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Member of EOTA
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European Technical Assessment

ETA 23/0934 of 08/04/2025

Technical Assessment Body issuing the ETA: Technical and Test Institute for Construction Prague

Trade name of the construction product	R-KF2 R-KF2-W R-KF2-S
Product family to which the construction product belongs	Product area code: 33 Bonded injection type anchor for use in uncracked concrete
Manufacturer	Rawlplug S.A. Ul. Kwidzyńska 6 51-416 Wrocław Poland
Manufacturing plant	Manufacturing plant no 3
This European Technical Assessment contains	21 pages including 18 Annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of	EAD 330499-02-0601
This version replaces	ETA 23/0934 issued on 17/10/2024

1. Technical description of the product

The R-KF2 / R-KF2-S / R-KF2-W are bonded anchors (injection type) consisting of an injection mortar cartridge using an applicator gun equipped with a special mixing nozzle and threaded anchor rod sizes M8 to M30 made of galvanized carbon steel, stainless steel or high corrosion resistant stainless steel, with hexagon nut and washer or rebar sizes Ø8 to Ø32. The cartridge can be coaxial, side by side, single component for two part foil capsules or foil capsule (CFS system).

The threaded rod or rebar is placed into a drilled hole previously cleaned and injected (using an applicator gun) with a mortar with a slow and slight twisting motion. The rod is anchored by adhesion between the steel element, injection mortar and concrete.

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 and 100 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 to tension and shear load for static and quasi-static loading	See Annex C 1 to C 4
Displacements under short term and long term loading	See Annex C 5

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Satisfy the requirements for performance class A1
Resistance to fire	No performance assessed

3.3 Hygiene, health and environment (BWR 3)

No performance determined.

3.4 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

[1] Official Journal of the European Communities L 254 of 08.10.1996

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

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.

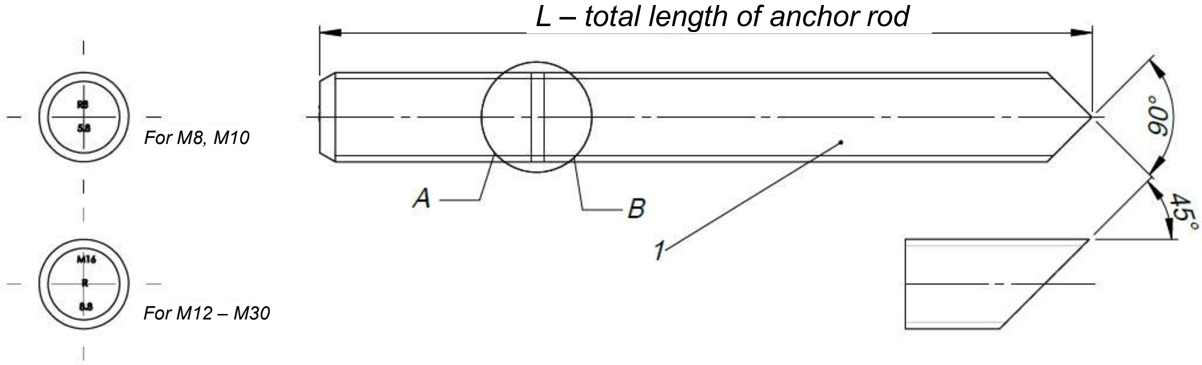
Issued in Prague on 08.04.2025

By

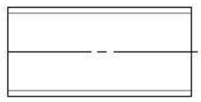
Ing. Jiří Studnička, Ph.D.
Head of the Technical Assessment Body

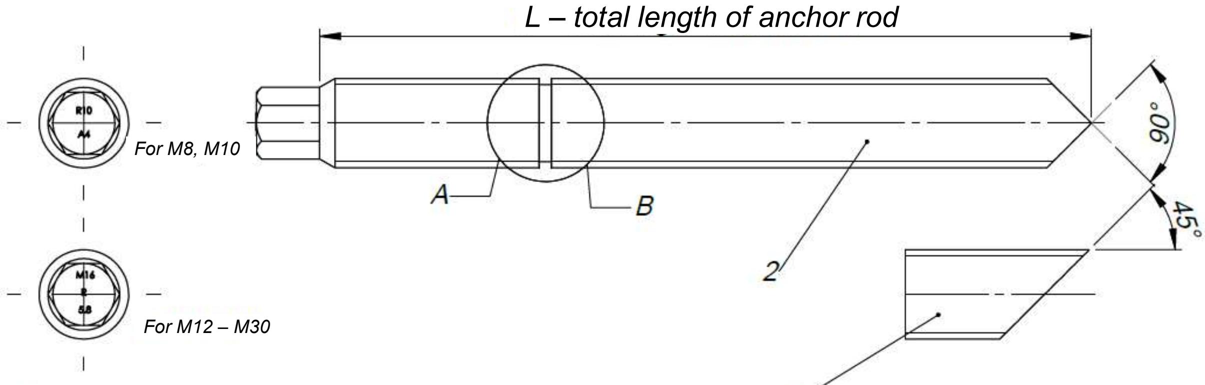
[2] The control plan is a confidential part of the documentation of the European Technical Assessment, but not published together with the ETA and only handed over to the approved body involved in the procedure of AVCP.

Threaded anchor rods

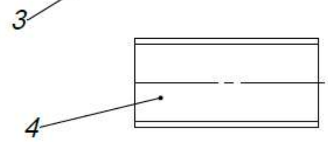


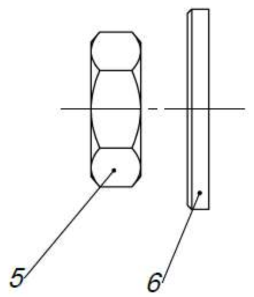
Marking: Identifying mark – R
Size rod: ´number´ for M8, M10; M´number´ for M12 to M30
Property: class steel (5.8; 8.8) or stainless steel (A2; A4; HC)





Marking: Identifying mark – R
Size rod: ´number´ for M8, M10; M´number´ for M12 to M30
Property: class steel (5.8; 8.8) or stainless steel (A2; A4; HC)





DETAIL A
SCALE 2:1
Painted Mark Version

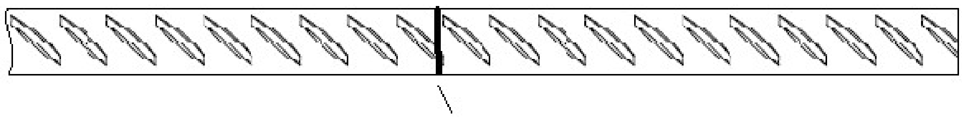
Depth h_{mld}

DETAIL B
SCALE 2:1
Notched Mark Version

Depth h_{mld}

1. Anchor rod R-STUDS-(88), (A2), (HC)-FL
2. Anchor rod R-STUDS-(88), (A2), (HC)-FL with the hexagonal tip
3. 45° shape with anchor rod
4. The flat of anchor rod
5. Hexagonal nut
6. Washer

Rebar



embedment depth marking h_{ef}

R-KF2, R-KF2-W, R-KF2-S	Annex A 1
Product description Threaded rods and rebars	

Table A1: Threaded rods

Designation		Material			
Steel, zinc plated **electroplated ≥ 5 µm according to EN ISO 4042** **hot-dip galvanized ≥ 40 µm according to EN ISO 1461** **non-electrolytically applied zinc flake coating ≥ 8 µm according to EN ISO 10683**					
Threaded rod	**Property class**	**Characteristic steel ultimate strength**	**Characteristic steel yield strength**	**Fracture elongation**	EN ISO 898-1
	4.8	f_{uk} ≥ 400 N/mm²	f_{yk} ≥ 320 N/mm²	A_5 > 8%	
	5.8	f_{uk} ≥ 500 N/mm²	f_{yk} ≥ 400 N/mm²	A_5 > 8%	
	8.8	f_{uk} ≥ 800 N/mm²	f_{yk} ≥ 640 N/mm²	A_5 ≥ 12%	
	10.9	f_{uk} ≥ 1000 N/mm²	f_{yk} ≥ 900 N/mm²	A_5 ≥ 9%	
	12.9	f_{uk} ≥ 1200 N/mm²	f_{yk} ≥ 1080 N/mm²	A_5 ≥ 8%	
Hexagon nut	4.8	for class 4.8 rods			EN ISO 898-2
	5.8	for class 5.8 rods			
	8.8	for class 8.8 rods			
	10.9	for class 10.9 rods			
	12.9	for class 12.9 rods			
Washer	Steel according to EN ISO 7089; corresponding to anchor rod material				
Stainless steel A2/A4 **High corrosion resistance stainless steel (HCR)**					
Threaded rod	**Property class**	**Characteristic steel ultimate strength**	**Characteristic steel yield strength**	**Fracture elongation**	EN 10088 EN ISO 3506
	50	f_{uk} ≥ 500 N/mm²	f_{yk} ≥ 210 N/mm²	A_5 ≥ 12%	
	70	f_{uk} ≥ 700 N/mm²	f_{yk} ≥ 450 N/mm²	A_5 ≥ 12%	
	80	f_{uk} ≥ 800 N/mm²	f_{yk} ≥ 600 N/mm²	A_5 ≥ 12%	
Hexagon nut	50	for class 50 rods			EN 10088 EN ISO 3506
	70	for class 70 rods			
	80	for class 80 rods			
Washer	Steel, according to EN 10088; corresponding to anchor rod material				
For anchorages under seismic actions which are designed in accordance with EN 1992-4:2018, Section 9.2 (3), option b): A_5 ≥ 12% and f_{uk} ≤ 800 N/mm².					

Commercial threaded rods (in the case of rods made of galvanized steel – standard rods with property class ≤ 8.8 only), with:

- material and mechanical properties according to Table A1,
- confirmation of material and mechanical properties by inspection certificate 3.1 according to EN-10204:2004; the documents shall be stored,
- marking of the threaded rod with the embedment depth.

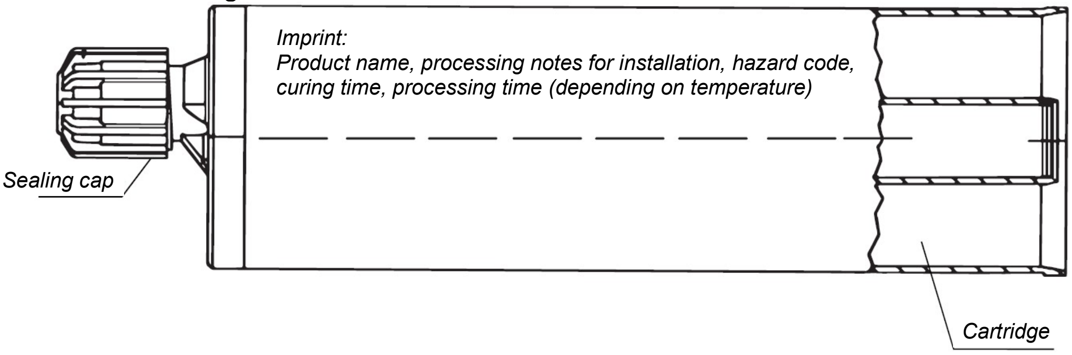
Note: Commercial standard threaded rods made of galvanized steel with property class above 8.8 are not permitted in some Member States.

Table A2: Rebars

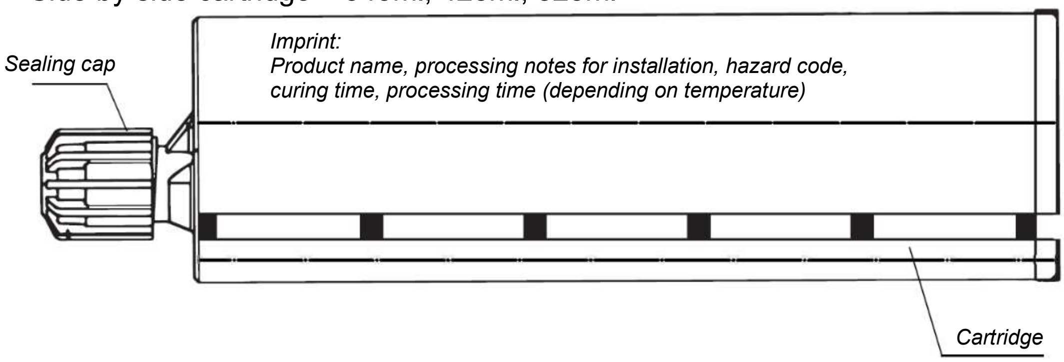
Product form		Bars and de-coiled rods	
Class		B	C
Characteristic yield strength f_{yk} or $f_{0,2k}$ [N/mm²]		400 to 600	
Minimum value of $k = (f_t / f_y)_k$		≥ 1,08	≥ 1,15 < 1,35
Characteristic strain at maximum force ε_{uk} [%]		≥ 5,0	≥ 7,5
Bendability		Bend / Rebend test	
Maximum deviation from nominal 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	

Cartridge

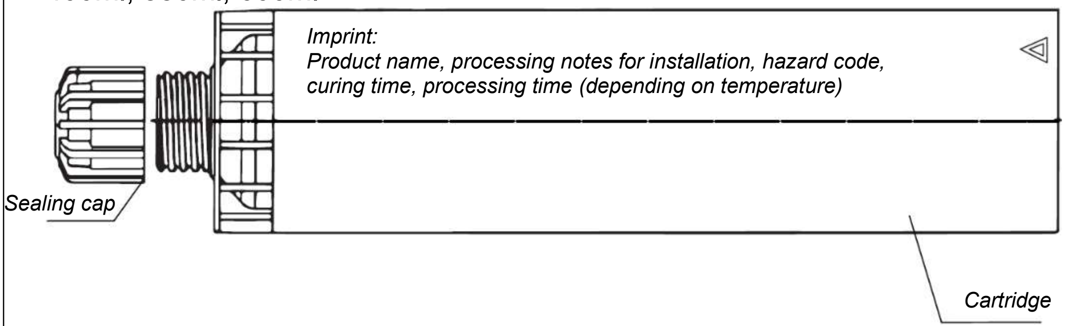
Coaxial cartridge – 150ml, 280ml, 300ml, 330ml, 380ml, 400ml, 410ml, 420ml



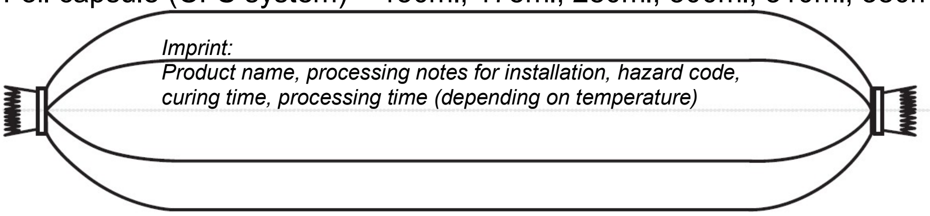
Side by side cartridge – 345ml, 425ml, 825ml



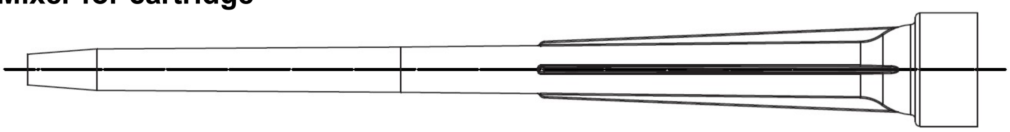
Cartridge a single component for two part foil capsule – 150 ml, 175ml, 280ml, 300ml, 310ml, 380ml, 400ml, 550ml, 600ml



Foil capsule (CFS system) – 150ml, 175ml, 280ml, 300ml, 310ml, 380ml, 400ml, 550ml, 600ml



Mixer for cartridge



R-KF2, R-KF2-W, R-KF2-S	**Annex A 3**
Product description Cartridge	

Specifications of intended use

Anchorages subject to:

- Static and quasi-static load.

Base materials

- Uncracked concrete.
- Reinforced or unreinforced normal weight concrete without fibres of strength class C20/25 at minimum and C50/60 at maximum according EN 206-1.

Temperature range:

- -40°C to +40°C (max. short. term temperature +40°C and max. long term temperature +24°C)
- -40°C to +80°C (max. short. term temperature +80°C and max. long term temperature +50°C)

Use conditions (Environmental conditions)

- Use in structures subject to dry, internal conditions
  (zinc coated steel, stainless steel, high corrosion resistant steel)
- For all other conditions according EN 1993-1-4, Annex A
  (stainless steel and high corrosion resistance steel according EN 1993-1-4, Annex A for the corresponding Corrosion Resistance Class (CRC))

Installation:

- Dry or wet concrete (use category I1)
- Water-filled drill holes (use category I2)
- Installation direction D3 (downward and horizontal and upwards installation).
- The anchors are suitable for hammer drilled holes
- Anchor installation carried out by trained personnel and under the supervision of the person responsible for technical matters of the site.

Design:

- The anchorages are designed in accordance with the EN 1992-4 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.

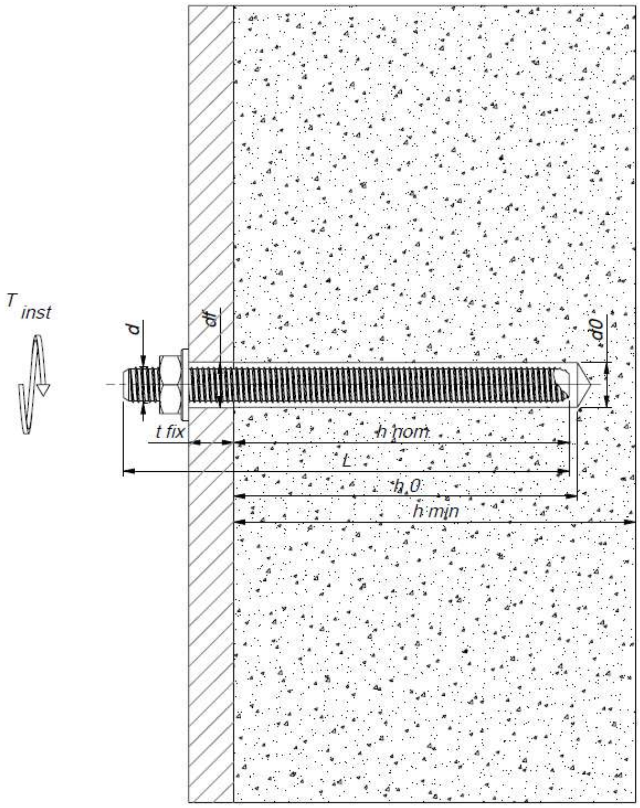


Table B1: Installation data – threaded anchor rod

Size		M8	M10	M12	M16	M20	M24	M27	M30
Nominal drilling diameter	d_0 [mm]	10	12	14	18	24	28	30	35
Maximum diameter hole in the fixture	d_f [mm]	9	12	14	18	22	26	30	33
Effective embedment depth	$h_{ef,min}$ [mm]	60	60	70	80	90	96	108	120
	$h_{ef,max}$ [mm]	160	200	240	320	400	480	540	600
Depth of the drilling hole	h_0 [mm]	h_{ef} + 5 mm							
Minimum thickness of the concrete slab	h_{min} [mm]	h_{ef} + 30 mm; ≥ 100 mm			$h_{ef} + 2d_0$				
Torque moment	T_{inst} [N·m]	10	20	40	80	130	200	240	280
Minimum spacing	s_{min} [mm]	40	40	50	65	80	100	110	120
Minimum edge distance	c_{min} [mm]	40	40	50	65	80	100	110	120

R-KF2, R-KF2-W, R-KF2-S

Intended use
Installation data

Annex B 2

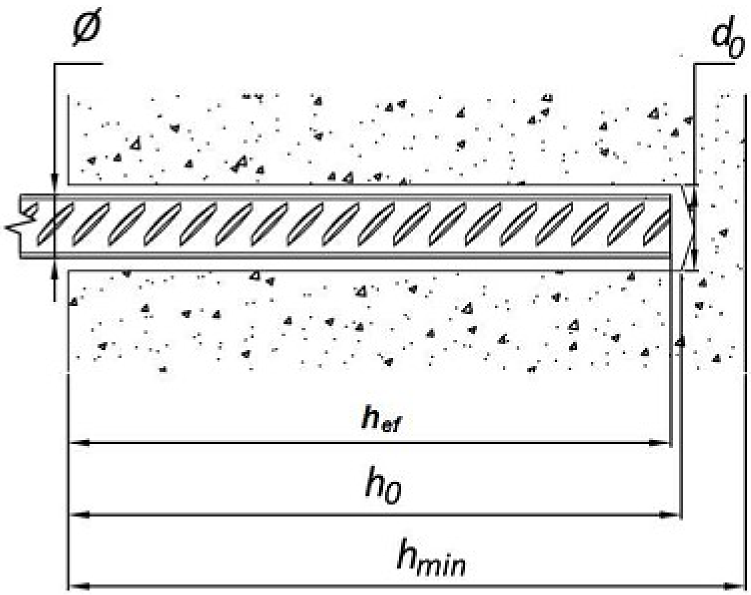


Table B2: Installation data – rebar

Size		Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø28	Ø32
Nominal drilling diameter	d_0 [mm]	12	14	16	20	25	32	34	40
Effective embedment depth	$h_{ef,min}$ [mm]	60	60	70	80	90	100	112	128
	$h_{ef,max}$ [mm]	160	200	240	320	400	500	560	640
Depth of the drilling hole	h_0 [mm]	h_{ef} + 5 mm							
Minimum thickness of the concrete slab	h_{min} [mm]	h_{ef} + 30 mm; ≥ 100 mm			$h_{ef} + 2d_0$				
Minimum spacing	s_{min} [mm]	40	40	40	40	50	50	60	65
Minimum edge distance	c_{min} [mm]	40	40	40	40	50	50	60	65

R-KF2, R-KF2-W, R-KF2-S

Intended use
Installation data

Annex B 3

Table B3: Working time and curing time

R-KF2		
Temperature in base material	**Maximum working time**	**Minimum curing time**
-5°C to 0°C	22 min	8 h
> 0°C to 5°C	14 min	4 h
> 5°C to 10°C	9 min	2 h
> 10°C to 15°C	5 min 30 sec	1.5 h
> 15°C to 20°C	3 min 30 sec	1 h
> 20°C to 25°C	2 min	45 min
>25°C to 30°C	1 min 30 sec	35 min
>30°C to 35°C	1 min	30 min
>35°C to 40°C	1 min	25 min

Minimum resin temperature = 5°C
Maximum resin temperature = 25°C
Times are provided for resin temperatures equal or the closest to base material temperature

Table B4: Working time and curing time

R-KF2-S		
Temperature in base material	**Maximum working time**	**Minimum curing time**
-5°C to 0°C	70 min	24 h
> 0°C to 5°C	43 min	18 h
> 5°C to 10°C	24 min	12 h
> 10°C to 15°C	15 min	8 h
> 15°C to 20°C	8 min	6 h
> 20°C to 25°C	6 min	4 h
>25°C to 30°C	5 min 30 sec	3 h
>30°C to 35°C	4 min	1,5 h
>35°C to 40°C	3min 30 sec	1 h

Minimum resin temperature = 5°C
Maximum resin temperature = 25°C
Times are provided for resin temperatures equal or the closest to base material temperature

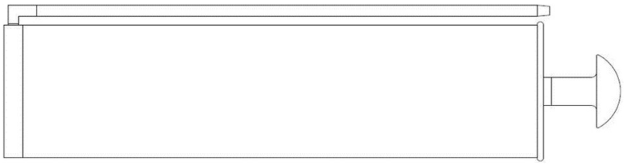
Table B5: Working time and curing time

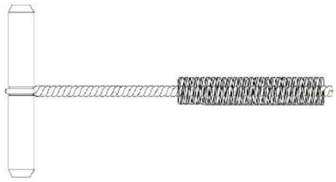
R-KF2-W		
Temperature in base material	**Maximum working time**	**Minimum curing time**
-20°C to -15°C	45 min	24 h
> -15°C to -10°C	32 min	18 h
> -10°C to -5°C	22 min	8 h
> -5°C to 0°C	14 min	5 h
> 0°C to 5°C	9 min	2 h
> 5°C to 10°C	6 min 30 sec	1 h
> 10°C to 15°C	4 min	45 min
> 15°C to 20°C	2 min 30 sec	30 min
> 20°C to 25°C	1 min	15 min
>25°C to 30°C	45 sec	15 min

Minimum resin temperature = 5°C
Maximum resin temperature = 25°C
Times are provided for resin temperatures equal or the closest to base material temperature

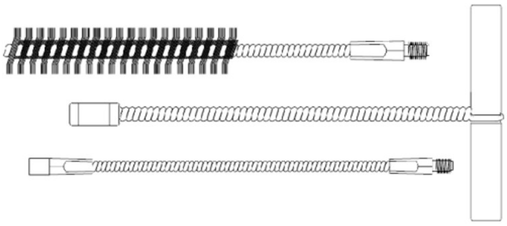
R-KF2, R-KF2-W, R-KF2-S	**Annex B 4**
Intended use Processing time and curing time	

Hollow drill bit RT-MAXH | **Hollow drill bit RT-SDSH**

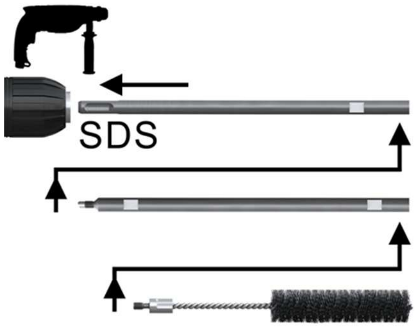




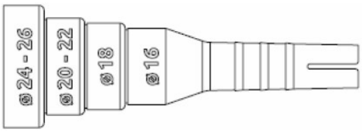
Manual blow pump R-BLOWPUMP | **Wire brush R-BRUSH**

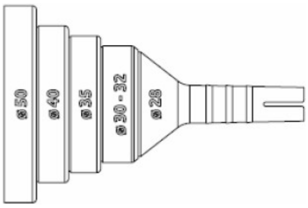


Wire brush R-BRUSH-TC,
extension with handle R-BRUSH-EXT-LT,
extension R-BRUSH-EXT-LH
for manual cleaning

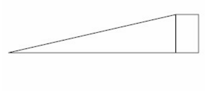


Wire brush R-BRUSH-TC,
extension with SDS tit R-BRUSH-EXT-H-SDS,
extension R-BRUSH-EXT-H-TC
for automatic cleaning





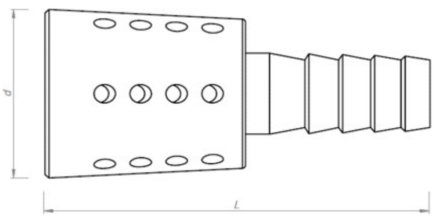
Dosing plug R-NOZ-P



Temporary centering wedge

Mixer nozzle extension SP-CE-ED-1M

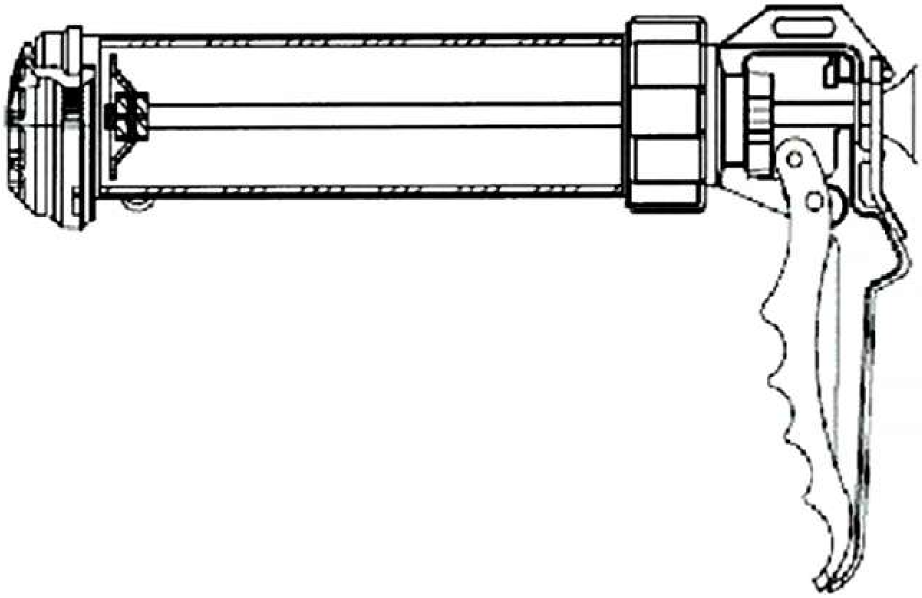
Air Adapter R-NOZ-ADAPTER



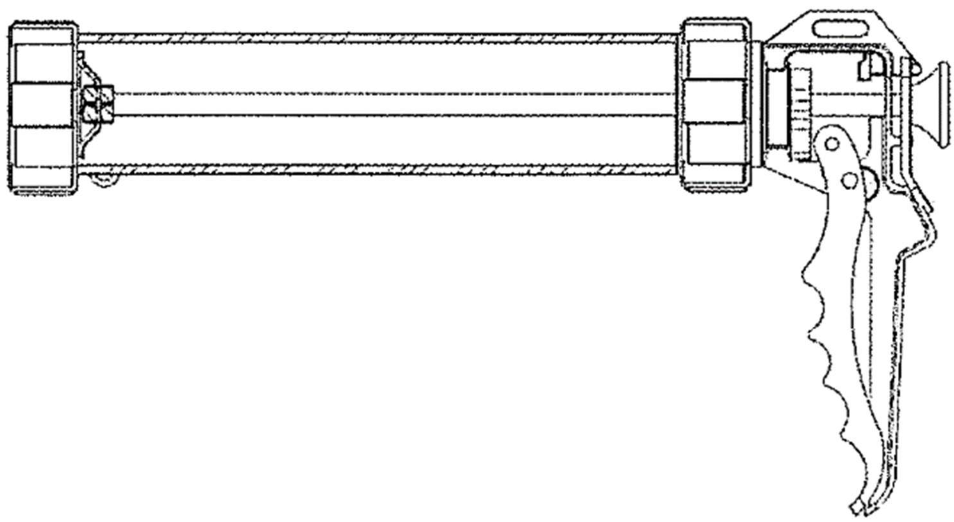
Elastic hose, R-NOZ-EXT

R-KF2, R-KF2-W, R-KF2-S	**Annex B 5**
Intended use Tools (1)	

Dispensers



Dispenser for cartridges



Dispenser for foil capsules (CFS)

R-KF2, R-KF2-W, R-KF2-S	**Annex B 6**
Intended use Tools (2)	

Table B6: Brush diameter for threaded rod

Threaded rod diameter		M8	M10	M12	M16	M20	M24	M27	M30
Brush diameter	d_b [mm]	12	14	16	20	26	30	35	37

Table B7: Brush diameter for rebar

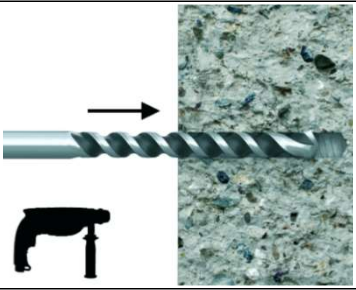
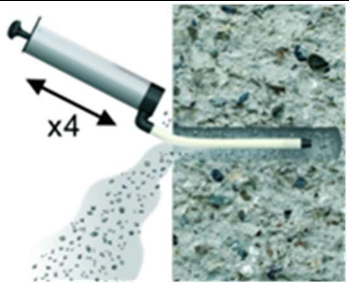
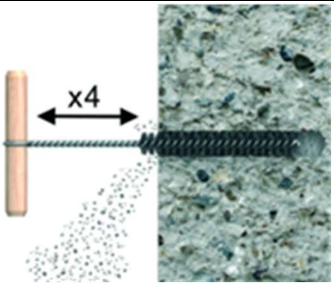
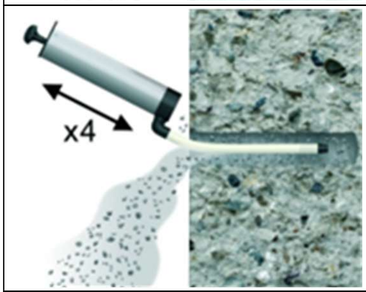
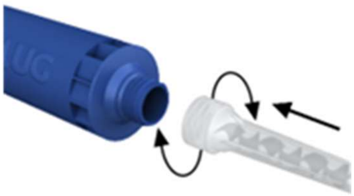
Rebar diameter		Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø28	Ø32
Brush diameter	d_b [mm]	14	16	18	22	27	32	37	42

Table B8: Piston plug R-NOZ-P

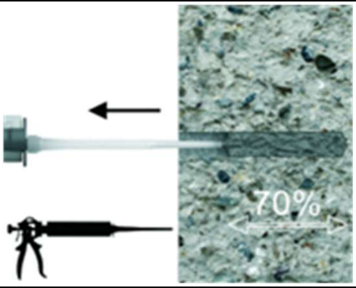
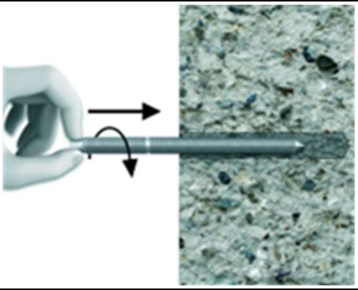
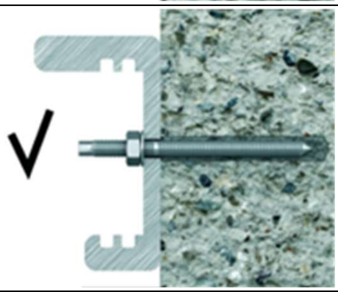
Hole diameter d_0 [mm]	16	18	22	24	26	28	30/32	35	40
Piston plug R-NOZ-P	Ø16	Ø18	Ø20-22	Ø24	Ø26	Ø28	Ø30-32	Ø35	Ø40

Table B9: Air Adapter, R-NOZ-ADAPTER

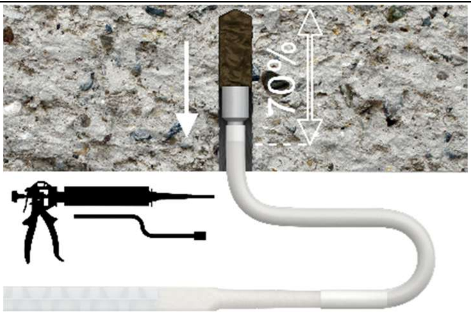
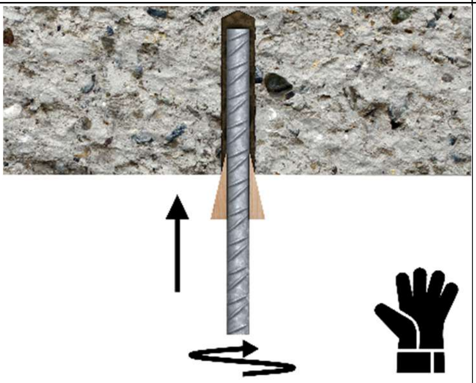
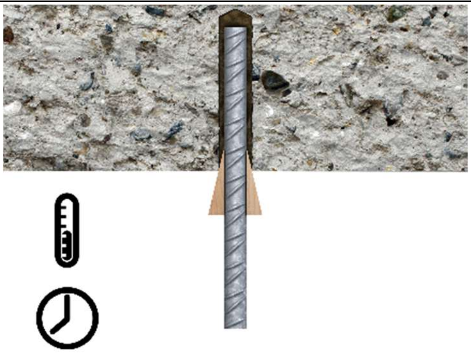
Product	Description	Hole diameter [mm]
R-NOZ-ADAPTER-14	Air Adapter	14 - 20
R-NOZ-ADAPTER-22	Air Adapter	22 - 26
R-NOZ-ADAPTER-28	Air Adapter	28 - 50

	1. Drill a hole to the required diameter and depth for rebar size being used.
  	2. Cleaning the hole. Clean the hole with a pump and brush: - starting from the bottom of the hole, clean it by blowing it out at least 4 times using a hand pump; - using an appropriate brush, clean the hole at least 4 times; - starting from the bottom of the hole, clean it by blowing it out at least 4 times using a hand pump.
	3. Unscrew the cap and screw on the resin dispensing tip.
	4. Place the cartridge in the dispenser.

R-KF2, R-KF2-W, R-KF2-S	**Annex B 8**
Intended use Installation instructions I.	

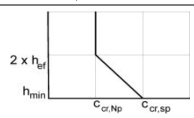
	5. Dispense to waste until even colour is obtained.
	6. Fill with resin 70% of the depth of the hole, starting from the bottom of the hole.
	7. Immediately after dispensing the resin, insert the rod into the hole with a slow twisting motion.
	8. Remove the unnecessary amount of resin that flowed from the hole and wait for the appropriate time for the resin to cure.
	9. Attach the fastened element and screw the nut to the required tightening torque. The tightening torque should not exceed $T_{inst.\ max}$.

R-KF2, R-KF2-W, R-KF2-S	**Annex B 9**
Intended use Installation instructions II.	

	1. Inject from the bottom of the hole. Inject the mortar about 70% of the hole depth. For best performance use extension and appropriately sized piston plug assembled on the mixer.
	2. Drive the rod immediately into the hole. Use temporary interlocking element e.g wedges.
	3. Leave the fixing undisturbed until the curing time elapses. To avoid the slipping of the rod during the open time of the product (due to the rod own weight) use a temporary interlocking element.

R-KF2, R-KF2-W, R-KF2-S	**Annex B 10**
Intended use Installation instructions II. – overhead installation	

Table C1: Characteristic values under tension load for threaded rod in uncracked concrete

Size			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure										
Steel, property class 4.8										
Characteristic resistance	$N_{Rk,s}$	[kN]	15	23	34	63	98	141	184	224
Partial safety factor[1]	γ_{Ms}	[-]	1,50							
Steel, property class 5.8										
Characteristic resistance	$N_{Rk,s}$	[kN]	18	29	42	78	122	176	230	280
Partial safety factor[1]	γ_{Ms}	[-]	1,50							
Steel, property class 8.8										
Characteristic resistance	$N_{Rk,s}$	[kN]	29	46	67	125	196	282	367	448
Partial safety factor[1]	γ_{Ms}	[-]	1,50							
Steel, property class 10.9										
Characteristic resistance	$N_{Rk,s}$	[kN]	37	58	84	157	245	353	459	561
Partial safety factor[1]	γ_{Ms}	[-]	1,40							
Steel, property class 12.9										
Characteristic resistance	$N_{Rk,s}$	[kN]	44	70	101	188	294	424	551	673
Partial safety factor[1]	γ_{Ms}	[-]	1,40							
Stainless steel, property class A2/A4/HCR-50										
Characteristic resistance	$N_{Rk,s}$	[kN]	18	29	42	78	122	176	230	280
Partial safety factor[1]	γ_{Ms}	[-]	2,86							
Stainless steel, property class A2/A4/HCR-70										
Characteristic resistance	$N_{Rk,s}$	[kN]	25	40	59	109	171	247	321	392
Partial safety factor[1]	γ_{Ms}	[-]	1,87							
Stainless steel, property class A2/A4/HCR-80										
Characteristic resistance	$N_{Rk,s}$	[kN]	29	46	67	125	196	282	367	448
Partial safety factor[1]	γ_{Ms}	[-]	1,60							
Combined pull-out and concrete cone failure in uncracked concrete C20/25 for a working life of 50 and 100 years										
Characteristic bond resistance temperature range -40°C / +40°C [2]	$\tau_{Rk,ucr}$	[N/mm²]	10,9	10,7	10,8	10,0	9,4	8,4	7,9	7,5
Characteristic bond resistance temperature range -40°C / +80°C [2]	$\tau_{Rk,ucr}$	[N/mm²]	10,3	10,1	10,1	9,4	8,9	7,8	7,4	7,0
Increasing factor for C 25/30	ψ_c	[-]	1,02							
Increasing factor for C 30/37			1,04							
Increasing factor for C 35/45			1,06							
Increasing factor for C 40/50			1,07							
Increasing factor for C 45/55			1,08							
Increasing factor for C 50/60			1,09							
Factor for influence of sustained load for a working life of 50 years – temperature range -40°C / +40°C [2]	ψ^0_{sus}	[-]	0,78							
Factor for influence of sustained load for a working life of 50 years – temperature range -40°C / +80°C [2]			0,78							
Factor for influence of sustained load for a working life of 100 years – temperature range -40°C / +40°C [2]			0,74							
Factor for influence of sustained load for a working life of 100 years – temperature range -40°C / +80°C [2]			0,73							
Concrete cone failure in uncracked concrete										
Factor for uncracked concrete	$k_{ucr,N}$	[-]	11,0							
Edge distance	$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$							
Spacing	$s_{cr,N}$	[mm]	$3,0 \cdot h_{ef}$							
Splitting failure										
Edge distance	$c_{cr,sp}$ for h_{min}	[mm]	$2,0 \cdot h_{ef}$							
	$c_{cr,sp}$ for $h_{min} < h^{3)} < 2 \cdot h_{ef}$ ($c_{cr,sp}$ from linear interpolation)									
	$c_{cr,sp}$ for $h^{3)} \geq 2 \cdot h_{ef}$		$c_{cr,N}$							
Spacing	$s_{cr,sp}$	[mm]	$2,0 \cdot c_{cr,sp}$							
Installation sensitivity factors for combined pull-out, concrete cone and splitting failure for hammer drilling										
Installation sensitivity factor for use in category I1 and I2[1]	γ_{inst}	[-]	1,4		1,2					
Installation sensitivity factors for combined pull-out, concrete cone and splitting failure for dustless drilling										
Installation sensitivity factor for use in category I1 and I2[1]	γ_{inst}	[-]	1,2							

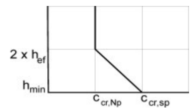
1) In the absence of other national regulation.
2) See: Annex B1.
3) h = concrete member thickness

R-KF2, R-KF2-W, R-KF2-S

Performances
Characteristic resistance under tension loads for threaded rod in uncracked concrete

Annex C 1

Table C2: Characteristic values under tension load for rebar in uncracked concrete

Size			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø28	Ø32
Steel failure										
Characteristic resistance	$N_{Rk,s}$	[kN]	A_s[4] · f_{uk}							
Partial safety factor[1]	γ_{Ms}	[-]	1,4							
Combined pull-out and concrete cone failure in uncracked concrete C20/25 for a working life of 50 and 100 years										
Characteristic bond resistance temperature range -40°C / +40°C [2]	$\tau_{Rk,ucr}$	[N/mm²]	9,5	8,7	8,9	8,6	7,6	6,9	6,3	5,8
Characteristic bond resistance temperature range -40°C / +80°C [2]	$\tau_{Rk,ucr}$	[N/mm²]	8,9	8,1	8,3	8,1	7,1	6,5	5,9	5,4
Increasing factor for C 25/30	ψ_c	[-]	1,02							
Increasing factor for C 30/37	ψ_c	[-]	1,04							
Increasing factor for C 35/45	ψ_c	[-]	1,06							
Increasing factor for C 40/50	ψ_c	[-]	1,07							
Increasing factor for C 45/55	ψ_c	[-]	1,08							
Increasing factor for C 50/60	ψ_c	[-]	1,09							
Factor for influence of sustained load for a working life of 50 years – temperature range -40°C / +40°C [2]	ψ^0_{sus}	[-]	0,78							
Factor for influence of sustained load for a working life of 50 years – temperature range -40°C / +80°C [2]	ψ^0_{sus}	[-]	0,78							
Factor for influence of sustained load for a working life of 100 years – temperature range -40°C / +40°C [2]	ψ^0_{sus}	[-]	0,74							
Factor for influence of sustained load for a working life of 100 years – temperature range -40°C / +80°C [2]	ψ^0_{sus}	[-]	0,73							
Concrete cone failure in uncracked concrete										
Factor for uncracked concrete	$k_{ucr,N}$	[-]	11,0							
Edge distance	$c_{cr,N}$	[mm]	1,5 · h_{ef}							
Spacing	$s_{cr,N}$	[mm]	3,0 · h_{ef}							
Splitting failure										
Edge distance	$c_{cr,sp}$ for h_{min}	[mm]	2,0 · h_{ef}							
Edge distance	$c_{cr,sp}$ for h_{min} < h[3] < 2 · h_{ef} ($c_{cr,sp}$ from linear interpolation)	[mm]								
Edge distance	$c_{cr,sp}$ for h[3] ≥ 2 · h_{ef}	[mm]	$c_{cr,N}$							
Spacing	$s_{cr,sp}$	[mm]	2,0 · $c_{cr,sp}$							
Installation sensitivity factors for combined pull-out, concrete cone and splitting failure for hammer drilling										
Installation sensitivity factor pro použití v kategorii I1 and I2[1]	γ_{inst}	[-]	1,4		1,2					
Installation sensitivity factors for combined pull-out, concrete cone and splitting failure for dustless drilling										
Installation sensitivity factor pro použití v kategorii I1 and I2[1]	γ_{inst}	[-]	1,2							

[1] In the absence of other national regulation.
[2] See: Annex B1.
[3] h = concrete member thickness
[4] Stressed cross section of the steel element

R-KF2, R-KF2-W, R-KF2-S

Performances
Characteristic resistance under tension loads for rebar in uncracked concrete

Annex C 2

Table C3: Characteristic values under shear loads for threaded rod steel failure without and with lever arm

Size			M8	M10	M12	M16	M20	M24	M27	M30
Steel, property class 4.8										
Steel failure without lever arm	$V_{Rk,s}$	[kN]	9	14	20	38	59	85	110	135
Steel failure with lever arm	$M^0_{Rk,s}$	[Nm]	15	30	52	133	260	449	666	900
Factor considering ductility	k_7	[-]	1							
Partial safety factor [1)]	γ_{Ms}	[-]	1,25							
Steel, property class 5.8										
Steel failure without lever arm	$V_{Rk,s}$	[kN]	11	17	25	47	73	106	138	168
Steel failure with lever arm	$M^0_{Rk,s}$	[Nm]	19	37	65	166	324	561	832	1124
Factor considering ductility	k_7	[-]	1							
Partial safety factor [1)]	γ_{Ms}	[-]	1,25							
Steel, property class 8.8										
Steel failure without lever arm	$V_{Rk,s}$	[kN]	15	23	34	63	98	141	184	224
Steel failure with lever arm	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519	898	1332	1799
Factor considering ductility	k_7	[-]	1							
Partial safety factor [1)]	γ_{Ms}	[-]	1,25							
Steel, property class 10.9										
Steel failure without lever arm	$V_{Rk,s}$	[kN]	18	29	42	79	123	177	230	281
Steel failure with lever arm	$M^0_{Rk,s}$	[Nm]	37	75	131	333	649	1123	1664	2249
Factor considering ductility	k_7	[-]	1							
Partial safety factor [1)]	γ_{Ms}	[-]	1,50							
Steel, property class 12.9										
Steel failure without lever arm	$V_{Rk,s}$	[kN]	22	35	51	94	147	212	275	337
Steel failure with lever arm	$M^0_{Rk,s}$	[Nm]	45	90	157	400	779	1347	1997	2699
Factor considering ductility	k_7	[-]	1							
Partial safety factor [1)]	γ_{Ms}	[-]	1,50							
Stainless steel, property class A2/A4/HCR-50										
Steel failure without lever arm	$V_{Rk,s}$	[kN]	9	15	21	39	61	88	115	140
Steel failure with lever arm	$M^0_{Rk,s}$	[Nm]	19	37	65	166	324	561	832	1124
Factor considering ductility	k_7	[-]	1							
Partial safety factor [1)]	γ_{Ms}	[-]	2,38							
Stainless steel, property class A2/A4/HCR-70										
Steel failure without lever arm	$V_{Rk,s}$	[kN]	13	20	29	55	86	124	161	196
Steel failure with lever arm	$M^0_{Rk,s}$	[Nm]	26	52	92	233	454	786	1165	1574
Factor considering ductility	k_7	[-]	1							
Partial safety factor [1)]	γ_{Ms}	[-]	1,56							
Stainless steel, property class A2/A4/HCR-80										
Steel failure without lever arm	$V_{Rk,s}$	[kN]	15	23	34	63	98	141	184	224
Steel failure with lever arm	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519	898	1332	1799
Factor considering ductility	k_7	[-]	1							
Partial safety factor [1)]	γ_{Ms}	[-]	1,33							

Table C4: Characteristic values under shear loads – pry out and concrete edge failure for threaded rod

Size			M8	M10	M12	M16	M20	M24	M27	M30
Pry out failure										
Factor	k_8	[-]	2							
Concrete edge failure										
Outside diameter of anchor	d_{nom}	[mm]	8	10	12	16	20	24	27	30
Effective length of anchor under shear loading	l_f	[mm]	min (h_{ef}; 8d_{nom})							

[1)] In the absence of other national regulation.

Table C6: Characteristic values under shear loads for rebar – steel failure without lever arm

Size			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø28	Ø32
Rebar										
Characteristic resistance	$V_{Rk,s}$	[kN]	$0{,}5 \cdot A_s{}^{2)} \cdot f_{uk}$							
Factor considering ductility	k_7	[-]	1							
Partial safety factor [1)]	γ_{Ms}	[-]	1,5							

Table C7: Characteristic values under shear loads for rebar – steel failure with lever arm

Size			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø28	Ø32
Rebar										
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	$1{,}2 \cdot W_{el}{}^{3)} \cdot f_{uk}$							
Partial safety factor [1)]	γ_{Ms}	[-]	1,5							

Table C8: Characteristic values under shear loads – pry out and concrete edge failure for rebar

Size			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø28	Ø32
Pry out failure										
Factor	k_8	[-]	2							
Concrete edge failure										
Outside diameter of anchor	d_{nom}	[mm]	8	10	12	16	20	25	28	32
Effective length of anchor under shear loading	l_f	[mm]	min (h_{ef}; 12d_{nom})					min (h_{ef}; 8d_{nom})		

[1)] In the absence of other national regulation
[2)] Stressed cross section of the steel element
[3)] Elastic section modulus calculated from the stressed cross section of steel element

Table C9: Displacement under tension loads – threaded rod

Size			M8	M10	M12	M16	M20	M24	M27	M30
Characteristic displacement in uncracked concrete C20/25 to C50/60 under tension loads										
Displacement	δ_{N0}	[mm/kN]	0,015	0,013	0,011	0,009	0,007	0,007	0,006	0,005
	$\delta_{N\infty}$	[mm/kN]	0,100	0,081	0,057	0,041	0,031	0,027	0,023	0,019

Table C10: Displacement under tension loads – rebar

Size			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø28	Ø32
Characteristic displacement in uncracked concrete C20/25 to C50/60 under tension loads										
Displacement	δ_{N0}	[mm/kN]	0,049	0,046	0,037	0,027	0,023	0,023	0,020	0,018
	$\delta_{N\infty}$	[mm/kN]	0,114	0,102	0,073	0,048	0,039	0,033	0,029	0,025

Table C11: Displacement under shear loads – threaded rod

Size			M8	M10	M12	M16	M20	M24	M27	M30
Characteristic displacement in concrete C20/25 to C50/60 under shear loads										
Displacement	δ_{V0}	[mm]	0,036	0,028	0,021	0,013	0,009	0,006	0,005	0,004
	$\delta_{V\infty}$	[mm]	0,054	0,041	0,032	0,019	0,013	0,009	0,008	0,007

Table C11: Displacement under shear loads – rebar

Size			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø28	Ø32
Characteristic displacement in concrete C20/25 to C50/60 under shear loads										
Displacement	δ_{V0}	[mm]	0,029	0,021	0,015	0,010	0,007	0,005	0,004	0,003
	$\delta_{V\infty}$	[mm]	0,004	0,031	0,023	0,015	0,010	0,007	0,005	0,005