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Designated according to Article 29 of Regulation (EU) No 305/2011

Member of EOTA
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European Technical Assessment

ETA 14/0157
of 04/09/2014

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011	Technical and Test Institute for Construction Prague
Trade name of the construction product	Sika AnchorFix®-3001 steel bonded anchor
Product family to which the construction product belongs	Product area code: 33 Bonded injection type anchor for use in cracked and non-cracked concrete
Manufacturer	Sika Services AG Tüffenwies 16 CH-8048 Zürich Switzerland
Manufacturing plant	Usine Sika Construction N° 503 44 08 (1138)
This European Technical Assessment contains	23 pages including 19 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	ETAG 001-Part 1 and Part 5, edition 2013, used as European Assessment Document (EAD)

1. Technical description of the product

The Sika AnchorFix®-3001 with steel elements is bonded anchor (injection type).

Steel elements can be galvanized or stainless steel threaded rod or rebar.

Steel element is placed into a drilled hole filled with injection mortar. The steel element is anchored via the bond between metal part, injection mortar and concrete. The anchor is intended to be used with embedment depth from 4 diameters to 20 diameters.

The illustration and the description of the product are given in Annex A.

2. Specification of the intended use in accordance with the applicable 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 provisions made in this European Technical Assessment are based on an assumed working life of the anchor of 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 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 loads - threaded rod	See Annex C 1
Characteristic resistance for tension loads - rebar	See Annex C 2
Characteristic resistance for shear loads - threaded rod	See Annex C 3
Characteristic resistance for shear loads - rebar	See Annex C 4
Characteristic resistance for tension loads - threaded rod	See Annex C 5
Characteristic resistance for tension loads - rebar	See Annex C 6
Characteristic resistance for shear loads - threaded rod	See Annex C 7
Characteristic resistance for shear loads - rebar	See Annex C 8
Displacement for threaded rod	See Annex C 9
Displacement for rebar	See Annex C 10
Reduction factors for seismic design	See Annex C 11

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Resistance to fire	No performance determined

3.3 Hygiene, health and environment (BWR 3)

Regarding dangerous substances contained in this European Technical Assessment, there may be requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Regulation (EU) No 305/2011, these requirements need also to be complied with, when and where they apply.

3.4 Safety in use (BWR 4)

For basic requirement safety in use the same criteria are valid as for Basic Requirement Mechanical resistance and stability.

3.5 Protection against noise (BWR 5)

Not relevant.

3.6 Energy economy and heat retention (BWR 6)

Not relevant.

3.7 Sustainable use of natural resources (BWR 7)

For the sustainable use of natural resources no performance was determined for this product.

3.8 General aspects relating to fitness for use

Durability and serviceability are only ensured if the specifications of intended use according to Annex B 1 are kept.

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

According to the Decision 96/582/EC of the European Commission[1] the system of assessment verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) given in the following table apply.

Product	Intended use	Level or class	System
Metal anchors for use in concrete	For fixing and/or supporting to concrete, structural elements (which contributes to the stability of the works) or heavy units	-	1

5. Technical details necessary for the implementation of the AVCP system, as provided in the applicable EAD

5.1 Tasks of the manufacturer

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall ensure that the product is in conformity with this European Technical Assessment.

The manufacturer may only use raw materials stated in the technical documentation of this European Technical Assessment.

The factory production control shall be in accordance with the control plan which is a part of the technical documentation of this European Technical Assessment. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited at Technický a zkušební ústav stavební Praha, s.p.[2] The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

The manufacturer shall, on the basis of a contract, involve a body which is notified for the tasks referred to in section 4 in the field of anchors in order to undertake the actions laid down in section 5.2. For this purpose, the control plan referred to in this section and section 5.2 shall be handed over by the manufacturer to the notified body involved.

The manufacturer shall make a declaration of performance, stating that the construction product is in conformity with the provisions of this European Technical Assessment.

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1 Official Journal of the European Communities L 254 of 08.10.1996

2 The control plan is a confidential part of the documentation of the European Technical Assessment, but not published together with the ETA and only handed over to the approved body involved in the procedure of AVCP.

5.2 Tasks of the notified bodies

The notified body shall retain the essential points of its actions referred to above and state the results obtained and conclusions drawn in a written report.

The notified certification body involved by the manufacturer shall issue an certificate of constancy of performance stating the conformity with the provisions of this European Technical Assessment.

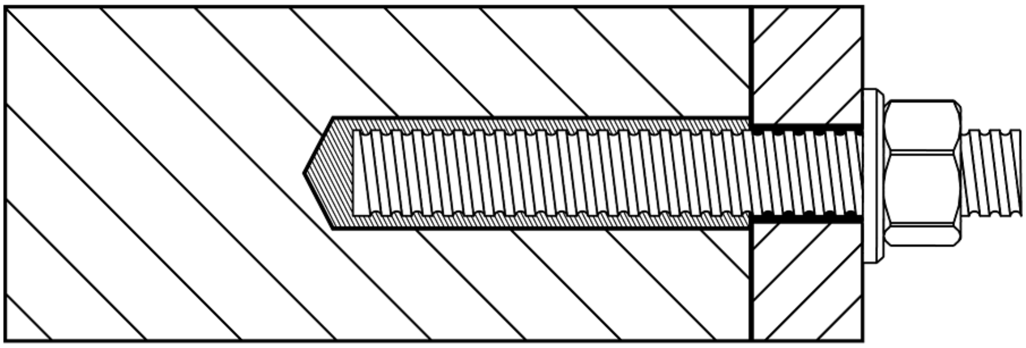
In cases where the provisions of the European Technical Assessment and its control plan are no longer fulfilled the notified body shall withdraw the certificate of constancy of performance and inform Technický a zkušební ústav stavební Praha, s.p without delay.

Issued in Prague on 04.09.2014

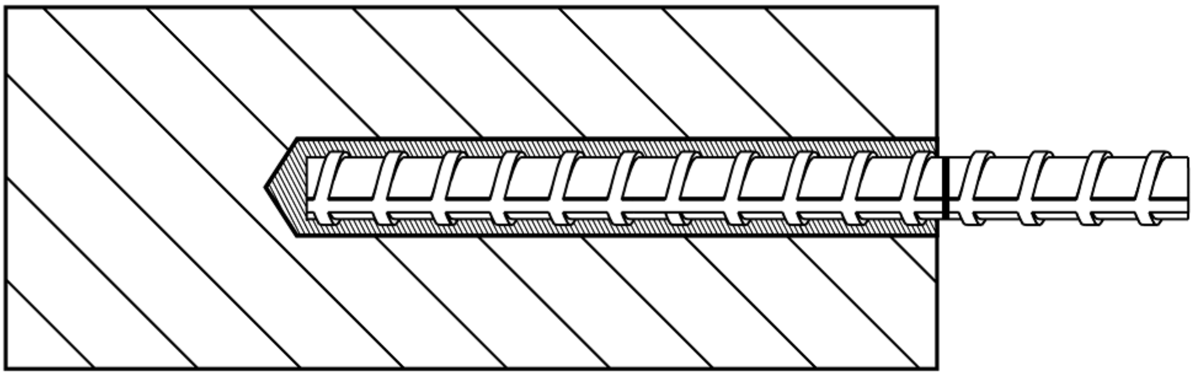
signed by

Ing. Božena Musilová
Head of the Technical Assessment Body

Threaded rod



Reinforcing bar



Sika AnchorFix®-3001	**Annex A 1**
Product description Installed conditions	

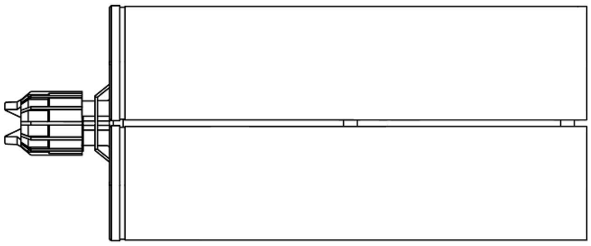
Cartridges

Universal cartridge

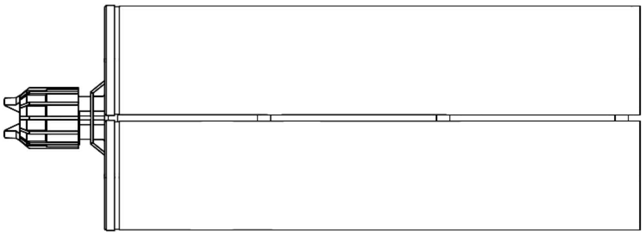
Sika AnchorFix®-3001 250 ml

Side by side cartridge

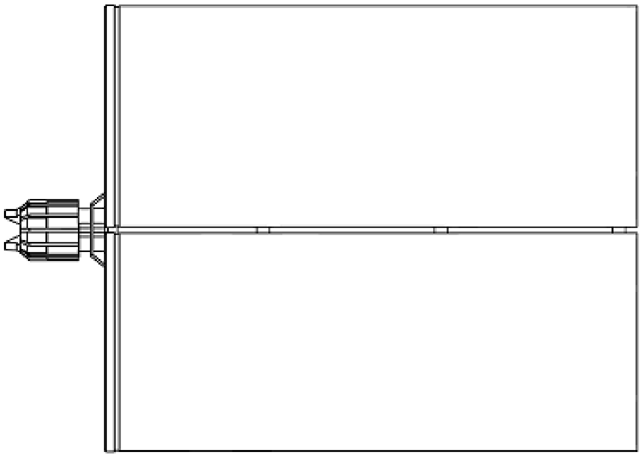
Sika AnchorFix®-3001 400 ml



Sika AnchorFix®-3001 600 ml



Sika AnchorFix®-3001 1500 ml

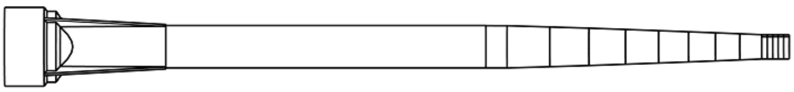


Marking of the mortar cartridges

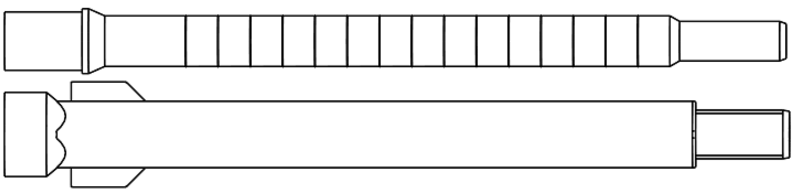
Identifying mark of the producer, Trade name, Charge code number, Storage life, Curing and processing time

Mixing nozzle

Q mixing nozzle

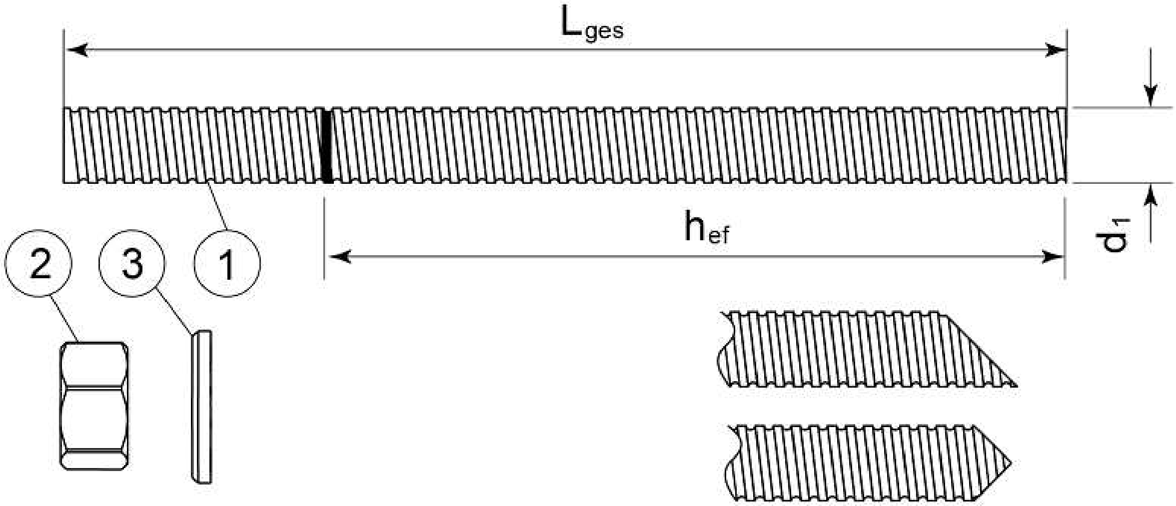


QH mixing nozzle



Sika AnchorFix®-3001	**Annex A 2**
Product description Injection system	

Threaded rod M10, M12, M16, M20, M24, M30



Standard commercial threaded rod with marked embedment depth

Part	Designation	Material
Steel, zinc plated ≥ 5 µm acc. to EN ISO 4042 or Steel, Hot-dip galvanized ≥ 40 µm acc. to EN ISO 1461 and EN ISO 10684		
1	Anchor rod	Steel, EN 10087 or EN 10263 Property class 5.8, 8.8, 10.9* EN ISO 898-1
2	Hexagon nut EN ISO 4032	According to threaded rod, EN 20898-2
3	Washer EN ISO 887, EN ISO 7089, EN ISO 7093 or EN ISO 7094	According to threaded rod
Stainless steel		
1	Anchor rod	Material: A4-70, A4-80, EN ISO 3506
2	Hexagon nut EN ISO 4032	According to threaded rod
3	Washer EN ISO 887, EN ISO 7089, EN ISO 7093 or EN ISO 7094	According to threaded rod
High corrosion resistant steel 1.4529		
1	Anchor rod	Material: 1.4529, EN 10088-1
2	Hexagon nut EN ISO 4032	According to threaded rod
3	Washer EN ISO 887, EN ISO 7089, EN ISO 7093 or EN ISO 7094	According to threaded rod

*Galvanized rod of high strength are sensitive to hydrogen induced brittle failure

Rebar Ø10, Ø12, Ø16, Ø20, Ø25, Ø32

Standard commercial reinforcing bar with marked embedment depth

Product form		**Bars and de-coiled rods**	
Class		B	C
Characteristic yield strength f_{yk} or $f_{0,2k}$ (MPa)		400 to 600	
Minimum value of k = $(f_t/f_y)_k$		≥ 1,08	≥ 1,15 < 1,35
Characteristic strain at maximum force ε_{uk} (%)		≥ 5,0	≥ 7,5
Bendability		Bend/Rebend test	
Maximum deviation from nominal mass (individual bar) (%)	Nominal bar size (mm) ≤ 8 > 8	 ±6,0 ±4,5	
Bond: Minimum relative rib area, $f_{R,min}$	Nominal bar size (mm) 8 to 12 > 12	 0,040 0,056	

Sika AnchorFix®-3001	**Annex A 4**
Product description Rebars and materials	

Specifications of intended use

Anchorages subject to:
- Static and quasi-static load.

Base materials
- Cracked and non-cracked concrete.
- Reinforced or unreinforced normal weight concrete of strength class C20/25 at minimum and C50/60 at maximum according EN 206-1:2000-12.

Temperature range:
- Ta) -40°C to +40°C (max. short. term temperature +40°C and max. long term temperature +24°C)
- Tb) -40°C to +70°C (max. short. term temperature +70°C and max. long term temperature +40°C)
- Tc) -40°C to +80°C (max. short. term temperature +80°C and max. long term temperature +40°C)

Use conditions (Environmental conditions)
- Structures subject to dry internal conditions (zinc coated steel, stainless steel, high corrosion resistance steel).
- Structures subject to external atmospheric exposure including industrial and marine environment, if no particular aggressive conditions exist (stainless steel, high corrosion resistance steel).
- Structures subject to permanently damp internal condition, if no particular aggressive conditions exist (stainless steel, high corrosion resistance steel).
- Structures subject to permanently damp internal condition, with particular aggressive conditions exist (high corrosion resistance steel).

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).

Use categories:
- Category 1 – installation in dry or wet concrete

Design:
- The anchorages are designed in accordance with the EOTA Technical Report TR 029 "Design of bonded anchors" 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.

Installation:
- Dry or wet concrete.
- Hole drilling by rotary drill mode.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

Applicator gun

A

B

C

D

E

Cartridge	Applicator gun
Universal 250 ml	A
Side by side 400 ml	B
Side by side 600 ml	C, D
Side by side 1500 ml	E

Cleaning brush

Size		M10	M12	M16	M20	M24	M30
Steel brush head diameter	[mm]	S14H/F	S16H/F	S22H/F	S24H/F	S31H/F	S38H/F
Steel brush head length	[mm]	75					
Min. overall brush length	[mm]	110					

Size		Ø10	Ø12	Ø16	Ø20	Ø25	Ø32
Steel brush head diameter	[mm]	S16H/F	S18H/F	S22H/F	S27H/F	S35H/F	S43H/F
Steel brush head length	[mm]	75					
Min. overall brush length	[mm]	110					

Table B1: Installation parameters of threaded rod

Size			M10	M12	M16	M20	M24	M30
Nominal drill hole diameter	$Ød_0$	[mm]	12	14	18	22	26	35
Diameter of cleaning brush	d_b	[mm]	S14H/F	S16H/F	S22H/F	S24H/F	S31H/F	S38H/F
Torque moment	T_{inst}	[Nm]	20	40	80	135	200	270
Min. embedment depth								
Depth of drill hole	h_0	[mm]	60	70	80	90	96	120
Effective anchorage depth	h_{ef}	[mm]	60	70	80	90	96	120
Minimum edge distance	c_{min}	[mm]	40	40	45	50	55	65
Minimum spacing	s_{min}	[mm]	40	40	45	50	55	65
Minimum thickness of member	h_{min}	[mm]	100	100	115	130	160	200
Max. embedment depth 20d								
Depth of drill hole	h_0	[mm]	200	240	320	400	480	600
Effective anchorage depth	h_{ef}	[mm]	200	240	320	400	480	600
Minimum edge distance	c_{min}	[mm]	40	40	45	50	55	65
Minimum spacing	s_{min}	[mm]	40	40	45	50	55	65
Minimum thickness of member	h_{min}	[mm]	224	268	336	444	532	670

Table B2: Installation parameters of rebar

Size			Ø10	Ø12	Ø16	Ø20	Ø25	Ø32
Nominal drill hole diameter	$Ød_0$	[mm]	14	16	20	25	32	40
Diameter of cleaning brush	d_b	[mm]	S16H/F	S18H/F	S22H/F	S27H/F	S35H/F	S43H/F
Torque moment	T_{inst}	[Nm]	20	40	80	135	200	270
Min. embedment depth								
Depth of drill hole	h_0	[mm]	60	70	80	90	100	128
Effective anchorage depth	h_{ef}	[mm]	60	70	80	90	100	128
Minimum edge distance	c_{min}	[mm]	40	40	45	50	55	65
Minimum spacing	s_{min}	[mm]	40	40	45	50	55	65
Minimum thickness of member	h_{min}	[mm]	100	100	120	140	164	208
Max. embedment depth 20d								
Depth of drill hole	h_0	[mm]	200	240	320	400	500	640
Effective anchorage depth	h_{ef}	[mm]	200	240	320	400	500	640
Minimum edge distance	c_{min}	[mm]	40	40	45	50	55	65
Minimum spacing	s_{min}	[mm]	40	40	45	50	55	65
Minimum thickness of member	h_{min}	[mm]	228	272	360	450	564	720

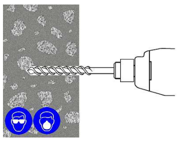
Table B3: Minimum curing time

Concrete temperature [°C]	Gel time [minutes]	Cure time [hours]
+5 to +10	20	24
+10 to +15		12
+15 to +20	15	8
+20 to +25	11	7
+25 to +30	8	6
+30 to +35	6	5
+35 to +40	4	4
+40	3	3
Cartridge must be conditioned to minimum +10°C		

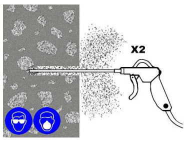
Installation procedure

Before commencing installation ensure the operative is equipped with appropriate personal protection equipment, SDS Hammer Drill, Air, Hole Cleaning Brush, good quality Dispensing Tool – either manual or power operated, Chemical cartridge with mixing nozzle and extension tube, if needed.

1. Using the SDS Hammer Drill in rotary hammer mode for drilling, with a carbide tipped drill bit of the appropriate size, drill the hole to the specified hole diameter and depth.

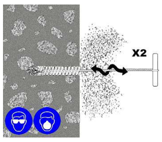


2. Insert the Air Lance to the bottom of the hole and depress the trigger for 2 seconds. The compressed air must be clean – free from water and oil – and at a minimum pressure of 6bar.



   Perform the blowing operation twice.

3. Select the correct size Hole Cleaning Brush. Ensure that the brush is in good condition and the correct diameter. Insert the brush to the bottom of the hole, using a brush extension if needed to reach the bottom of the hole and withdraw with a twisting motion. *There should be positive interaction between the steel bristles of the brush and the sides of the drilled hole*.



   Perform the brushing operation twice.

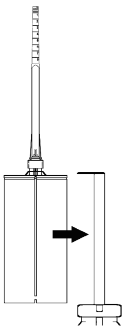
4. Repeat 2

5. Repeat 3

6. Repeat 2

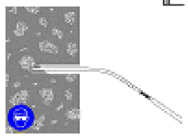
7. Select the appropriate static mixer nozzle, checking that the mixing elements are present and correct **(do not modify the mixer)**. Attach mixer nozzle to the cartridge. Check the Dispensing Tool is in good working order. Place the cartridge into the dispensing tool.

   Note: The QH nozzle is in two sections. One section contains the mixing elements and the other section is an extension piece. Connect the extension piece to the mixing section by pushing the two sections firmly together until a positive engagement is felt.



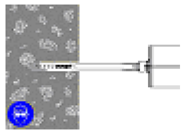
8. Extrude some resin to waste until an even-colored mixture is extruded, The cartridge is now ready for use

9. Attach an extension tube with resin stopper (if required) to the end of the mixing nozzle with a push fit

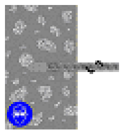


   (The extension tubes may be pushed into the resin stoppers and are held in place with a coarse internal thread).

10. Insert the mixing nozzle to the bottom of the hole. Extrude the resin and slowly withdraw the nozzle from the hole. **Ensure no air voids are created** as the nozzle is withdrawn. Inject resin until the hole is approximately ¾ full and remove the nozzle from the hole.

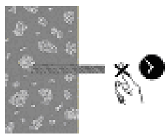


11. Select the steel anchor element ensuring it is free from oil or other contaminants, and mark with the required embedment depth. Insert the steel element into the hole using a back and forth twisting motion to ensure complete cover, until it reaches the bottom of the hole. Excess resin will be expelled from the hole evenly around the steel element and there shall be no gaps between the anchor element and the wall of the drilled hole.



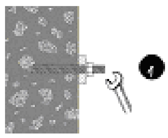
12. Clean any excess resin from around the mouth of the hole.

13. Do not disturb the anchor until at least the minimum cure time has elapsed. Refer to the Working and Load Timetable to determine the appropriate cure time.



14. Position the fixture and tighten the anchor to the appropriate installation torque.

    Do not over-torque the anchor as this could adversely affect its performance.



Sika AnchorFix®-3001	**Annex B 4**
Intended use Installation instructions	

Table C1: Design method TR 029
Characteristic values of resistance to tension load of threaded rod

Steel failure – Characteristic resistance								
Size			**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Steel grade **5.8**	$N_{Rk,s}$	[kN]	29	42	79	123	177	281
Partial safety factor	γ_{Ms} [1)]	[-]	1,5					
Steel grade **8.8**	$N_{Rk,s}$	[kN]	46	67	126	196	282	449
Partial safety factor	γ_{Ms} [1)]	[-]	1,5					
Steel grade **10.9***	$N_{Rk,s}$	[kN]	58	84	157	245	353	561
Partial safety factor	γ_{Ms} [1)]	[-]	1,4					
Stainless steel grade **A4-70**	$N_{Rk,s}$	[kN]	41	59	110	172	247	393
Partial safety factor	γ_{Ms} [1)]	[-]	1,9					
Stainless steel grade **A4-80**	$N_{Rk,s}$	[kN]	46	67	126	196	282	449
Partial safety factor	γ_{Ms} [1)]	[-]	1,6					
Stainless steel grade **1.4529**	$N_{Rk,s}$	[kN]	41	59	110	172	247	393
Partial safety factor	γ_{Ms} [1)]	[-]	1,5					

*Galvanized rod of high strength are sensitive to hydrogen induced brittle failure

Pullout failure in concrete C20/25								
Size			**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Characteristic bond resistance in non-cracked concrete C20/25								
Temperature a) -40°C to +40°C	τ_{Rk}	[N/mm²]	12	12	12	12	13	11
Temperature b) -40°C to +70°C	τ_{Rk}	[N/mm²]	5,5	5,5	5,5	5,5	6	5
Temperature c) -40°C to +80°C	τ_{Rk}	[N/mm²]	5	4,5	4,5	4,5	5	4,5
Partial safety factor	γ_{Mc} [1)]	[-]	1,8 [2)]	2,1 [3)]				
Factor for non-cracked concrete C30/37	ψ_c		1,12					
Factor for non-cracked concrete C40/50	ψ_c		1,23					
Factor for non-cracked concrete C50/60	ψ_c		1,30					
Characteristic bond resistance in cracked concrete C20/25								
Temperature a) -40°C to +40°C	τ_{Rk}	[N/mm²]	9	9	9	6	6	6
Temperature b) -40°C to +70°C	τ_{Rk}	[N/mm²]	4	4	4,5	2,5	2,5	2,5
Temperature c) -40°C to +80°C	τ_{Rk}	[N/mm²]	3,5	3,5	3,5	2,5	2,5	2,5
Partial safety factor	γ_{Mc} [1)]	[-]	1,8 [2)]	2,1 [3)]				
Factor for cracked concrete C30/37	ψ_c		1,03					
Factor for cracked concrete C40/50	ψ_c		1,06					
Factor for cracked concrete C50/60	ψ_c		1,07					

Splitting failure								
Size			**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Edge distance	$c_{cr,sp}$	[mm]	$1{,}0 \cdot h_{ef} \leq 2{,}0 \cdot h_{ef} \cdot \left(2{,}5 - \frac{h}{h_{ef}}\right) \leq 2{,}4 \cdot h_{ef}$					
Spacing	$s_{cr,sp}$	[mm]	$2 \cdot C_{cr,sp}$					
Partial safety factor	γ_{Msp} [1)]	[-]	1,8					

1) In absence of national regulations
2) The partial safety factor γ_2=1,2 is included
3) The partial safety factor γ_2=1,4 is included

Sika AnchorFix®-3001	
Performances Design according to TR 029 Characteristic resistance for tension loads - threaded rod	**Annex C 1**

Table C2: Design method TR 029
Characteristic values of resistance to tension load of rebar

Steel failure – Characteristic resistance								
Size			**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø25**	**Ø32**
Rebar BSt 500 S	$N_{Rk,s}$	[kN]	43	62	111	173	270	442
Partial safety factor	γ_{Ms} 1)	[-]	1,4					

Pullout failure in concrete C20/25								
Size			**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø25**	**Ø32**
Characteristic bond resistance in non-cracked concrete C20/25								
Temperature a) -40°C to +40°C	τ_{Rk}	[N/mm²]	12	12	13	13	13	13
Temperature b) -40°C to +70°C	τ_{Rk}	[N/mm²]	5,5	5,5	6	6	6	6
Temperature c) -40°C to +80°C	τ_{Rk}	[N/mm²]	5	5	5	5	5	5
Partial safety factor	γ_{Mc} 1)	[-]	1,8 2)	2,1 3)				
Factor for non-cracked concrete C30/37	ψ_c		1,06					
Factor for non-cracked concrete C40/50	ψ_c		1,11					
Factor for non-cracked concrete C50/60	ψ_c		1,14					
Characteristic bond resistance in cracked concrete C20/25								
Temperature a) -40°C to +40°C	τ_{Rk}	[N/mm²]	9	9	7	7	5	5
Temperature b) -40°C to +70°C	τ_{Rk}	[N/mm²]	4	4	3	3	2	2
Temperature c) -40°C to +80°C	τ_{Rk}	[N/mm²]	3,5	3,5	2,5	2,5	2	2
Partial safety factor	γ_{Mc} 1)	[-]	1,8 2)	2,1 3)				
Factor for cracked concrete C30/37	ψ_c		1,04					
Factor for cracked concrete C40/50	ψ_c		1,07					
Factor for cracked concrete C50/60	ψ_c		1,09					

Splitting failure								
Size			**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø25**	**Ø32**
Edge distance	$c_{cr,sp}$	[mm]	$1{,}0 \cdot h_{ef} \leq 2{,}0 \cdot h_{ef} \cdot \left(2{,}5 - \frac{h}{h_{ef}}\right) \leq 2{,}4 \cdot h_{ef}$					
Spacing	$s_{cr,sp}$	[mm]	$2 \cdot C_{cr,sp}$					
Partial safety factor	γ_{Msp} 1)	[-]	1,8					

1) In absence of national regulations
2) The partial safety factor γ_2=1,2 is included
3) The partial safety factor γ_2=1,4 is included

Table C3: Design method TR 029
Characteristic values of resistance to shear load of threaded rod

Steel failure without lever arm								
Size			**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Steel grade **5.8**	$V_{Rk,s}$	[kN]	15	21	39	61	88	140
Partial safety factor	γ_{Ms} [1)]	[-]	1,25					
Steel grade **8.8**	$V_{Rk,s}$	[kN]	23	34	63	98	141	224
Partial safety factor	γ_{Ms} [1)]	[-]	1,25					
Steel grade **10.9***	$V_{Rk,s}$	[kN]	29	42	79	123	177	281
Partial safety factor	γ_{Ms} [1)]	[-]	1,5					
Stainless steel grade **A4-70**	$V_{Rk,s}$	[kN]	20	30	55	86	124	196
Partial safety factor	γ_{Ms} [1)]	[-]	1,56					
Stainless steel grade **A4-80**	$V_{Rk,s}$	[kN]	23	34	63	98	141	224
Partial safety factor	γ_{Ms} [1)]	[-]	1,33					
Stainless steel grade **1.4529**	$V_{Rk,s}$	[kN]	20	30	55	86	124	196
Partial safety factor	γ_{Ms} [1)]	[-]	1,25					

Steel failure with lever arm								
Size			**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Steel grade **5.8**	$M^o_{Rk,s}$	[N.m]	37	66	166	325	561	1125
Partial safety factor	γ_{Ms} [1)]	[-]	1,25					
Steel grade **8.8**	$M^o_{Rk,s}$	[N.m]	60	105	266	519	898	1799
Partial safety factor	γ_{Ms} [1)]	[-]	1,25					
Steel grade **10.9***	$M^o_{Rk,s}$	[N.m]	75	131	333	649	1123	2249
Partial safety factor	γ_{Ms} [1)]	[-]	1,50					
Stainless steel grade **A4-70**	$M^o_{Rk,s}$	[N.m]	52	92	233	454	786	1574
Partial safety factor	γ_{Ms} [1)]	[-]	1,56					
Stainless steel grade **A4-80**	$M^o_{Rk,s}$	[N.m]	60	105	266	519	898	1799
Partial safety factor	γ_{Ms} [1)]	[-]	1,33					
Stainless steel grade **1.4529**	$M^o_{Rk,s}$	[N.m]	52	92	233	454	786	1574
Partial safety factor	γ_{Ms} [1)]	[-]	1,25					
Concrete pryout failure								
Factor *k* from TR 029 Design of bonded anchors, Part 5.2.3.3			2					
Partial safety factor	γ_{Mp} [1)]	[-]	1,5					

*Galvanized rod of high strength are sensitive to hydrogen induced brittle failure

Concrete edge failure								
Size			**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
See section 5.2.3.4 of Technical Report TR 029 for the Design of Bonded Anchors								
Partial safety factor	γ_{Mc} [1)]	[-]	1,5					

[1)] In absence of national regulations

Sika AnchorFix®-3001	
Performances Design according to TR 029 Characteristic resistance for shear loads - threaded rod	**Annex C 3**

Table C4: Design method TR 029
Characteristic values of resistance to shear load of rebar

Steel failure without lever arm								
Size			**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø25**	**Ø32**
Rebar BSt 500 S	$V_{Rk,s}$	[kN]	22	31	55	86	135	221
Partial safety factor	γ_{Ms} 1)	[-]	1,5					

Steel failure with lever arm								
Size			**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø25**	**Ø32**
Rebar BSt 500 S	$M^o_{Rk,s}$	[N.m]	65	112	265	518	1013	2122
Partial safety factor	γ_{Ms} 1)	[-]	1,5					
Concrete pryout failure								
Factor *k* from TR 029 Design of bonded anchors, Part 5.2.3.3			2					
Partial safety factor	γ_{Mp} 1)	[-]	1,5					

Concrete edge failure								
Size			**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø25**	**Ø32**
See section 5.2.3.4 of Technical Report TR 029 for the Design of Bonded Anchors								
Partial safety factor	γ_{Mc} 1)	[-]	1,5					

1) In absence of national regulations

Table C5: Design method CEN/TS 1992-4
Characteristic values of resistance to tension load of threaded rod

Steel failure – Characteristic resistance								
Size			**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Steel grade **5.8**	$N_{Rk,s}$	[kN]	29	42	79	123	177	281
Partial safety factor	γ_{Ms} 1)	[-]	1,5					
Steel grade **8.8**	$N_{Rk,s}$	[kN]	46	67	126	196	282	449
Partial safety factor	γ_{Ms} 1)	[-]	1,5					
Steel grade **10.9***	$N_{Rk,s}$	[kN]	58	84	157	245	353	561
Partial safety factor	γ_{Ms} 1)	[-]	1,4					
Stainless steel grade **A4-70**	$N_{Rk,s}$	[kN]	41	59	110	172	247	393
Partial safety factor	γ_{Ms} 1)	[-]	1,9					
Stainless steel grade **A4-80**	$N_{Rk,s}$	[kN]	46	67	126	196	282	449
Partial safety factor	γ_{Ms} 1)	[-]	1,6					
Stainless steel grade **1.4529**	$N_{Rk,s}$	[kN]	41	59	110	172	247	393
Partial safety factor	γ_{Ms} 1)	[-]	1,5					

*Galvanized rod of high strength are sensitive to hydrogen induced brittle failure

Pullout failure in concrete C20/25								
Size			**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Characteristic bond resistance in non-cracked concrete C20/25								
Temperature a) -40°C to +40°C	τ_{Rk}	[N/mm²]	12	12	12	12	13	11
Temperature b) -40°C to +70°C	τ_{Rk}	[N/mm²]	5,5	5,5	5,5	5,5	6	5
Temperature c) -40°C to +80°C	τ_{Rk}	[N/mm²]	5	4,5	4,5	4,5	5	4,5
Partial safety factor	γ_{Mc} 1)	[-]	1,8 2)	2,1 3)				
Factor for non-cracked concrete C30/37	ψ_c		1,12					
Factor for non-cracked concrete C40/50	ψ_c		1,23					
Factor for non-cracked concrete C50/60	ψ_c		1,30					
Factor according to CEN/TS 1992-4-5 Section 6.2.2	k_8		10,1					
Characteristic bond resistance in cracked concrete C20/25								
Temperature a) -40°C to +40°C	τ_{Rk}	[N/mm²]	9	9	9	6	6	6
Temperature b) -40°C to +70°C	τ_{Rk}	[N/mm²]	4	4	4,5	2,5	2,5	2,5
Temperature c) -40°C to +80°C	τ_{Rk}	[N/mm²]	3,5	3,5	3,5	2,5	2,5	2,5
Partial safety factor	γ_{Mc} 1)	[-]	1,8 2)	2,1 3)				
Factor for cracked concrete C30/37	ψ_c		1,03					
Factor for cracked concrete C40/50	ψ_c		1,06					
Factor for cracked concrete C50/60	ψ_c		1,07					
Factor according to CEN/TS 1992-4-5 Section 6.2.2	k_8		7,2					

Concrete cone failure								
Size			**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Factor according to CEN/TS 1992-4-5 Section 6.2.3	k_{ucr}		10,1					
	k_{cr}		7,2					
Edge distance	$c_{cr,N}$	[mm]	$1{,}5h_{ef}$					
Spacing	$s_{cr,N}$	[mm]	$3{,}0h_{ef}$					
Splitting failure								
Edge distance	$c_{cr,sp}$	[mm]	$1{,}0 \cdot h_{ef} \leq 2{,}0 \cdot h_{ef} \cdot \left(2{,}5 - \frac{h}{h_{ef}}\right) \leq 2{,}4 \cdot h_{ef}$					
Spacing	$s_{cr,sp}$	[mm]	$2 \cdot C_{cr,sp}$					
Partial safety factor	γ_{Msp} 1)	[-]	1,8					

1) In absence of national regulations
2) The partial safety factor γ_2=1,2 is included
3) The partial safety factor γ_2=1,4 is included

Sika AnchorFix®-3001	**Annex C 5**
Performances Design according to CEN/TS 1992-4 Characteristic resistance for tension loads - threaded rod	

Table C6: Design method CEN/TS 1992-4
Characteristic values of resistance to tension load of rebar

Steel failure – Characteristic resistance								
Size			**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø25**	**Ø32**
Rebar BSt 500 S	$N_{Rk,s}$	[kN]	43	62	111	173	270	442
Partial safety factor	γ_{Ms} 1)	[-]	1,4					

Pullout failure in concrete C20/25								
Size			**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø25**	**Ø32**
Characteristic bond resistance in non-cracked concrete C20/25								
Temperature a) -40°C to +40°C	τ_{Rk}	[N/mm²]	12	12	13	13	13	13
Temperature b) -40°C to +70°C	τ_{Rk}	[N/mm²]	5,5	5,5	6	6	6	6
Temperature c) -40°C to +80°C	τ_{Rk}	[N/mm²]	5	5	5	5	5	5
Partial safety factor	γ_{Mc} 1)	[-]	1,8 2)	2,1 3)				
Factor for non-cracked concrete C30/37	ψ_c		1,06					
Factor for non-cracked concrete C40/50	ψ_c		1,11					
Factor for non-cracked concrete C50/60	ψ_c		1,14					
Factor according to CEN/TS 1992-4-5 Section 6.2.2	k_8		10,1					
Characteristic bond resistance in cracked concrete C20/25								
Temperature a) -40°C to +40°C	τ_{Rk}	[N/mm²]	9	9	7	7	5	5
Temperature b) -40°C to +70°C	τ_{Rk}	[N/mm²]	4	4	3	3	2	2
Temperature c) -40°C to +80°C	τ_{Rk}	[N/mm²]	3,5	3,5	2,5	2,5	2	2
Partial safety factor	γ_{Mc} 1)	[-]	1,8 2)	2,1 3)				
Factor for cracked concrete C30/37	ψ_c		1,04					
Factor for cracked concrete C40/50	ψ_c		1,07					
Factor for cracked concrete C50/60	ψ_c		1,09					
Factor according to CEN/TS 1992-4-5 Section 6.2.2	k_8		7,2					

Concrete cone failure								
Size			**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø25**	**Ø32**
Factor according to CEN/TS 1992-4-5 Section 6.2.3	k_{ucr}		10,1					
	k_{cr}		7,2					
Edge distance	$c_{cr,N}$	[mm]	$1{,}5h_{ef}$					
Spacing	$s_{cr,N}$	[mm]	$3{,}0h_{ef}$					
Splitting failure								
Edge distance	$c_{cr,sp}$	[mm]	$1{,}0 \cdot h_{ef} \leq 2{,}0 \cdot h_{ef} \cdot \left(2{,}5 - \frac{h}{h_{ef}}\right) \leq 2{,}4 \cdot h_{ef}$					
Spacing	$s_{cr,sp}$	[mm]	$2 \cdot C_{cr,sp}$					
Partial safety factor	γ_{Msp} 1)	[-]	1,8					

1) In absence of national regulations
2) The partial safety factor γ_2=1,2 is included
3) The partial safety factor γ_2=1,4 is included

Table C7: Design method CEN/TS 1992-4
Characteristic values of resistance to shear load of threaded rod

Steel failure without lever arm								
Size			**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Steel grade **5.8**	$V_{Rk,s}$	[kN]	15	21	39	61	88	140
Partial safety factor	γ_{Ms} [1)]	[-]	1,25					
Steel grade **8.8**	$V_{Rk,s}$	[kN]	23	34	63	98	141	224
Partial safety factor	γ_{Ms} [1)]	[-]	1,25					
Steel grade **10.9***	$V_{Rk,s}$	[kN]	29	42	79	123	177	281
Partial safety factor	γ_{Ms} [1)]	[-]	1,5					
Stainless steel grade **A4-70**	$V_{Rk,s}$	[kN]	20	30	55	86	124	196
Partial safety factor	γ_{Ms} [1)]	[-]	1,56					
Stainless steel grade **A4-80**	$V_{Rk,s}$	[kN]	23	34	63	98	141	224
Partial safety factor	γ_{Ms} [1)]	[-]	1,33					
Stainless steel grade **1.4529**	$V_{Rk,s}$	[kN]	20	30	55	86	124	196
Partial safety factor	γ_{Ms} [1)]	[-]	1,25					
Ductility factor according to CEN/TS 1992-4-5 Section 6.3.2.1		k_2	0,8					

Steel failure with lever arm								
Size			**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Steel grade **5.8**	$M^o_{Rk,s}$	[N.m]	37	66	166	325	561	1125
Partial safety factor	γ_{Ms} [1)]	[-]	1,25					
Steel grade **8.8**	$M^o_{Rk,s}$	[N.m]	60	105	266	519	898	1799
Partial safety factor	γ_{Ms} [1)]	[-]	1,25					
Steel grade **10.9***	$M^o_{Rk,s}$	[N.m]	75	131	333	649	1123	2249
Partial safety factor	γ_{Ms} [1)]	[-]	1,50					
Stainless steel grade **A4-70**	$M^o_{Rk,s}$	[N.m]	52	92	233	454	786	1574
Partial safety factor	γ_{Ms} [1)]	[-]	1,56					
Stainless steel grade **A4-80**	$M^o_{Rk,s}$	[N.m]	60	105	266	519	898	1799
Partial safety factor	γ_{Ms} [1)]	[-]	1,33					
Stainless steel grade **1.4529**	$M^o_{Rk,s}$	[N.m]	52	92	233	454	786	1574
Partial safety factor	γ_{Ms} [1)]	[-]	1,25					
Concrete pryout failure								
Factor according to CEN/TS 1992-4-5 Section 6.3.3			2					
Partial safety factor	γ_{Mp} [1)]	[-]	1,5					

*Galvanized rod of high strength are sensitive to hydrogen induced brittle failure

Concrete edge failure								
Size			**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
See section 6.3.4 of CEN/TS 1992-4-5								
Effective length of anchor	l_f	[mm]	$l_f = \min(h_{ef}; 8\ d_{nom})$					
Outside diameter of anchor	d_{nom}	[mm]	10	12	16	20	24	30
Partial safety factor	γ_{Mc} [1)]	[-]	1,5					

[1)] In absence of national regulations

Sika AnchorFix®-3001

Performances
Design according to CEN/TS 1992-4
Characteristic resistance for shear loads - threaded rod

Annex C 7

Table C8: Design method CEN/TS 1992-4
Characteristic values of resistance to shear load of rebar

Steel failure without lever arm								
Size			**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø25**	**Ø32**
Rebar BSt 500 S	$V_{Rk,s}$	[kN]	22	31	55	86	135	221
Partial safety factor	γ_{Ms} [1)]	[-]	1,5					
Ductility factor according to CEN/TS 1992-4-5 Section 6.3.2.1	k_2		0,8					

Steel failure with lever arm								
Size			**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø25**	**Ø32**
Rebar BSt 500 S	$M^o_{Rk,s}$	[N.m]	65	112	265	518	1013	2122
Partial safety factor	γ_{Ms} [1)]	[-]	1,5					
Concrete pryout failure								
Factor according to CEN/TS 1992-4-5 Section 6.3.3			2,0					
Partial safety factor	γ_{Mp} [1)]	[-]	1,5					

Concrete edge failure								
Size			**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø25**	**Ø32**
See section 6.3.4 of CEN/TS 1992-4-5								
Effective length of anchor	l_f	[mm]	$l_f = \min(h_{ef}; 8\ d_{nom})$					
Outside diameter of anchor	d_{nom}	[mm]	10	12	16	20	24	30
Partial safety factor	γ_{Mc} [1)]	[-]	1,5					

1) In absence of national regulations

Sika AnchorFix®-3001	**Annex C 8**
Performances Design according to CEN/TS 1992-4 Characteristic resistance for shear loads - rebar	

Table C9: Displacement of threaded rod

Tension load

Anchor size			**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Non-cracked concrete								
40°C / 24°C	δ_{N0}	[mm/(N/mm^2)]	0,080	0,092	0,118	0,143	0,168	0,206
	$\delta_{N\infty}$	[mm/(N/mm^2)]	0,080	0,092	0,118	0,143	0,168	0,206
70°C / 40°C	δ_{N0}	[mm/(N/mm^2)]	0,113	0,131	0,167	0,203	0,239	0,293
	$\delta_{N\infty}$	[mm/(N/mm^2)]	0,176	0,204	0,260	0,316	0,371	0,455
80°C / 40°C	δ_{N0}	[mm/(N/mm^2)]	0,113	0,131	0,167	0,203	0,239	0,293
	$\delta_{N\infty}$	[mm/(N/mm^2)]	0,176	0,204	0,260	0,316	0,371	0,455
Cracked concrete								
40°C / 24°C	δ_{N0}	[mm/(N/mm^2)]	0,119	0,136	0,168	0,201	0,234	0,283
	$\delta_{N\infty}$	[mm/(N/mm^2)]	0,119	0,136	0,168	0,201	0,234	0,283
70°C / 40°C	δ_{N0}	[mm/(N/mm^2)]	0,119	0,136	0,168	0,201	0,234	0,283
	$\delta_{N\infty}$	[mm/(N/mm^2)]	0,179	0,204	0,253	0,303	0,352	0,426
80°C / 40°C	δ_{N0}	[mm/(N/mm^2)]	0,119	0,136	0,168	0,201	0,234	0,283
	$\delta_{N\infty}$	[mm/(N/mm^2)]	0,179	0,204	0,253	0,303	0,352	0,426

Shear load

Anchor size			**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Non-cracked concrete								
All temperatures	δ_{V0}	[mm/(N/mm^2)]	0,23	0,16	0,09	0,05	0,04	0,04
	$\delta_{V\infty}$	[mm/(N/mm^2)]	0,47	0,32	0,17	0,11	0,08	0,08

Table C10: Displacement of rebar

Tension load

Anchor size			Ø10	Ø12	Ø16	Ø20	Ø25	Ø32
Non-cracked concrete								
40°C / 24°C	δ_{N0}	[mm/(N/mm²)]	0,080	0,092	0,118	0,143	0,174	0,206
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,080	0,092	0,118	0,143	0,174	0,206
70°C / 40°C	δ_{N0}	[mm/(N/mm²)]	0,113	0,131	0,167	0,203	0,248	0,293
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,176	0,204	0,260	0,316	0,385	0,455
80°C / 40°C	δ_{N0}	[mm/(N/mm²)]	0,113	0,131	0,167	0,203	0,248	0,293
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,176	0,204	0,260	0,316	0,385	0,455
Cracked concrete								
40°C / 24°C	δ_{N0}	[mm/(N/mm²)]	0,119	0,136	0,168	0,201	0,242	0,283
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,119	0,136	0,168	0,201	0,242	0,283
70°C / 40°C	δ_{N0}	[mm/(N/mm²)]	0,115	0,131	0,163	0,195	0,235	0,274
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,179	0,204	0,253	0,303	0,365	0,426
80°C / 40°C	δ_{N0}	[mm/(N/mm²)]	0,115	0,131	0,163	0,195	0,235	0,274
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,179	0,204	0,253	0,303	0,365	0,426

Shear load

Anchor size			Ø10	Ø12	Ø16	Ø20	Ø25	Ø32
Non-cracked concrete								
All temperatures	δ_{V0}	[mm/(N/mm²)]	0,23	0,16	0,09	0,05	0,04	0,04
	$\delta_{V\infty}$	[mm/(N/mm²)]	0,47	0,32	0,17	0,11	0,08	0,08

Table C11: Reduction factors for seismic design category C1 for threaded rods

Size			M10	M12	M16	M20	M24	M30
Tension load								
Steel failure								
Characteristic resistance grade 5.8	$N_{Rk,s,seis}$	[kN]	29,0	42,2	78,5	122,5	176,5	280,5
Characteristic resistance grade 8.8	$N_{Rk,s,seis}$	[kN]	46,4	67,4	125,6	196,0	282,4	448,8
Characteristic resistance grade 10.9	$N_{Rk,s,seis}$	[kN]	58,0	84,3	157,0	245,0	353,0	561,0
Characteristic resistance A4-70	$N_{Rk,s,seis}$	[kN]	40,6	59,0	109,9	171,5	247,1	392,7
Characteristic resistance A4-80	$N_{Rk,s,seis}$	[kN]	46,4	67,4	125,6	196,0	282,4	448,8
Characteristic resistance 1.4529	$N_{Rk,s,seis}$	[kN]	40,6	59,0	109,9	171,5	247,1	392,7
Combined pull-out and concrete cone failure								
Factor for calculation of $\tau_{Rk,seis}$ [1)]	$\alpha_{N,seis}$	-	1,00	0,96	0,79	0,79	0,68	0,46
Shear load								
Steel failure without lever arm								
Characteristic resistance grade 5.8	$V_{Rk,s,seis}$	[kN]	13,5	19,6	36,5	61,3	86,3	140,3
Characteristic resistance grade 8.8	$V_{Rk,s,seis}$	[kN]	21,6	32,3	58,4	98,0	141,2	224,4
Characteristic resistance grade 10.9	$V_{Rk,s,seis}$	[kN]	27,0	39,2	73,0	122,5	176,5	280,5
Characteristic resistance A4-70	$V_{Rk,s,seis}$	[kN]	18,9	27,4	51,2	85,8	123,6	196,4
Characteristic resistance A4-80	$V_{Rk,s,seis}$	[kN]	21,6	31,3	58,4	98,0	141,2	224,4
Characteristic resistance 1.4529	$V_{Rk,s,seis}$	[kN]	18,9	27,4	51,2	85,8	123,6	196,4

1) $\tau_{Rk,seis} = \alpha_{N,seis} \times \tau_{Rk}$

Note: Rebars are not qualified for seismic design

Sika AnchorFix®-3001	Annex C 11
Performances Reduction factors for seismic design	