Designated according to The Construction Products (Amendment etc.) (EU Exit) Regulations 2020

UK Technical Assessment	UKTA-0836-22/6128 of 19/07/2022
Technical Assessment Body issuing the UK Technical Assessment:	British Board of Agrément
Trade name of the construction product:	R-KER-II-S for rebar connections
Product family to which the construction product belongs:	Area Code 33, Post-installed rebar connections with R-KER-II-S injection mortar
Manufacturer:	RAWLPLUG S.A. ul. Kwidzyńska 6 51-416 Wrocław Poland
Manufacturing plant(s):	Manufacturing Plant No. 3
This UK Technical Assessment contains:	20 pages including 3 annexes which form an integral part of this assessment
This UK Technical Assessment is issued in accordance with The Construction Products (Amendment etc.) (EU Exit) Regulations 2020 on the basis of:	UKAD 330087-00-0601 *Systems for post-installed rebar connections with mortar*

1 Technical description of the product

R-KER-II-S injection mortar for use in conjunction with steel reinforcing bars of diameter from 8 mm to 40 mm for the post-installed rebar connections in existing structures constructed with normal weight concrete. The reinforcing bar is placed into a drilled hole previously filled with the injection mortar and is anchored by the bond between embedded element, injection mortar and concrete. The injection mortar R-KER-II-S must be used in accordance with the regulations for reinforced concrete construction

The product description is given in Annex A.

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

The performances given in Section 3 are only valid if the post-installed rebar connections are used in compliance with the specifications and conditions given in Annex B.

The performances given in this UK Technical Assessment are based on an assumed working life of the rebar connection of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer or the Technical Assessment Body 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 under static and quasi-static loading	Annex C

3.2 Safety in case of fire (BWR 2)

Characteristic	Performance
Reaction to fire	The post-installed rebar connection satisfies requirements for Class A1
Resistance to fire	No performance assessed

3.3 Health, hygiene and the environment (BWR 3)

Not relevant.

3.4 Safety and accessibility in use (BWR 4)

Not relevant.

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)

No performance assessed.

4 Assessment and verification of constancy of performance (hereinafter AVCP) system applied

4.1 System of assessment and verification of constancy of performance

According to UKAD No. 330087-00-0601 and Annex V of the Construction Products Regulation (Regulation (EU) 305/2011 as brought into UK law and amended, the system of assessment and verification of constancy of performance (AVCP) 1 applies.

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with the British Board of Agrément and made available to the UK Approved Bodies involved in the conformity attestation process.

5.1 UKCA marking for the product/ system must contain the following information:

- Identification number of the Approved Body
- Name/address of the manufacturer of the product/ system
- Marking with intention of clarification of intended use
- Date of marking
- Number of certificate of constancy of performance
- UKTA number.

On behalf of the British Board of Agrément 	
Date of Issue: 19 July 2022	**Hardy Giesler** Chief Executive Officer

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ANNEX A : Product specification

This annex applies to the product described in the main body of the UK Technical Assessment.

Figures A1 to A5 Installation conditions

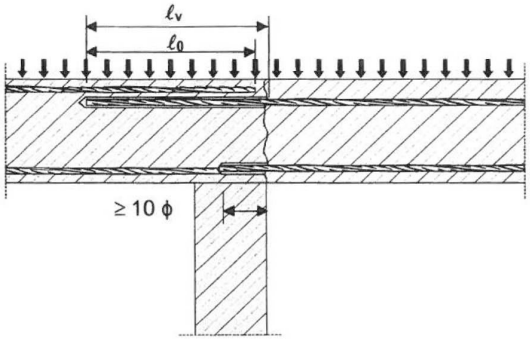


Figure A1 Overlap joint for rebar connections of slabs and beams

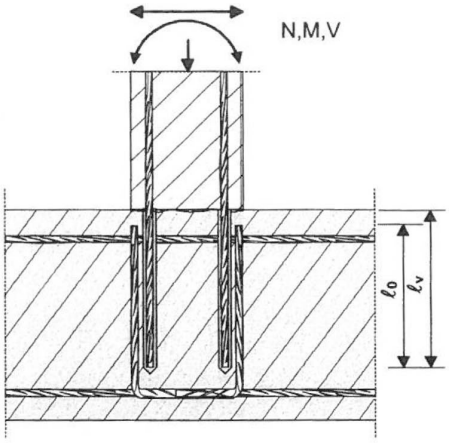


Figure A2 Overlap joint at a foundation of a column or wall where the rebar is stressed in tension

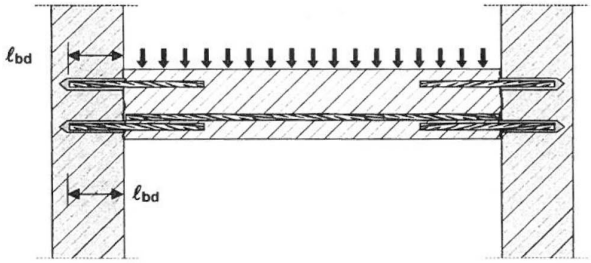


Figure A3 End anchoring of slabs or beams, designed as simply supported

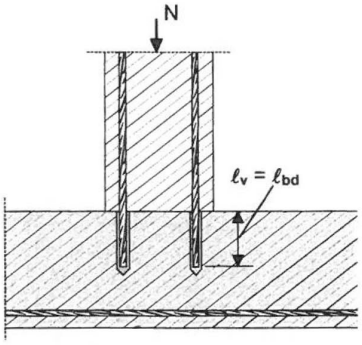
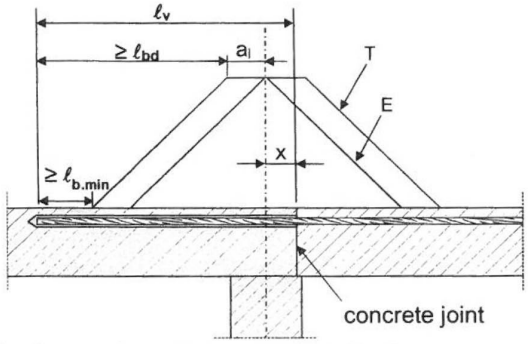


Figure A4 rebar connection for components stressed primarily in compression; rebar is stressed in compression



(only post-installed rebar is plotted)

Figure A5 Anchoring of reinforcement to cover the line of acting tensile force

Key to Figure A5

T acting tensile force

E envelope of $M_{ed}/z + N_{ed}$ (see EN 1992-1-1, Figure 9.2)

x distance between the theoretical point of support and concrete joint

Note to Figure A1 to A5

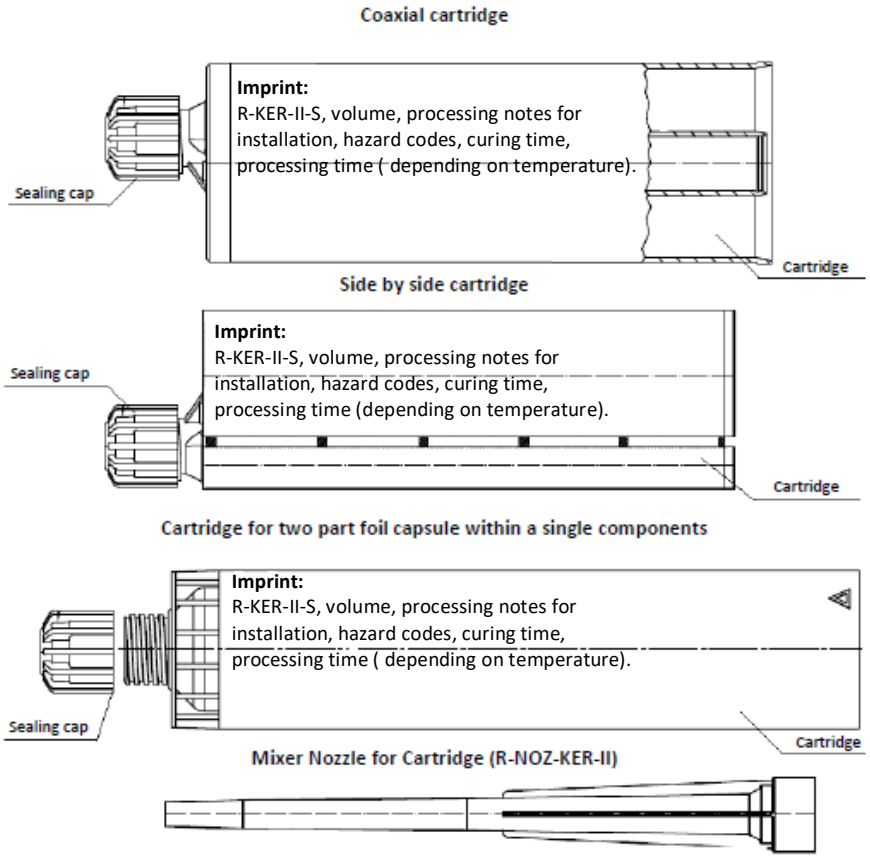
In the Figures no transverse reinforcement is plotted, the transverse reinforcement as required by EN 1992-1-1 shall be present.

The shear transfer between old and new concrete shall be designed according to EN 1992-1-1.

R-KER-II-S for rebar connections	Annex A 1
Product description Installed condition: application examples of post-installed rebar	

ANNEX A : Product specifications (continued)

Figure A1 Cartridge types and sizes



Imprint:
R-KER-II-S, volume, processing notes for installation, hazard codes, curing time, processing time (depending on temperature).

R-KER-II-S for rebar connections	Annex A 2
Product description Cartridge types and sizes	

ANNEX A : Product specifications (continued)

Table A1: Injection mortar

Designation	Composition
R-KER-II-S (Injection mortar)	Additive: quartz Bonding agent: vinyl ester resin styrene free Hardener: dibenzoyl peroxide

Table A2: Rebar

Designation	Rebar
Rebar according to EN 1992-1-1, Annex C, Table C.1 and C.2N	Bars and de-coiled rods Class B or C Minimum relative rib area, $f_{R,min}$, according to EN 1992-1-1 The rib height h: $h \leq 0{,}07 \cdot ø$

R-KER-II-S for rebar connections	Annex A 3
Product description Materials	

ANNEX B : Installation

B1 Intended use - specifications

Anchorages subject to:

Static and quasi-static loads.

Base material:

- Reinforced or unreinforced normal weight concrete of strength class C12/15 at minimum to C50/60 at maximum according to EN 206.
- Maximum chloride content of 0.40% (Cl 0.40) related to the cement content according to EN 206.
- Non-carbonated concrete.

Note: In case of a carbonated surface of the existing concrete structure the carbonate layer shall be removed in the area of the post-installed rebar connection with a diameter of d_s + 60 mm prior to the installation of the new rebar. The depth of concrete to be removed shall correspond to at least the minimum concrete cover according to EN 1992-1-1.

The above may be neglected if building components are new and not carbonated and if building components are in dry conditions.

Temperature in the base material:

At installation:

- +5°C to +50°C

In service:

- -40°C to +120°C (max. short term temperature +120°C and max. long term temperature +70°C).

Use conditions (environmental conditions):

- Structures subject to dry internal conditions.
- Structures subject to external atmospheric exposure including industrial and marine environment.
- Structures subject to permanently damp internal conditions if no aggressive conditions exist.

Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking into account of the forces to be transmitted.
- Design according to EN 1992-1-1 and Annex B2.
- The actual position of the reinforcement in the existing structure shall be determined on the basis of the construction documentation and taken into account when designing.

Installation:

- Dry or wet concrete (use category 1).
- It must not be installed in flooded holes.
- Overhead installation is permissible.
- Hole drilling by hammer drilling with hollow drill bit.
- Installation of the post-installed rebar shall be done only by suitable trained installer and under supervision on the site.

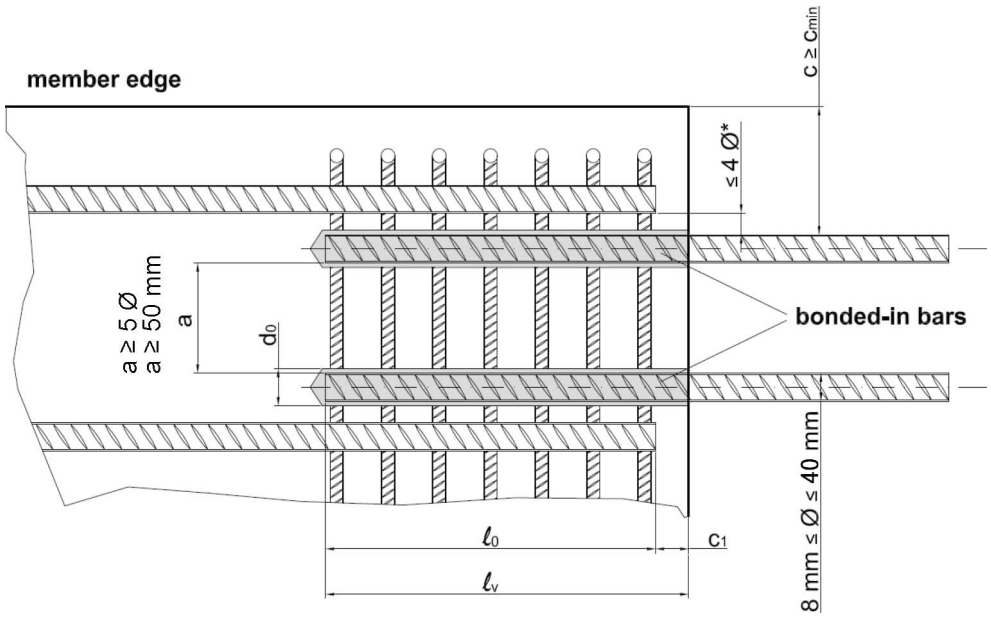
Check the position of the existing rebar (if the position of existing rebars is not known it shall be determined using a rebar detector suitable for this purpose as well as on the basis of the construction documentation and then marked on the building component for the overlap joint).

R-KER-II-S for rebar connections	Annex B 1
Intended use Specification	

ANNEX B : Installation (continued)

B2 : General design rules of construction for post-installed rebar

- Only tension forces in the axis of the rebar may be transmitted.
- The transfer of shear forces between new concrete and existing structure shall be designed additionally according to EN 1992-1-1.
- The joints for concreting must be roughened to at least such an extended that aggregate protrude.



* If the clear distance between overlapping rebar is greater than 4·Ø the overlap length shall be enlarged by the difference between the clear distance and 4·Ø.

l_0 – lap length acc. to EN 1992-1-1, clause 8.7.3
l_v – effective embedment depth; $l_v \geq l_0 + c_1$
c – concrete cover of post-installed rebar
c_{min} – minimum concrete cover acc. to Annex B3 and EN 1992-1-1, clause 4.4.1.2.
c_1 – concrete cover at end-face of existing rebar
d_0 – nominal drill bit diameter acc. to Annex B3
Ø – rebar diameter (d_s)

R-KER-II-S for rebar connections	Annex B 2
Intended use General construction rules for post-installed rebar	

ANNEX B : Installation (continued)

Table B1: Installation data – hammer drilling

Size of rebar	ø8	ø10	ø12	ø14	ø16	ø20	ø25	ø28	ø32	ø40
Drill bit diameter [mm]	12	14	16	18	20	25	30	35	40	50
Brush diameter [mm]	14	16	18	20	22	27	32	37	42	52
Minimum anchoring rebar $l_{b,min}$ [mm]	115	145	170	200	230	285	355	400	455	570
Minimum overlap joint $l_{0,\ min}$ [mm]	200	215	255	300	340	430	540	600	690	860
Maximum anchoring rebar $l_{v,max}$ [mm]	400	500	600	700	800	1000	1200	1400	1500	1000

* for diameter from ø20 to ø40 mm all installation over 700 mm depth has to be done with a cartridge stored at +20°C

Note:
$l_{b,min}$ (or $l_{v,min}$) = α_{lb} x max {0.3 x $l_{b,rqd}$; 10ø; 100 mm} for ø8 to ø40
$l_{o,min}$ (or $l_{v,min}$) = α_{lb} x max {0.3 x α_6 x $l_{b,rqd}$; 15ø; 200 mm} for ø8 to ø40
with: yield stress for rebar 500 N.mm^{-2}; γ_M = 1.15; α_6 = 1.5; concrete C20/25 and f_{bd} = 2.3 N.mm^{-2} (good bond conditions)

Minimum concrete cover (see Annex B2):
c_{min} = 30 mm + 0.06 · l_v ≥ 2ø for ø < 25 mm
c_{min} = 40 mm + 0.06 · l_v ≥ 2ø for ø ≥ 25 mm
The minimum concrete cover according to EN 1992-1-1 shall be observed.

Minimum clear spacing between two post-installed rebar:
a ≥ 50 mm
a ≥ 5ø

Table B2: Processing time and minimum curing time

Temperature of resin [C°]	Temperature of substrate [°C]	Processing time [min.]	Minimum curing time [min.]
5	5	40	720
10	10	20	480
15	15	15	360
20	20	10	240
25	25	9.5	180
25	30	7	120
25	35	6.5	120
25	40	6.5	90
25	45	6	60
25	50	5	30

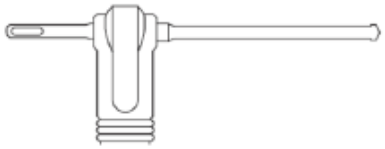
R-KER-II-S for rebar connections	Annex B 3
Installation data Processing time and curing time	

ANNEX B : Installation (continued)

Figure B1 : Tools for installation

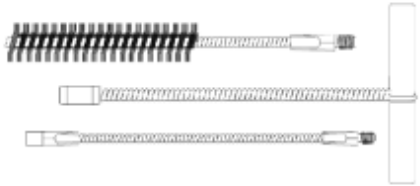
Manual blow pump R-BLOWPUMP

Hollow drill bit



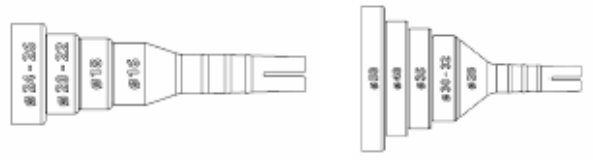
Steel brush R-BRUSH

Steel brush with extension R-BRUSH-T



Mixer nozzle extension R-NOZ-EXT

Dosing plug R-NOZ-P



Temporary positioning wedge

R-KER-II-S for rebar connections	Annex B 4
Installation data Tools for installation (1)	

ANNEX B : Installation (continued)

Table B3: Brushes for cleaning the drilled holes (steel wires)

Rebar diameter [mm]		**ø8**	**ø10**	**ø12**	**ø14**	**ø16**	**ø20**	**ø25**	**ø28**	**ø32**	**ø40**
Type of the brush		Steel									
Nominal drill bit diameter	[mm]	12	14	16	18	20	25	30	35	40	50
Brush head diameter	[mm]	14	16	18	20	22	27	32	37	42	52

Table. B4: Dosing plug R-NOZ-P size

Rebar diameter [mm]	**ø16**	**ø18**	**ø20**	**ø25**	**ø28**	**ø32**	**ø 35**	**ø40**	**ø50**
Dosing plug R-NOZ-P description	ø16	ø18	ø20	ø24 – ø26	ø28	ø32	ø35	ø40	ø50

R-KER-II-S for rebar connections	Annex B 5
Installation data Tools for installation (2)	

ANNEX B : Installation (continued)

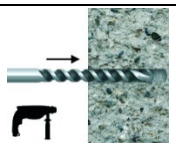
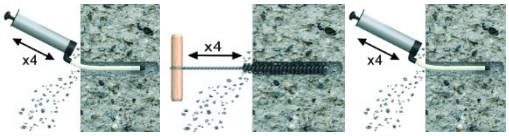
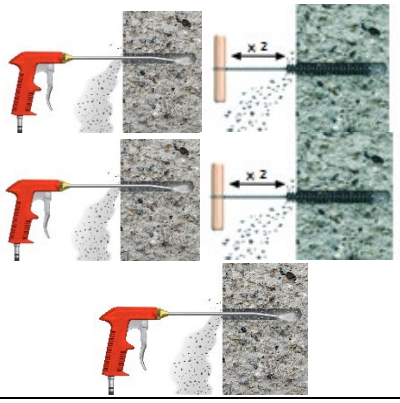
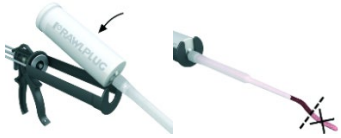
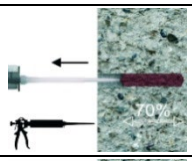
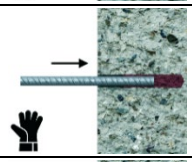
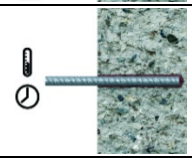
Figure B2 : Cartridge applicators

Dispensers	Cartridge or foil capsule size
 Manual gun for coaxial cartridges	380, 400, 410 and 420 ml
 Manual gun for side by side cartridges	345 ml
 Manual gun for foil capsule in cartridge and coaxial cartridges	150, 175, 280, 300 and 310 ml
 Manual gun for foil capsules CFS+	300 to 600 ml
 Cordless dispenser gun for coaxial cartridges	380, 400, 410 and 420 ml
 Cordless dispenser gun for foil capsules	300 to 600 ml
 Pneumatic gun for coaxial cartridges	380, 400, 410 and 420 ml

R-KER-II-S for rebar connections	Annex B 6
Installation data Tools for installation (3)	

ANNEX B : Installation (continued)

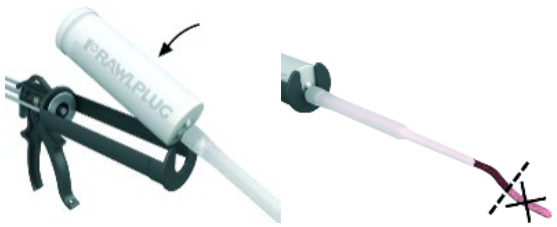
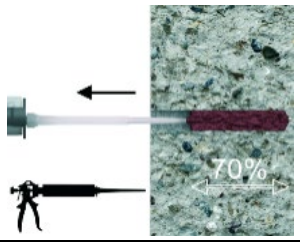
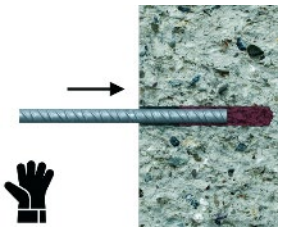
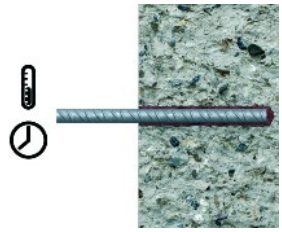
Figure B3 : Installation procedure (pump/brush cleaning)

	1. Drill hole to the required diameter and depth using a rotary percussive machine.
a)  b) 	2. Hole cleaning. a) Cleaning hole with brush and hand pump: - starting from the drill hole bottom blow the hole at least 4 times using the hand pump, - using the specified brush, mechanically brush out the hole at least 4 times, - starting from the drill hole bottom, blow at least 4 times with the hand pump. b) Cleaning hole with compressed air: - starting from the drill hole bottom blow the hole at least twice by compressed air 6 atm, - using the specified brush, mechanically brush out the hole at least twice, - blow the hole at least twice by compressed air 6 atm, - brush out the hole at least twice, - blow over the hole at least twice by compressed air 6 atm.
	3. Insert cartridge into dispenser and attach nozzle. Dispense to waste until even colour is obtained (min. 10 cm).
	4. Insert the mixing nozzle to the far end of the hole and inject resin, slowly withdrawing the nozzle as the hole is filled to 2/3 of its depth.
	5. Immediately insert the rebar, slowly and with slight twisting motion. Remove any excess resin around the hole before it sets.
	6. Leave the fixing undisturbed until the curing time elapses.

R-KER-II-S for rebar connections	Annex B 7
Installation instruction Standard cleaning	

ANNEX B : Installation (continued)

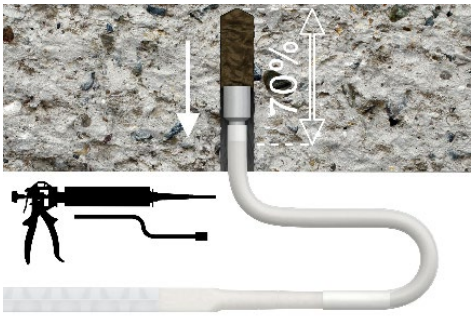
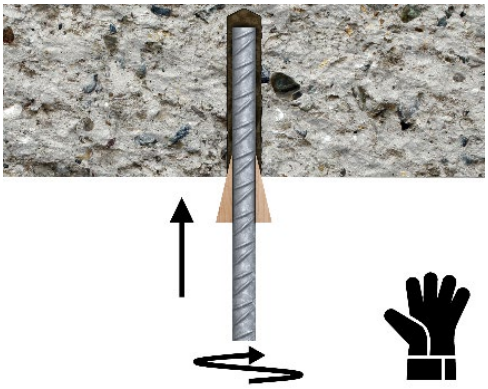
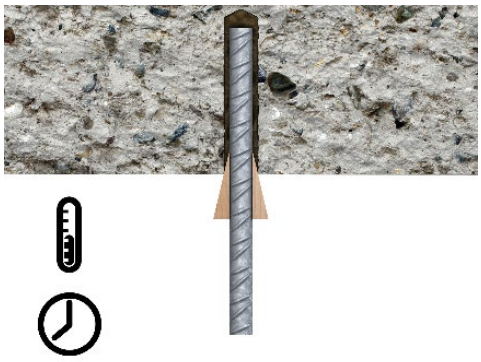
Figure B3 : Installation procedure (vacuum cleaning)

	1. Drill hole to the required diameter and depth using a hollow drill bit with vacuum cleaner.
	2. Insert cartridge into dispenser and attach nozzle. Dispense to waste until even colour is obtained (min. 10 cm).
	3. Insert the mixing nozzle to the far end of the hole and inject resin, slowly withdrawing the nozzle as the hole is filled to 2/3 of its depth.
	4. Immediately insert the rebar, slowly and with slight twisting motion. Remove any excess resin around the hole before it sets.
	5. Leave the fixing undisturbed until the curing time elapses.

R-KER-II-S for rebar connections	Annex B 8
Installation instruction cleaning when hollow drill bit with vacuum cleaner is used (special cleaning method)	

ANNEX B : Installation (continued)

Figure B4 : Installation procedure (overhead)

	1. Inject from the bottom of the hole. Inject the product about 2/3 of the hole depth. Use extension and appropriately sized piston plug assembled on the mixer.
	2. Drive the rebar 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 rebar during the open time of the product (due to the rebar own weight) use a temporary interlocking element.

R-KER-II-S for rebar connections	Annex B 9
Installation instruction Overhead installation	

ANNEX C : Characteristic performance values

Table C1: Amplification factor α_{lb}

The minimum anchorage length $l_{b,min}$ and the minimum lap length $l_{o.min}$ according to EN 1992-1-1 shall be multiplied by the relevant amplification factor α_{lb} in table C1.

Rebar diameter [mm]	Concrete strength class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ø8	1	1	1	1	1	1	1	1	1
ø10	1	1	1	1	1	1	1	1	1
ø12	1	1	1	1	1	1	1	1	1
ø14	1	1	1	1	1	1	1	1	1
ø16	1	1	1	1	1	1	1	1	1
ø20	1	1	1	1	1	1	1	1	1
ø25	1	1	1	1	1	1	1	1	1
ø28	1	1	1	1	1	1	1	1	1
ø32	1	1	1	1	1	1	1	1	1
ø40	1	1	1	1	1	1	1	1	1

R-KER-II-S for rebar connections	Annex C 1
Performance Amplification factor α_{lb}	

ANNEX C : Characteristic performance values (continued)

Table C2 : Bond efficiency value k_b

Bar diameter [mm]	Concrete strength class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ø8	1	1	1	1	1	1	1	1	1
ø10	1	1	1	1	1	1	1	1	1
ø12	1	1	1	1	1	1	1	1	0.93
ø14	1	1	1	1	1	1	1	0.92	0.93
ø16	1	1	1	1	1	1	1	0.92	0.86
ø20	1	1	1	1	1	1	0.91	0.84	0.86
ø25	1	1	1	1	1	0.90	0.82	0.84	0.79
ø28	1	1	1	1	1	0.90	0.82	0.76	0.79
ø32	1	1	1	1	0.89	0.90	0.82	0.76	0.71
ø40	1	1	0.86	0.74	0.66	0.59	0.63	0.58	0.54

R-KER-II-S for rebar connections	Annex C 2
Performance Bond efficiency value k_b	

ANNEX C : Characteristic performance values (continued)

Table C3: Design values of the ultimate bond resistance f_{bd}(1) in N/mm²

Rebar diameter [mm]	Concrete strength class								
	C12/15	C16/20	20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ø8	1.60	2.00	2.30	2.70	3.00	3.40	3.70	4.00	4.30
ø10	1.60	2.00	2.30	2.70	3.00	3.40	3.70	4.00	4.30
ø12	1.60	2.00	2.30	2.70	3.00	3.40	3.70	4.00	4.00
ø14	1.60	2.00	2.30	2.70	3.00	3.40	3.70	3.70	4.00
ø16	1.60	2.00	2.30	2.70	3.00	3.40	3.70	3.70	3.70
ø20	1.60	2.00	2.30	2.70	3.00	3.40	3.40	3.40	3.70
ø25	1.60	2.00	2.30	2.70	3.00	3.00	3.00	3.40	3.40
ø28	1.60	2.00	2.30	2.70	3.00	3.00	3.00	3.00	3.40
ø32	1.60	2.00	2.30	2.70	2.70	3.00	3.00	3.00	3.00
ø40	1.60	2.00	2.00	2.00	2.00	2.00	2.30	2.30	2.30

1) According to EN 1992-1-1 for good bond conditions.
For all other bond conditions multiply the value by 0.7.

R-KER-II-S for rebar connections	Annex C 3
Performance Design values of the ultimate bond resistance f_{bd}	

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