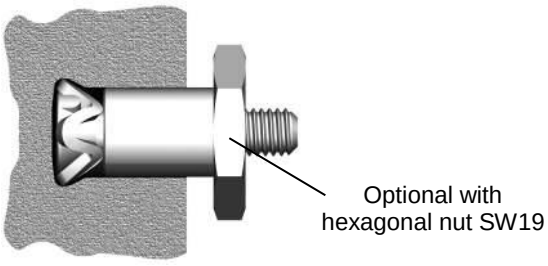
beglaubigt:
Aksünger

Deutsches Institut für Bautechnik DIBt

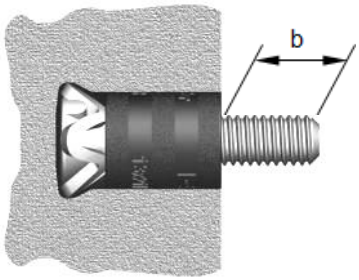
Type of mounting



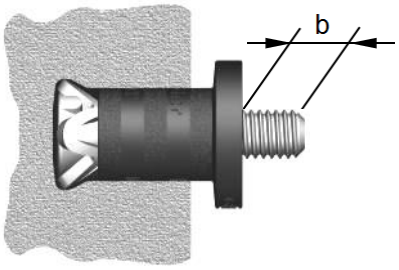
Flush fixing (steel sleeve)



Stand-off fixing (steel sleeve)



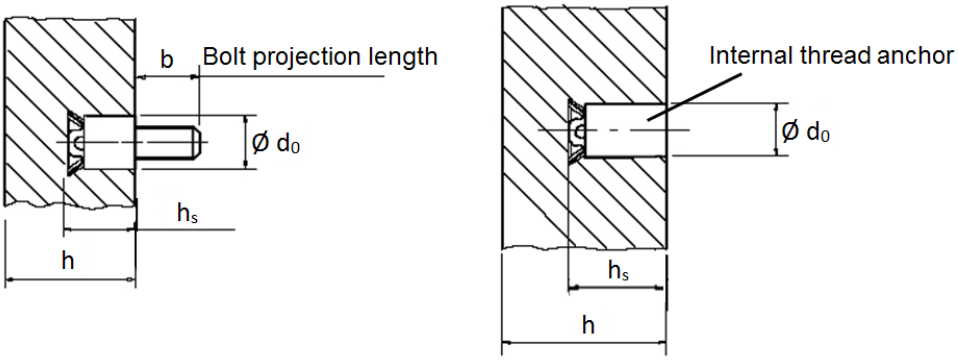
Flush fixing (carbonfibre sleeve)



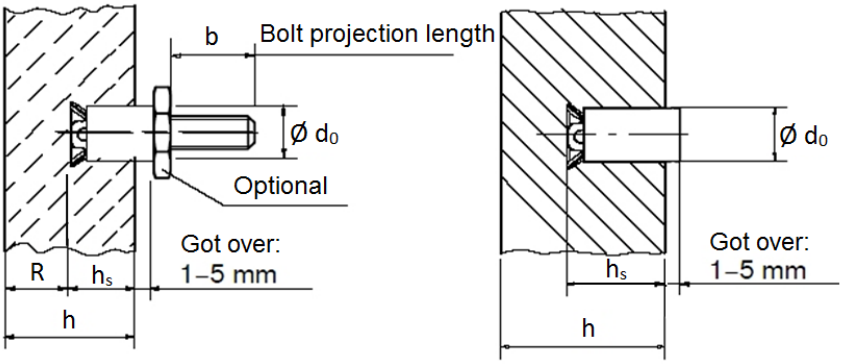
Stand-off fixing (carbonfibre sleeve)

Definition of dimensions

Flush fixing



Stand-off fixing



For FZP: anchoring depth hv = drill hole depth h1 = embedment depth hs

fischer Zykon panel anchor FZP (-W)	Annex A 1
Product description Product and built-in state	

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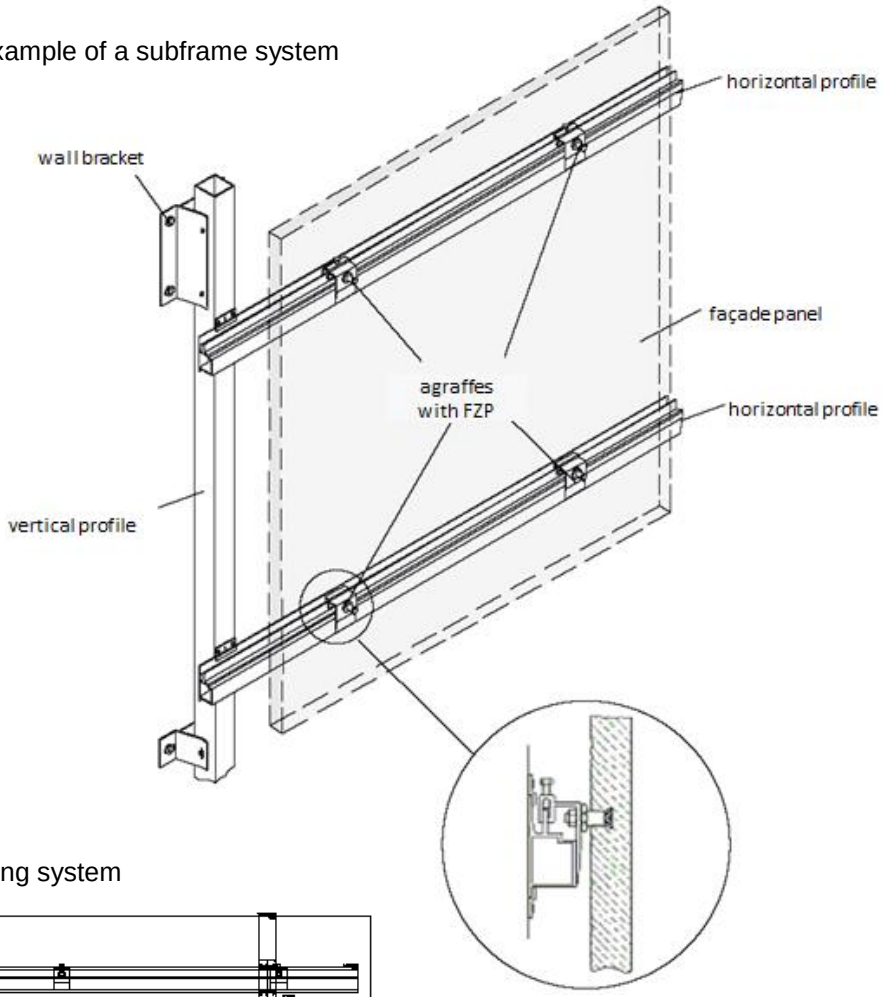
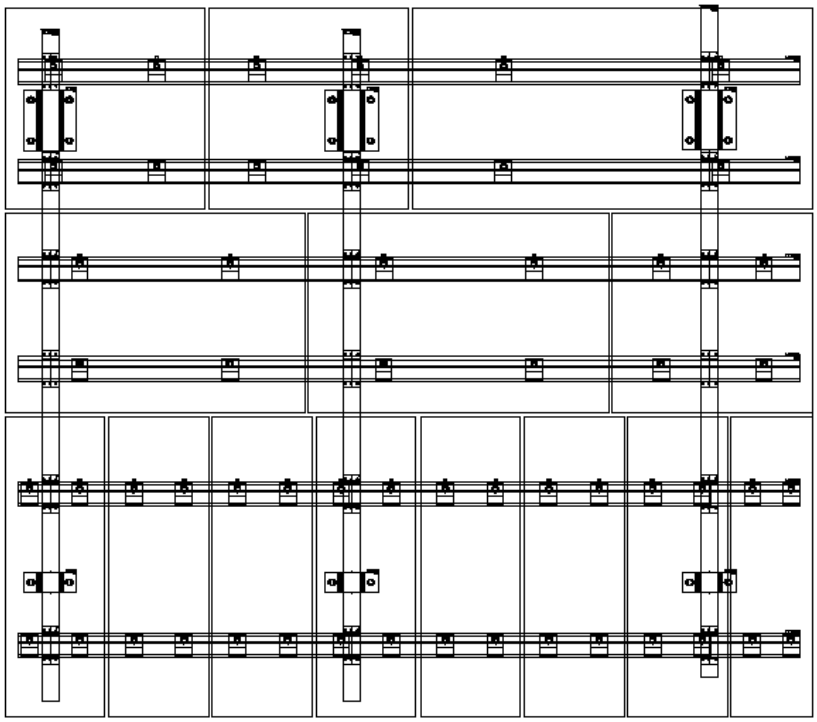
Example of substructure and fixing of the panel

Example of a subframe system



Example of a typical bearing system



fischer Zykon panel anchor FZP (-W)

Product description
Example of substructure and fixing of the panel

Annex A 2

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Cone bolt

External thread
M6 or M8

Optional hexagonal nut SW19
for stand-off fixing

Internal thread
M6 or M8

Option:
Anti rotation lock
(Nose) or frontal elevation

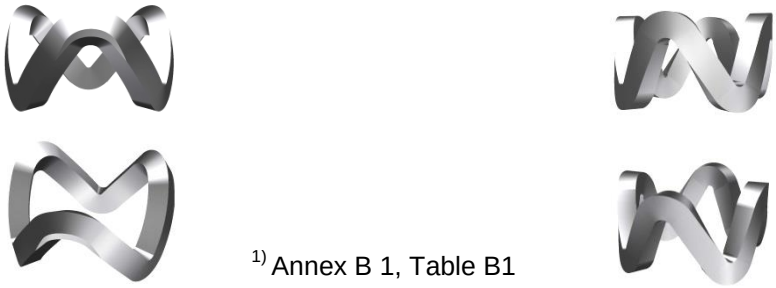
Drive optional, e.g.
slot,
hexagon socket,
external hexagon,
spanner flats

Marking:
Stainless steel = A4
Aluminum = Al

Expansion ring

3 convolutions (FZP)
for stone group I to IV[1)]

4 convolutions (FZP-W)
for stone group III to IV[1)]



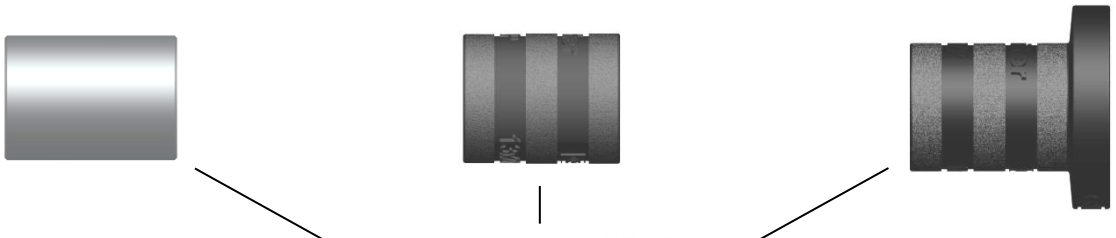
[1)] Annex B 1, Table B1

Sleeve

Stainless steel A4

Carbonfibre (flush fixing)

Carbonfibre (stand-off fixing)



Type designation e.g. FZP

Table A1: Material of anchor Parts

Anchor parts	**Material**
Cone bolt	Stainless steel, EN 10088 :2014
Expansion ring	Stainless steel, EN 10088 :2014
Sleeve	Stainless steel, EN 10088 :2014
Carbonsleeve	Polyamide 6.6 CF
Hexagonal nut SW19	Aluminum, EN 755 :2016 Stainless steel, EN 10088 :2014

fischer Zykon panel anchor FZP (-W)

Annex A 3

Product description
Parts of anchor and material

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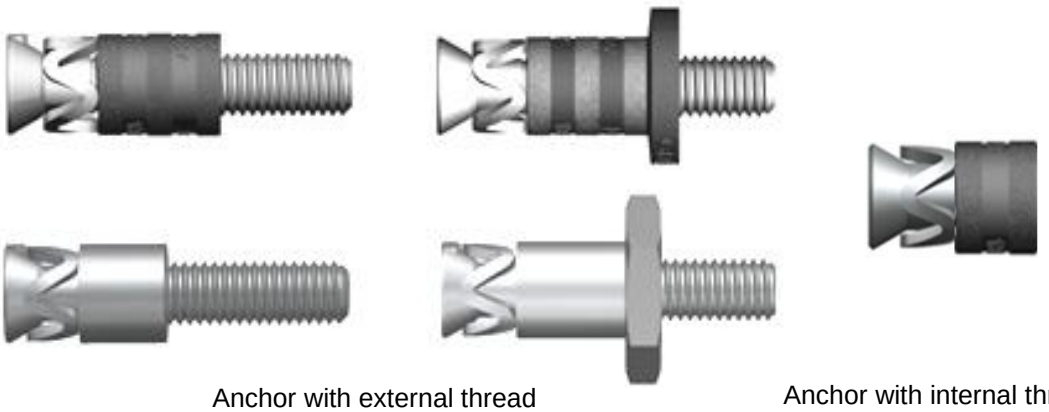
Type of anchor



Anchor with external thread

Anchor with internal thread [1)]

[1)] For the anchor with internal thread only a fixing screw of size M6 or M8 made of stainless steel 1.4401 or 1.4571 EN ISO 10088-3 with a minimum strength class 70 according to EN ISO 3506-1 (f_{uk} = 700 N / mm², f_{yk} = 450 N / mm²) can be used.

Identification system

FZP 13x24 M8 W / SO / 14 Al

- Hexagonal nut material SW19
- Bolt projection length **b**
- **S**tand-**o**ff fixing
- With 4 convolutions
- Thread diameter
- Drill hole depth $\mathbf{h_v}$ (for FZP $h_v = h_1 = h_s$)
- Cylindrical drill hole ∅ $\mathbf{d_0}$
- **F**ischer **Z**ykon **P**anel anchor
  (Drill hole geometry: cylindrical conical)

fischer Zykon panel anchor FZP (-W)	Annex A 4
Product description Type of anchor and Identification system	

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Specifications of intended use

Anchorages subject to:

- Static and quasi-static loads.

Base materials:

- Natural stone facade panels according to EN 1469: 2015
- The used material is free of crevices and mechanically effective cracks and alterations.
- Natural stone panels of natural stone groups in accordance with Table B1.
- Characteristic values of the panels correspond to Table B2.

Table B1: Natural stone groups

Group of stone		Natural stones	Boundary conditions
I	High-quality intrusive rocks (plutonic rocks)	granite, granitite, syenite, tonalite, diorite, monzonite, gabbro, other magmatic plutonic rocks	None
II	Metamorphic rocks with "hard stone character“	quarzite, granulite, gneiss, migmatite	None
III	High-quality extrusive rocks (volcanic rocks)	basalt and basaltlava without harmful ingredients (like sun burner basalt)	Density: Basalt: ρ ≥ 2,7 kg/dm³ Basaltlava ρ ≥ 2,2 kg/dm³
IV	Sedimentary rocks with "hard stone character" [1)]	sandstone and limestone	Sandstone ρ ≥ 2.1 kg/dm³

[1)] For façade panels made of natural stones with planes of anisotropy, the difference between the bending strenghts determined parallel to the planesof anisotropy and perpendicular to the edges of the planes of anisotropy schall not be more than about 50%.

Table B2: Characteristic values of anchors and façade and reveal panels made of nature stones

Façade panel			
Panel thickness		h_{nom} [mm]	20 (30) [1)] ≤ h_{nom} ≤ 70
Maximum size of panel		A ≤ [m²]	3,0
Maximum side length		H (l_x) or L (l_y) ≤ [m]	3,0
Number of anchors in rectangular arrangement		[-]	4
Anchorage depth [2)]		h_s = [mm]	12 ≤ h_s ≤ 40
Nominal diameter of drill hole		M6 ∅ d_0 = [mm]	11
		M8 ∅ d_0 = [mm]	13
Edge distance		a_{rx} bzw. a_{ry} ≥ [mm]	50 mm ≤ a_{rx} or a_{ry} = 0,25 l_x or 0,25 l_y
Edge distance at reveal panel		a_{rxL} bzw. a_{ryL} ≥ [mm]	40 mm ≤ a_{rxL} or a_{ryL} = 0,2 l_{xL} or 0,2 l_{yL}
Spacing		a ≥ [mm]	8 h_s
Remaining wall thickness [3)]		R ≥ [mm]	0,4 h_{nom}
Bending strength	Dakar; Colatina, Espirito Santo	$\sigma_{5\%}$ ≥ [N/mm²]	9,2
	Onur; Antalya	$\sigma_{5\%}$ ≥ [N/mm²]	4,8

[1)] For sandstone, limestone and basalt lava: plate thickness h_{nom} ≥ 30 mm, if the expected minimum value (5% fractile) of the bending tensile strength guaranteed by the panel manufacturer is <8 N / mm²

[2)] $h_s = (h_1) = (h_v)$ in 1 mm steps only (12, 13, 14 mm ... 40 mm) - tolerances see Annex B 3, Table B4, footnote [3)]

[3)] Only for stand-off fixing

fischer Zykon panel anchor FZP (-W)	Annex B 1
Intended use Specifications	

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Use conditions (Environmental conditions):

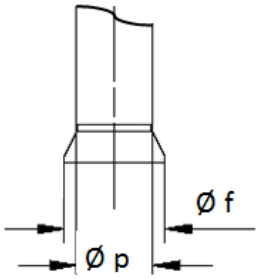
- Structures subject to dry internal conditions.
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist.
  Note: Particular aggressive conditions are e.g. permanent, alternating 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).

Installation:

- The drillings are done at the factory or on site under workshop conditions; when making the drillings on site the execution is supervised by the responsible project supervisor or a skilled representative of the project supervisor.
- Making of the undercut drilling is done with a special drill bit according to Annex B 3 and a special drilling device in accordance with the information deposited with Deutsches Institut für Bautechnik.
- The drilling residues are removed from the drill hole.
- In case of aborted drill hole: new drilling at a minimum distance away of twice the depth of the aborted hole.
- The geometry of the drill hole is checked on 1 % of all drillings. The following dimensions shall be checked and documented according to manufacturer's information and testing instructions by means of a measuring device according to Annex B 4:
  - Diameter of the cylindrical drill hole
  - Diameter of the undercut
  - Remaining wall thickness (drill hole depth and panel thickness respectively)
- If the tolerances are exceeded, the geometry of the drill hole shall be checked on 25 % of the drillings performed. No further drill hole may exceed the tolerances otherwise all the drill holes shall be controlled. Drilling holes falling below or exceeding the tolerances shall be rejected.
  Note: Checking the geometry of the drill hole on 1 % of all drillings means that on one of the 25 panels (this corresponds to 100 drillings) one drilling shall be checked. If the tolerances given in Annex B 3 are exceeded the extent of the control shall be increase to 25 % of the drillings, i.e. one drilling each shall be checked on all the 25 panels.
- During transport and storage on site the façade panels are protected from damages; the façade panels are not to be hung up jerkily (if need be lifters shall be used for hanging up the façade panels); façade panels and reveal panels respectively with incipient cracks are not be installed.
- The anchors are installed in a deformation controlled manner. For this purpose suitable installation tools per Annex B 4 shall be used. The anchor is set correctly if, the bolt projection "b" as per Annex A 1 and Annex A 4 according to Annex B 7 figure 5 is observed. When flush fixing, the sleeve must not project beyond the surface of the plate.

fischer Zykon panel anchor FZP (-W)	Annex B 2
Intended use Specifications	

Drill bit



Dimensions of drill hole

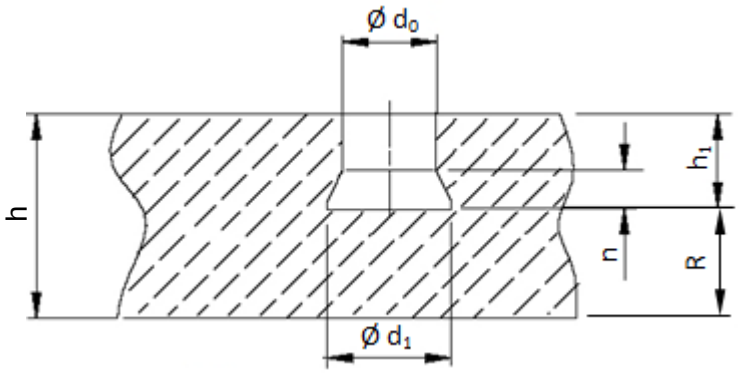


Table B3: Dimensions [mm] of drill bit

Drill bits [1]		
Type	∅ p	∅ f
FZPB 9	5,8	9
FZPB 11	7,8	11
FZPB 13	9,8	13

[1] Drill bit for different drill methods

Table B4: Assignment of drill bits and dimensions [mm] of drill hole

Drill hole					
Drill bit	∅ d_0 [2]	∅ d_1 [2]	n	h_1 [3]	R [4]
FZPB 9 FZPB 11	$11^{+0,4}_{-0,2}$	13,5 ±0,3	≈ 4	$12 \le h_1 \le 40$	≥ 0,4 h
FZPB 11 FZPB 13	$13^{+0,4}_{-0,2}$	15,5 ±0,3			

[2] Measurements can be proved by diameter or volume gauge (Annex B 4)

[3] Tolerances for flush fixing: $h_1 = h_v {}^{+0,4}_{-0,1}$

[4] Only for stand-off fixing

fischer Zykon panel anchor FZP (-W)	Annex B 3
Intended use Drill bit, geometry of the drill hole and installation parameters	

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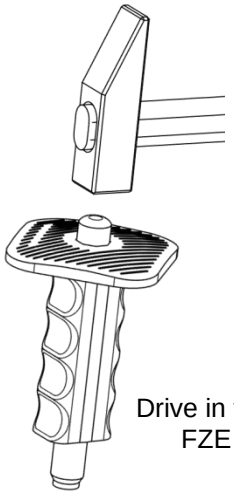
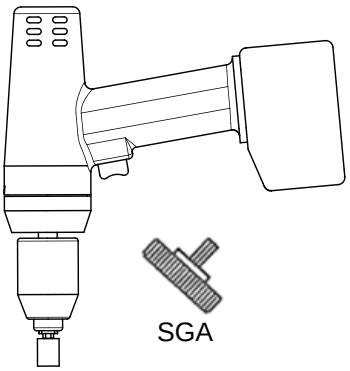
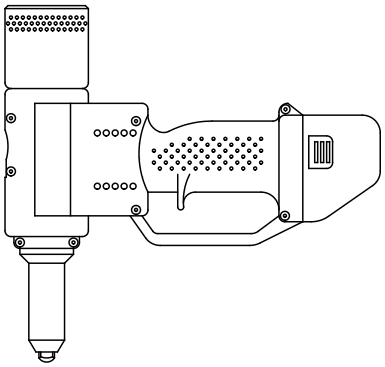
Setting tools



Drive in tool FZE

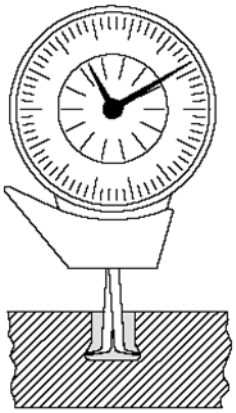


Cordless screwdriver with setting tool, e.g. SGA

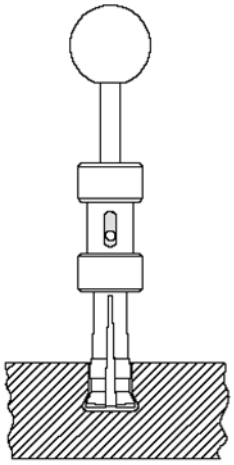


Battery-setting tool SGB

Testing equipment for checking the undercut ∅ d_1

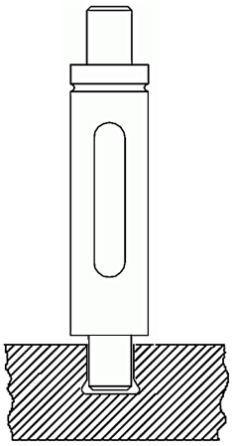


Internal quicktest



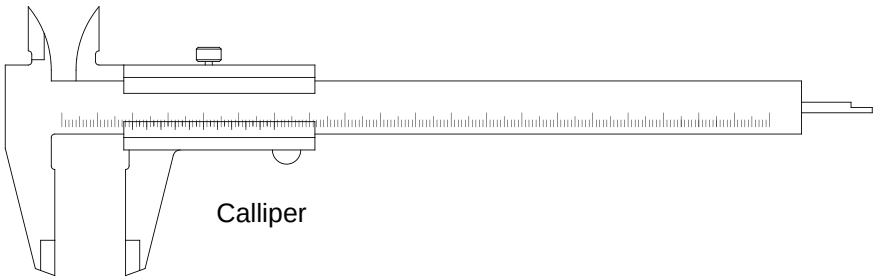
Undercut minimum volume gauge (HVL)

Go / no Go gauge for checking cylindrical drill hole diameter ∅ d_0



Diameter gauge (DPL

Depth measurement h_v



Calliper

fischer Zykon panel anchor FZP (-W)	Annex B 4
Intended use Setting devices and testing equipment	

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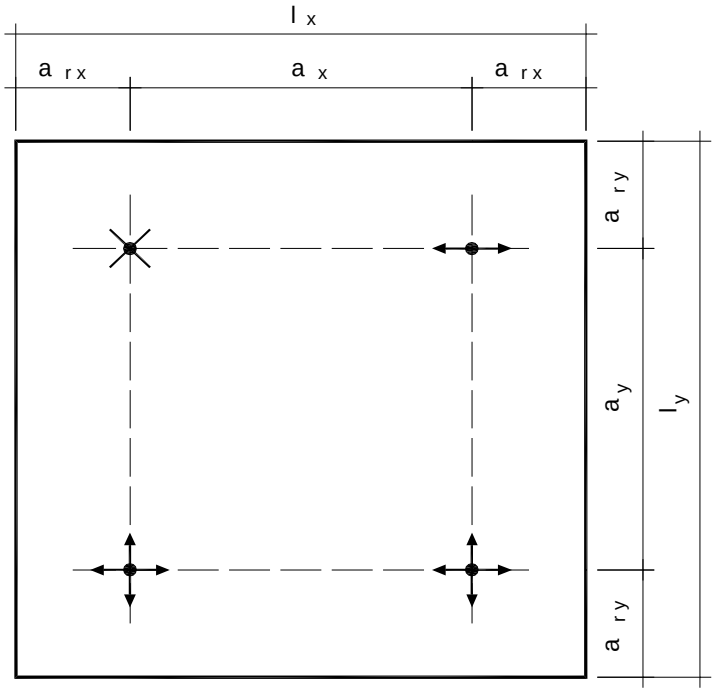
Definition of edge distances and spacing



Caption:

a_{rx}, a_{ry}	=	Edge distance – anchor distance to the panel edge
a_x, a_y	=	Spacing – Distance between the anchors
l_x	=	Length of the panel in horizontal direction
l_y	=	Length of the panel in vertical direction
	=	Fixed bearing (fixed support)
	=	Horizontal slide bearing (slide support)
	=	Horizontal and vertical slide bearing (slide support)

fischer Zykon panel anchor FZP (-W)	Annex B 5
Intended use Supports – Definition of edge distances and spacing	

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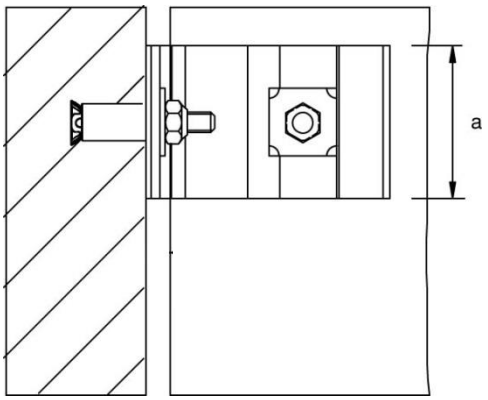
Reveal angle

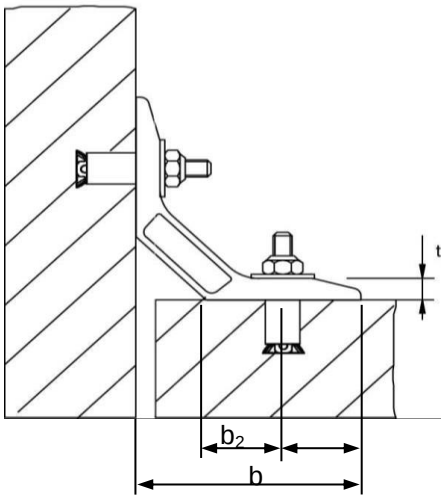
As a rule reveal panels are fastened to the façade panel with two reveal supports and mounted with anchors by flush fixing; it is ensured that the reveal angles are resting against to the panel; When using a reveal angle with oblong holes, a defined load transfer (e.g. claw washer or opposite toothing of the washer to the angle surface) in the direction of the elongated hole must ensure.

Table B4: Characteristic values of the reveal angles

		Stainless Steel 1.4401 or 1.4571 EN 10088-3	Aluminum EN 755-1
Angle thickness	t [mm]	$t \geq 4$	$t \geq 5$
Angle width	a [mm]	$40 \leq a \leq 100$	$40 \leq a \leq 100$
Angle length	b [mm]	$65 \leq b \leq 20\ t$	$65 \leq b \leq 16\ t$
Distance between the centre of anchor to outer edge of reveal angle	b_1 [mm]	$25 \leq b_1 \leq 10\ t$	$25 \leq b_1 \leq 8\ t$
Distance between the centre of anchor to inner edge of reveal angle	b_2 [mm]	$40 \leq b_2 \leq 10\ t$	$40 \leq b_2 \leq 8\ t$
Cross tension stiffness	c_q [MN/m]	$c_q \leq 2{,}5$	

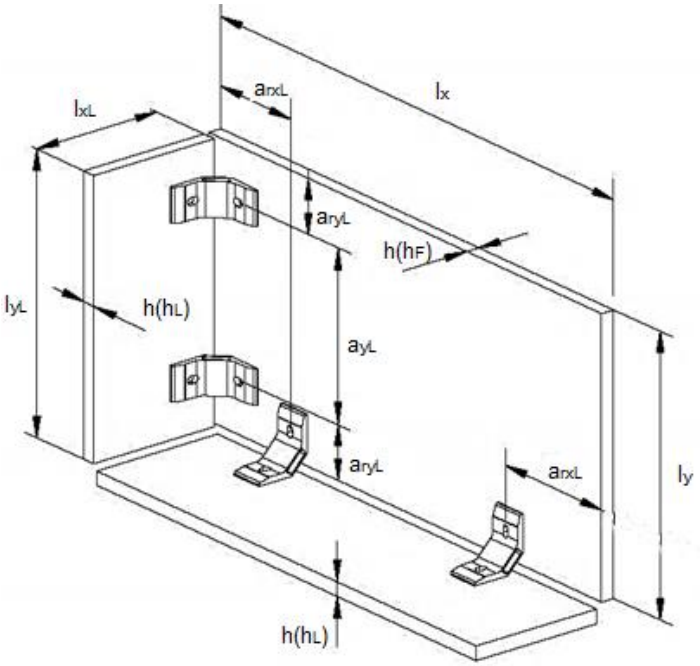
Denominations of dimensions





e.g. reveal angle fischer LW 50

t = 8 mm
a = 50 mm
b = 80 mm
b_1 = 30 mm
b_2 = 25 mm



fischer Zykon panel anchor FZP (-W)

Intended use
Reveal angle

Annex B 6

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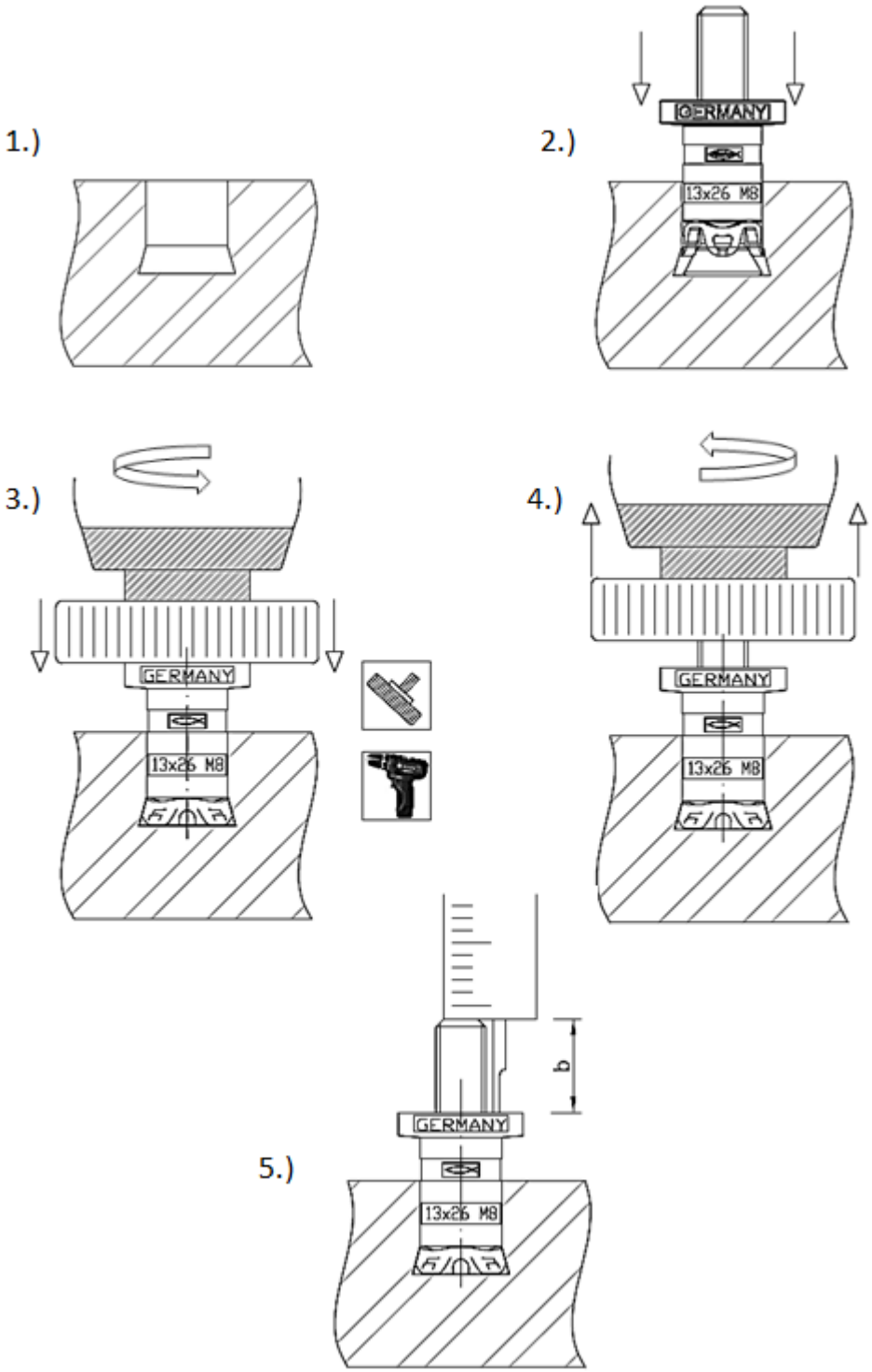
Installation instructions
e.g. installation with setting adapter SGA



fischer Zykon panel anchor FZP (-W)	Annex B 7
Intended use Installation instructions	

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Characteristic load capacities of the anchor

Table C1: Characteristic values of anchors for façade panels and reveal panels

Naturstein			Dakar; Colatina, Espirito Santo; Brazil [1)]	Onur; Antalya; Turkey[1)]
Anchorage depth	h_s =	[mm]	15	17
Edge distance	$a_r \geq$	[mm]	100	100
Spacing	$a \geq$	[mm]	120	136
Characteristic tension load	N_{Rk} [1)] =	[kN]	7,6	3,1
Characteristic sher load	V_{Rk} [1)] =	[kN]	5,0	3,0

[1)] According to Table B2, for different natural stones the load capacities may be determined as follows:

$N_{Rk} = N_{u,5\%} \bullet \alpha_{exp}$

$V_{Rk} = V_{u,5\%} \bullet \alpha_{exp}$

mit:

$\alpha_{exp} = 1,0$ Natural stone group I and II

$\alpha_{exp} = 1,25 \bullet \frac{\sigma_{um,exp}}{\sigma_{um}} \leq 1,0$ Natural stone group III and IV

$N_{u,5\%}$ and $V_{u,5\%}$, $\sigma_{um,exp}$ and σ_{um} according to EAD 330030-00-0601, Annex A