

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

**ETA-04/0095  
of 21 July 2023**

English translation prepared by DIBt - Original version in German language

### General Part

Technical Assessment Body issuing the  
European Technical Assessment:

Trade name of the construction product

Product family  
to which the construction product belongs

Manufacturer

Manufacturing plant

This European Technical Assessment  
contains

This European Technical Assessment is  
issued in accordance with Regulation (EU)  
No 305/2011, on the basis of

This version replaces

Deutsches Institut für Bautechnik

Injection System W-VIZ

Bonded fastener for use in concrete

Adolf Würth GmbH & Co. KG  
Reinhold Würth Straße 12-17  
74653 Künzelsau

Werk 1 Werk 3

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

330499-01-0601, Edition 04/2020

ETA-04/0095 issued on 11 May 2017

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## Specific Part

### 1 Technical description of the product

The Injection System V-WIZ is a torque controlled bonded fastener consisting of a cartridge with injection mortar WIT-VIZ, WIT-VIZ EXPRESS, WIT-VM 100 or WIT-EXPRESS and an anchor rod with expansion cones and external connection thread (type W-VIZ-A) or with internal connection thread (type W-V-Z-IG).

The load transfer is realised by mechanical interlock of several cones in the bonding mortar and then via a combination of bonding and friction forces in the anchorage ground (concrete).

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
Characteristic resistance to tension load (static and quasi-static loading)	See Annex C1 – C3, C10, B5 – B6
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C4 – C5, C11
Displacements under short-term and long-term loading	See Annex C8 – C9, C11
Characteristic resistance and displacements for seismic performance categories C1 and C2	See Annex C6 – C9

#### 3.2 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Content, emission and/or release of dangerous substances	No performance assessed

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

In accordance with EAD 330499-01-0601 the applicable European legal act is: [96/582/EC]

The system to be applied is: 1

**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 at Deutsches Institut für Bautechnik.

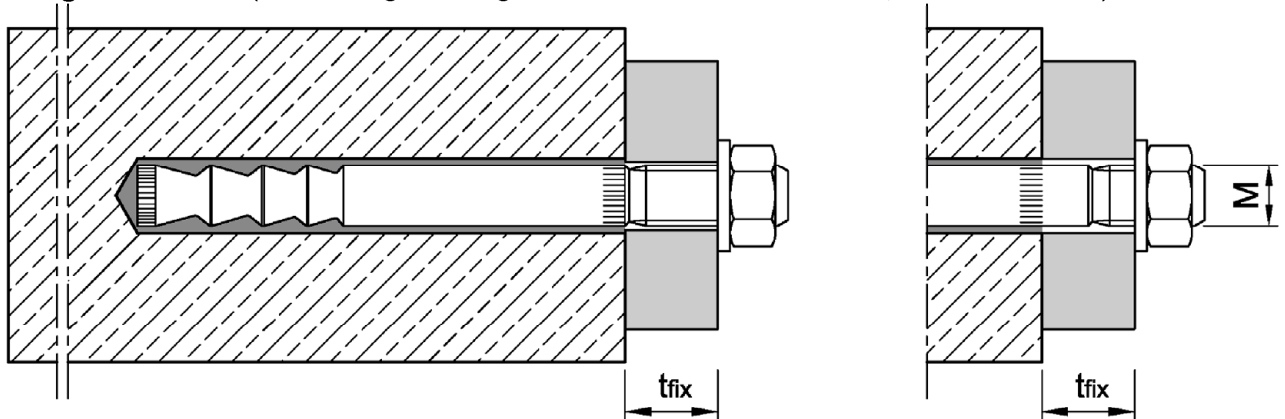
Issued in Berlin on 21 July 2023 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock  
Head of Section

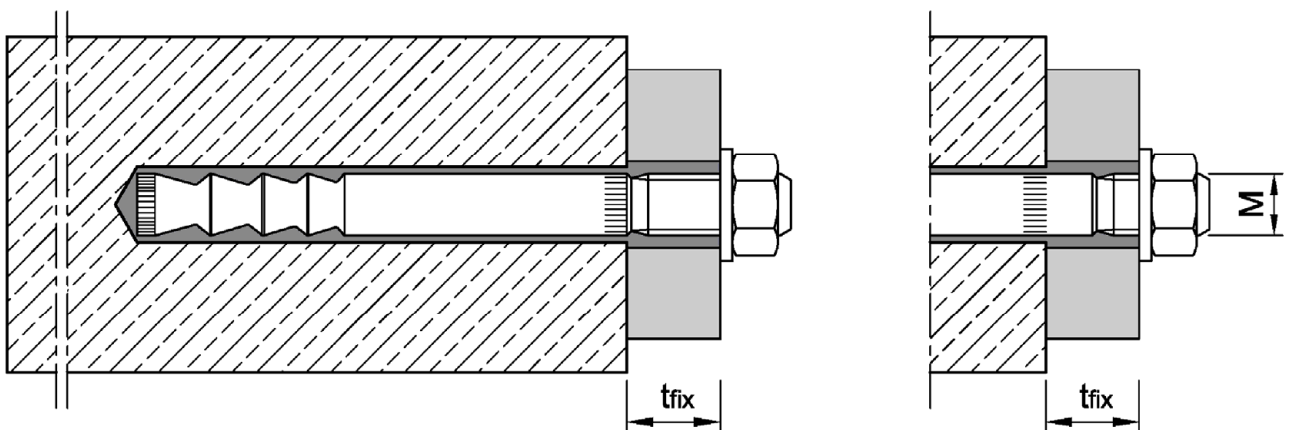
*beglaubigt:*  
Baderschneider

## Anchor rod W-VIZ-A

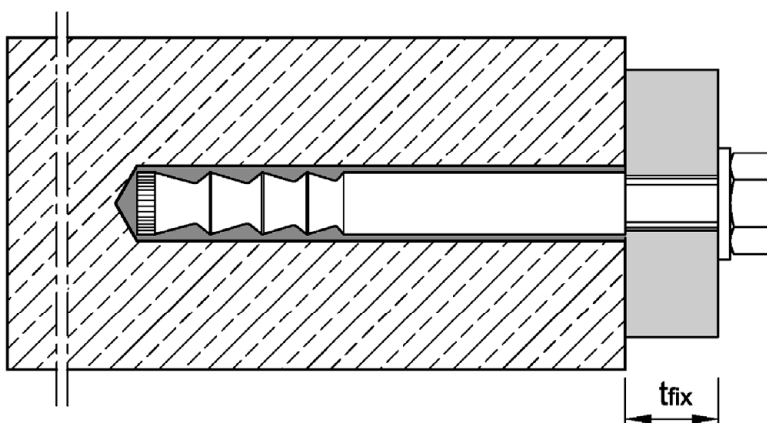
**Pre-setting installation** (and through-setting installation W-VIZ-A 75 M12, see Annex B11)



**Through-setting installation**



**Anchor rod W-VIZ-IG with internal thread<sup>1)</sup>**



<sup>1)</sup> Illustration with hexagon head screw exemplified; other screws or threaded rods also permitted (see Annex A5, requirements of the fastening screw or threaded rod).

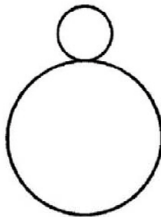
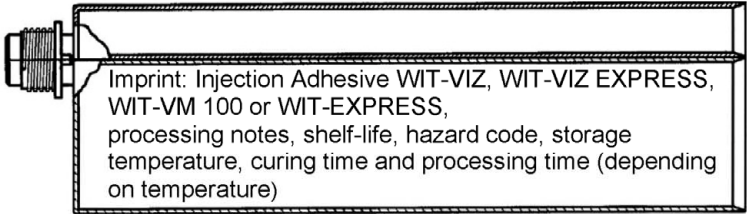
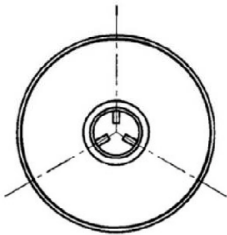
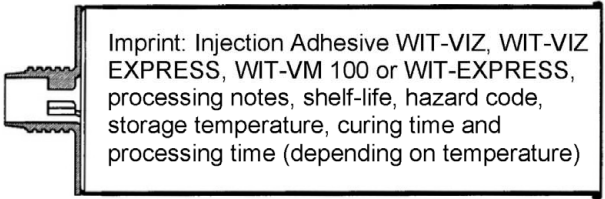
**Injection System W-VIZ**

**Product description**  
Installation situation

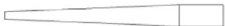
**Annex A1**

Injection System W-VIZ

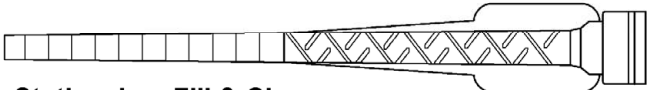
Mortar cartridge



Sealing cap



Reducing adapter



Static mixer Fill & Clean



Blow-out pump



Air Blower

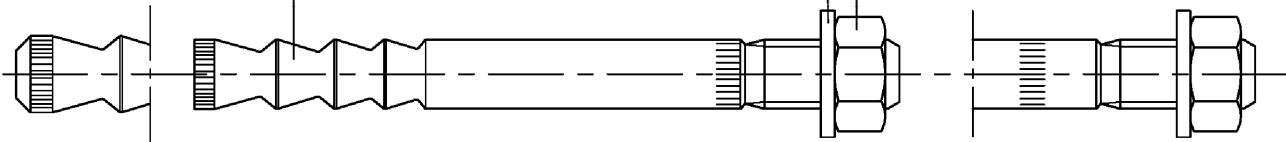
Cleaning Brush WIT-RMB



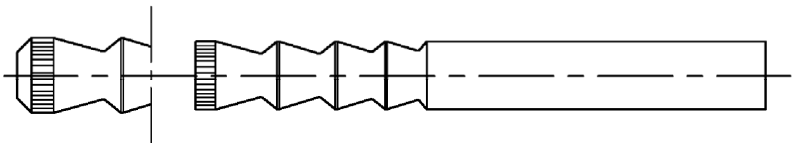
Anchor rod W-VIZ-A

Washer  
(optional: washer with bore)

Hexagon nut



Anchor rod W-VIZ-IG



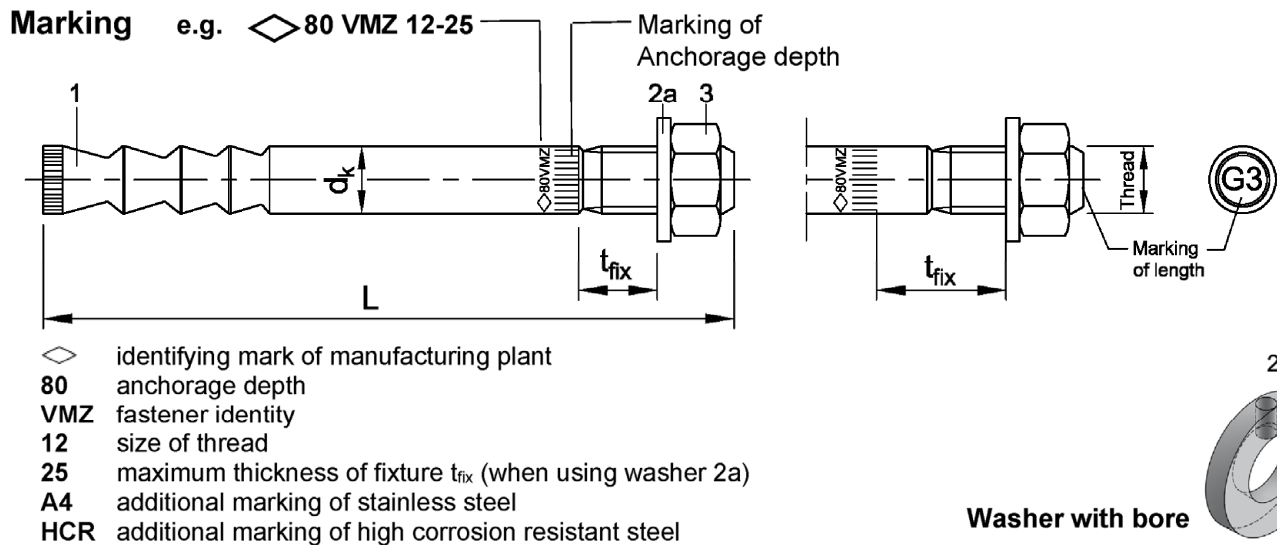
Injection System W-VIZ

Product description  
Cartridges, Cleaning tools, Anchor types

Annex A2

Table A1: Materials W-VIZ-A

Part	Designation	Steel, zinc plated			Stainless steel A4 (CRC III)	High corrosion resistant steel HCR (CRC V)
		galvanised ≥ 5µm	hot-dip galvanised ≥ 40µm (50µm in average)	sherardized ≥ 45µm		
1	Anchor rod	Steel acc. to EN ISO 683-1:2018			Stainless steel, 1.4401, 1.4404, 1.4571, EN 10088:2014, coated	High corrosion resistant steel 1.4529, 1.4565 EN 10088:2014, coated
		galvanised and coated	hot-dip galvanised and coated	sherardized and coated		
2a	Washer	Steel, zinc plated			Stainless steel, EN 10088:2014	High corrosion resistant steel 1.4529, 1.4565 EN 10088:2014
2b	Washer with bore					
3	Hexagon nut	Property class 8 acc. to EN ISO 898-2:2012			EN ISO 3506-2: 2020, A4-70, A4-80 1.4401, 1.4571 EN 10088:2014	EN ISO 3506-2:2020, Property class 70, high corrosion resistant steel 1.4529, 1.4565 EN 10088:2014
		galvanised	hot-dip galvanised	sherardized or hot-dip galvanised		
4	Mortar cartridge	Vinylester resin, styrene free, mixing ratio 1:10				



Marking of length		B	C	D	E	F	G	H	I	J	K	L	M	N
Length of anchor	min ≥	50,8	63,5	76,2	88,9	101,6	114,3	127,0	139,7	152,4	165,1	177,8	190,5	203,2
	max <	63,5	76,2	88,9	101,6	114,3	127,0	139,7	152,4	165,1	177,8	190,5	203,2	215,9
Marking of length		O	P	Q	R	S	T	U	V	W	X	Y	Z	>Z
Length of anchor	min ≥	215,9	228,6	241,3	254,0	279,4	304,8	330,2	355,6	381,0	406,4	431,8	457,2	482,6
	max <	228,6	241,3	254,0	279,4	304,8	330,2	355,6	381,0	406,4	431,8	457,2	482,6	

## Injection System W-VIZ

### Product description

W-VIZ-A: Materials, Marking, Marking of length

Annex A3

**Table A2: Dimensions of anchor rod, W-VIZ-A M8 – M12**

Anchor size W-VIZ-A		40 M8	50 M8	60 M10	75 M10	75 M12	70 M12	80 M12	95 M12	100 M12	110 M12	125 M12
Additional marking		1	2	1	2	1	2	3	4	5	6	7
1	Thread	M8		M10		M12						
	Number of cones	2	3	3	3	3	3	4	4	6	6	6
	$d_k =$	8,0	8,0	9,7	9,7	10,7	12,5	12,5	12,5	12,5	12,5	12,5
	Length L (with washer 2a)	$52+t_{fix}$	$63+t_{fix}$	$75+t_{fix}$	$90+t_{fix}$	$95+t_{fix}$	$90+t_{fix}$	$100+t_{fix}$	$115+t_{fix}$	$120+t_{fix}$	$130+t_{fix}$	$145+t_{fix}$
	Reduction $t_{fix}^{1)}$ (with washer with bore 2b)	3,4	3,4	3	3	2,5	2,5	2,5	2,5	2,5	2,5	2,5
3	Hexagon nut SW	13	13	17	17	19	19	19	19	19	19	19

<sup>1)</sup> When using washer with bore (2b) the thickness of fixture is reduced by the specified value.

Dimensions in mm

**Table A3: Dimensions of anchor rod, W-VIZ-A M16 – M24**

Anchor size W-VIZ-A		90 M16	105 M16	125 M16	145 M16	160 M16	115 M20	170 M20 (LG)	190 M20 (LG)	170 M24 (LG)	200 M24 (LG)	225 M24 (LG)
Additional marking		1	2	3	4	5	1	2	3	1	2	3
1	Thread	M16					M20			M24		
	Number of cones	3	4	6	6	6	3	6	6	6	6	6
	$d_k =$	16,5	16,5	16,5	16,5	16,5	19,7	22,0	22,0	24,0	24,0	24,0
	Length L (with washer 2a)	$114+t_{fix}$	$129+t_{fix}$	$150+t_{fix}$	$170+t_{fix}$	$185+t_{fix}$	$143+t_{fix}$	$203+t_{fix}$	$223+t_{fix}$	$210+t_{fix}$	$240+t_{fix}$	$265+t_{fix}$
	Reduction $t_{fix}^{1)}$ (with washer with bore 2b)	2	2	2	2	2	2	2	2	2	2	2
3	Hexagon nut SW	24	24	24	24	24	30	30	30	36	36	36

<sup>1)</sup> When using washer with bore (2b) the thickness of fixture is reduced by the specified value.

Dimensions in mm

**Injection System W-VIZ**

**Product description**  
**W-VIZ-A:** Anchor dimensions

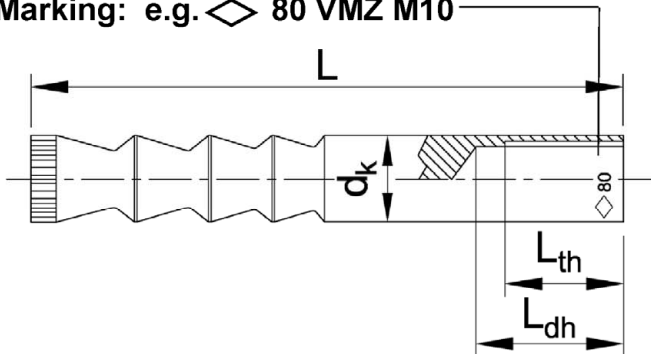
**Annex A4**



**Table A4: Materials W-VIZ-IG**

Part	Designation	Steel, zinc plated $\geq 5\mu\text{m}$	Stainless steel A4 (CRC III)	High corrosion resistant steel HCR (CRC V)
1	Anchor rod	Steel acc. to EN ISO 683-4:2018, galvanized and coated	Stainless steel, 1.4401, 1.4404, 1.4571 acc. to EN 10088:2014, coated	High corrosion resistant steel 1.4529, 1.4565 acc. to EN 10088:2014, coated
4	Mortar cartridge	Vinylester resin, styrene free, mixing ratio 1:10		

Marking: e.g.  $\diamond$  80 VMZ M10



- $\diamond$  identifying mark of manufacturing plant
- 80 anchorage depth
- VMZ fastener identity
- M10 size of internal thread
- A4 additional marking of stainless steel
- HCR additional marking of high corrosion resistant steel

**Table A5: Dimensions of anchor rod W-VIZ-IG**

Anchor size	W-VIZ-IG	40 M6	50 M6	60 M8	75 M8	70 M10	80 M10	90 M12	105 M12	125 M12	115 M16	170 M16	170 M20
Internal thread	-	M6		M8		M10		M12			M16		M20
Number of cones	-	2	3	3	3	3	4	3	4	6	3	6	6
Outer diameter	$d_k$ [mm]	8,0	8,0	9,7	10,7	12,5	12,5	16,5	16,5	16,5	19,7	22,0	24,0
Thread length	$L_{th}$ [mm]	12	15	16	19	20	23	24	27	30	32	32	40
Total length	$L$ [mm]	41	52	63	78	74	84	94	109	130	120	180	182
Length identifier	[mm]	$L_{dh} < 18$	$L_{dh} > 19$	$L_{dh} < 22,5$	$L_{dh} > 23,5$	$L_{dh} < 27$	$L_{dh} > 28$	$L_{dh} < 31,5$	$32,5 < L_{dh} < 34,5$	$L_{dh} > 35,5$	$d_k < 21$	$d_k > 21$	-

**Requirements of the fastening screw or the threaded rod and nut**

- Minimum screw-in depth  $L_{sdmin}$  see Table B7
- The length of screw or the threaded rod must depending on the thickness of fixture  $t_{fix}$ , available thread length  $L_{th}$  (=maximum available thread length, see Table B7) and the minimum screw-in depth  $L_{sdmin}$  be established
- $A_5 > 8\%$  ductility
- Material
  - **Steel, zinc plated:** Minimum property class 8.8 according to EN ISO 898-1:2013 or EN ISO 898-2:2022
  - **Stainless steel A4 or high corrosion resistant steel (HCR):** Minimum property class 70 according to EN ISO 3506-1:2020 or according to EN ISO 3506-2:2020

**Injection System W-VIZ**

**Product description**  
W-VIZ-IG: Materials, Marking, Anchor dimensions

**Annex A5**

## Specifications of intended use

Injection System W-VIZ with anchor rod		W-VIZ-A	M8	M10	M12	M16	M20	M24
Static and quasi-static action					✓			
Seismic action (Category C1 + C2)			– <sup>3)</sup>	✓	✓	✓	✓	✓
Cracked or uncracked concrete					✓			
Strength classes acc. to EN 206-1:2013+A1:2016					C20/25 to C50/60			
Reinforced or unreinforced normal weight concrete acc. to EN 206-1: 2013+A1:2016					✓			
Temperature Range I	–40 °C to +80 °C		max. short term temperature +80 °C max. long term temperature +50 °C					
Temperature Range II	–40 °C to +120 °C		max. short term temperature +120 °C max. long term temperature +72 °C					
Making of drill hole	Hammer drill bit				✓			
	Vacuum drill bit <sup>1)</sup>	– <sup>3)</sup>	✓	✓	✓	✓	✓	✓
	Diamond drill bit (seismic action excluded)	– <sup>3)</sup>	✓	✓	✓	✓	✓	✓
Installation allowable in	dry concrete				✓			
	wet concrete				✓			
	water-filled hole	– <sup>3)</sup>	– <sup>3)</sup>	✓ <sup>2)</sup>	✓	✓	✓	✓
Overhead installation					✓			
Pre-setting installation					✓			
Trough-setting installation		– <sup>3)</sup>	✓	✓	✓	✓	✓	✓

<sup>1)</sup> e.g. Würth vacuum drill bit, MKT vacuum drill bit or Heller Duster Expert

<sup>2)</sup> Exception: W-VIZ-A 75 M12 (Installation in water-filled drill hole is not allowed)

<sup>3)</sup> No performance assessed

Injection System W-VIZ with anchor rod		W-VIZ-IG	M6	M8	M10	M12	M16	M20
Static and quasi-static action					✓			
Seismic action (Category C1 + C2)					– <sup>2)</sup>			
Cracked and uncracked concrete					✓			
Strength classes acc. to EN 206-1:2013+A1:2016					C20/25 to C50/60			
Reinforced or unreinforced normal weight concrete acc. to EN 206-1:2013+A1:2016					✓			
Temperature Range I	–40 °C to +80 °C		max. short term temperature +80 °C max. long term temperature +50 °C					
Temperature Range II	–40 °C to +120 °C		max. short term temperature +120 °C max. long term temperature +72 °C					
Making of drill hole	Hammer drill bit				✓			
	Vacuum drill bit <sup>1)</sup>	– <sup>2)</sup>	✓	✓	✓	✓	✓	✓
	Diamond drill bit	– <sup>2)</sup>	✓	✓	✓	✓	✓	✓
Installation allowable in	dry concrete				✓			
	wet concrete				✓			
	water-filled hole	– <sup>2)</sup>	– <sup>2)</sup>	✓	✓	✓	✓	✓
Overhead installation					✓			
Pre-setting installation					✓			

<sup>1)</sup> e.g. Würth vacuum drill bit, MKT vacuum drill bit or Heller Duster Expert

<sup>2)</sup> No performance assessed

## Injection System W-VIZ

**Intended use**  
Specifications and installation conditions

**Annex B1**

## Specifications of intended use

### Use conditions (Environmental conditions):

- Structures subject to dry internal conditions: all versions W-VIZ-A and W-VIZ-IG
- For all other conditions:  
Intended use of materials according to Annex A3, Table A1 and Annex A5, Table A4 corresponding to the corrosion resistance class CRC to EN 1993-1-4:2015

### 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 are designed in accordance with EN 1992-4:2018 and Technical Report TR 055, Edition February 2018.

### Installation:

- Drill hole must be cleaned directly prior to installation of the anchor or the drill hole has to be protected against re-contamination in an appropriate way until dispensing the mortar in the drill hole.
- Water filled drill holes must not be polluted – otherwise the cleaning of the drill hole must be repeated.
- The anchor component installation temperature shall be at least +5 °C; during curing of the injection mortar the temperature of the concrete must not fall below -15 °C.
- It must be ensured that icing does not occur in the drill hole.
- Optionally, the annular gap between anchor rod and fixture may be filled with injection adhesive WIT-VIZ, WIT-VIZ EXPRESS, WIT-VM 100 or WIT-EXPRESS using the washer with bore (Part 2b, Annex A3) instead of the washer (Part 2a, Annex A3).

## Injection System W-VIZ

Intended use  
Specifications

Annex B2

**Table B1: Working and curing time WIT-VIZ, WIT-VM 100**

Temperature in the drill hole	Maximum working time	Minimum curing time dry concrete <sup>1)</sup>
- 15 °C to - 10 °C	45 min	7 d
- 9 °C to - 5 °C	45 min	10:30 h
- 4 °C to - 1 °C	45 min	6:00 h
0 °C to + 4 °C	20 min	3:00 h
+5 °C to + 9 °C	12 min	2:00 h
+10 °C to +19 °C	6 min	1:20 h
+20 °C to +29 °C	4 min	45 min
+30 °C to +34 °C	2 min	25 min
+35 °C to +39 °C	1,4 min	20 min
+ 40 °C	1,4 min	15 min
<b>Cartridge temperature</b>	<b>≥ 5°C</b>	

<sup>1)</sup> Curing time in wet concrete shall be doubled.

**Table B2: Working and curing time WIT-VIZ EXPRESS, WIT-EXPRESS**

Temperature in the drill hole	Maximum working time	Minimum curing time dry concrete <sup>1)</sup>
- 5 °C to - 1 °C	20 min	4:00 h
0 °C to + 4 °C	10 min	2:00 h
+ 5 °C to + 9 °C	6 min	1:00 h
+10 °C to +19 °C	3 min	40 min
+20 °C to +29 °C	1 min	20 min
+ 30 °C	1 min	10 min
<b>Cartridge temperature</b>	<b>≥ 5°C</b>	

<sup>1)</sup> Curing time in wet concrete shall be doubled.

**Injection System W-VIZ**

**Intended use**  
Working and curing time

**Annex B3**

**Table B3: Installation parameters, W-VIZ-A M8 – M12**

Anchor size	W-VIZ-A	40 M8	50 M8	60 M10	75 M10	75 M12	70 M12	80 M12	95 M12	100 M12	110 M12	125 M12
Effective anchorage depth	$h_{ef} \geq$ [mm]	40	50	60	75	75	70	80	95	100	110	125
Nominal diameter of drill hole	$d_0 =$ [mm]	10	10	12	12	12	14	14	14	14	14	14
Depth of drill hole	$h_0 \geq$ [mm]	42	55	65	80	80	75	85	100	105	115	130
Diameter of cleaning brush	$D \geq$ [mm]	10,8	10,8	13,0	13,0	13,0	15,0	15,0	15,0	15,0	15,0	15,0
Installation torque	$T_{inst} \leq$ [Nm]	10	10	15	15	25	25	25	25	30	30	30
Diameter of clearance hole in the fixture												
Pre-setting installation	$d_f \leq$ [mm]	9	9	12	12	14	14	14	14	14	14	14
Through-setting installation	$d_f \leq$ [mm]	-2)	-2)	14	14	14 <sup>1)</sup> / 16	16	16	16	16	16	16

<sup>1)</sup> see Annex B11

<sup>2)</sup> No performance assessed

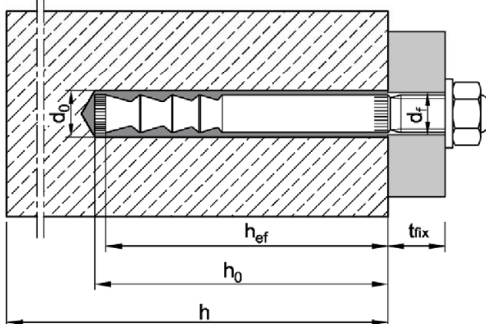
**Table B4: Installation parameters, W-VIZ-A M16 – M24**

Anchor size	W-VIZ-A	90 M16	105 M16	125 M16	145 M16	160 M16	115 M20	170 M20 (LG)	190 M20 (LG)	170 M24 (LG)	200 M24 (LG)	225 M24 (LG)
Effective anchorage depth	$h_{ef} \geq$ [mm]	90	105	125	145	160	115	170	190	170	200	225
Nominal diameter of drill hole	$d_0 =$ [mm]	18	18	18	18	18	22	24	24	26	26	26
Depth of drill hole	$h_0 \geq$ [mm]	98	113	133	153	168	120	180	200	185	215	240
Diameter of cleaning brush	$D \geq$ [mm]	19,0	19,0	19,0	19,0	19,0	23,0	25,0	25,0	27,0	27,0	27,0
Installation torque	$T_{inst} \leq$ [Nm]	50	50	50	50	50	80	80	80	100	120	120
Diameter of clearance hole in the fixture												
Pre-setting installation	$d_f \leq$ [mm]	18	18	18	18	18	22	24 (22)	24 (22)	26	26	26
Through-setting installation	$d_f \leq$ [mm]	20	20	20	20	20	24	26	26	28	28	28

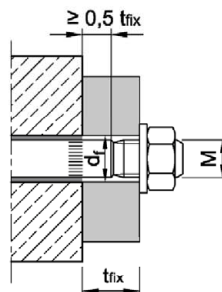
**Pre-setting installation**

**Through-setting installation**

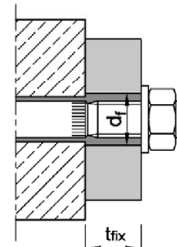
size  
M8 to M16,  
M20 LG, M24 LG



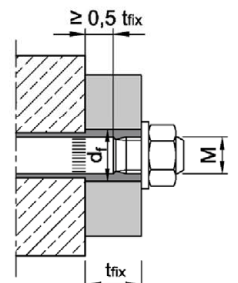
size  
M20 + M24



size  
M10 to M16,  
M20 LG, M24



size  
M20 + M24



The annular gap in the clearance hole in the fixture has to be filled completely by excess mortar!

**Injection System W-VIZ**

**Intended use**  
Installation parameters W-VIZ-A

**Annex B4**

**Table B5: Minimum spacing and edge distance, W-VIZ-A M8 – M12**

Anchor size		W-VIZ-A	40 M8	50 M8	60 M10	75 M10	75 M12	70 M12	80 M12	95 M12	100 M12	110 M12	125 M12
Minimum thickness of concrete	$h_{min}$	[mm]	80	80	100	110 100 <sup>1)</sup>	110	110	110	130 125 <sup>1)</sup>	130	140	160
<b>Cracked concrete</b>													
Minimum spacing	$s_{min}$	[mm]	40	40	40	40	50	55	40	40	50	50	50
Minimum edge distance	$c_{min}$	[mm]	40	40	40	40	50	55	50	50	50	50	50
<b>Uncracked concrete</b>													
Minimum spacing	$s_{min}$	[mm]	40	40	50	50	50	55	55	55	80 <sup>2)</sup>	80 <sup>2)</sup>	80 <sup>2)</sup>
Minimum edge distance	$c_{min}$	[mm]	40	40	50	50	50	55	55	55	55 <sup>2)</sup>	55 <sup>2)</sup>	55 <sup>2)</sup>

<sup>1)</sup> The reverse of the concrete member must not be damaged after drilling and must be filled with high-strength mortar if drilled through.

<sup>2)</sup> For an edge distance  $c \geq 80$  mm a minimum spacing  $s_{min} = 55$  mm is applicable.

**Table B6: Minimum spacing and edge distance, W-VIZ-A M16 – M24**

Anchor size		W-VIZ-A	90 M16	105 M16	125 M16	145 M16	160 M16	115 M20	170 M20 (LG)	190 M20 (LG)	170 M24 (LG)	200 M24 (LG)	225 M24 (LG)
Minimum thickness of concrete	$h_{min}$	[mm]	130	150	170 160 <sup>1)</sup>	190 180 <sup>1)</sup>	205 200 <sup>1)</sup>	160	230 220 <sup>1)</sup>	250 240 <sup>1)</sup>	230 220 <sup>1)</sup>	270 260 <sup>1)</sup>	300 290 <sup>1)</sup>
<b>Cracked concrete</b>													
Minimum spacing	$s_{min}$	[mm]	50	50	60	60	60	80	80	80	80	80	80
Minimum edge distance	$c_{min}$	[mm]	50	50	60	60	60	80	80	80	80	80	80
<b>Uncracked concrete</b>													
Minimum spacing	$s_{min}$	[mm]	50	60	60	60	60	80	80	80	80	105	105
Minimum edge distance	$c_{min}$	[mm]	50	60	60	60	60	80	80	80	80	105	105

<sup>1)</sup> The reverse of the concrete member must not be damaged after drilling and must be filled with high-strength mortar if drilled through.

**Injection System W-VIZ**

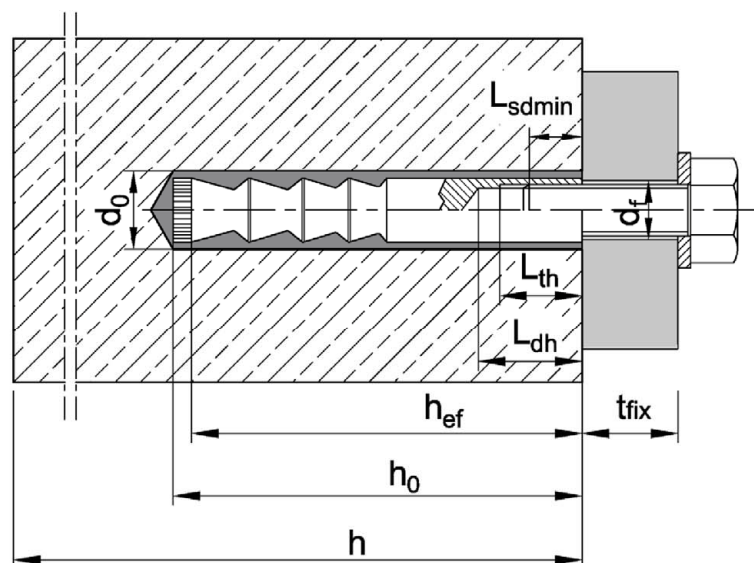
**Intended use**  
Minimum spacing and edge distance, W-VIZ-A

**Annex B5**

**Table B7: Installation parameters W-VIZ-IG**

Anchor size	W-VIZ-IG	40 M6	50 M6	60 M8	75 M8	70 M10	80 M10	90 M12	105 M12	125 M12	115 M16	170 M16	170 M20
Effective anchorage depth	$h_{ef}$ [mm]	40	50	60	75	70	80	90	105	125	115	170	170
Nominal diameter of drill hole	$d_0$ [mm]	10	10	12	12	14	14	18	18	18	22	24	26
Depth of drill hole	$h_0 \geq$ [mm]	42	55	65	80	80	85	98	113	133	120	180	185
Diameter of cleaning brush	$D \geq$ [mm]	10,8	10,8	13,0	13,0	15,0	15,0	19,0	19,0	19,0	23,0	25,0	27,0
Installation torque	$T_{inst} \leq$ [Nm]	8	8	10	10	15	15	25	25	25	50	50	80
Diameter of clearance hole in the fixture	$d_f \leq$ [mm]	7	7	9	9	12	12	14	14	14	18	18	22
Available thread length	$L_{th}$ [mm]	12	15	16	19	20	23	24	27	30	32	32	40
Minimum screw-in depth	$L_{sdmin}$ [mm]	7	7	9	9	12	12	14	14	14	18	18	22
Minimum thickness of concrete	$h_{min}$ [mm]	80	80	100	110	110	110	130	150	170 160 <sup>1)</sup>	160	230 220 <sup>1)</sup>	230 220 <sup>1)</sup>
<b>Cracked concrete</b>													
Minimum spacing	$s_{min}$ [mm]	40	40	40	40	55	40	50	50	60	80	80	80
Minimum edge distance	$c_{min}$ [mm]	40	40	40	40	55	50	50	50	60	80	80	80
<b>Uncracked concrete</b>													
Minimum spacing	$s_{min}$ [mm]	40	40	50	50	55	55	50	60	60	80	80	80
Minimum edge distance	$c_{min}$ [mm]	40	40	50	50	55	55	50	60	60	80	80	80

<sup>1)</sup> The reverse of the concrete member must not be damaged after drilling and must be filled with high-strength mortar if drilled through.



**Injection System W-VIZ**

**Intended use**  
Installation parameters **W-VIZ-IG**

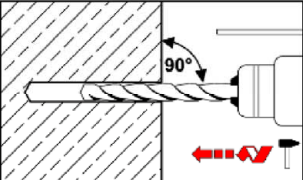
**Annex B6**



## Installation instructions - Hammer drill bit

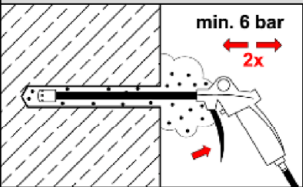
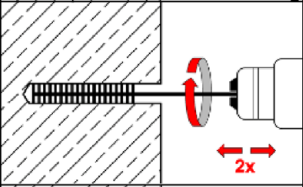
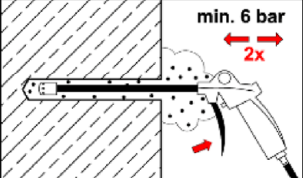
### Hammer drill bit

#### Hole drilling

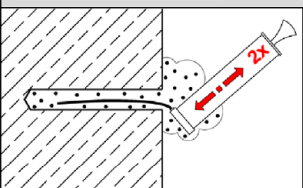
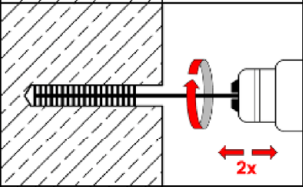
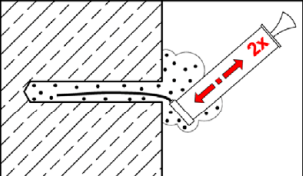
1		Use hammer drill or compressed air drill with drill bit and depth gauge. Drill perpendicular to concrete surface.
---	---	---

#### Cleaning

##### Cleaning with compressed air (all sizes)

2a		Connect Air Blower to compressed air (min. 6 bar, oil-free). Open air valve and blow out drill hole along the entire depth with back and forth motion at least two times.
3a		Check diameter of cleaning brush. If the brush can be pushed into the drill hole without any resistance, it must be replaced. Chuck brush into drill machine. Turn on drill machine and brush drill hole back and forth along the entire drill hole depth at least two times while rotated by drill machine.
4a		Connect Air Blower to compressed air (min. 6 bar, oil-free). Open air valve and blow out drill hole along the entire depth with back and forth motion at least two times.

##### Manual cleaning (alternatively, up to drill hole diameter 18mm)

2b		Blow out drill hole from the bottom with Blow-out pump at least two times.
3b		Check diameter of cleaning brush. If the brush can be pushed into the drill hole without any resistance, it must be replaced. Chuck brush into drill machine. Turn on drill machine and brush drill hole back and forth along the entire drill hole depth at least two times while rotated by drill machine.
4b		Blow out drill hole from the bottom with Blow-out pump at least two times.

### Injection System W-VIZ

#### Intended use

Installation instructions  
Hole drilling and cleaning (hammer drill bit)

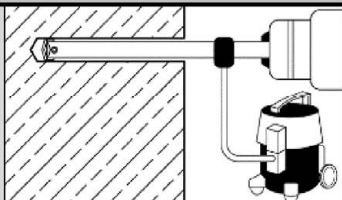
Annex B7



## Installation instructions - Vacuum drill bit

### Vacuum drill bit

#### Hole drilling and cleaning

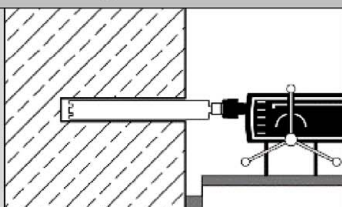
1		<p>Drill hole perpendicular to concrete surface by using a vacuum drill bit (see Annex B1). The nominal underpressure of the vacuum cleaner must be at least 230 mbar / 23kPa.</p> <p><b>Pay attention to the function of the dust extraction system!</b></p> <p>Make sure the dust extraction is working properly throughout the whole drilling process.</p>
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**Additional cleaning is not necessary - continue with step 5!**

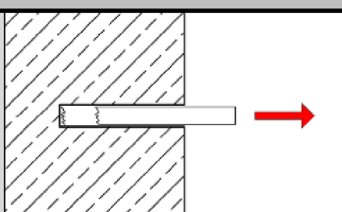
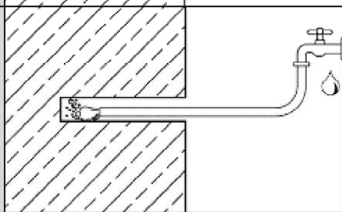
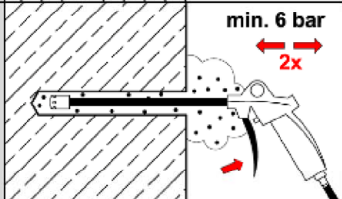
## Installation instructions - Diamond drilling

### Diamond drilling

#### Hole drilling

1		<p>Use diamond drill with diamond drill bit and depth gauge.</p> <p>Drill perpendicular to concrete surface.</p>
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#### Cleaning

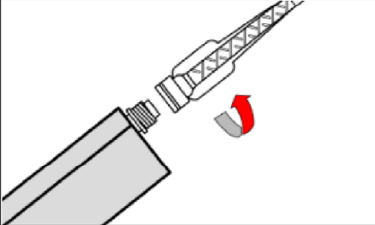
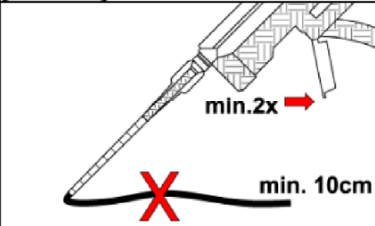
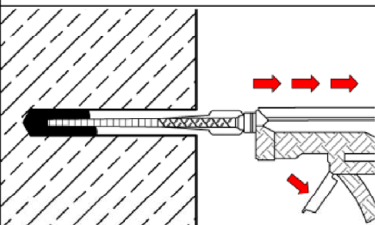
2		<p>Remove drill core at least up to the nominal hole depth and check drill hole depth.</p>
3		<p>Flushing of drill hole:</p> <p>Flush drill hole with water, starting from the bottom, until clear water gets out of the drill hole.</p>
4		<p>Connect Air Blower to compressed air (min. 6 bar, oil-free).</p> <p>Open air valve and blow out drill hole along the entire depth with back and forth motion at least two times.</p>

### Injection System W-VIZ

**Intended use**  
Installation instructions  
Hole drilling and cleaning (vacuum drill bit and diamond drill bit)

**Annex B8**

## Installation instructions - Continuation

Injection		
5		Check expiration date on cartridge. Never use when expired. Remove cap from cartridge. Attach the supplied static mixer to the cartridge. For every working interruption longer than the recommended working time (Table B1 or Table B2) as well as for a new cartridge always use a new static mixer. Never use static mixer without helix inside.
6		Insert cartridge in Dispenser. Before injecting discard mortar (at least 2 full strokes or a line of 10 cm) until it shows a consistent grey colour. Never use this mortar.
7		Prior to injection, check if static mixer reaches the bottom of the drill hole. If it does not reach the bottom, plug Mixer Extension onto static mixer in order to fill the drill hole properly. Fill hole with a sufficient quantity of injection mortar. Start from the bottom of the drill hole and work out to avoid trapping air pockets.

### Injection System W-VIZ

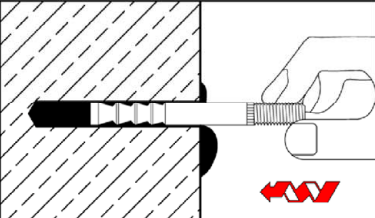
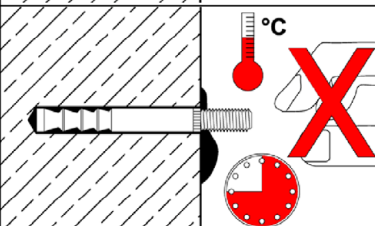
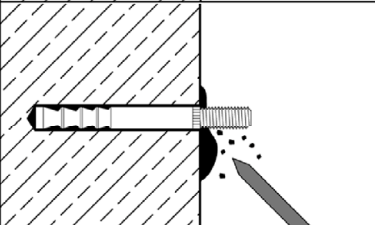
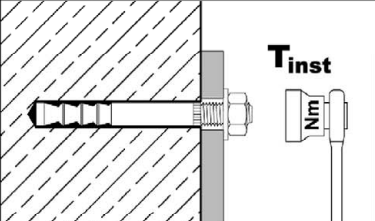
**Intended use**  
Installation instructions  
Injection

**Annex B9**

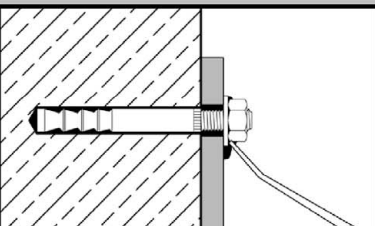
## Installation instructions - Continuation

### Anchor rod W-VIZ-A

#### Inserting the anchor rod

8		Insert the anchor rod W-VIZ-A by hand, rotating slightly up to the full embedment depth as marked on the anchor rod. The anchor rod is properly set when excess mortar seeps from the hole (Pre-setting installation) or the annular gap in the clearance hole in the fixture is completely filled by excess mortar (Through-setting installation). If the hole is not completely filled, pull out anchor rod, let mortar cure, drill out hole and repeat entire cleaning process.
9		Follow minimum curing time shown in Table B1 or Table B2 During curing time, anchor rod must not be moved or loaded.
10		Remove excess mortar.
11		The fixture can be mounted after curing time. Apply installation torque $T_{inst}$ according to Table B3 or Table B4 by using torque wrench.

#### Filling annular gap

Optional		Annular gap between anchor rod and attachment may optionally be filled with mortar. Therefore, replace regular washer by washer with bore and plug on reducing adapter on static mixer. Annular gap is completely filled, when excess mortar seeps out.
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### Injection System W-VIZ

**Intended use**  
Installation instructions  
Installation Anchor rod **W-VIZ-A**

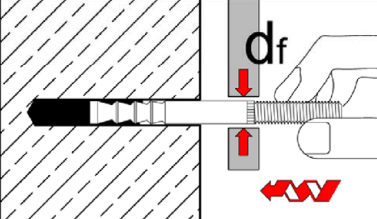
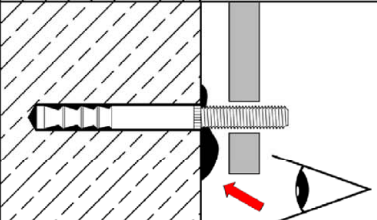
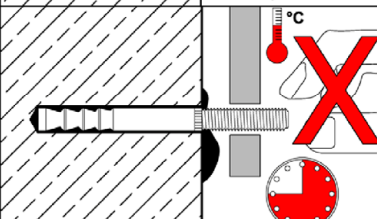
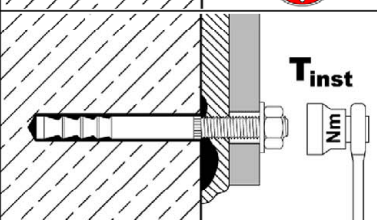
**Annex B10**

## Installation instructions – Stand-off Installation

### Stand-off installation with Anchor rod W-VIZ-A 75 M12

Requirement: Diameter of clearance hole in the fixture  $d_f \leq 14 \text{ mm}$

Work step 1-7 as illustrated in Annexes B7 – B9

8		Insert the anchor rod W-VIZ-A by hand, rotating slightly up to the full embedment depth.
9		Check if excess mortar seeps from the hole. If the hole is not completely filled, pull out anchor rod, let mortar cure, drill out hole and repeat the entire cleaning process. <b>The annular gap in the fixture does not have to be filled.</b>
10		During curing time according to Table B1 or Table B2 anchor rod must not be moved or loaded.
11		Washer and nut can be mounted after curing time and backfilling of anchor plate. Apply installation torque $T_{inst}$ according to Table B3 by using torque wrench.

### Injection System W-VIZ

#### Intended use

Installation instructions W-VIZ-A 75 M12

Through-setting installation with clearance between concrete and anchor plate

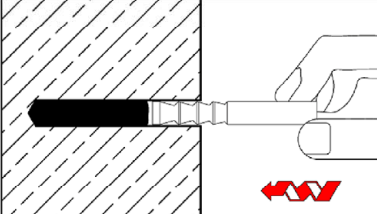
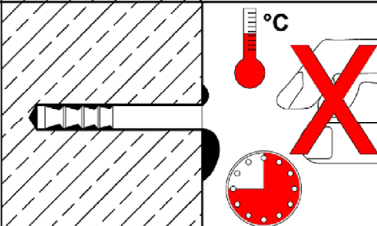
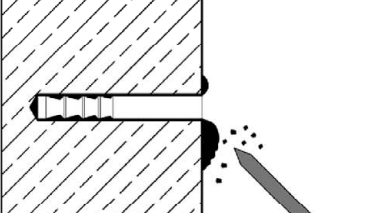
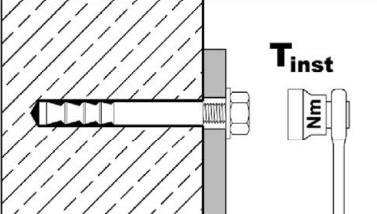
Annex B11

## Installation instructions - Continuation

### Anchor rod W-VIZ-IG

#### Setting of anchor

Work step 1-7 as illustrated in Annexes B7 – B9

8		Insert the anchor rod W-VIZ-IG by hand, rotating slightly up to about 1 mm below the concrete surface in the drill hole. The anchor rod is properly set when excess mortar seeps from the hole. If the hole is not completely filled, pull out anchor rod, let mortar cure, drill out hole and repeat the entire cleaning process.
9		Follow minimum curing time shown in Table B1 and Table B2. During curing time anchor rod must not be moved or loaded.
10		Remove excess mortar.
11		The fixture can be mounted after curing time. Apply installation torque $T_{inst}$ according to Table B7 by using torque wrench.

### Injection System W-VIZ

**Intended use**  
Installation instructions  
Anchor installation W-VIZ-IG

**Annex B12**

**Table C1: Characteristic values for concrete failure and splitting**

Anchor size		W-VIZ-A W-VIZ-IG		all sizes
Concrete cone failure				
Factor for $k_1$	uncracked concrete	$k_{ucr,N}$	[-]	11,0
	cracked concrete	$k_{cr,N}$	[-]	7,7
Characteristic edge distance		$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$
Characteristic spacing		$s_{cr,N}$	[mm]	$2 \cdot c_{cr,N}$
<b>Splitting</b>				
For each proof of splitting failure, $N_{Rk,sp}$ shall be calculated according to EN 1992-4:2018, equation (7.23). The higher value for $N_{Rk,sp}$ of case 1 and case 2 may be applied for the design.				
Case 1				
Characteristic resistance		$N^0_{Rk,sp}$	[kN]	see following tables
Characteristic edge distance		$c_{cr,sp}$	[mm]	$1,5 \cdot h_{ef}$
Characteristic spacing		$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$
Case 2				
Characteristic resistance		$N^0_{Rk,sp}$	[kN]	$\min [N_{Rk,p} ; N^0_{Rk,c}]$
Characteristic edge distance		$c_{cr,sp}$	[mm]	see following tables
Characteristic spacing		$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$

Injection System W-VIZ

**Performance**

Characteristic values for concrete failure and splitting, W-VIZ-A and W-VIZ-IG

**Annex C1**



**Table C2: Characteristic values for tension loads, W-VIZ-A M8 – M12,  
static and quasi-static action**

Anchor size			W-VIZ-A		40 M8	50 M8	60 M10	75 M10	75 M12	70 M12	80 M12	95 M12	100 M12	110 M12	125 M12
Installation factor			$\gamma_{inst}$	[-]	1,0										
Steel failure															
Characteristic resistance			$N_{Rk,s}$	[kN]	15	18	25		35	49	54		57		
Partial factor			$\gamma_{Ms}$	[-]	1,5										
Pull-out															
Characteristic resistance (concrete C20/25)															
uncracked concrete	50°C / 80°C <sup>1)</sup>	$N_{Rk,p}$	[kN]	9	17,4	22,9	32	32	28,8	35,2	40	49,2	50	50	
	72°C / 120°C <sup>1)</sup>		[kN]	6	9	16	16	16	16	25	25	30	30	30	
cracked concrete	50°C / 80°C <sup>1)</sup>	$N_{Rk,p}$	[kN]	8,7	12,2	16	22,4	22,4	20,2	24,6	31,9	34,4	39,7	48,1	
	72°C / 120°C <sup>1)</sup>		[kN]	5	7,5	12	12	12	16	20	20	30	30	30	
Splitting															
Splitting for <b>standard thickness of concrete member</b>															
Standard thickness of concrete			$h_{min,1} \geq$	[mm]	100		120	150	150	140	160	190	200	220	250
Case 1															
Characteristic resistance (concrete C20/25)			$N^0_{Rk,sp}$	[kN]	7,5	9	16	20	20		35,2	30	40		
Case 2															
Characteristic edge distance			$C_{cr,sp}$	[mm]	3 $h_{ef}$		2,5 $h_{ef}$	3,5 $h_{ef}$	3,5 $h_{ef}$	2,5 $h_{ef}$	1,5 $h_{ef}$	2,5 $h_{ef}$	2 $h_{ef}$	3 $h_{ef}$	2,5 $h_{ef}$
Splitting for <b>minimum thickness of concrete member</b>															
Minimum thickness of concrete			$h_{min,2} \geq$	[mm]	80		100		110		125	130	140	160	
Case 1															
Characteristic resistance (concrete C20/25)			$N^0_{Rk,sp}$	[kN]	7,5	2)	16		16	20	25	25	30		
Case 2															
Characteristic edge distance			$C_{cr,sp}$	[mm]	3 $h_{ef}$	3,5 $h_{ef}$	3 $h_{ef}$	3,5 $h_{ef}$	3,5 $h_{ef}$		3 $h_{ef}$	3,5 $h_{ef}$	3 $h_{ef}$		
Increasing factor for $N_{Rk,p} = \psi_c \cdot N_{Rk,p}$ (C20/25) and $N^0_{Rk,sp} = \psi_c \cdot N^0_{Rk,sp}$ (C20/25) <sup>3)</sup>			$\psi_c$	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$										
Concrete cone failure															
Effective anchorage depth			$h_{ef}$	[mm]	40	50	60	75	75	70	80	95	100	110	125

<sup>1)</sup> Maximum long-term temperature / Maximum short-term temperature

<sup>2)</sup> No performance assessed

<sup>3)</sup> Increasing factor for  $N^0_{Rk,sp}$  only for Case 1

## Injection System W-VIZ

### Performance

Characteristic values for **tension loads, W-VIZ-A M8 – M12,**  
static and quasi-static action

## Annex C2

**Table C3: Characteristic values for tension loads, W-VIZ-A M16 – M24,  
static and quasi-static action**

Anchor size			W-VIZ-A	90 M16	105 M16	125 M16	145 M16	160 M16	115 M20	170 M20 (LG)	190 M20 (LG)	170 M24 (LG)	200 M24 (LG)	225 M24 (LG)
Installation factor		$\gamma_{inst}$	[-]	1,0										
Steel failure														
Characteristic tension resistance $N_{Rk,s}$	Steel, zinc plated	[kN]	88	95	111		97	96	188		222			
	A4, HCR	[kN]	88	95	111		97	114	165		194			
Partial factor		$\gamma_{Ms}$	[-]	1,5					1,68	1,5		1,5		
Pull-out														
Characteristic resistance (concrete C20/25)														
uncracked concrete	50°C/80°C <sup>1)</sup>	$N_{Rk,p}$	[kN]	42	52,9	68,8	75	90	60,7	109	128,8	109	139,1	166
	72°C/120°C <sup>1)</sup>		[kN]	25	35	50		53	40	75		95		
cracked concrete	50°C/80°C <sup>1)</sup>	$N_{Rk,p}$	[kN]	29,4	37,1	48,1	60,1	69,7	42,5	76,3	90,2	76,3	97,4	116,2
	72°C/120°C <sup>1)</sup>		[kN]	25	30	50		51	30	60		75		
Splitting														
Splitting for <b>standard thickness of concrete</b>														
Standard thickness of concrete		$h_{min,1} \geq$	[mm]	180	200	250	290	320	230	340	380	340	400	450
Case 1														
Characteristic resistance (concrete C20/25)		$N^0_{Rk,sp}$	[kN]	40	50		60	80	60,7	109	115	109	139,1	140
Case 2														
Characteristic edge distance		$c_{cr,sp}$	[mm]	2 $h_{ef}$					1,5 $h_{ef}$		2 $h_{ef}$	1,5 $h_{ef}$		1,8 $h_{ef}$
Splitting for <b>minimum thickness of concrete</b>														
Minimum thickness of concrete		$h_{min,2} \geq$	[mm]	130	150	160	180	200	160	220	240	220	260	290
Case 1														
Characteristic resistance (concrete C20/25)		$N^0_{Rk,sp}$	[kN]	35	50	40	50	71	2)	75		109	115	
Case 2														
Characteristic edge distance		$c_{cr,sp}$	[mm]	2,5 $h_{ef}$		3 $h_{ef}$	2,5 $h_{ef}$		2,5 $h_{ef}$	2,6 $h_{ef}$	2,2 $h_{ef}$	2,6 $h_{ef}$	2,2 $h_{ef}$	
Increasing factor for $N_{Rk,p} = \psi_c \cdot N_{Rk,p}$ (C20/25) and $N^0_{Rk,sp} = \psi_c \cdot N^0_{Rk,sp}$ (C20/25) <sup>3)</sup>			$\psi_c$	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$									
Concrete cone failure														
Effective anchorage depth		$h_{ef}$	[mm]	90	105	125	145	160	115	170	190	170	200	225

<sup>1)</sup> Maximum long-term temperature / Maximum short-term temperature

<sup>2)</sup> No performance assessed

<sup>3)</sup> Increasing factor for  $N^0_{Rk,sp}$  only for Case 1

#### Injection System W-VIZ

**Performance**  
Characteristic values for **tension loads, W-VIZ-A M16 – M24,**  
static and quasi-static action

**Annex C3**



**Table C4:** Characteristic values for **shear load, W-VIZ-A M8 – M12,**  
static and quasi-static action

Anchor size			W-VIZ-A		40 M8	50 M8	60 M10	75 M10	75 M12	70 M12	80 M12	95 M12	100 M12	110 M12	125 M12
Installation factor			$\gamma_{\text{inst}}$	[-]	1,0										
Steel failure without lever arm															
Characteristic resistance $V_{\text{Rk,s}}^0$	Steel, zinc plated	[kN]	14			21			34						
	A4, HCR	[kN]	15			23			34						
Partial factor			$\gamma_{\text{Ms}}$	[-]	1,25										
Ductility factor			$k_7$	[-]	1,0										
Steel failure with lever arm															
Characteristic bending resistance $M_{\text{Rk,s}}^0$	Steel, zinc plated	[Nm]	30			60			105						
	A4, HCR	[Nm]	30			60			105						
Partial factor			$\gamma_{\text{Ms}}$	[-]	1,25										
Concrete pry-out failure															
Pry-out factor			$k_8$	[-]	2										
Concrete edge failure															
Effective length of anchor in shear load		$l_f$	[mm]	40	50	60	75	75	70	80	95	100	110	125	
Outside diameter of anchor		$d_{\text{nom}}$	[mm]	10		12		12	14						

#### Injection System W-VIZ

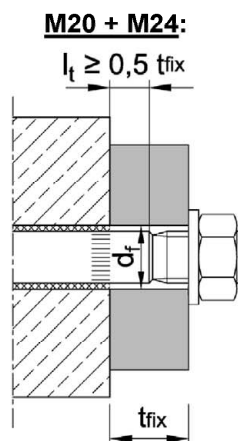
**Performance**  
Characteristic values for **shear load, W-VIZ-A M8 – M12,**  
static and quasi-static action

**Annex C4**

**Table C5:** Characteristic values for **shear load, W-VIZ-A M16 – M24,**  
static or quasi-static action

Anchor size			W-VIZ-A	90 M16	105 M16	125 M16	145 M16	160 M16	115 M20	170 M20 (LG)	190 M20 (LG)	170 M24 (LG)	200 M24 (LG)	225 M24 (LG)	
Installation factor		$\gamma_{inst}$	[-]	1,0											
Steel failure without lever arm															
Characteristic resistance $V^0_{Rk,s}$	Steel, zinc plated	[kN]	63						70	149 <sup>1)</sup> (98)		178 <sup>1)</sup> (141)			
	A4, HCR	[kN]	63						86	131 <sup>1)</sup> (86)		156 <sup>1)</sup> (123)			
Partial factor		$\gamma_{Ms}$	[-]	1,25						1,4	1,25		1,25		
Ductility factor		$k_7$	[-]	1,0											
Steel failure with lever arm															
Characteristic bending resistance $M^0_{Rk,s}$	Steel, zinc plated	[Nm]	266						392	519		896			
	A4, HCR	[Nm]	266						454		784				
Partial factor		$\gamma_{Ms}$	[-]	1,25						1,4	1,25		1,25		
Concrete pry-out failure															
Pry-out factor		$k_8$	[-]	2,0											
Concrete edge failure															
Effective length of anchor in shear load		$l_f$	[mm]	90	105	125	145	160	115	170	190	170	200	225	
Outside diameter of anchor		$d_{nom}$	[mm]	18						22	24		26		

<sup>1)</sup> This value may only be applied if  $l_t \geq 0,5 t_{fix}$



#### Injection System W-VIZ

#### Performance

Characteristic values for **shear load, W-VIZ-A M16 – M24,**  
static and quasi-static action

**Annex C5**

**Table C6: Characteristic values for seismic action,  
W-VIZ-A M10 – M12 performance category C1 and C2**

Anchor size			W-VIZ-A	60 M10	75 M10	75 M12	70 M12	80 M12	95 M12	100 M12	110 M12	125 M12
Tension loads												
Installation factor			$\gamma_{inst}$	[-]	1,0							
Steel failure, steel zinc plated, stainless steel A4, HCR												
Characteristic resistance			$N_{Rk,s,C1}$ $N_{Rk,s,C2}$	[kN]	25	35	49	54	57			
Partial factor			$\gamma_{Ms}$	[-]	1,5							
Pull-out (concrete C20/25 to C50/60)												
Characteristic resistance	$N_{Rk,p,C1}$	50°C / 80°C <sup>1)</sup>	[kN]	14,5	14,5	30,6	36,0	41,5	42,8			
		72°C / 120°C <sup>1)</sup>	[kN]	10,9	10,9	20,0	30,0					
	$N_{Rk,p,C2}$	50°C / 80°C <sup>1)</sup>	[kN]	7,4	7,4	8,7	17,6					
		72°C / 120°C <sup>1)</sup>	[kN]	5,1	5,1	6,5	12,3					

Shear loads												
Steel failure without lever arm, steel zinc plated												
Characteristic resistance			$V_{Rk,s,C1}$	[kN]	11,8	27,2						
			$V_{Rk,s,C2}$	[kN]	12,6	27,2						
Partial factor			$\gamma_{Ms}$	[-]	1,25							
Steel failure without lever arm, stainless steel A4, HCR												
Characteristic resistance			$V_{Rk,s,C1}$	[kN]	12,9	27,2						
			$V_{Rk,s,C2}$	[kN]	13,8	27,2						
Partial factor			$\gamma_{Ms}$	[-]	1,25							
Factor for anchorages with	filled annular gap	$\alpha_{gap}$	[-]	1,0								
	unfilled annular gap	$\alpha_{gap}$	[-]	0,5								

<sup>1)</sup> Maximum long-term temperature / Maximum short-term temperature

#### Injection System W-VIZ

#### Performance

Characteristic values for seismic action, W-VIZ-A M10 – M12,  
performance category C1 and C2

**Annex C6**

**Table C7: Characteristic values for seismic action,  
W-VIZ-A M16 – M24, performance category C1 and C2**

Anchor size			W-VIZ-A	90 M16	105 M16	125 M16	145 M16	160 M16	115 M20	170 M20 (LG)	190 M20 (LG)	170 M24 (LG)	200 M24 (LG)	225 M24 (LG)
Tension loads														
Installation factor			$\gamma_{inst}$	[-]	1,0									
Steel failure, steel zinc plated														
Characteristic resistance		$N_{Rk,s,C1}$ $N_{Rk,s,C2}$	[kN]	88	95	111		97	96	188		222		
Steel failure, stainless steel A4, HCR														
Characteristic resistance		$N_{Rk,s,C1}$ $N_{Rk,s,C2}$	[kN]	88	95	111		97	114	165		194		
Partial factor			$\gamma_{Ms}$	[-]	1,5				1,68	1,5		1,5		
Pull-out (concrete C20/25 to C50/60)														
Charac- teristic resistance	$N_{Rk,p,C1}$	50°C / 80°C <sup>1)</sup>	[kN]	30,7	38,7	43,7			44,4	88,2		90,7		
		72°C / 120°C <sup>1)</sup>	[kN]	25,0	30,0	38,5			29,4	55,8		59,3		
	$N_{Rk,p,C2}$	50°C / 80°C <sup>1)</sup>	[kN]	16,3	22,1	26,1			30,9	59,7		59,7		
		72°C / 120°C <sup>1)</sup>	[kN]	10,5	14,4	19,5			16,2	44,4		44,4		

Shear loads															
Steel failure without lever arm, steel zinc plated															
Characteristic resistance		$V_{Rk,s,C1}$	[kN]	39,1					39,1	82,3		107			
		$V_{Rk,s,C2}$	[kN]	50,4					51	108,8 <sup>1)</sup> (71,5)		154,9 <sup>1)</sup> (122,7)			
Partial factor			$\gamma_{Ms}$	[-]	1,25					1,4	1,25		1,25		
Steel failure without lever arm, stainless steel A4, HCR															
Characteristic resistance		$V_{Rk,s,C1}$	[kN]	39,1					39,1	72,2		93			
		$V_{Rk,s,C2}$	[kN]	50,4					62,6	95,6 <sup>1)</sup> (62,8)		135,7 <sup>1)</sup> (107)			
Partial factor			$\gamma_{Ms}$	[-]	1,25					1,4	1,25		1,25		
Factor for anchorages with	filled annular gap	$\alpha_{gap}$	[-]	1,0											
	unfilled annular gap	$\alpha_{gap}$	[-]	0,5											

<sup>1)</sup> This value may only be applied if  $l_t \geq 0,5 t_{fix}$ , (see Annex C4)

#### Injection System W-VIZ

**Performance**  
Characteristic values for seismic action, W-VIZ-A M16 – M24,  
performance category C1 and C2

**Annex C7**

**Table C8: Displacements under tension loads, W-VIZ-A M8 – M12**

Anchor size			W-VIZ-A		40 M8	50 M8	60 M10	75 M10	75 M12	70 M12	80 M12	95 M12	100 M12	110 M12	125 M12
Tension load in <b>cracked</b> concrete			N	[kN]	4,3	6,1	8,0	11,1	11,1	10,0	12,3	15,9	17,1	19,8	24,0
Displacement			$\delta_{N0}$	[mm]	0,5		0,5	0,6	0,6					0,7	
			$\delta_{N\infty}$	[mm]	1,3										
Tension load in <b>uncracked</b> concrete			N	[kN]	4,3	8,5	11,1	15,6	15,6	14,1	17,2	19,0	24,0	23,8	23,8
Displacement			$\delta_{N0}$	[mm]	0,2	0,4	0,4		0,4					0,6	
			$\delta_{N\infty}$	[mm]	1,3										
Displacements under seismic tension loads C2															
Displacements for DLS			$\delta_{N,C2(DLS)}$	[mm]	no perfor- mance assessed		1,0		1,0		1,3		1,1		
Displacements for ULS			$\delta_{N,C2(ULS)}$	[mm]			3,0		3,0		3,9		3,0		

**Table C9: Displacements under tension loads, W-VIZ-A M16 – M24**

Anchor size			W-VIZ-A	90 M16	105 M16	125 M16	145 M16	160 M16	115 M20	170 M20 (LG)	190 M20 (LG)	170 M24 (LG)	200 M24 (LG)	225 M24 (LG)
Tension load in <b>cracked</b> concrete			N [kN]	14,6	18,4	24,0	30,0	34,7	21,1	38,0	44,9	38,0	48,5	57,9
Displacement			$\delta_{N0}$ [mm]	0,7			0,8	1,2	0,7	0,8		0,8	0,9	
			$\delta_{N\infty}$ [mm]	1,3			1,6	1,1	1,3		1,3			
Tension load in <b>uncracked</b> concrete			N [kN]	20,5	25,9	33,0	35,7	48,1	29,6	53,3	63,0	53,3	67,9	81,1
Displacement			$\delta_{N0}$ [mm]	0,6			0,8	0,5	0,6		0,6			
			$\delta_{N\infty}$ [mm]	1,3			1,6	1,1	1,3		1,3			
Displacements under seismic tension loads C2														
Displacements for DLS			$\delta_{N,C2(DLS)}$ [mm]	1,6		1,5		1,7		1,9		1,9		
Displacements for ULS			$\delta_{N,C2(ULS)}$ [mm]	3,7		4,4		4,0		4,5		4,5		

**Injection System W-VIZ**

**Performance**  
Displacements under tension loads, **W-VIZ-A**

**Annex C8**

**Table C10: Displacements under shear loads W-VIZ-A M8 – M12**

Anchor size			W-VIZ-A	40 M8	50 M8	60 M10	75 M10	75 M12	70 M12	80 M12	95 M12	100 M12	110 M12	125 M12
Shear load	V	[kN]	8,3		13,3		19,3							
Displacements	$\delta_{V0}$	[mm]	2,4	2,5	2,9		3,3							
	$\delta_{V\infty}$	[mm]	3,6	3,8	4,4		5,0							
Displacements under seismic shear loads C2														
Displacements for DLS	$\delta_{V,C2(DLS)}$	[mm]	no perfor- mance assessed		2,1		2,5							
Displacements for ULS	$\delta_{V,C2(ULS)}$	[mm]			3,7		5,1							

**Table C11: Displacements under shear loads W-VIZ-A M16 – M24**

Anchor size			W-VIZ-A	90 M16	105 M16	125 M16	145 M16	160 M16	115 M20	170 M20 (LG)	190 M20 (LG)	170 M24 (LG)	200 M24 (LG)	225 M24 (LG)
Shear load	V	[kN]	36						44	75 (49)	89 (71)			
Displacements	$\delta_{V0}$	[mm]	3,8						3,0	4,3 (3,0)	4,6 (3,5)			
	$\delta_{V\infty}$	[mm]	5,7						4,5	6,5 (4,5)	6,9 (5,3)			
Displacements under seismic shear loads C2														
Displacements for DLS	$\delta_{V,C2(DLS)}$	[mm]	2,9						3,5			3,7		
Displacements for ULS	$\delta_{V,C2(ULS)}$	[mm]	6,8						9,3			9,3		

**Injection System W-VIZ**

**Performance**  
Displacements under shear loads, **W-VIZ-A**

**Annex C9**

**Table C12: Characteristic values for tension load, W-VIZ-IG**

Anchor size			W-VIZ-IG	40 M6	50 M6	60 M8	75 M8	70 M10	80 M10	90 M12	105 M12	125 M12	115 M16	170 M16	170 M20	
Installation factor			$\gamma_{inst}$	[-]			1,0									
Steel failure																
Characteristic resistance $N_{Rk,s}$	Steel, zinc plated	[kN]	15	16	19	29	35	67	52	125	108					
	A4, HCR	[kN]	11	19	21	33	47	65	88	94						
Partial factor			$\gamma_{Ms}$	[-]			1,5									
Pull-out																
Characteristic resistance (concrete C20/25)																
uncracked concrete	50°C / 80°C <sup>1)</sup>	$N_{Rk,p}$	[kN]	9	17,4	22,9	32	28,8	35,2	42	52,9	68,8	60,7	109	109	
	72°C / 120°C <sup>1)</sup>		[kN]	6	9	16	16	16	25	25	35	50	40	75	95	
cracked concrete	50°C / 80° C <sup>1)</sup>	$N_{Rk,p}$	[kN]	8,7	12,2	16	22,4	20,2	24,6	29,4	37,1	48,1	42,5	76,3	76,3	
	72°C / 120° C <sup>1)</sup>		[kN]	5	7,5	12	12	16	20	20	30	50	30	60	75	
Splitting																
Splitting for standard thickness of concrete																
Standard thickness of concrete $h_{min,1} \geq$			[mm]	100	120	150	140	160	180	200	250	230	340	340		
Case 1																
Characteristic resistance (concrete C20/25)			$N^0_{Rk,sp}$	[kN]	7,5	9	16	20	20	35,2	40	50	50	60,7	109	109
Case 2																
Characteristic edge distance			$c_{cr,sp}$	[mm]	3 $h_{ef}$	2,5 $h_{ef}$	3,5 $h_{ef}$	2,5 $h_{ef}$	1,5 $h_{ef}$	2 $h_{ef}$	1,5 $h_{ef}$	1,5 $h_{ef}$				
Splitting for minimum thickness of concrete																
Minimum thickness of concrete $h_{min,2} \geq$			[mm]	80	100	110	110	130	150	160	160	220	220			
Case 1																
Characteristic resistance (concrete C20/25)			$N^0_{Rk,sp}$	[kN]	7,5	2)	16	20	25	35	50	40	2)	75	109	
Case 2																
Characteristic edge distance			$c_{cr,sp}$	[mm]	3 $h_{ef}$	3,5 $h_{ef}$	3 $h_{ef}$	3,5 $h_{ef}$	3,5 $h_{ef}$	3 $h_{ef}$	2,5 $h_{ef}$	2,5 $h_{ef}$	3 $h_{ef}$	2,5 $h_{ef}$	2,6 $h_{ef}$	2,6 $h_{ef}$
Increasing factor for $N_{Rk,p} = \psi_c \cdot N_{Rk,p}$ (C20/25) and $N^0_{Rk,sp} = \psi_c \cdot N^0_{Rk,sp}$ (C20/25) <sup>3)</sup>			$\psi_c$	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$											
Concrete cone failure																
Effective anchorage depth			$h_{ef}$	[mm]	40	50	60	75	70	80	90	105	125	115	170	170

<sup>1)</sup> Maximum long-term temperature / Maximum short-term temperature

<sup>2)</sup> No performance assessed

<sup>3)</sup> Increasing factor for  $N^0_{Rk,sp}$  only for Case 1

## Injection System W-VIZ

### Performance

Characteristic values for tension loads, W-VIZ-IG

**Annex C10**

**Table C13: Characteristic values for shear load, W-VIZ-IG**

Anchor size		W-VIZ-IG	40 M6	50 M6	60 M8	75 M8	70 M10	80 M10	90 M12	105 M12	125 M12	115 M16	170 M16	170 M20	
Installation factor		$\gamma_{inst}$	[-]		1,0										
Steel failure without lever arm															
Characteristic resistance $V^0_{Rk,s}$	Steel, zinc plated	[kN]	8,0		9,5	15	18		34		26		63	54	
	A4, HCR	[kN]	5,5		9,5	10	16		24		32		44	47	
Partial factor		$\gamma_{Ms}$	[-]		1,25										
Ductility factor		$k_7$	[-]		1,0										
Steel failure with lever arm															
Characteristic bending resistance $M^0_{Rk,s}$	Steel, zinc plated	[kN]	12		30		60		105		212		266	519	
	A4, HCR	[kN]	8,5		21		42		74		187		187	365	
Partial factor		$\gamma_{Ms}$	[-]		1,25										
Concrete pry-out failure															
Pry-out factor		$k_8$	[-]		2,0										
Concrete edge failure															
Effective length of anchor in shear load		$l_f$	[mm]	40	50	60	75	70	80	90	105	125	115	170	170
Outside diameter of anchor		$d_{nom}$	[mm]	10		12		14		18		22		24	26

**Table C14: Displacements under tension loads, W-VIZ-IG**

Anchor size		W-VIZ-IG	40 M6	50 M6	60 M8	75 M8	70 M10	80 M10	90 M12	105 M12	125 M12	115 M16	170 M16	170 M20
Tension load in <b>cracked</b> concrete		N [kN]	4,3	6,1	8,0	11,1	10,0	12,3	14,6	18,4	24,0	21,1	38,0	38,0
Displacement	$\delta_{N0}$	[mm]	0,5		0,5	0,6	0,6		0,7			0,7	0,8	0,8
	$\delta_{N\infty}$	[mm]					1,3					1,1	1,3	1,3
Tension load in <b>uncracked</b> concrete		N [kN]	4,3	8,5	11,1	15,6	14,1	17,2	20,5	25,9	33,0	29,6	53,3	53,3
Displacement	$\delta_{N0}$	[mm]	0,2	0,4	0,4		0,4		0,6			0,5	0,6	0,6
	$\delta_{N\infty}$	[mm]					1,3					1,1	1,3	1,3

**Table C15: Displacements under shear loads, W-VIZ-IG**

Anchor size		W-VIZ-IG	40 M6	50 M6	60 M8	75 M8	70 M10	80 M10	90 M12	105 M12	125 M12	115 M16	170 M16	170 M20
Shear load <b>Steel, zinc plated</b>		V [kN]	4,6		5,4	8,4	10,1		19,3			14,8	35,8	30,7
Displacement	$\delta_{V0}$	[mm]	0,4		0,5	0,4	0,5		1,2			0,8	1,9	1,2
	$\delta_{V\infty}$	[mm]	0,7		0,8	0,7	0,8		1,9			1,2	2,8	1,9
Shear load <b>Stainless steel A4 / HCR</b>		V [kN]	3,2		5,4	5,9	9,3		13,5			18,5	25,2	26,9
Displacement	$\delta_{V0}$	[mm]	0,3		0,5	0,3	0,5		0,9			1,0	1,4	1,1
	$\delta_{V\infty}$	[mm]	0,4		0,7	0,5	0,7		1,4			1,5	2,1	1,6

#### Injection System W-VIZ

**Performance**  
Characteristic values for **shear load W-VIZ-IG, Displacements W-VIZ-IG**

**Annex C11**