Service catalogue

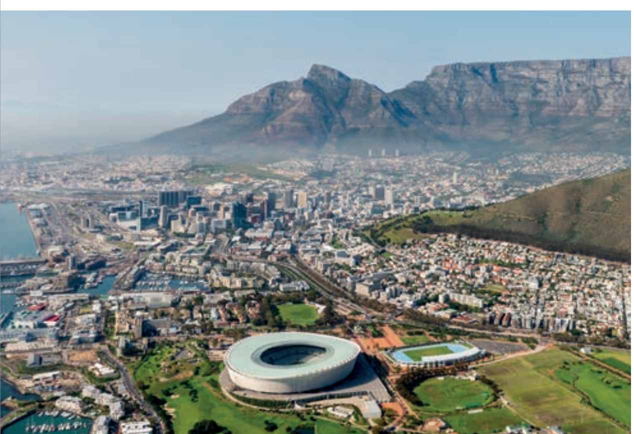
Specification & Design Guide

100 years 1919-2019

RAWLPLUG®

From London to Mars in 100 years

1919	beginning of the Rawlplug brand
1930	1st Mechanical Anchor
1948	1st Metal Drywall Anchor
1998	1st British company to obtain the ETA certification
2012	Rawlplug on the planet MARS (Curiosity Rover)
2019	Rawlplug's 100th anniversary



100 years 1919-2019 RAWLPLUG®

Everywhere in the world

Rawlplug is the global brand of first choice. In the everyday pursuit of Rawlplug's vision, we keep the promise expressed in our mission, as we support our customers with state-of-the-art products they can trust without reservations. Having chosen them, you receive a guarantee that buildings and facilities visited daily by thousands of people not only look great, but are absolutely safe to use. We can proudly claim that, over the last 100 years, Rawlplug has become an unsung hero of numerous investment projects completed all over the world.

100 YEARS OF EXPERTISE IN FIXINGS, FASTENERS AND TOOLS

Content

Rawlplug® Offer

Rawlplug® has been operating as an expert in fixings, fasteners and tools for 100 years.

Although the most important, our products designed for professionals are not the only pillar of our comprehensive offering. They are complemented by specialised services and an innovative training programme. They have all been created to provide our customers, namely engineers, architects, constructors, contractors or salespeople, with access to a full portfolio of capabilities, know-how and best practices aimed to support them in the everyday pursuit of various tasks and business goals. And we can actually vouch for that, because we know our customers and respect their work. We are in touch with them on a daily basis, watching and listening to them carefully. We wish to share with them our knowledge and experience, allowing them to meet even the most ambitious challenges.

Products

The Rawlplug® offering spans as many as **10 specialised categories of products** manufactured in some of the most advanced production plants in Europe. Rawlplug is the only brand that can actually cater for the needs of all segments of the construction industry. Every product is provided between several to several dozen variants matching specific requirements of different substrates, applications and installation conditions. Each one comes with dedicated accessories, altogether forming a complete system.

Services

Our extensive portfolio of services dedicated for engineers, designers and constructors stems from our comprehensive approach to the designing of fixings. What is interesting about our range of tools tailored to the needs of all these professionals as well as the extensive technical assistance is that, on the one hand, they provide the consumers of the Rawlplug® services with high comfort of working under conditions which affect their efficiency and enable them to save time, and on the other hand, ensure safety which they find so important at work.

RAWLPLUG® Academy

Training

The brand's training offer is delivered under the **Rawlplug Academy®** project, being a truly innovative development programme based on the foundation of comprehensive development of knowledge and skills of our customers. The integration of Rawlplug Academy's four pillars, i.e. the e-learning platform, the Training Centre in London, the mobile education and development centre known as the RawlTruck, as well as traditional workshops and the knowledge base, makes it the most comprehensive and useful educational scheme in the sector of fixings and fasteners.

Timeless inventions

The world's first wall plug was a prelude to Rawlplug's further patents which revolutionised the construction industry:

1919 Rawlplug
The world's first wall plug

1926 Rawlhammer
The world's first patented hammer drill

1934 Rawlbolt
The world's first mechanical anchor

1941 Rawlnut
The world's first shock- and corrosion-resistant fixing

Spring Toggle
The world's first fixing solution dedicated to drywall applications

1948 Rawlanchor
Drywall fixing solution which revolutionised the market

100 years 1919-2019
RAWLPLUG®

Heritage

John Joseph Rawlings – entrepreneur, visionary, inventor.

The world's first wall plug he had patented, triggered a true revolution in the construction industry and went down in history for good. At the same time, this invention marked the beginning of a completely new history – a history of the brand whose contemporary strength draws abundantly from the legacy of the past, the achievements of the present and the vision of the future.
– A brand which not only astonished the general public over decades with innovative solutions and products dedicated to professionals, but also with its panache and scale of operations, extraordinary ideas that revolutionised the marketing of its era, and its comprehensive approach to customers' needs and expectations, in which it has never ceased to be a role model. We are deeply convinced that the true Renaissance man of the construction sector, whom John Joseph Rawlings definitely was, would be proud of us. He would surely commend us on building the brand's strength on the grounds which combine the past heritage, the achievements of the present and the vision of the future.

Revolution in marketing

It's truly extraordinary that whatever the effort undertaken by the Rawlplug brand, it stepped far beyond the standards of their day and age. Take the publicity campaign following their breakthrough invention of the world's first wall plug. It was then that the brand spent thousands of pounds for press advertising, only to change the potential users' mindset vis-à-vis the actual fixing capabilities of their times. Acting with impressive panache and on a massive scale, the brand made a commercial sensation, all the more since never before had any construction company been advertised on Daily Mail's front page!

Travelling Rawlplug

What proved unquestionably supportive of the brand's global expansion was the mobile display installation known as Rawlplug Travelling Showroom. It marked yet another revolution in marketing. These vehicles took long trips lasting several months on all continents, from Sweden to Australia, and made a sensation in each market where they appeared. Never before had the potential customers encountered such a direct form of commodity promotion combined with the opportunity to use the products in practice. In a tailored van, customers could become familiar with the full portfolio of fixings as well as product datasheets, use individual items on site, thus learning about their applications and installation methods, as well as speak to the brand's experts, hoping for some individual consultations.

Service that begins on drawing boards

Rawlplug has always understood and recognised the role and importance of architects, designers and engineers. Already in the 1940s, free-of-charge technical advisory and support service were promoted by the industry's press as a means to solve any kinds of fixing related issues. "A service that begins on a drawing board." Isn't it stunning that such a comprehensive approach to customer service is one of the foundations of our legacy? Heritage which allows us to respond to the needs of the present while curiously awaiting the future.

Conquest of the world

The initial 20 years of Rawlplug's operations were marked with global expansion. To be present in "every civilised country in the world" was John Joseph Rawlings's vision which he consistently pursued over the successive years. At the turn of the 1940s, the brand was present on all continents, completing the conquest of the United States and aiming at Australia. By that time, Rawlplug's products had already been manufactured in 10 countries, including London, New York, Paris or Zurich.

Products

100 years of expertise in fixings, fasteners and tools.

No other brand in the world manufactures and delivers to its customers products that cater to virtually every segment of the construction industry. Our offering consists of as many as 10 specialised product categories.
We control every step in the manufacturing process, starting from designing performed by engineers collaborating with constructors, through prototyping and testing handled by the R&D Department, to production conducted in manufacturing plants which, in terms of technology, are surely among the most highly advanced and best automated factories in the world. For 100 years now, it has allowed us to deliver products that are universal, on the one hand, and on the other hand, which meet requirements of even the most highly specialised construction works, offer modern design and unique technical parameters, being easy to install and extremely durable in operation.

Mechanical anchors
Advanced technology for high load capacity and simplicity of use.

Bonded anchors
Uncompromising technical parameters and safety guaranteed in all applications.

Facade insulation fixings
Simplicity and speed of installation in innovative solutions for energy-saving buildings.

Roofing insulation fixings
System solutions ensuring efficient installation and long service life.

Lightweight fixings
Strength, versatility and simplicity of installation in all substrates and with any fixture.

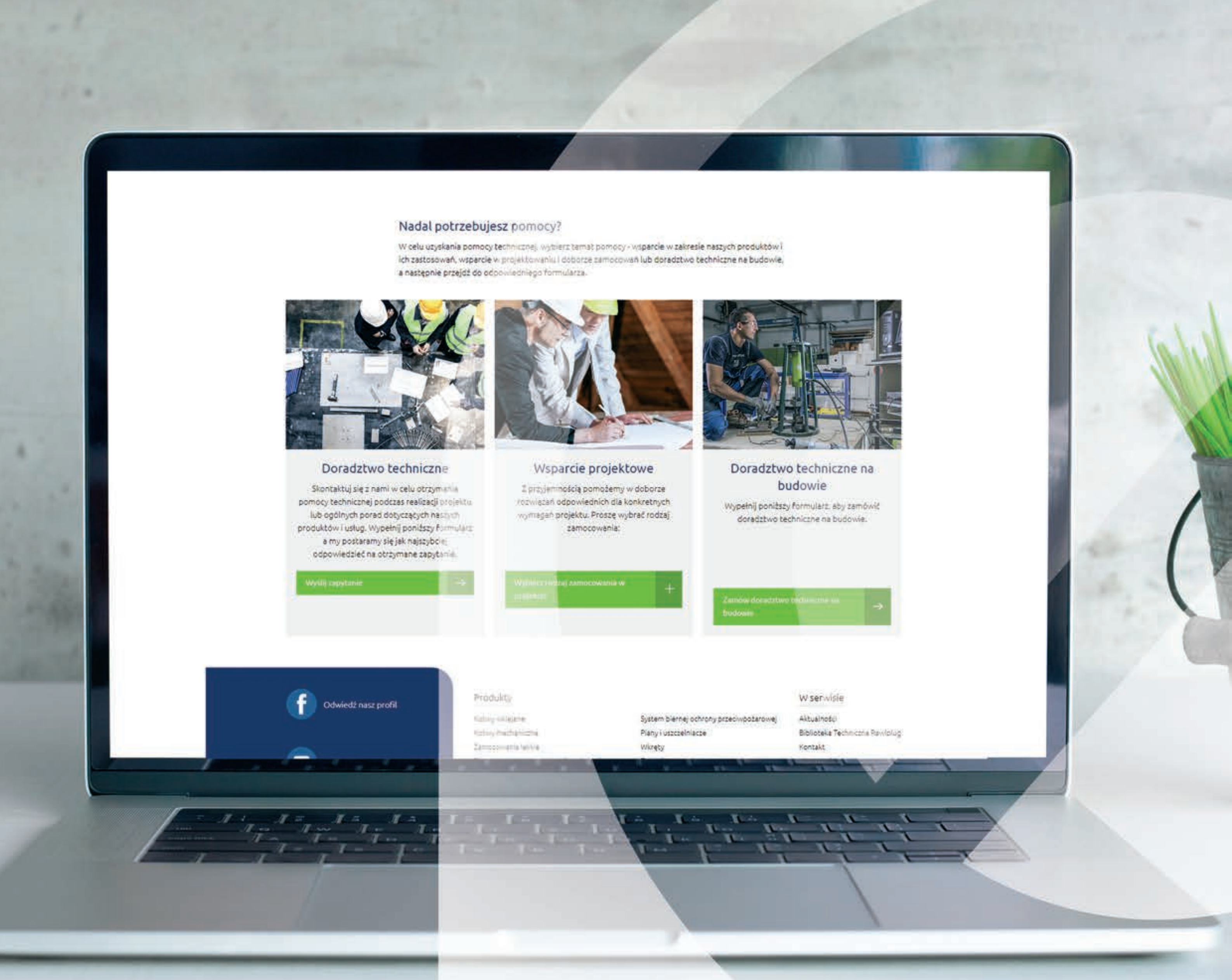
Power tool accessories
Comprehensive and complementary portfolio of accessories for top-quality fixing solutions.

Fasteners
Highly specialised products dedicated to all materials and service conditions.

Manual and direct fastening systems
Portfolio of professional tools designed with time saving and fixing reliability in mind.

Foams and sealants
High efficiency and unparalleled universality in a wide range of products matching diverse applications.

Passive fire protection system
Product portfolio for uncompromising fire safety.



- OnsiteTechnicalSupport
- TechnicalHelpdesk
- TechnicalLibrary
- ProductSelector
- EasyFix
- BIM

Services

We have genuine experts on board – specialists who cooperate on a daily basis to keep track of the actual needs of construction professionals.

They continuously seek to improve the Rawlplug® service package, focused on technical and design support for architects, constructors and contractors. They track even the most specific and ambitious expectations of customers, and successfully integrate them with our solutions. Rawlplug® has been investing in the development and improvement of tools intended to make your daily work easier and to enhance its comfort, efficiency and quality. And we haven't stopped there, since all our services are rendered at no extra charge.

OnsiteTechnicalSupport

Technical advisory provided by local engineering teams to tackle all technical challenges, particu-larly with regard to on-site strength testing of the Rawlplug® products under real-life operating conditions.

- Technical support offered by our engineers on a local basis, on the given construction investment's location.
- Site testing of the Rawlplug® products under real-life operating conditions.
- Signature standard based on EAD, BS:8539 and the relevant recom-mendations of the British Construction Fixings Association.
- Repeated testing to confirm reliability of original test results.
- Detailed reports taking all technical parameters and our experts' individual recommendations into consideration.

ProductSelector

Appropriate selection of products to match specific applications by taking the project's requirements and particular requirements into account.

- Possibility to choose products from among 10 product categories in a selection-assisted process.
- Numerous convenient product browsing options relevant from the intended use perspective.
- Transparent and highly functional presentation of useful information.
- Option to enquire about product availability or specific properties.

EasyFix

Design calculations required to plan fixings for diverse construction elements using Rawlplug® branded products..

- Proprietary and free-of-charge application for design calculations, responding to even the most specific requirements of construction investments.
- Divided into subject-specific modules dedicated to individual segments of construction works.
- Based on the latest EAD, ETAG and EUROCODE guidelines, ensuring that calculations conform to the standards, that they are precise and highly useful.
- Highly specialised features combined with simplicity and intuitiveness of use to support every designer and ensure safety of the solutions being designed.

ACCES TO EASYFIX

The EasyFix application is free to download and use.
You can get the software from www.easyfix.rawlplug.com/en

BIM

Automatic implementation of models and technical drawings of the Rawlplug® fixings in the BIM/CAD design environment.

- Proprietary application enabling models and technical drawings of the Rawlplug® fixings to be downloaded and embedded in designs.
- Comprehensive sets of product data making design-related decisions easier.
- Models and drawings available in 2D and 3D, in 6 projections and the 360° view mode.
- Available on-line or ready to download and implement in the BIM/CAD environment.

ACCESS TO SOFTWARE

There are two ways to use the data contained in BIM Rawlplug:

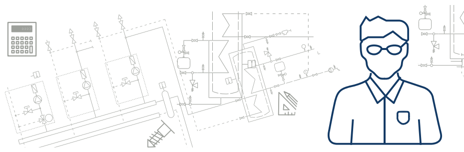
Integration of BIM Rawlplug with Autodesk® Revit®

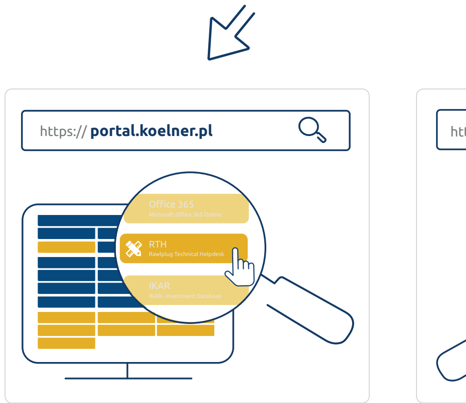
Integration of the data library with Autodesk® Revit® is possible thanks to the innovative Revit plug-in. You just need to download the plug-in from the rawlplug.com website. It is available in the Services/Design & Software tab.

Using on-line software

BIM Rawlplug is an application that can be downloaded from the Services/ Design & Software tab on rawlplug.com. It may be used by anyone who intends to browse through and become familiar with the models, drawings and information the system provides, without being forced to register and subsequently log on.

Technical enquir



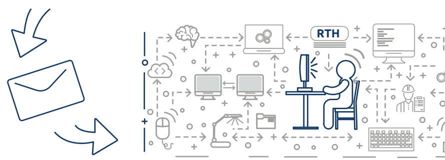


Choose subject

Design-related enquiry

Technical advisory

Enquire ...



Check its advantages

Quick reply

Entire conversation history at one place

Easy-to-check project history, even after several years

* You can also contact us via https://onerawlplug.com

TechnicalHelpdesk

Consultations and technical/design support provided by the Technical Department's engineers, practitioners and market experts.

- Technical and design-related consultations with our Technical Department's engineers.
- Systematic and structured handling of problem-solving tasks thanks to forms dedicated to specific applications and products.
- Personalised design assistance with the specificity and requirements of individual solutions in mind.

HOW TO SUBMIT ENQUIRIES?

Enquiries are submitted via Rawlplug's website. You simply need to pick the right form, enter your data and information about your project, and submit the enquiry form. Our employees contact the website using the RTH tab of our corporate portal.The new format is user-friendly, and it provides our engineers with enhanced tools, since now they have access to all enquiries at one place.

TechnicalLibrary

Complete portfolio of technical documentation required to place the products on the market as well as to select and use them in the right manner.

- Option to pick from among 15 categories of information and documents required to make the right choice of the brand's products and to use them correctly.
- Complete set of product-specific technical and commercial documents.
- Original documents as well as documentation required for legal purposes, enabling distribution, designing and use of fixing solutions.

Training

Beyond highly specialised knowledge and experience based on practice, nothing can give you the real certainty of quality, durability and reliability of the outcomes of your work.

We have always been close to our customers for many reasons, such as to share the know-how and experience gathered over the last 100 years of our operations. Engineers, designers, contractors and salespeople could always count on our technical support. But today we give them even more, namely an innovative development programme dedicated to education and competence building, designed to actually cater to their daily needs, known as Rawlplug Academy®. The integration of Rawlplug Academy's four pillars, i.e. the e-learning platform, the Training Centre, traditional workshops and the knowledge base, makes it the most comprehensive and useful educational scheme in the sector of fixings and fasteners.

RAWLPLUG® Academy

E-LEARNING platform

- Integrated training scheme covering industry-specific knowledge as well as Rawlplug's products and services that every professional will find indispensable, supporting them in tackling even the most ambitious challenges.
- Building development paths based on individual needs, the knowledge and skills already acquired as well as professional specialisation of the participants.
- Access to on-line training via a highly functional platform enabling you to join the training at any place and time.
- Development programmes dedicated to various groups of professionals: engineers, contractors, designers and representatives of the Trade & DIY sector.

Classroom training

- Workshops devised in a way to consolidate and extend the knowledge acquired at e-learning courses.
- Meetings in small groups enabling the participants to talk about their typical and potential design and contracting challenges.
- Exchange of the most valuable experiences with market practitioners and experts responsible for shaping Rawlplug's product and service portfolio.
- Training modules designed and delivered by specialists with extensive experience in collaboration with designers, contractors and salespeople, responsible for developing individual product groups.



Training centre

- Modern training facility where you can experience and get to know Rawlplug's entire offering, comprising products, services and training.
- Possibility to select and use a full range of our products under conditions that closely reflect their real-life on-site application.
- Unique opportunity to get to know latest trend-setting Rawlplug® releases that go beyond even the most highly specific expectations of our customers.

Training Center Rawlplug Academy®
Products Zone

Training Center Rawlplug Academy®
Services Zone

Training Center Rawlplug Academy®
Testing Zone

Knowledge base

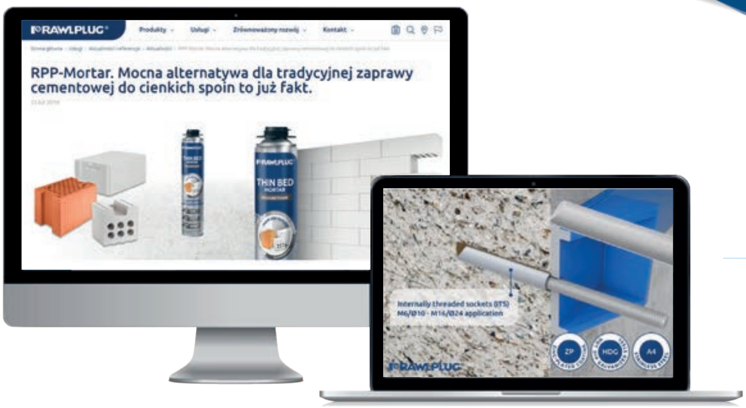
- Access to original materials prepared by recognised market experts relying on extensive experience, know-how and best practices.
- Materials that come in handy for every professional from the industry, regardless of their specialisation level.
- Attractiveness and utility value guaranteed by diversified forms of information presentation – both traditional and on-line.
- Tools intended for application in practice, in a broad range of design and construction works, and useful for those who wish to build their expert's position in the market during public appearances, training courses or trade meetings.

Pricelists

Rawlplug offer

Product catalogues

Technical guidance notes



Product leaflets

Three levels of
advancement of
product presentation
for every catalogue

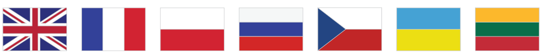
Animations

Technical product comparison
based on approvals
and declarations

Technical product
benchmark based on
lab tests

Installation movies

Design & specification
guides



CONSTRUCTION

For nearly a century Rawlplug has been renowned for its high quality products and technical expertise within the building and civil engineering industry. . Our heavy duty anchors have been specified for safety critical applications on many prestigious projects.

Our technical personnel liaise with construction professionals daily, ensuring the most appropriate anchoring solutions are selected and that future product developments reflect the trends within the industry.

Our focus is on delivering the highest quality products cost effectively. Wherever our products are purchased around the world the quality remains consistent so engineers can specify with confidence.

Whether you are a specifier, contractor, distributor or user, you can contact Rawlplug for free advice plus site testing, product training and technical seminars.

Construction Fixings Association

Rawlplug is a proud member of the Construction Fixings Association (CFA) which represents major fixings suppliers within the UK.

All CFA full members are committed to providing technically proven products manufactured to recognised quality assurance procedures and backed up with comprehensive technical support services including performance data, anchor selection software, application advice, on site testing and training in the correct use of our products.

The CFA is directly involved in the development of European and British Standards, contributing to the development of European Guidelines for Technical Approval of anchors. The CFA also ensures best fixings practice by publishing a series of free guidance notes, downloadable from the website which also carries articles, news and technical advice.

TECHNICAL ADVISORY SERVICE

The Rawlplug Specification Team provides a complete package of technical support from the design stage of a project to its completion.

Our national service involves the recommendation of appropriate Rawlplug product taking into account the structure, life expectancy, location, load applied, and all other criteria.

We can check the design and specification of any product from lightweight fixings to heavily loaded safety critical anchors. This ensures that the correct specification is written for any product and includes the required safety factors to ensure that the anchor works satisfactorily over it's lifetime.

Our Technical Advisory Service can be contacted in Glasgow, between the hours of 9.00am and 5.00pm. They will also provide information, technical data, samples etc., and arrange for one of our engineers to call to offices or sites.

We will also visit sites to conduct pull-out tests. This is particularly useful where structures are unknown or potentially weak, for example solid or hollow, low-strength blockwork, which can be as thin as 100mm, and brickwork, where there could be voids and poor mortar strength.

A series of tests is carried out in accordance with the engineering requirements and in compliance with BS 8539 and the Construction Fixings Association guidelines. A recommendation is then made based on the actual results obtained to enable an accurate specification to be done and for the appropriate Rawlplug product to be selected.

The Rawlplug Specification Team also conducts product training on site or at the client's premises and on request will visit site to periodically check the quality of installation.

All specifiers including structural, civil and mechanical engineers will be interested to know that we conduct technical seminars at lunchtime or in early evening. Subjects include the correct selection of mechanical and bonded Anchors and reference is made to applications and case studies. We also provide some details on our design software and new technical handbook. The seminar can be conducted for any number of people and is normally carried out at the clients premises, and focuses on relevant topics.

In Glasgow we have a newly refurbished training centre where groups of up to 12 people can be trained on the correct methods of installation and provided with technical knowledge and applications across the range of Rawlplug products.

FIELD ENGINEERS

Highly skilled professional Technical Engineers cover all of the markets that we operate in and are available to offer fixing advice in the convenience of your office or building site.

Our dedicated team of field engineers have many years of experience and offer a complete technical support service that includes:

- » Advice on anchor selection, usage and application
- » On site testing
- » Technical seminars
- » Distributor training

SITE TESTING

Rawlplug® provides a comprehensive site testing service.

Pull-out tests can be conducted on any of the products in the range, and are normally done on site in the actual structure. Alternatively, we can demonstrate the anchor performance with test blocks in another location. Engineers and contractors are encouraged to be present at the testing.

Testing is conducted in accordance with the guidelines of the Construction Fixings Association.

The Construction Fixings Association (CFA) represents the major quality manufacturers of anchoring products, ensuring good practice at all times. Rawlplug is a founder member of the CFA and have its personnel on the Technical Committee, Promotions Committee and on the Board of Directors (Vice Chairman).

Since the company was founded over 100 years ago, Rawlplug has been respected as a top quality manufacturer, this approach to quality and performance has never been compromised, even with competition from imported products.

Free Site Testing Service

To encourage best practice, we offer the site testing service free of charge. Based on the information supplied by the structural engineer, civil engineer or other specifier, a number of pull-out tests will be conducted using the most appropriate fixings.

These could include mechanical and bonded anchors, insulation fixings for facades and roofing, direct fasteners or lightweight fixings depending on the application.

Site Testing Results

If the test results are inconsistent, more tests will be carried out to determine the structure's limitations.

Rawlplug Engineers are qualified professionals with many years of experience and the client can fully rely on the outcome.

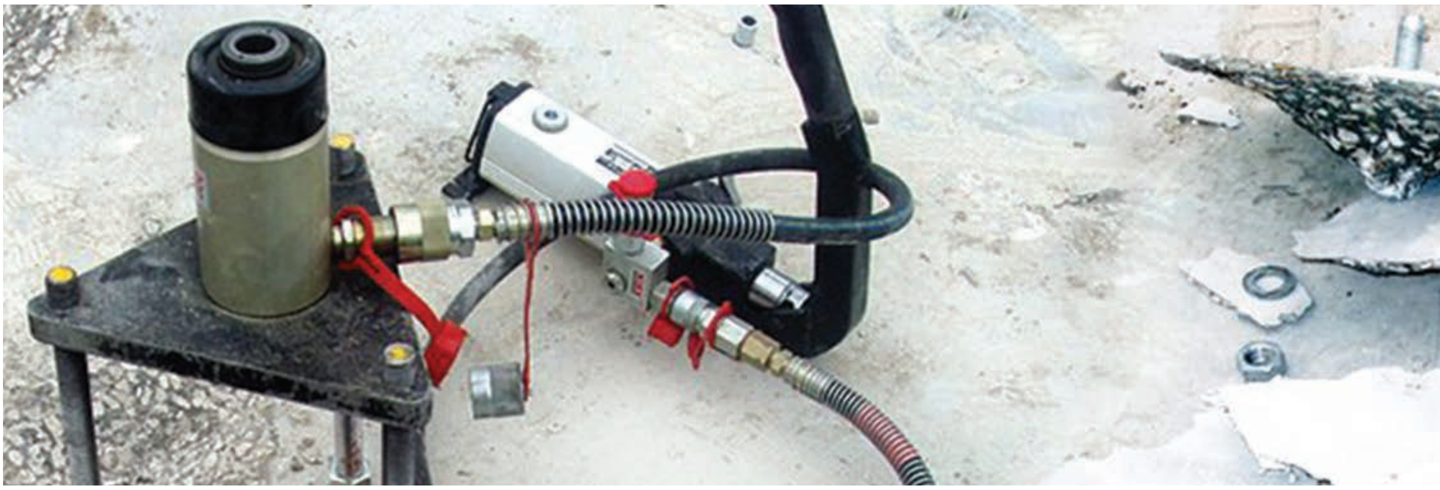
The solution recommended will be the most economical one that will provide the performance required, based on all the information provided by the engineer or contractor and the test results achieved.

A detailed site test report will be distributed to all interested parties shortly after the test is completed. This will include the names of those who witnessed the tests and all the information available including test load, load achieved, structure type, strength and thickness, fixture thickness and material type, etc.

The Rawlplug engineer will include comments about the application, observations and recommendations based on all the data collected to ensure that a comprehensive report is available for future reference.

A request for Site Testing (UK)

Can go via your supplier of Rawlplug products, or directly to the Rawlplug technical advisory service in Glasgow and you will receive an immediate response with confirmation of our attendance within 1 hour and the test will be completed within 2 days. Testing can be conducted at a time convenient to the customer, including night time if required.



TECHNICAL (CPD) SEMINARS

It is a Rawlplug tradition to carry out seminars which ensure that personnel involved in the technical specification and selection of structural anchors are up-to-date with developments and standards in our ever changing markets, ensuring continuous professional development of engineers and specifiers alike.

These are usually carried out in the convenience of your offices over less busy periods to ensure maximum attendance and less inconvenience to your busy work schedule.

OVERVIEW OF OUR RANGE - BONDED ANCHOR SELECTOR

	BONDED ANCHOR SYSTEM:	R-KEX-II with threaded rods	R-KEX-II with ITS	R-KEX-II with rebar as an anchor	R-KEX-II with post -installed rebar
ANCHOR MATERIAL	5.8 STEEL CLASS, ZINC PLATED	☑	-	-	-
	8.8 STEEL CLASS, ZINC PLATED	☑	-	-	-
	STAINLESS STEEL	☑	-	-	-
	REBAR	-	-	☑	☑
	R-ITS	-	☑	-	-
SUBSTRATES	CONCRETE	☑	☑	☑	☑
	CRACKED CONCRETE	☑	-	☑	☑
	SILICATE BRICK	-	-	-	-
	SOLID BRICK	-	-	-	-
	HOLLOW BRICK	-	-	-	-
	LIGHTWEIGHT CONCRETE BLOCKS	-	-	-	-
APPROVALS	ETA, CE, SEISMIC	☑ Option 1	☑ Option 7	☑ Option 1	☑ ETA
	POLISH ROADS AND BRIDGES CONSTRUCTION INSTITUTE	☑	☑	☑	☑
	FIRE	-	-	-	-
TENSION LOADS IN kN	[kN]	N_{Rd}	N_{Rd}	N_{Rd}	N_{Rd}
	10	M8 for 5.8	M6 for 5.8	Ø8 for A-II	Ø8 for A-II
	20				
	30				
	40		M16		
	50				
	60				
	70				
	80				
	90				
	100				
	110				
	120				
	130				
	140				
	150				
	160				
	170			Ø32	Ø32
	180				
	190				
	200				
	210				
	220				
	230	M30			

OVERVIEW OF OUR RANGE - BONDED ANCHOR SELECTOR

 R-KER-II with threaded rods	 R-KER-II with ITS	 R-KER-II with rebar as an anchor	 R-KER-II with post -installed rebar	 R-KER | RV200 with threaded rods	 R-KER | RV200 with ITS	 R-KER | RV200 with rebar as an anchor	 R-KER | RV200 with post -installed rebar
☑				☑	-	-	-
☑				☑	-	-	-
☑				☑	-	-	-
		☑	☑	-	-	☑	☑
	☑			-	☑	-	-
☑	☑	☑	☑	☑	☑	☑	☑
☑	☑	☑	☑	☑	-	-	-
				-	-	-	-
				-	-	-	-
				-	-	-	-
				-	-	-	-
☑ Option 1	☑ Option 1	☑ Option 1	☑ ETA	☑ Option 1	☑ Option 7	☑ Option 7	☑ ETA
☑	☑	☑	☑	☑	☑	☑	☑
☑	☑	☑	☑	☑	-	-	☑
N_{Rd}	N_{Rd}	N_{Rd}	N_{Rd}	N_{Rd}	N_{Rd}	N_{Rd}	N_{Rd}
M8 for 5.8	M6 for 5.8	Ø8 for A-II	Ø8 for A-II	M8 for 5.8	M6 for 5.8	Ø8 for A-II	Ø8 for A-II
	M16				M16		
M30				M30			
		Ø32				Ø32	
			Ø40				Ø32

OVERVIEW OF OUR RANGE - BONDED ANCHOR SELECTOR

				
BONDED ANCHOR SYSTEM:		R-KEM II | RM50 in concrete	R-KEM II | RM50 in masonry	R-KF2 with threaded rods
ANCHOR MATERIAL	5.8 STEEL CLASS, ZINC PLATED	☑	☑	☑
	8.8 STEEL CLASS, ZINC PLATED	☑	☑	☑
	STAINLESS STEEL	☑	☑	☑
	REBAR	-	-	-
	R-ITS	-	-	-
SUBSTRATES	CONCRETE	☑	-	☑
	CRACKED CONCRETE	-	-	-
	SILICATE BRICK	-	☑	-
	SOLID BRICK	-	☑	-
	HOLLOW BRICK	-	☑	-
	LIGHTWEIGHT CONCRETE BLOCKS	-	☑	-
APPROVALS	ETA, CE, SEISMIC	☑ Option 7	☑ 001	☑ Option 7
	POLISH ROADS AND BRIDGES CONSTRUCTION INSTITUTE	☑	☑	☑
	FIRE	-	-	-
TENSION LOADS IN kN	[kN]	N_{Rd}	N_{Rd}	N_{Rd}
	10	M8 for 5.8	M8-M16 for 5.8	M8 for 5.8
	20			
	30			
	40			
	50			
	60			
	70			
	80			M30
	90	M30		
	100			
	110			
	120			
	130			
	140			
	150			
	160			
	170			
	180			
	190			
	200			
	210			
	220			
	230			

OVERVIEW OF OUR RANGE - BONDED ANCHOR SELECTOR

		
R-CAS-V with threaded rods	**R-HAC-V** with threaded rods	**R-HAC-V** with rebar as an anchor
☑	☑	-
☑	☑	-
☑	☑	-
-	-	☑
-	-	-
☑	☑	☑
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
☑ Option 7	☑ Option 7	☑ Option 7
☑	☑	☑
-	-	-
N_{Rd}	N_{Rd}	N_{Rd}
M8 for 5.8	M8 for 5.8	Ø8 for 5.8
		Ø25
	M30	
M30		

OVERVIEW OF OUR RANGE - MECHANICAL ANCHOR SELECTOR

	MECHANICAL ANCHORS:	R-HPTIIA4	R-HPTIIZF	R-XPTIIA4	R-XPT	R-XPT-HD
ANCHOR MATERIAL	5.8 STEEL CLASS, ZINC PLATED	-	-	-	☑	-
	8.8 STEEL CLASS, ZINC PLATED	-	-	-	-	-
	ZINC FLAKE & HOT DIP GALVANISED	-	☑	-	-	☑
	STAINLESS STEEL	☑	-	☑	-	-
SUBSTRATES	CONCRETE	☑	☑	☑	☑	☑
	CRACKED CONCRETE	☑	☑	-	-	-
	AERATED CONCRETE	-	-	-	-	-
	STONE	-	-	-	-	-
	SOLID BRICK	-	-	-	-	-
	HOLLOW BRICK	-	-	-	-	-
	LIGHTWEIGHT CONCRETE BLOCKS	-	-	-	-	-
APPROVALS	ETA CE	☑ ETAG 001-2 Option 1	☑ ETAG 001-2 Option 1	☑ ETAG001-2 Option 7	☑ ETAG001-2 Option 7	-
	FIRE	☑	☑	-	-	-
	SEISMIC	-	-	-	-	-
		-	-	-	☑ for M6 and M24	☑

TENSION AND SHEAR LOADS IN kN

[kN]	R-HPTIIA4 N_{Rd}	R-HPTIIA4 V_{Rd}	R-HPTIIZF N_{Rd}	R-HPTIIZF V_{Rd}	R-XPTIIA4 N_{Rd}	R-XPTIIA4 V_{Rd}	R-XPT N_{Rd}	R-XPT V_{Rd}	R-XPT-HD N_{Rd}	R-XPT-HD V_{Rd}
5	M8	M8	M8	M8	M8	M8	M8	M8	M8	M8
10										
15							M24		M24	
20										
25	M16									
30			M20		M24					M24
35		M16								
40										
45										
50										
60				M20						
70						M24		M24		
80										
90										
100										

OVERVIEW OF OUR RANGE - MECHANICAL ANCHOR SELECTOR

						
RAWLBOLT	**SAFETY PLUS II**	**SAFETY PLUS**	**R-DCA**	**R-DCL**	**R-DCA-A4**	**R-LX**
☑	-	-	☑	☑	-	-
-	☑	☑	-	-	-	☑
-	-	-	-	-	-	-
-	-	-	-	-	☑	☑
☑	☑	☑	☑	☑	☑	☑
☑	☑	-	☑	☑	☑	☑
-	-	-	-	-	-	-
☑	-	-	-	-	-	-
☑	-	-	-	-	-	-
-	-	-	-	-	-	-
☑ AT-15-7280/2014	-	-	-	-	-	-
☑ ETAG001-2 Option 1	☑ ETAG001-2 Option 1	☑ ETAG001-2 Option 7	☑ ETAG001-6	☑ ETAG001-6	☑ ETAG001-6	☑ ETA 17/0806
☑	☑	-	☑	☑	☑	-
-	☑ C1, C2	-	-	-	-	-
-	-	-	-	-	-	-

N_{Rd}	V_{Rd}	N_{Rd}	V_{Rd}	N_{Rd}	V_{Rd}	N_{Rd}	V_{Rd}	N_{Rd}	V_{Rd}	N_{Rd}	V_{Rd}	N_{Rd}	V_{Rd}
M6	M8	M8	M8	M8	M8	M6	M6	M6	M6	M6-M20	M6-M20	PENDING	PENDING
M20	M24	M16	M16	M20	M20	M20	M20	M20	M20				

OVERVIEW OF OUR RANGE - BONDED ANCHOR SELECTOR

BONDED ANCHORS - RESIN TYPES

PURE EPOXY

- Most suitable for construction, as well as for deep anchorages.
- Designed for heavy-duty anchorages in cracked and non-cracked concrete.
- Suitable for use in dry and wet substrates as well as holes and substrates covered with water.

HYBRID VINYLESTER

- Most common product for construction.
- Intended for medium and heavy -duty anchorages in cracked and non-cracked concrete.
- Suitable for use in low temperatures (down to -20° for winter option) enables use throughout the year
- Suitable for use in dry and wet substrates as well as holes and substrates covered with water

POLYESTER STYRENE FREE

- The most contemporary general use bonded anchor.
- Intended for medium duty fixings in 15 types of substrate.
- Low odour suitable for indoor applications.
- Product with wide spectrum of use in the medium load capacity area.

POLYESTER

- Recommended for outdoor applications.
- Suitable for medium-duty fixings in non-cracked concrete.

BONDED ANCHORS ARE OFFERED IN A WIDE RANGE OF SYSTEMS

GLASS CAPSULES

Glass capsules containing both the resin and hardener, which mix and set after the stud or socket is driven in to the hole.

CARTRIDGES

Tubular plastic cartridges containing resin. Various formats depending on resin components, which are kept separate within cartridge until delivered via mixer nozzle.

- foil cartridge system CHUBAPAC
- coaxial cartridge system COX
- cartridge system side by side SBS

FOILS

CFS+ (Cartridge Free System) Innovative resin dispensing system with unique packaging solution, which reduces overall waste. Resin components contained separately within foil until delivered via mixer nozzle.

FEATURES & BENEFITS OF DELIVERY SYSTEMS

Glass capsules

- Quick and easy to install
- Only solid substrates
- Minimal packaging waste - Whole capsule installed in hole
- No waste resin
- No special tools required
- No time limitations - Resin only begins to set after stud, rod or rebar is inserted

Cartridges

- For all substrates, including deep anchorages
- Many applications from one cartridge
- Ability to resume use after stoppages
- Small cartridges are compatible with standard, low-cost silicone guns
- Simple to store and transport

Foils

- For all substrates, including deep anchorages
- Easy to dispense
- Less waste - Recyclable packaging
- The cost-effective solution for many customers

RESIN PRODUCTS AVAILABLE IN EACH SYSTEM

Glass capsules: VINYLESTER: R-HAC-V, R-CAS-V

Cartridges:
PURE EPOXY: R-KEX II
HYBRID VINYLESTER: R-KER-II
POLYESTER: R-KEM II, R-KF2

Foils:
POLYESTER: RM50, RP30
VINYLESTER: RV200

OVERVIEW OF OUR RANGE - MECHANICAL ANCHOR SELECTOR

MECHANICAL ANCHORS - OUR RANGE

THROUGHBOLTS

Throughbolt anchors designed for use in cracked and non-cracked concrete

SHIELD ANCHORS

World's most popular all-purpose expanding shield anchor for use in cracked and non-cracked concrete

HEAVY DUTY EXPANSION ANCHORS

Heavy duty expansion anchor, suitable for demanding safety-critical applications

FEATURES AND BENEFITS

Throughbolts

» High performance in cracked and non-cracked concrete confirmed by ETA Option 1 or ETA Option 7
» Stainless steel material for the highest corrosion resistance
» New generation of throughbolt with unique corrosion-resistant coating
» Throughbolts are suitable for reduced embedment to avoid contact with reinforcement
» Embedment depth markings help to ensure precise installation
» Design allows drilling and installation directly through the fixture and reduces overall installation effort

Shield anchors

» For use in cracked and non-cracked concrete (ETA option 1), hollow-core slabs, flooring blocks and ceramics
» Shield anchor (shield also available separately)
» Product recommended for applications requiring fire resistance
» Bolt lengths suitable for fixture thicknesses of up to 150 mm
» Ferrule marked with hole diameter to ensure correct installation
» Optimum geometry for maximum expansion in all recommended substrates
» Excellent tolerance to variation in hole size

Heavy duty expansion anchors

» Mechanical anchor for highest tension and shear loads
» Seismic category C2 for Structural applications. Seismic category C1 for non-structural use in areas with low seismic risk
» For usage with required fire resistance
» Option 1 ETA for Cracked and Non-Cracked Concrete

ANCHOR PRODUCTS AVAILABLE:

Throughbolts	Shield anchors	Heavy duty expansion anchors
R-HPTIIA4, R-HPTIIZF, R-XPTIIA4, R-XPT, R-XPT-HD	RAWLBOLT: R-RBL, R-RBP, R-RB-PF, R-RBL-E, R-RBL-H, R-RB	SAFETY PLUS: R-SPLII-L, R-SPLII-P, R-SPLII-C, R-SPL, R-SPL-BP, R-SPL-C

WEDGE ANCHORS

Internally threaded wedge anchors for simple hammer-set installation

SCREW ANCHORS

Self-tapping and removable concrete screw anchor for through-fixing installation

FEATURES AND BENEFITS

Wedge anchors

» High performance in cracked and non-cracked concrete confirmed by ETA
» Product recommended for applications requiring fire resistance
» Internally threaded to be used with threaded studs, rods or bolts
» Easy to install by hammer action
» Slotted sleeve and internal wedge component together facilitate easy setting and expansion
» Allows bolts or studs to be installed or removed without damaging the anchorage

Screw anchors

» Time-efficient installation through streamlined procedure - simply drill and drive
» Completely removable, allows repeatable use
» Unique design with patented threadform ensures high performance for relatively small hole diameter
» Integral washer ensures a neat overall appearance
» Non-expansion functioning ensures low risk of damage to base material and makes R-LX ideal for installation near edges and adjacent anchors
» Performance data at two embedment depths (reduced embedment to avoid contact with reinforcement)

ANCHOR PRODUCTS AVAILABLE:

Wedge anchors	Screw anchors
R-DCA, R-DCL, R-DCA-A4	R-LX-HF-ZP, R-LX-H-ZP, R-LX-CS-ZP, R-LX-HF-ZF, R-LX-H-ZF, R-LX-CS-ZF,

BASICS OF ANCHORING - TYPES OF ANCHORS

Torque-controlled expansion anchors

Applied loads are transferred to the substrate via friction between the anchor and the wall of the drilled hole. Friction is the result of expansion force, achieved by applying torque to the bolt or nut, thus drawing a cone component in to an expanding sleeve to create the anchorage.

Deformation-controlled expansion anchors

Applied loads are transferred to the substrate via friction between the anchor and the wall of the drilled hole. Friction is the result of expansion force, achieved by displacement of a wedge component, deforming the anchor body and creating the anchorage.

Concrete screw

Threaded fastener screwed into a predrilled hole where threads create a mechanical interlock with the concrete.

Undercut anchors

Applied load is transferred to the substrate by mechanical interlock – the result of interaction between the anchor form and the cavity form. The required cavity (or undercut) may be pre-formed within the substrate.

Bonded (injection) anchors

Applied loads are transferred to the substrate by adhesion at the anchor/resin and resin/substrate interfaces. Anchors are supplied as a two-piece set, containing resin (in capsule or cartridge form) and a steel element. In cases involving hollow substrates, a plastic or metal mesh sleeve may be introduced as a third system component. Bonded anchors minimise the introduction of stresses in the substrate material, due to the absence of expansion forces.

BASICS OF ANCHORING - ANCHOR SELECTION FACTORS

In order to select and install an anchor correctly, the user should consider the following factors:

» Environmental conditions (humidity, chemicals, etc.), which are the most important factor for selection of the material and coating type of the fastener (corrosion resistance)
» Base material (type of concrete, solid or hollow masonry structures) – some products (R-KEM II, for example) are suitable for a wide range of substrates, whilst others are recommended for only one
» Anchor spacing and edge distances - Consideration must be given to the minimum distances required to avoid damaging the substrate
» Load-bearing capacity - Data (much of which stems from technical approvals) is provided for each product presented in this catalogue
» Loading type (static/dynamic) and direction (tension/shear/combined)
» Setting data – embedment depths, installation guidelines, etc.

Expanded detail of each of these main selection factors is presented in the following sections.

CORROSION

Corrosion is one of the most important and influential factors in the selection of anchors. Two basic corrosion types must be considered: atmospheric and galvanic corrosion.

Galvanic corrosion may occur when two dissimilar metals are in contact with each other. In the presence of an electrolyte (e.g. water) a galvanic cell is created, causing gradual corrosion of one of the metal elements.

The table below shows metals that may commonly be used as connector (anchor) and/or fixture materials, with indications of the expected corrosion outcome for each possible combination:
- the first column lists the fixed element (fixture) material
- the top row lists the anchor/connector material

Comments:
» Metal of the fixed element is not exposed to galvanic corrosion and, in fact, it takes advantage of galvanic protection (low, when the difference of electrochemical potentials is low, higher as the difference of potentials increases).

» The galvanic effect is influenced by the comparative surface areas of the two metals:
  – in cases where the surface area of the fixture is the lesser, corrosion is accelerated
  – in cases where the surface area of the fixture is the greater, corrosion is slowed.

The effect becomes more pronounced as the difference between the two surface areas increases.

Connector metal > Fixture metal ⌄	Stainless steel	Hot dip galvanised steel	Zinc electroplated steel	Zinc alloys	Lead	Brass
Stainless steel	■	↑	↑	↑	↑	↑
Hot dip galvanised steel	←	■	■	■	←	←
Zinc electroplated steel	←	■	■	■	■	←
Low carbon steel	←	↑	↑	↑	■	←
Aluminium alloys	←	↑	↑	↑	■	■
Zinc alloys	←	■	■	■	←	←

■ Contact between these metals is allowable ↑ The connector metal will corrode ← The fixture metal will corrode

BASICS OF ANCHORING - TYPES OF ANCHORS

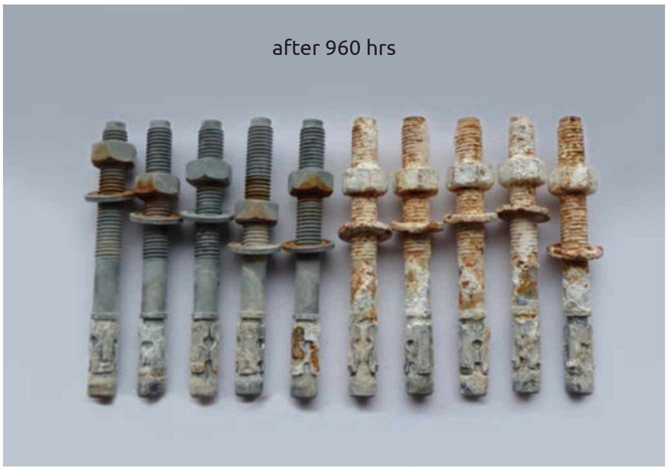
Atmospheric corrosion is caused by the interaction of moisture or chemical compounds from the air with exposed metal. Corrosion rates depend on the concentration of chemical compounds in the air, as well as humidity levels.

According to ISO 12944-2:1998 (Table 1), atmospheric corrosion categories can be differentiated depending on locality, as well as the prevailing conditions. It is therefore important to accurately determine the working conditions of designated fixings and materials to ensure their correct application.

Atmospheric corrosion classification Corrosion categories	Typical environments		Recommended material			
	External	Internal	Zinc plating	Zinc flake	A2	A4
C1 Very low	–	Interior of air-conditioned premises with clean atmosphere (e.g. shops, offices, hotels)	5-10 µm	■	■	■
C2 Low	Atmosphere with low pollution and dry climate; mainly rural areas	Unheated buildings where condensation may occur (e.g. warehouses)	5-10 µm	■	■	■
C3 Moderate	Residential and industrial atmosphere with moderate pollution of SO_2. Coastal areas; low salinity atmosphere	Light industry with humidity and air pollution (food production, laundry facilities, etc.)	40 µm	■	□	■
C4 High	Industrial and coastal areas; medium salinity atmosphere	Chemical factories, swimming pools, offshore ships, etc.	40 µm	■	–	■
C5-I/M Very high (marine)	Coastal and offshore areas with highly-aggressive atmospheric conditions of high salinity and humidity	Buildings and areas with condensation of water and high pollution	40 µm	□	–	■

■ suitable for use □ consultation with our technical advisor recommended – not suitable for use

For anticorrosion protection RAWLPLUG® use not only standard technologies like zinc electroplating, but also more advanced alternatives. These include traditional protective measures such as hot dip galvanizing, or the use of stainless steel as the primary material. Modern protective technologies, like Deltatone or similar zinc flake coatings, are utilised also. Images below show comparisons of zinc flake coated and hot dip galvanized samples after neutral salt Spray testing. Samples were installed in concrete cubes and placed in a corrosion testing chamber for 960 hours, with images showing sample condition after 504 hours, as well as 960 hours when the anchors were extracted from the substrate.



ZINC FLAKE COATING
Zinc electroplated expander
HPTIIZF

HDG
Stainless steel expander
XPT-HDG

BASICS OF ANCHORING - LOADING CONSIDERATIONS

Moreover, fasteners and fixings offered by RAWLPLUG® are tested in high salinity atmospheric conditions on a regular basis. The tests constitute a foundation for product development in cooperation with our customers.

All of our metal anchors for applications in low corrosion risk environments are zinc electroplated and passivated. In cases where anchors are intended for use in higher risk environments we recommend hot dip galvanized, zinc flake or stainless steel products.

LOADING DIRECTIONS:

1. Axial tensile load – Load application is in the direction of the connector axis, acting to pull the connector away from the substrate.
2. Axial compressive load – Load application is in the direction of the connector axis, acting to clamp the connector onto the substrate.
3. Shear (transverse) load – Loading direction is perpendicular to connector axis, with the load applied at the substrate surface (fixture tightened against the substrate).
4. Combined load (resultant) occurs when axial and shear loads are acting simultaneously.
5. Bending moment occurs when a shear load is applied offset from the substrate surface. Magnitude of bending moment is dependent on applied load and lever arm length.

DESIGN OF FASTENING FOR USE IN CONCRETE

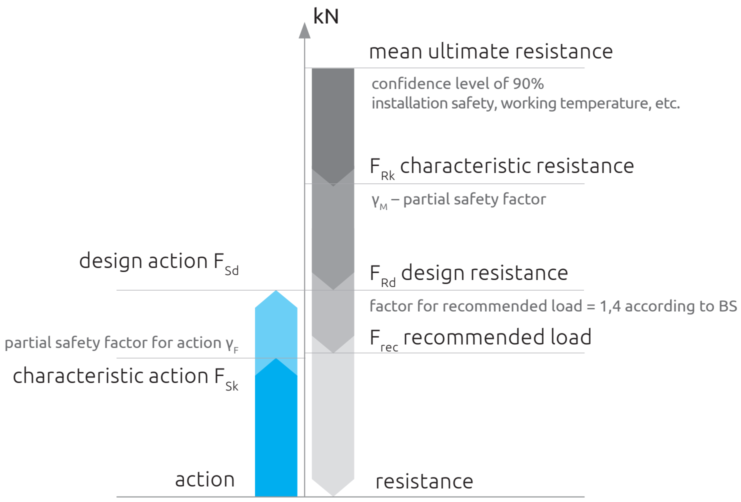
TERMS AND DEFINITIONS (ACC. EN 1990)

PERSISTENT DESIGN SITUATION	Design situation that is relevant during a period of the same order as the design working life of the structure. NOTE Generally it refers to conditions of normal use.
ACTION (F)	a) Set of forces (loads) applied to the structure (direct action); b) Set of imposed deformations or accelerations caused for example, by temperature changes, moisture variation, uneven settlement or earthquakes (indirect action).
PERMANENT ACTION (G)	Action that is likely to act throughout a given reference period and for which the variation in magnitude with time is negligible, or for which the variation is always in the same direction (monotonic) until the action attains a certain limit value.), e.g. self-weight of structures, fixed equipment and road surfacing, and indirect actions caused by shrinkage and uneven settlements
VARIABLE ACTION (Q)	Action for which the variation in magnitude with time is neither negligible nor monotonic, e.g. imposed loads on building floors, beams and roofs, wind actions or snow loads ;
ACCIDENTAL ACTION (A)	Action, usually of short duration but of significant magnitude, that is unlikely to occur on a given structure during the design working life. An accidental action can be expected in many cases to cause severe consequences unless appropriate measures are taken. NOTE 1 Certain actions, such as seismic actions and snow loads, may be considered as either accidental and/or variable actions, depending on the site location, see EN 1991 and EN 1998. NOTE 2 Actions caused by water may be considered as permanent and/or variable actions depending on the variation of their magnitude with time.
STATIC ACTION	Action that does not cause significant acceleration of the structure or structural members
QUASI-STATIC ACTION	Dynamic action represented by an equivalent static action in a static model
CHARACTERISTIC VALUE OF AN ACTION (F_k)	Principal representative value of an action NOTE: In so far as a characteristic value can be fixed on statistical bases, it is chosen so as to correspond to a prescribed probability of not being exceeded on the unfavourable side during a „reference period" taking into account the design working life of the structure and the duration of the design situation.
DESIGN VALUE OF AN ACTION (F_d)	Value obtained by multiplying the representative value by the partial factor γ_f NOTE The product of the representative value multiplied by the partial factor $\gamma_F = \gamma_{Sd} \cdot \gamma_f$ may also be designated as the design value of the action.
RECOMMENDED VALUE OF AN ACTION (F_{rec})	Maximum working load recommended by a manufacturer. Value obtained by multiplying the design value by the global safety factor γ_F=1,4 according to BS 8539.
FIRE DESIGN RESISTANCE ($R_{d,fi}$)	Design resistance in the fire situation; $R_{d,fi}(t)$ at a given time t. R 30 or R 60,... - fire resistance class for the load-bearing criterion for 30, or 60... minutes in standard fire exposure.
SEISMIC DESIGN SITUATION	Design situation involving exceptional conditions of the structure when subjected to a seismic event.

DESIGN OF FASTENINGS IN CONCRETE IN ACCORDANCE WITH EN 1992-4:2018

General design concept is based on partial safety factors, where the basis for designing the correct connection is the fulfillment of the condition:

$$F_{Sd} \leq F_{Rd}$$



PARTIAL SAFETY FACTORS

ACTIONS

Partial factors shall be appropriate with EN 1990.

Persistent and Transient design situations	Permanent actions		Leading variable action	Accompanying variable actions (*)	
	Unfavourable	Favourable		Main (if any)	Others
(Eq. 6.10)	$\gamma_{Gj,sup}G_{kj,sup}$	$\gamma_{Gj,inf}G_{kj,inf}$	$\gamma_{Q,1}Q_{k,1}$	-	$\gamma_{Q,i}\Psi_{0,i}Q_{k,i}$
(Eq. .10a)	$\gamma_{Gj,sup}G_{kj,sup}$	$\gamma_{Gj,inf}G_{kj,inf}$	-	$\gamma_{Q,1}\Psi_{0,1}Q_{k,1}$	$\gamma_{Q,i}\Psi_{0,i}Q_{k,i}$
(Eq. .10b)	$\xi\gamma_{Gj,sup}G_{kj,sup}$	$\gamma_{Gj,inf}G_{kj,inf}$	$\gamma_{Q,1}Q_{k,1}$	-	$\gamma_{Q,i}\Psi_{0,i}Q_{k,i}$

NOTE 1
The choice between 6.10, or 6.10a and 6.10b will be in the National annex. In case of 6.10a and 6.10b, the National annex may in addition modify 6.10a to include permanent actions only.

NOTE 2
The γ and ξ values may be set by the National annex. The following values for γ and ξ are recommended when using expressions 6.10, or 6.10a and 6.10b.
$\gamma_{Gj,sup}$ = 1,35
$\gamma_{Gj,inf}$ = 1,00
$\gamma_{Q,1}$ = 1,50 where unfavourable (0 where favourable)
$\gamma_{Q,i}$ = 1,50 where unfavourable (0 where favourable)
ξ = 0,85 (so that $\xi\gamma_{Gj,sup}$ = 0,85 x 1,35 ≈ 1,15).
See also EN 1991 to EN 1999 for γ values to be used for imposed deformations.

NOTE 3
The characteristic values of all permanent actions from one source are multiplied by $\gamma_{G,sup}$ if the total resulting action effect is unfavourable and $\gamma_{G,inf}$ if the total resulting action effect is favourable. For example, all actions originating from the self weight of the structure may be considered as coming from one source ; this also applies if different materials are involved.

NOTE 4
For particular verifications, the values for γ_G and γ_Q may be subdivided into γ_g and γ_q and the model uncertainty factor γ_{Sd}. A value of γ_{Sd} in the range 1,05 to 1,15 can be used in most common cases and can be modified in the National annex.

RESISTANCE

Partial safety factors should be in accordance with EN 1992-4: 2018.

Failure modes	Partial safety factor	
Steel failure		
Tension	γ_{Ms}	$= 1{,}2 \cdot f_{uk} / f_{yk} \geq 1{,}4$
Shear with and without lever arm	γ_{Ms}	$= 1{,}0 \cdot \frac{f_{uk}}{f_{yk}} \geq 1{,}25$ when $f_{uk} \leq 800\ N/mm^2$ and $f_{yk}/f_{uk} \leq 0{,}8$ $= 1{,}5$ when $f_{uk} > 800\ N/mm^2$ or $f_{yk}/f_{uk} > 0{,}8$
Steel failure – supplementary reinforcement		
Tension	$\gamma_{Ms,re}$	=1,15 in acc. with EN 1992-1-1

Steel failure - exposure to fire		
Tension and Shear with and without lever arm	$\gamma_{Ms,fi}$	= 1,0
Concrete related failure		
Concrete cone failure and concrete edge failure	γ_{Mc} γ_c	$=\gamma_c \cdot \gamma_{inst}$ =1,5 in accordance with EN 1992-1-1
and concrete blow-out failure and concrete pry-out failure	γ_{inst}	for seismic repair and strengthening of existing structures see the EN 1998 series ≥ 1,0 for post-installed fasteners in tension, is given in the relevant European Technical Product Specification. = 1,0 for post-installed fasteners in shear
Concrete splitting failure	γ_{Msp}	$=\gamma_{Mc}$
Concrete related failure - exposure to fire		
Concrete cone failure and concrete edge failure and concrete blow-out failure and concrete pry-out failure	$\gamma_{Mc,fi}$ $\gamma_{c,fi}$ γ_{inst}	$=\gamma_{(c,fi)} \cdot \gamma_{inst}$ =1,0 in accordance with EN 1992-4 ≥ 1,0 for post-installed fasteners in tension, is given in the relevant European Technical Product Specification. = 1,0 for post-installed fasteners in shear
Concrete splitting failure	$\gamma_{Msp,fi}$	$=\gamma_{(Mc,fi)}$
Pull-out and combined pull-out and concrete failure	$\gamma_{Mp,fi}$	$=\gamma_{(Mc,fi)}$

NOTE 1
Partial factors for materials for exposure to fire for exposure to fire $\gamma_{M,fi}$ may be found in a Country's National Annex to EN 1992-4.

STATIC LOADS

STATIC AND QUASI-STATIC LOADS

REQUIRED VERIFICATION FOR FASTENERS IN TENSION

Steel failure

$$A_s \quad f_{uk}$$

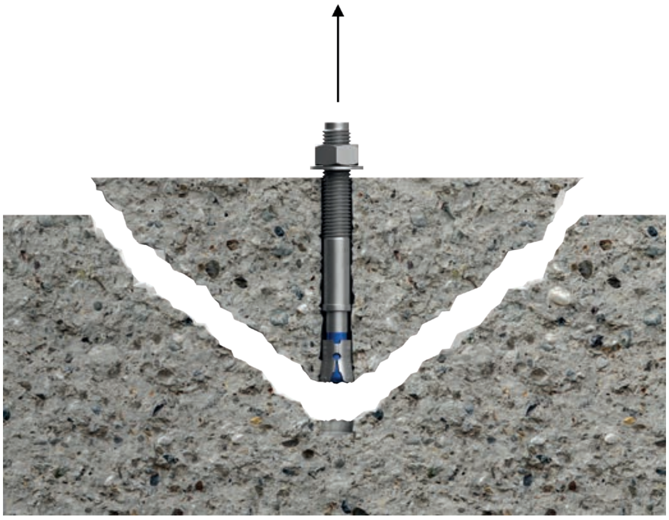
This is a break of the steel element of the fastener with no damage to the substrate or total pull-out of the fastener due to the tension force. The most important factors that affect the fastener's steel strength are: the ultimate tensile strength of the steel and the cross-sectional area of the fastener measured in the narrowest section.

Failure mode	Single fastener	Group of fasteners	
		most loaded fasteners	group
Steel failure of fastener	$N_{Ed} \leq N_{Rd,s} = \frac{N_{Rk,s}}{\gamma_{Ms}}$	$N^h_{Ed} \leq N_{Rd,s} = \frac{N_{Rk,s}}{\gamma_{Ms}}$	-

$$N_{Rk,s} = A_s \cdot f_{uk}$$

$N_{Rk,s}$	characteristic value of steel resistance of a fastener under tension load
A_s	effective cross-sectional area of the fastener in tension
f_{uk}	nominal characteristic steel ultimate tensile strength

Concrete cone failure



It is concrete failure by breaking a piece of concrete in the shape of a cone due to the tension load. The direct cause of damage are high stresses in concrete resulting from the action of tensile forces on the fastener. The forces are transferred from the fastener to the substrate by mechanical expansion of the fastener, undercutting of the substrate, or adhesion forces. The main factors affecting the bearing capacity of the substrate are: the compressive strength of the concrete and effective embedment depth of anchor.

Failure mode	Single fastener	Group of fasteners	
		most loaded fasteners	group
Concrete cone failure	$N_{Ed} \leq N_{Rd,c} = \frac{N_{Rk,c}}{\gamma_{Ms}}$	-	$N^g_{Ed} \leq N_{Rd,c} = \frac{N_{Rk,c}}{\gamma_{Ms}}$

$$N_{Rk,c} = N^0_{Rk,c} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot \Psi_{s,N} \cdot \Psi_{re,N} \cdot \Psi_{ec,N} \cdot \Psi_{M,N}$$

$$N^0_{Rk,c} = k_1 \cdot \sqrt{f_{ck}} \cdot h_{ef}^{1,5}$$

$N_{Rk,c}$	characteristic resistance in case of concrete cone failure under tension load
k_1	factor taking into account the effect of the compressed and expanded concrete zone
f_{ck}	nominal characteristic compressive cylinder strength
h_{ef}	effective embedment depth in concrete
$A_{c,N}/A^0_{c,N}$	reduction factor, taking into account the real surface area of the anchor's impact in the substrate in the case of a group of fasteners or the presence of concrete edges within the range of the fastener's impact.
$\Psi_{s,N}, \Psi_{re,N}, \Psi_{ec,N}, \Psi_{M,N}$	reduction factors, taking into account the impact of: concrete edges; dense surface reinforcement in concrete; asymmetrical distribution of forces in the anchor group; clamping force between the base plate and the substrate in case of bending moment.

Pull-out failure

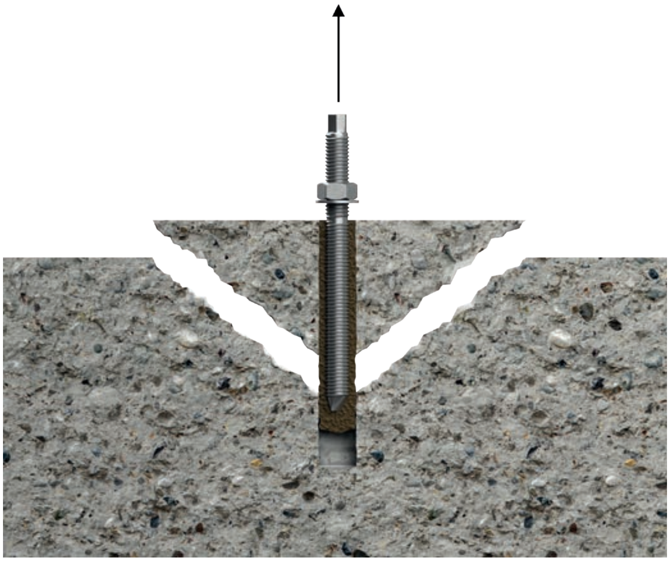
It is the total pull-out of the mechanical fastener without damaging the concrete due to the tension force. The anchor's efficiency is directly influenced by the effectiveness of anchoring in the concrete by mechanical locking. The pull-out of the fastener occurs when the force of the fastener impact on the substrate is less than the load capacity of the substrate - the concrete cone. The main factor affecting the load capacity is the fastener structure.

Failure mode	Single fastener	Group of fasteners	
		most loaded fasteners	group
Pull-out failure of fastener [a]	$N_{Ed} \leq N_{Rd,p} = \frac{N_{Rk,p}}{\gamma_{Mp}}$	$N^h_{Ed} \leq N_{Rd,p} = \frac{N_{Rk,p}}{\gamma_{Mp}}$	-

[a] Not required for post-installed bonded fasteners.

$N_{Rk,p}$ characteristic resistance in case of pull-out failure under tension load

Combined pull-out and concrete failure
(in case of post-installed bonded fasteners)



τ_{Rk} h_{ef} d

It is the total pull-out of the adhesive bond with surface damage of the substrate due to the tension force. The anchoring effect is directly influenced by the effectiveness of anchoring in the substrate through the use of adhesive forces. The pull-out of the fastener occurs when the force of the fastener interaction on the substrate is less than the load capacity of the substrate - the concrete cone. The main factors affecting the load capacity of the fastener are: resin strength, anchorage depth and fastener diameter.

Failure mode	Single fastener	Group of fasteners	
		most loaded fasteners	group
Combined pull-out and concrete failure [b]	$N_{Ed} \leq N_{Rd,p} = \frac{N_{Rk,p}}{\gamma_{Mp}}$	-	$N^g_{Ed} \leq N_{Rd,p} = \frac{N_{Rk,p}}{\gamma_{Mp}}$

[b] Not required for headed and post-installed mechanical fasteners.

$$N_{Rk,p} = N^0_{Rk,p} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot \Psi_{g,Np} \cdot \Psi_{s,Np} \cdot \Psi_{re,N} \cdot \Psi_{ec,Np}$$

$$N^0_{Rk,p} = \Psi_{sus} \cdot \tau_{Rk} \cdot \pi \cdot d \cdot h_{ef}$$

$N_{Rk,p}$	characteristic resistance in case of combined pull-out and concrete failure under tension load
Ψ_{sus}	factor that takes account of the influence of sustained load
τ_{Rk}	characteristic bond resistance
d	outer diameter of fastener
h_{ef}	effective embedment depth in concrete
$A_{p,N}/A^0_{p,N}$	reduction factor, taking into account the real surface area of the anchor's impact in the substrate in the case of a group of fasteners or the presence of concrete edges within the range of the fastener's impact.
$\Psi_{g,Np}$, $\Psi_{s,Np}$, $\Psi_{re,Np}$, $\Psi_{ec,Np}$	reduction factors taking into account the impact of: groups of fasteners placed close to each other; concrete edges; dense surface reinforcement in concrete; asymmetrical distribution of forces in the anchor group.

Splitting failure

$$N^0_{Rk,p} \quad N^0_{Rk,c}$$

It is concrete damage due to linear cracking of the concrete as a result of tension forces. The direct cause of damage is the proximity of the fastener to the concrete edge and high stresses in concrete resulting from the effects of tensile forces on the fastener. Calculations are not necessary, either with the appropriate thickness of the substrate and when the edges of the concrete are outside the zone of impact of the fasteners, or if the destruction by breaking out and the concrete cone is calculated for cracked concrete, and the substrate has appropriate reinforcement limiting the width of the crack. The main factors affecting the load capacity of the fastener when splitting concrete are: pull-out resistance and concrete cone resistance.

Failure mode	Single fastener	Group of fasteners	
		most loaded fasteners	group
Concrete splitting failure	$N_{Ed} \leq N_{Rd,sp} = \frac{N_{Rk,sp}}{\gamma_{Msp}}$	-	$N^g_{Ed} \leq N_{Rd,sp} = \frac{N_{Rk,sp}}{\gamma_{Msp}}$

$$N_{Rk,sp} = N^0_{Rk,sp} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot \Psi_{s,N} \cdot \Psi_{re,N} \cdot \Phi\Psi_{ec,N} \cdot \Psi_{h,sp}$$

$$N^0_{Rk,sp} = \min (N^0_{Rk,p}, N^0_{Rk,c})$$

$N_{Rk,sp}$	characteristic resistance in case of concrete splitting failure under tension load
$N^0_{Rk,p}$	characteristic resistance in case of pull-out failure of a single fastener not influenced by adjacent bonded fasteners or edges of the concrete member
$N^0_{Rk,c}$	characteristic resistance in case of concrete cone failure of a single fastener not influenced by adjacent bonded fasteners or edges of the concrete member
$A_{c,N}/A^0_{c,N}$	reduction factor, taking into account the real surface area of the anchor's impact in the substrate in the case of a group of fasteners or the presence of concrete edges within the range of the fastener's impact.
$\Psi_{s,N}, \Psi_{re,N}, \Psi_{ec,N}, \Psi_{h,sp}$	reduction factors taking into account the impact of: concrete edges; dense surface reinforcement in concrete; asymmetrical distribution of forces in the base plate; substrate thickness.

Blow-out failure

$$c_1 \quad A_h \quad f_{ck}$$

This is concrete damage by blow-out the side of the concrete at the edge. This damage due to the characteristics of the fastener action is considered only for headed anchors and undercut mechanical anchors acting as headed anchors. The main factors affecting the load capacity of the fastener when blow-out concrete are: distance from the edge of the concrete, the surface of the fastener head impact on the concrete and the strength of the concrete.

Failure mode	Single fastener	Group of fasteners	
		most loaded fasteners	group
Concrete blow-out failure [c]	$N_{Ed} \leq N_{Rd,cp} = \frac{N_{Rk,cp}}{\gamma_{Mcp}}$	-	$N^{g}_{Ed} \leq N_{Rd,cp} = \frac{N_{Rk,cp}}{\gamma_{Mc}}$

[c] Not required for post-installed mechanical and bonded fasteners – except mechanical undercut fasteners

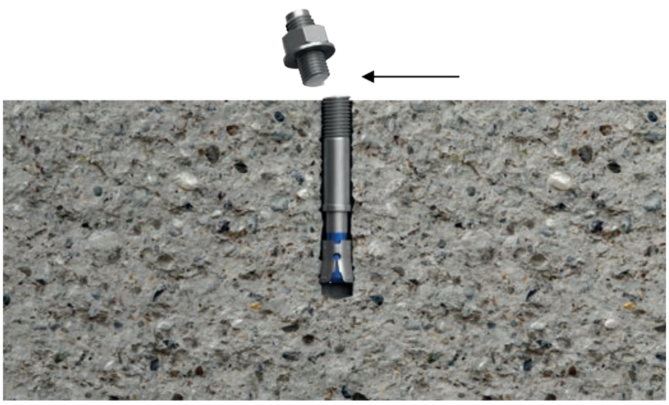
$$N_{Rk,cb} = N^{0}_{Rk,cb} \cdot \frac{A_{c,Nb}}{A^{0}_{c,Nb}} \cdot \Psi_{s,Nb} \cdot \Psi_{g,Nb} \cdot \Psi_{ec,Nb}$$

$$N^{0}_{Rk,cb} = k_5 \cdot c_1 \cdot \sqrt{A_h} \cdot \sqrt{f_{ck}}$$

$N_{Rk,cb}$	characteristic resistance in case of concrete blow-out failure under tension load
k_5	factor taking into account the effect of the compressed and expanded concrete zone
c_1	distance of the fastener from the edge of the concrete
A_h	the surface of the fastener head impact on the concrete
f_{ck}	nominal characteristic compressive cylinder strength
$A_{c,Nb}/A^{0}_{c,Nb}$	reduction factor, taking into account the real surface area of the anchor's impact in the substrate in the case of a group of fasteners or the presence of concrete edges within the range of the fastener's impact.
$\Psi_{s,Nb}, \Psi_{g,Nb}, \Psi_{ec,Nb}$	reduction factors taking into account the impact of: concrete edges; groups of anchors parallel to the edges of the concrete; asymmetrical distribution of forces in the anchor group.

REQUIRED VERIFICATION FOR FASTENERS IN SHEAR

Steel failure without lever arm



A_s f_{uk}

It is cutting the steel element of the fastener with no damage to the concrete or total extension of the fastener due to the shear force. The most important factors that affect the fastener's steel strength are: the ultimate tensile strength of the steel and the fastener's cross-sectional area measured at the potential shear.

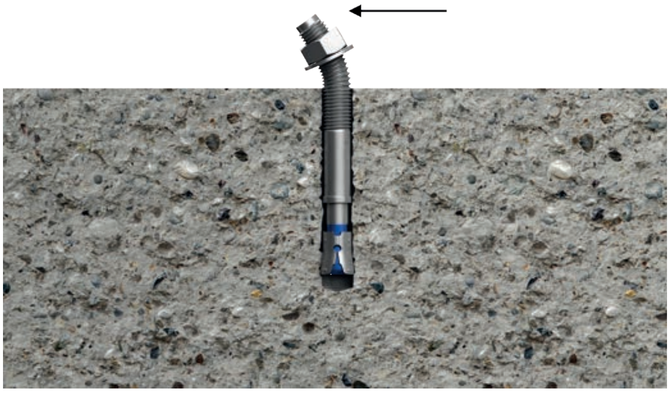
Failure mode	Single fastener	Group of fasteners	
		most loaded fasteners	group
Steel failure of fastener without lever arm	$V_{Ed} \leq V_{Rd,s} = \frac{V_{Rk,s}}{\gamma_{Ms}}$	$V^{h}_{Ed} \leq V_{Rd,s} = \frac{V_{Rk,s}}{\gamma_{Ms}}$	-

$$V^{0}_{Rk,s} = k_6 \cdot A_s \cdot f_{uk}$$

$$V_{Rk,s} = k_7 \cdot V^{0}_{Rk,s}$$

$V_{Rk,s}$	characteristic value of steel resistance of a fastener under shear load
k_7	factor taking into account the load effect in the anchor group and the ductile steel class
k_6	factor taking into account the steel tensile strength class
A_s	stressed cross section of a fastener
f_{uk}	nominal characteristic steel ultimate tensile strength

Steel failure with lever arm



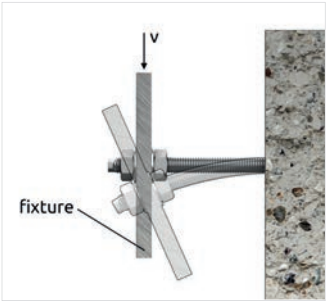
$M_{Rk,s}$ l_a

It is a deformation of the steel element of the fastener with no damage to the concrete or total extension of the fastener due to the shear force. The most important factors that affect the strength of the fastener steel are: the bending moment of the fastener and the length of the arm to the force.

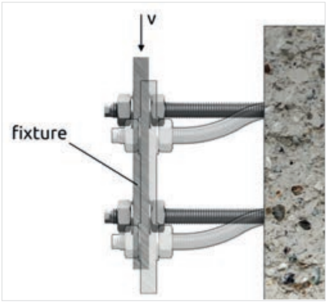
Failure mode	Single fastener	Group of fasteners	
		most loaded fasteners	group
Steel failure of fastener without lever arm	$V_{Ed} \leq V_{Rd,s,M} = \frac{V_{Rk,s,M}}{\gamma_{Ms}}$	$V^h_{Ed} \leq V_{Rd,s,M} = \frac{V_{Rk,s,M}}{\gamma_{Ms}}$	-

$$V_{Rk,s,M} = \frac{\alpha_M \cdot M_{Rk,s}}{l_a}$$

$V_{Rk,s,M}$ characteristic resistance in case of steel failure with lever arm under shear

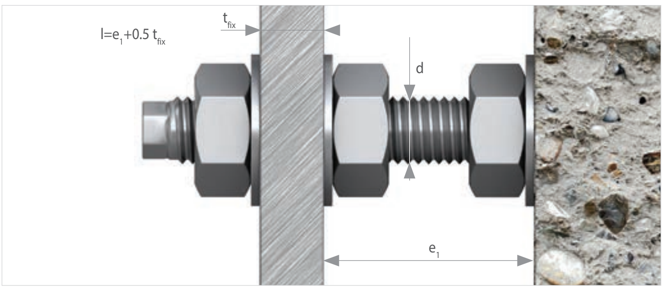


α_M = 1.0 when element (fixture) is not fixed and can rotate freely

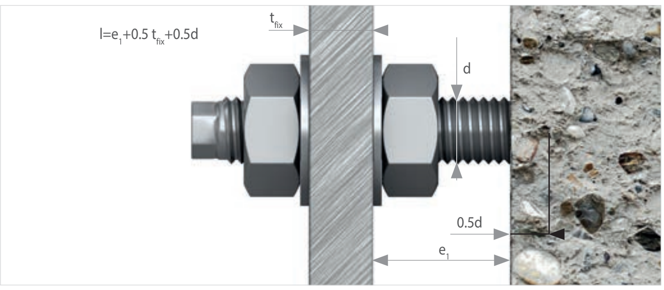


α_M = 2.0 when element (fixture) is fixed and cannot rotate

α_M factor accounting for the degree of restraint of the fastener at the side of the fixture of the application in question. It should be determined according to good engineering practice.



stand-off installation



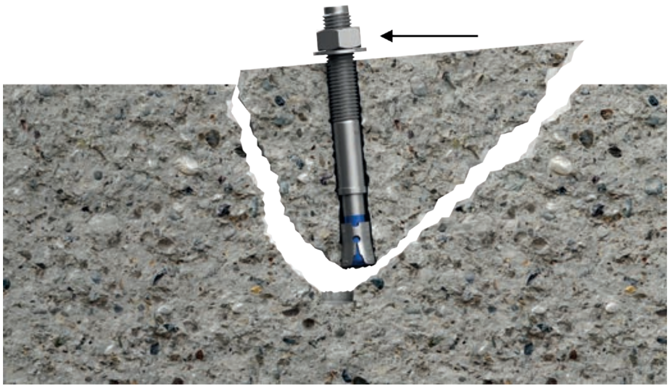
stand-off installation with nut and washer to prevent local concrete spalling

$l_a = a_3 + e_1$ length of the effective lever arm of the shear force

e_1 is the distance between shear load and concrete surface neglecting the thickness of any levelling grout

a_3 = 0,5 d_{nom}
= 0 if a washer and a nut are directly clamped to the concrete surface or to the surface of an anchor channel
or if a levelling grout layer with a compressive strength ≥ 30 N/mm2 and a thickness t grout ≤ d / 2 is present.

Concrete pry-out failure



$N_{Rk,c}$ $N_{Rk,p}$

It is concrete damage by breaking a piece of concrete in the shape of a half cone due to the shear force. The direct cause of damage is high stress in concrete resulting from shear forces on the fastener. The main factor affecting the load capacity of the fastener during pry-out is the load capacity of the concrete cone or load capacity of pull-out.

Failure mode	Single fastener	Group of fasteners	
		most loaded fasteners	group
Concrete pry-out failure	$V_{Ed} \leq V_{Rd,cp} = \frac{V_{Rk,cp}}{\gamma_{Ms}}$	-	$V^g_{Ed} \leq V_{Rd,cp} = \frac{V_{Rk,cp}}{\gamma_{Mc}}$

$$V_{Rk,cp} = k_8 \cdot N_{Rk,c}$$

$V_{Rk,cp}$ characteristic resistance in case of concrete pry-out failure under shear load

k_8 factor taking into account the fastener embedment depth

$N_{Rk,c} = N_{Rk,c}$	for mechanical anchors
$N_{Rk,c} = \min(N_{Rk,c};N_{Rk,p})$	for bonded anchors

Concrete edge failure

d_{nom} l_f c_1

It is concrete damage by tearing off the edge of the concrete due to the shear force. The direct cause of damage is high stress in concrete resulting from shear forces on the fastener. The main factors affecting the load capacity of the fastener in case of concrete edge failure are: the fastener diameter, the effective embedment length of anchor and the edge distance from the fastener.

Failure mode	Single fastener	Group of fasteners	
		most loaded fasteners	group
Concrete edge failure	$V_{Ed} \leq V_{Rd,c} = \frac{V_{Rk,c}}{\gamma_{Ms}}$	-	$V^g_{Ed} \leq V_{Rd,c} = \frac{V_{Rk,c}}{\gamma_{Ms}}$

$$V_{Rk,c} = V^0_{Rk,c} \cdot \frac{A_{c,V}}{A^0_{c,V}} \cdot \Psi_{s,V} \cdot \Psi_{h,V} \cdot \Psi_{ec,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{re,V}$$

$$V^0_{Rk,c} = k_9 \cdot d^{\alpha}_{nom} \cdot l^{\beta}_f \cdot \sqrt{f_{ck}} \cdot c_1^{1,5}$$

$$\alpha = 0,1\left(\frac{l_f}{c_1}\right)^{0,5} \qquad \beta = 0,1\left(\frac{d_{nom}}{c_1}\right)^{0,2}$$

$V_{Rk,c}$	characteristic resistance in case of concrete edge failure under shear load
k_9	factor taking into account the effect of the compressed and expanded concrete zone
f_{ck}	nominal characteristic compressive cylinder strength
d_{nom}	outside diameter of a fastener
l_f	effective embedment length of fastener
c_1	edge distance from the fastener
$A_{c,V}/A^0_{c,V}$	reduction factor, taking into account the real surface area of the anchor's impact in the substrate in the case of a group of fasteners or the presence of concrete edges within the range of the fastener's impact.
$\Psi_{s,V}, \Psi_{h,V}, \Psi_{ec,V}, \Psi_{\alpha,V}, \Psi_{re,V}$	reduction factors taking into account the impact of: edge distance; thickness of concrete member; asymmetrical distribution of forces in the base plate; no perpendicular application of shear force to the concrete edge; reinforcement located on the edge.

COMBINED TENSION AND SHEAR LOADS

Failure mode		Verification	
		Fastenings without supplementary reinforcement	Fastenings with supplementary reinforcement
1	Steel failure of fastener[a]	$\left(\frac{N_{Ed}}{N_{Rd,s}}\right)^2 + \left(\frac{V_{Ed}}{V_{Rd,s}}\right)^2 \leq 1$ and $N_{Ed}/N_{Rd,s} \leq 1$ and $V_{Ed}/V_{Rd,s} \leq 1$	
2	Failute modes other than steel failure	$\left(\frac{N_{Ed}}{N_{Rd,i}}\right)^{1,5} + \left(\frac{V_{Ed}}{V_{Rd,i}}\right)^{1,5} \leq 1$ or $\left(\frac{N_{Ed}}{N_{Rd,i}}\right) + \left(\frac{V_{Ed}}{V_{Rd,i}}\right) \leq 1,2$ and $N_{Ed}/N_{Rd,i} \leq 1$ and $V_{Ed}/V_{Rd,i} \leq 1$	$\left(\frac{N_{Ed}}{N_{Rd,i}}\right)^{1,5} + \left(\frac{V_{Ed}}{V_{Rd,i}}\right)^{1,5} \leq 1$ and $N_{Ed}/N_{Rd,i} \leq 1$ and $V_{Ed}/V_{Rd,i} \leq 1$

[a] This verification is not required in case of shear load with lever arm

FIRE DESIGN

The design method covers fasteners with a fire exposure from one side only. For fire exposure from more than one side, the design method may be used only, if the edge distance of the fastener is both, c ≥ 300 mm and $c \geq 2h_{ef}$.

If characteristic resistances under fire exposure are not available in a European Technical Product Specification the conservative values given below may be used.

REQUIRED VERIFICATION FOR FASTENERS IN TENSION

Steel failure

The characteristic tension strength $\sigma_{Rk,s,fi}$ of a fastener in case of steel failure under fire exposure given in the following Tables D.1 and D.2 is valid for the unprotected steel part of the fastener outside the concrete and may be used in the design. The characteristic resistance $N_{Rk,s,fi}$ is obtained as:

$$N_{Rk,s,fi} = A_s \cdot \sigma_{Rk,s,fi}$$

Fastener bolt/thread diameter	Embedment depth h_{ef} [mm]	**Characteristic tension strength $\sigma_{Rk,s,fi}$ [N/mm2]** of an unprotected fastener made of carbon steel according to the EN 10025 series in case of fire exposure			
		30 min (R15 to R30)	60 min (R45 to R60)	90 min (R90)	120 min (≤ R120)
Ø6	≥ 30	10	9	7	5
Ø8	≥ 30	10	9	7	5
Ø10	≥ 40	15	13	10	8
Ø12 and greater	≥ 50	20	15	13	10

Table D.1 - Characteristic tension strength of a carbon steel fastener under fire exposure

Fastener bolt/thread diameter	Embedment depth h_{ef} [mm]	**Characteristic tension strength $\sigma_{Rk,s,fi}$ [N/mm2]** of an unprotected fastener made of stainless steel of at least steel grade A4 according to the EN ISO 3506 series in case of fire exposure			
		30 min (R15 to R30)	60 min (R45 to R60)	90 min (R90)	120 min (≤ R120)
Ø6	≥ 30	10	9	7	5
Ø8	≥ 30	20	16	12	10
Ø10	≥ 40	25	20	16	14
Ø12 and greater	≥ 50	30	25	20	16

Table D.2 - Characteristic tension strength of a stainless steel fastener under fire exposure

Concrete cone failure

The characteristic resistance of a single fastener not influenced by neighbouring fasteners (anchors) or concrete edges installed in concrete strength classes C20/25 to C50/60 may be obtained according to:

$N^0_{Rc,c,fi(90)} = \frac{h_{ef}}{200} \cdot N^0_{Rk,c} \leq N^0_{Rk,c}$	for fire exposure up to 90 min
$N^0_{Rc,c,fi(120)} = 08 \frac{h_{ef}}{200} \cdot N^0_{Rk,c} \leq N^0_{Rk,c}$	for fire exposure between 90 min and 120 min

h_{ef} is the effective embedment depth

$N^0_{Rk,c}$ is the characteristic resistance of a single fastener in cracked concrete C20/25 under ambient temperature according to static loads.
The characteristic spacing $s_{cr,N}$ and edge distance $c_{cr,N}$ should be taken as follows: $s_{cr,N} = 2\ c_{cr,N} = 4\ h_{ef}$ (headed and post-installed fasteners)

Pull-out failure

The characteristic resistance of headed and post-installed mechanical fasteners installed in concrete classes C20/25 to C50/60 may be obtained from:

$N_{Rk,p,fi(90)} = 0{,}25 \cdot N_{Rk,p}$	for fire exposure up to 90 minutes
$N_{Rk,p,fi(120)} = 0{,}20 \cdot N_{Rk,p}$	for fire exposure between 90 minutes and 120 minutes

$N_{Rk,p}$ is the characteristic resistance for pull-out failure given in the relevant European Technical Product Specification in cracked concrete C20/25 under ambient temperature

Splitting failure

The assessment of concrete splitting failure due to fire exposure is not required because the splitting forces are assumed to be taken up by the reinforcement.

REQUIRED VERIFICATION FOR FASTENERS IN SHEAR

Steel failure without lever arm

For the characteristic shear strength $\tau_{Rk,s,fi}$ of a fastener in the case of shear load without lever arm and steel failure under fire exposure the values given in Tables D.1 and D.2 for the characteristic tension strength may be used ($\tau_{Rk,s,fi} = \sigma_{Rk,s,fi}$). These values apply for the unprotected steel part of the fastener outside the concrete and may be used in the design. The characteristic resistance VRk,s,fi is obtained as follows:

$$V_{Rk,s,fi} = A_s \cdot \sigma_{Rk,s,fi}$$

NOTE
Limited numbers of tests have indicated, that the ratio of shear strength to tensile strength increases under fire conditions above that for normal ambient temperature design. Here it is assumed that this ratio is equal to 1,0. This is a discrepancy to the behaviour in the cold state where the ratio is smaller than 1.

Steel failure with lever arm

The characteristic shear resistance of a single fastener in case of shear load with lever arm under fire exposure, M0Rk,s,fi should be obtained from Formula

$$M_{Rk,s,fi} = 1{,}2 \cdot W_{el} \cdot \sigma_{Rk,s,fi}$$

Concrete pry-out failure

The characteristic resistance in case of fasteners installed in concrete classes C20/25 to C50/60 should be obtained using Formula:

$V_{Rk,cp,fi(90)} = k_8 \cdot N_{Rk,c,fi(90)}$	for fire exposure up to 90 minutes
$V_{Rk,cp,fi(120)} = k_8 \cdot N_{Rk,c,fi(120)}$	for fire exposure between 90 minutes and 120 minutes

k_8 is the factor to be taken from the relevant European Technical Product Specification (ambient temperature)

Concrete edge failure

The characteristic resistance of a single fastener installed in concrete classes C20/25 to C50/60 should be obtained using Formula:

$V_{Rk,c,fi(90)} = 0{,}25 \cdot V^0_{Rk,c}$	for fire exposure up to 90 minutes
$V_{Rk,c,fi(120)} = 0{,}20 \cdot V^0_{Rk,c}$	for fire exposure between 90 minutes and 120 minutes

$V_{0Rk,c}$ is the initial value of the characteristic resistance of a single fastener in cracked concreteC20/25 under normal ambient temperature.

REQUIRED VERIFICATION FOR FASTENERS IN TENSION

	Failure mode	Verification
1	Steel failure of fastener[a]	$\left(\frac{N_{Ed}}{N_{Rd,s}}\right)^2 + \left(\frac{V_{Ed}}{V_{Rd,s}}\right)^2 \leq 1$ and $N_{Ed}/N_{Rd,s} \leq 1$ and $V_{Ed}/V_{Rd,s} \leq 1$
2	Failute modes other than steel failure	$\left(\frac{N_{Ed}}{N_{Rd,i}}\right)^{1,5} + \left(\frac{V_{Ed}}{V_{Rd,i}}\right)^{1,5} \leq 1$ or $\left(\frac{N_{Ed}}{N_{Rd,i}}\right) + \left(\frac{V_{Ed}}{V_{Rd,i}}\right) \leq 1{,}2$ and $N_{Ed}/N_{Rd,i} \leq 1$ and $V_{Ed}/V_{Rd,i} \leq 1$

[a] This verification is not required in case of shear load with lever arm

SEISMIC DESIGN

When it is appropriate to consider dynamic actions as quasi-static, the dynamic parts may be considered either by including them in the static values or by applying equivalent dynamic amplification factors to the static actions.

The seismic performance of fasteners subjected to seismic loading is categorized by performance categories C1 and C2. Performance category C1 provides fastener capacities only in terms of resistances at ultimate limit state, while performance category C2 provides fastener capacities in terms of both resistances at ultimate limit state and displacements at damage limitation state and ultimate limit state. The requirements for category C2 are more stringent compared to those for category C1. The performance category valid for a fastener is given in the corresponding European Technical Product Specification.

Table C.1 relates the seismic performance categories C1 and C2 to the seismicity level and building importance class. The level of seismicity is defined as a function of the product ag ·S , where ag is the design ground acceleration on Type A ground and S the soil factor both in accordance with EN 1998-1.

Seismicity level[a]		Importance Class acc. to EN 1998–1:2004, 4.2.5			
Class	$a_g \cdot S$[c]	I	II	III	IV
Very Low[b]	$a_g \cdot S \leq 0{,}05g$	No seismic performance category required			
Low[b]	$0{,}05g \leq a_g \cdot S \leq 0{,}1g$	C1	C1[d] or C2[e]		C2
> low	$a_g \cdot S > 0{,}1g$	C1	C2		

Table C.1 Recommended seismic performance categories for fasteners

[a] The values defining the seismicity levels are subject to a National Annex. The recommended values are given here.

[b] Definition according to EN 1998–1:2004, 3.2.1.

[c] a_g = design ground acceleration on type A ground (see EN 1998–1:2004, 3.2.1),

S = soil factor (see EN 1998–1:2004, 3.2.2).

[d] C1 for fixing non-structural elements to structures (Type ‚B' connections).

[e] C2 for fixing structural elements to structures (Type ‚A' connections).

NOTE
The recommended seismic performance categories are given in Table C.1. The value of ag or that of the product ag ·S used in a Country to define threshold values for the seismicity classes may be found in its National Annex of EN 1998–1. Furthermore the assignment of the seismic performance categories C1 and C2 to the seismicity level and building importance classes in a Country may be found in its National Annex to this EN.

Importance class	Buildings
I	Buildings of minor importance for public safety, e.g. agricultural buildings, etc.
II	Ordinary buildings, not belonging in the other categories.
III	Buildings whose seismic resistance is of importance in view of the consequences associated with a collapse, e.g. schools, assembly halls, cultural institutions etc.
IV	Buildings whose integrity during earthquakes is of vital importance for civil protection, e.g. hospitals, fire stations, power plants, etc.

Table 4.3 Importance classes for buildings

In the design of fastenings one of the following options a1), a2) or b) shall be satisfied.

a) Design without requirements on the ductility of the fasteners. It shall be assumed that fasteners are non-dissipative elements and they are not able to dissipate energy by means of ductile hysteretic behaviour and that they do not contribute to the overall ductile behaviour of the structure.

a1) Capacity design: The fastener or group of fasteners is designed for the maximum tension and/or shear load that can be transmitted to the fastening based on either the development of a ductile yield mechanism in the fixture or the attached element taking into account strain hardening and material over-strength or the capacity of a non-yielding attached element.

a2) Elastic design: The fastening is designed for the maximum load obtained from the design load combinations that include seismic actions EEd corresponding to the ultimate limit state (see EN 1998-1) assuming elastic behaviour of the fastening and the structure. Furthermore, uncertainties in the model to derive seismic actions on the fastening shall be taken into account.

b) Design with requirements on the ductility of the fasteners:

This option is applicable only for the tension component of the load acting on the fastener.

The fastener or group of fasteners is designed for the design actions including the seismic actions EEd corresponding to the ultimate limit state (see EN 1998-1). The tension steel capacity of the fastening shall be smaller than the tension capacity governed by concrete related failure modes. Sufficient elongation capacity of the fasteners is required.

The fasteners should not be accounted for energy dissipation in the global structural analysis or in the analysis of a non-structural element. The contribution of the fastening to the energy dissipation capacity of the structure (see EN 1998-1:2004, 4.2.2) is not addressed within this standard.

Option b) should not be used for the fastening of primary seismic members (see EN 1998-1) due to the possible large non-recoverable displacements of the fastener that may be expected. Unless shear loads acting on the fastening are resisted by additional means, additional fasteners should be provided and designed in accordance with option a1) or a2).

REQUIRED VERIFICATION FOR FASTENERS

Generally the seismic design resistance of a fastening is given by:

$$N_{Ed} \leq N_{Rd,eq} = \frac{N_{Rk,eq}}{\gamma_{M,eq}}$$

$\gamma_{M,eq}$ — the recommended values for the partial factors for fastenings under seismic loading are identical to the corresponding values for quasi static loading.

$N_{Rk,eq}$ — the characteristic seismic resistance of a fastening

$$N_{Rk,eq} = \alpha_{gap} \cdot \alpha_{eq} \cdot N^0_{Rk,eq}$$

α_{gap} — is the reduction factor to take into account inertia effects due to an annular gap between fastener and fixture in case of shear loading, given in the relevant European Technical Product Specification

α_{eq} — is the factor to take into account the influence of seismic actions and associated cracking on
a) concrete cone resistance and bond strength of supplementary reinforcement, and
b) resistance of groups due to uneven load transfer to the individual fasteners in a group

$N^0_{Rk,eq}$ — is the basic characteristic seismic resistance for a given failure mode.
For steel and pull-out failure under tension load and steel failure under shear load N0Rk,eq shall be taken from the relevant European Technical Product Specification (i.e. $N_{Rk,s,eq}$, $N_{Rk,p,eq}$, $V_{Rk,s,eq}$).

Loading	Failure mode	Single fastener [a]	Fastener group
tension	Steel failure	1,0	1,0
	Concrete cone failure - Headed fastener and undercut fasteners with k1 – factor same as headed fastener - all other fasteners	1,0 0,85	0,85 0,75
	Pull-out failure	1,0	0,85
	Combined pull-out and concrete failure (bonded fastener)	1,0	0,85
shear	Concrete splitting failure	1,0	0,85
	Steel failure	1,0	0,85
	Concrete pry-out failure - Headed fastener and undercut fasteners with k1 – factor same as headed fastener - all other fasteners	1,0 0,85	0,85 0,75
	Concrete edge failure	1,0	0,85

[a] This also applies where only one fastener in a group is subjected to tension load.

Table C.3 Reduction factor αeq

COMBINED TENSION AND SHEAR LOADS

	Failure mode	Verification
1	Steel failure of fastener[a]	$\left(\frac{N_{Ed}}{N_{Rd,s,eq}}\right) + \left(\frac{V_{Ed}}{V_{Rd,s,eq}}\right) \leq 1$ and $N_{Ed}/N_{Rd,s,eq} \leq 1$ and $V_{Ed}/V_{Rd,s,eq} \leq 1$
2	Failute modes other than steel failure	$\left(\frac{N_{Ed}}{N_{Rd,i,eq}}\right)^{k_{15}} + \left(\frac{V_{Ed}}{V_{Rd,i,eq}}\right)^{k_{15}} \leq 1$ and $N_{Ed}/N_{Rd,i,eq} \leq 1$ and $V_{Ed}/V_{Rd,i,eq} \leq 1$

a This verification is not required in case of shear load with lever arm

k_{15} = 2/3 for fastenings with a supplementary reinforcement to take up tension or shear loads only = 1 in all other cases

BASICS OF ANCHORING - MATERIALS

THE BASE MATERIAL/SUBSTRATE

Consideration of the base material (and its associated properties) is critical in the selection of an anchor or connector technology. It is therefore important to correctly define the material in order to ensure correct anchor installation without substrate damage, as well as safe and reliable subsequent performance under load.


concrete

Concrete
Concrete, in its standard form, is a compound of cement, aggregates and water. It usually possesses high compressive strength, while tensile strength is comparatively low.


cracked concrete

Lightweight concrete is another derivative, in which case heavy aggregate is replaced by light additives like pumice, slag or Styrofoam. Due to the lower compressive strength of these materials, lightweight concrete shows lower strength parameters in general when compared to plain concrete.

This document presents anchor performance data for the following concrete grades: C20/25, C30/37, C40/50 and C50/60 (according to ENV 206 standard). In this format, the values before and after the oblique signify characteristic compressive strengths measured for cylinders (150mm diameter, 300mm height) and cubes (150mm edge), respectively. The table below lists concrete compressive strengths traditionally applied in different countries.

As a measure to increase the low tensile strength of concrete, steel reinforcing elements (bars, mesh, etc.) may be cast into the concrete member. Their function is to withstand tensile loads within the structure, which may otherwise lead to extensive crack formation within the tensile zone. Reinforcement does not guarantee elimination of cracking in this so-called crack zone. It does, however, limit the size of cracks significantly, ultimately leading to an admissable crack size of no greater than 0.3 mm. Cracks usually assume a wedge form, terminating in the region of the neutral axis within the concrete structure cross-section.

Products approved for use in cracked concrete
R-HPTII-A4, R-HPTII-ZF, R-SPLII, R-DCA, R-DCL, R-RBL, R-RBP, R-KER, R-KEX II

Grade CE	Characteristic compressive strength F_{ck} (cylinder)	Characteristic compressive strength F_{ck} (cube)	Great Britain	Germany	France	Poland
			Mean compressive strength, tested (150mm cube)	Mean compressive strength, tested (200mm cube)	Mean resistance, tested (cylinder 16×32cm)	PN-B-03264:2002
C12/15	12	15	20	19	17	B15
C16/20	16	20	25	24	21	B20
C20/25	20	25	30	29	25	B25
C25/30	25	30	35	33	30	B30
C30/37	30	37	42	40	35	B37
C35/45	35	45	50	48	40	B45
C40/50	40	50	55	54	45	B50
C45/55	45	55	60	57	50	B55
C50/60	50	60	65	62	55	B60

MASONRY

Masonry walls are multi-layer substrates consisting of blocks of heterogeneous material, built in to the desired structure using mortar.

The compressive strength of the block material is usually higher than that of the mortar. Thus the connectors should, as a rule, be installed within the body of the block.

Blocks may take several forms:

» Solid blocks with compact structure. Blocks of various dimensions, without internal cavities, made from ceramic (ceramic or clinker bricks) or sand-lime (silica) materials. These possess relatively high compressive strength.

» Hollow blocks with compact structure. Blocks of various dimensions and shapes, with several internal cavities. Blocks possess reasonably low compressive strength, despite being made from relatively high compressive strength materials (ceramic or silica).

» Solid blocks with porous structure. Blocks of various dimensions, without internal cavities but with high concentrations of pores or inclusions of other materials. Examples include aerated concrete or solid blocks of lightweight concrete. Materials of this category possess low compressive strengths.

» Hollow blocks with porous structure. Similarly to solid porous blocks these elements have low compressive strength, weakened further by internal cavities. In most cases these blocks are made from lightweight concrete.

Products with Approval for masonry and hollow walls:
R-KEM II and RM50


solid brick (ceramic or silica)


lightweight concrete


hollow brick


hollow block

BASICS OF ANCHORING - MATERIALS

ANCHOR MATERIAL

Steel
Durability characteristics of screws and bolts are determined by appropriate mechanical property classes from 3.6 to 12.9.
This classification system consists of two numbers separated with a dot, e.g.

5.6
The first number corresponds to the value of 0.01 R_m of the finished part in MPa. The second number determines the value of 0.1 of R_e/R_m percentage ratio, as follows:

$$R_m = 500\ \text{MPa} \ \ | \ \ R_e/R_m = 60\% \ \ | \ \ R_e = 300\ \text{MPa}$$

The strength classes of nuts are marked 4, 5, 6, 7, 8, 10 & 12 which corresponds with the value of 0.01 of R_m of nut steel in MPa.

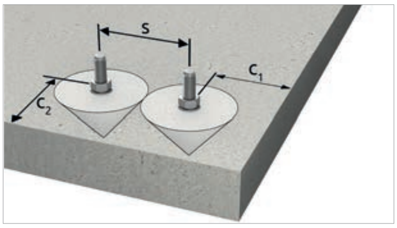
Nut classes shall correspond to screw or bolt classes; therefore, for class 5.6 screws or bolts, class 5 (or greater) nuts shall be used.

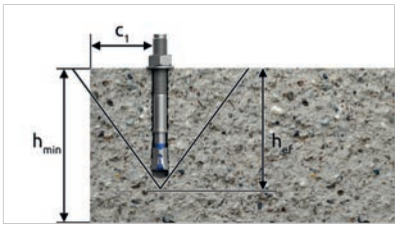
ANCHOR SPACING AND EDGE DISTANCES

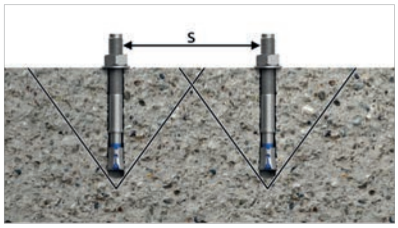
Due to the expansion forces induced by the functioning of anchorage connections, the following parameters shall be taken into account while determining load bearing capacity for a particular product:

» thickness of base material (determined by fixing's effective embedment depth h_{ef})
» spacing of anchored joints (s)
» distance of connections from the edge (c_1, c_2) and corners (c_3) of the base material.

Overlapping of tension cones of neighbouring anchorages in concrete reduces the load bearing capacity of such fasteners.







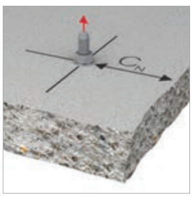
BASICS OF ANCHORING - SPACING & EDGE DISTANCES

Reduction of anchor spacing and edge distances
In some cases the anchor spacing and distance from edges and corners can be reduced. Such a reduction will impact the anchor's load bearing capacity and, in order to account for the impact, one or more reduction factors will have to be applied.

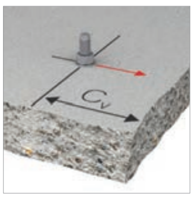
Effective embedment of fixing h_{ef}
For each connection the minimum fixing depth is determined, which ensures safe load resistance. Some types of anchors can be fixed at greater depth, which increases the load bearing capability (R-SPL, in particular). For more information, please contact RAWLPLUG® technical consultant.

Reduction factors related to the anchor spacing: fs

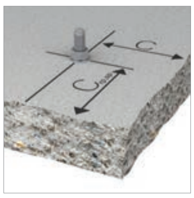
Reduction factor related to the distance c_N of the anchor from the edge, in cases where load is not being applied towards a free edge: fc_N



Reduction factor related to the distance c_V of the anchor from the edge, in cases where load is being applied towards a free edge: fc_V



Reduction factor related to the distance $c_{cr,sp}$ of the anchor from a corner: $fc_{cr,sp}$



In case of a group of anchors, it is necessary to consider the connection which is located in the most unfavourable place.

tensile

shear

REDUCED DESIGN RESISTANCE OF ANCHOR

$$F_{Rd,rec} = F_{Rd} \cdot fs \cdot fc_N \cdot fc_V$$

$$F_{Rd,red} \geq F_{Sd}$$

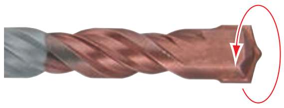
F_{Rd} – design resistance according to the technical data tables herein,
fs, fc_N, fc_V – reduction factors of axial spacing of anchors and distance to the edge of the base material.

BASICS OF ANCHORING - ANCHOR INSTALLATION

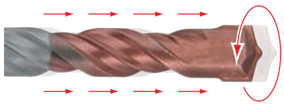
DRILLING

The method of drilling a hole for the installation of an anchor depends on the type of substrate material. There are drilling techniques:

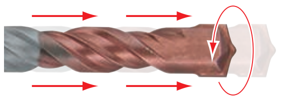
» rotary drilling – drilling by rotation and without percussion (or hammer action), recommended for drilling in materials of low mechanical strength such as bricks & aerated concrete due to the fact that it does not enlarge the hole, nor damage the structure of the material;



» percussive drilling – drilling by rotation with multiple light strikes with the drill bit into the substrate; recommended for drilling materials with high mechanical strength and solid structure such as concrete & solid brick;



» hammer drilling – drilling by rotation with a small number of high energy strikes with the drill bit into the substrate; recommended for drilling in extremely hard structures such as concrete;



A drill bit is a tool, which is subject to wear – its degree and frequency is a derivative of the hardness of the substrate material. The harder the substrate, the greater the wear of the drill bit. Be sure to monitor wear and replace the drill bit whenever necessary.

In the process of drilling a hole for embedding an anchor it is important to be aware of and achieve the correct diameter and depth of the hole.

After the drilling is finished it is essential to clear the hole of dust and drill debris. Failure to do this can be the cause of improper anchoring of the fastener in the substrate.

ANCHOR INSTALLATION METHODS

1. Push-through installation – convenient and time-efficient method, which allows user to drill and install directly through the fixture without marking out hole locations and pre-positioning anchors. If the fixture is pre-drilled then it may be used as a drilling template, before the anchors are installed directly through the clearance holes. RAWLPLUG® R-XPT, R-XPTII and R-HPTII throughbolt families are all examples of push-through fixings.

2. Pre-positioning installation – this method requires the installation of the anchors in the base material, before the fixture is moved into place. In this case the anchor diameter and the drill hole diameter are different. Our RAWLBOLT (R-RBP) and all bonded anchors are examples of products that require pre-positioning.

3. Stand-off installation – attachment of the fixture at an offset distance from the surface of the base material. One common offset application is the use of internally threaded anchors with long rods, studs or bolts. The anchor is installed in the base material before assembling with threaded rod or bolt. The RAWLPLUG® internally threaded wedge anchors - R-DCA, R-DCA-A4 & R-DCL - may be used for stand-off applications.

BASICS OF ANCHORING - TORQUE & BENDING MOMENTS

TIGHTENING TORQUE

When using expanding anchors, it is necessary to apply a required tightening torque of the magnitude given herein, in order to ensure optimal expansion and achieve the load-bearing capacities given in tables in the next chapter (we recommend using a calibrated torque wrench). Torque transmits to a pre-tensioning force, influencing the initial expansion of the anchor. Moreover, the tightening torque applied will clamp the fixed element to the base material.

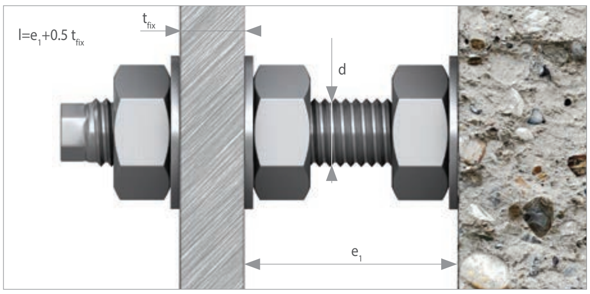
The values of tightening torque given in the specification and design guide should not be exceeded.

After initial application of the tightening torque, relaxation occurs causing a reduction in tension and therefore clamping force.

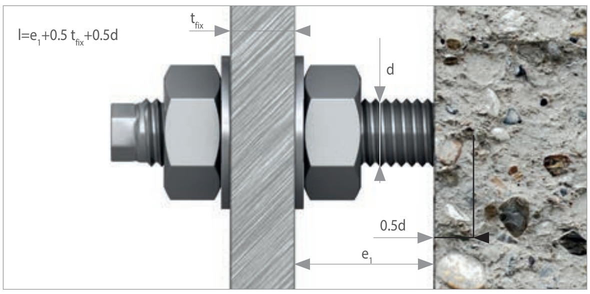
All data related to a load bearing capacity given in the present specification and design guide account for this torque relaxation behaviour.

BENDING MOMENT

In the case of some applications, anchored connections are subject to the influence of bending moments. Generally, this applies when fixed elements are offset from the base material. Applied load is, as a result, not purely in the shear direction - significant tension is also present. It is necessary to ensure the bending moment induced by such loads is not higher than allowable bending moment (given for each type and diameter of anchor).



with clamping to the base material



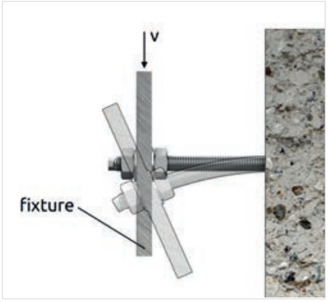
without clamping to the base material

$$M_V = V \times \frac{l}{\alpha_M} \text{ [Nm]}$$

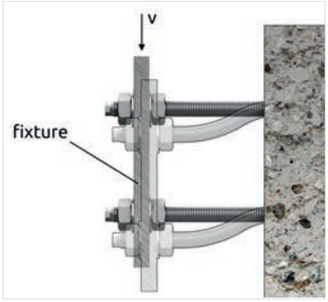
BASICS OF ANCHORING - TORQUE & BENDING MOMENTS

INSTALLATION OF ANCHORS

Installation guidelines are attached to all packaging for our anchors. We recommend strict adherence to all of the instructions contained therein. Debris and dust must always be removed from the hole before the anchor is installed in order to avoid risk of limiting the anchorage depth. Hole cleaning is particularly important for bonded anchors, because any debris or dust will decrease the load bearing capacity of the anchorage.



α_M = 1.0 when element (fixture) is not fixed and can rotate freely



α_M = 2.0 when element (fixture) is fixed and cannot rotate

BASICS OF ANCHORING - REBAR CONNECTIONS

POST-INSTALLED REBAR CONNECTIONS

Using chemical resin, rebar can be post-installed in concrete to act as structural reinforcement or, alternatively, to create an anchorage. The role depends on the application, installation type and also the feasibility of use of a specified resin.

RAWLPLUG® offer resin products that can provide a solution in both scenarios.

REBAR INSTALLED WITH CHEMICAL RESIN AS AN ANCHOR

In many applications rebar installed with chemical resin must be designed to act as an anchorage. This scenario may arise for a number of reasons: the rebar may not be carrying the full tensile load as it would in structural reinforcement (i.e. the concrete must resist an element of the tensile loading), there may be an absence of existing cast-in reinforcement (i.e. no overlap splice to take up tensile loads), or the rebar anchorage may be subject to shear loading.

The characteristic failure mode for this type of anchorage - similarly to chemical anchors using threaded rods - is concrete cone failure, or a combination of concrete cone failure and pull-out. It is therefore important to keep appropriate spacing and edge distances.

Embedment depths are generally smaller, compared with cases of rebar acting as structural reinforcement. They can, however, vary and for some types of RAWLPLUG® resins deeper embedments can be employed, facilitating higher performance.

Depending on the type of resin, various diameters of rebar and grades of steel can be applied.

REBAR INSTALLED WITH CHEMICAL RESIN AS STRUCTURAL REINFORCEMENT

Introduction

Both for new reinforced concrete construction requiring connection with an existing structure, and for the reinforcement, modernisation or upgrading of an existing structure, there can be a requirement to create permanent connections between new and existing construction elements. In these applications post-installed rebar connections are very useful. The aforementioned scenarios can arise when joining slabs, beams and columns, reinforcing nodes, walls and when building balconies and cantilevers.

Depending on the type of existing construction and its reinforcement, two different types of connections can be described - anchorage (Figure 1.1), and overlap splice with existing construction rebar (Figure 1.2)

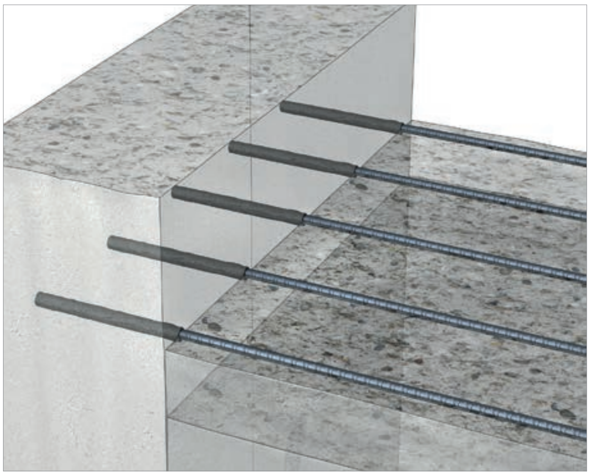


Figure 1.1: Anchorage

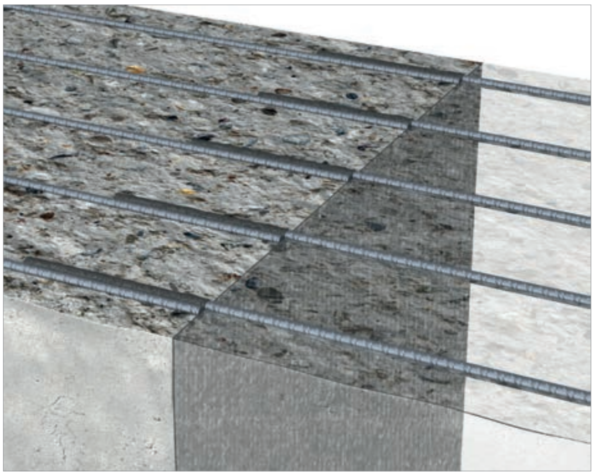


Figure 1.2: Overlap splice

BASICS OF ANCHORING - REBAR CONNECTIONS

Various applications (Figures 1-5) are covered by Technical Report TR 023 "Assessment of post-installed rebar connections", which, alongside European standard Eurocode 2 "Design of concrete structures" Part 1-1 "General rules and rules for buildings", is a fundamental document for the design and testing of these types of anchorages.

Examples of post-installed rebar applications

Figures 1-5 (below) show applications in which resins with rebar can be used successfully.

Figure 1
Overlap joint for rebar connections of slabs and beams

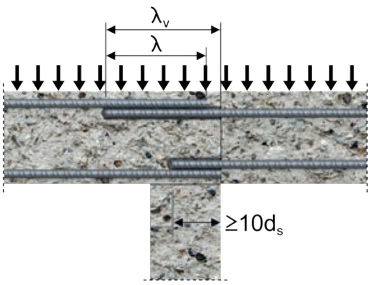


Figure 2
Overlap joint at a foundation of a column or wall where the rebars are stressed in tension

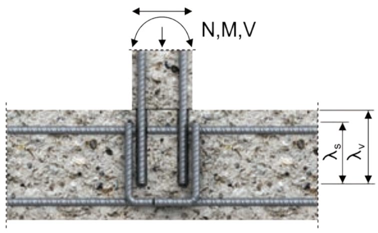


Figure 3
End anchoring of slabs or beams designed as simply supported

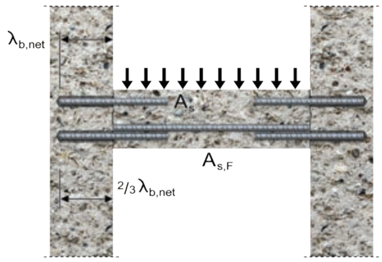


Figure 4
Rebar connection for components stressed primarily in compression. The rebars are stressed in compression

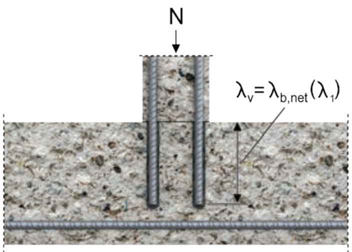
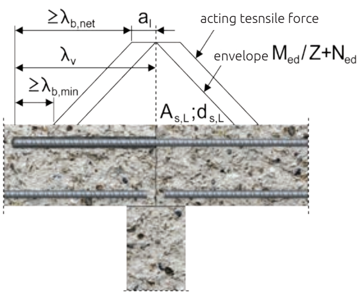


Figure 5
Anchoring of reinforcement to cover the line of acting tensile force.



Note to Figure 1-5
In the figures transverse reinforcement is not shown, however, the transverse reinforcement as required by EC2 shall be present.

The shear transfer between old and new concrete shall be designed according to EC2.

REBARS

Rebars are key elements of reinforced concrete constructions. Their role is to bear tension loads due to the fact that concrete possesses high compressive strength but very low tensile strength.

In the applications previously described, depending on construction type and implementation, rebars can form either an overlap splice effect, where new bars will extend the effect of existing rebar, or an anchorage.

In the case of post-installed rebar, loads are transferred into the concrete via the adhesion of the resin, which simultaneously dovetails with the ribs of the rebar (equivalent to the effect at the rebar-concrete interface in cast-in rebar solutions). The resin reacts like compressive struts at an angle of 45° in a strut-and-tie model.

Cooperation between bars in overlap splice is possible because of load transference between them based on a 45° truss model. Similarly to the above scenario, resin and concrete act as compressive struts.

One possible failure mode in the case of post-installed rebar is pull out failure, when resin wedges are sheared causing the rebar to act like a smooth bar (performance is determined only by friction and adhesion, as the dovetailing effect is eliminated). Another is concrete splitting failure caused by naturally occurring cracks, which run from the rebar ribs in the direction of the concrete surface. Consequently, it is important to ensure correct concrete cover and rebar spacing.

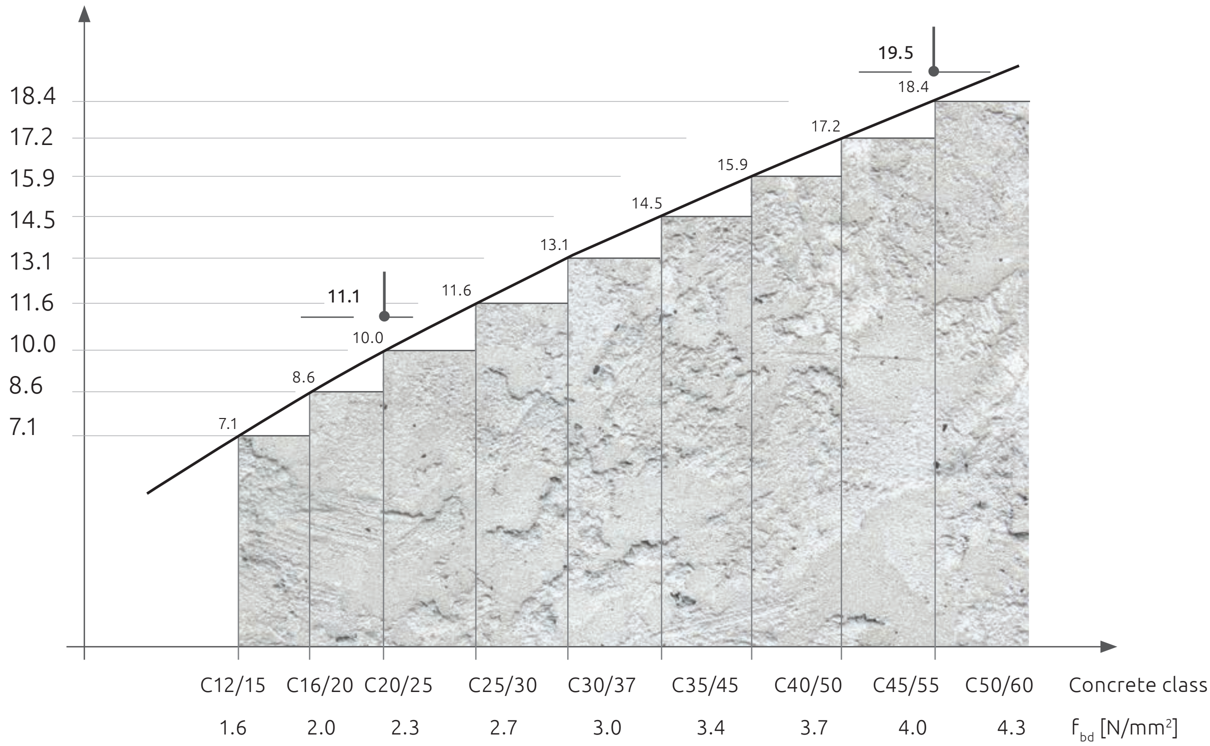
RESIN CHARACTERISTICS

Load bearing capacity is determined by adhesion forces at the rebar-resin and resin-concrete interfaces, as well as the strength characteristics of the steel elements used. Of subsequent importance is the resin bond strength, which should be equal to or greater in strength than the concrete. Accordingly, to permit the use of a given resin in the applications described previously, it needs to be tested according to TR 023 "Assessment of post-installed rebar connections" to obtain Technical Approval. TR 023 covers post-installed rebar connections designed in accordance with the EN standard Eurocode 2 "Design of concrete structures", Part 1-1 "General rules and rules for buildings", on the assumption that only tension loads can be transferred, shear loads are not considered and transverse reinforcement should be designed in addition, based on Eurocode 2. The base material is non-carbonated concrete of class C12/15 – C50/60. Post-installed rebar are straight reinforcing bar with properties according to Eurocode 2,

BASICS OF ANCHORING - REBAR CONNECTIONS

Annex C, with classes B and C recommended. The Technical Report does not cover fire resistance, fatigue, dynamic or seismic loading of post-installed rebar connection. Among others, tests include: tests for bond resistance in C20/25 and C50/60, installation safety tests in dry and wet concrete, functioning under sustained loads, functioning under freeze/thaw conditions, installation at maximum embedment depth, and correct injection. Proof is required that post-installed rebar connections function like cast-in rebar – with comparable load transference and displacement behaviour.

This is demonstrated by achieving appropriate bond resistance f_{bd}. **Figure 6**: Design according to EC2 without limitation compared with cast-in rebar bond strength. The necessary bond resistance for connections designed according to Eurocode 2 for different concrete classes is shown in Figure 6. For resins having a bond resistance smaller than that assumed, values based on testing and decreased according to levels from TR 023 should be included in the technical approval.



DESIGN OF ANCHORAGE AND SPLICE OVERLAP CONNECTIONS

Connections should be designed in accordance with obligatory rules for the design of reinforced concrete structures, taking into account the load distribution on the construction and its nodes. It is very important to determine and factor in the existing reinforcement layout.

Technical Approvals, obtained based on Technical Report TR 023, and Eurocode 2, Part 1-1 are the primary reference documents for determining internal load distribution in sections and for the design of these types of connections.

An approval contains bond resistance values depending on concrete class and rebar diameter, data for concrete cover, minimum and maximum embedment depth and lap splice, as well as general rules for rebar arrangement.

Meanwhile Eurocode 2 covers the design of reinforced concrete structures, facilitating determination of internal load distribution and calculation of embedment depth or overlap splice, taking into account factors such as: bond conditions, rebar shape, concrete cover and transverse reinforcement.

The first value calculated in the design process, according to Eurocode 2, is basic anchorage length:

$$l_{b,rqd} = \left(\frac{Ø}{4}\right) \cdot \left(\frac{\sigma_{sd}}{f_{bd}}\right)$$

where:
Ø – anchorage rebar diameter
σ_{sd} – design stress of the bar
f_{bd} – design value of the ultimate bond resistance according to corresponding ETA

BASICS OF ANCHORING - REBAR CONNECTIONS

DESIGN ANCHORAGE LENGTH FOR ANCHORAGES

The next value to consider is the design anchorage length calculated as follows.

$$l_{bd} = \alpha_1\alpha_2\alpha_3\alpha_4\alpha_5 l_{b,rqd}$$

$\alpha_1 - \alpha_5$ – coefficients acc. to EC2, Tab. 8.2
α_1 – effect of the form of the bars assuming adequate cover (1.0 for straight bar in tension and in compression)
α_2 – effect of concrete minimum cover (acc. to EC2, Figure 8.3)

$$0.7 \leq \alpha_2 \leq 1.00$$

$$\alpha_2 = 1 - 0.15\,\frac{c_d - \varnothing}{\varnothing} \text{ – rebar in tension}$$

$$\alpha_2 = 1.0 \text{ – rebar in compression}$$

$$c_d = \min\{0.5a;\, c_1;\, c\} \text{ – for straight bars (acc. to EC2, Figure 8.3)}$$

α_3 – the effect of confinement by transverse reinforcement not welded to main reinforcement
α_3 = 1.0 when no transverse reinforcement or no influence

$$0.7 \leq \alpha_3 \leq 1.00$$

$$\alpha_3 = 1 - K \times \lambda \text{ – rebar in tension}$$

$$\alpha_3 = 1.0 \text{ – rebar in compression}$$

K – values for beams and slabs acc. to EC2, Figure 8.4

$$\lambda = \frac{\Sigma A_{st} - \Sigma A_{st,min}}{A_s}$$

ΣA_{st} – cross-sectional area of the transverse reinforcement along the design anchorage length l_{bd}
$\Sigma A_{st,\,min}$ – cross-sectional area of the minimum transverse reinforcement

A_s – area of a single anchored bar with maximum bar diameter
α_4 – influence of one or more welded transverse bars along the design anchorage length,
α_4 = 1.0 when no transverse reinforcement or no influence
α_5 – the effect of the pressure transverse to the plane of splitting along the design anchorage length

$$0.7 \leq \alpha_5 \leq 1.0$$

$$\alpha_5 = 1 - 0.04\,p \text{ (only rebar in tension)}$$

p – transverse pressure at ultimate limit state along l_{bd}

Product of $\alpha_2\alpha_3\alpha_5$ must fulfil: $\alpha_2\alpha_3\alpha_5 \geq 0.7$
Design anchorage length must be in the range between minimum and maximum anchorage length:

$$l_{b,min} \leq l_{bd} \leq l_{v,max}$$

$l_{b,min}$ – minimum anchorage length
$l_{b,min}$ = max {$0.3 l_{b,rqd}$; 10Ø ; 100 mm} – rebar in tension
$l_{b,min}$ = max {$0.6 l_{b,rqd}$; 10Ø ; 100 mm} – rebar in compression
$l_{v,max}$ = maximum embedment depth, from ETA

DESIGN EMBEDMENT LENGTH FOR OVERLAP SPLICE

$$l_0 = \alpha_1\alpha_2\alpha_3\alpha_5\alpha_6 l_{b,rqd}$$

$\alpha_1 - \alpha_5$ – as above
α_6 – influence of overlap splice relative to the total cross-section area

$$\alpha_6 = \sqrt{\frac{\rho_1}{25}} \quad 1.0 \leq \alpha_6 \leq 1.5$$

ρ_1 – percentage of reinforcement lapped within 0.65 l_0 from the centre of the lap length considered, acc. to EC2, Tab.8.3
Design lap splice length must be in the range between minimum and maximum lap splice length:

$$l_{0,min} \leq l_0 \leq l_{v,max} - c_1$$

$l_{0,min}$ – minimum lap splice length
$l_{0,min}$ = max {$0.3\alpha_6 l_{b,rqd}$; 15Ø ; 200 mm}
$l_{v,max}$ – maximum embedment depth, from ETA
c_1 – concrete cover at frontal concrete surface

Embedment depth for lap splice connections:

$$l_v \geq l_0 + c_1$$

» The clear distance between lapped bars should not be greater than 4ø, or else the lap length should be increased by a length equal to the difference between the clear space and 4ø

» Minimum concrete cover is stated in appropriate ETA, whilst minimum cover should also be kept acc. to EC2, chapter 4.4.1.2
» Transverse reinforcement should be designed acc. to EC2, chapter 8.7.4
» Connections between existing and new concrete should be designed according to EC2
» Minimum clear spacing between bars is kept according to ETA requirements

Connections between existing and new concrete
Connections between existing and new concrete should be designed according to EC2.

The surface of the joint should be prepared, for example roughened to expose aggregate. If the surface of the existing concrete is carbonated, the layer should be removed in the area of the new reinforcing bar prior to installation.

The above directions may be disregarded in cases where building components are new, not carbonated and the environment conforms to dry condition criteria.

Design process using RAWLPLUG® EasyFix software
The EasyFix program functions as a helpful tool in the design of post-installed rebar connections, both in cases of chemical anchorage and structural reinforcement. The program includes a Calculator for calculation and selection of anchors, a Resin Consumption Calculator for chemical resins and a Post-Installed Connection module for anchorage and lap splices, for use in both new and existing structures.

BASICS OF ANCHORING - DESIGN SOFTWARE

EasyFix

Rawlplug EasyFix is an innovative application allowing you to conduct design calculations required to plan fixings for diverse construction elements using Rawlplug branded products.

Individual program modules are dedicated to specific segments of construction works. Each of them enables real-time calculations and provides the user with virtually unlimited possibilities of matching fixings and elements to be fixed to what is actually needed at the given time.

There is more to that, since subject-specific modules contain default elements chosen by taking into consideration individual needs related to diverse applications typical to construction investments.

Rawlplug EasyFix is intended for different groups of professionals.

WHAT FOR?

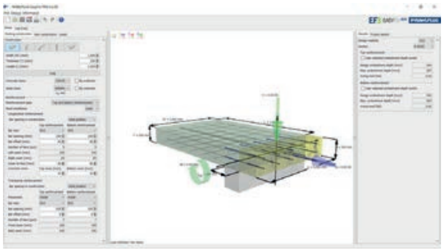
It enables you to create building designs using reliable fixings, regardless of the investment type and scale.

WHY?

Functionality and comfort are the two most straightforward words that summarise the advantages which the EasyFix application offers. It is good to know more about the key ones. Firstly, Individual EasyFix modules contain comprehensive information based on up-to-date guidelines intended for the given solution. Secondly, the program's interface is easy-to-use, transparent and very intuitive. Thirdly, what you receive is real-time display of results, meaning that on-screen results of the calculations you rely on are shown immediately after each modification of input data. Fourthly, the available set of both typical and highly specific filters allows you to find the optimum solution. Fifthly, the program's additional features enable optimisation of the elements to be fixed at an early stage of design work. And sixthly, the application enables you to pick items from an extensive database of BIM and CAD models and Technical drawings rendered available by the BIM Rawlplug software, which makes both programs fully complementary.

Calculations pertaining to specific aspects are conducted using modules dedicated to individual segments of construction works. Each offers specific features that enable quick, precise and highly useful calculations which take the nature of the given scope of works into consideration.

INCLUDING



CONCRETE MODULE

The available filters and optimisation functions provide you with an easy and quick solution to choose the appropriate type and size of fixings. The module also makes it possible to calculate the required slab thickness. Makes use of a wide range of possible arrangements of fixings on the element to be fixed.

Option to apply the proprietary REDM method (Rawlplug Engineering Design Method) based on many years of experience of Rawlplug's engineers as well as on European normative guidelines. This allows for designing of more complex anchor layouts.

Enter design loads and characteristic loads, including safety factors typical of the given region as well as seismic and fire conditions.

BALUSTRADE MODULE

Design features that rely on guidelines defined for the BASE PLATE module. Schematics matching the arrangements typically used when installing safety barriers.

Simplified model for entering load parameters. Support for the guidelines of the EN 1991-1-1 standard on the response to loads. Design fixings for concrete substrates.

REBAR MODULE

Make use of diverse combinations of elements of the existing and the new reinforcement available in default depending on the user's needs.

Define parameters of the existing reinforcement.

Calculate internal forces acting in cross-sections of the existing and the new rebars.

Apply the REDM method (Rawlplug Engineering Design Method) based on many years of experience of Rawlplug's engineers as well as on European normative guidelines.

This allows for designing of more complex anchor layouts.

Define loads per a single bar or an entire cross-section, or calculate maximum forces transferred by joints taking mechanical strength of steel into consideration.

Apply a wide range of existing steel and concrete grades or user-defined data.

Design chemical rebar anchoring in concrete substrates.

BASICS OF ANCHORING - TERMINOLOGY & SYMBOLS

The notations and symbols frequently used in catalogues are given below. Further notations are given in the text.

APPROVALS AND CERTIFICATES SYMBOLS	
	European Technical Approval / European Technical Assessment (ETA)
	CE marking (conformity with ETA or harmonised standard)
	Polish Construction Sign
	Resistance to fire exposure
	Factory Mutual Research Corporation (FM) approved
	Earthquake Resistant
INDICES	
c	Concrete
cp	Concrete pry-out
d	Design value
k	Characteristic value
M	Material
p	Pull-out
R	Resistance
s	Steel
S	Action
sp	Splitting
u	Ultimate
y	Yield
LOADS	
N	Normal force (positive: tension load, negative: compression load)
N_{Rk}	Characteristic value of resistance of a single anchor or an anchor group (tension load)
$N_{Rk,p}$	Characteristic resistance in case of failure by pull-out (tension load)
$N_{Rk,c}$	Characteristic resistance in case of concrete cone failure (tension load)
$N_{Rk,s}$	Characteristic resistance of an anchor in case of steel failure (tension load)
N_{Rd}	Design value of resistance of a single anchor or an anchor group (tension load)
$N_{Rd,p}$	Design resistance of an anchor in case of failure by pull-out (tension load)
$N_{Rd,c}$	Design resistance for an anchor or an group of anchors in the case of concrete cone failure (tension load)
$N_{Rd,s}$	Design resistance of an anchor in case of steel failure (tension load)
V	Shear force
V_{Rk}	Characteristic resistance of a single anchor or an anchor group (shear load)
$V_{Rk,c}$	Characteristic resistance in case of concrete edge failure (shear load)
$V_{Rk,cp}$	Characteristic resistance in case of failure by pry-out (shear load)
$V_{Rk,s}$	Characteristic resistance in case of steel failure (shear load)
V_{Rd}	Design resistance of a single anchor or an anchor group (shear load)

BASICS OF ANCHORING - TERMINOLOGY & SYMBOLS

$V_{Rd,c}$	Design resistance in case of concrete edge failure (shear load)
$V_{Rd,cp}$	Design resistance of an anchor in case of failure by pry-out (shear load)
$V_{Rd,s}$	Design resistance in case of steel failure (shear load)
SAFETY FACTORS	
γ_{Mc}	Partial safety factor for concrete cone failure
γ_{Ms}	Partial safety factor for steel failure
CONCRETE AND STEEL (MECHANICAL PROPERTIES)	
f_{yk}	Characteristic steel yield strength (nominal value)
f_{uk}	Characteristic steel ultimate tensile strength (nominal value)
A_s	Stressed cross-sectional area of steel
W_{el}	Elastic section modulus calculated from the stressed cross-sectional area of steel
$M^0_{Rk,s}$	Characteristic bending resistance of an individual anchor
M	Allowable bending moment
CHARACTERISTIC VALUES OF ANCHORS	
c	Edge distance
c_N	Edge distance (tensile resistance)
c_V	Edge distance (shear resistance)
c_{cr}	Edge distance for ensuring the transmission of the characteristic resistance
$c_{cr,N}$	Edge distance for ensuring the transmission of the characteristic tensile resistance of a single anchor without spacing and edge effects
$c_{cr,V}$	Edge distance for ensuring the transmission of the characteristic shear resistance of a single anchor without spacing and edge effects
c_{min}	Minimum allowable edge distance
d	Diameter of anchor bolt or thread diameter
d_f	Drill hole diameter in fixture
d_0	Drill hole diameter in substrate
h	Thickness of substrate
h_{min}	Minimum thickness of substrate
h_{ef}	Effective anchorage depth
h_{nom}	Embedment depth
h_0	Minimum drilled hole depth
k	Factor to be taken from the relevant ETA (pry-out failure)
L	Anchor length
s	Spacing of anchors in a group
s_{cr}	Spacing for ensuring the transmission of the characteristic resistance
s_{min}	Minimum allowable spacing
$s_{cr,N}$	Spacing for ensuring the transmission of the characteristic tensile resistance of a single anchor without spacing and edge effects
t_{fix}	Fixture thickness
T_{inst}	Installation torque

Bonded Anchors

R-KEX-II WITH THREADED RODS

Premium pure epoxy resin approved for use in cracked and non-cracked concrete

ETA ETA-13/0455 SEISMIC C1 VOC EMISSION TESTING

FEATURES AND BENEFITS

- Approved for use with threaded rods for use in cracked and non-cracked concrete (EAD 330499-00-0601)
- Suitable for use in dry and wet substrates including under water
- Very high chemical resistance – suitable for applications exposed to influence of various agents (industrial or marine environment)
- Minimal shrinkage provides the option to use in diamond drilled holes and over-sized holes.
- Extended bonding time ensures easy installation of metal components (up to 35 min in +20°C)
- For use in temperatures above 0°C
- Seismic category C1
- Diamond and hammer drilling
- Special mixer nozzle - allows for precise mixing of the product

APPLICATIONS

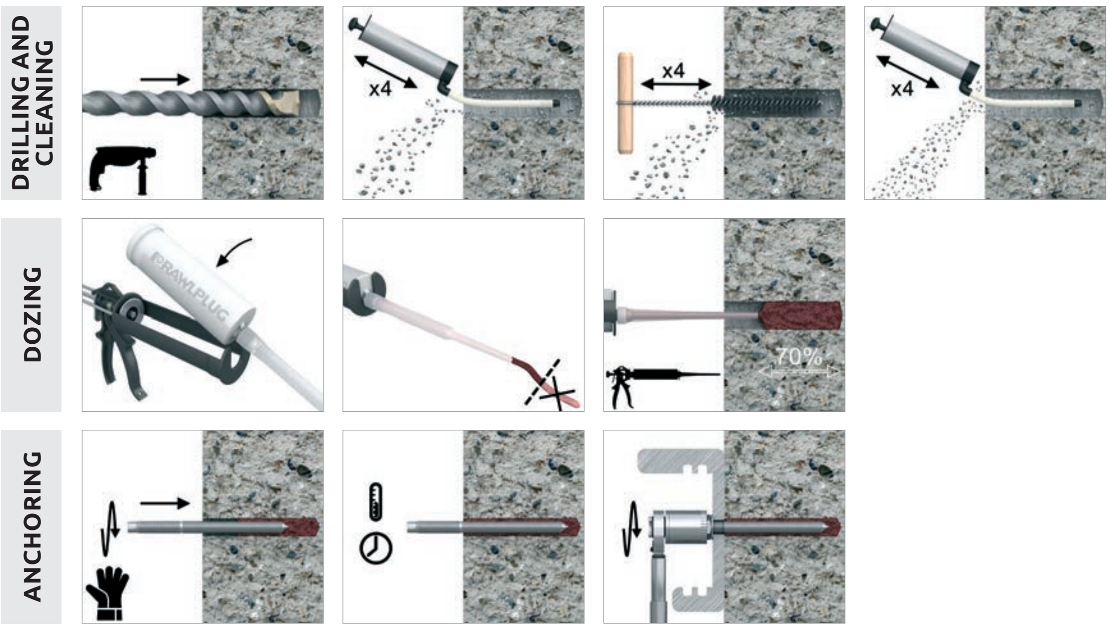
- Safety barriers
- Formworks support systems
- Structural steelwork
- Street lamps
- Curtain walling
- Racking systems
- Balustrading
- Barriers
- Cladding restraints
- Masonry support
- Machinery
- Platforms

BASE MATERIALS

Approved for use in:

- Cracked concrete C20/25-C50/60
- Non-cracked concrete C20/25-C50/60

INSTALLATION GUIDE



R-KEX-II WITH THREADED RODS

INSTALLATION GUIDE (cont.)

1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with brush and hand pump at least four times before installation.
3. Insert cartridge into gun and attach nozzle.
4. Dispense to waste until even colour is obtained.
5. Insert the mixer nozzle to the bottom of the drill hole and inject resin, slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
6. Immediately insert the stud, slowly and with slight twisting motion. Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.
7. Attach fixture and tighten the nut to the required torque.

PRODUCT INFORMATION

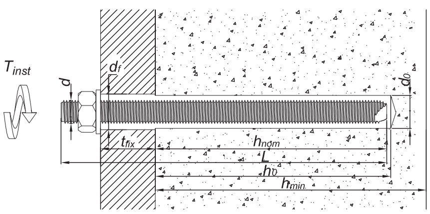
Product Code	Resin	Description / Resin Type	Volume [ml]
R-KEX-II-385	R-KEX II	Epoxy Resin	385
R-KEX-II-600			600

R-STUDS

Size	Product Code			Anchor		Fixture		
	Steel class 5.8	Steel class 8.8	Steel grade A4	Diameter	Length	Hole diameter	Max. thickness t_{fix} for:	
				d	L	d_f	$h_{nom, min}$	$h_{nom, max}$
				[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-STUDS-08110	R-STUDS-08110-88	R-STUDS-08110-A4	8	110	9	40	-
	R-STUDS-08160	-	R-STUDS-08160-A4	8	160	9	90	-
M10	R-STUDS-10130	R-STUDS-10130-88	R-STUDS-10130-A4	10	130	12	48	-
	R-STUDS-10170	-	R-STUDS-10170-A4	10	170	12	88	-
	R-STUDS-10190	-	R-STUDS-10190-A4	10	190	12	108	-
M12	R-STUDS-12160	R-STUDS-12160-88	R-STUDS-12160-A4	12	160	14	65	-
	R-STUDS-12190	-	R-STUDS-12190-A4	12	190	14	95	-
	R-STUDS-12220	-	R-STUDS-12220-A4	12	220	14	125	-
	R-STUDS-12260	-	R-STUDS-12260-A4	12	260	14	165	-
	R-STUDS-12300	-	R-STUDS-12300-A4	12	300	14	205	45
M16	R-STUDS-16190	R-STUDS-16190-88	R-STUDS-16190-A4	16	190	18	71	-
	R-STUDS-16220	R-STUDS-16220-88	R-STUDS-16220-A4	16	220	18	101	-
	R-STUDS-16260	-	R-STUDS-16260-A4	16	260	18	141	-
	R-STUDS-16300	-	R-STUDS-16300-A4	16	300	18	181	-
	R-STUDS-16380	-	R-STUDS-16380-A4	16	380	18	261	41
M20	R-STUDS-20260	R-STUDS-20260-88	R-STUDS-20260-A4	20	260	22	117	-
	R-STUDS-20300	-	R-STUDS-20300-A4	20	300	22	157	-
	R-STUDS-20350	-	R-STUDS-20350-A4	20	350	22	207	-
M24	R-STUDS-24300	R-STUDS-24300-88	R-STUDS-24300-A4	24	300	26	132	-
M30	R-STUDS-30380	R-STUDS-30380-88	R-STUDS-30380-A4	30	380	32	181	-

INSTALLATION DATA

R-STUDS



Size			M8	M10	M12	M16	M20	M24	M30
Thread diameter	d	[mm]	8	10	12	16	20	24	30
Hole diameter in substrate	d_0	[mm]	10	12	14	18	24	28	35
Hole diameter in fixture	d_f	[mm]	9	12	14	18	22	26	32
Min. hole depth in substrate	h_0	[mm]	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$
Min. substrate thickness	h_{min}	[mm]	$h_{nom} + 30 \geq 100$	$h_{nom} + 30 \geq 100$	$h_{nom} + 30 \geq 100$	$h_{nom} + 2d_0$	$h_{nom} + 2d_0$	$h_{nom} + 2d_0$	$h_{nom} + 2d_0$
Installation torque	T_{inst}	[Nm]	10	20	40	80	120	180	200
Min. spacing	s_{min}	[mm]	40	40	40	50	60	70	85
Min. edge distance	c_{min}	[mm]	40	40	40	50	60	70	85
MINIMUM EMBEDMENT DEPTH									
Min. installation depth	$h_{nom, min}$	[mm]	60	70	80	100	120	140	165
MAXIMUM EMBEDMENT DEPTH									
Min. installation depth	$h_{nom, max}$	[mm]	160	200	240	320	400	480	600

R-KEX-II WITH THREADED RODS

INSTALLATION DATA

Minimum working and curing time

Resin temperature	Concrete temperature	Curing time*	Working time
[°C]	[°C]	[min]	[min]
5	5	2880	150
10	10	1080	120
20	20	480	35
25	30	300	12

* For wet concrete the curing time must be doubled

MECHANICAL PROPERTIES

Size			M8	M10	M12	M16	M20	M24	M30
R-STUDS Metric Threaded Rods - Steel Class 5.8									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	500	500	500	500	500	500	500
Nominal yield strength - tension	f_{yk}	[N/mm²]	400	400	400	400	400	400	400
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	19	37	65	166	324	561	1124
Design bending resistance	M	[Nm]	15	30	52	133	259	449	899
Allowable bending resistance	M_{rec}	[Nm]	11	21	37	95	185	321	642
R-STUDS Metric Threaded Rods - Steel Class 8.8									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	800	800	800	800	800	800	800
Nominal yield strength - tension	f_{yk}	[N/mm²]	640	640	640	640	640	640	640
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519	898	1799
Design bending resistance	M	[Nm]	24	48	84	213	416	718	1439
Allowable bending resistance	M_{rec}	[Nm]	17	34	60	152	297	513	1028
R-STUDS Metric Threaded Rods - A4									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	700	700	700	700	700	700	700
Nominal yield strength - tension	f_{yk}	[N/mm²]	350	350	350	350	350	350	350
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	233	454	786	1574
Design bending resistance	M	[Nm]	17	34	59	149	291	504	1009
Allowable bending resistance	M_{rec}	[Nm]	12	24	42	107	208	360	721

BASIC PERFORMANCE DATA

R-STUDS

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M8	M10	M12	M16	M20	M24	M30	M8	M10	M12	M16	M20	M24	M30
Substrate		Non-cracked concrete							Cracked concrete						
MEAN ULTIMATE LOAD															
TENSION LOAD $N_{Ru,m}$															
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8															
Minimum embedment depth	[kN]	18.9	30.5	44.1	67.5	88.7	111.8	143.1	18.9	27.8	34.0	47.5	62.4	76.7	100.7
Maximum embedment depth	[kN]	18.9	30.5	44.1	81.9	128.1	184.8	294.0	18.9	30.5	44.1	81.9	128.1	184.8	294.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8															
Minimum embedment depth	[kN]	28.7	39.5	48.3	67.5	88.7	111.8	143.1	22.1	27.8	34.0	47.5	62.4	76.7	100.7
Maximum embedment depth	[kN]	30.5	48.3	70.4	132.3	205.8	296.1	471.1	30.5	48.3	70.4	132.3	205.8	196.1	471.5
R-STUDS METRIC THREADED RODS - A4															
Minimum embedment depth	[kN]	27.3	39.5	48.3	67.5	88.7	111.8	143.1	22.1	27.8	34.0	47.5	62.4	76.7	100.7
Maximum embedment depth	[kN]	27.3	43.1	62.0	115.5	179.6	259.4	412.7	27.3	43.1	62.0	115.5	179.6	259.4	412.7
SHEAR LOAD $V_{Ru,m}$															
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8															
Minimum embedment depth	[kN]	11.3	18.3	26.5	49.1	76.9	110.9	176.4	11.3	18.3	26.5	49.1	76.9	110.9	176.4
Maximum embedment depth	[kN]	11.3	18.3	26.5	49.1	76.9	110.9	176.4	11.3	18.3	26.5	49.1	76.9	110.9	176.4
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8															
Minimum embedment depth	[kN]	18.3	29.0	42.2	79.4	123.5	177.7	282.9	18.3	29.0	42.2	79.4	123.5	153.4	201.4
Maximum embedment depth	[kN]	18.3	29.0	42.2	79.4	123.5	177.7	282.9	18.3	29.0	42.2	79.4	123.5	177.7	282.9
R-STUDS METRIC THREADED RODS - A4															
Minimum embedment depth	[kN]	16.4	16.4	37.2	69.3	107.7	155.6	247.6	16.4	25.8	31.2	69.3	107.7	155.6	201.4
Maximum embedment depth	[kN]	16.4	16.4	37.2	69.3	107.7	155.6	247.6	16.4	25.8	31.2	69.3	107.7	155.6	247.6

R-KEX-II WITH THREADED RODS

BASIC PERFORMANCE DATA (cont.)

Size		M8	M10	M12	M16	M20	M24	M30	M8	M10	M12	M16	M20	M24	M30
CHARACTERISTIC LOAD															
TENSION LOAD N_{Rk}															
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8															
Minimum embedment depth	[kN]	18.0	29.0	36.1	50.5	66.4	83.7	107.0	12.1	17.6	21.1	35.2	47.3	59.6	76.3
Maximum embedment depth	[kN]	18.0	29.0	42.0	78.0	122.0	176.0	280.0	18.0	29.0	42.0	78.0	122.0	176.0	280.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8															
Minimum embedment depth	[kN]	23.5	29.6	36.1	50.5	66.4	83.7	107.0	12.1	17.6	21.1	35.2	47.3	59.6	76.3
Maximum embedment depth	[kN]	29.0	46.0	67.0	126.0	196.0	282.0	449.0	29.0	46.0	63.3	112.6	175.9	217.2	282.7
R-STUDS METRIC THREADED RODS - A4															
Minimum embedment depth	[kN]	23.5	29.6	36.1	50.5	66.4	83.7	107.0	12.1	17.6	21.1	35.2	47.3	59.6	76.3
Maximum embedment depth	[kN]	26.0	41.0	59.0	110.0	171.0	247.0	393.0	26.0	41.0	59.0	110.0	171.0	217.2	282.7
SHEAR LOAD V_{Rk}															
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8															
Minimum embedment depth	[kN]	9.00	14.0	21.0	39.0	61.0	88.0	140.0	9.00	14.0	21.0	39.0	61.0	88.0	140.0
Maximum embedment depth	[kN]	9.00	14.0	21.0	39.0	61.0	88.0	140.0	9.00	14.0	21.0	39.0	61.0	88.0	140.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8															
Minimum embedment depth	[kN]	15.0	23.0	34.0	63.0	98.0	141.0	214.1	15.0	23.0	34.0	63.0	94.7	119.3	152.6
Maximum embedment depth	[kN]	15.0	23.0	34.0	63.0	98.0	141.0	224.0	15.0	23.0	34.0	63.0	98.0	141.0	224.0
R-STUDS METRIC THREADED RODS - A4															
Minimum embedment depth	[kN]	13.0	20.0	29.0	55.0	86.0	124.0	196.0	13.0	20.0	29.0	55.0	86.0	119.3	152.6
Maximum embedment depth	[kN]	13.0	20.0	29.0	55.0	86.0	124.0	196.0	13.0	20.0	29.0	55.0	86.0	124.0	196.0
DESIGN LOAD															
TENSION LOAD N_{Rd}															
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8															
Minimum embedment depth	[kN]	12.0	19.3	24.1	33.7	44.3	55.8	71.4	8.04	11.7	14.1	23.5	31.6	39.8	50.9
Maximum embedment depth	[kN]	12.0	19.3	28.0	52.0	81.3	117.3	186.7	12.0	19.3	28.0	52.0	81.3	117.3	186.7
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8															
Minimum embedment depth	[kN]	15.7	19.7	24.1	33.7	44.3	55.8	71.4	8.04	11.7	14.1	23.5	31.6	39.8	50.9
Maximum embedment depth	[kN]	19.3	30.7	44.7	84.0	130.7	188.0	299.3	19.3	30.7	42.2	75.1	117.3	144.8	188.5
R-STUDS METRIC THREADED RODS - A4															
Minimum embedment depth	[kN]	13.9	19.7	24.1	33.7	44.3	55.8	71.4	8.04	11.7	14.1	23.5	31.6	39.8	50.9
Maximum embedment depth	[kN]	13.9	21.9	31.6	58.8	91.4	132.1	210.2	13.9	21.9	31.6	58.8	91.4	132.1	188.5
SHEAR LOAD V_{Rd}															
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8															
Minimum embedment depth	[kN]	7.20	11.2	16.8	31.2	48.8	70.4	112.0	7.20	11.2	16.8	31.2	48.8	70.4	101.7
Maximum embedment depth	[kN]	7.20	11.2	16.8	31.2	48.8	70.4	112.0	7.20	11.2	16.8	31.2	48.8	70.4	112.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8															
Minimum embedment depth	[kN]	12.0	18.4	27.2	50.4	78.4	111.5	142.7	12.0	18.4	27.2	46.9	63.1	79.5	101.7
Maximum embedment depth	[kN]	12.0	18.4	27.2	50.4	78.4	112.8	179.2	12.0	18.4	27.2	50.4	78.4	112.8	179.2
R-STUDS METRIC THREADED RODS - A4															
Minimum embedment depth	[kN]	8.33	12.8	18.6	35.3	55.1	79.5	125.6	8.33	12.8	18.6	35.3	55.1	79.5	101.7
Maximum embedment depth	[kN]	8.33	12.8	18.6	35.3	55.1	79.5	125.6	8.33	12.8	18.6	35.3	55.1	79.5	125.6
RECOMMENDED LOAD															
TENSION LOAD N_{rec}															
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8															
Minimum embedment depth	[kN]	8.57	13.8	17.2	24.1	31.6	39.8	51.0	5.74	8.38	10.1	16.8	22.5	28.4	36.3
Maximum embedment depth	[kN]	8.57	13.8	20.0	37.1	58.1	83.8	133.3	8.57	13.8	20.0	37.1	58.1	83.8	133.3
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8															
Minimum embedment depth	[kN]	11.2	14.1	17.2	24.1	31.6	39.8	51.0	5.74	8.38	10.1	16.8	22.5	28.4	36.3
Maximum embedment depth	[kN]	13.8	21.9	31.9	60.0	93.3	134.3	213.8	13.8	21.9	30.2	55.6	83.8	103.4	134.6
R-STUDS METRIC THREADED RODS - A4															
Minimum embedment depth	[kN]	9.93	14.1	17.2	24.1	31.6	39.8	51.0	5.74	8.38	10.1	16.8	22.5	28.4	36.3
Maximum embedment depth	[kN]	9.93	15.7	22.5	42.0	65.3	94.4	150.1	9.93	15.7	22.5	42.0	65.3	94.4	134.6
SHEAR LOAD V_{rec}															
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8															
Minimum embedment depth	[kN]	5.14	8.00	12.0	22.3	34.9	50.3	80.0	5.14	8.00	12.0	22.3	34.9	50.3	72.7
Maximum embedment depth	[kN]	5.14	8.00	12.0	22.3	34.9	50.3	80.0	5.14	8.00	12.0	22.3	34.9	50.3	80.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8															
Minimum embedment depth	[kN]	8.57	13.1	19.4	36.0	56.0	79.7	101.9	8.57	13.1	19.4	33.5	45.1	56.8	72.7
Maximum embedment depth	[kN]	8.57	13.1	19.4	36.0	56.0	80.6	128.0	8.57	13.1	19.4	36.0	56.0	80.6	128.0
R-STUDS METRIC THREADED RODS - A4															
Minimum embedment depth	[kN]	5.95	9.16	13.3	25.2	39.4	56.8	89.7	5.95	9.16	13.3	25.2	39.4	56.8	72.7
Maximum embedment depth	[kN]	5.95	9.16	13.3	25.2	39.4	56.8	89.7	5.95	9.16	13.3	25.2	39.4	56.8	89.7

R-KEX-II WITH THREADED RODS

DESIGN PERFORMANCE DATA

R-STUDS

Size			M8	M10	M12	M16	M20	M24	M30
TENSION LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	18.00	29.00	42.00	78.00	122.00	176.00	280.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	29.00	46.00	67.00	126.00	196.00	282.00	448.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance	$N_{Rk,s}$	[kN]	26.00	41.00	59.00	110.00	171.00	247.00	392.00
Partial safety factor	γ_{Ms}	-	1.87	1.87	1.87	1.87	1.87	1.87	1.87
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (40°C/24°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	17.00	16.00	17.00	15.00	15.00	13.00	12.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (80°C/50°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	15.00	14.00	15.00	13.00	13.00	12.00	10.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (40°C/24°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	8.00	8.00	7.00	7.00	7.00	6.00	5.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (80°C/50°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	7.00	7.00	6.00	6.00	6.00	5.00	4.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Factor of the influence of sustained load	Ψ^0_{sus}	-	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.09	1.09	1.09	1.09	1.09	1.09	1.09
CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Factor for cracked concrete	k_1	-	7.20	7.20	7.20	7.20	7.20	7.20	7.20
Factor for cracked concrete	$k_{cr,N}$	-	7.70	7.70	7.70	7.70	7.70	7.70	7.70
Factor for non-cracked concrete	k_1	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Edge distance	$c_{cr,N}$	[mm]	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$
Spacing	$s_{cr,N}$	[mm]	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$
CONCRETE SPLITTING FAILURE									
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SHEAR LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	9.00	14.00	21.00	39.00	61.00	88.00	140.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	19.00	37.00	65.00	166.00	324.00	561.00	1124.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	15.00	23.00	34.00	63.00	98.00	141.00	224.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	30.00	60.00	105.00	266.00	519.00	898.00	1799.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	13.00	20.00	29.00	55.00	86.00	124.00	196.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	26.00	52.00	92.00	233.00	454.00	786.00	1574.00
Partial safety factor	γ_{Ms}	-	1.56	1.56	1.56	1.56	1.56	1.56	1.56
CONCRETE PRY-OUT FAILURE									
Factor	k	-	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Anchor diameter	d_{nom}	[mm]	8.00	10.00	12.00	16.00	20.00	24.00	30.00
Effective length of anchor	ℓ_f	[mm]	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Combined pull-out and concrete cone failure:
(acc. TR 029, p.5.2.2.3. acc. to formula (5.2a) – $N^0_{Rk,p} = \pi*d*h_{ef}*\tau_{Rk}$
acc. EN 1992-4, p.7.2.1.6. acc. to formula (7.14) – $N^0_{Rk,p} = \psi_{sus}*\pi*d*h_{ef}*\tau_{Rk}$ where $\psi_{sus} = \psi^0_{sus}+1-\alpha_{sus}\leq 1$ (7.14a,b)) .
Concrete cone failure:
(acc. TR 029, p.5.2.2.4. acc. to formula (5.3a) – $N^0_{Rk,c} = k_1 *f_{ck,cube}{}^{0,5}*hef^{1,5}$
Acc. EN 1992-4, p.7.2.1.4. acc. to formula (7.2) – $N^0_{Rk,c} = k_{ucr,N} *f_{ck}{}^{0,5}*h_{ef}{}^{1,5}$).

R-KER-II | R-CFS+KER-II

HYBRID RESIN
WITH THREADED RODS

High strength and versatile application in cracked and non-cracked concrete with threaded rods

ETA-17/0594

FEATURES AND BENEFITS

- Approved for use with threaded rods in cracked and non-cracked concrete
- Suitable for use in dry or wet substrates and water filled holes
- For faster curing winter version of the resin can be used
- Approved for 3 types of hole cleaning (including use of dustless drill bit)
- Special nozzle with longer mixer for more comfortable and precise application
- Suitable for multiple use. Partly used product can be reused after fitting new nozzle
- Very high load capacity

APPLICATIONS

- Curtain walling
- Balustrading
- Handrails
- Canopies
- Cable conduits and trays
- Fencing & gates manufacturing and installation
- Pipework/ductwork supports
- Platforms
- Pipelines systems
- Passenger lifts
- Safety barriers
- Formwork support systems
- Structural steelwork
- Street lamps

BASE MATERIALS

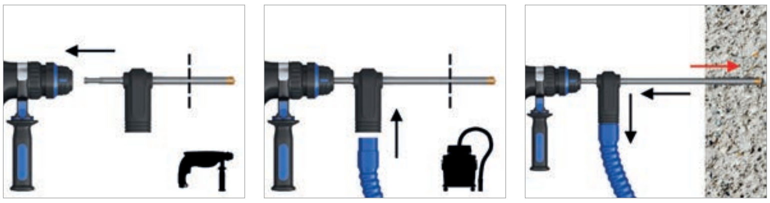
Approved for use in:

- Cracked concrete C20/25-C50/60
- Non-cracked concrete C20/25-C50/60

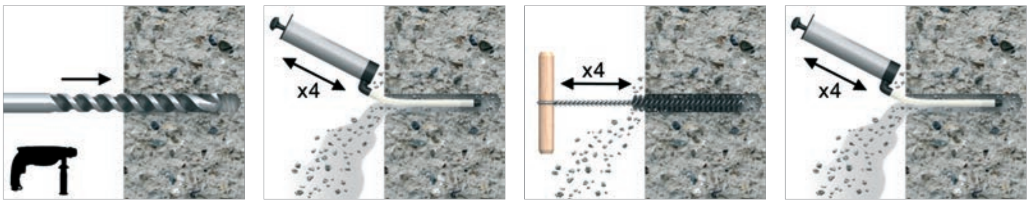
INSTALLATION GUIDE

DRILLING AND CLEANING

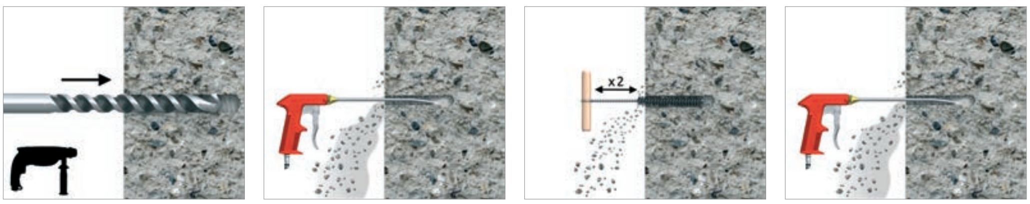
Drilling with automatic cleaning with the hollow Dustlessdrill bit



Drilling with automatic cleaning with the hollow Dustlessdrill bit



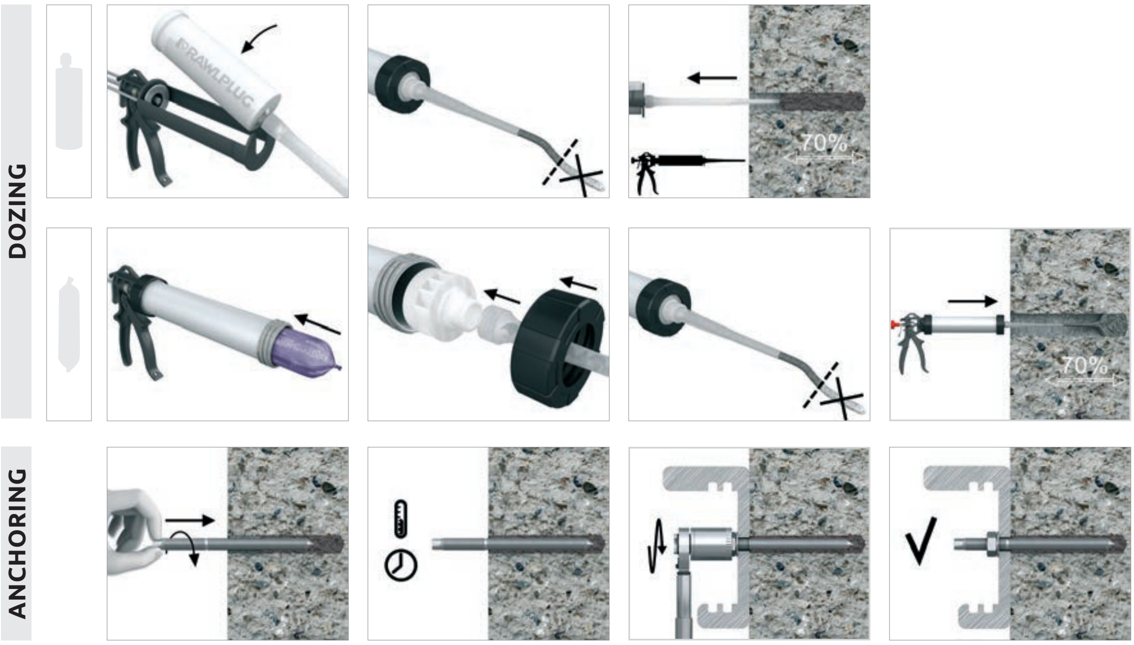
Cleaning with compressed air (2x, 2x, 2x)



R-KER-II | R-CFS+KER-II

HYBRID RESIN WITH THREADED RODS

INSTALLATION GUIDE (cont.)



1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with brush and hand pump at least four times before installation.
3. Insert cartridge into gun and attach nozzle.
4. Dispense to waste until even colour is obtained (min. 10 cm).
5. Insert the mixer nozzle to the bottom of the drill hole and inject resin, slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
6. Immediately insert the stud, slowly and with slight twisting motion. Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.
7. Attach fixture and tighten the nut to the required torque.

PRODUCT INFORMATION

Product Code	Resin	Description / Resin Type	Volume [ml]
R-KER-II-300	R-KER-II	R-KER II Hybrid Resin	300
R-KER-II-345			345
R-KER-II-400			400
R-KER-II-300-S	R-KER-II-S	R-KER II Hybrid Resin for High Temperature (Summer) / Slow Cure Styrene Free Hybrid Resin	300
R-KER-II-400-S			400
R-KER-II-300-W	R-KER-II-W	R-KER II Hybrid Resin for Low Temperature (Winter) / Rapid Cure Styrene Free Hybrid Resin	300
R-KER-II-345-W			345
R-KER-II-400-W			400
R-CFS+KERII-300	R-KER-II	Styrene Free Vinylester Resin	300
R-CFS+KERII-600	R-KER-II	Styrene Free Vinylester Resin	600
R-CFS+KERII-300-S	R-KER-II-S	High Temperature (Summer) / Slow Cure Styrene Free Vinylester Resin	300
R-CFS+KERII-600-S	R-KER-II-S	High Temperature (Summer) / Slow Cure Styrene Free Vinylester Resin	600
R-CFS+KERII-300-W	R-KER-II-W	Low Temperature (Winter) / Rapid Cure Styrene Free Vinylester Resin	300
R-CFS+KERII-600-W	R-KER-II-W	Low Temperature (Winter) / Rapid Cure Styrene Free Vinylester Resin	600

PRODUCT INFORMATION

R-STUDS

Size	Product Code			Anchor		Fixture		
	Steel class 5.8	Steel class 8.8	Steel grade A4	Diameter d [mm]	Length L [mm]	Hole diameter d_f [mm]	Max. thickness t_{fix} for: $h_{nom, min}$ [mm]	$h_{nom, max}$ [mm]
M8	R-STUDS-08110	R-STUDS-08110-88	R-STUDS-08110-A4	8	110	9	40	-
	R-STUDS-08160	-	R-STUDS-08160-A4	8	160	9	90	-
M10	R-STUDS-10130	R-STUDS-10130-88	R-STUDS-10130-A4	10	130	12	58	-
	R-STUDS-10170	-	R-STUDS-10170-A4	10	170	12	98	-
	R-STUDS-10190	-	R-STUDS-10190-A4	10	190	12	118	-
M12	R-STUDS-12160	R-STUDS-12160-88	R-STUDS-12160-A4	12	160	14	85	-
	R-STUDS-12190	-	R-STUDS-12190-A4	12	190	14	115	-
	R-STUDS-12220	-	R-STUDS-12220-A4	12	220	14	145	-
	R-STUDS-12260	-	R-STUDS-12260-A4	12	260	14	185	-
	R-STUDS-12300	-	R-STUDS-12300-A4	12	300	14	225	45

R-KER-II | R-CFS+KER-II

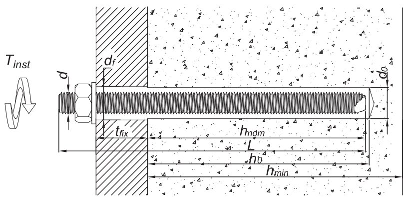
HYBRID RESIN WITH THREADED RODS

PRODUCT INFORMATION (cont.)

Size	Product Code			Anchor		Fixture		
	Steel class 5.8	Steel class 8.8	Steel grade A4	Diameter	Length	Hole diameter	Max. thickness t_{Fix} for:	
				d	L	d_f	$h_{nom, min}$	$h_{nom, max}$
				[mm]	[mm]	[mm]	[mm]	[mm]
M16	R-STUDS-16190	R-STUDS-16190-88	R-STUDS-16190-A4	16	190	18	111	-
	R-STUDS-16220	R-STUDS-16220-88	R-STUDS-16220-A4	16	220	18	141	-
	R-STUDS-16260	-	R-STUDS-16260-A4	16	260	18	181	-
	R-STUDS-16300	-	R-STUDS-16300-A4	16	300	18	221	-
	R-STUDS-16380	-	R-STUDS-16380-A4	16	380	18	301	41
M20	R-STUDS-20260	R-STUDS-20260-88	R-STUDS-20260-A4	20	260	22	157	-
	R-STUDS-20300	-	R-STUDS-20300-A4	20	300	22	197	-
	R-STUDS-20350	-	R-STUDS-20350-A4	20	350	22	247	-
M24	R-STUDS-24300	R-STUDS-24300-88	R-STUDS-24300-A4	24	300	26	176	-
M30	R-STUDS-30380	R-STUDS-30380-88	R-STUDS-30380-A4	30	380	32	226	-

INSTALLATION DATA

R-STUDS



Size			M8	M10	M12	M16	M20	M24	M30
Thread diameter	d	[mm]	8	10	12	16	20	24	30
Hole diameter in substrate	d_0	[mm]	10	12	14	18	24	28	35
Hole diameter in fixture	d_f	[mm]	9	12	14	18	22	26	32
Min. hole depth in substrate	h_0	[mm]	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$
Min. substrate thickness	h_{min}	[mm]	$h_{nom} + 30 \geq 100$	$h_{nom} + 30 \geq 100$	$h_{nom} + 30 \geq 100$	$h_{nom} + 2d_0$	$h_{nom} + 2d_0$	$h_{nom} + 2d_0$	$h_{nom} + 2d_0$
Installation torque	T_{inst}	[Nm]	10	20	40	80	120	160	200
Min. spacing	s_{min}	[mm]	40	40	40	40	40	50	60
Min. edge distance	c_{min}	[mm]	40	40	40	40	40	50	60
MINIMUM EMBEDMENT DEPTH									
Min. installation depth	$h_{nom, min}$	[mm]	60	60	60	60	80	96	120
MAXIMUM EMBEDMENT DEPTH									
Min. installation depth	$h_{nom, max}$	[mm]	160	200	240	320	400	480	600

Minimum working and curing time

R-KER-II

Resin temperature	Concrete temperature	Curing time* [min.]			Working time [min]		
°C	°C	R-KER-II S	R-KER-II	R-KER-II W	R-KER-II S	R-KER-II	R-KER-II W
5	-20	-	-	1440	-	-	80
5	-15	-	-	960	-	-	60
5	-10	-	-	480	-	-	40
5	-5		1440	240	-	40	20
5	0	-	180	120	-	30	14
5	5	720	90	60	40	15	9
10	10	480	60	45	20	8	5.5
15	15	360	60	30	15	5	3
20	20	240	45	15	10	2.5	2
25	25	180	45	10	9.5	2	1.5
25	30	120	45	10	7	2	1.5
25	35	120	30	5	6.5	1.5	1
25	40	90	30	5	6.5	1.5	1

*For wet concrete the curing time must be doubled

MECHANICAL PROPERTIES

Size			M8	M10	M12	M16	M20	M24	M30
R-STUDS Metric Threaded Rods - Steel Class 5.8									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	500	500	500	500	500	500	500
Nominal yield strength - tension	f_{yk}	[N/mm²]	400	400	400	400	400	400	400
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	19	37	65	166	324	561	1124
Design bending resistance	M	[Nm]	15	30	52	133	259	449	899
Allowable bending resistance	M_{rec}	[Nm]	11	21	37	95	185	321	642

R-KER-II | R-CFS+KER-II

HYBRID RESIN
WITH THREADED RODS

MECHANICAL PROPERTIES (cont.)

Size			M8	M10	M12	M16	M20	M24	M30
R-STUDS Metric Threaded Rods - Steel Class 8.8									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	800	800	800	800	800	800	800
Nominal yield strength - tension	f_{yk}	[N/mm²]	640	640	640	640	640	640	640
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519	898	1799
Design bending resistance	M	[Nm]	24	48	84	213	416	718	1439
Allowable bending resistance	M_{rec}	[Nm]	17	34	60	152	297	513	1028
R-STUDS Metric Threaded Rods - A4									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	700	700	700	700	700	700	700
Nominal yield strength - tension	f_{yk}	[N/mm²]	350	350	350	350	350	350	350
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	233	454	786	1574
Design bending resistance	M	[Nm]	17	34	59	149	291	504	1009
Allowable bending resistance	M_{rec}	[Nm]	12	24	42	107	208	360	721

BASIC PERFORMANCE DATA

R-STUDS

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M8	M10	M12	M16	M20	M24	M30	M8	M10	M12	M16	M20	M24	M30
Substrate		Non-cracked concrete							Cracked concrete						
MEAN ULTIMATE LOAD															
TENSION LOAD $N_{Ru,m}$															
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8															
Minimum embedment depth	[kN]	22.0	28.2	28.2	28.2	43.4	57.0	79.7	20.1	20.1	20.1	20.1	30.9	40.6	56.8
Maximum embedment depth	[kN]	22.0	34.8	50.6	94.2	147.0	211.7	335.9	22.0	34.8	50.6	94.2	147.0	211.7	335.9
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8															
Minimum embedment depth	[kN]	28.2	28.2	28.2	28.2	43.4	57.0	79.7	20.1	20.1	20.1	20.1	30.9	40.6	56.8
Maximum embedment depth	[kN]	32.9	52.2	75.9	141.3	220.5	317.5	503.8	32.9	52.2	75.9	141.3	220.5	317.5	503.8
R-STUDS METRIC THREADED RODS - A4															
Minimum embedment depth	[kN]	28.2	28.2	28.2	28.2	43.4	57.0	79.7	20.1	20.1	20.1	20.1	30.9	40.6	56.8
Maximum embedment depth	[kN]	28.9	45.8	66.6	124.0	193.6	278.7	442.2	28.9	45.8	66.6	124.0	193.6	278.7	442.2
SHEAR LOAD $V_{Ru,m}$															
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8															
Minimum embedment depth	[kN]	11.0	17.4	25.3	47.1	73.5	105.8	167.9	11.0	17.4	25.3	47.1	73.5	105.8	135.7
Maximum embedment depth	[kN]	11.0	17.4	25.3	47.1	73.5	105.8	167.9	11.0	17.4	25.3	47.1	73.5	105.8	167.9
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8															
Minimum embedment depth	[kN]	16.5	26.1	37.9	70.7	110.3	158.8	194.3	16.5	26.1	37.9	64.3	84.8	114.1	115.0
Maximum embedment depth	[kN]	16.5	26.1	37.9	70.7	110.3	158.8	240.4	16.5	26.1	37.9	70.7	110.3	158.8	226.9
R-STUDS METRIC THREADED RODS - A4															
Minimum embedment depth	[kN]	14.5	22.9	33.3	62.0	96.8	139.4	221.1	14.5	22.9	33.3	62.0	85.3	114.3	170.7
Maximum embedment depth	[kN]	14.5	22.9	33.3	62.0	96.8	139.4	221.1	14.5	22.9	33.3	62.0	96.8	139.4	221.1
CHARACTERISTIC LOAD															
TENSION LOAD N_{Rk}															
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8															
Minimum embedment depth	[kN]	18.0	23.5	23.5	23.5	36.1	47.5	66.4	15.1	16.7	16.7	16.7	25.8	33.9	47.3
Maximum embedment depth	[kN]	18.0	29.0	42.0	78.0	122.0	176.0	280.0	18.0	29.0	42.0	78.0	122.0	176.0	280.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8															
Minimum embedment depth	[kN]	23.5	23.5	23.5	23.5	36.1	47.5	66.4	15.1	16.7	16.7	16.7	25.8	33.9	47.3
Maximum embedment depth	[kN]	29.0	46.0	67.0	126.0	196.0	282.0	448.0	29.0	46.0	67.0	126.0	188.5	253.3	282.7
R-STUDS METRIC THREADED RODS - A4															
Minimum embedment depth	[kN]	23.5	23.5	23.5	23.5	36.1	47.5	66.4	15.1	16.7	16.7	16.7	25.8	33.9	47.3
Maximum embedment depth	[kN]	26.0	41.0	59.0	110.0	171.0	247.0	392.0	26.0	41.0	59.0	110.0	171.0	247.0	282.7
SHEAR LOAD V_{Rk}															
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8															
Minimum embedment depth	[kN]	9.00	14.0	21.0	39.0	61.0	88.0	132.8	9.00	14.0	21.0	33.5	51.5	67.7	94.7
Maximum embedment depth	[kN]	9.00	14.0	21.0	39.0	61.0	88.0	140.0	9.00	14.0	21.0	39.0	61.0	88.0	140.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8															
Minimum embedment depth	[kN]	15.0	23.0	34.0	46.9	72.3	95.0	132.8	15.0	23.0	33.5	33.5	51.5	67.7	94.7
Maximum embedment depth	[kN]	15.0	23.0	34.0	63.0	98.0	141.0	224.0	15.0	23.0	34.0	63.0	98.0	141.0	224.0
R-STUDS METRIC THREADED RODS - A4															
Minimum embedment depth	[kN]	13.0	20.5	29.0	46.9	72.3	95.0	132.8	13.0	20.0	29.0	33.5	51.5	67.7	94.7
Maximum embedment depth	[kN]	13.0	20.5	29.0	55.0	86.0	124.0	196.0	13.0	20.0	29.0	55.0	86.0	124.0	196.0

R-KER-II | R-CFS+KER-II

HYBRID RESIN
WITH THREADED RODS

BASIC PERFORMANCE DATA (cont.)

Size		M8	M10	M12	M16	M20	M24	M30	M8	M10	M12	M16	M20	M24	M30
DESIGN LOAD															
TENSION LOAD N_{Rd}															
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8															
Minimum embedment depth	[kN]	12.0	15.7	15.7	15.7	24.1	31.7	44.3	10.1	11.2	11.2	11.2	17.2	22.6	31.6
Maximum embedment depth	[kN]	12.0	19.3	28.0	52.0	81.3	117.3	186.7	12.0	19.3	28.0	52.0	81.3	117.3	186.7
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8															
Minimum embedment depth	[kN]	15.7	15.7	15.7	15.7	24.1	31.7	44.3	10.1	11.2	11.2	11.2	17.2	22.6	31.6
Maximum embedment depth	[kN]	19.3	30.7	44.7	84.0	130.7	188.0	298.7	19.3	30.7	44.7	84.0	125.7	168.9	188.5
R-STUDS METRIC THREADED RODS - A4															
Minimum embedment depth	[kN]	13.9	15.7	15.7	15.7	24.1	31.7	44.3	10.1	11.2	11.2	11.2	17.2	22.6	31.6
Maximum embedment depth	[kN]	13.9	21.9	31.6	58.8	91.4	132.1	209.6	13.9	21.9	31.6	58.8	91.4	132.1	188.5
SHEAR LOAD V_{Rd}															
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8															
Minimum embedment depth	[kN]	7.20	11.2	16.8	31.2	48.2	63.3	88.5	7.20	11.2	16.8	22.3	34.4	45.2	63.1
Maximum embedment depth	[kN]	7.20	11.2	16.8	31.2	48.8	70.4	112.0	7.20	11.2	16.8	31.2	48.8	70.4	112.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8															
Minimum embedment depth	[kN]	12.0	18.4	27.2	31.3	48.2	63.3	88.5	12.0	18.4	22.3	22.3	34.4	45.2	63.1
Maximum embedment depth	[kN]	12.0	18.4	27.2	50.4	78.4	112.8	179.2	12.0	18.4	27.2	50.4	78.4	112.8	179.2
R-STUDS METRIC THREADED RODS - A4															
Minimum embedment depth	[kN]	8.33	13.1	18.6	31.3	48.2	63.3	88.5	8.33	12.8	18.6	22.3	34.4	45.2	63.1
Maximum embedment depth	[kN]	8.33	13.1	18.6	35.3	55.1	79.5	125.6	8.33	12.8	18.6	35.3	55.1	79.5	125.6
RECOMMENDED LOAD															
TENSION LOAD N_{rec}															
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8															
Minimum embedment depth	[kN]	8.57	11.2	11.2	11.2	17.2	22.6	31.6	7.18	7.97	7.97	7.97	12.3	16.1	22.5
Maximum embedment depth	[kN]	8.57	13.8	20.0	37.1	58.1	83.8	133.3	8.57	13.8	20.0	37.1	58.1	83.8	133.3
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8															
Minimum embedment depth	[kN]	11.2	11.2	11.2	11.2	17.2	22.6	31.6	7.18	7.97	7.97	7.97	12.3	16.1	22.5
Maximum embedment depth	[kN]	13.8	21.9	31.9	60.0	93.3	134.3	213.3	13.8	21.9	31.9	60.0	89.8	120.6	134.6
R-STUDS METRIC THREADED RODS - A4															
Minimum embedment depth	[kN]	9.93	11.2	11.2	11.2	17.2	22.6	31.6	7.18	7.97	7.97	7.97	12.3	16.1	22.5
Maximum embedment depth	[kN]	9.93	15.7	22.5	42.0	65.3	94.4	149.7	9.93	15.7	22.5	42.0	65.3	94.4	134.6
SHEAR LOAD V_{rec}															
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8															
Minimum embedment depth	[kN]	5.14	8.00	12.0	22.3	34.4	45.2	63.2	5.14	8.00	12.0	15.9	24.5	32.3	45.1
Maximum embedment depth	[kN]	5.14	8.00	12.0	22.3	34.9	50.3	80.0	5.14	8.00	12.0	22.3	34.9	50.3	80.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8															
Minimum embedment depth	[kN]	8.57	13.1	19.4	22.4	31.4	45.2	63.2	8.57	13.1	15.9	15.9	24.5	32.3	45.1
Maximum embedment depth	[kN]	8.57	13.1	19.4	36.0	56.0	80.6	128.0	8.57	13.1	19.4	36.0	56.0	80.6	128.0
R-STUDS METRIC THREADED RODS - A4															
Minimum embedment depth	[kN]	5.95	9.39	13.3	22.4	34.4	45.2	53.2	5.95	9.16	13.3	15.9	24.5	32.3	45.1
Maximum embedment depth	[kN]	5.95	9.39	13.3	25.2	39.4	56.8	89.7	5.95	9.16	13.3	25.2	39.4	56.8	89.7

DESIGN PERFORMANCE DATA

R-STUDS

Size			M8	M10	M12	M16	M20	M24	M30
TENSION LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	18.00	29.00	42.00	78.00	122.00	176.00	280.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	29.00	46.00	67.00	126.00	196.00	282.00	448.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance	$N_{Rk,s}$	[kN]	26.00	41.00	59.00	110.00	171.00	247.00	392.00
Partial safety factor	γ_{Ms}	-	1.87	1.87	1.87	1.87	1.87	1.87	1.87
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (40°C/24°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	16.00	15.00	15.00	13.00	10.00	10.00	8.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (80°C/50°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	16.00	15.00	15.00	13.00	10.00	10.00	8.00

R-KER-II | R-CFS+KER-II

HYBRID RESIN WITH THREADED RODS

DESIGN PERFORMANCE DATA (cont.)

Size			M8	M10	M12	M16	M20	M24	M30
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (120°C/80°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	8.50	8.00	8.00	7.00	5.50	5.50	4.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (40°C/24°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	10.00	11.00	11.00	9.50	7.50	7.00	5.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (80°C/50°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	10.00	11.00	11.00	9.50	7.50	7.00	5.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (120°C/80°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	5.00	6.00	6.00	5.00	4.00	4.00	3.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Factor of the influence of sustained load	ψ^0_{sus}		0,6	0,6	0,6	0,6	0,6	0,6	0,6
Increasing factors for $N_{Rd,p}$ - C30/37	ψ_c	-	1.05	1.04	1.04	1.04	1.04	1.04	1.04
Increasing factors for $N_{Rd,p}$ - C40/50	ψ_c	-	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Increasing factors for $N_{Rd,p}$ - C50/60	ψ_c	-	1.09	1.09	1.09	1.09	1.09	1.09	1.09
CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Factor for cracked concrete	k_1	-	7.20	7.20	7.20	7.20	7.20	7.20	7.20
Factor for cracked concrete	$k_{cr,N}$	-	7.70	7.70	7.70	7.70	7.70	7.70	7.70
Factor for non-cracked concrete	k_1	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Edge distance	$c_{cr,N}$	[mm]	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$
Spacing	$s_{cr,N}$	[mm]	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$
CONCRETE SPLITTING FAILURE									
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SHEAR LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	9.00	14.00	21.00	39.00	61.00	88.00	140.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	19.00	37.00	65.00	166.00	324.00	561.00	1124.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	15.00	23.00	34.00	63.00	98.00	141.00	224.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	30.00	60.00	105.00	266.00	519.00	898.00	1799.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	13.00	20.00	29.00	55.00	86.00	124.00	196.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	26.00	52.00	92.00	233.00	454.00	786.00	1574.00
Partial safety factor	γ_{Ms}	-	1.56	1.56	1.56	1.56	1.56	1.56	1.56
CONCRETE PRY-OUT FAILURE									
Factor	k	-	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Anchor diameter	d_{nom}	[mm]	8.00	10.00	12.00	16.00	20.00	24.00	30.00
Effective length of anchor	ℓ_f	[mm]	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Combined pull-out and concrete cone failure:
(acc. TR 029, p.5.2.2.3. acc. to formula (5.2a) – $N^0_{Rk,p} = \pi*d*h_{ef}*\tau_{Rk}$
acc. EN 1992-4, p.7.2.1.6. acc. to formula (7.14) – $N^0_{Rk,p} = \psi_{sus}*\pi*d*h_{ef}*\tau_{Rk}$ where $\psi_{sus} = \psi^0_{sus}+1-\alpha_{sus}\le 1$ (7.14a,b)) .
Concrete cone failure:
(acc. TR 029, p.5.2.2.4. acc. to formula (5.3a) – $N^0_{Rk,c} = k_1 *f_{ck,cube}^{0,5}*hef^{1,5}$
Acc. EN 1992-4, p.7.2.1.4. acc. to formula (7.2) – $N^0_{Rk,c} = k_{ucr,N} *f_{ck}^{0,5}*h_{ef}^{1,5}$).

R-KER | R-CFS+RV200 WITH THREADED RODS

High performance vinylester resin approved for use in cracked and non-cracked concrete

ETA-10/0055

FEATURES AND BENEFITS

- Approved for use with threaded rods for use in cracked and non-cracked concrete (EAD 330499-00-0601)
- Suitable for use in low temperatures (down to -20°C for winter option) enables use throughout the year
- Winter version can be used in warmer temperatures for faster curing
- Suitable for use in dry or wet substrates and water filled holes
- Rapid bonding time enables quick execution of works
- Very high load capacity
- Anchor does not generate tensions in the substrate which enables R-KER to be specified where closer edge and spacing distances are required

APPLICATIONS

- Curtain walling
- Balustrading
- Handrails
- Canopies
- Large panel reinforcing system -Copy Eco
- Cable conduits and trays
- Fencing & gates manufacturing and installation
- Pipework/ductwork supports
- Platforms
- Pipelines systems
- Passenger lifts

BASE MATERIALS

Approved for use in:

- Cracked concrete C20/25-C50/60
- Non-cracked concrete C20/25-C50/60

Also suitable for use in:

- High-Density Natural Stone
- Solid Brick
- Solid Concrete Block
- Solid Sand-lime Brick
- Reinforced concrete

INSTALLATION GUIDE

R-KER | R-CFS+RV200 WITH THREADED RODS

INSTALLATION GUIDE (cont.)

ANCHORING

1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the drill hole thoroughly with brush and hand pump at least four times before installation.
3. Attach nozzle and insert cartridge into gun.
4. Dispense to waste until even colour is obtained.
5. Insert the mixer nozzle to the bottom of the drill hole and inject resin, slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
6. Immediately insert the stud, slowly and with slight twisting motion. Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.
7. Attach fixture and tighten the nut to the required torque.

	Product Code	Resin	Description / Resin Type	Volume [ml]
	R-KER-300	R-KER	Styrene Free Vinylester Resin	300
	R-KER-345			345
	R-KER-380			380
	R-KER-400			400
	R-KER-300-W	R-KER-W	Low Temperature (Winter) / Rapid Cure Styrene Free Vinylester Resin	300
	R-KER-380-W			380
	R-KER-400-W			400
	R-KER-380-S	R-KER-S	High Temperature (Summer) / Slow Cure Styrene Free Vinylester Resin	380
	R-KER-400-S			400
	R-CFS+RV200-4	RV200	Styrene Free Vinylester Resin	300
	R-CFS+RV200W-4	RV200-W	Low Temperature (Winter) / Rapid Cure Styrene Free Vinylester Resin	
	R-CFS+RV200S-4	RV200-S	High Temperature (Summer) / Slow Cure Styrene Free Vinylester Resin	
	R-CFS+RV200-600-8	RV200	Styrene Free Vinylester Resin	600
	R-CFS+RV200TW-6008	RV200-W	Low Temperature (Winter) / Rapid Cure Styrene Free Vinylester Resin	

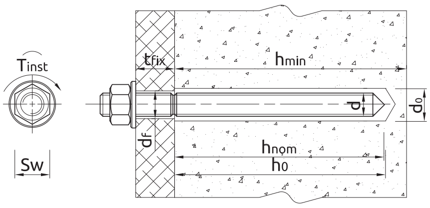
R-STUDS

Size	Product Code			Anchor		Fixture		
	Steel class 5.8	Steel class 8.8	Steel grade A4	Diameter	Length	Hole diameter	Max. thickness t_{fix} for:	
				d	L	d_f	$h_{nom, min}$	$h_{nom, max}$
				[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-STUDS-08110	R-STUDS-08110-88	R-STUDS-08110-A4	8	110	9	40	-
	R-STUDS-08160	-	R-STUDS-08160-A4	8	160	9	90	50
M10	R-STUDS-10130	R-STUDS-10130-88	R-STUDS-10130-A4	10	130	12	48	-
	R-STUDS-10170	-	R-STUDS-10170-A4	10	170	12	88	38
	R-STUDS-10190	-	R-STUDS-10190-A4	10	190	12	108	58
M12	R-STUDS-12160	R-STUDS-12160-88	R-STUDS-12160-A4	12	160	14	65	-
	R-STUDS-12190	-	R-STUDS-12190-A4	12	190	14	95	30
	R-STUDS-12220	-	R-STUDS-12220-A4	12	220	14	125	60
	R-STUDS-12260	-	R-STUDS-12260-A4	12	260	14	165	100
	R-STUDS-12300	-	R-STUDS-12300-A4	12	300	14	205	140
M16	R-STUDS-16190	R-STUDS-16190-88	R-STUDS-16190-A4	16	190	18	71	-
	R-STUDS-16220	R-STUDS-16220-88	R-STUDS-16220-A4	16	220	18	101	11
	R-STUDS-16260	-	R-STUDS-16260-A4	16	260	18	141	51
	R-STUDS-16300	-	R-STUDS-16300-A4	16	300	18	181	91
	R-STUDS-16380	-	R-STUDS-16380-A4	16	380	18	261	171
M20	R-STUDS-20260	R-STUDS-20260-88	R-STUDS-20260-A4	20	260	22	117	-
	R-STUDS-20300	-	R-STUDS-20300-A4	20	300	22	157	37
	R-STUDS-20350	-	R-STUDS-20350-A4	20	350	22	207	87
M24	R-STUDS-24300	R-STUDS-24300-88	R-STUDS-24300-A4	24	300	26	132	-
M30	R-STUDS-30380	R-STUDS-30380-88	R-STUDS-30380-A4	30	380	32	180	-

R-KER | R-CFS+RV200 WITH THREADED RODS

INSTALLATION DATA

R-STUDS



Size			M8	M10	M12	M16	M20	M24	M30
Thread diameter	d	[mm]	8	10	12	16	20	24	30
Hole diameter in substrate	d_0	[mm]	10	12	14	18	24	28	35
Hole diameter in fixture	d_f	[mm]	9	12	14	18	22	26	32
Min. hole depth in substrate	h_0	[mm]	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$
Min. substrate thickness	h_{min}	[mm]	$h_{nom} + 30 \geq 100$	$h_{nom} + 30 \geq 100$	$h_{nom} + 30 \geq 100$	$h_{nom} + 30 \geq 100$	$h_{nom} + 2d_0$	$h_{nom} + 2d_0$	$h_{nom} + 2d_0$
Installation torque	T_{inst}	[Nm]	10	20	40	80	120	180	300
Min. spacing	s_{min}	[mm]	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$
Min. edge distance	c_{min}	[mm]	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$
MINIMUM EMBEDMENT DEPTH									
Min. installation depth	$h_{nom, min}$	[mm]	60	70	80	100	120	140	165
MAXIMUM EMBEDMENT DEPTH									
Min. installation depth	$h_{nom, max}$	[mm]	100	120	145	190	240	290	360

Minimum working and curing time

Resin temperature	Concrete temperature	Working time [min]			Curing time* [min]		
[°C]	[°C]	R-KEMII-S	R-KEMII	R-KEMII-W	R-KEMII-S	R-KEMII	R-KEMII-W
5	-20	-	-	45	-	-	24h
5	-15	-	-	30	-	-	18h
5	-10	-	-	20	-	-	8h
5	-5	3h	70	11	24h	8h	5h
5	0	2h	45	7	18h	4h	2h
5	5	1h	25	5	12h	2h	1h
10	10	45	15	2	8h	90	45
15	15	25	9	1,5	6h	60	30
20	20	15	5	1	4h	45	15
25	30	7	2	-	1.5h	30	-
25	35	6	-	-	1h	-	-
25	40	5	-	-	45	-	-

*For wet concrete the curing time must be doubled

MECHANICAL PROPERTIES

Size			M8	M10	M12	M16	M20	M24	M30
R-STUDS Metric Threaded Rods - Steel Class 5.8									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	500	500	500	500	500	500	500
Nominal yield strength - tension	f_{yk}	[N/mm²]	400	400	400	400	400	400	400
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	19	37	65	166	324	561	1124
Design bending resistance	M	[Nm]	15	30	52	133	259	449	899
Allowable bending resistance	M_{rec}	[Nm]	11	21	37	95	185	321	642
R-STUDS Metric Threaded Rods - Steel Class 8.8									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	800	800	800	800	800	800	800
Nominal yield strength - tension	f_{yk}	[N/mm²]	640	640	640	640	640	640	640
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519	898	1799
Design bending resistance	M	[Nm]	24	48	84	213	416	718	1439
Allowable bending resistance	M_{rec}	[Nm]	17	34	60	152	297	513	1028
R-STUDS Metric Threaded Rods - A4									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	700	700	700	700	700	700	700
Nominal yield strength - tension	f_{yk}	[N/mm²]	350	350	350	350	350	350	350
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	233	454	786	1574
Design bending resistance	M	[Nm]	17	34	59	149	291	504	1009
Allowable bending resistance	M_{rec}	[Nm]	12	24	42	107	208	360	721

R-KER | R-CFS+RV200 WITH THREADED RODS

BASIC PERFORMANCE DATA

R-STUDS

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M8	M10	M12	M16	M20	M24	M30	M12	M16	M20	M24
Substrate		Non-cracked concrete							Cracked concrete			
MEAN ULTIMATE LOAD												
TENSION LOAD $N_{Ru,m}$												
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8												
Minimum embedment depth	[kN]	18.9	37.4	44.1	67.5	88.7	111.8	140.0	32.2	34.2	46.6	65.1
Maximum embedment depth	[kN]	18.9	43.1	44.1	81.9	128.1	184.8	294.0	44.1	64.9	93.2	134.9
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8												
Minimum embedment depth	[kN]	25.6	37.4	48.3	67.5	88.7	111.8	140.0	32.2	34.2	46.6	65.1
Maximum embedment depth	[kN]	30.5	48.3	70.4	132.3	203.6	251.5	305.4	58.4	64.9	93.2	134.9
R-STUDS METRIC THREADED RODS - A4												
Minimum embedment depth	[kN]	25.6	37.4	48.3	67.5	88.7	111.8	140.0	32.2	34.2	46.6	65.1
Maximum embedment depth	[kN]	27.3	43.1	62.0	115.5	179.6	251.5	305.4	58.4	64.9	93.2	134.9
SHEAR LOAD $V_{Ru,m}$												
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8												
Minimum embedment depth	[kN]	11.3	25.8	26.5	49.1	76.9	110.9	176.4	26.5	49.1	76.9	110.9
Maximum embedment depth	[kN]	11.3	25.8	26.5	49.1	76.9	110.9	176.4	26.5	49.1	76.9	110.9
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8												
Minimum embedment depth	[kN]	18.3	29.0	42.2	79.4	123.5	177.7	279.9	42.2	68.4	93.2	130.3
Maximum embedment depth	[kN]	18.3	29.0	42.2	79.4	123.5	177.7	282.9	42.2	79.4	123.5	177.7
R-STUDS METRIC THREADED RODS - A4												
Minimum embedment depth	[kN]	16.4	25.8	37.2	69.3	107.7	155.6	247.6	37.2	68.4	93.2	130.3
Maximum embedment depth	[kN]	16.4	25.8	37.2	69.3	107.7	155.6	247.6	37.2	69.3	107.7	155.6
CHARACTERISTIC LOAD												
TENSION LOAD N_{Rk}												
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8												
Minimum embedment depth	[kN]	18.0	28.6	36.1	50.5	66.4	83.7	107.0	19.6	22.6	30.2	42.2
Maximum embedment depth	[kN]	18.0	41.0	42.0	78.0	122.0	176.0	237.5	35.5	43.0	60.3	87.5
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8												
Minimum embedment depth	[kN]	19.6	28.6	36.1	50.5	66.4	83.7	107.0	19.6	22.6	30.2	42.2
Maximum embedment depth	[kN]	29.0	46.0	67.0	105.1	143.3	196.8	237.5	35.5	43.0	60.3	87.5
R-STUDS METRIC THREADED RODS - A4												
Minimum embedment depth	[kN]	19.6	28.6	36.1	50.5	66.4	83.7	107.0	19.6	22.6	30.2	42.2
Maximum embedment depth	[kN]	26.0	41.0	59.0	105.1	143.3	196.8	237.5	35.5	43.0	60.3	87.5
SHEAR LOAD V_{Rk}												
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8												
Minimum embedment depth	[kN]	9.00	20.0	21.0	39.0	61.0	88.0	140.0	21.0	39.0	60.3	84.5
Maximum embedment depth	[kN]	9.00	20.0	21.0	39.0	61.0	88.0	140.0	21.0	39.0	61.0	88.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8												
Minimum embedment depth	[kN]	15.0	23.0	34.0	63.0	98.0	141.0	214.1	34.0	45.2	60.3	84.5
Maximum embedment depth	[kN]	15.0	23.0	34.0	63.0	98.0	141.0	224.0	34.0	63.0	98.0	141.0
R-STUDS METRIC THREADED RODS - A4												
Minimum embedment depth	[kN]	13.0	20.0	29.0	55.0	86.0	124.0	196.0	29.0	45.2	60.3	84.5
Maximum embedment depth	[kN]	13.0	20.0	29.0	55.0	86.0	124.0	196.0	29.0	55.0	86.0	124.0
DESIGN LOAD												
TENSION LOAD N_{Rd}												
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8												
Minimum embedment depth	[kN]	10.9	15.9	20.1	28.1	36.9	39.8	51.0	10.9	12.6	16.8	20.1
Maximum embedment depth	[kN]	12.0	21.9	28.0	52.0	79.6	93.7	113.1	19.7	23.9	33.5	41.7
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8												
Minimum embedment depth	[kN]	10.9	15.9	20.1	28.1	36.9	39.8	51.0	10.9	12.6	16.8	20.1
Maximum embedment depth	[kN]	18.2	27.2	39.5	58.4	79.6	93.7	113.1	19.7	23.9	33.5	41.7
R-STUDS METRIC THREADED RODS - A4												
Minimum embedment depth	[kN]	10.9	15.9	20.1	28.1	36.9	39.8	51.0	10.9	12.6	16.8	20.1
Maximum embedment depth	[kN]	13.9	21.9	31.6	58.4	79.6	93.7	113.1	19.7	23.9	33.5	41.7
SHEAR LOAD V_{Rd}												
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8												
Minimum embedment depth	[kN]	7.20	12.8	16.8	31.2	48.8	70.4	112.0	16.8	30.2	40.2	56.3
Maximum embedment depth	[kN]	7.20	12.8	16.8	31.2	48.8	70.4	112.0	16.8	31.2	48.8	70.4
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8												
Minimum embedment depth	[kN]	12.0	18.4	27.2	50.4	78.4	111.5	142.7	26.1	30.2	40.2	56.3
Maximum embedment depth	[kN]	12.0	18.4	27.2	50.4	78.4	112.8	179.2	27.2	50.4	78.4	112.8
R-STUDS METRIC THREADED RODS - A4												
Minimum embedment depth	[kN]	8.33	12.8	18.6	35.3	55.1	79.5	125.6	18.6	30.2	40.2	56.3
Maximum embedment depth	[kN]	8.33	12.8	18.6	35.3	55.1	79.5	125.6	18.6	35.3	55.1	79.5

R-KER | R-CFS+RV200 WITH THREADED RODS

BASIC PERFORMANCE DATA

Size		M8	M10	M12	M16	M20	M24	M30	M12	M16	M20	M24
RECOMMENDED LOAD												
TENSION LOAD N_{rec}												
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8												
Minimum embedment depth	[kN]	7.78	11.3	14.3	20.0	26.3	28.5	36.4	7.78	8.98	12.0	14.4
Maximum embedment depth	[kN]	8.57	15.7	20.0	37.1	56.9	66.9	80.8	14.1	17.1	23.9	29.8
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8												
Minimum embedment depth	[kN]	7.78	11.3	14.3	20.0	26.3	28.5	36.4	7.78	8.98	12.0	14.4
Maximum embedment depth	[kN]	13.0	19.5	28.2	41.7	56.9	66.9	80.8	14.1	17.1	23.9	29.8
R-STUDS METRIC THREADED RODS - A4												
Minimum embedment depth	[kN]	7.78	11.3	14.3	20.0	26.3	28.5	36.4	7.78	8.98	12.0	14.4
Maximum embedment depth	[kN]	9.93	15.7	22.5	41.7	56.9	66.9	80.8	14.1	17.1	23.9	29.8
SHEAR LOAD V_{rec}												
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8												
Minimum embedment depth	[kN]	5.14	9.16	12.0	22.3	34.9	50.3	80.0	12.0	21.5	28.7	40.2
Maximum embedment depth	[kN]	5.14	9.16	12.0	22.3	34.9	50.3	80.0	12.0	22.3	34.9	50.3
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8												
Minimum embedment depth	[kN]	8.57	13.1	19.4	36.0	56.0	79.7	101.9	18.7	21.5	28.7	40.2
Maximum embedment depth	[kN]	8.57	13.1	19.4	36.0	56.0	80.6	128.0	19.4	36.0	56.0	80.6
R-STUDS METRIC THREADED RODS - A4												
Minimum embedment depth	[kN]	5.95	9.16	13.3	25.2	39.4	56.8	89.7	13.3	21.5	28.7	40.2
Maximum embedment depth	[kN]	5.95	9.16	13.3	25.2	39.4	56.8	89.7	13.3	25.2	39.4	56.8

BASIC PERFORMANCE DATA

R-STUDS

Size			M8	M10	M12	M16	M20	M24	M30
TENSION LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	18.00	29.00	42.00	78.00	122.00	176.00	280.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	29.00	46.00	67.00	126.00	196.00	282.00	448.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance	$N_{Rk,s}$	[kN]	26.00	41.00	59.00	110.00	171.00	247.00	392.00
Partial safety factor	γ_{Ms}	-	1.87	1.87	1.87	1.87	1.87	1.87	1.87
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (40°C/24°C)									
Characteristic bond resistance	T_{Rk}	[N/mm²]	13.00	13.00	13.00	11.00	9.50	9.00	7.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (80°C/50°C)									
Characteristic bond resistance	T_{Rk}	[N/mm²]	10.00	11.00	10.00	9.00	7.50	7.00	5.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (40°C/24°C)									
Characteristic bond resistance	T_{Rk}	[N/mm²]	-	-	6.50	4.50	4.00	4.00	-
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (80°C/50°C)									
Characteristic bond resistance	T_{Rk}	[N/mm²]	-	-	5.50	4.00	3.00	3.00	-
COMBINED PULL-OUT AND CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.40	1.40
Factor of the influence of sustained load	Ψ^0_{sus}	-	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.09	1.09	1.09	1.09	1.09	1.09	1.09
CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.40	1.40
Factor for cracked concrete	k_1	-	7.20	7.20	7.20	7.20	7.20	7.20	7.20
Factor for cracked concrete	$k_{cr,N}$	-	7.70	7.70	7.70	7.70	7.70	7.70	7.70
Factor for non-cracked concrete	k_1	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Edge distance	$c_{cr,N}$	[mm]	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$
Spacing	$s_{cr,N}$	[mm]	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$
CONCRETE SPLITTING FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.40	1.40

R-KER | R-CFS+RV200 WITH THREADED RODS

DESIGN PERFORMANCE DATA (cont.)

Size			M8	M10	M12	M16	M20	M24	M30
SHEAR LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	9.00	14.00	21.00	39.00	61.00	88.00	140.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	19.00	37.00	65.00	166.00	324.00	561.00	1124.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	15.00	23.00	34.00	63.00	98.00	141.00	224.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	30.00	60.00	105.00	266.00	519.00	898.00	1799.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	13.00	20.00	29.00	55.00	86.00	124.00	196.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	26.00	52.00	92.00	233.00	454.00	786.00	1574.00
Partial safety factor	γ_{Ms}	-	1.56	1.56	1.56	1.56	1.56	1.56	1.56
CONCRETE PRY-OUT FAILURE									
Factor	k	-	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Anchor diameter	d_{nom}	[mm]	8.00	10.00	12.00	16.00	20.00	24.00	30.00
Effective length of anchor	ℓ_f	[mm]	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Combined pull-out and concrete cone failure:
(acc. TR 029, p.5.2.2.3. acc. to formula (5.2a) – $N^0_{Rk,p} = \pi * d * h_{ef} * \tau_{Rk}$
acc. EN 1992-4, p.7.2.1.6. acc. to formula (7.14) – $N^0_{Rk,p} = \psi_{sus} * \pi * d * h_{ef} * \tau_{Rk}$ where $\psi_{sus} = \psi^0_{sus} + 1 - \alpha_{sus} \leq 1$ (7.14a,b)) .
Concrete cone failure:
(acc. TR 029, p.5.2.2.4. acc. to formula (5.3a) – $N^0_{Rk,c} = k_1 * f_{ck,cube}{}^{0,5} * hef^{1,5}$
Acc. EN 1992-4, p.7.2.1.4. acc. to formula (7.2) – $N^0_{Rk,c} = k_{ucr,N} * f_{ck}{}^{0,5} * h_{ef}{}^{1,5}$).

R-CAS-V

SPIN-IN CAPSULE WITH THREADED RODS

High-performance, quick-setting, styrene-free vinylester resin for concrete

ETA-10/0108

FEATURES AND BENEFITS

- Approved for use with threaded rods in non-cracked concrete (ETAG001 Option 7)
- High performance for use safety critical application - heavy-duty fastenings with small spacing and edge distances
- The system relies on the adhesion between the concrete and resin, which is free from expansion forces. This makes it an ideal choice where close edge and spacing distances are required
- Capsule contains precise amounts of ingredients making it a very consistent product
- Suitable for making fixings underwater. Adhesive strength is not affected by unpolluted water
- Suitable for dry or wet non-cracked concrete
- Styrene free - odourless

APPLICATIONS

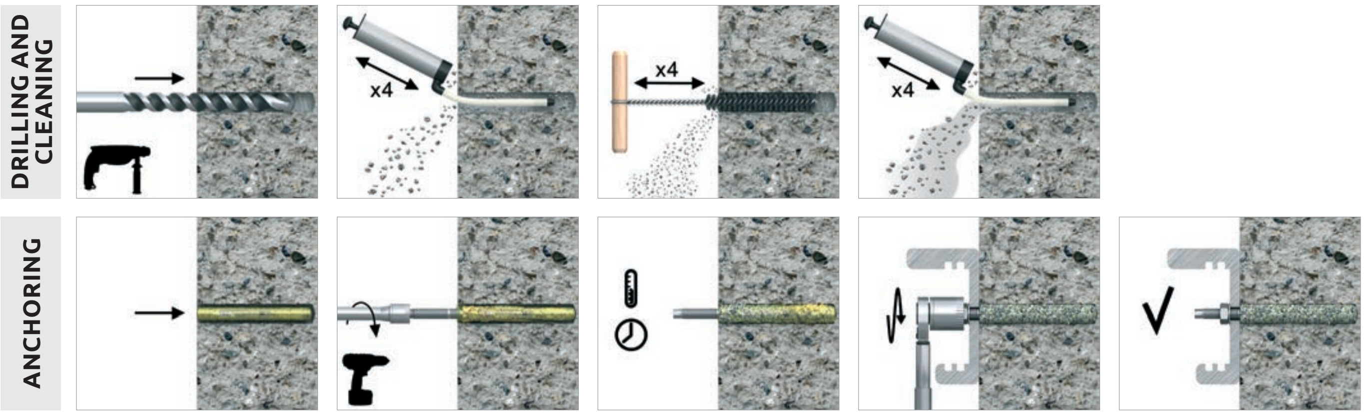
- Threaded rods
- Balustrading
- Railings
- Heavy machinery
- Structural steel
- Steel columns
- Cladding restraints
- Curtain walling
- Fencing & gates manufacturing and installation
- Formwork support systems
- Garage doors
- Guard rails

BASE MATERIALS

Approved for use in:
- Non-cracked concrete C20/25-C50/60

Also suitable for use in:
- Natural Stone (after site testing)

INSTALLATION GUIDE



1. Drill hole to the required diameter and depth for capsule size being used.
2. Clean the hole thoroughly with brush and hand pump at least four times before installation.
3. Insert capsule into the hole. Connect stud to drilling machine using appropriate driver system.
4. Position the stud into the glass capsule then switch on the drilling machine and drive stud into the capsule. Switch off the drilling machine as soon as the bottom of hole is reached.
5. Leave the anchor undisturbed unitl the curing time elapses.
6. Attach fixture and tighten the nut to the required torque.

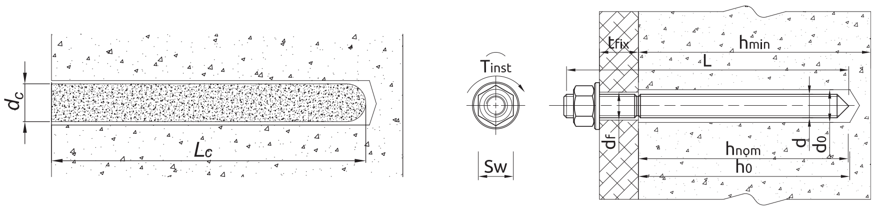
PRODUCT INFORMATION

Size	Product Code	Description / Resin Type
M8	R-CAS-V-08	Styrene Free Vinylester Resin
M10	R-CAS-V-10	
M12	R-CAS-V-12	
M16	R-CAS-V-16	
M20	R-CAS-V-20	
M24	R-CAS-V-24	
M30	R-CAS-V-30	

R-CAS-V SPIN-IN CAPSULE WITH THREADED RODS

INSTALLATION DATA

REBARS AS ANCHORS



Size			M8	M10	M12	M16	M20	M24	M30
Thread diameter	d	[mm]	8	10	12	16	20	24	30
Hole diameter in substrate	d_0	[mm]	10	12	14	18	24	28	35
Capsule size		[mm]	8	10	12	16	20	24	30
Capsule diameter	d_c	[mm]	9.25	10.75	12.65	16.75	21.55	23.75	33.2
Installation torque	T_{inst}	[Nm]	10	20	40	80	120	180	300
Min. hole depth in substrate	h_0	[mm]	85	95	115	130	175	215	275
Min. installation depth	h_{nom}	[mm]	80	90	110	125	170	210	270
Min. substrate thickness	h_{min}	[mm]	120	130	140	180	230	270	340
Min. spacing	s_{min}	[mm]	40	45	55	63	85	105	135
Min. edge distance	c_{min}	[mm]	40	45	55	63	85	105	135

Minimum working and curing time

Resin temperature	Concrete temperature	Curing time*	Working time
[°C]	[°C]	[min]	[min]
5	-5	-	480
5	0	-	240
5	5	-	150
10	10	-	120
15	15	-	90
20	20	-	45
25	30	-	20
25	40	-	10

MECHANICAL PROPERTIES

Size			M8	M10	M12	M16	M20	M24	M30
R-STUDS Metric Threaded Rods - Steel Class 5.8									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	500	500	500	500	500	500	500
Nominal yield strength - tension	f_{yk}	[N/mm²]	400	400	400	400	400	400	400
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	19	37	65	166	324	561	1124
Design bending resistance	M	[Nm]	15	30	52	133	259	449	899
Allowable bending resistance	M_{rec}	[Nm]	11	21	37	95	185	321	642
R-STUDS Metric Threaded Rods - Steel Class 8.8									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	800	800	800	800	800	800	800
Nominal yield strength - tension	f_{yk}	[N/mm²]	640	640	640	640	640	640	640
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519	898	1799
Design bending resistance	M	[Nm]	24	48	84	213	416	718	1439
Allowable bending resistance	M_{rec}	[Nm]	17	34	60	152	297	513	1028
R-STUDS Metric Threaded Rods - A4									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	700	700	700	700	700	700	700
Nominal yield strength - tension	f_{yk}	[N/mm²]	350	350	350	350	350	350	350
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	233	454	786	1574
Design bending resistance	M	[Nm]	17	34	59	149	291	504	1009
Allowable bending resistance	M_{rec}	[Nm]	12	24	42	107	208	360	721

R-CAS-V SPIN-IN CAPSULE WITH THREADED RODS

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M8	M10	M12	M16	M20	M24	M30
Substrate		Non-cracked concrete						
Effective embedment depth h_{ef}	[mm]	80.0	90.0	110.0	125.0	170.0	210.0	270.0
MEAN ULTIMATE LOAD								
TENSION LOAD $N_{Ru,m}$								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	18.9	30.5	44.1	82.9	128.2	171.0	259.6
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	30.5	40.7	59.7	82.9	128.2	171.0	259.6
R-STUDS METRIC THREADED RODS - A4	[kN]	27.3	40.7	59.7	82.9	128.2	171.0	259.6
SHEAR LOAD $V_{Ru,m}$								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	11.3	18.3	26.5	49.1	76.9	110.9	176.4
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	18.3	30.0	42.2	79.4	123.5	177.7	282.9
R-STUDS METRIC THREADED RODS - A4	[kN]	16.4	25.8	37.2	69.3	107.7	155.6	247.6
CHARACTERISTIC LOAD								
TENSION LOAD N_{Rk}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	18.0	29.0	42.0	69.1	106.8	142.5	216.3
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	26.1	33.9	49.8	69.1	106.8	142.5	216.3
R-STUDS METRIC THREADED RODS - A4	[kN]	26.0	33.9	49.8	69.1	106.8	142.5	216.3
SHEAR LOAD V_{Rk}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	9.00	14.0	21.0	39.0	61.0	88.0	140.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	15.0	23.0	34.0	63.0	98.0	141.0	224.0
R-STUDS METRIC THREADED RODS - A4	[kN]	13.0	20.0	29.0	55.0	86.0	124.0	196.0
DESIGN LOAD								
TENSION LOAD N_{Rd}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	12.0	18.9	27.7	38.4	59.3	79.2	120.2
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	14.5	18.9	27.7	38.4	59.3	79.2	120.2
R-STUDS METRIC THREADED RODS - A4	[kN]	13.9	18.9	27.7	38.4	59.3	79.2	120.2
SHEAR LOAD V_{Rd}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	7.20	11.2	16.8	31.2	48.8	70.4	112.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	12.0	18.4	27.2	50.4	78.4	112.8	179.2
R-STUDS METRIC THREADED RODS - A4	[kN]	8.33	12.8	18.6	35.3	55.1	79.5	125.6
RECOMMENDED LOAD								
TENSION LOAD N_{rec}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	8.57	13.5	19.8	27.4	42.4	56.6	85.8
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	10.4	13.5	19.8	27.4	42.4	56.6	85.8
R-STUDS METRIC THREADED RODS - A4	[kN]	9.93	13.5	19.8	27.4	42.4	56.6	85.8
SHEAR LOAD V_{rec}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	5.14	8.00	12.0	22.3	34.9	50.3	80.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	8.57	13.1	19.4	36.0	56.0	80.6	128.0
R-STUDS METRIC THREADED RODS - A4	[kN]	5.95	9.16	13.3	25.2	39.4	56.8	89.7

DESIGN PERFORMANCE DATA

R-STUDS

Size			M8	M10	M12	M16	M20	M24	M30
Effective embedment depth	h_{ef}	[mm]	80.00	90.00	110.00	125.00	170.00	210.00	270.00
TENSION LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	18.00	29.00	42.00	78.00	122.00	176.00	280.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	29.00	46.00	67.00	126.00	196.00	282.00	448.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance	$N_{Rk,s}$	[kN]	26.00	41.00	59.00	110.00	171.00	247.00	392.00
Partial safety factor	γ_{Ms}	-	1.87	1.87	1.87	1.87	1.87	1.87	1.87
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (40°C/24°C)									
Characteristic bond resistance	T_{Rk}	[N/mm²]	13.00	12.00	12.00	11.00	10.00	9.00	8.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (80°C/50°C)									
Characteristic bond resistance	T_{Rk}	[N/mm²]	13.00	12.00	12.00	11.00	10.00	9.00	8.50

R-CAS-V SPIN-IN CAPSULE WITH THREADED RODS

DESIGN PERFORMANCE DATA (cont.)

Size			M8	M10	M12	M16	M20	M24	M30
COMBINED PULL-OUT AND CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Increasing factors for $N_{Rd,p}$ - C30/37	ψ_c	-	1.04	1.04	1.04	1.04	1.04	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C40/50	ψ_c	-	1.07	1.07	1.07	1.07	1.07	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C50/60	ψ_c	-	1.09	1.09	1.09	1.09	1.09	1.00	1.00
CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Factor of the influence of sustained load	ψ^0_{sus}		0,6	0,6	0,6	0,6	0,6	0,6	0,6
Factor for non-cracked concrete	k	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Edge distance	$c_{cr,N}$	[mm]	1.5*h_{ef}	1.5*h_{ef}	1.5*h_{ef}	1.5*h_{ef}	1.5*h_{ef}	1.5*h_{ef}	1.5*h_{ef}
Spacing	$s_{cr,N}$	[mm]	3.0*h_{ef}	3.0*h_{ef}	3.0*h_{ef}	3.0*h_{ef}	3.0*h_{ef}	3.0*h_{ef}	3.0*h_{ef}
CONCRETE SPLITTING FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20
SHEAR LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	9.00	14.00	21.00	39.00	61.00	88.00	140.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	19.00	37.00	65.00	166.00	324.00	561.00	1124.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	15.00	23.00	34.00	63.00	98.00	141.00	224.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	30.00	60.00	105.00	266.00	519.00	898.00	1799.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	13.00	20.00	29.00	55.00	86.00	124.00	196.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	26.00	52.00	92.00	233.00	454.00	786.00	1574.00
Partial safety factor	γ_{Ms}	-	1.56	1.56	1.56	1.56	1.56	1.56	1.56
CONCRETE PRY-OUT FAILURE									
Factor	k	-	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Anchor diameter	d_{nom}	[mm]	8.00	10.00	12.00	16.00	20.00	24.00	30.00
Effective length of anchor	ℓ_f	[mm]	80.00	90.00	110.00	125.00	170.00	210.00	270.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Combined pull-out and concrete cone failure:
(acc. TR 029, p.5.2.2.3. acc. to formula (5.2a) – $N^0_{Rk,p} = \pi * d * h_{ef} * \tau_{Rk}$
acc. EN 1992-4, p.7.2.1.6. acc. to formula (7.14) – $N^0_{Rk,p} = \psi_{sus} * \pi * d * h_{ef} * \tau_{Rk}$ where $\psi_{sus} = \psi^0_{sus} + 1 - \alpha_{sus} \le 1$ (7.14a,b)) .
Concrete cone failure:
(acc. TR 029, p.5.2.2.4. acc. to formula (5.3a) – $N^0_{Rk,c} = k_1 * f_{ck,cube}^{0,5} * hef^{1,5}$
Acc. EN 1992-4, p.7.2.1.4. acc. to formula (7.2) – $N^0_{Rk,c} = k_{ucr,N} * f_{ck}^{0,5} * h_{ef}^{1,5}$).

R-HAC-V

**HAMMER-IN
WITH THREADED RODS**

Heavy duty anchor with small spacing and edge distances, simply installed by hammering the stud or rebar

ETA ETA-11/0002 CE

FEATURES AND BENEFITS

- High performance anchor, for use in safety critical applications
- The system relies on the adhesion between concrete and resin, which is free from expansion forces. This makes it an ideal choice where close edge and spacing distances are required
- Capsule contains precise amounts of ingredients making it a very consistent product
- Adhesive bond strength is not affected by unpolluted water
- Suitable for dry or wet non-cracked concrete
- Low cost tooling required for installation, quick and easy to install
- Styrene free - virtually odourless
- Approved for use with threaded rods in non-cracked concrete (ETAG001 Option 7)

APPLICATIONS

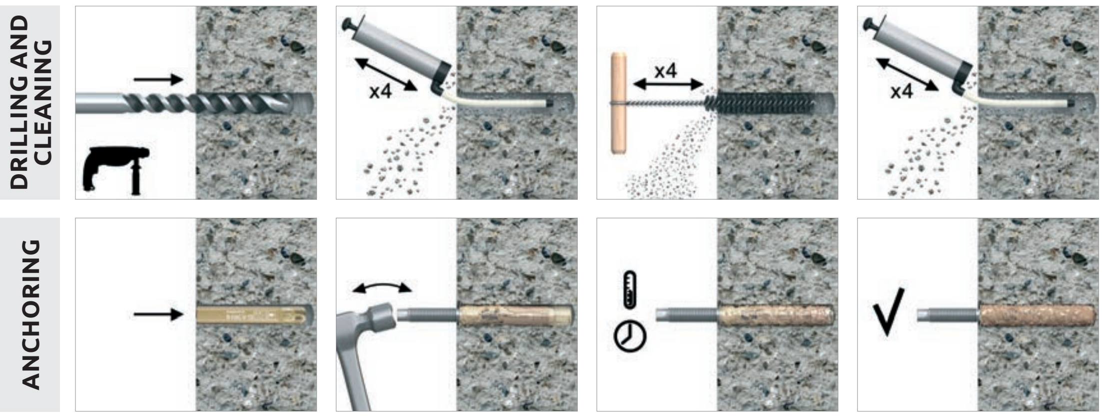
- Balustrading & handrails
- Cable trays
- Guard rails
- Heavy machinery
- Threaded rods
- Cladding restraints
- Curtain walling
- Fencing & gates manufacturing and installation
- Reinforcement bars

BASE MATERIALS

Approved for use in:
- Non-cracked concrete C20/25-C50/60

Also suitable for use in:
- Natural Stone (after site testing)

INSTALLATION GUIDE



1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with brush and hand pump at least four times before installation.
3. Insert capsule into the hole.
4. The stud is simply hammered through the capsule using a manual or mechanical hammer (M16-M30).
5. Leave the anchor undisturbed unitl the curing time elapses.
6. Attach fixture and tighten the nut to the required torque.

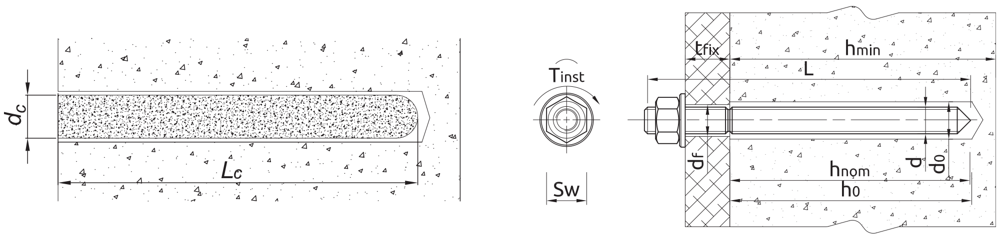
PRODUCT INFORMATION

Size	Product Code	Description / Resin Type
M8	R-HAC-V-08	Styrene Free Vinylester Resin
M10	R-HAC-V-10	
M12	R-HAC-V-12	
M16	R-HAC-V-16	
M20	R-HAC-V-20	
M24	R-HAC-V-24	
M30	R-HAC-V-30	

R-HAC-V HAMMER-IN WITH THREADED RODS

INSTALLATION DATA

R-STUDS



Size			M8	M10	M12	M16	M20	M24	M30
Thread diameter	d	[mm]	8	10	12	16	20	24	30
Hole diameter in substrate	d_0	[mm]	10	12	14	18	24	28	35
Capsule size		[mm]	8	10	12	16	20	24	30
Capsule diameter	d_c	[mm]	9.25	10.75	12.65	16.75	21.55	23.75	33.2
Installation torque	T_{inst}	[Nm]	10	20	40	80	120	180	300
Min. hole depth in substrate	h_0	[mm]	85	95	115	130	175	215	275
Min. installation depth	h_{nom}	[mm]	80	90	110	125	170	210	270
Min. substrate thickness	h_{min}	[mm]	120	130	140	180	230	270	340
Min. spacing	s_{min}	[mm]	40	45	55	63	85	105	135
Min. edge distance	c_{min}	[mm]	40	45	55	63	85	105	135

Minimum working and curing time

Resin temperature	Concrete temperature	Curing time*	Working time
[°C]	[°C]	[min]	[min]
5	-5	-	1440
5	0	-	840
5	5	-	240
10	10	-	180
15	15	-	90
20	20	-	45
25	30	-	20
25	40	-	10

MECHANICAL PROPERTIES

Size			M8	M10	M12	M16	M20	M24	M30
R-STUDS Metric Threaded Rods - Steel Class 5.8									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	500	500	500	500	500	500	500
Nominal yield strength - tension	f_{yk}	[N/mm²]	400	400	400	400	400	400	400
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	19	37	65	166	324	561	1124
Design bending resistance	M	[Nm]	15	30	52	133	259	449	899
Allowable bending resistance	M_{rec}	[Nm]	11	21	37	95	185	321	642
R-STUDS Metric Threaded Rods - Steel Class 8.8									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	800	800	800	800	800	800	800
Nominal yield strength - tension	f_{yk}	[N/mm²]	640	640	640	640	640	640	640
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519	898	1799
Design bending resistance	M	[Nm]	24	48	84	213	416	718	1439
Allowable bending resistance	M_{rec}	[Nm]	17	34	60	152	297	513	1028
R-STUDS Metric Threaded Rods - A4									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	700	700	700	700	700	700	700
Nominal yield strength - tension	f_{yk}	[N/mm²]	350	350	350	350	350	350	350
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	233	454	786	1574
Design bending resistance	M	[Nm]	17	34	59	149	291	504	1009
Allowable bending resistance	M_{rec}	[Nm]	12	24	42	107	208	360	721

R-HAC-V HAMMER-IN WITH THREADED RODS

BASIC PERFORMANCE DATA

R-STUDS

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M8	M10	M12	M16	M20	M24	M30
Substrate		Non-cracked concrete						
MEAN ULTIMATE LOAD								
TENSION LOAD $N_{Ru,m}$								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	18.9	30.5	44.1	75.4	115.4	171.0	213.8
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	26.5	37.3	49.8	75.4	115.4	171.0	213.8
R-STUDS METRIC THREADED RODS - A4	[kN]	26.5	37.3	49.8	75.4	115.4	171.0	213.8
SHEAR LOAD $V_{Ru,m}$								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	11.3	18.3	26.5	49.1	76.9	110.9	176.4
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	18.3	29.0	42.2	79.4	123.5	177.7	282.9
R-STUDS METRIC THREADED RODS - A4	[kN]	16.4	25.8	37.2	69.3	107.7	155.6	247.6
CHARACTERISTIC LOAD								
TENSION LOAD N_{Rk}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	18.0	29.0	41.5	62.8	96.1	142.5	178.1
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	22.1	31.1	41.5	62.8	96.1	142.5	178.1
R-STUDS METRIC THREADED RODS - A4	[kN]	22.1	31.1	41.5	62.8	96.1	142.5	178.1
SHEAR LOAD V_{Rk}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	9.00	14.0	21.0	39.0	61.0	88.0	140.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	15.0	23.0	34.0	63.0	98.0	141.0	224.0
R-STUDS METRIC THREADED RODS - A4	[kN]	13.0	20.0	29.0	55.0	86.0	124.0	196.0
DESIGN LOAD								
TENSION LOAD N_{Rd}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	10.5	14.8	23.0	29.9	45.8	67.9	84.8
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	10.5	14.8	23.0	29.9	45.8	67.9	84.8
R-STUDS METRIC THREADED RODS - A4	[kN]	10.5	14.8	23.0	29.9	45.8	67.9	84.8
SHEAR LOAD V_{Rd}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	7.20	11.2	16.8	31.2	48.8	70.4	112.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	12.0	18.4	27.2	50.4	78.4	112.8	179.2
R-STUDS METRIC THREADED RODS - A4	[kN]	8.33	12.8	18.6	35.3	55.1	79.5	125.6
RECOMMENDED LOAD								
TENSION LOAD N_{rec}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	7.52	10.6	16.5	21.4	32.7	48.5	60.6
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	7.52	10.6	16.5	21.4	32.7	48.5	60.6
R-STUDS METRIC THREADED RODS - A4	[kN]	7.52	10.6	16.5	21.4	32.7	48.5	60.6
SHEAR LOAD V_{rec}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	5.14	8.00	12.0	22.3	34.9	50.3	80.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	8.57	13.1	19.4	36.0	56.0	80.6	128.0
R-STUDS METRIC THREADED RODS - A4	[kN]	5.95	9.16	13.3	25.2	39.4	56.8	89.7

R-HAC-V HAMMER-IN WITH THREADED RODS

DESIGN PERFORMANCE DATA

R-STUDS

Size			M8	M10	M12	M16	M20	M24	M30
Effective embedment depth	h_{ef}	[mm]	80.00	90.00	110.00	125.00	170.00	210.00	270.00
TENSION LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	18.00	29.00	42.00	78.00	122.00	176.00	280.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	29.00	46.00	67.00	126.00	196.00	282.00	448.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance	$N_{Rk,s}$	[kN]	26.00	41.00	59.00	110.00	171.00	247.00	392.00
Partial safety factor	γ_{Ms}	-	1.87	1.87	1.87	1.87	1.87	1.87	1.87
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (40°C/24°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	11.00	11.00	10.00	10.00	9.00	9.00	7.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (80°C/50°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	9.50	9.00	8.50	8.00	7.00	7.00	6.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.40	1.40	1.20	1.40	1.40	1.40	1.40
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.04	1.04	1.04	1.04	1.04	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.09	1.09	1.09	1.09	1.09	1.09	1.09
CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.40	1.40	1.20	1.40	1.40	1.40	1.40
Factor of the influence of sustained load	Ψ^0_{sus}		0.6	0.6	0.6	0.6	0.6	0.6	0.6
Factor for non-cracked concrete	k	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Edge distance	$c_{cr,N}$	[mm]	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$
Spacing	$s_{cr,N}$	[mm]	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$
CONCRETE SPLITTING FAILURE									
Installation safety factor	γ_2	-	1.40	1.40	1.20	1.40	1.40	1.40	1.40
SHEAR LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	9.00	14.00	21.00	39.00	61.00	88.00	140.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	19.00	37.00	65.00	166.00	324.00	561.00	1124.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	15.00	23.00	34.00	63.00	98.00	141.00	224.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	30.00	60.00	105.00	266.00	519.00	898.00	1799.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	13.00	20.00	29.00	55.00	86.00	124.00	196.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	26.00	52.00	92.00	233.00	454.00	786.00	1574.00
Partial safety factor	γ_{Ms}	-	1.56	1.56	1.56	1.56	1.56	1.56	1.56
CONCRETE PRY-OUT FAILURE									
Factor	k	-	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Anchor diameter	d_{nom}	[mm]	8.00	10.00	12.00	16.00	20.00	24.00	30.00
Effective length of anchor	ℓ_f	[mm]	80.00	90.00	110.00	125.00	170.00	210.00	270.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Combined pull-out and concrete cone failure:
(acc. TR 029, p.5.2.2.3. acc. to formula (5.2a) – $N^0_{Rk,p} = \pi*d*h_{ef}*\tau_{Rk}$
acc. EN 1992-4, p.7.2.1.6. acc. to formula (7.14) – $N^0_{Rk,p} = \psi_{sus}*\pi*d*h_{ef}*\tau_{Rk}$ where $\psi_{sus} = \psi^0_{sus}+1-\alpha_{sus} \leq 1$ (7.14a,b)) .
Concrete cone failure:
(acc. TR 029, p.5.2.2.4. acc. to formula (5.3a) – $N^0_{Rk,c} = k_1*f_{ck,cube}{}^{0,5}*hef^{1,5}$
Acc. EN 1992-4, p.7.2.1.4. acc. to formula (7.2) – $N^0_{Rk,c} = k_{ucr,N}*f_{ck}{}^{0,5}*h_{ef}{}^{1,5}$).

RAWLPLUG® | BONDED ANCHORS

R-KEM-II | RM50 WITH THREADED RODS FOR CONCRETE

Universal polyester (styrene free) resin - with Threaded Rods for Concrete

ETA ETA-12/0394

FEATURES AND BENEFITS

- The most convenient bonded anchor for general purpose use
- Quick, secure and simple installation
- Product with wide spectrum of use in the medium load capacity area
- Ideal for applications where mechanical anchors are not suitable
- Easy dosage thanks to patented self-opening system and use of manual or pneumatic gun
- Option of use standard manual silicone gun
- Suitable for multiple use. Partly used product can be reused after fitting new nozzle

APPLICATIONS

- Consoles
- Staircases
- Gates
- High racking
- Canopies
- Sanitary appliances
- Steel constructions
- Railings
- Handrails
- Ladders
- Cable trays

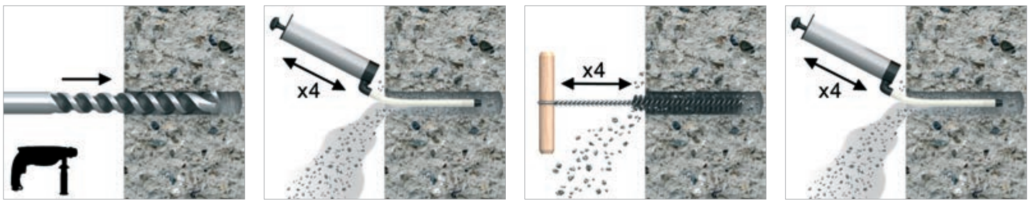
BASE MATERIALS

Approved for use in:
- Non-cracked concrete C20/25-C50/60

Also suitable for use in:
- Natural Stone (after site testing)

INSTALLATION GUIDE

DRILLING AND CLEANING

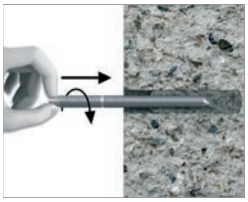


DOZING

R-KEM-II | RM50 WITH THREADED RODS FOR CONCRETE

INSTALLATION GUIDE (cont.)

ANCHORING



1. Drill hole to the required diameter and depth for stud size being used.
2. Solid substrates: clean the drill hole thoroughly with brush and hand pump at least four times before installation.
3. Insert cartridge into gun and attach nozzle.
4. Dispense to waste until even colour is obtained.
5. Insert the mixer nozzle to the bottom of the drill hole and inject resin,
   slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
6. Immediately insert the stud, slowly and with slight twisting motion.
   Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.
7. Attach fixture and tighten the nut to the required torque.

PRODUCT INFORMATION

	Product Code	Resin	Description / Resin Type	Volume [ml]
	R-KEM-II-175	R-KEMII	Styrene Free Polyester Resin	175
	R-KEM-II-300			300
	R-KEM-II-380			380
	R-KEM-II-410			410
	R-KEM-II-175-W	R-KEMII-W	Low Temperature (Winter) / Rapid Cure Styrene Free Polyester Resin	175
	R-KEM-II-300-W			300
	R-KEM-II-175-S	R-KEMII-S	High Temperature (Summer) / Slow Cure Styrene Free Polyester Resin	175
	R-KEM-II-300-S			300
	R-KEM-II-175-SET	R-KEMII	Set with 4 studs and plastic sleeves	175
	R-KEM-II-300-SET			300
	R-KEM-II-300-STONE		Stone colour Styrene Free Polyester Resin	
	R-KEM-II-410-STONE			410
	R-KEM-II-300-GREY		Grey colour Styrene Free Polyester Resin	300
	R-KEM-II-410-GREY			410
	R-CFS+RM50-4	RM50	Styrene Free Polyester Resin	300
	R-CFS+RMS50-4	RM50-S	High Temperature (Summer) / Slow Cure Styrene Free Polyester Resin	
	R-CFS+RM50W-4	RM50-W	Low Temperature (Winter) / Rapid Cure Styrene Free Polyester Resin	
	R-CFS+RM50-600-8	RM50	Styrene Free Polyester Resin	600

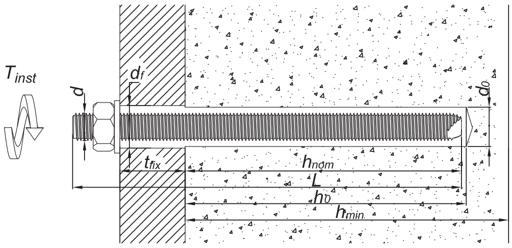
R-STUDS

Size	Product Code: Steel class 5.8	Product Code: Steel class 8.8	Product Code: Steel grade A4	Anchor: Diameter d [mm]	Anchor: Length L [mm]	Fixture: Hole diameter d_f [mm]
M8	R-STUDS-08110	R-STUDS-08110-88	R-STUDS-08110-A4	8	110	9
	R-STUDS-08160	-	R-STUDS-08160-A4	8	160	9
M10	R-STUDS-10130	R-STUDS-10130-88	R-STUDS-10130-A4	10	130	12
	R-STUDS-10170	-	R-STUDS-10170-A4	10	170	12
	R-STUDS-10190	-	R-STUDS-10190-A4	10	190	12
M12	R-STUDS-12160	R-STUDS-12160-88	R-STUDS-12160-A4	12	160	14
	R-STUDS-12190	-	R-STUDS-12190-A4	12	190	14
	R-STUDS-12220	-	R-STUDS-12220-A4	12	220	14
	R-STUDS-12260	-	R-STUDS-12260-A4	12	260	14
	R-STUDS-12300	-	R-STUDS-12300-A4	12	300	14
M16	R-STUDS-16190	R-STUDS-16190-88	R-STUDS-16190-A4	16	190	18
	R-STUDS-16220	-	R-STUDS-16220-A4	16	220	18
	R-STUDS-16260	-	R-STUDS-16260-A4	16	260	18
	R-STUDS-16300	-	R-STUDS-16300-A4	16	300	18
	R-STUDS-16380	-	R-STUDS-16380-A4	16	380	18
M20	R-STUDS-20260	R-STUDS-20260-88	R-STUDS-20260-A4	20	260	22
	R-STUDS-20300	-	R-STUDS-20300-A4	20	300	22
	R-STUDS-20350	-	R-STUDS-20350-A4	20	350	22
M24	R-STUDS-24300	R-STUDS-24300-88	R-STUDS-24300-A4	24	300	26
M30	R-STUDS-30380	R-STUDS-30380-88	R-STUDS-30380-A4	30	380	32

R-KEM-II | RM50 WITH THREADED RODS FOR CONCRETE

INSTALLATION DATA

R-STUDS



Size			M8	M10	M12	M16	M20	M24	M30
Thread diameter	d	[mm]	8	10	12	16	20	24	30
Hole diameter in substrate	d_0	[mm]	10	12	14	18	24	28	35
Hole diameter in fixture	d_f	[mm]	9	12	14	18	22	26	32
Min. hole depth in substrate	h_0	[mm]	$h_{nom}+5$	$h_{nom}+5$	$h_{nom}+5$	$h_{nom}+5$	$h_{nom}+5$	$h_{nom}+5$	$h_{nom}+5$
Min. substrate thickness	h_{min}	[mm]	$h_{nom}+2d_0$	$h_{nom}+2d_0$	$h_{nom}+2d_0$	$h_{nom}+2d_0$	$h_{nom}+2d_0$	$h_{nom}+2d_0$	$h_{nom}+2d_0$
Installation torque	T_{inst}	[Nm]	10	20	40	80	120	180	300
Min. spacing	s_{min}	[mm]	$0.5*h_{nom}\geq 40$	$0.5*h_{nom}\geq 40$	$0.5*h_{nom}\geq 40$	$0.5*h_{nom}\geq 40$	$0.5*h_{nom}\geq 40$	$0.5*h_{nom}\geq 40$	$0.5*h_{nom}\geq 40$
Min. edge distance	c_{min}	[mm]	$0.5*h_{nom}\geq 40$	$0.5*h_{nom}\geq 40$	$0.5*h_{nom}\geq 40$	$0.5*h_{nom}\geq 40$	$0.5*h_{nom}\geq 40$	$0.5*h_{nom}\geq 40$	$0.5*h_{nom}\geq 40$
MINIMUM EMBEDMENT DEPTH									
Min. installation depth	$h_{nom, min}$	[mm]	60	70	80	100	120	140	165
MAXIMUM EMBEDMENT DEPTH									
Min. installation depth	$h_{nom, max}$	[mm]	100	120	145	190	240	290	360

Minimum working and curing time

Resin temperature	Concrete temperature	Working time [min]			Curing time* [min]		
[°C]	[°C]	R-KEMII-S	R-KEMII	R-KEMII-W	R-KEMII-S	R-KEMII	R-KEMII-W
5	-20	-	-	45	-	-	24h
5	-15	-	-	30	-	-	18h
5	-10	-	-	20	-	-	8h
5	-5	3h	70	11	24h	8h	5h
5	0	2h	45	7	18h	4h	2h
5	5	1h	25	5	12h	2h	1h
10	10	45	15	2	8h	90	45
15	15	25	9	1,5	6h	60	30
20	20	15	5	1	4h	45	15
25	30	7	2	-	1.5h	30	-
25	35	6	-	-	1h	-	-
25	40	5	-	-	45	-	-

*For wet concrete the curing time must be doubled

R-KEM-II | RM50 WITH THREADED RODS FOR CONCRETE

MECHANICAL PROPERTIES

R-STUDS

Size			M8	M10	M12	M16	M20	M24	M30
R-STUDS Metric Threaded Rods - Steel Class 5.8									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	500	500	500	500	500	500	500
Nominal yield strength - tension	f_{yk}	[N/mm²]	400	400	400	400	400	400	400
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	19	37	65	166	324	561	1124
Design bending resistance	M	[Nm]	15	30	52	133	259	449	899
Allowable bending resistance	M_{rec}	[Nm]	11	21	37	95	185	321	642
R-STUDS Metric Threaded Rods - Steel Class 8.8									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	800	800	800	800	800	800	800
Nominal yield strength - tension	f_{yk}	[N/mm²]	640	640	640	640	640	640	640
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519	898	1799
Design bending resistance	M	[Nm]	24	48	84	213	416	718	1439
Allowable bending resistance	M_{rec}	[Nm]	17	34	60	152	297	513	1028
R-STUDS Metric Threaded Rods - A4									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	700	700	700	700	700	700	700
Nominal yield strength - tension	f_{yk}	[N/mm²]	350	350	350	350	350	350	350
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	233	454	786	1574
Design bending resistance	M	[Nm]	17	34	59	149	291	504	1009
Allowable bending resistance	M_{rec}	[Nm]	12	24	42	107	208	360	721

BASIC PERFORMANCE DATA

R-STUDS

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M8	M10	M12	M16	M20	M24	M30
Substrate		Non-cracked concrete						
MEAN ULTIMATE LOAD								
TENSION LOAD $N_{Ru,m}$								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8								
Minimum embedment depth	[kN]	18.9	30.5	40.7	63.4	88.7	111.8	143.1
Maximum embedment depth	[kN]	18.9	30.5	44.1	81.9	128.1	184.8	294.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8								
Minimum embedment depth	[kN]	21.1	30.8	40.7	65.4	88.7	111.8	143.1
Maximum embedment depth	[kN]	30.5	48.3	70.4	124.2	196.0	251.5	339.3
R-STUDS METRIC THREADED RODS - A4								
Minimum embedment depth	[kN]	21.1	30.8	40.7	65.4	88.7	111.8	143.1
Maximum embedment depth	[kN]	27.3	43.1	62.0	115.5	179.6	251.5	339.3
SHEAR LOAD $V_{Ru,m}$								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8								
Minimum embedment depth	[kN]	11.3	18.3	26.5	49.1	76.9	110.9	176.4
Maximum embedment depth	[kN]	11.3	18.3	26.5	49.1	76.9	110.9	176.4
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8								
Minimum embedment depth	[kN]	18.3	29.0	42.2	79.4	123.5	177.7	282.9
Maximum embedment depth	[kN]	18.3	29.0	42.2	79.4	123.5	177.7	282.9
R-STUDS METRIC THREADED RODS - A4								
Minimum embedment depth	[kN]	16.4	25.8	37.2	69.3	107.7	155.6	247.6
Maximum embedment depth	[kN]	16.4	25.8	37.2	69.3	107.7	155.6	247.6

R-KEM-II | RM50 WITH THREADED RODS FOR CONCRETE

BASIC PERFORMANCE DATA (cont.)

Size		M8	M10	M12	M16	M20	M24	M30
CHARACTERISTIC LOAD								
TENSION LOAD N_{Rk}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8								
Minimum embedment depth	[kN]	14.3	20.9	27.1	40.2	60.3	68.6	85.5
Maximum embedment depth	[kN]	18.0	29.0	42.0	76.4	120.6	142.1	186.6
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8								
Minimum embedment depth	[kN]	14.3	20.9	27.1	40.2	60.3	68.6	85.5
Maximum embedment depth	[kN]	23.9	35.8	49.2	76.4	120.6	142.1	186.6
R-STUDS METRIC THREADED RODS - A4								
Minimum embedment depth	[kN]	14.3	20.9	27.1	40.2	60.3	68.6	85.5
Maximum embedment depth	[kN]	23.9	35.8	49.2	76.4	120.6	142.1	186.6
SHEAR LOAD V_{Rk}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8								
Minimum embedment depth	[kN]	9.00	14.0	21.0	39.0	61.0	88.0	140.0
Maximum embedment depth	[kN]	9.00	14.0	21.0	39.0	61.0	88.0	140.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8								
Minimum embedment depth	[kN]	15.0	23.0	34.0	63.0	98.0	137.2	171.1
Maximum embedment depth	[kN]	15.0	23.0	34.0	63.0	98.0	141.0	224.0
R-STUDS METRIC THREADED RODS - A4								
Minimum embedment depth	[kN]	13.0	20.0	29.0	55.0	86.0	124.0	171.1
Maximum embedment depth	[kN]	13.0	20.0	29.0	55.0	86.0	124.0	196.0
DESIGN LOAD								
TENSION LOAD N_{Rd}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8								
Minimum embedment depth	[kN]	6.82	11.6	15.1	22.3	33.5	38.1	47.5
Maximum embedment depth	[kN]	11.4	19.3	27.3	42.5	67.0	79.0	103.7
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8								
Minimum embedment depth	[kN]	6.82	11.6	15.1	22.3	33.5	38.1	47.5
Maximum embedment depth	[kN]	11.4	19.9	27.3	42.5	67.0	79.0	103.7
R-STUDS METRIC THREADED RODS - A4								
Minimum embedment depth	[kN]	6.82	11.6	15.1	22.3	33.5	38.1	47.5
Maximum embedment depth	[kN]	11.4	19.9	27.3	42.5	67.0	79.0	103.7
SHEAR LOAD V_{Rd}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8								
Minimum embedment depth	[kN]	7.20	11.2	16.8	31.2	48.8	70.4	112.0
Maximum embedment depth	[kN]	7.20	11.2	16.8	31.2	48.8	70.4	112.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8								
Minimum embedment depth	[kN]	12.0	18.4	27.2	50.4	78.4	91.5	114.0
Maximum embedment depth	[kN]	12.0	18.4	27.2	50.4	78.4	112.8	179.2
R-STUDS METRIC THREADED RODS - A4								
Minimum embedment depth	[kN]	8.33	12.8	18.6	35.3	55.1	79.5	114.0
Maximum embedment depth	[kN]	8.33	12.8	18.6	35.3	55.1	79.5	125.6
RECOMMENDED LOAD								
TENSION LOAD N_{rec}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8								
Minimum embedment depth	[kN]	4.87	8.29	10.8	16.0	23.9	27.2	33.9
Maximum embedment depth	[kN]	8.12	13.8	19.5	30.3	47.9	56.4	74.1
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8								
Minimum embedment depth	[kN]	4.87	8.29	10.8	16.0	23.9	27.2	33.9
Maximum embedment depth	[kN]	8.12	14.2	19.5	30.3	47.9	56.4	74.1
R-STUDS METRIC THREADED RODS - A4								
Minimum embedment depth	[kN]	4.87	8.29	10.8	16.0	23.9	27.2	33.9
Maximum embedment depth	[kN]	8.12	14.2	19.5	30.3	47.9	56.4	74.1
SHEAR LOAD V_{rec}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8								
Minimum embedment depth	[kN]	5.14	8.00	12.0	22.3	34.9	50.3	80.0
Maximum embedment depth	[kN]	5.14	8.00	12.0	22.3	34.9	50.3	80.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8								
Minimum embedment depth	[kN]	8.57	13.1	19.4	36.0	56.0	65.4	81.5
Maximum embedment depth	[kN]	8.57	13.1	19.4	36.0	56.0	80.6	128.0
R-STUDS METRIC THREADED RODS - A4								
Minimum embedment depth	[kN]	5.95	9.16	13.3	25.2	39.4	56.8	81.5
Maximum embedment depth	[kN]	5.95	9.16	13.3	25.2	39.4	56.8	89.7

R-KEM-II | RM50 WITH THREADED RODS FOR CONCRETE

DESIGN PERFORMANCE DATA

Size			M8	M10	M12	M16	M20	M24	M30
TENSION LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	18.00	29.00	42.00	78.00	122.00	176.00	280.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	29.00	46.00	67.00	126.00	196.00	282.00	448.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance	$N_{Rk,s}$	[kN]	26.00	41.00	59.00	110.00	171.00	247.00	392.00
Partial safety factor	γ_{Ms}	-	1.87	1.87	1.87	1.87	1.87	1.87	1.87
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (40°C/24°C)									
Characteristic bond resistance	T_{Rk}	[N/mm²]	9.50	9.50	9.00	8.00	8.00	6.50	5.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (80°C/50°C)									
Characteristic bond resistance	T_{Rk}	[N/mm²]	8.00	8.00	7.50	7.00	6.50	5.00	4.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.40	1.20	1.20	1.20	1.20	1.20	1.20
Factor of the influence of sustained load	Ψ^0_{sus}	-	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.04	1.04	1.04	1.04	1.00	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.07	1.07	1.07	1.07	1.00	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.09	1.09	1.09	1.09	1.00	1.00	1.00
CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.40	1.20	1.20	1.20	1.20	1.20	1.20
Factor for non-cracked concrete	k_1	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Edge distance	$c_{cr,N}$	[mm]	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$
Spacing	$s_{cr,N}$	[mm]	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$
CONCRETE SPLITTING FAILURE									
Installation safety factor	γ_2	-	1.40	1.20	1.20	1.20	1.20	1.20	1.20
SHEAR LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	9.00	14.00	21.00	39.00	61.00	88.00	140.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	19.00	37.00	65.00	166.00	324.00	561.00	1124.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	15.00	23.00	34.00	63.00	98.00	141.00	224.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	30.00	60.00	105.00	266.00	519.00	898.00	1799.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	13.00	20.00	29.00	55.00	86.00	124.00	196.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	26.00	52.00	92.00	233.00	454.00	786.00	1574.00
Partial safety factor	γ_{Ms}	-	1.56	1.56	1.56	1.56	1.56	1.56	1.56
CONCRETE PRY-OUT FAILURE									
Factor	k	-	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Anchor diameter	d_{nom}	[mm]	8.00	10.00	12.00	16.00	20.00	24.00	30.00
Effective length of anchor	ℓ_f	[mm]	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Combined pull-out and concrete cone failure:
(acc. TR 029, p.5.2.2.3. acc. to formula (5.2a) – $N^0_{Rk,p} = \pi*d*h_{ef}*\tau_{Rk}$
acc. EN 1992-4, p.7.2.1.6. acc. to formula (7.14) – $N^0_{Rk,p} = \psi_{sus}*\pi*d*h_{ef}*\tau_{Rk}$ where $\psi_{sus} = \psi^0_{sus}+1-\alpha_{sus} \leq 1$ (7.14a,b)) .
Concrete cone failure:
(acc. TR 029, p.5.2.2.4. acc. to formula (5.3a) – $N^0_{Rk,c} = k_1 *f_{ck,cube}{}^{0,5}*hef^{1,5}$
Acc. EN 1992-4, p.7.2.1.4. acc. to formula (7.2) – $N^0_{Rk,c} = k_{ucr,N}*f_{ck}{}^{0,5}*h_{ef}{}^{1,5}$).

R-KF2 WITH THREADED RODS FOR CONCRETE

Economical polyester resin approved for use in non-cracked concrete

ETA
ETA-11/0141

FEATURES AND BENEFITS

- Economical resin for medium duty load applications
- Can be used in damp condition and underwater applications
- Wide range of steel studs with different lengths and diameters
- Small edge and space distances
- Suitable for repetitive use. Partly used product can be reused by fitting a new mixing nozzle

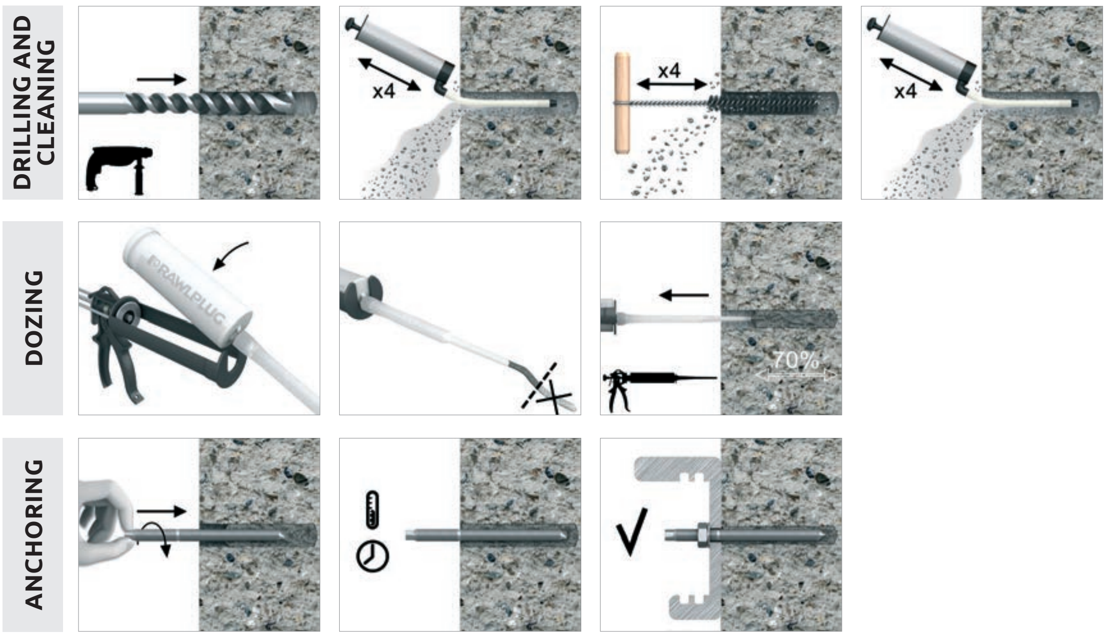
APPLICATIONS

- Guard rails
- Handrails
- Canopies
- Masonry support
- Balustrading
- Cable trays
- Curtain walling
- Fencing & gates manufacturing and installation

BASE MATERIALS

Approved for use in:
- Non-cracked concrete C20/25-C50/60

INSTALLATION GUIDE



1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with brush and hand pump at least four times before installation.
3. Insert cartridge into gun and attach nozzle.
4. Dispense to waste until even colour is obtained.
5. Insert the mixer nozzle to the bottom of the drill hole and inject resin, slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
6. Immediately insert the stud, slowly and with slight twisting motion.
   Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.
7. Attach fixture and tighten the nut to the required torque.

R-KF2 WITH THREADED RODS FOR CONCRETE

PRODUCT INFORMATION

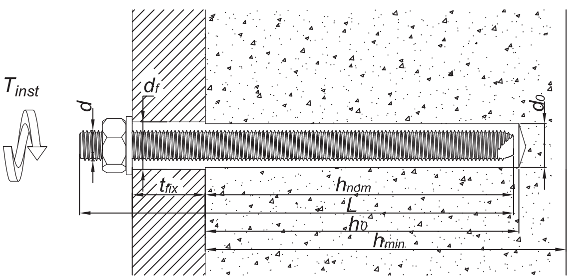
	Product Code	Resin	Description / Resin Type	Volume [ml]
	R-KF2-300	R-KF2	Polyester Resin	300
	R-KF2-380			380
	R-KF2-400			400

R-STUDS

Size	Product Code			Anchor		Fixture		
	Steel class 5.8	Steel class 8.8	Steel grade A4	Diameter d [mm]	Length L [mm]	Hole diameter d_f [mm]	Max. thickness t_{fix} for: $h_{nom, min}$ [mm]	$h_{nom, max}$ [mm]
M8	R-STUDS-08110	R-STUDS-08110-88	R-STUDS-08110-A4	8	110	9	40	-
	R-STUDS-08160	-	R-STUDS-08160-A4	8	160	9	90	50
M10	R-STUDS-10130	R-STUDS-10130-88	R-STUDS-10130-A4	10	130	12	48	-
	R-STUDS-10170	-	R-STUDS-10170-A4	10	170	12	88	38
	R-STUDS-10190	-	R-STUDS-10190-A4	10	190	12	108	58
M12	R-STUDS-12160	R-STUDS-12160-88	R-STUDS-12160-A4	12	160	14	65	-
	R-STUDS-12190	-	R-STUDS-12190-A4	12	190	14	95	30
	R-STUDS-12220	-	R-STUDS-12220-A4	12	220	14	125	60
	R-STUDS-12260	-	R-STUDS-12260-A4	12	260	14	165	100
	R-STUDS-12300	-	R-STUDS-12300-A4	12	300	14	205	140
M16	R-STUDS-16190	R-STUDS-16190-88	R-STUDS-16190-A4	16	190	18	71	-
	R-STUDS-16220	R-STUDS-16220-88	R-STUDS-16220-A4	16	220	18	101	11
	R-STUDS-16260	-	R-STUDS-16260-A4	16	260	18	141	51
	R-STUDS-16300	-	R-STUDS-16300-A4	16	300	18	181	91
	R-STUDS-16380	-	R-STUDS-16380-A4	16	380	18	261	171
M20	R-STUDS-20260	R-STUDS-20260-88	R-STUDS-20260-A4	20	260	22	117	-
	R-STUDS-20300	-	R-STUDS-20300-A4	20	300	22	157	37
	R-STUDS-20350	-	R-STUDS-20350-A4	20	350	22	207	87
M24	R-STUDS-24300	R-STUDS-24300-88	R-STUDS-24300-A4	24	300	26	132	-
M30	R-STUDS-30380	R-STUDS-30380-88	R-STUDS-30380-A4	30	380	32	180	-

INSTALLATION DATA

R-STUDS



Size			M8	M10	M12	M16	M20	M24	M30
Thread diameter	d	[mm]	8	10	12	16	20	24	30
Hole diameter in substrate	d_0	[mm]	10	12	14	18	24	28	35
Hole diameter in fixture	d_f	[mm]	9	12	14	18	22	26	32
Min. hole depth in substrate	h_0	[mm]	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$
Min. substrate thickness	h_{min}	[mm]	$h_{nom} + 30 \geq 100$	$h_{nom} + 30 \geq 100$	$h_{nom} + 30 \geq 100$	$h_{nom} + 30 \geq 100$	$h_{nom} + 2d_0$	$h_{nom} + 2d_0$	$h_{nom} + 2d_0$
Installation torque	T_{inst}	[Nm]	10	20	40	80	120	180	300
Min. spacing	s_{min}	[mm]	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$
Min. edge distance	c_{min}	[mm]	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$	$0.5 * h_{nom} \geq 40$
MINIMUM EMBEDMENT DEPTH									
Min. installation depth	$h_{nom, min}$	[mm]	60	70	80	100	120	140	165
MAXIMUM EMBEDMENT DEPTH									
Min. installation depth	$h_{nom, max}$	[mm]	100	120	145	190	240	290	360

R-KF2 WITH THREADED RODS FOR CONCRETE

INSTALLATION DATA (cont.)

Minimum working and curing time

Resin temperature	Concrete temperature	Curing time*	Working time
[°C]	[°C]	[min]	[min]
5	-5	360	60
5	0	180	40
5	5	120	20
10	10	80	12
15	15	60	8
20	20	45	5
25	30	20	2

*For wet concrete the curing time must be doubled

MECHANICAL PROPERTIES)

Size			M8	M10	M12	M16	M20	M24	M30
R-STUDS Metric Threaded Rods - Steel Class 5.8									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	520	520	520	520	520	520	520
Nominal yield strength - tension	f_{yk}	[N/mm²]	420	420	420	420	420	420	420
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	20	39	68	173	338	583	1166
Design bending resistance	M	[Nm]	11	22	39	99	193	333	666
R-STUDS Metric Threaded Rods - Steel Class 8.8									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	800	800	800	800	800	800	800
Nominal yield strength - tension	f_{yk}	[N/mm²]	640	640	640	640	640	640	640
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519	898	1793
Design bending resistance	M	[Nm]	17	34	60	152	297	513	1025
R-STUDS Metric Threaded Rods - A4									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	700	700	700	700	700	700	700
Nominal yield strength - tension	f_{yk}	[N/mm²]	350	350	350	350	350	350	350
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	233	454	785	1569
Design bending resistance	M	[Nm]	12	24	42	107	208	360	719

BASIC PERFORMANCE DATA

R-STUDS

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M8	M10	M12	M16	M20	M24	M30
Substrate		Non-cracked concrete						
MEAN ULTIMATE LOAD								
TENSION LOAD $N_{Ru,m}$								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8								
Minimum embedment depth	[kN]	18.9	30.5	42.2	65.4	88.7	111.8	143.1
Maximum embedment depth	[kN]	18.9	30.5	44.1	81.9	128.1	184.8	294.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8								
Minimum embedment depth	[kN]	21.1	31.9	42.2	65.4	88.7	111.8	143.1
Maximum embedment depth	[kN]	30.5	48.3	70.4	124.2	196.0	251.5	339.3
R-STUDS METRIC THREADED RODS - A4								
Minimum embedment depth	[kN]	21.1	31.9	42.2	65.4	88.7	111.8	143.1
Maximum embedment depth	[kN]	27.3	43.1	62.0	115.5	179.6	251.5	339.3
SHEAR LOAD $V_{Ru,m}$								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8								
Minimum embedment depth	[kN]	11.3	18.3	26.5	49.1	76.9	110.9	176.4
Maximum embedment depth	[kN]	11.3	18.3	26.5	49.2	76.9	110.9	176.4
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8								
Minimum embedment depth	[kN]	18.3	30.0	42.2	79.4	123.5	177.7	282.9
Maximum embedment depth	[kN]	18.3	30.0	42.2	79.4	123.5	177.7	282.9
R-STUDS METRIC THREADED RODS - A4								
Minimum embedment depth	[kN]	16.4	25.8	37.2	69.3	107.7	155.6	247.6
Maximum embedment depth	[kN]	16.4	25.8	37.2	69.3	107.7	155.6	247.6

R-KF2 WITH THREADED RODS FOR CONCRETE

BASIC PERFORMANCE DATA (cont.)

Size		M8	M10	M12	M16	M20	M24	M30
CHARACTERISTIC LOAD								
TENSION LOAD N_{Rk}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8								
Minimum embedment depth	[kN]	14.3	22.0	28.7	45.2	64.1	73.9	77.8
Maximum embedment depth	[kN]	18.0	29.0	42.0	78.0	122.0	153.1	169.7
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8								
Minimum embedment depth	[kN]	14.3	22.0	28.7	45.2	64.1	73.9	77.8
Maximum embedment depth	[kN]	23.9	37.7	51.9	86.0	128.2	153.1	169.7
R-STUDS METRIC THREADED RODS - A4								
Minimum embedment depth	[kN]	14.3	22.0	28.7	45.2	64.1	73.9	77.8
Maximum embedment depth	[kN]	23.9	37.7	51.9	86.0	128.2	153.1	169.7
SHEAR LOAD V_{Rk}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8								
Minimum embedment depth	[kN]	9.00	14.0	21.0	39.0	61.0	88.0	140.0
Maximum embedment depth	[kN]	9.00	14.0	21.0	39.0	61.0	88.0	140.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8								
Minimum embedment depth	[kN]	15.0	23.0	34.0	63.0	98.0	141.0	155.5
Maximum embedment depth	[kN]	15.0	23.0	34.0	63.0	98.0	141.0	224.0
R-STUDS METRIC THREADED RODS - A4								
Minimum embedment depth	[kN]	13.0	20.0	29.0	55.0	86.0	124.0	155.5
Maximum embedment depth	[kN]	13.0	20.0	29.0	55.0	86.0	124.0	196.0
DESIGN LOAD								
TENSION LOAD N_{Rd}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8								
Minimum embedment depth	[kN]	7.96	12.2	15.9	25.1	35.6	35.2	37.0
Maximum embedment depth	[kN]	12.0	19.3	28.0	47.8	71.2	72.9	80.8
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8								
Minimum embedment depth	[kN]	7.96	12.2	15.9	25.1	35.6	35.2	37.0
Maximum embedment depth	[kN]	13.3	20.9	28.9	47.8	71.2	72.9	80.8
R-STUDS METRIC THREADED RODS - A4								
Minimum embedment depth	[kN]	7.96	12.2	15.9	25.1	35.6	35.2	37.0
Maximum embedment depth	[kN]	13.3	20.9	28.9	47.8	71.2	72.9	80.8
SHEAR LOAD V_{Rd}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8								
Minimum embedment depth	[kN]	7.20	11.2	16.8	31.2	48.8	70.4	103.7
Maximum embedment depth	[kN]	7.20	11.2	16.8	31.2	48.8	70.4	112.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8								
Minimum embedment depth	[kN]	12.0	18.4	27.2	50.4	78.4	98.5	103.7
Maximum embedment depth	[kN]	12.0	18.4	27.2	50.4	78.4	112.8	179.2
R-STUDS METRIC THREADED RODS - A4								
Minimum embedment depth	[kN]	8.33	12.8	18.6	35.3	55.1	79.5	103.7
Maximum embedment depth	[kN]	8.33	12.8	18.6	35.3	55.1	79.5	125.6
RECOMMENDED LOAD								
TENSION LOAD N_{rec}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8								
Minimum embedment depth	[kN]	5.68	8.73	11.4	18.0	25.4	25.1	26.5
Maximum embedment depth	[kN]	8.57	13.8	20.0	34.1	50.9	52.1	57.7
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8								
Minimum embedment depth	[kN]	5.68	8.73	11.4	18.0	25.4	25.1	26.5
Maximum embedment depth	[kN]	9.47	15.0	20.6	34.1	50.9	52.1	57.7
R-STUDS METRIC THREADED RODS - A4								
Minimum embedment depth	[kN]	5.68	8.73	11.4	18.0	25.4	25.1	26.5
Maximum embedment depth	[kN]	9.47	15.0	20.6	34.1	50.9	52.1	57.7
SHEAR LOAD V_{rec}								
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8								
Minimum embedment depth	[kN]	5.14	8.00	12.0	22.3	34.9	50.3	74.1
Maximum embedment depth	[kN]	5.14	8.00	12.0	22.3	34.9	50.3	80.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8								
Minimum embedment depth	[kN]	8.57	13.1	19.4	36.0	56.0	70.4	74.1
Maximum embedment depth	[kN]	8.57	13.1	19.4	36.0	56.0	80.6	128.0
R-STUDS METRIC THREADED RODS - A4								
Minimum embedment depth	[kN]	5.95	9.16	13.3	25.2	39.4	56.8	74.1
Maximum embedment depth	[kN]	5.95	9.16	13.3	25.2	39.4	56.8	89.7

R-KF2 WITH THREADED RODS FOR CONCRETE

DESIGN PERFORMANCE DATA

R-STUDS

Size			M8	M10	M12	M16	M20	M24	M30
TENSION LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	18.00	29.00	42.00	78.00	122.00	176.00	280.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	29.00	46.00	67.00	126.00	196.00	282.00	448.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance	$N_{Rk,s}$	[kN]	26.00	41.00	59.00	110.00	171.00	247.00	392.00
Partial safety factor	γ_{Ms}	-	1.87	1.87	1.87	1.87	1.87	1.87	1.87
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (40°C/24°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	9.50	10.00	9.50	9.00	8.50	7.00	5.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (80°C/50°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	8.50	9.00	8.50	8.00	7.50	6.00	4.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.40	1.40
Factor of the influence of sustained load	ψ^0_{sus}	-	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Increasing factors for $N_{Rd,p}$ - C30/37	ψ_c	-	1.11	1.08	1.08	1.08	1.08	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C40/50	ψ_c	-	1.15	1.15	1.15	1.15	1.15	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C50/60	ψ_c	-	1.19	1.19	1.19	1.19	1.19	1.00	1.00
CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.40	1.40
Factor for non-cracked concrete	k_1	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Edge distance	$c_{cr,N}$	[mm]	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$
Spacing	$s_{cr,N}$	[mm]	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$
CONCRETE SPLITTING FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.40	1.40
SHEAR LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	9.00	14.00	21.00	39.00	61.00	88.00	140.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	19.00	37.00	65.00	166.00	324.00	561.00	1124.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	15.00	23.00	34.00	63.00	98.00	141.00	224.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	30.00	60.00	105.00	266.00	519.00	898.00	1799.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	13.00	20.00	29.00	55.00	86.00	124.00	196.00
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	26.00	52.00	92.00	233.00	454.00	786.00	1574.00
Partial safety factor	γ_{Ms}	-	1.56	1.56	1.56	1.56	1.56	1.56	1.56
CONCRETE PRY-OUT FAILURE									
Factor	k	-	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Anchor diameter	d_{nom}	[mm]	8.00	10.00	12.00	16.00	20.00	24.00	30.00
Effective length of anchor	ℓ_f	[mm]	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Combined pull-out and concrete cone failure:
(acc. TR 029, p.5.2.2.3. acc. to formula (5.2a) – $N^0_{Rk,p} = \pi*d*h_{ef}*\tau_{Rk}$
acc. EN 1992-4, p.7.2.1.6. acc. to formula (7.14) – $N^0_{Rk,p} = \psi_{sus}*\pi*d*h_{ef}*\tau_{Rk}$ where $\psi_{sus} = \psi^0_{sus}+1-\alpha_{sus} \leq 1$ (7.14a,b)) .
Concrete cone failure:
(acc. TR 029, p.5.2.2.4. acc. to formula (5.3a) – $N^0_{Rk,c} = k_1 *f_{ck,cube}{}^{0,5}*hef^{1,5}$
Acc. EN 1992-4, p.7.2.1.4. acc. to formula (7.2) – $N^0_{Rk,c} = k_{ucr,N} *f_{ck}{}^{0,5}*h_{ef}{}^{1,5}$).

R-KEX-II WITH SOCKETS

Premium pure epoxy resin approved for use with internally threaded sockets

ETA ETA-13/0455 CE

FEATURES AND BENEFITS

- Allows removal of bolt to leave a re-usable socket in place
- Approved for use with sockets (ITS) for use in non-cracked concrete (EAD 330499-00-0601)
- Suitable for use in dry and wet substrates including flooded holes (use category I1 & I2)
- Very high chemical resistance – suitable for applications exposed to influence of various agents (industrial or marine environment)
- Extended working time ensures easy installation of metal components (up to 30 min. in 20°C)
- For use in positive temperatures

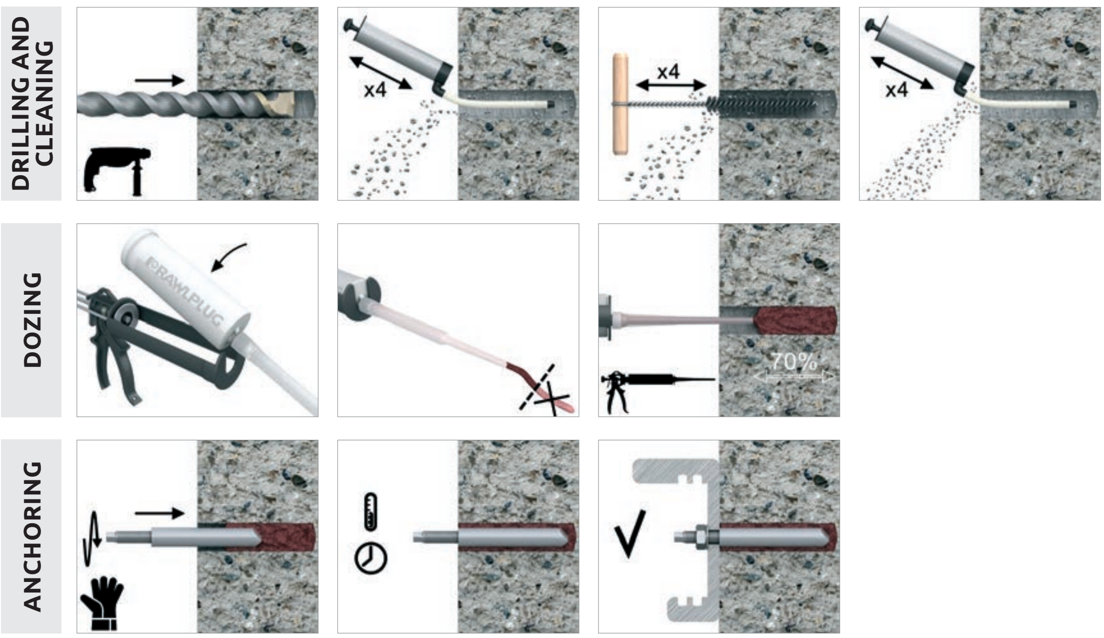
APPLICATIONS

- Safety barriers
- Temporary works/formworks support systems
- Balustrading
- Barriers
- Cladding restraints
- Masonry support
- Heavy machinery
- Platforms
- Structural steelwork

BASE MATERIALS

- Approved for use in: Non-cracked concrete C20/25-C50/60

INSTALLATION GUIDE



R-KEX-II WITH SOCKETS

INSTALLATION GUIDE (cont.)

1. Drill hole to the required diameter and depth for socket size being used.
2. Clean the hole thoroughly with brush and hand pump at least four times before installation.
3. Insert cartridge into gun and attach nozzle.
4. Dispense to waste until even colour is obtained.
5. Insert the mixing nozzle to the far end of the hole and inject resin,
   slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
6. Immediately insert the socket, slowly and with slight twisting motion.
   Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.
7. Attach fixture and tighten the bolt to the required torque.

PRODUCT INFORMATION

Product Code	Resin	Description / Resin Type	Volume
			[ml]
R-KEX-II-385	R-KEX II	Epoxy Resin	385
R-KEX-II-600			600

SOCKETS

Size	Product Code		Anchor			Fixture
	Steel class 5.8	Steel grade A4	Socket diameter	Length	Internal thread length	Hole diameter
			d	L	l_g	d_f
			[mm]	[mm]	[mm]	[mm]
M6	R-ITS-Z-06075	R-ITS-A4-06075	10	75	24	7
M8	R-ITS-Z-08075	R-ITS-A4-08075	12	75	25	9
	R-ITS-Z-08090	R-ITS-A4-08090	12	90	25	9
M10	R-ITS-Z-10075	R-ITS-A4-10075	16	75	30	12
	R-ITS-Z-10100	R-ITS-A4-10100	16	100	30	12
M12	R-ITS-Z-12100	R-ITS-A4-12100	16	100	35	14
M16	R-ITS-Z-16125	R-ITS-A4-16125	24	125	50	18

INSTALLATION DATA

SOCKETS

Size			M6	M8		M10		M12	M16
Min. installation depth	h_{nom}	[mm]	75	75	90	75	100	100	125
Thread diameter	d	[mm]	6	8	8	10	10	12	16
Hole diameter in substrate	d_0	[mm]	12	14	14	20	20	20	28
Hole diameter in fixture	d_f	[mm]	7	9	9	12	12	14	18
Thread engagement length	h_s	[mm]	24	25	25	30	30	35	50
Min. hole depth in substrate	h_0	[mm]	80	80	95	80	105	105	130
Min. substrate thickness	h_{min}	[mm]	105	105	120	115	140	140	181
Installation torque	T_{inst}	[Nm]	3	5	5	10	10	20	40
Min. spacing	s_{min}	[mm]	40	40	50	40	50	50	70
Min. edge distance	c_{min}	[mm]	40	40	50	40	50	50	70

Minimum working and curing time

Resin temperature	Concrete temperature	Curing time*	Working time
[°C]	[°C]	[min]	[min]
5	5	150	2880
10	10	120	1080
20	20	35	480
25	30	12	300

R-KEX-II WITH SOCKETS

MECHANICAL PROPERTIES

Size			M6	M8	M10	M12	M16
R-ITS-Z Internally Threaded Sockets							
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	520	500	500	500	500
Nominal yield strength - tension	f_{yk}	[N/mm²]	420	400	400	400	400
Cross sectional area - tension	A_s	[mm²]	20.1	36.6	58	84.3	157
Elastic section modulus	W_{el}	[mm³]	21.21	50.3	98.2	169.7	402.1
R-ITS-A4 Internally Threaded Sockets							
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	700	700	700	700	700
Nominal yield strength - tension	f_{yk}	[N/mm²]	350	350	350	350	350
Cross sectional area - tension	A_s	[mm²]	20.1	36.6	58	84.3	157
Elastic section modulus	W_{el}	[mm³]	21.21	50.3	98.2	169.7	402.1
Metric Threaded Rods - Steel Class 5.8							
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	8	19	37	65	166
Design bending resistance	M	[Nm]	6	15	30	52	133
Allowable bending resistance	M_{rec}	[Nm]	5	11	21	37	95
Metric Threaded Rods - Steel Class 8.8							
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12	30	60	105	266
Design bending resistance	M	[Nm]	10	24	48	84	213
Allowable bending resistance	M_{rec}	[Nm]	7	17	34	60	152
Metric Threaded Rods - A4							
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	11	26	52	92	233
Design bending resistance	M	[Nm]	7	17	34	59	149
Allowable bending resistance	M_{rec}	[Nm]	5	12	24	42	107

BASIC PERFORMANCE DATA

SOCKETS

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M6	M8		M10		M12	M16
Substrate		Non-cracked concrete						
Effective embedment depth h_{ef}	[mm]	75.0		90.0	75.0	100.0		125.0
MEAN ULTIMATE LOAD								
TENSION LOAD $N_{Ru,m}$								
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	12.5	21.6	21.6	34.8	34.8	50.4	93.6
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	19.2	34.8	34.8	50.6	55.2	77.9	108.9
METRIC THREADED RODS - A4	[kN]	16.8	31.2	31.2	49.2	49.2	70.9	108.9
SHEAR LOAD $V_{Ru,m}$								
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	6.00	10.8	10.8	16.8	16.8	25.2	46.8
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	9.60	18.0	18.0	27.6	27.6	40.8	75.6
METRIC THREADED RODS - A4	[kN]	8.40	15.6	15.6	24.0	24.0	34.8	66.0
CHARACTERISTIC LOAD								
TENSION LOAD N_{Rk}								
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	10.00	18.0	18.0	29.0	29.0	42.0	70.6
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	16.0	29.0	29.0	32.8	46.0	50.5	70.6
METRIC THREADED RODS - A4	[kN]	14.0	26.0	26.0	32.8	41.0	50.5	70.6
SHEAR LOAD V_{Rk}								
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	5.00	9.00	9.00	14.0	14.0	21.0	39.0
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	8.00	15.0	15.0	23.0	23.0	34.0	63.0
METRIC THREADED RODS - A4	[kN]	7.00	13.0	13.0	20.0	20.0	29.0	55.0
DESIGN LOAD								
TENSION LOAD N_{Rd}								
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	6.67	12.0	12.0	18.2	19.3	28.0	39.2
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	10.5	18.2	19.3	18.2	28.1	28.1	39.2
METRIC THREADED RODS - A4	[kN]	7.49	13.9	13.9	18.2	21.9	28.1	39.2
SHEAR LOAD V_{Rd}								
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	4.00	7.20	7.20	11.2	11.2	16.8	31.2
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	6.40	12.0	12.0	18.4	18.4	27.2	50.4
METRIC THREADED RODS - A4	[kN]	4.49	8.33	8.33	12.8	12.8	18.6	35.3
RECOMMENDED LOAD								
TENSION LOAD N_{rec}								
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	4.76	8.57	8.57	13.0	13.8	20.0	28.0
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	7.50	13.0	13.8	13.0	20.1	20.0	28.0
METRIC THREADED RODS - A4	[kN]	5.35	9.93	9.93	13.0	15.6	20.0	28.0
SHEAR LOAD V_{rec}								
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	2.86	5.14	5.14	8.00	8.00	12.0	22.3
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	4.57	8.57	8.57	13.1	13.1	19.4	36.0
METRIC THREADED RODS - A4	[kN]	3.21	5.95	5.95	9.16	9.16	13.3	25.2

R-KEX-II WITH SOCKETS

DESIGN PERFORMANCE DATA

SOCKETS

Size			M6	M8		M10		M12	M16
Effective embedment depth	h_{ef}	[mm]	75.00	75.00	90.00	75.00	100.00	100.00	125.00
TENSION LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	10.00	18.00	18.00	29.00	29.00	42.00	78.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	16.00	29.00	29.00	46.00	46.00	67.00	125.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance	$N_{Rk,s}$	[kN]	14.00	25.00	25.00	40.00	40.00	59.00	109.00
Partial safety factor	γ_{Ms}	-	1.87	1.87	1.87	1.87	1.87	1.87	1.87
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (40°C/24°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	8.00	12.00	12.00	12.00	12.00	11.00	10.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (80°C/50°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	7.50	11.00	11.00	11.00	11.00	10.00	9.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Factor of the influence of sustained load	ψ^0_{sus}	-	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Increasing factors for $N_{Rd,p}$ - C30/37	ψ_c	-	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Increasing factors for $N_{Rd,p}$ - C40/50	ψ_c	-	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Increasing factors for $N_{Rd,p}$ - C50/60	ψ_c	-	1.09	1.09	1.09	1.09	1.09	1.09	1.09
CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Factor for non-cracked concrete	k_1	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Edge distance	$c_{cr,N}$	[mm]	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$
Spacing	$s_{cr,N}$	[mm]	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$
CONCRETE SPLITTING FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20
SHEAR LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.00	9.20	9.20	14.50	14.50	21.10	39.30
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	7.60	18.70	18.70	37.40	37.40	65.50	166.50
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	8.00	14.60	14.60	23.20	23.20	33.70	62.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	12.20	30.00	30.00	59.80	59.80	104.80	266.40
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	7.00	12.80	12.80	20.30	20.30	29.50	55.00
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	10.70	26.20	26.20	52.30	52.30	91.70	233.10
Partial safety factor	γ_{Ms}	-	1.56	1.56	1.56	1.56	1.56	1.56	1.56
CONCRETE PRY-OUT FAILURE									
Factor	k	-	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Anchor diameter	d_{nom}	[mm]	10.00	12.00	12.00	16.00	16.00	16.00	24.00
Effective length of anchor	ℓ_f	[mm]	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Combined pull-out and concrete cone failure:
(acc. TR 029, p.5.2.2.3. acc. to formula (5.2a) – $N^0_{Rk,p} = \pi*d*h_{ef}*\tau_{Rk}$
acc. EN 1992-4, p.7.2.1.6. acc. to formula (7.14) – $N^0_{Rk,p} = \psi_{sus}*\pi*d*h_{ef}*\tau_{Rk}$ where $\psi_{sus} = \psi^0_{sus}+1-\alpha_{sus} \leq 1$ (7.14a,b)) .
Concrete cone failure:
(acc. TR 029, p.5.2.2.4. acc. to formula (5.3a) – $N^0_{Rk,c} = k_1*f_{ck,cube}{}^{0,5}*hef^{1,5}$
Acc. EN 1992-4, p.7.2.1.4. acc. to formula (7.2) – $N^0_{Rk,c} = k_{ucr,N}*f_{ck}{}^{0,5}*h_{ef}{}^{1,5}$).

R-KER-II | R-CFS+KER-II WITH THREADED RODS FOR CONCRETE

High strength and versatile application in cracked and non-cracked concrete with internally threaded sockets (ITS)

ETA ETA-17/0594 CE

FEATURES AND BENEFITS

- Approved for use in cracked and non-cracked concrete
- Allows removal of bolt to leave a re-usable socket in place
- Winter version can be used in warmer temperatures for faster curing
- Suitable for use in dry and wet substrates as well as holes and substrates covered with water
- Rapid bonding time enables quick execution of works
- Very high load capacity
- Anchor does not generate tensions in the substrate which enables R-KER to be specified where closer edge and spacing distances are required

APPLICATIONS

- Curtain walling
- Balustrading
- Handrails
- Canopies

BASE MATERIALS

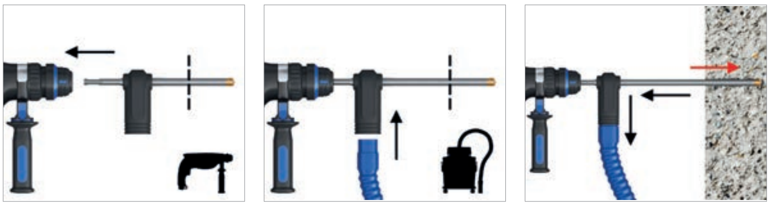
Approved for use in:

- Non-cracked concrete C20/25-C50/60
- Cracked concrete C20/25-C50/60

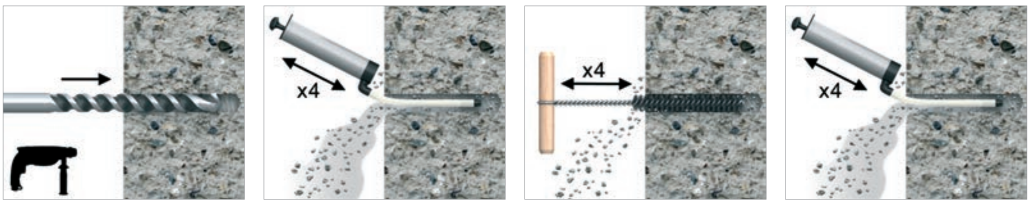
INSTALLATION GUIDE

DRILLING AND CLEANING

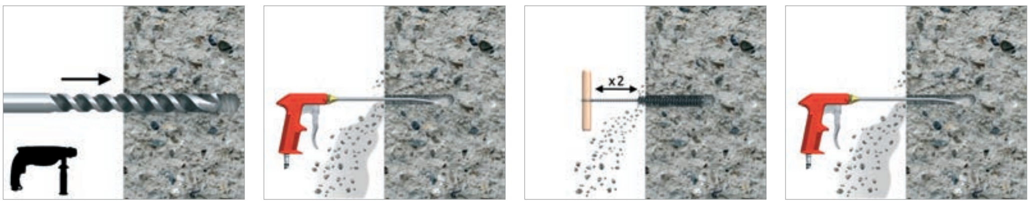
Drilling with automatic cleaning with the hollow Dustlessdrill bit



Drilling with automatic cleaning with the hollow Dustlessdrill bit



Cleaning with compressed air (2x, 2x, 2x)



R-KER-II | R-CFS+KER-II

WITH THREADED RODS
FOR CONCRETE

1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with brush and hand pump at least four times before installation.
3. Insert cartridge into gun and attach nozzle.
4. Dispense to waste until even colour is obtained (min. 10 cm).
5. Insert the mixer nozzle to the bottom of the drill hole and inject resin,
   slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
6. Immediately insert the stud, slowly and with slight twisting motion.
   Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.
7. Attach fixture and tighten the nut to the required torque.

PRODUCT INFORMATION

	Product Code	Resin	Description / Resin Type	Volume [ml]
	R-KER-II-300	R-KER-II	R-KER II Hybrid Resin	300
	R-KER-II-345			345
	R-KER-II-400			400
	R-KER-II-300-S	R-KER-II-S	R-KER II Hybrid Resin for High Temperature (Summer) / Slow Cure Styrene Free Hybrid Resin	300
	R-KER-II-400-S			400
	R-KER-II-300-W	R-KER-II-W	R-KER II Hybrid Resin for Low Temperature (Winter) / Rapid Cure Styrene Free Hybrid Resin	300
	R-KER-II-345-W			345
	R-KER-II-400-W			400
	R-CFS+KERII-300	R-KER-II	R-KER II Hybrid Resin	300
	R-CFS+KERII-600			600
	R-CFS+KERII-300-S	R-KER-II-S	R-KER II Hybrid Resin for High Temperature (Summer) / Slow Cure Styrene Free Hybrid Resin	300
	R-CFS+KERII-600-S			600
	R-CFS+KERII-300-W	R-KER-II-W	R-KER II Hybrid Resin for Low Temperature (Winter) / Rapid Cure Styrene Free Hybrid Resin	300
	R-CFS+KERII-600-W			600

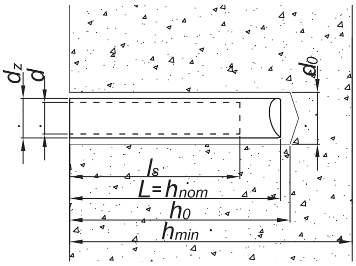
SOCKETS

Size	Product Code		Anchor			Fixture
	Steel class 5.8	Steel grade A4	Socket diameter d [mm]	Length L [mm]	Internal thread length l_g [mm]	Hole diameter d_f [mm]
M6	R-ITS-Z-06075	R-ITS-A4-06075	10	75	24	7
M8	R-ITS-Z-08075	R-ITS-A4-08075	12	75	25	9
	R-ITS-Z-08090	R-ITS-A4-08090	12	90	25	9
M10	R-ITS-Z-10075	R-ITS-A4-10075	16	75	30	12
	R-ITS-Z-10100	R-ITS-A4-10100	16	100	30	12
M12	R-ITS-Z-12100	R-ITS-A4-12100	16	100	35	14
M16	R-ITS-Z-16125	R-ITS-A4-16125	24	125	50	18

R-KER-II | R-CFS+KER-II WITH THREADED RODS FOR CONCRETE

INSTALLATION DATA

SOCKETS



Size			M6	M8		M10		M12	M16
Min. installation depth	h_{nom}	[mm]	75	75	90	75	100	100	125
Thread diameter	d	[mm]	6	8	8	10	10	12	16
Hole diameter in substrate	d_0	[mm]	12	14	14	20	20	20	28
Hole diameter in fixture	d_f	[mm]	7	9	9	12	12	14	18
Thread engagement length	h_s	[mm]	24	25	25	30	30	35	50
Min. hole depth in substrate	h_0	[mm]	80	80	95	80	105	105	130
Min. substrate thickness	h_{min}	[mm]	105	105	120	115	140	140	181
Installation torque	T_{inst}	[Nm]	3	5	5	10	10	20	40
Min. spacing	s_{min}	[mm]	40	40	50	40	50	50	70
Min. edge distance	c_{min}	[mm]	40	40	50	40	50	50	70

Minimum working and curing time

Resin temperature	Concrete temperature	Working time [min]			Curing time* [min.]		
°C	°C	R-KER-II S	R-KER-II	R-KER-II W	R-KER-II S	R-KER-II	R-KER-II W
5	-20	-	-	1440	-	-	80
5	-15	-	-	960	-	-	60
5	-10	-	-	480	-	-	40
5	-5		1440	240	-	40	20
5	0	-	180	120	-	30	14
5	5	720	90	60	40	15	9
10	10	480	60	45	20	8	5.5
15	15	360	60	30	15	5	3
20	20	240	45	15	10	2.5	2
25	25	180	45	10	9.5	2	1.5
25	30	120	45	10	7	2	1.5
25	35	120	30	5	6.5	1.5	1
25	40	90	30	5	6.5	1.5	1

*For wet concrete the curing time must be doubled

MECHANICAL PROPERTIES

Size			M6	M8	M10	M12	M16
R-ITS-Z Internally Threaded Sockets							
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	520	500	500	500	500
Nominal yield strength - tension	f_{yk}	[N/mm²]	420	400	400	400	400
Cross sectional area - tension	A_s	[mm²]	20.1	36.6	58	84.3	157
Elastic section modulus	W_{el}	[mm³]	21.21	50.3	98.2	169.7	402.1
R-ITS-A4 Internally Threaded Sockets							
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	700	700	700	700	700
Nominal yield strength - tension	f_{yk}	[N/mm²]	350	350	350	350	350
Cross sectional area - tension	A_s	[mm²]	20.1	36.6	58	84.3	157
Elastic section modulus	W_{el}	[mm³]	21.21	50.3	98.2	169.7	402.1
Metric Threaded Rods - Steel Class 5.8							
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	8	19	37	65	166
Design bending resistance	M	[Nm]	6	15	30	52	133
Allowable bending resistance	M_{rec}	[Nm]	5	11	21	37	95
Metric Threaded Rods - Steel Class 8.8							
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12	30	60	105	266
Design bending resistance	M	[Nm]	10	24	48	84	213
Allowable bending resistance	M_{rec}	[Nm]	7	17	34	60	152
Metric Threaded Rods - A4							
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	11	26	52	92	233
Design bending resistance	M	[Nm]	7	17	34	59	149
Allowable bending resistance	M_{rec}	[Nm]	5	12	24	42	107

R-KER-II | R-CFS+KER-II WITH THREADED RODS FOR CONCRETE

BASIC PERFORMANCE DATA

SOCKETS

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M6	M8		M10		M12	M16	M6	M8		M10		M12	M16
Substrate		Non-cracked concrete							Cracked concrete						
Effective embedment depth h_{ef}	[mm]	75.0		90.0	75.0	100.0		125.0	75.0		90.0	75.0	100.0		125.0
MEAN ULTIMATE LOAD															
TENSION LOAD $N_{Ru,m}$															
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	12.5	21.6	21.6	34.8	34.8	50.4	100.1	12.5	21.6	21.6	28.1	34.8	43.2	45.2
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	19.2	34.8	34.8	39.4	55.2	60.6	100.1	19.2	28.1	34.8	28.1	43.2	43.2	45.2
METRIC THREADED RODS - A4	[kN]	16.8	31.2	31.2	39.4	49.2	60.6	100.1	16.8	28.1	31.2	28.1	43.2	43.2	45.2
SHEAR LOAD $V_{Ru,m}$															
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	6.00	10.8	10.8	16.8	16.8	25.2	46.8	6.00	10.8	10.8	16.8	16.8	25.2	46.8
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	9.60	18.0	18.0	27.6	27.6	40.8	75.6	9.60	18.0	18.0	27.6	27.6	40.8	75.6
METRIC THREADED RODS - A4	[kN]	8.40	15.6	15.6	24.0	24.0	34.8	66.0	8.40	15.6	15.6	24.0	24.0	34.8	66.0
CHARACTERISTIC LOAD															
TENSION LOAD N_{Rk}															
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	10.00	18.0	18.0	29.0	29.0	42.0	70.6	10.00	18.0	18.0	23.4	29.0	36.0	37.7
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	16.0	29.0	29.0	32.8	46.0	50.5	70.6	16.0	23.4	29.0	23.4	36.0	36.0	37.7
METRIC THREADED RODS - A4	[kN]	14.0	25.0	25.0	32.8	40.0	50.5	70.6	14.0	23.4	25.0	23.4	36.0	36.0	37.7
SHEAR LOAD V_{Rk}															
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	5.00	9.00	9.00	14.5	14.5	21.0	39.0	5.00	9.00	9.00	14.5	14.5	21.0	39.0
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	8.00	14.5	14.5	23.0	23.0	33.5	62.5	8.00	14.5	14.5	23.0	23.0	33.5	62.5
METRIC THREADED RODS - A4	[kN]	7.00	12.5	12.5	20.0	20.0	29.5	54.5	7.00	12.5	12.5	20.0	20.0	29.5	54.5
DESIGN LOAD															
TENSION LOAD N_{Rd}															
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	6.67	12.0	12.0	19.3	19.3	28.0	47.1	6.67	12.0	12.0	15.6	19.3	24.0	25.1
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	10.7	19.3	19.3	21.9	30.7	33.7	47.1	10.7	15.6	19.3	15.6	24.0	24.0	25.1
METRIC THREADED RODS - A4	[kN]	7.49	13.4	13.4	21.4	21.4	32.6	47.1	7.49	13.4	13.4	15.6	21.4	24.0	25.1
SHEAR LOAD V_{Rd}															
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	4.00	7.20	7.20	11.6	11.6	16.8	31.2	4.00	7.20	7.20	11.6	11.6	16.8	31.2
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	6.40	11.6	11.6	18.4	18.4	26.8	50.0	6.40	11.6	11.6	18.4	18.4	26.8	50.0
METRIC THREADED RODS - A4	[kN]	4.49	8.01	8.01	12.8	12.8	18.9	34.9	4.49	8.01	8.01	12.8	12.8	18.9	34.9
RECOMMENDED LOAD															
TENSION LOAD N_{rec}															
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	4.76	8.57	8.57	13.8	13.8	20.0	33.6	4.76	8.57	8.57	11.1	13.8	17.1	18.0
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	7.62	13.8	13.8	15.6	21.9	24.1	33.6	7.62	11.1	13.8	11.1	17.1	17.1	20.0
METRIC THREADED RODS - A4	[kN]	5.35	9.55	9.55	15.3	15.3	22.5	33.6	5.35	9.55	9.55	11.1	15.3	17.1	18.0
SHEAR LOAD V_{rec}															
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	2.86	5.14	5.14	8.29	8.29	12.0	22.3	2.86	5.14	5.14	8.29	8.29	12.0	22.3
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	4.57	8.29	8.29	13.1	13.1	19.1	35.7	4.57	8.29	8.29	13.1	13.1	19.1	35.7
METRIC THREADED RODS - A4	[kN]	3.21	5.72	5.72	9.16	9.16	13.5	25.0	3.21	5.72	5.72	9.16	9.16	13.5	25.0

DESIGN PERFORMANCE DATA

SOCKETS

Size			M6	M8		M10		M12	M16
Effective embedment depth	h_{ef}	[mm]	75.00	75.00	90.00	75.00	100.00	100.00	125.00
TENSION LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	10.00	18.00	18.00	29.00	29.00	42.00	78.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	16.00	29.00	29.00	46.00	46.00	67.00	125.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance	$N_{Rk,s}$	[kN]	14.00	25.00	25.00	40.00	40.00	59.00	109.00
Partial safety factor	γ_{Ms}	-	1.87	1.87	1.87	1.87	1.87	1.87	1.87
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (40°C/24°C)									
Characteristic bond resistance	T_{Rk}	[N/mm²]	11.00	14.00	14.00	11.00	11.00	11.00	8.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (80°C/50°C)									
Characteristic bond resistance	T_{Rk}	[N/mm²]	11.00	14.00	14.00	11.00	11.00	11.00	8.00

R-KER-II | R-CFS+KER-II WITH THREADED RODS FOR CONCRETE

DESIGN PERFORMANCE DATA (cont.)

Size			M6	M8		M10		M12	M16
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (120°C/80°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	6.00	7.00	7.00	6.00	6.00	6.00	4.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (40°C/24°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	10.00	10.00	10.00	9.50	9.50	9.00	4.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (80°C/50°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	10.00	10.00	10.00	9.50	9.50	9.00	4.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (120°C/80°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	5.00	6.00	6.00	5.00	5.00	5.00	2.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Factor of the influence of sustained load	ψ^0_{sus}		0.6	0.6	0.6	0.6	0.6	0.6	0.6
Increasing factors for $N_{Rd,p}$ - C30/37	ψ_c	-	1.04	1.04	1.04	1.04	1.04	1.04	1.00
Increasing factors for $N_{Rd,p}$ - C40/50	ψ_c	-	1.07	1.07	1.07	1.07	1.07	1.07	1.00
Increasing factors for $N_{Rd,p}$ - C50/60	ψ_c	-	1.09	1.09	1.09	1.09	1.09	1.09	1.00
CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Factor for cracked concrete	k_1	-	7.20	7.20	7.20	7.20	7.20	7.20	7.20
Factor for cracked concrete	$k_{cr,N}$	-	7.70	7.70	7.70	7.70	7.70	7.70	7.70
Factor for non-cracked concrete	k_1	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Edge distance	$c_{cr,N}$	[mm]	$1.5{*}h_{ef}$	$1.5{*}h_{ef}$	$1.5{*}h_{ef}$	$1.5{*}h_{ef}$	$1.5{*}h_{ef}$	$1.5{*}h_{ef}$	$1.5{*}h_{ef}$
Spacing	$s_{cr,N}$	[mm]	$3.0{*}h_{ef}$	$3.0{*}h_{ef}$	$3.0{*}h_{ef}$	$3.0{*}h_{ef}$	$3.0{*}h_{ef}$	$3.0{*}h_{ef}$	$3.0{*}h_{ef}$
CONCRETE SPLITTING FAILURE									
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SHEAR LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.00	9.20	9.20	14.50	14.50	21.10	39.30
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	7.60	18.70	18.70	37.40	37.40	65.50	166.50
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	8.00	14.60	14.60	23.20	23.20	33.70	62.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	12.20	30.00	30.00	59.80	59.80	104.80	266.40
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	7.00	12.80	12.80	20.30	20.30	29.50	55.00
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	10.70	26.20	26.20	52.30	52.30	91.70	233.10
Partial safety factor	γ_{Ms}	-	1.56	1.56	1.56	1.56	1.56	1.56	1.56
CONCRETE PRY-OUT FAILURE									
Factor	k	-	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Anchor diameter	d_{nom}	[mm]	10.00	12.00	12.00	16.00	16.00	16.00	24.00
Effective length of anchor	ℓ_f	[mm]	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Combined pull-out and concrete cone failure:
(acc. TR 029, p.5.2.2.3. acc. to formula (5.2a) – $N^0_{Rk,p} = \pi{*}d{*}h_{ef}{*}\tau_{Rk}$
acc. EN 1992-4, p.7.2.1.6. acc. to formula (7.14) – $N^0_{Rk,p} = \psi_{sus}{*}\pi{*}d{*}h_{ef}{*}\tau_{Rk}$ where $\psi_{sus} = \psi^0_{sus}+1-\alpha_{sus}\leq 1$ (7.14a,b)) .
Concrete cone failure:
(acc. TR 029, p.5.2.2.4. acc. to formula (5.3a) – $N^0_{Rk,c} = k_1{*}f_{ck,cube}^{\ 0,5}{*}hef^{\ 1,5}$
Acc. EN 1992-4, p.7.2.1.4. acc. to formula (7.2) – $N^0_{Rk,c} = k_{ucr,N}{*}f_{ck}^{\ 0,5}{*}h_{ef}^{\ 1,5}$).

R-KER | R-CFS+RV200 WITH INTERNALLY THREADED SOCKETS (ITS)

High performance vinylester resin approved for use with internally threaded sockets

ETA | ETA-13/0805 | CE

FEATURES AND BENEFITS

- Approved for use with sockets in non-cracked concrete
- Allows removal of bolt to leave a re-usable socket in place
- Suitable for use in low temperatures (down to -20° C for winter option) enables use throughout the year
- Winter version can be used in warmer temperatures for faster curing
- Suitable for use in dry and wet substrates as well as holes and substrates covered with water
- Rapid bonding time enables quick execution of works
- Very high load capacity
- Anchor does not generate tensions in the substrate which enables R-KER to be specified where closer edge and spacing distances are required
- Suitable for multiple use. Partly used cartridge can continue to be used after fitting new nozzle

APPLICATIONS

- Temporary works/formworks support systems
- Balustrading
- Cladding restrains
- Masonry support
- Machinery
- Platforms
- Steelwork

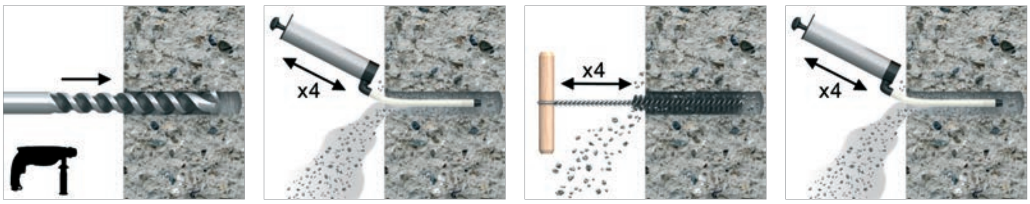
BASE MATERIALS

Approved for use in:

- Non-cracked concrete C20/25-C50/60

INSTALLATION GUIDE

DRILLING AND CLEANING

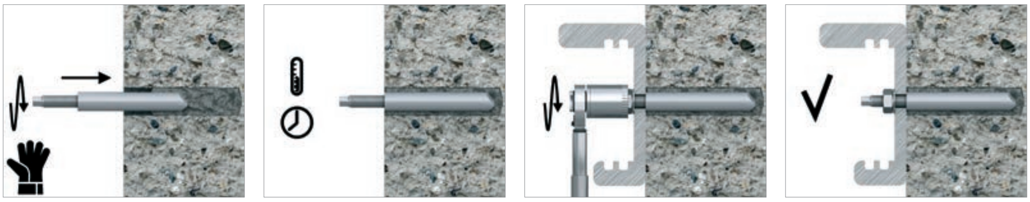


DOZING

R-KER | R-CFS+RV200 WITH INTERNALLY THREADED SOCKETS (ITS)

INSTALLATION GUIDE (cont.)

ANCHORING



1. Drill hole to the required diameter and depth for socket size being used.
2. Clean the drill hole thoroughly with brush and hand pump at least four times before installation.
3. Attach nozzle and insert cartridge into gun.
4. Dispense to waste until even colour is obtained.
5. Insert the mixer nozzle to the bottom of the drill hole and inject resin, slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
6. Immediately insert the socket, slowly and with slight twisting motion. Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.
7. Attach fixture and tighten the bolt to the required torque.

PRODUCT INFORMATION

	Product Code	Resin	Description / Resin Type	Volume [ml]
	R-KER-300	R-KER	Styrene Free Vinylester Resin	300
	R-KER-345			345
	R-KER-380			380
	R-KER-400			400
	R-KER-300-W	R-KER-W	Low Temperature (Winter) / Rapid Cure Styrene Free Vinylester Resin	300
	R-KER-380-W			380
	R-KER-400-W			400
	R-KER-380-S	R-KER-S	High Temperature (Summer) / Slow Cure Styrene Free Vinylester Resin	380
	R-KER-400-S			400
	R-CFS+RV200-4	RV200	Styrene Free Vinylester Resin	300
	R-CFS+RV200W-4	RV200-W	Low Temperature (Winter) / Rapid Cure Styrene Free Vinylester Resin	
	R-CFS+RV200S-4	RV200-S	High Temperature (Summer) / Slow Cure Styrene Free Vinylester Resin	
	R-CFS+RV200-600-8	RV200	Styrene Free Vinylester Resin	600
	R-CFS+RV200TW-6008	RV200-W	Low Temperature (Winter) / Rapid Cure Styrene Free Vinylester Resin	

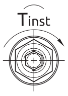
MECHANICAL PROPERTIES

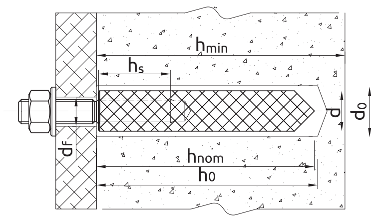
SOCKETS

Size	Product Code		Anchor			Fixture
	Steel class 5.8	Steel grade A4	Socket diameter	Length	Internal thread length	Hole diameter
			d	L	l_g	d_f
			[mm]	[mm]	[mm]	[mm]
M6	R-ITS-Z-06075	R-ITS-A4-06075	10	75	24	7
M8	R-ITS-Z-08075	R-ITS-A4-08075	12	75	25	9
	R-ITS-Z-08090	R-ITS-A4-08090	12	90	25	9
M10	R-ITS-Z-10075	R-ITS-A4-10075	16	75	30	12
	R-ITS-Z-10100	R-ITS-A4-10100	16	100	30	12
M12	R-ITS-Z-12100	R-ITS-A4-12100	16	100	35	14
M16	R-ITS-Z-16125	R-ITS-A4-16125	24	125	50	18

INSTALLATION DATA

SOCKETS





R-KER | R-CFS+RV200 WITH INTERNALLY THREADED SOCKETS (ITS)

INSTALLATION DATA (cont.)

Size			M6	M8		M10		M12	M16
Min. installation depth	h_{nom}	[mm]	75	75	90	75	100	100	125
Thread diameter	d	[mm]	6	8	8	10	10	12	16
Hole diameter in substrate	d_0	[mm]	12	14	14	20	20	20	28
Hole diameter in fixture	d_f	[mm]	7	9	9	12	12	14	18
Thread engagement length	h_s	[mm]	24	25	25	30	30	35	50
Min. hole depth in substrate	h_0	[mm]	h_{nom} + 5	h_{nom} + 5	h_{nom} + 5	h_{nom} + 5	h_{nom} + 5	h_{nom} + 5	h_{nom} + 5
Min. substrate thickness	h_{min}	[mm]	105	105	120	115	140	140	181
Installation torque	T_{inst}	[Nm]	3	5	5	10	10	20	40
Min. spacing	s_{min}	[mm]	40	40	45	40	50	50	63
Min. edge distance	c_{min}	[mm]	40	40	45	40	50	50	63

Minimum working and curing time

Resin temperature	Concrete temperature	Working time [min.]			Curing time* [min.]		
°C	°C	R-KER-S	R-KER	R-KER-W	R-KER-S	R-KER	R-KER-W
5	-20	-	-	100	-	-	24h
5	-15	-	-	60	-	-	16h
5	-10	-	-	30	-	-	8h
5	-5	65	60	16	24h	6h	4h
5	0	50	40	12	16h	3h	2h
5	5	35	20	8	12h	2h	1h
10	10	20	12	5	8h	80	45
15	15	12	8	3	6h	60	30
20	20	9	5	2	4h	45	10
25	25	7	3	-	3h	30	-
25	30	6	2	-	2h	20	-
25	40	5	0.5	-	45	10	-
25	45	3	-	-	35	-	-
25	50	2	-	-	25	-	-

*For wet concrete the curing time must be doubled

MECHANICAL PROPERTIES

Size			M6	M8	M10	M12	M16
R-ITS-Z Internally Threaded Sockets							
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	520	500	500	500	500
Nominal yield strength - tension	f_{yk}	[N/mm²]	420	400	400	400	400
Cross sectional area - tension	A_s	[mm²]	20.1	36.6	58	84.3	157
Elastic section modulus	W_{el}	[mm³]	21.21	50.27	98.17	169.65	402.12
R-ITS-A4 Internally Threaded Sockets							
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	700	700	700	700	700
Nominal yield strength - tension	f_{yk}	[N/mm²]	350	350	350	350	350
Cross sectional area - tension	A_s	[mm²]	20.1	36.6	58	84.3	157
Elastic section modulus	W_{el}	[mm³]	21.21	50.27	98.17	169.65	402.12
Metric Threaded Rods - Steel Class 5.8							
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	8	19	37	65	166
Design bending resistance	M	[Nm]	6	15	30	52	133
Allowable bending resistance	M_{rec}	[Nm]	5	11	21	37	95
Metric Threaded Rods - Steel Class 8.8							
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12	30	60	105	266
Design bending resistance	M	[Nm]	10	24	48	84	213
Allowable bending resistance	M_{rec}	[Nm]	7	17	34	60	152
Metric Threaded Rods - A4							
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	11	26	52	92	233
Design bending resistance	M	[Nm]	7	17	34	59	149
Allowable bending resistance	M_{rec}	[Nm]	5	12	24	42	107

R-KER | R-CFS+RV200 WITH INTERNALLY THREADED SOCKETS (ITS)

BASIC PERFORMANCE DATA

SOCKETS

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M6	M8		M10		M12	M16
Substrate		Non-cracked concrete						
Effective embedment depth h_{ef}	[mm]	75.0		90.0	75.0	100.0		125.0
MEAN ULTIMATE LOAD								
TENSION LOAD $N_{Ru,m}$								
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	12.5	21.6	21.6	34.8	34.8	50.4	93.6
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	19.2	34.8	34.8	50.6	55.2	63.0	97.4
METRIC THREADED RODS - A4	[kN]	16.8	31.2	31.2	49.2	49.2	63.0	97.4
SHEAR LOAD $V_{Ru,m}$								
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	6.00	10.8	10.8	16.8	16.8	25.2	46.8
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	9.60	18.0	18.0	27.6	27.6	40.8	75.6
METRIC THREADED RODS - A4	[kN]	8.40	15.6	15.6	24.0	24.0	34.8	66.0
CHARACTERISTIC LOAD								
TENSION LOAD N_{Rk}								
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	10.00	18.0	18.0	29.0	29.0	42.0	66.0
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	16.0	25.5	29.0	32.8	46.0	42.7	66.0
METRIC THREADED RODS - A4	[kN]	14.0	25.5	26.0	32.8	41.0	42.7	66.0
SHEAR LOAD V_{Rk}								
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	5.00	9.00	9.00	14.0	14.0	21.0	39.0
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	8.00	15.0	15.0	23.0	23.0	34.0	63.0
METRIC THREADED RODS - A4	[kN]	7.00	13.0	13.0	20.0	20.0	29.0	55.0
DESIGN LOAD								
TENSION LOAD N_{Rd}								
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	6.67	12.0	12.0	18.2	19.3	23.7	36.7
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	9.82	14.1	17.0	18.2	26.5	23.7	36.7
METRIC THREADED RODS - A4	[kN]	7.49	13.9	13.9	18.2	21.9	23.7	36.7
SHEAR LOAD V_{Rd}								
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	4.00	7.20	7.20	11.2	11.2	16.8	31.2
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	6.40	12.0	12.0	18.4	18.4	27.2	50.4
METRIC THREADED RODS - A4	[kN]	4.49	8.33	8.33	12.8	12.8	18.6	35.3
RECOMMENDED LOAD								
TENSION LOAD N_{rec}								
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	4.76	8.57	8.57	13.0	13.8	17.0	26.2
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	7.01	10.1	12.1	13.0	19.0	17.0	26.2
METRIC THREADED RODS - A4	[kN]	5.35	9.93	9.93	13.0	15.7	17.0	26.2
SHEAR LOAD V_{rec}								
METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	2.86	5.14	5.14	8.00	8.00	12.0	22.3
METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	4.57	8.57	8.57	13.1	13.1	19.4	36.0
METRIC THREADED RODS - A4	[kN]	3.21	5.95	5.95	9.16	9.16	13.3	25.2

R-KER | R-CFS+RV200 WITH INTERNALLY THREADED SOCKETS (ITS)

DESIGN PERFORMANCE DATA

SOCKETS

Size			M6	M8		M10		M12	M16
Effective embedment depth	h_{ef}	[mm]	75.00	75.00	90.00	75.00	100.00	100.00	125.00
TENSION LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	10.00	18.00	18.00	29.00	29.00	42.00	78.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	16.00	29.00	29.00	46.00	46.00	67.00	126.00
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance	$N_{Rk,s}$	[kN]	14.00	26.00	26.00	41.00	41.00	59.00	110.00
Partial safety factor	γ_{Ms}	-	1.87	1.87	1.87	1.87	1.87	1.87	1.87
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (40°C/24°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	7.50	9.00	9.00	9.50	9.50	8.50	7.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (80°C/50°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	6.00	7.00	7.00	7.50	7.50	6.50	5.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Factor of the influence of sustained load	ψ^0_{sus}	-	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Increasing factors for $N_{Rd,p}$ - C30/37	ψ_c	-	1.04	1.04	1.04	1.04	1.04	1.04	1.00
Increasing factors for $N_{Rd,p}$ - C40/50	ψ_c	-	1.07	1.07	1.07	1.07	1.07	1.07	1.00
Increasing factors for $N_{Rd,p}$ - C50/60	ψ_c	-	1.09	1.09	1.09	1.09	1.09	1.09	1.00
CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Factor for non-cracked concrete	k_1	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Edge distance	$c_{cr,N}$	[mm]	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$
Spacing	$s_{cr,N}$	[mm]	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$
CONCRETE SPLITTING FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20
SHEAR LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.00	9.00	9.00	14.00	14.00	21.00	39.00
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	7.60	19.00	19.00	37.00	37.00	64.00	166.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	8.00	15.00	15.00	23.00	23.00	34.00	63.00
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	12.20	30.00	30.00	60.00	60.00	105.00	266.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	7.00	13.00	13.00	20.00	20.00	29.00	55.00
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	10.70	26.00	26.00	52.00	52.00	92.00	233.00
Partial safety factor	γ_{Ms}	-	1.56	1.56	1.56	1.56	1.56	1.56	1.56
CONCRETE PRY-OUT FAILURE									
Factor	k	-	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Anchor diameter	d_{nom}	[mm]	10.00	12.00	12.00	16.00	16.00	16.00	24.00
Effective length of anchor	ℓ_f	[mm]	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Combined pull-out and concrete cone failure:
(acc. TR 029, p.5.2.2.3. acc. to formula (5.2a) – $N^0_{Rk,p} = \pi * d * h_{ef} * \tau_{Rk}$
acc. EN 1992-4, p.7.2.1.6. acc. to formula (7.14) – $N^0_{Rk,p} = \psi^{sus} * \pi * d * h_{ef} * \tau_{Rk}$ where $\psi_{sus} = \psi^0_{sus} + 1 - \alpha_{sus} \le 1$ (7.14a,b)) .
Concrete cone failure:
(acc. TR 029, p.5.2.2.4. acc. to formula (5.3a) – $N^0_{Rk,c} = k_1 * f_{ck,cube}^{0,5} * hef^{1,5}$
Acc. EN 1992-4, p.7.2.1.4. acc. to formula (7.2) – $N^0_{Rk,c} = k_{ucr,N} * f_{ck}^{0,5} * h_{ef}^{1,5}$).

R-KEX II WITH REBAR AS AN ANCHOR

Premium pure epoxy resin approved for use with reinforcement bars

ETA-13/0455

FEATURES AND BENEFITS

- The strongest resin in the epoxy resin class
- Approved for use in cracked and non-cracked concrete (EAD 330499-00-0601)
- Suitable for use in dry and wet substrates including flooded holes (use category I1 & I2)
- Diamond and hammer drilling
- Seismic category C1
- Very high chemical resistance – suitable for applications exposed to influence of various agents (industrial or marine environment)
- Minimal shrinkage provides option of use in diamond-drilled holes and oversized holes
- Extended working time ensures easy installation of metal components (up to 30 min. in 20°C)
- For use in positive temperatures

APPLICATIONS

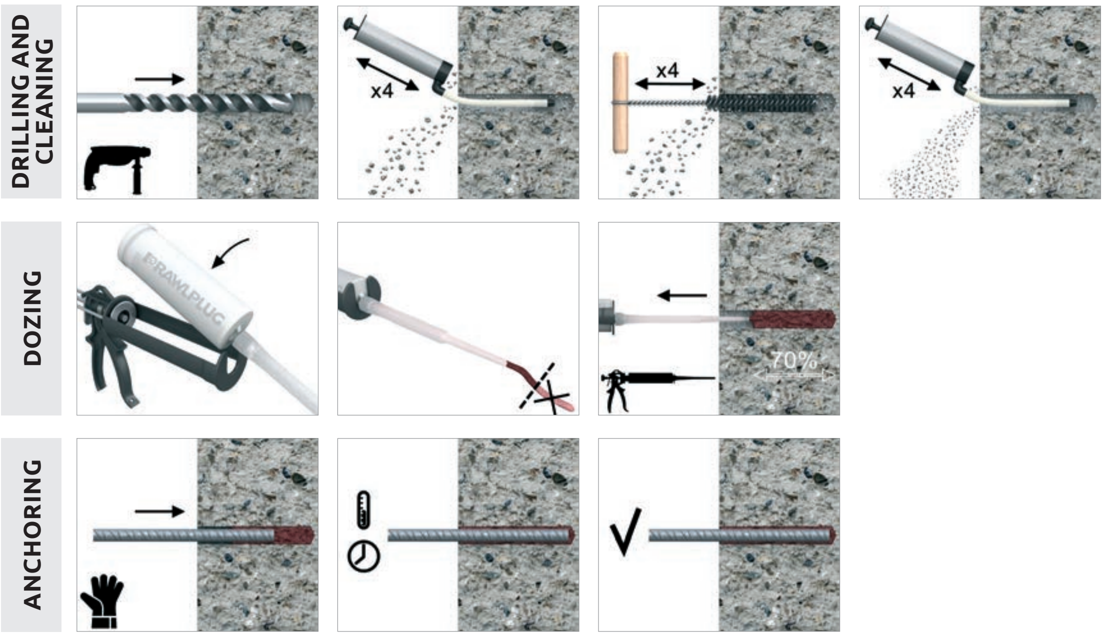
- Safety barriers
- Temporary works/formworks support systems
- Rebar
- Curtain walling
- Formwork support systems
- Masonry support
- Platforms
- Structural steelwork
- Rebar dowelling
- Starter bars
- Rebar missed-outs

BASE MATERIALS

Approved for use in:
- Non-cracked concrete C20/25-C50/60
- Cracked concrete C20/25-C50/60

Also suitable for use in:
- High-Density Natural Stone

INSTALLATION GUIDE



R-KEX II WITH REBAR AS AN ANCHOR

INSTALLATION GUIDE (cont.)

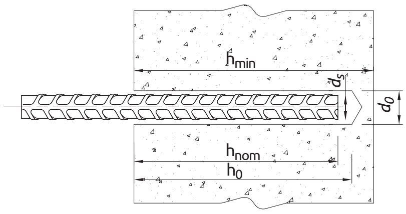
1. Drill hole to the required diameter and depth for rebar size being used.
2. Clean the hole with brush and hand pump at least four times each. It is very important and necessary before installation.
3. Insert cartridge into gun and attach nozzle.
4. Dispense to waste until even colour is obtained.
5. Insert the mixer nozzle to the bottom of the drill hole and inject resin,
   slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
6. Immediately insert the rebar, slowly and with slight twisting motion.
   Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.

PRODUCT INFORMATION

Product Code	Resin	Description / Resin Type	Volume [ml]
R-KEX-II-385	R-KEX II	Epoxy Resin	385
R-KEX-II-600			600

INSTALLATION DATA

REBARS AS ANCHORS



Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
Rebar diameter	d_s	[mm]	8	10	12	14	16	20	25	32
Hole diameter in substrate	d_0	[mm]	12	14	18	18	22	26	32	40
Min. hole depth in substrate	h_0	[mm]	h_{nom}+5	h_{nom}+5	h_{nom}+5	h_{nom}+5	h_{nom}+5	h_{nom}+5	h_{nom}+5	h_{nom}+5
Min. substrate thickness	h_{min}	[mm]	h_{nom}+30 ≥100	h_{nom}+30 ≥100	h_{nom}+30 ≥100	h_{nom}+30 ≥100	h_{nom} + 2d_0	h_{nom} + 2d_0	h_{nom} + 2d_0	h_{nom} + 2d_0
Min. spacing	s_{min}	[mm]	40	40	40	40	50	60	70	85
Min. edge distance	c_{min}	[mm]	40	40	40	40	50	60	70	85
MINIMUM EMBEDMENT DEPTH										
Min. installation depth	$h_{nom, min}$	[mm]	60	70	80	80	100	120	140	165
MAXIMUM EMBEDMENT DEPTH										
Min. installation depth	$h_{nom, max}$	[mm]	160	200	240	280	320	400	500	640

Minimum working and curing time

Resin temperature [°C]	Concrete temperature [°C]	Curing time* [min]	Working time [min]
5	5	150	2880
10	10	120	1080
20	20	35	480
25	30	12	300

MECHANICAL PROPERTIES

REBARS AS ANCHORS

Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)										
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	540	540	540	540	540	540	540	540
Nominal yield strength - tension	f_{yk}	[N/mm²]	500	500	500	500	500	500	500	500
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	804.2
Elastic section modulus	W_{el}	[mm³]	50.3	98.2	169.6	269.4	402.1	785.4	1534	3217
f_uk = 575 (e.g. B 500 SP acc. to EC2)										
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	575	575	575	575	575	575	575	575
Nominal yield strength - tension	f_{yk}	[N/mm²]	500	500	500	500	500	500	500	500
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	804.2
Elastic section modulus	W_{el}	[mm³]	50.3	98.2	169.6	269.4	402.1	785.4	1534	3217
f_uk = 620 (e.g. G-60 acc. to ASTM 615)										
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	620	620	620	620	620	620	620	620
Nominal yield strength - tension	f_{yk}	[N/mm²]	420	420	420	420	420	420	420	420
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	804.2
Elastic section modulus	W_{el}	[mm³]	50.3	98.2	169.6	269.4	402.1	785.4	1534	3217

R-KEX II WITH REBAR AS AN ANCHOR

BASIC PERFORMANCE DATA

Size		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
Substrate		Non-cracked concrete								Cracked concrete							
MEAN ULTIMATE LOAD																	
TENSION LOAD $N_{Ru,m}$																	
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)																	
Minimum embedment depth	[kN]	24.7	34.0	43.3	45.7	67.5	88.7	111.8	143.1	18.7	27.8	34.0	34.0	47.5	62.4	78.7	100.7
Maximum embedment depth	[kN]	28.5	44.5	61.1	87.3	114.0	178.1	278.3	456.0	28.5	44.5	64.1	87.3	114.0	178.1	278.3	456.0
f_uk = 575 (e.g. B 500 SP acc. to EC2)																	
Minimum embedment depth	[kN]	24.7	34.0	43.3	45.7	67.5	88.7	111.8	143.1	18.7	27.8	34.0	34.0	47.5	62.4	78.7	100.7
Maximum embedment depth	[kN]	30.6	47.4	68.3	92.9	121.4	189.7	296.4	485.6	30.4	47.4	68.3	92.9	121.4	189.7	296.4	485.6
f_uk = 620 (e.g. G-60 acc. to ASTM 615)																	
Minimum embedment depth	[kN]	24.7	34.0	43.3	45.7	67.5	88.7	111.8	143.1	18.7	27.8	34.0	34.0	47.5	62.4	78.7	100.7
Maximum embedment depth	[kN]	32.7	51.1	73.6	100.2	130.9	204.5	319.6	523.6	33.7	51.1	73.6	100.2	130.9	204.5	319.6	523.6
SHEAR LOAD $V_{Ru,m}$																	
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)																	
Minimum embedment depth	[kN]	17.1	26.7	38.5	52.4	68.4	106.9	167.0	273.6	17.1	26.7	38.5	44.2	68.4	106.9	157.4	137.6
Maximum embedment depth	[kN]	17.1	26.7	38.5	52.4	68.4	106.9	167.0	273.6	17.1	26.7	38.5	52.4	68.4	106.9	167.0	273.6
f_uk = 575 (e.g. B 500 SP acc. to EC2)																	
Minimum embedment depth	[kN]	18.2	28.5	41.0	55.8	72.8	113.8	177.8	286.1	18.2	28.5	41.0	55.8	72.8	113.8	157.4	201.4
Maximum embedment depth	[kN]	18.2	28.5	41.0	55.8	72.8	113.8	177.8	291.3	18.2	28.5	41.0	55.8	72.8	113.8	177.8	291.3
f_uk = 620 (e.g. G-60 acc. to ASTM 615)																	
Minimum embedment depth	[kN]	19.6	30.7	44.2	60.1	78.5	122.7	191.7	286.1	19.6	30.7	44.2	60.1	78.5	122.7	157.4	201.4
Maximum embedment depth	[kN]	19.6	30.7	44.2	60.1	78.5	122.7	191.7	314.1	19.6	30.7	44.2	60.1	78.5	122.7	191.7	314.1
CHARACTERISTIC LOAD																	
TENSION LOAD N_{Rk}																	
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)																	
Minimum embedment depth	[kN]	16.6	26.4	36.1	35.2	50.5	66.4	83.7	107.0	8.29	11.0	16.6	19.4	25.1	37.7	59.6	66.4
Maximum embedment depth	[kN]	27.1	42.4	61.1	83.1	108.6	169.7	265.1	434.3	22.1	31.4	49.8	58.1	80.4	125.7	216.0	257.4
f_uk = 575 (e.g. B 500 SP acc. to EC2)																	
Minimum embedment depth	[kN]	16.6	26.4	36.1	35.2	50.5	66.4	83.7	107.0	8.29	11.0	16.6	19.4	25.1	37.7	59.6	66.4
Maximum embedment depth	[kN]	28.9	45.2	65.0	88.5	115.6	180.6	282.3	462.4	22.1	31.4	49.8	58.1	80.4	125.7	216.0	257.4
f_uk = 620 (e.g. G-60 acc. to ASTM 615)																	
Minimum embedment depth	[kN]	16.6	26.4	36.1	35.2	50.5	66.4	83.7	107.0	8.29	11.0	16.6	19.4	25.1	37.7	59.6	66.4
Maximum embedment depth	[kN]	31.2	48.7	70.1	95.4	124.7	194.8	304.3	482.6	22.1	31.4	49.8	58.1	80.4	125.7	216.0	257.4
SHEAR LOAD V_{Rk}																	
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)																	
Minimum embedment depth	[kN]	13.6	21.2	30.5	41.6	54.3	84.8	132.5	214.1	13.6	21.2	30.5	33.5	50.3	75.4	119.3	90.1
Maximum embedment depth	[kN]	13.6	21.2	30.5	41.6	54.3	84.8	132.5	217.2	13.6	21.2	30.5	41.6	54.3	84.8	132.5	217.2
f_uk = 575 (e.g. B 500 SP acc. to EC2)																	
Minimum embedment depth	[kN]	14.5	22.6	32.5	44.3	57.8	90.3	141.1	214.1	14.5	22.0	32.5	38.7	50.3	75.4	119.3	132.7
Maximum embedment depth	[kN]	14.5	22.6	32.5	44.3	57.8	90.3	141.1	231.2	14.5	22.6	32.5	44.3	57.8	90.3	141.1	231.2
f_uk = 620 (e.g. G-60 acc. to ASTM 615)																	
Minimum embedment depth	[kN]	15.6	24.4	35.1	46.9	62.3	97.4	152.2	214.1	15.6	22.0	33.2	38.7	50.3	75.4	119.3	132.7
Maximum embedment depth	[kN]	15.6	24.4	35.1	47.7	62.3	97.4	152.2	249.3	15.6	24.4	35.1	47.7	62.3	97.4	152.2	249.3
DESIGN LOAD																	
TENSION LOAD N_{Rd}																	
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)																	
Minimum embedment depth	[kN]	9.22	14.7	20.1	19.6	28.1	36.9	46.5	59.5	4.61	6.11	9.22	10.8	14.0	20.9	33.1	36.9
Maximum embedment depth	[kN]	19.4	30.3	43.6	58.6	77.6	121.2	189.3	303.8	12.3	17.5	27.7	32.3	44.7	69.8	120.0	143.0
f_uk = 575 (e.g. B 500 SP acc. to EC2)																	
Minimum embedment depth	[kN]	9.22	14.7	20.1	19.6	28.1	36.9	46.5	59.5	4.61	6.11	9.22	10.8	14.0	20.9	33.1	36.9
Maximum embedment depth	[kN]	20.6	32.3	46.5	58.6	82.6	129.0	201.6	303.8	12.3	17.5	27.7	32.3	44.7	69.8	120.0	143.0
f_uk = 620 (e.g. G-60 acc. to ASTM 615)																	
Minimum embedment depth	[kN]	9.22	14.7	20.1	19.6	28.1	36.9	46.5	59.5	4.61	6.11	9.22	10.8	14.0	20.9	33.1	36.9
Maximum embedment depth	[kN]	22.3	34.8	50.1	58.6	89.0	139.1	207.3	303.8	12.3	17.5	27.7	32.3	44.7	69.8	120.0	143.0
SHEAR LOAD V_{Rd}																	
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)																	
Minimum embedment depth	[kN]	9.05	14.1	20.4	27.7	36.2	56.6	88.4	142.7	9.05	14.1	20.4	22.3	33.5	50.3	79.5	60.1
Maximum embedment depth	[kN]	9.05	14.1	20.4	27.7	36.2	56.6	88.4	144.8	9.05	14.1	20.4	27.7	36.2	56.6	88.4	144.8
f_uk = 575 (e.g. B 500 SP acc. to EC2)																	
Minimum embedment depth	[kN]	9.63	15.1	21.7	29.5	38.5	60.2	94.1	142.7	9.63	14.7	21.7	25.8	33.5	50.3	79.5	88.5
Maximum embedment depth	[kN]	9.63	15.1	21.7	29.5	38.5	60.2	94.1	154.2	9.63	15.1	21.7	29.5	38.5	60.2	94.1	154.2
f_uk = 620 (e.g. G-60 acc. to ASTM 615)																	
Minimum embedment depth	[kN]	10.4	16.2	23.4	31.3	41.6	64.9	101.5	142.7	10.4	14.7	22.1	25.8	33.5	50.3	79.5	88.5
Maximum embedment depth	[kN]	10.4	16.2	23.4	31.8	41.6	64.9	101.5	166.2	10.4	16.2	23.4	31.8	41.6	64.9	101.5	166.2

R-KEX II WITH REBAR AS AN ANCHOR

BASIC PERFORMANCE DATA (cont.)

Size		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
RECOMMENDED LOAD																	
TENSION LOAD N_{rec}																	
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)																	
Minimum embedment depth	[kN]	6.58	10.5	14.3	14.0	20.0	26.3	33.2	42.5	3.29	4.36	6.58	7.68	9.97	15.0	23.7	26.3
Maximum embedment depth	[kN]	13.9	21.6	31.2	41.9	55.4	86.6	135.2	217.0	8.78	12.5	19.8	23.0	31.9	49.9	85.7	102.1
f_uk = 575 (e.g. B 500 SP acc. to EC2)																	
Minimum embedment depth	[kN]	6.58	10.5	14.3	14.0	20.0	26.3	33.2	42.5	3.29	4.36	6.58	7.68	9.97	15.0	23.7	26.3
Maximum embedment depth	[kN]	14.8	23.0	33.2	41.9	59.0	92.2	144.0	217.0	8.78	12.5	19.8	23.0	31.9	49.9	85.7	102.1
f_uk = 620 (e.g. G-60 acc. to ASTM 615)																	
Minimum embedment depth	[kN]	6.58	10.5	14.3	14.0	20.0	26.3	33.2	42.5	3.29	4.36	6.58	7.68	9.97	15.0	23.7	26.3
Maximum embedment depth	[kN]	15.9	24.8	35.8	41.9	63.6	99.4	148.0	217.0	8.78	12.5	19.7	23.0	31.9	49.9	85.7	102.1
SHEAR LOAD V_{rec}																	
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)																	
Minimum embedment depth	[kN]	6.46	10.1	14.5	19.8	25.9	40.4	63.1	101.9	6.46	10.1	14.5	15.9	23.9	35.9	56.8	42.9
Maximum embedment depth	[kN]	6.46	10.1	14.5	19.8	25.9	40.4	63.1	103.4	6.46	10.1	14.5	19.8	25.9	40.4	63.1	103.4
f_uk = 575 (e.g. B 500 SP acc. to EC2)																	
Minimum embedment depth	[kN]	6.88	10.8	15.5	21.1	27.5	43.0	67.2	101.9	6.88	10.5	15.5	18.4	23.9	35.9	56.8	63.2
Maximum embedment depth	[kN]	6.88	10.8	15.5	21.1	27.5	43.0	67.2	110.1	6.88	10.8	15.5	21.1	27.5	43.0	67.2	110.1
f_uk = 620 (e.g. G-60 acc. to ASTM 615)																	
Minimum embedment depth	[kN]	7.42	11.6	16.7	22.4	29.7	46.4	72.5	101.9	7.42	10.5	15.8	18.4	23.9	35.9	56.8	63.2
Maximum embedment depth	[kN]	7.42	11.6	16.7	22.7	29.7	46.4	72.5	118.7	7.42	11.6	16.7	22.7	29.7	46.4	72.5	118.7

DESIGN PERFORMANCE DATA

REBARS AS ANCHORS

Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
TENSION LOAD										
STEEL FAILURE; F_UK = 540 (E.G. 500 B ACC. TO BS 4449; B 500 B ACC. TO SS 560)										
Characteristic resistance	$N_{Rk,s}$	[kN]	27.14	42.41	61.07	83.13	108.57	169.65	265.07	434.29
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
STEEL FAILURE; F_UK = 575 (E.G. B 500 SP ACC. TO EC2)										
Characteristic resistance	$N_{Rk,s}$	[kN]	28.90	45.16	65.03	88.51	115.61	180.64	282.25	462.44
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
STEEL FAILURE; F_UK = 620 (E.G. G-60 ACC. TO ASTM 615)										
Characteristic resistance	$N_{Rk,s}$	[kN]	31.16	48.69	70.12	95.44	124.66	194.78	304.34	498.63
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (40°C/24°C)										
Characteristic bond resistance	τ_{Rk}	[N/mm²]	11.00	12.00	12.00	10.00	12.00	12.00	9.50	8.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (80°C/50°C)										
Characteristic bond resistance	τ_{Rk}	[N/mm²]	10.00	11.00	11.00	9.00	11.00	11.00	8.50	7.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (40°C/24°C)										
Characteristic bond resistance	τ_{Rk}	[N/mm²]	5.50	5.00	5.50	5.50	5.00	5.00	5.50	4.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (80°C/50°C)										
Characteristic bond resistance	τ_{Rk}	[N/mm²]	5.00	4.50	5.00	5.00	4.50	4.50	5.00	3.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE										
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Factor of the influence of sustained load	ψ^0_{sus}	-	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Increasing factors for $N_{Rd,p}$ - C30/37	ψ_c	-	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Increasing factors for $N_{Rd,p}$ - C40/50	ψ_c	-	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Increasing factors for $N_{Rd,p}$ - C50/60	ψ_c	-	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
CONCRETE CONE FAILURE										
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Factor for cracked concrete	k_1	-	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
Factor for cracked concrete	$k_{cr,N}$	-	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70
Factor for non-cracked concrete	k_1	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Edge distance	$c_{cr,N}$	[mm]	$1.5 \cdot h_{ef}$	$1.5 \cdot h_{ef}$	$1.5 \cdot h_{ef}$	$1.5 \cdot h_{ef}$	$1.5 \cdot h_{ef}$	$1.5 \cdot h_{ef}$	$1.5 \cdot h_{ef}$	$1.5 \cdot h_{ef}$
Spacing	$s_{cr,N}$	[mm]	$3.0 \cdot h_{ef}$	$3.0 \cdot h_{ef}$	$3.0 \cdot h_{ef}$	$3.0 \cdot h_{ef}$	$3.0 \cdot h_{ef}$	$3.0 \cdot h_{ef}$	$3.0 \cdot h_{ef}$	$3.0 \cdot h_{ef}$
CONCRETE SPLITTING FAILURE										
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20

R-KEX II WITH REBAR AS AN ANCHOR

DESIGN PERFORMANCE DATA (cont.)

Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
SHEAR LOAD										
STEEL FAILURE; F_UK = 540 (E.G. 500 B ACC. TO BS 4449; B 500 B ACC. TO SS 560)										
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	13.57	21.21	30.54	41.56	54.29	84.82	132.54	217.15
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	32.57	63.62	109.93	174.57	260.58	508.94	994.02	2084.61
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; F_UK = 575 (E.G. B 500 SP ACC. TO EC2)										
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	14.45	22.59	32.52	44.26	57.81	90.32	141.13	231.22
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	34.68	67.74	117.06	185.88	277.47	541.92	1058.45	2219.72
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; F_UK = 620 (E.G. G-60 ACC. TO ASTM 615)										
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	15.58	24.35	35.06	47.72	62.33	97.39	152.17	249.32
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	37.40	73.04	126.22	200.43	299.18	584.34	1141.28	2393.44
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
CONCRETE PRY-OUT FAILURE										
Factor	k	-	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE										
Anchor diameter	d_{nom}	[mm]	8.00	10.00	12.00	14.00	16.00	20.00	25.00	32.00
Effective length of anchor	ℓ_f	[mm]	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Combined pull-out and concrete cone failure:
(acc. TR 029, p.5.2.2.3. acc. to formula (5.2a) – $N^0_{Rk,p} = \pi * d * h_{ef} * \tau_{Rk}$
acc. EN 1992-4, p.7.2.1.6. acc. to formula (7.14) – $N^0_{Rk,p} = \psi_{sus} * \pi * d * h_{ef} * \tau_{Rk}$ where $\psi_{sus} = \psi^0_{sus} + 1 - \alpha_{sus} \leq 1$ (7.14a,b)) .
Concrete cone failure:
(acc. TR 029, p.5.2.2.4. acc. to formula (5.3a) – $N^0_{Rk,c} = k_1 * f_{ck,cube}{}^{0,5} * hef^{1,5}$
Acc. EN 1992-4, p.7.2.1.4. acc. to formula (7.2) – $N^0_{Rk,c} = k_{ucr,N} * f_{ck}{}^{0,5} * h_{ef}{}^{1,5}$).

R-KER-II | R-CFS+KER-II WITH REBAR AS AN ANCHOR

High performance hybrid resin approved for use with post-installed rebar connections

ETA | ETA-17/0594 | CE | SEISMIC C1 | VOC EMISSION TESTING | HYGIENIC CERTIFICATE

FEATURES AND BENEFITS

- Approved for use with rebar as an anchor in cracked and non-cracked concrete
- Winter version can be used in warmer temperatures for faster curing
- Suitable for use in dry and wet substrates as well as holes and substrates covered with water
- Rapid bonding time enables quick execution of works
- Very high load capacity
- Anchor does not generate expansion forces in the concrete which means reduced spacing and edge distances.
- Suitable for multiple use. Partly used product can be reused after fitting new nozzle

APPLICATIONS

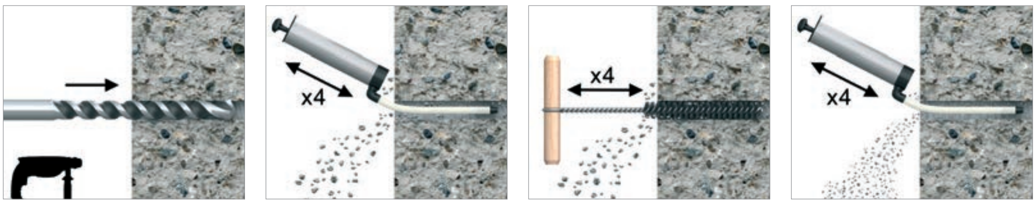
- Curtain walling
- Balustrading
- Barriers
- Cable trays
- Cladding restraints
- Structural steelwork
- Rebar dowelling
- Starter bars
- Rebar missed-outs

BASE MATERIALS

Approved for use in:
- Non-cracked concrete C20/25-C50/60
- Cracked concrete C20/25-C50/60

INSTALLATION GUIDE

DRILLING AND CLEANING



DOZING

R-KER-II | R-CFS+KER-II WITH REBAR AS AN ANCHOR

INSTALLATION GUIDE (cont.)

ANCHORING

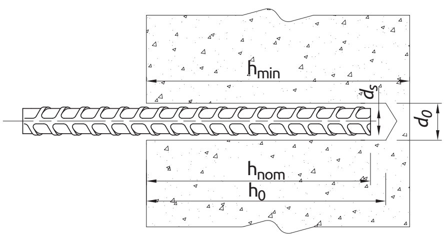
1. Drill hole to the required diameter and depth for rebar size being used.
2. Clean the drill hole thoroughly with brush and hand pump at least four times before installation
3. Insert cartridge into gun and attach nozzle.
4. Dispense to waste until even colour is obtained (min. 10 cm)
5. Insert the mixer nozzle to the bottom of the drill hole and inject resin, slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
6. Immediately insert the rebar, slowly and with slight twisting motion. Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.

PRODUCT INFORMATION

	Product Code	Resin	Description / Resin Type	Volume [ml]
	R-KER-II-300	R-KER-II	R-KER II Hybrid Resin	300
	R-KER-II-345			345
	R-KER-II-400			400
	R-KER-II-300-S	R-KER-II-S	R-KER II Hybrid Resin for High Temperature (Summer) / Slow Cure Styrene Free Hybrid Resin	300
	R-KER-II-400-S			400
	R-KER-II-300-W	R-KER-II-W	R-KER II Hybrid Resin for Low Temperature (Winter) / Rapid Cure Styrene Free Hybrid Resin	300
	R-KER-II-345-W			345
	R-KER-II-400-W			400
	R-CFS+KERII-300	R-KER-II	R-KER II Hybrid Resin	300
	R-CFS+KERII-600			600
	R-CFS+KERII-300-S	R-KER-II-S	R-KER II Hybrid Resin for High Temperature (Summer) / Slow Cure Styrene Free Hybrid Resin	300
	R-CFS+KERII-600-S			600
	R-CFS+KERII-300-W	R-KER-II-W	R-KER II Hybrid Resin for Low Temperature (Winter) / Rapid Cure Styrene Free Hybrid Resin	300
	R-CFS+KERII-600-W			600

INSTALLATION DATA

REBARS AS ANCHORS



Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
Rebar diameter	d_s	[mm]	8	10	12	14	16	20	25	32
Hole diameter in substrate	d_0	[mm]	12	14	18	18	22	26	32	40
Min. hole depth in substrate	h_0	[mm]	h_{nom}+5	h_{nom}+5	h_{nom}+5	h_{nom}+5	h_{nom}+5	h_{nom}+5	h_{nom}+5	h_{nom}+5
Min. substrate thickness	h_{min}	[mm]	h_{nom}+30 ≥100	h_{nom}+30 ≥100	h_{nom}+30 ≥100	h_{nom}+30 ≥100	h_{nom} + $2d_0$	h_{nom} + $2d_0$	h_{nom} + $2d_0$	h_{nom} + $2d_0$
Min. spacing	s_{min}	[mm]	40	40	40	40	40	40	50	70
Min. edge distance	c_{min}	[mm]	40	40	40	40	40	40	50	70
MINIMUM EMBEDMENT DEPTH										
Min. installation depth	$h_{nom, min}$	[mm]	60	60	60	60	64	80	100	128
MAXIMUM EMBEDMENT DEPTH										
Min. installation depth	$h_{nom, max}$	[mm]	160	200	240	280	320	400	500	640

R-KER-II | R-CFS+KER-II WITH REBAR AS AN ANCHOR

INSTALLATION DATA (cont.)

Minimum working and curing time

R-KER-II

Resin temperature	Concrete temperature	Working time [min]			Curing time* [min.]		
°C	°C	R-KER-II S	R-KER-II	R-KER-II W	R-KER-II S	R-KER-II	R-KER-II W
5	-20	-	-	1440	-	-	80
5	-15	-	-	960	-	-	60
5	-10	-	-	480	-	-	40
5	-5		1440	240	-	40	20
5	0	-	180	120	-	30	14
5	5	720	90	60	40	15	9
10	10	480	60	45	20	8	5.5
15	15	360	60	30	15	5	3
20	20	240	45	15	10	2.5	2
25	25	180	45	10	9.5	2	1.5
25	30	120	45	10	7	2	1.5
25	35	120	30	5	6.5	1.5	1
25	40	90	30	5	6.5	1.5	1

*For wet concrete the curing time must be doubled

MECHANICAL PROPERTIES

REBARS AS ANCHORS

Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)										
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	540	540	540	540	540	540	540	540
Nominal yield strength - tension	f_{yk}	[N/mm²]	500	500	500	500	500	500	500	500
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	804.2
Elastic section modulus	W_{el}	[mm³]	50.3	98.2	169.6	269.4	402.1	785.4	1534	3217
f_uk = 575 (e.g. B 500 SP acc. to EC2)										
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	575	575	575	575	575	575	575	575
Nominal yield strength - tension	f_{yk}	[N/mm²]	500	500	500	500	500	500	500	500
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	804.2
Elastic section modulus	W_{el}	[mm³]	50.3	98.2	169.6	269.4	402.1	785.4	1534	3217
f_uk = 620 (e.g. G-60 acc. to ASTM 615)										
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	620	620	620	620	620	620	620	620
Nominal yield strength - tension	f_{yk}	[N/mm²]	420	420	420	420	420	420	420	420
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	804.2
Elastic section modulus	W_{el}	[mm³]	50.3	98.2	169.6	269.4	402.1	785.4	1534	3217

BASIC PERFORMANCE DATA

REBARS AS ANCHORS

Size		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
Substrate		Non-cracked concrete								Cracked concrete							
MEAN ULTIMATE LOAD																	
TENSION LOAD $N_{Ru,m}$																	
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)																	
Minimum embedment depth	[kN]	26.8	31.4	31.4	31.4	34.6	48.3	67.5	97.8	22.1	22.1	22.1	22.1	24.3	34.0	47.5	68.8
Maximum embedment depth	[kN]	28.5	44.5	64.1	87.3	114.0	178.1	278.3	456.0	28.5	44.5	64.1	87.3	114.0	178.1	278.3	456.0
f_uk = 575 (e.g. B 500 SP acc. to EC2)																	
Minimum embedment depth	[kN]	26.8	31.4	31.4	31.4	34.6	48.3	67.5	97.8	22.1	22.1	22.1	22.1	24.3	34.0	47.5	68.8
Maximum embedment depth	[kN]	30.6	47.4	68.3	92.9	121.4	189.7	296.4	485.6	30.6	47.4	68.3	92.9	121.4	189.7	296.4	485.6
f_uk = 620 (e.g. G-60 acc. to ASTM 615)																	
Minimum embedment depth	[kN]	26.8	31.4	31.4	31.4	34.6	48.3	67.5	97.8	22.1	22.1	22.1	22.1	24.3	34.0	47.5	68.8
Maximum embedment depth	[kN]	32.7	51.1	73.6	100.2	130.9	204.5	319.6	523.6	32.7	51.1	73.6	100.2	130.9	204.5	319.6	523.6
SHEAR LOAD $V_{Ru,m}$																	
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)																	
Minimum embedment depth	[kN]	17.1	26.7	38.5	52.4	68.4	96.6	135.0	195.5	17.1	26.7	38.5	44.2	48.6	68.0	95.0	137.6
Maximum embedment depth	[kN]	17.1	26.7	38.5	52.4	68.4	106.9	167.0	273.6	17.1	26.7	38.5	52.4	68.4	106.9	167.0	273.6
f_uk = 575 (e.g. B 500 SP acc. to EC2)																	
Minimum embedment depth	[kN]	18.2	28.5	41.0	55.8	69.1	96.6	135.0	195.5	18.2	28.5	41.0	44.2	48.6	68.0	95.0	137.6
Maximum embedment depth	[kN]	18.2	28.5	41.0	55.8	72.8	113.8	177.8	291.3	18.2	28.5	41.0	55.8	72.8	113.8	177.8	291.3
f_uk = 620 (e.g. G-60 acc. to ASTM 615)																	
Minimum embedment depth	[kN]	19.6	30.7	44.2	60.1	69.1	96.6	135.0	195.5	19.6	30.7	44.2	44.2	48.6	68.0	95.0	137.6
Maximum embedment depth	[kN]	19.6	30.7	44.2	60.1	78.5	122.7	191.7	314.1	19.6	30.7	44.2	60.1	78.5	122.7	191.7	314.1

R-KER-II | R-CFS+KER-II WITH REBAR AS AN ANCHOR

BASIC PERFORMANCE DATA (cont.)

Size		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
CHARACTERISTIC LOAD																	
TENSION LOAD N_{Rk}																	
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)																	
Minimum embedment depth	[kN]	19.6	23.5	23.5	23.5	25.9	36.1	50.5	73.1	12.1	16.7	16.7	16.7	18.4	25.8	36.0	45.0
Maximum embedment depth	[kN]	27.1	42.4	61.1	83.1	108.6	169.7	265.1	434.3	27.1	42.4	61.1	83.1	108.6	169.7	235.6	225.2
f_uk = 575 (e.g. B 500 SP acc. to EC2)																	
Minimum embedment depth	[kN]	19.6	23.5	23.5	23.5	25.9	36.1	50.5	73.1	12.1	16.7	16.7	16.7	18.4	25.8	36.0	45.0
Maximum embedment depth	[kN]	28.9	45.2	65.0	88.5	115.6	180.6	282.3	462.4	28.9	45.2	65.0	88.5	115.6	180.6	235.6	225.2
f_uk = 620 (e.g. G-60 acc. to ASTM 615)																	
Minimum embedment depth	[kN]	19.6	23.5	23.5	23.5	25.9	36.1	50.5	73.1	12.1	16.7	16.7	16.7	18.4	25.8	36.0	45.0
Maximum embedment depth	[kN]	31.2	48.7	70.1	95.4	124.7	194.8	304.3	482.6	31.2	48.7	70.1	95.4	124.7	188.5	235.6	225.2
SHEAR LOAD V_{Rk}																	
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)																	
Minimum embedment depth	[kN]	13.6	21.2	30.5	41.6	51.7	72.3	101.0	146.3	13.6	21.2	30.5	33.5	36.9	51.5	72.0	90.1
Maximum embedment depth	[kN]	13.6	21.2	30.5	41.6	54.3	84.8	132.5	217.2	13.6	21.2	30.5	41.6	54.3	84.8	132.5	217.2
f_uk = 575 (e.g. B 500 SP acc. to EC2)																	
Minimum embedment depth	[kN]	14.5	22.6	32.5	44.3	51.7	72.3	101.0	146.3	14.5	22.6	32.5	33.5	36.9	51.5	72.0	90.1
Maximum embedment depth	[kN]	14.5	22.6	32.5	44.3	57.8	90.3	141.1	231.2	14.5	22.6	32.5	44.3	57.8	90.3	141.1	231.2
f_uk = 620 (e.g. G-60 acc. to ASTM 615)																	
Minimum embedment depth	[kN]	15.6	24.4	35.1	46.9	51.7	72.3	101.0	146.3	15.6	24.4	33.5	33.5	36.9	51.5	72.0	90.1
Maximum embedment depth	[kN]	15.6	24.4	35.1	47.7	62.3	97.4	152.2	249.3	15.6	24.4	35.1	47.7	62.3	97.4	152.2	249.3
DESIGN LOAD																	
TENSION LOAD N_{Rd}																	
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)																	
Minimum embedment depth	[kN]	13.1	15.7	15.7	15.7	17.2	24.1	33.7	48.8	8.04	11.2	11.2	11.2	12.3	17.2	24.0	30.3
Maximum embedment depth	[kN]	19.4	30.3	43.6	59.4	77.6	121.2	189.3	310.2	19.4	30.3	43.6	59.4	77.6	121.2	157.1	150.1
f_uk = 575 (e.g. B 500 SP acc. to EC2)																	
Minimum embedment depth	[kN]	13.1	15.7	15.7	15.7	17.2	24.1	33.7	48.8	8.04	11.2	11.2	11.2	12.3	17.2	24.0	30.3
Maximum embedment depth	[kN]	20.6	32.3	46.5	63.2	82.6	129.0	201.6	321.7	20.6	32.3	46.5	63.2	82.6	125 .7	157 .1	150.1
f_uk = 620 (e.g. G-60 acc. to ASTM 615)																	
Minimum embedment depth	[kN]	13.1	15.7	15.7	15.7	17.2	24.1	33.7	48.8	8.04	11.2	11.2	11.2	12.3	17.2	24.0	30.3
Maximum embedment depth	[kN]	22.3	34.8	50.1	68.2	89.0	139.1	217.4	321.7	21.5	34.8	50.1	68.2	89.0	125.7	157.1	150.1
SHEAR LOAD V_{Rd}																	
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)																	
Minimum embedment depth	[kN]	9.05	14.1	20.4	27.7	34.5	48.2	67.3	97.5	9.05	14.1	20.4	22.3	24.6	34.4	48.0	60.1
Maximum embedment depth	[kN]	9.05	14.1	20.4	27.7	36.2	56.6	88.4	144.8	9.05	14.1	20.4	27.7	36.2	56.6	88.4	144 .8
f_uk = 575 (e.g. B 500 SP acc. to EC2)																	
Minimum embedment depth	[kN]	9.63	15.1	21.7	29.5	34.5	48.2	67.3	97.5	9.63	15.1	21.7	22.3	24.6	34.4	48.0	60.1
Maximum embedment depth	[kN]	9.63	15.1	21.7	29.5	38.5	60.2	94.1	154.2	9.63	15.1	21.7	29.5	38.5	60.2	94.1	154.2
f_uk = 620 (e.g. G-60 acc. to ASTM 615)																	
Minimum embedment depth	[kN]	10.4	16.2	23.4	31.3	34.5	48.2	67.3	97.5	10.4	16.2	22.3	22.3	24.6	34.4	48.0	60.1
Maximum embedment depth	[kN]	10.4	16.2	23.4	31.8	41.6	64.9	101.5	166.2	10.4	16.2	23.4	31.8	41.6	64.9	101.5	166.2
RECOMMENDED LOAD																	
TENSION LOAD N_{rec}																	
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)																	
Minimum embedment depth	[kN]	9.34	11.2	11.2	11.2	12.3	17.2	24.1	34.8	5.74	7.97	7.97	7.97	8.78	12.3	17.1	21.5
Maximum embedment depth	[kN]	13.9	21.6	31.2	42.4	55.4	86.6	135.2	221.6	13.9	21.6	31.2	42.4	55.4	86.6	112.2	107.2
f_uk = 575 (e.g. B 500 SP acc. to EC2)																	
Minimum embedment depth	[kN]	9.34	11.2	11.2	11.2	12.3	17.2	24.1	34.8	5.74	7.97	7.97	7.97	8.78	12.3	17.1	21.5
Maximum embedment depth	[kN]	14.8	23.0	33.2	45.2	59.0	92.2	144.0	229.8	14.8	23.0	33.2	45.2	59.0	89.8	112.2	107.2
f_uk = 620 (e.g. G-60 acc. to ASTM 615)																	
Minimum embedment depth	[kN]	9.34	11.2	11.2	11.2	12.3	17.2	24.1	34.8	5.74	7.97	7.97	7.97	8.78	12.3	17.1	21.5
Maximum embedment depth	[kN]	15.9	24.8	35.8	48.7	63.6	99.4	155.3	229.8	15.3	24.8	35.8	48.7	63.6	89.8	112.2	107.2
SHEAR LOAD V_{rec}																	
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)																	
Minimum embedment depth	[kN]	6.46	10.1	14.5	19.8	24.6	34.4	48.1	69.7	6.46	10.1	14.5	15.9	17.6	24.5	34.3	42.9
Maximum embedment depth	[kN]	6.46	10.1	14.5	19.8	25.9	40.4	63.1	103.4	6.46	10.1	14.5	19.8	25.9	40.4	63.1	103.4
f_uk = 575 (e.g. B 500 SP acc. to EC2)																	
Minimum embedment depth	[kN]	6.46	10.1	14.5	19.8	24.6	34.4	48.1	69.7	6.46	10.1	14.5	15.9	17.6	24.5	34.3	42.9
Maximum embedment depth	[kN]	6.88	10.8	15.5	21.1	27.5	43.0	67.2	110.1	6.88	10.8	15.5	21.1	27.5	43.0	67.2	110.1
f_uk = 620 (e.g. G-60 acc. to ASTM 615)																	
Minimum embedment depth	[kN]	6.46	10.1	14.5	19.8	24.6	34.4	48.1	69.7	6.46	10.1	14.5	15.9	17.6	24.5	34.3	42.9
Maximum embedment depth	[kN]	7.42	11.6	16.7	22.7	29.7	46.4	72.5	118.7	7.42	11.6	16.7	22.7	29.7	46.4	72.5	118.7

R-KER-II | R-CFS+KER-II WITH REBAR AS AN ANCHOR

DESIGN PERFORMANCE DATA

REBARS AS ANCHORS

Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
TENSION LOAD										
STEEL FAILURE; F_UK = 540 (E.G. 500 B ACC. TO BS 4449; B 500 B ACC. TO SS 560)										
Characteristic resistance	$N_{Rk,s}$	[kN]	27.14	42.41	61.07	83.13	108.57	169.65	265.07	434.29
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
STEEL FAILURE; F_UK = 575 (E.G. B 500 SP ACC. TO EC2)										
Characteristic resistance	$N_{Rk,s}$	[kN]	28.90	45.16	65.03	88.51	115.61	180.64	282.25	462.44
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
STEEL FAILURE; F_UK = 620 (E.G. G-60 ACC. TO ASTM 615)										
Characteristic resistance	$N_{Rk,s}$	[kN]	31.16	48.69	70.12	95.44	124.66	194.78	304.34	498.63
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (40°C/24°C)										
Characteristic bond resistance	τ_{Rk}	[N/mm²]	13.00	14.00	14.00	13.00	13.00	10.00	9.00	7.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (80°C/50°C)										
Characteristic bond resistance	τ_{Rk}	[N/mm²]	13.00	14.00	14.00	13.00	13.00	10.00	9.00	7.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (120°C/80°C)										
Characteristic bond resistance	τ_{Rk}	[N/mm²]	7.00	7.00	7.00	7.00	7.00	5.50	5.00	4.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (40°C/24°C)										
Characteristic bond resistance	τ_{Rk}	[N/mm²]	8.00	9.00	10.00	10.00	8.50	7.50	6.00	3.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (80°C/50°C)										
Characteristic bond resistance	τ_{Rk}	[N/mm²]	8.00	9.00	10.00	10.00	8.50	7.50	6.00	3.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (120°C/80°C)										
Characteristic bond resistance	τ_{Rk}	[N/mm²]	4.50	5.00	5.00	5.00	4.50	4.00	3.00	2.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE										
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Factor of the influence of sustained load	ψ^0_{sus}		0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Increasing factors for $N_{Rd,p}$ - C30/37	ψ_c	-	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Increasing factors for $N_{Rd,p}$ - C40/50	ψ_c	-	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Increasing factors for $N_{Rd,p}$ - C50/60	ψ_c	-	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
CONCRETE CONE FAILURE										
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Factor for cracked concrete	k_1	-	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
Factor for cracked concrete	$k_{cr,N}$	-	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70
Factor for non-cracked concrete	k_1	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Edge distance	$c_{cr,N}$	[mm]	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$
Spacing	$s_{cr,N}$	[mm]	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$
CONCRETE SPLITTING FAILURE										
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
SHEAR LOAD										
STEEL FAILURE; F_UK = 540 (E.G. 500 B ACC. TO BS 4449; B 500 B ACC. TO SS 560)										
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	13.57	21.21	30.54	41.56	54.29	84.82	132.54	217.15
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	32.57	63.62	109.93	174.57	260.58	508.94	994.02	2084.61
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
STEEL FAILURE; F_UK = 575 (E.G. B 500 SP ACC. TO EC2)										
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	14.45	22.59	32.52	44.26	57.81	90.32	141.13	231.22
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	34.68	67.74	117.06	185.88	277.47	541.92	1058.45	2219.72
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; F_UK = 620 (E.G. G-60 ACC. TO ASTM 615)										
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	15.58	24.35	35.06	47.72	62.33	97.39	152.17	249.32
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	37.40	73.04	126.22	200.43	299.18	584.34	1141.28	2393.44
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
CONCRETE PRY-OUT FAILURE										
Factor	k	-	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE										
Anchor diameter	d_{nom}	[mm]	8.00	10.00	12.00	14.00	16.00	20.00	25.00	32.00
Effective length of anchor	ℓ_f	[mm]	min (h_{ef};$8d_{nom}$)	min (h_{ef};$8d_{nom}$)	min (h_{ef};$8d_{nom}$)	min (h_{ef};$8d_{nom}$)	min (h_{ef};$8d_{nom}$)	min (h_{ef};$8d_{nom}$)	min (h_{ef};$8d_{nom}$)	min (h_{ef};$8d_{nom}$)
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Combined pull-out and concrete cone failure:
(acc. TR 029, p.5.2.2.3. acc. to formula (5.2a) – $N^0_{Rk,p} = \pi*d*h_{ef}*\tau_{Rk}$
acc. EN 1992-4, p.7.2.1.6. acc. to formula (7.14) – $N^0_{Rk,p} = \psi_{sus}*\pi*d*h_{ef}*\tau_{Rk}$ where $\psi_{sus} = \psi^0_{sus}+1-\alpha_{sus} \le 1$ (7.14a,b)) .
Concrete cone failure:
(acc. TR 029, p.5.2.2.4. acc. to formula (5.3a) – $N^0_{Rk,c} = k_1 *f_{ck,cube}^{0,5}*hef^{1,5}$
Acc. EN 1992-4, p.7.2.1.4. acc. to formula (7.2) – $N^0_{Rk,c} = k_{ucr,N} *f_{ck}^{0,5}*h_{ef}^{1,5}$).

R-KER-II | R-CFS+KER-II WITH REBAR AS AN ANCHOR

DESIGN PERFORMANCE DATA (cont.)

Allowable values for resistance in case of Seismic performance category C1

Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
TENSION LOAD										
STEEL FAILURE; F_UK = 540 (E.G. 500 B ACC. TO BS 4449; B 500 B ACC. TO SS 560)										
Characteristic resistance	$N_{Rk,s}$	[kN]	27.14	42.41	61.07	83.13	108.57	169.65	265.07	434.29
Partial safety factor	$\gamma_{MsN,seisC1}$	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
STEEL FAILURE; F_UK = 575 (E.G. B 500 SP ACC. TO EC2)										
Characteristic resistance	$N_{Rk,s}$	[kN]	28.90	45.16	65.03	88.51	115.61	180.64	282.25	462.44
Partial safety factor	$\gamma_{MsN,seisC1}$	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
STEEL FAILURE; F_UK = 620 (E.G. G-60 ACC. TO ASTM 615)										
Characteristic resistance	$N_{Rk,s}$	[kN]	31.16	48.69	70.12	95.44	124.66	194.78	304.34	498.63
Partial safety factor	$\gamma_{MsN,seisC1}$	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (40°C/24°C)										
Characteristic bond resistance	τ_{Rk}	[N/mm²]	7.00	8.50	10.00	10.00	8.50	7.50	6.00	3.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (80°C/50°C)										
Characteristic bond resistance	τ_{Rk}	[N/mm²]	7.00	8.50	10.00	10.00	8.50	7.50	6.00	3.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE, C20/25 (120°C/80°C)										
Characteristic bond resistance	τ_{Rk}	[N/mm²]	4.00	4.50	5.00	5.00	4.50	4.00	3.00	1.50
PULL-OUT FAILURE										
Partial safety factor	$\gamma_{Mp,seisC1}$	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
SHEAR LOAD										
STEEL FAILURE; F_UK = 540 (E.G. 500 B ACC. TO BS 4449; B 500 B ACC. TO SS 560)										
Characteristic resistance	$N_{Rk,s}$	[kN]	9.50	14.84	21.38	29.09	38.00	59.38	92.78	152.00
Partial safety factor	$\gamma_{MsN,seisC1}$	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; F_UK = 575 (E.G. B 500 SP ACC. TO EC2)										
Characteristic resistance	$N_{Rk,s}$	[kN]	10.12	15.81	22.76	30.98	40.46	63.22	98.79	161.85
Partial safety factor	$\gamma_{MsN,seisC1}$	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; F_UK = 620 (E.G. G-60 ACC. TO ASTM 615)										
Characteristic resistance	$N_{Rk,s}$	[kN]	10.91	17.04	24.51	33.40	43.63	68.17	106.52	174.52
Partial safety factor	$\gamma_{MsN,seisC1}$	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50

R-KER | R-CFS+RV200 WITH REBAR AS AN ANCHOR

High performance vinylester resin approved for use with reinforcement bars

ETA | ETA-13/0805 | CE

FEATURES AND BENEFITS

- Approved for use with rebar as an anchor for use in non-cracked concrete (ETAG001 Option 7)
- Suitable for use in low temperatures (down to -20°C for winter option) enables use throughout the year
- Winter version can be used in warmer temperatures for faster curing
- Suitable for use in dry or wet substrates and water filled holes
- Rapid bonding time enables quick execution of works
- Very high load capacity
- Anchor does not generate expansion forces in the concrete which means reduced spacing and edge distances.

APPLICATIONS

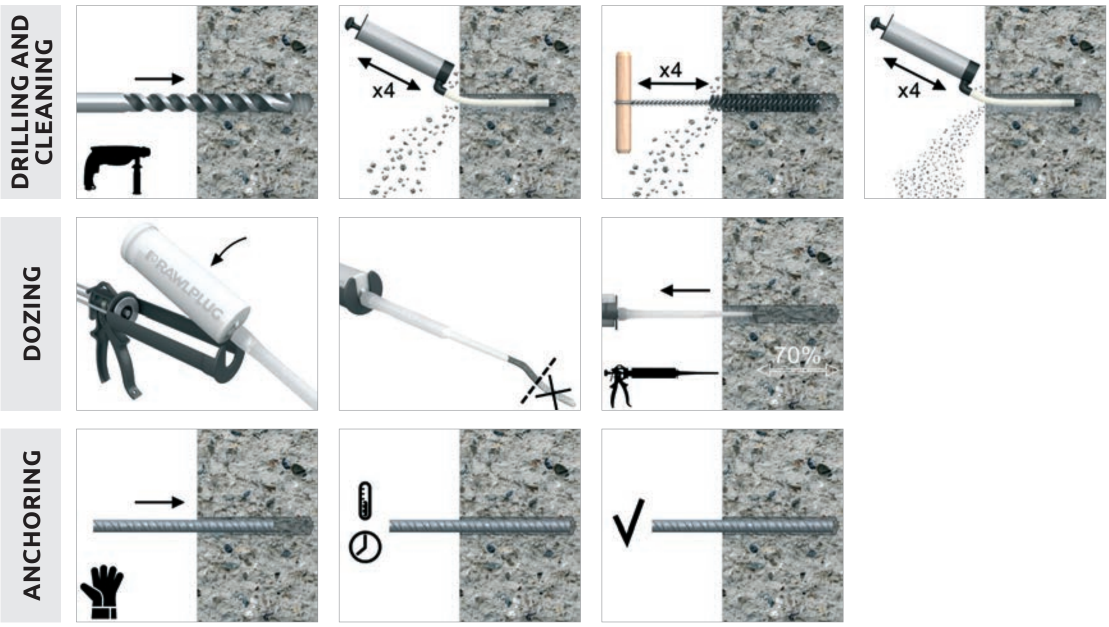
- Curtain walling
- Balustrading
- Barriers
- Cable trays
- Cladding restraints
- Structural steelwork
- Rebar dowelling
- Starter bars
- Rebar missed-outs

BASE MATERIALS

Approved for use in:

- Non-cracked concrete C20/25-C50/60

INSTALLATION GUIDE



R-KER | R-CFS+RV200 WITH REBAR AS AN ANCHOR

INSTALLATION GUIDE (cont.)

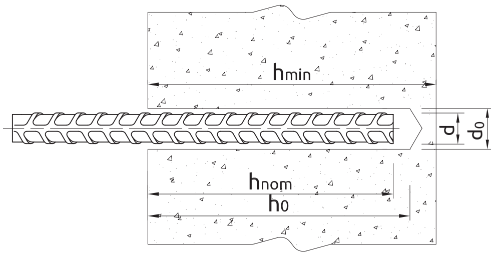
1. Drill hole to the required diameter and depth for rebar size being used.
2. Clean the drill hole thoroughly with brush and hand pump at least four times before installation
3. Insert cartridge into gun and attach nozzle.
4. Dispense to waste until even colour is obtained.
5. Insert the mixer nozzle to the bottom of the drill hole and inject resin, slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
6. Immediately insert the rebar, slowly and with slight twisting motion.
   Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.

PRODUCT INFORMATION

Product Code	Resin	Description / Resin Type	Volume [ml]
R-KER-300	R-KER	Styrene Free Vinylester Resin	300
R-KER-345			345
R-KER-380			380
R-KER-400			400
R-KER-300-W	R-KER-W	Low Temperature (Winter) / Rapid Cure Styrene Free Vinylester Resin	300
R-KER-380-W			380
R-KER-400-W			400
R-KER-380-S	R-KER-S	High Temperature (Summer) / Slow Cure Styrene Free Vinylester Resin	380
R-KER-400-S			400
R-CFS+RV200-4	RV200	Styrene Free Vinylester Resin	300
R-CFS+RV200W-4	RV200-W	Low Temperature (Winter) / Rapid Cure Styrene Free Vinylester Resin	
R-CFS+RV200S-4	RV200-S	High Temperature (Summer) / Slow Cure Styrene Free Vinylester Resin	
R-CFS+RV200-600-8	RV200	Styrene Free Vinylester Resin	600
R-CFS+RV200TW-6008	RV200-W	Low Temperature (Winter) / Rapid Cure Styrene Free Vinylester Resin	

INSTALLATION DATA

REBARS AS ANCHORS



Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
Rebar diameter	d_s	[mm]	8	10	12	14	16	20	25	32
Hole diameter in substrate	d_0	[mm]	12	14	18	18	22	26	32	40
Min. hole depth in substrate	h_0	[mm]	h_{nom}+5	h_{nom}+5	h_{nom}+5	h_{nom}+5	h_{nom}+5	h_{nom}+5	h_{nom}+5	h_{nom}+5
Min. substrate thickness	h_{min}	[mm]	h_{nom}+30 ≥100	h_{nom}+30 ≥100	h_{nom} + 2d_0	h_{nom} + 2d_0	h_{nom} + 2d_0	h_{nom} + 2d_0	h_{nom} + 2d_0	h_{nom} + 2d_0
Min. spacing	s_{min}	[mm]	0.5 * h_{nom} ≥ 40	0.5 * h_{nom} ≥ 40	0.5 * h_{nom} ≥ 40	0.5 * h_{nom} ≥ 40	0.5 * h_{nom} ≥ 40	0.5 * h_{nom} ≥ 40	0.5 * h_{nom} ≥ 40	0.5 * h_{nom} ≥ 40
Min. edge distance	c_{min}	[mm]	0.5 * h_{nom} ≥ 40	0.5 * h_{nom} ≥ 40	0.5 * h_{nom} ≥ 40	0.5 * h_{nom} ≥ 40	0.5 * h_{nom} ≥ 40	0.5 * h_{nom} ≥ 40	0.5 * h_{nom} ≥ 40	0.5 * h_{nom} ≥ 40
MINIMUM EMBEDMENT DEPTH										
Min. installation depth	$h_{nom, min}$	[mm]	60	70	80	80	100	120	140	165
MAXIMUM EMBEDMENT DEPTH										
Min. installation depth	$h_{nom, max}$	[mm]	100	120	145	145	190	240	290	360

R-KER | R-CFS+RV200 WITH REBAR AS AN ANCHOR

INSTALLATION DATA (cont.)

Minimum working and curing time

Resin temperature	Concrete temperature	Working time [min.]			Curing time* [min.]		
°C	°C	R-KER-S RV200-S	R-KER RV200	R-KER-W RV200-W	R-KER-S RV200-S	R-KER RV200	R-KER-W RV200-W
5	-20	-	-	100	-	-	24h
5	-15	-	-	60	-	-	16h
5	-10	-	-	30	-	-	8h
5	-5	65	60	16	24h	6h	4h
5	0	50	40	12	16h	3h	2h
5	5	35	20	8	12h	2h	1h
10	10	20	12	5	8h	80	45
15	15	12	8	3	6h	60	30
20	20	9	5	2	4h	45	10
25	25	7	3	-	3h	30	-
25	30	6	2	-	2h	20	-
25	40	5	0.5	-	45	10	-
25	45	3	-	-	35	-	-
25	50	2	-	-	25	-	-

*For wet concrete the curing time must be doubled

MECHANICAL PROPERTIES

REBARS AS ANCHORS

Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)										
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	540	540	540	540	540	540	540	540
Nominal yield strength - tension	f_{yk}	[N/mm²]	500	500	500	500	500	500	500	500
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	804.2
Elastic section modulus	W_{el}	[mm³]	50.3	98.2	169.6	269.4	402.1	785.4	1534	3217
f_uk = 575 (e.g. B 500 SP acc. to EC2)										
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	575	575	575	575	575	575	575	575
Nominal yield strength - tension	f_{yk}	[N/mm²]	500	500	500	500	500	500	500	500
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	804.2
Elastic section modulus	W_{el}	[mm³]	50.3	98.2	169.6	269.4	402.1	785.4	1534	3217
f_uk = 620 (e.g. G-60 acc. to ASTM 615)										
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	620	620	620	620	620	620	620	620
Nominal yield strength - tension	f_{yk}	[N/mm²]	420	420	420	420	420	420	420	420
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	804.2
Elastic section modulus	W_{el}	[mm³]	50.3	98.2	169.6	269.4	402.1	785.4	1534	3217

BASIC PERFORMANCE DATA

REBARS AS ANCHORS

Size		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
Substrate		Non-cracked concrete							
MEAN ULTIMATE LOAD									
TENSION LOAD $N_{Ru,m}$									
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)									
Minimum embedment depth	[kN]	26.8	37.3	48.3	48.3	67.5	88.7	111.8	143.1
Maximum embedment depth	[kN]	28.5	44.5	64.1	87.3	114.0	178.1	246.7	348.2
f_uk = 575 (e.g. B 500 SP acc. to EC2)									
Minimum embedment depth	[kN]	26.8	37.3	48.3	48.3	67.5	88.7	111.8	143.1
Maximum embedment depth	[kN]	30.4	47.4	68.3	92.9	121.4	189.7	246.7	348.2
f_uk = 620 (e.g. G-60 acc. to ASTM 615)									
Minimum embedment depth	[kN]	26.8	37.3	48.3	48.3	67.5	88.7	111.8	143.1
Maximum embedment depth	[kN]	32.7	51.1	73.6	100.2	130.9	190.6	246.7	348.2
SHEAR LOAD $V_{Ru,m}$									
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)									
Minimum embedment depth	[kN]	17.1	26.7	38.5	52.4	68.4	106.9	167.0	273.6
Maximum embedment depth	[kN]	17.1	26.7	38.5	52.4	68.4	106.9	167.0	273.6
f_uk = 575 (e.g. B 500 SP acc. to EC2)									
Minimum embedment depth	[kN]	18.2	28.5	41.0	55.8	72.8	113.8	177.8	276.1
Maximum embedment depth	[kN]	18.2	28.5	41.0	55.8	72.8	113.8	177.8	291.3
f_uk = 620 (e.g. G-60 acc. to ASTM 615)									
Minimum embedment depth	[kN]	19.6	30.7	44.2	60.1	78.5	122.7	191.7	286.1
Maximum embedment depth	[kN]	19.6	30.7	44.2	60.1	78.5	122.7	191.7	314.1

R-KER | R-CFS+RV200 WITH REBAR AS AN ANCHOR

BASIC PERFORMANCE DATA (cont.)

Size		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
CHARACTERISTIC LOAD									
TENSION LOAD N_{Rk}									
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)									
Minimum embedment depth	[kN]	16.6	22.0	30.2	31.7	45.3	56.6	77.0	107.0
Maximum embedment depth	[kN]	27.1	37.7	54.7	57.4	86.0	113.1	159.4	235.2
f_uk = 575 (e.g. B 500 SP acc. to EC2)									
Minimum embedment depth	[kN]	16.6	22.0	30.2	31.7	45.2	56.6	77.0	107.0
Maximum embedment depth	[kN]	27.7	37.7	54.7	57.4	86.0	113.1	159.4	235.2
f_uk = 620 (e.g. G-60 acc. to ASTM 615)									
Minimum embedment depth	[kN]	16.6	22.0	30.2	31.7	45.2	56.6	77.0	107.0
Maximum embedment depth	[kN]	27.7	37.7	54.7	57.4	86.0	113.1	159.4	235.2
SHEAR LOAD V_{Rk}									
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)									
Minimum embedment depth	[kN]	13.6	21.2	30.5	41.6	54.3	84.8	132.5	214.1
Maximum embedment depth	[kN]	13.6	21.2	30.5	41.6	54.3	84.8	132.5	217.2
f_uk = 575 (e.g. B 500 SP acc. to EC2)									
Minimum embedment depth	[kN]	14.5	22.6	32.5	44.3	57.8	90.3	141.1	214.1
Maximum embedment depth	[kN]	14.5	22.6	32.5	44.3	57.8	90.3	141.1	231.2
f_uk = 620 (e.g. G-60 acc. to ASTM 615)									
Minimum embedment depth	[kN]	15.6	24.4	35.1	47.7	62.3	97.4	152.2	214.1
Maximum embedment depth	[kN]	15.6	24.4	35.1	47.7	62.3	97.4	152.2	249.3
DESIGN LOAD									
TENSION LOAD N_{Rd}									
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)									
Minimum embedment depth	[kN]	9.22	12.2	16.8	17.6	25.1	31.4	42.8	59.5
Maximum embedment depth	[kN]	15.4	20.9	30.4	31.9	47.8	62.8	88.6	130.7
f_uk = 575 (e.g. B 500 SP acc. to EC2)									
Minimum embedment depth	[kN]	9.22	12.2	16.8	17.6	25.1	31.4	42.8	59.5
Maximum embedment depth	[kN]	15.4	20.9	30.4	31.9	47.8	62.8	88.6	130.7
f_uk = 620 (e.g. G-60 acc. to ASTM 615)									
Minimum embedment depth	[kN]	9.22	12.2	16.8	17.6	25.1	31.4	42.8	59.5
Maximum embedment depth	[kN]	15.4	20.9	30.4	31.9	47.8	62.8	88.6	130.7
SHEAR LOAD V_{Rd}									
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)									
Minimum embedment depth	[kN]	9.05	14.1	20.4	27.7	36.2	56.6	88.4	142.7
Maximum embedment depth	[kN]	9.05	14.1	20.4	27.7	36.2	56.6	88.4	144.8
f_uk = 575 (e.g. B 500 SP acc. to EC2)									
Minimum embedment depth	[kN]	9.63	15.1	21.7	29.5	38.5	60.2	94.1	142.7
Maximum embedment depth	[kN]	9.63	15.1	21.7	29.5	38.5	60.2	94.1	154.2
f_uk = 620 (e.g. G-60 acc. to ASTM 615)									
Minimum embedment depth	[kN]	10.4	16.2	23.4	31.8	41.6	64.9	101.5	142.7
Maximum embedment depth	[kN]	10.4	16.2	23.4	31.8	41.6	64.9	101.5	166.2
RECOMMENDED LOAD									
TENSION LOAD N_{rec}									
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)									
Minimum embedment depth	[kN]	6.58	8.73	12.0	12.6	18.0	22.4	30.5	42.3
Maximum embedment depth	[kN]	11.0	15.0	21.7	22.8	34.1	44.9	63.3	93.4
f_uk = 575 (e.g. B 500 SP acc. to EC2)									
Minimum embedment depth	[kN]	6.58	8.73	12.0	12.6	18.0	22.4	30.5	42.5
Maximum embedment depth	[kN]	11.0	15.0	21.7	22.8	34.1	44.9	63.3	93.4
f_uk = 620 (e.g. G-60 acc. to ASTM 615)									
Minimum embedment depth	[kN]	6.58	8.73	12.0	12.6	18.0	22.4	30.5	42.5
Maximum embedment depth	[kN]	11.0	15.0	21.7	22.8	34.1	44.9	63.3	93.6
SHEAR LOAD V_{rec}									
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)									
Minimum embedment depth	[kN]	6.46	10.1	14.5	19.8	25.9	40.4	63.1	101.9
Maximum embedment depth	[kN]	6.46	10.1	14.5	19.8	25.9	40.4	63.1	103.4
f_uk = 575 (e.g. B 500 SP acc. to EC2)									
Minimum embedment depth	[kN]	6.88	10.8	15.5	21.1	27.5	43.0	67.2	101.9
Maximum embedment depth	[kN]	6.88	10.8	15.5	21.1	27.5	43.0	67.2	110.1
f_uk = 620 (e.g. G-60 acc. to ASTM 615)									
Minimum embedment depth	[kN]	7.42	11.6	16.7	22.7	29.7	46.4	72.5	101.9
Maximum embedment depth	[kN]	7.42	11.6	16.7	22.7	29.7	46.4	72.5	118.7

R-KER | R-CFS+RV200 WITH REBAR AS AN ANCHOR

DESIGN PERFORMANCE DATA

REBARS AS ANCHORS

Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32
TENSION LOAD										
STEEL FAILURE; F_UK = 540 (E.G. 500 B ACC. TO BS 4449; B 500 B ACC. TO SS 560)										
Characteristic resistance	$N_{Rk,s}$	[kN]	27.14	42.41	61.07	83.13	108.57	169.65	265.07	434.29
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
STEEL FAILURE; F_UK = 575 (E.G. B 500 SP ACC. TO EC2)										
Characteristic resistance	$N_{Rk,s}$	[kN]	28.90	45.16	65.03	88.51	115.61	180.64	282.25	462.44
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
STEEL FAILURE; F_UK = 620 (E.G. G-60 ACC. TO ASTM 615)										
Characteristic resistance	$N_{Rk,s}$	[kN]	31.16	48.69	70.12	95.44	124.66	194.78	304.34	498.63
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (40°C/24°C)										
Characteristic bond resistance	τ_{Rk}	[N/mm²]	11.00	10.00	10.00	9.00	9.00	7.50	7.00	6.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (80°C/50°C)										
Characteristic bond resistance	τ_{Rk}	[N/mm²]	9.00	8.00	8.00	7.00	7.00	6.00	6.00	5.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE										
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Factor of the influence of sustained load	ψ^0_{sus}	-	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Increasing factors for $N_{Rd,p}$ - C30/37	ψ_c	-	1.04	1.04	1.04	1.04	1.04	1.00	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C40/50	ψ_c	-	1.07	1.07	1.07	1.07	1.07	1.00	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C50/60	ψ_c	-	1.09	1.09	1.09	1.09	1.09	1.00	1.00	1.00
CONCRETE CONE FAILURE										
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Factor for non-cracked concrete	k_1	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Edge distance	$c_{cr,N}$	[mm]	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$
Spacing	$s_{cr,N}$	[mm]	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$
CONCRETE SPLITTING FAILURE										
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
SHEAR LOAD										
STEEL FAILURE; F_UK = 540 (E.G. 500 B ACC. TO BS 4449; B 500 B ACC. TO SS 560)										
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	13.57	21.21	30.54	41.56	54.29	84.82	132.54	217.15
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	32.57	63.62	109.93	174.57	260.58	508.94	994.02	2084.61
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; F_UK = 575 (E.G. B 500 SP ACC. TO EC2)										
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	14.45	22.59	32.52	44.26	57.81	90.32	141.13	231.22
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	34.68	67.74	117.06	185.88	277.47	541.92	1058.45	2219.72
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; F_UK = 620 (E.G. G-60 ACC. TO ASTM 615)										
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	15.58	24.35	35.06	47.72	62.33	97.39	152.17	249.32
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	37.40	73.04	126.22	200.43	299.18	584.34	1141.28	2393.44
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
CONCRETE PRY-OUT FAILURE										
Factor	k	-	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE										
Anchor diameter	d_{nom}	[mm]	8.00	10.00	12.00	14.00	16.00	20.00	25.00	32.00
Effective length of anchor	ℓ_f	[mm]	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$	min $(h_{ef};8d_{nom})$
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Combined pull-out and concrete cone failure:
(acc. TR 029, p.5.2.2.3. acc. to formula (5.2a) – $N^0_{Rk,p} = \pi*d*h_{ef}*\tau_{Rk}$
acc. EN 1992-4, p.7.2.1.6. acc. to formula (7.14) – $N^0_{Rk,p} = \psi_{sus}*\pi*d*h_{ef}*\tau_{Rk}$ where $\psi_{sus} = \psi^0_{sus}+1-\alpha_{sus}\leq 1$ (7.14a,b)) .
Concrete cone failure:
(acc. TR 029, p.5.2.2.4. acc. to formula (5.3a) – $N^0_{Rk,c} = k_1 *f_{ck,cube}{}^{0,5}*hef^{1,5}$
Acc. EN 1992-4, p.7.2.1.4. acc. to formula (7.2) – $N^0_{Rk,c} = k_{ucr,N} *f_{ck}{}^{0,5}*h_{ef}{}^{1,5}$).

R-HAC-V HAMMER-IN WITH REBAR

Heavy duty anchor with small spacing and edge distances, simply installed by hammering the stud or rebar

ETA ETA-11/0002 CE

FEATURES AND BENEFITS

- Approved for use with rebar in non-cracked concrete (ETAG001 Option 7)
- High performance anchor, for use in safety critical applications
- The system relies on the adhesion between concrete and resin, which is free from expansion forces. This makes it an ideal choice where close edge and spacing distances are required
- Capsule contains precise amounts of ingredients making it a very consistent product
- Adhesive bond strength is not affected by unpolluted water
- Suitable for dry or wet non-cracked concrete
- Ideal for starter bar applications
- Low cost tooling required for installation, quick and easy to install
- Styrene free - virtually odourless

APPLICATIONS

- Reinforcement bars
- Cable trays
- Heavy machinery
- Fencing & gates manufacturing and installation
- Formwork support systems

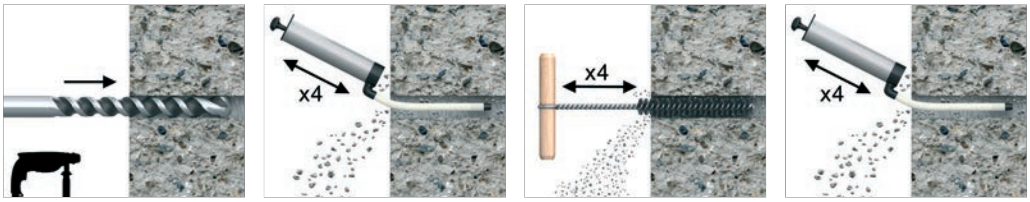
BASE MATERIALS

Approved for use in:
- Non-cracked concrete C20/25-C50/60

Also suitable for use in:
- Natural Stone (after site testing)

INSTALLATION GUIDE

DRILLING AND CLEANING



DOZING AND ANCHORING

1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with brush and hand pump at least four times before installation.
3. Insert capsule into the hole.
4. The stud is simply hammered through the capsule using a manual or mechanical hammer (M16-M30).
5. Leave the anchor undisturbed unitl the curing time elapses.
6. Attach fixture and tighten the nut to the required torque.

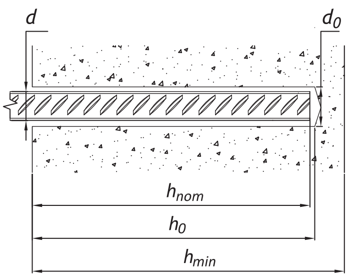
PRODUCT INFORMATION

Size	Product Code	Description / Resin Type
M8	R-HAC-V-08	Styrene Free Vinylester Resin
M10	R-HAC-V-10	
M12	R-HAC-V-12	
M16	R-HAC-V-16	
M20	R-HAC-V-20	
M24	R-HAC-V-24	
M30	R-HAC-V-30	

R-HAC-V HAMMER-IN WITH REBAR

INSTALLATION DATA

REBARS AS ANCHORS



Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25
Rebar diameter	d_s	[mm]	8	10	12	14	16	20	25
Hole diameter in substrate	d_0	[mm]	12	14	18	18	22	26	35
Capsule size	-	[mm]	10	12	16	16	20	24	30
Capsule diameter	d_c	[mm]	10.75	12.65	16.75	16.75	21.55	23.75	33.2
Min. hole depth in substrate	h_0	[mm]	85	95	115	115	130	175	215
Min. installation depth	h_{nom}	[mm]	80	90	110	110	125	170	210
Min. substrate thickness	h_{min}	[mm]	120	130	140	140	180	230	270
Min. spacing	s_{min}	[mm]	40	45	55	55	63	85	105
Min. edge distance	c_{min}	[mm]	40	45	55	55	63	85	105

REBARS AS ANCHORS

Resin temperature	Concrete temperature	Curing time*	Working time
[°C]	[°C]	[min]	[min]
5	-5	-	1440
5	0	-	840
5	5	-	240
10	10	-	180
15	15	-	90
20	20	-	45
25	30	-	20
25	40	-	10

*For wet concrete the curing time must be doubled

MECHANICAL PROPERTIES

REBARS AS ANCHORS

Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	540	540	540	540	540	540	540
Nominal yield strength - tension	f_{yk}	[N/mm²]	500	500	500	500	500	500	500
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9
Elastic section modulus	W_{el}	[mm³]	50.3	98.2	169.6	269.4	402.1	785.4	1534
f_uk = 575 (e.g. B 500 SP acc. to EC2)									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	575	575	575	575	575	575	575
Nominal yield strength - tension	f_{yk}	[N/mm²]	500	500	500	500	500	500	500
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9
Elastic section modulus	W_{el}	[mm³]	50.3	98.2	169.6	269.4	402.1	785.4	1534
f_uk = 620 (e.g. G-60 acc. to ASTM 615)									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	620	620	620	620	620	620	620
Nominal yield strength - tension	f_{yk}	[N/mm²]	420	420	420	420	420	420	420
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9
Elastic section modulus	W_{el}	[mm³]	50.3	98.2	169.6	269.4	402.1	785.4	1534

R-HAC-V HAMMER-IN WITH REBAR

BASIC PERFORMANCE DATA

REBARS AS ANCHORS

Size		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25
Substrate		Non-cracked concrete						
MEAN ULTIMATE LOAD								
TENSION LOAD $N_{Ru,m}$								
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)	[kN]	19.3	27.1	39.8	49.4	67.9	89.7	128.7
f_uk = 575 (e.g. B 500 SP acc. to EC2)	[kN]	19.3	27.1	39.8	49.4	67.9	89.7	128.7
f_uk = 620 (e.g. G-60 acc. to ASTM 615)	[kN]	19.3	27.1	39.8	49.4	67.9	89.7	128.7
SHEAR LOAD $V_{Ru,m}$								
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)	[kN]	17.1	26.7	38.5	52.4	68.4	106.9	167.0
f_uk = 575 (e.g. B 500 SP acc. to EC2)	[kN]	18.2	28.5	41.0	55.8	72.8	113.8	177.8
f_uk = 620 (e.g. G-60 acc. to ASTM 615)	[kN]	19.6	30.7	44.2	60.1	78.5	122.7	191.7
CHARACTERISTIC LOAD								
TENSION LOAD N_{Rk}								
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)	[kN]	16.1	22.6	33.2	41.1	56.6	74.8	107.2
f_uk = 575 (e.g. B 500 SP acc. to EC2)	[kN]	16.1	22.6	33.2	41.1	56.6	74.8	107.2
f_uk = 620 (e.g. G-60 acc. to ASTM 615)	[kN]	16.1	22.6	33.2	41.1	56.6	74.8	107.2
SHEAR LOAD V_{Rk}								
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)	[kN]	13.6	21.2	30.5	41.6	54.3	84.8	132.5
f_uk = 575 (e.g. B 500 SP acc. to EC2)	[kN]	14.5	22.6	32.5	44.3	57.8	90.3	141.1
f_uk = 620 (e.g. G-60 acc. to ASTM 615)	[kN]	15.6	24.4	35.1	47.7	62.3	97.4	152.2
DESIGN LOAD								
TENSION LOAD N_{Rd}								
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)	[kN]	8.94	12.6	18.4	22.9	31.4	41.5	59.6
f_uk = 575 (e.g. B 500 SP acc. to EC2)	[kN]	8.94	12.6	18.4	22.9	31.4	41.5	59.6
f_uk = 620 (e.g. G-60 acc. to ASTM 615)	[kN]	8.94	12.6	18.4	22.9	31.4	41.5	59.6
SHEAR LOAD V_{Rd}								
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)	[kN]	9.05	14.1	20.4	27.7	36.2	56.6	88.4
f_uk = 575 (e.g. B 500 SP acc. to EC2)	[kN]	9.63	15.1	21.7	29.5	38.5	60.2	94.1
f_uk = 620 (e.g. G-60 acc. to ASTM 615)	[kN]	10.4	16.2	23.4	31.8	41.6	64.9	101.5
RECOMMENDED LOAD								
TENSION LOAD N_{rec}								
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)	[kN]	6.38	8.98	13.2	16.3	22.4	29.7	42.5
f_uk = 575 (e.g. B 500 SP acc. to EC2)	[kN]	6.38	8.98	13.2	16.3	22.4	29.7	42.5
f_uk = 620 (e.g. G-60 acc. to ASTM 615)	[kN]	6.38	8.98	13.2	16.3	22.4	29.7	42.5
SHEAR LOAD V_{rec}								
f_uk = 540 (e.g. 500 B acc. to BS 4449; B 500 B acc. to SS 560)	[kN]	6.46	10.1	14.5	19.8	25.9	40.4	63.1
f_uk = 575 (e.g. B 500 SP acc. to EC2)	[kN]	6.88	10.8	15.5	21.1	27.4	43.0	67.2
f_uk = 620 (e.g. G-60 acc. to ASTM 615)	[kN]	7.42	11.6	16.7	22.7	29.7	46.4	72.5

R-HAC-V HAMMER-IN WITH REBAR

DESIGN PERFORMANCE DATA

REBARS AS ANCHORS

Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25
Effective embedment depth	h_{ef}	[mm]	80.00	90.00	110.00	110.00	125.00	170.00	210.00
TENSION LOAD									
STEEL FAILURE; F_UK = 540 (E.G. 500 B ACC. TO BS 4449; B 500 B ACC. TO SS 560)									
Characteristic resistance	$N_{Rk,s}$	[kN]	27.14	42.41	61.07	83.13	108.57	169.65	265.07
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40
STEEL FAILURE; F_UK = 575 (E.G. B 500 SP ACC. TO EC2)									
Characteristic resistance	$N_{Rk,s}$	[kN]	28.90	45.16	65.03	88.51	115.61	180.64	282.25
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40
STEEL FAILURE; F_UK = 620 (E.G. G-60 ACC. TO ASTM 615)									
Characteristic resistance	$N_{Rk,s}$	[kN]	31.16	48.69	70.12	95.44	124.66	194.78	304.34
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (40°C/24°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	8.00	8.00	8.00	8.50	9.00	7.00	6.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE, C20/25 (80°C/50°C)									
Characteristic bond resistance	τ_{Rk}	[N/mm²]	7.00	7.00	7.00	7.00	7.50	6.00	5.50
COMBINED PULL-OUT AND CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Factor of the influence of sustained load	ψ^0_{sus}		0.6	0.6	0.6	0.6	0.6	0.6	0.6
Increasing factors for $N_{Rd,p}$ - C30/37	ψ_c	-	1.04	1.04	1.04	1.04	1.04	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C40/50	ψ_c	-	1.07	1.07	1.07	1.07	1.07	1.00	1.07
Increasing factors for $N_{Rd,p}$ - C50/60	ψ_c	-	1.09	1.09	1.09	1.09	1.09	1.00	1.09
CONCRETE CONE FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Factor for non-cracked concrete	k_1	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Edge distance	$c_{cr,N}$	[mm]	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$	$1.5*h_{ef}$
Spacing	$s_{cr,N}$	[mm]	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$	$3.0*h_{ef}$
CONCRETE SPLITTING FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20
SHEAR LOAD									
STEEL FAILURE; F_UK = 540 (E.G. 500 B ACC. TO BS 4449; B 500 B ACC. TO SS 560)									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	13.57	21.21	30.54	41.56	54.29	84.82	132.54
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	32.57	63.62	109.93	174.57	260.58	508.94	994.02
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; F_UK = 575 (E.G. B 500 SP ACC. TO EC2)									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	14.45	22.59	32.52	44.26	57.81	90.32	141.13
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	34.68	67.74	117.06	185.88	277.47	541.92	1058.45
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
STEEL FAILURE; F_UK = 620 (E.G. G-60 ACC. TO ASTM 615)									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	15.58	24.35	35.06	47.72	62.33	97.39	152.17
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	37.40	73.04	126.22	200.43	299.18	584.34	1141.28
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
CONCRETE PRY-OUT FAILURE									
Factor	k	-	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Anchor diameter	d_{nom}	[mm]	8.00	10.00	12.00	14.00	16.00	20.00	25.00
Effective length of anchor	ℓ_f	[mm]	80.00	90.00	110.00	110.00	125.00	170.00	210.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Combined pull-out and concrete cone failure:
(acc. TR 029, p.5.2.2.3. acc. to formula (5.2a) – $N^0_{Rk,p} = \pi*d*h_{ef}*\tau_{Rk}$
acc. EN 1992-4, p.7.2.1.6. acc. to formula (7.14) – $N^0_{Rk,p} = \psi_{sus}*\pi*d*h_{ef}*\tau_{Rk}$ where $\psi_{sus} = \psi^0_{sus}+1-\alpha_{sus} \leq 1$ (7.14a,b)) .
Concrete cone failure:
(acc. TR 029, p.5.2.2.4. acc. to formula (5.3a) – $N^0_{Rk,c} = k_1 *f_{ck,cube}{}^{0,5}*hef^{1,5}$
Acc. EN 1992-4, p.7.2.1.4. acc. to formula (7.2) – $N^0_{Rk,c} = k_{ucr,N} *f_{ck}{}^{0,5}*h_{ef}{}^{1,5}$).

R-KEX-II WITH POST-INSTALLED REBAR

Premium pure epoxy resin approved for use with post-installed rebar connections

ETA | ETA-13/0585 | CE | SEISMIC C1 | FIRE | VOC EMISSION TESTING

FEATURES AND BENEFITS

- The strongest resin in the epoxy resin class
- Approved for use with post-installed rebars concrete (EAD 330087-00-0601)
- Suitable for use in dry and wet substrates including flooded holes
- High depth of anchoring up to 2,5 m for rebar applications
- Very high chemical resistance – suitable for applications exposed to influence of various agents (industrial or marine environment)
- Minimal shrinkage provides option of use in diamond-drilled holes and oversized holes
- Extended working time ensures easy installation of metal components (up to 30 min. in 20°C)
- For use in positive temperatures
- Diamond and hammer drilling

APPLICATIONS

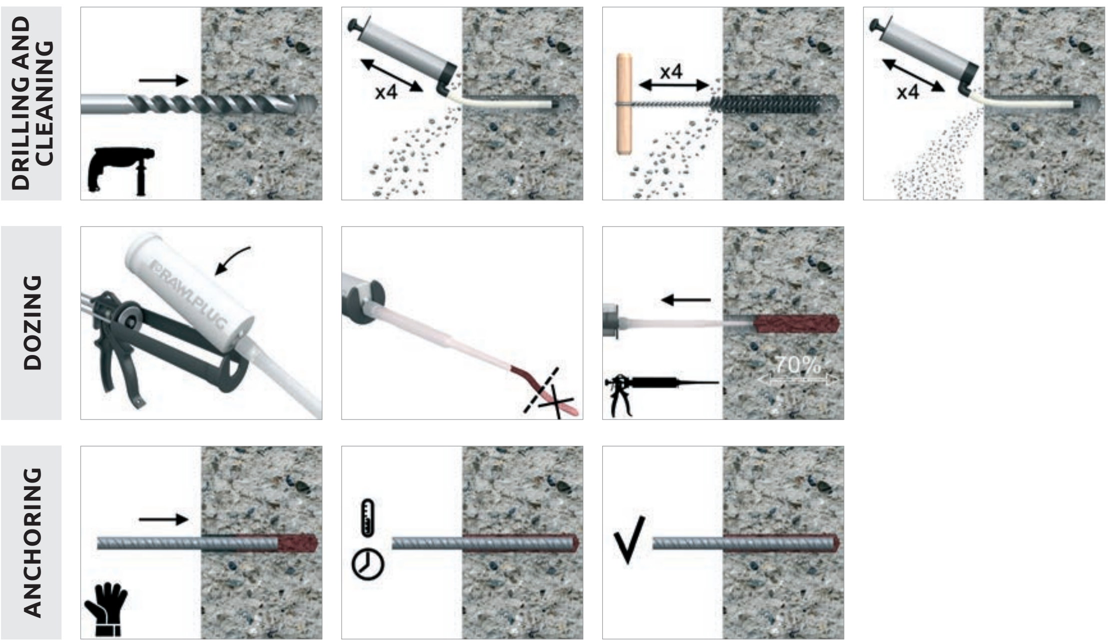
- Post-installed rebar connections
- Rebar
- Rebar missed-outs
- Extending existing buildings and structures.
- Renovation and modrnization of bridges, buildings.
- Safety barriers
- Barriers
- Platforms

BASE MATERIALS

Approved for use in:

- Concrete C12/15-C50/60

INSTALLATION GUIDE



R-KEX-II WITH POST-INSTALLED REBAR

INSTALLATION GUIDE

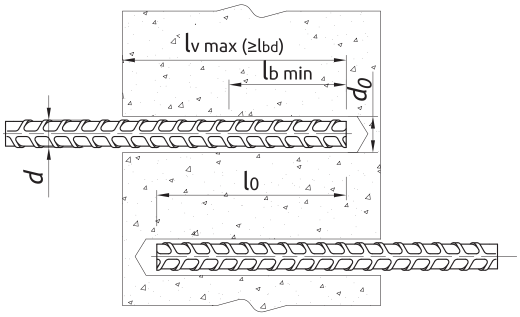
1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with brush and hand pump at least four times before installation.
3. Insert cartridge into gun and attach nozzle.
4. Dispense to waste until even colour is obtained.
5. Insert the mixing nozzle to the far end of the hole and inject resin, slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
6. Immediately insert the rebar, slowly and with slight twisting motion. Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.

PRODUCT INFORMATION

Product Code	Resin	Description / Resin Type	Volume [ml]
R-KEX-II-385	R-KEX II	Epoxy Resin	385
R-KEX-II-600			600

INSTALLATION DATA

POST INSTALLED REBARS



Size			Ø8	Ø10	Ø12	Ø13	Ø14	Ø16	Ø18	Ø20	Ø22	Ø25	Ø28	Ø30	Ø32	Ø34	Ø36	Ø40
Rebar diameter	d_s	[mm]	8	10	12	13	14	16	18	20	22	25	28	30	32	34	36	40
Hole diameter in substrate	d_0	[mm]	12	14	16	16	18	20	22	25	26	30	35	35	40	45	45	50
Brush diameter	-	[mm]	14	16	18	18	20	22	24	27	27	32	37	37	42	47	47	52
Min. anchorage length	$l_{b,min.}$	[mm]	115	145	170	185	200	230	260	285	315	355	400	420	455	485	510	570
Min. lap length (overlap splice)	$l_{0,min.}$	[mm]	200	215	260	270	300	345	430	430	470	535	600	640	690	725	770	855
Max. anchorage length	$l_{v,max.}$	[mm]	400	500	600	700	700	800	1000	1000	1100	1200	1400	1500	2500	2000	2000	2000

Minimum working and curing time

Resin temperature [°C]	Concrete temperature [°C]	Curing time* [min]	Working time [min]
5	5	2880	150
10	10	1080	120
20	20	480	35
25	30	300	12

*For wet concrete the curing time must be doubled

R-KEX-II WITH POST-INSTALLED REBAR

MECHANICAL PROPERTIES

POST INSTALLED REBARS

Size			Ø8	Ø10	Ø12	Ø13	Ø14	Ø16	Ø18	Ø20	Ø22	Ø25	Ø28	Ø30	Ø32	Ø34	Ø36	Ø40
f_yk = 410 (e.g. 34GS acc. to EC2)																		
Nominal yield strength - tension	f_{yk}	[N/mm²]	410	410	410	410	410	410	410	410	410	410	410	410	410	410	410	410
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	132.7	153.9	201.1	254.5	314.2	380.1	490.9	615.8	706.9	804.2	907.9	1017.9	1256.6
f_yk = 420 (e.g. G-60 acc. to ASTM 615)																		
Nominal yield strength - tension	f_{yk}	[N/mm²]	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	132.7	153.9	201.1	254.5	314.2	380.1	490.9	615.8	706.9	804.2	907.9	1017.9	1256.6
f_yk = 460 (e.g. 460 B acc. to BS 4449)																		
Nominal yield strength - tension	f_{yk}	[N/mm²]	460	460	460	460	460	460	460	460	460	460	460	460	460	460	460	460
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	132.7	153.9	201.1	254.5	314.2	380.1	490.9	615.8	706.9	804.2	907.9	1017.9	1256.6
f_yk = 500 (e.g. B 500 SP acc. to EC2; 500 B acc. to BS 4449; B 500 B acc. to SS 560)																		
Nominal yield strength - tension	f_{yk}	[N/mm²]	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	132.7	153.9	201.1	254.5	314.2	380.1	490.9	615.8	706.9	804.2	907.9	1017.9	1256.6
f_yk = 600 (e.g. B 600 B acc. to SS 560)																		
Nominal yield strength - tension	f_{yk}	[N/mm²]	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	132.7	153.9	201.1	254.5	314.2	380.1	490.9	615.8	706.9	804.2	907.9	1017.9	1256.6

BASIC PERFORMANCE DATA

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 410 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	5,8	6,9	8,1	9,2	10,4	11,6	14,5	17,3	17,9	17,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17,9
10	-	8,7	10,1	11,6	13,0	14,5	18,1	21,7	25,3	28,0	28,0	28,0	-	-	-	-	-	-	-	-	-	-	-	-	28,0
12	-	-	12,1	13,9	15,6	17,3	21,7	26,0	30,3	34,7	39,0	40,3	40,3	40,3	-	-	-	-	-	-	-	-	-	-	40,3
13	-	-	-	15,0	16,9	18,8	23,5	28,2	32,9	37,6	42,3	47,0	47,3	47,3	47,3	47,3	-	-	-	-	-	-	-	-	47,3
14	-	-	-	-	18,2	20,2	25,3	30,3	35,4	40,5	45,5	50,6	54,9	54,9	54,9	54,9	-	-	-	-	-	-	-	-	54,9
16	-	-	-	-	-	23,1	28,9	34,7	40,5	46,2	52,0	57,8	63,6	69,4	71,7	71,7	71,7	71,7	-	-	-	-	-	-	71,7
18	-	-	-	-	-	-	32,5	39,0	45,5	52,0	58,5	65,0	71,5	78,0	84,5	90,7	90,7	90,7	90,7	-	-	-	-	-	90,7
20	-	-	-	-	-	-	36,1	43,4	50,6	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	112,0	112,0	112,0	-	-	-	-	112,0
22	-	-	-	-	-	-	-	47,7	55,6	63,6	71,5	79,5	87,4	95,4	103,3	111,3	119,2	127,2	135,5	135,5	-	-	-	-	135,5
25	-	-	-	-	-	-	-	54,2	63,2	72,3	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	162,6	175,0	-	-	-	-	175,0
28	-	-	-	-	-	-	-	-	70,8	80,9	91,0	101,2	111,3	121,4	131,5	141,6	151,7	161,9	182,1	202,3	219,5	-	-	-	219,5
30	-	-	-	-	-	-	-	-	75,9	86,7	97,5	108,4	119,2	130,1	140,9	151,7	162,6	173,4	195,1	216,8	252,0	252,0	-	-	252,0
32	-	-	-	-	-	-	-	-	-	92,5	104,0	115,6	127,2	138,7	150,3	161,9	173,4	185,0	208,1	231,2	286,7	286,7	286,7	286,7	286,7
34	-	-	-	-	-	-	-	-	-	98,3	110,6	122,8	135,1	147,4	159,7	172,0	184,3	196,5	221,1	245,7	307,1	323,7	323,7	-	323,7
36	-	-	-	-	-	-	-	-	-	-	117,1	130,1	143,1	156,1	169,1	182,1	195,1	208,1	234,1	260,1	325,2	362,9	362,9	-	362,9
40	-	-	-	-	-	-	-	-	-	-	-	125,7	138,2	150,8	163,4	175,9	188,5	201,1	226,2	251,3	314,2	377,0	448,0	-	448,0

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 410 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	10,8	13,0	15,1	17,3	17,9	17,9	17,9	17,9	17,9	17,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17,9
10	13,5	16,2	18,9	21,6	24,3	27,0	28,0	28,0	28,0	28,0	28,0	28,0	-	-	-	-	-	-	-	-	-	-	-	-	28,0
12	-	19,5	22,7	25,9	29,2	32,4	40,3	40,3	40,3	40,3	40,3	40,3	40,3	40,3	-	-	-	-	-	-	-	-	-	-	40,3
13	-	-	24,6	28,1	31,6	35,1	43,9	47,3	47,3	47,3	47,3	47,3	47,3	47,3	47,3	47,3	-	-	-	-	-	-	-	-	47,3
14	-	-	26,5	30,3	34,0	37,8	47,3	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	-	-	-	-	-	-	-	-	54,9
16	-	-	-	32,2	36,2	40,2	50,3	60,3	70,4	71,7	71,7	71,7	71,7	71,7	71,7	71,7	71,7	71,7	-	-	-	-	-	-	71,7
18	-	-	-	-	40,7	45,2	56,5	67,9	79,2	90,5	90,7	90,7	90,7	90,7	90,7	90,7	90,7	90,7	90,7	-	-	-	-	-	90,7
20	-	-	-	-	-	46,5	58,1	69,7	81,4	93,0	104,6	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	-	-	-	-	112,0
22	-	-	-	-	-	-	63,9	76,7	89,5	102,3	115,1	127,9	135,5	135,5	135,5	135,5	135,5	135,5	135,5	135,5	-	-	-	-	135,5
25	-	-	-	-	-	-	66,8	80,1	93,5	106,8	120,2	133,5	146,9	160,2	173,6	175,0	175,0	175,0	175,0	175,0	-	-	-	-	175,0
28	-	-	-	-	-	-	-	89,7	104,7	119,6	134,6	149,5	164,5	179,4	194,4	209,4	219,5	219,5	219,5	219,5	219,5	-	-	-	219,5
30	-	-	-	-	-	-	-	84,8	99,0	113,1	127,2	141,4	155,5	169,6	183,8	197,9	212,1	226,2	252,0	252,0	252,0	252,0	-	-	252,0
32	-	-	-	-	-	-	-	-	95,0	108,6	122,1	135,7	149,3	162,9	176,4	190,0	203,6	217,1	244,3	271,4	286,7	286,7	286,7	286,7	286,7
34	-	-	-	-	-	-	-	-	100,9	115,4	129,8	144,2	158,6	173,0	187,5	201,9	216,3	230,7	259,6	288,4	323,7	323,7	323,7	-	323,7
36	-	-	-	-	-	-	-	-	-	-	117,1	130,1	143,1	156,1	169,1	182,1	195,1	208,1	234,1	260,1	325,2	362,9	362,9	-	362,9
40	-	-	-	-	-	-	-	-	-	-	-	125,7	138,2	150,8	163,4	175,9	188,5	201,1	226,2	251,3	314,2	377,0	448,0	-	448,0

R-KEX-II WITH POST-INSTALLED REBAR

BASIC PERFORMANCE DATA (cont.)

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 410 [N/mm²]																									
d_s [mm] \ l_0 [mm]	200	220	240	260	280	300	325	350	375	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	11,6	12,7	13,9	15,0	16,2	17,3	17,9	17,9	17,9	17,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17,9
10	14,5	15,9	17,3	18,8	20,2	21,7	23,5	25,3	27,1	28,0	28,0	28,0	-	-	-	-	-	-	-	-	-	-	-	-	28,0
12	-	19,1	20,8	22,5	24,3	26,0	28,2	30,3	32,5	34,7	39,0	40,3	40,3	40,3	-	-	-	-	-	-	-	-	-	-	40,3
13	-	-	22,5	24,4	26,3	28,2	30,5	32,9	35,2	37,6	42,3	47,0	47,3	47,3	47,3	47,3	-	-	-	-	-	-	-	-	47,3
14	-	-	-	26,3	28,3	30,3	32,9	35,4	37,9	40,5	45,5	50,6	54,9	54,9	54,9	54,9	-	-	-	-	-	-	-	-	54,9
16	-	-	-	-	32,4	34,7	37,6	40,5	43,4	46,2	52,0	57,8	63,6	69,4	71,7	71,7	71,7	71,7	-	-	-	-	-	-	71,7
18	-	-	-	-	-	-	42,3	45,5	48,8	52,0	58,5	65,0	71,5	78,0	84,5	90,7	90,7	90,7	90,7	-	-	-	-	-	90,7
20	-	-	-	-	-	-	-	50,6	54,2	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	112,0	112,0	112,0	-	-	-	-	112,0
22	-	-	-	-	-	-	-	-	-	63,6	71,5	79,5	87,4	95,4	103,3	111,3	119,2	127,2	135,5	135,5	-	-	-	-	135,5
25	-	-	-	-	-	-	-	-	-	-	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	162,6	175,0	-	-	-	-	175,0
28	-	-	-	-	-	-	-	-	-	-	-	101,2	111,3	121,4	131,5	141,6	151,7	161,9	182,1	202,3	219,5	-	-	-	219,5
30	-	-	-	-	-	-	-	-	-	-	-	-	119,2	130,1	140,9	151,7	162,6	173,4	195,1	216,8	252,0	252,0	-	-	252,0
32	-	-	-	-	-	-	-	-	-	-	-	-	-	138,7	150,3	161,9	173,4	185,0	208,1	231,2	286,7	286,7	286,7	286,7	286,7
34	-	-	-	-	-	-	-	-	-	-	-	-	-	147,4	159,7	172,0	184,3	196,5	221,1	245,7	307,1	323,7	323,7	-	323,7
36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	169,1	182,1	195,1	208,1	234,1	260,1	325,2	362,9	362,9	-	362,9
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	188,5	201,1	226,2	251,3	314,2	377,0	448,0	-	448,0

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 410 [N/mm²]																									
d_s [mm] \ l_0 [mm]	200	220	240	260	280	300	325	350	375	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	17,9	17,9	17,9	17,9	17,9	17,9	17,9	17,9	17,9	17,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17,9
10	27,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	-	-	-	-	-	-	-	-	-	-	-	-	28,0
12	32,4	35,7	38,9	40,3	40,3	40,3	40,3	40,3	40,3	40,3	40,3	40,3	40,3	40,3	-	-	-	-	-	-	-	-	-	-	40,3
13	35,1	38,6	42,1	45,7	47,3	47,3	47,3	47,3	47,3	47,3	47,3	47,3	47,3	47,3	47,3	47,3	-	-	-	-	-	-	-	-	47,3
14	-	41,6	45,4	49,2	53,0	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	-	-	-	-	-	-	-	-	54,9
16	-	-	48,3	52,3	56,3	60,3	65,3	70,4	71,7	71,7	71,7	71,7	71,7	71,7	71,7	71,7	71,7	71,7	-	-	-	-	-	-	71,7
18	-	-	-	-	63,3	67,9	73,5	79,2	84,8	90,5	90,7	90,7	90,7	90,7	90,7	90,7	90,7	90,7	90,7	-	-	-	-	-	90,7
20	-	-	-	-	-	69,7	75,6	81,4	87,2	93,0	104,6	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	-	-	-	-	112,0
22	-	-	-	-	-	-	-	89,5	95,9	102,3	115,1	127,9	135,5	135,5	135,5	135,5	135,5	135,5	135,5	135,5	-	-	-	-	135,5
25	-	-	-	-	-	-	-	-	100,1	106,8	120,2	133,5	146,9	160,2	173,6	175,0	175,0	175,0	175,0	175,0	-	-	-	-	175,0
28	-	-	-	-	-	-	-	-	-	-	134,6	149,5	164,5	179,4	194,4	209,4	219,5	219,5	219,5	219,5	219,5	-	-	-	219,5
30	-	-	-	-	-	-	-	-	-	-	127,2	141,4	155,5	169,6	183,8	197,9	212,1	226,2	252,0	252,0	252,0	252,0	-	-	252,0
32	-	-	-	-	-	-	-	-	-	-	-	135,7	149,3	162,9	176,4	190,0	203,6	217,1	244,3	271,4	286,7	286,7	286,7	286,7	286,7
34	-	-	-	-	-	-	-	-	-	-	-	-	158,6	173,0	187,5	201,9	216,3	230,7	259,6	288,4	323,7	323,7	323,7	-	323,7
36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	169,1	182,1	195,1	208,1	234,1	260,1	325,2	362,9	362,9	-	362,9
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	188,5	201,1	226,2	251,3	314,2	377,0	448,0	-	448,0

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 420 [N/mm²]																									
d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	5,8	6,9	8,1	9,2	10,4	11,6	14,5	17,3	18,4	18,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18,4
10	-	8,7	10,1	11,6	13,0	14,5	18,1	21,7	25,3	28,7	28,7	28,7	-	-	-	-	-	-	-	-	-	-	-	-	28,7
12	-	-	-	13,9	15,6	17,3	21,7	26,0	30,3	34,7	39,0	41,3	41,3	41,3	-	-	-	-	-	-	-	-	-	-	41,3
13	-	-	-	15,0	16,9	18,8	23,5	28,2	32,9	37,6	42,3	47,0	48,5	48,5	48,5	48,5	-	-	-	-	-	-	-	-	48,5
14	-	-	-	-	18,2	20,2	25,3	30,3	35,4	40,5	45,5	50,6	55,6	56,2	56,2	56,2	-	-	-	-	-	-	-	-	56,2
16	-	-	-	-	-	23,1	28,9	34,7	40,5	46,2	52,0	57,8	63,6	69,4	73,4	73,4	73,4	73,4	-	-	-	-	-	-	73,4
18	-	-	-	-	-	-	32,5	39,0	45,5	52,0	58,5	65,0	71,5	78,0	84,5	91,0	92,9	92,9	92,9	-	-	-	-	-	92,9
20	-	-	-	-	-	-	36,1	43,4	50,6	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	114,8	114,8	114,8	-	-	-	-	114,8
22	-	-	-	-	-	-	-	47,7	55,6	63,6	71,5	79,5	87,4	95,4	103,3	111,3	119,2	127,2	138,8	138,8	-	-	-	-	138,8
25	-	-	-	-	-	-	-	54,2	63,2	72,3	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	162,6	179,3	-	-	-	-	179,3
28	-	-	-	-	-	-	-	-	70,8	80,9	91,0	101,2	111,3	121,4	131,5	141,6	151,7	161,9	182,1	202,3	224,9	-	-	-	224,9
30	-	-	-	-	-	-	-	-	-	86,7	97,5	108,4	119,2	130,1	140,9	151,7	162,6	173,4	195,1	216,8	258,2	258,2	-	-	258,2
32	-	-	-	-	-	-	-	-	-	92,5	104,0	115,6	127,2	138,7	150,3	161,9	173,4	185,0	208,1	231,2	289,0	293,7	293,7	293,7	293,7
34	-	-	-	-	-	-	-	-	-	-	110,6	122,8	135,1	147,4	159,7	172,0	184,3	196,5	221,1	245,7	307,1	331,6	331,6	-	331,6
36	-	-	-	-	-	-	-	-	-	-	117,1	130,1	143,1	156,1	169,1	182,1	195,1	208,1	234,1	260,1	325,2	371,7	371,7	-	371,7
40	-	-	-	-	-	-	-	-	-	-	-	-	138,2	150,8	163,4	175,9	188,5	201,1	226,2	251,3	314,2	377,0	458,9	-	458,9

R-KEX-II WITH POST-INSTALLED REBAR

BASIC PERFORMANCE DATA (cont.)

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 420 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	10,8	13,0	15,1	17,3	18,4	18,4	18,4	18,4	18,4	18,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18,4
10	13,5	16,2	18,9	21,6	24,3	27,0	28,7	28,7	28,7	28,7	28,7	28,7	-	-	-	-	-	-	-	-	-	-	-	-	28,7
12	-	19,5	22,7	25,9	29,2	32,4	40,5	41,3	41,3	41,3	41,3	41,3	41,3	41,3	-	-	-	-	-	-	-	-	-	-	41,3
13	-	-	24,6	28,1	31,6	35,1	43,9	48,5	48,5	48,5	48,5	48,5	48,5	48,5	48,5	48,5	-	-	-	-	-	-	-	-	48,5
14	-	-	26,5	30,3	34,0	37,8	47,3	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	-	-	-	-	-	-	-	-	56,2
16	-	-	-	32,2	36,2	40,2	50,3	60,3	70,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	-	-	-	-	-	-	73,4
18	-	-	-	-	40,7	45,2	56,5	67,9	79,2	90,5	92,9	92,9	92,9	92,9	92,9	92,9	92,9	92,9	92,9	-	-	-	-	-	92,9
20	-	-	-	-	-	46,5	58,1	69,7	81,4	93,0	104,6	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	-	-	-	-	114,8
22	-	-	-	-	-	-	63,9	76,7	89,5	102,3	115,1	127,9	138,8	138,8	138,8	138,8	138,8	138,8	138,8	138,8	-	-	-	-	138,8
25	-	-	-	-	-	-	66,8	80,1	93,5	106,8	120,2	133,5	146,9	160,2	173,6	179,3	179,3	179,3	179,3	179,3	-	-	-	-	179,3
28	-	-	-	-	-	-	-	89,7	104,7	119,6	134,6	149,5	164,5	179,4	194,4	209,4	224,3	224,9	224,9	224,9	224,9	-	-	-	224,9
30	-	-	-	-	-	-	-	84,8	99,0	113,1	127,2	141,4	155,5	169,6	183,8	197,9	212,1	226,2	254,5	258,2	258,2	258,2	-	-	258,2
32	-	-	-	-	-	-	-	-	95,0	108,6	122,1	135,7	149,3	162,9	176,4	190,0	203,6	217,1	244,3	271,4	293,7	293,7	293,7	293,7	293,7
34	-	-	-	-	-	-	-	-	100,9	115,4	129,8	144,2	158,6	173,0	187,5	201,9	216,3	230,7	259,6	288,4	331,6	331,6	331,6	-	331,6
36	-	-	-	-	-	-	-	-	-	-	117,1	130,1	143,1	156,1	169,1	182,1	195,1	208,1	234,1	260,1	325,2	371,7	371,7	-	371,7
40	-	-	-	-	-	-	-	-	-	-	-	-	138,2	150,8	163,4	175,9	188,5	201,1	226,2	251,3	314,2	377,0	458,9	-	458,9

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 420 [N/mm²]

d_s [mm] \ l_0 [mm]	200	220	240	260	280	300	325	350	375	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	11,6	12,7	13,9	15,0	16,2	17,3	18,4	18,4	18,4	18,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18,4
10	14,5	15,9	17,3	18,8	20,2	21,7	23,5	25,3	27,1	28,7	28,7	28,7	-	-	-	-	-	-	-	-	-	-	-	-	28,7
12	-	19,1	20,8	22,5	24,3	26,0	28,2	30,3	32,5	34,7	39,0	41,3	41,3	41,3	-	-	-	-	-	-	-	-	-	-	41,3
13	-	-	22,5	24,4	26,3	28,2	30,5	32,9	35,2	37,6	42,3	47,0	48,5	48,5	48,5	48,5	-	-	-	-	-	-	-	-	48,5
14	-	-	-	26,3	28,3	30,3	32,9	35,4	37,9	40,5	45,5	50,6	55,6	56,2	56,2	56,2	-	-	-	-	-	-	-	-	56,2
16	-	-	-	-	-	34,7	37,6	40,5	43,4	46,2	52,0	57,8	63,6	69,4	73,4	73,4	73,4	73,4	-	-	-	-	-	-	73,4
18	-	-	-	-	-	-	42,3	45,5	48,8	52,0	58,5	65,0	71,5	78,0	84,5	91,0	92,9	92,9	92,9	-	-	-	-	-	92,9
20	-	-	-	-	-	-	-	-	54,2	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	114,8	114,8	114,8	-	-	-	-	114,8
22	-	-	-	-	-	-	-	-	-	63,6	71,5	79,5	87,4	95,4	103,3	111,3	119,2	127,2	138,8	138,8	-	-	-	-	138,8
25	-	-	-	-	-	-	-	-	-	-	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	162,6	179,3	-	-	-	-	179,3
28	-	-	-	-	-	-	-	-	-	-	-	-	111,3	121,4	131,5	141,6	151,7	161,9	182,1	202,3	224,9	-	-	-	224,9
30	-	-	-	-	-	-	-	-	-	-	-	-	119,2	130,1	140,9	151,7	162,6	173,4	195,1	216,8	258,2	258,2	-	-	258,2
32	-	-	-	-	-	-	-	-	-	-	-	-	-	138,7	150,3	161,9	173,4	185,0	208,1	231,2	289,0	293,7	293,7	293,7	293,7
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	159,7	172,0	184,3	196,5	221,1	245,7	307,1	331,6	331,6	-	331,6
36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	169,1	182,1	195,1	208,1	234,1	260,1	325,2	371,7	371,7	-	371,7
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	201,1	226,2	251,3	314,2	377,0	458,9	-	458,9

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 420 [N/mm²]

d_s [mm] \ l_0 [mm]	200	220	240	260	280	300	325	350	375	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	18,4	18,4	18,4	18,4	18,4	18,4	18,4	18,4	18,4	18,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18,4
10	27,0	28,7	28,7	28,7	28,7	28,7	28,7	28,7	28,7	28,7	28,7	28,7	-	-	-	-	-	-	-	-	-	-	-	-	28,7
12	32,4	35,7	38,9	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	-	-	-	-	-	-	-	-	-	-	41,3
13	35,1	38,6	42,1	45,7	48,5	48,5	48,5	48,5	48,5	48,5	48,5	48,5	48,5	48,5	48,5	48,5	-	-	-	-	-	-	-	-	48,5
14	-	41,6	45,4	49,2	53,0	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	-	-	-	-	-	-	-	-	56,2
16	-	-	48,3	52,3	56,3	60,3	65,3	70,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	-	-	-	-	-	-	73,4
18	-	-	-	-	63,3	67,9	73,5	79,2	84,8	90,5	92,9	92,9	92,9	92,9	92,9	92,9	92,9	92,9	92,9	-	-	-	-	-	92,9
20	-	-	-	-	-	69,7	75,6	81,4	87,2	93,0	104,6	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	-	-	-	-	114,8
22	-	-	-	-	-	-	-	89,5	95,9	102,3	115,1	127,9	138,8	138,8	138,8	138,8	138,8	138,8	138,8	138,8	-	-	-	-	138,8
25	-	-	-	-	-	-	-	-	100,1	106,8	120,2	133,5	146,9	160,2	173,6	179,3	179,3	179,3	179,3	179,3	-	-	-	-	179,3
28	-	-	-	-	-	-	-	-	-	-	134,6	149,5	164,5	179,4	194,4	209,4	224,3	224,9	224,9	224,9	224,9	-	-	-	224,9
30	-	-	-	-	-	-	-	-	-	-	127,2	141,4	155,5	169,6	183,8	197,9	212,1	226,2	254,5	258,2	258,2	258,2	-	-	258,2
32	-	-	-	-	-	-	-	-	-	-	-	135,7	149,3	162,9	176,4	190,0	203,6	217,1	244,3	271,4	293,7	293,7	293,7	293,7	293,7
34	-	-	-	-	-	-	-	-	-	-	-	-	158,6	173,0	187,5	201,9	216,3	230,7	259,6	288,4	331,6	331,6	331,6	-	331,6
36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	169,1	182,1	195,1	208,1	234,1	260,1	325,2	371,7	371,7	-	371,7
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	201,1	226,2	251,3	314,2	377,0	458,9	-	458,9

R-KEX-II WITH POST-INSTALLED REBAR

BASIC PERFORMANCE DATA (cont.)

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 460 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	-	6,9	8,1	9,2	10,4	11,6	14,5	17,3	20,1	20,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20,1
10	-	-	10,1	11,6	13,0	14,5	18,1	21,7	25,3	28,9	31,4	31,4	-	-	-	-	-	-	-	-	-	-	-	-	31,4
12	-	-	-	13,9	15,6	17,3	21,7	26,0	30,3	34,7	39,0	43,4	45,2	45,2	-	-	-	-	-	-	-	-	-	-	45,2
13	-	-	-	-	16,9	18,8	23,5	28,2	32,9	37,6	42,3	47,0	51,7	53,1	53,1	53,1	-	-	-	-	-	-	-	-	53,1
14	-	-	-	-	-	20,2	25,3	30,3	35,4	40,5	45,5	50,6	55,6	60,7	61,6	61,6	-	-	-	-	-	-	-	-	61,6
16	-	-	-	-	-	-	28,9	34,7	40,5	46,2	52,0	57,8	63,6	69,4	75,1	80,4	80,4	80,4	-	-	-	-	-	-	80,4
18	-	-	-	-	-	-	32,5	39,0	45,5	52,0	58,5	65,0	71,5	78,0	84,5	91,0	97,5	101,8	101,8	-	-	-	-	-	101,8
20	-	-	-	-	-	-	-	43,4	50,6	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	115,6	125,7	125,7	-	-	-	-	125,7
22	-	-	-	-	-	-	-	47,7	55,6	63,6	71,5	79,5	87,4	95,4	103,3	111,3	119,2	127,2	143,1	152,1	-	-	-	-	152,1
25	-	-	-	-	-	-	-	-	63,2	72,3	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	162,6	180,6	-	-	-	-	196,4
28	-	-	-	-	-	-	-	-	-	80,9	91,0	101,2	111,3	121,4	131,5	141,6	151,7	161,9	182,1	202,3	246,3	-	-	-	246,3
30	-	-	-	-	-	-	-	-	-	86,7	97,5	108,4	119,2	130,1	140,9	151,7	162,6	173,4	195,1	216,8	271,0	282,7	-	-	282,7
32	-	-	-	-	-	-	-	-	-	-	104,0	115,6	127,2	138,7	150,3	161,9	173,4	185,0	208,1	231,2	289,0	321,7	321,7	321,7	321,7
34	-	-	-	-	-	-	-	-	-	-	110,6	122,8	135,1	147,4	159,7	172,0	184,3	196,5	221,1	245,7	307,1	363,2	363,2	-	363,2
36	-	-	-	-	-	-	-	-	-	-	-	130,1	143,1	156,1	169,1	182,1	195,1	208,1	234,1	260,1	325,2	390,2	407,2	-	407,2
40	-	-	-	-	-	-	-	-	-	-	-	-	-	150,8	163,4	175,9	188,5	201,1	226,2	251,3	314,2	377,0	502,6	-	502,6

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 460 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	10,8	13,0	15,1	17,3	19,5	20,1	20,1	20,1	20,1	20,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20,1
10	13,5	16,2	18,9	21,6	24,3	27,0	31,4	31,4	31,4	31,4	31,4	31,4	-	-	-	-	-	-	-	-	-	-	-	-	31,4
12	-	19,5	22,7	25,9	29,2	32,4	40,5	45,2	45,2	45,2	45,2	45,2	45,2	45,2	-	-	-	-	-	-	-	-	-	-	45,2
13	-	-	24,6	28,1	31,6	35,1	43,9	52,7	53,1	53,1	53,1	53,1	53,1	53,1	53,1	53,1	-	-	-	-	-	-	-	-	53,1
14	-	-	26,5	30,3	34,0	37,8	47,3	56,7	61,6	61,6	61,6	61,6	61,6	61,6	61,6	61,6	-	-	-	-	-	-	-	-	61,6
16	-	-	-	32,2	36,2	40,2	50,3	60,3	70,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	-	-	-	-	-	-	80,4
18	-	-	-	-	40,7	45,2	56,5	67,9	79,2	90,5	101,8	101,8	101,8	101,8	101,8	101,8	101,8	101,8	101,8	-	-	-	-	-	101,8
20	-	-	-	-	-	46,5	58,1	69,7	81,4	93,0	104,6	116,2	125,7	125,7	125,7	125,7	125,7	125,7	125,7	125,7	-	-	-	-	125,7
22	-	-	-	-	-	-	63,9	76,7	89,5	102,3	115,1	127,9	140,6	152,1	152,1	152,1	152,1	152,1	152,1	152,1	-	-	-	-	152,1
25	-	-	-	-	-	-	66,8	80,1	93,5	106,8	120,2	133,5	146,9	160,2	173,6	186,9	196,4	196,4	196,4	196,4	-	-	-	-	196,4
28	-	-	-	-	-	-	-	89,7	104,7	119,6	134,6	149,5	164,5	179,4	194,4	209,4	224,3	239,3	246,3	246,3	246,3	-	-	-	246,3
30	-	-	-	-	-	-	-	84,8	99,0	113,1	127,2	141,4	155,5	169,6	183,8	197,9	212,1	226,2	254,5	282,7	282,7	282,7	-	-	282,7
32	-	-	-	-	-	-	-	-	-	108,6	122,1	135,7	149,3	162,9	176,4	190,0	203,6	217,1	244,3	271,4	321,7	321,7	321,7	321,7	321,7
34	-	-	-	-	-	-	-	-	-	115,4	129,8	144,2	158,6	173,0	187,5	201,9	216,3	230,7	259,6	288,4	360,5	363,2	363,2	-	363,2
36	-	-	-	-	-	-	-	-	-	-	-	130,1	143,1	156,1	169,1	182,1	195,1	208,1	234,1	260,1	325,2	390,2	407,2	-	407,2
40	-	-	-	-	-	-	-	-	-	-	-	-	-	150,8	163,4	175,9	188,5	201,1	226,2	251,3	314,2	377,0	502,6	-	502,6

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 460 [N/mm²]

d_s [mm] \ l_0 [mm]	200	220	240	260	280	300	325	350	375	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	11,6	12,7	13,9	15,0	16,2	17,3	18,8	20,1	20,1	20,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20,1
10	14,5	15,9	17,3	18,8	20,2	21,7	23,5	25,3	27,1	28,9	31,4	31,4	-	-	-	-	-	-	-	-	-	-	-	-	31,4
12	-	-	20,8	22,5	24,3	26,0	28,2	30,3	32,5	34,7	39,0	43,4	45,2	45,2	-	-	-	-	-	-	-	-	-	-	45,2
13	-	-	-	24,4	26,3	28,2	30,5	32,9	35,2	37,6	42,3	47,0	51,7	53,1	53,1	53,1	-	-	-	-	-	-	-	-	53,1
14	-	-	-	-	28,3	30,3	32,9	35,4	37,9	40,5	45,5	50,6	55,6	60,7	61,6	61,6	-	-	-	-	-	-	-	-	61,6
16	-	-	-	-	-	-	37,6	40,5	43,4	46,2	52,0	57,8	63,6	69,4	75,1	80,4	80,4	80,4	-	-	-	-	-	-	80,4
18	-	-	-	-	-	-	-	-	48,8	52,0	58,5	65,0	71,5	78,0	84,5	91,0	97,5	101,8	101,8	-	-	-	-	-	101,8
20	-	-	-	-	-	-	-	-	-	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	115,6	125,7	125,7	-	-	-	-	125,7
22	-	-	-	-	-	-	-	-	-	-	71,5	79,5	87,4	95,4	103,3	111,3	119,2	127,2	143,1	152,1	-	-	-	-	152,1
25	-	-	-	-	-	-	-	-	-	-	-	90,3	99,4	108,4	117,4	126,4	135,5	144,5	162,6	180,6	-	-	-	-	196,4
28	-	-	-	-	-	-	-	-	-	-	-	-	111,3	121,4	131,5	141,6	151,7	161,9	182,1	202,3	246,3	-	-	-	246,3
30	-	-	-	-	-	-	-	-	-	-	-	-	-	130,1	140,9	151,7	162,6	173,4	195,1	216,8	271,0	282,7	-	-	282,7
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	150,3	161,9	173,4	185,0	208,1	231,2	289,0	321,7	321,7	321,7	321,7
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	172,0	184,3	196,5	221,1	245,7	307,1	363,2	363,2	-	363,2
36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	195,1	208,1	234,1	260,1	325,2	390,2	407,2	-	407,2
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	226,2	251,3	314,2	377,0	502,6	-	502,6

R-KEX-II WITH POST-INSTALLED REBAR

BASIC PERFORMANCE DATA (cont.)

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 460 [N/mm²]

d_s [mm] \ l_0 [mm]	200	220	240	260	280	300	325	350	375	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	20,1	20,1	20,1	20,1	20,1	20,1	20,1	20,1	20,1	20,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20,1
10	27,0	29,7	31,4	31,4	31,4	31,4	31,4	31,4	31,4	31,4	31,4	31,4	-	-	-	-	-	-	-	-	-	-	-	-	31,4
12	32,4	35,7	38,9	42,1	45,2	45,2	45,2	45,2	45,2	45,2	45,2	45,2	45,2	45,2	-	-	-	-	-	-	-	-	-	-	45,2
13	35,1	38,6	42,1	45,7	49,2	52,7	53,1	53,1	53,1	53,1	53,1	53,1	53,1	53,1	53,1	53,1	-	-	-	-	-	-	-	-	53,1
14	-	41,6	45,4	49,2	53,0	56,7	61,5	61,6	61,6	61,6	61,6	61,6	61,6	61,6	61,6	61,6	-	-	-	-	-	-	-	-	61,6
16	-	-	48,3	52,3	56,3	60,3	65,3	70,4	75,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	-	-	-	-	-	-	80,4
18	-	-	-	-	63,3	67,9	73,5	79,2	84,8	90,5	101,8	101,8	101,8	101,8	101,8	101,8	101,8	101,8	101,8	-	-	-	-	-	101,8
20	-	-	-	-	-	69,7	75,6	81,4	87,2	93,0	104,6	116,2	125,7	125,7	125,7	125,7	125,7	125,7	125,7	125,7	-	-	-	-	125,7
22	-	-	-	-	-	-	-	89,5	95,9	102,3	115,1	127,9	140,6	152,1	152,1	152,1	152,1	152,1	152,1	152,1	-	-	-	-	152,1
25	-	-	-	-	-	-	-	-	100,1	106,8	120,2	133,5	146,9	160,2	173,6	186,9	196,4	196,4	196,4	196,4	-	-	-	-	196,4
28	-	-	-	-	-	-	-	-	-	-	134,6	149,5	164,5	179,4	194,4	209,4	224,3	239,3	246,3	246,3	246,3	-	-	-	246,3
30	-	-	-	-	-	-	-	-	-	-	127,2	141,4	155,5	169,6	183,8	197,9	212,1	226,2	254,5	282,7	282,7	282,7	-	-	282,7
32	-	-	-	-	-	-	-	-	-	-	-	-	149,3	162,9	176,4	190,0	203,6	217,1	244,3	271,4	321,7	321,7	321,7	321,7	321,7
34	-	-	-	-	-	-	-	-	-	-	-	-	-	173,0	187,5	201,9	216,3	230,7	259,6	288,4	360,5	363,2	363,2	-	363,2
36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	195,1	208,1	234,1	260,1	325,2	390,2	407,2	-	407,2
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	226,2	251,3	314,2	377,0	502,6	-	502,6

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 500 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	-	6,9	8,1	9,2	10,4	11,6	14,5	17,3	20,2	21,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21,9
10	-	-	-	11,6	13,0	14,5	18,1	21,7	25,3	28,9	32,5	34,1	-	-	-	-	-	-	-	-	-	-	-	-	34,1
12	-	-	-	-	15,6	17,3	21,7	26,0	30,3	34,7	39,0	43,4	47,7	49,2	-	-	-	-	-	-	-	-	-	-	49,2
13	-	-	-	-	-	18,8	23,5	28,2	32,9	37,6	42,3	47,0	51,7	56,4	57,7	57,7	-	-	-	-	-	-	-	-	57,7
14	-	-	-	-	-	20,2	25,3	30,3	35,4	40,5	45,5	50,6	55,6	60,7	65,8	66,9	-	-	-	-	-	-	-	-	66,9
16	-	-	-	-	-	-	28,9	34,7	40,5	46,2	52,0	57,8	63,6	69,4	75,1	80,9	86,7	87,4	-	-	-	-	-	-	87,4
18	-	-	-	-	-	-	-	39,0	45,5	52,0	58,5	65,0	71,5	78,0	84,5	91,0	97,5	104,0	110,6	-	-	-	-	-	110,6
20	-	-	-	-	-	-	-	43,4	50,6	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	115,6	130,1	136,6	-	-	-	-	136,6
22	-	-	-	-	-	-	-	-	55,6	63,6	71,5	79,5	87,4	95,4	103,3	111,3	119,2	127,2	143,1	159,0	-	-	-	-	165,3
25	-	-	-	-	-	-	-	-	-	72,3	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	162,6	180,6	-	-	-	-	213,4
28	-	-	-	-	-	-	-	-	-	80,9	91,0	101,2	111,3	121,4	131,5	141,6	151,7	161,9	182,1	202,3	252,9	-	-	-	267,7
30	-	-	-	-	-	-	-	-	-	-	97,5	108,4	119,2	130,1	140,9	151,7	162,6	173,4	195,1	216,8	271,0	307,3	-	-	307,3
32	-	-	-	-	-	-	-	-	-	-	-	115,6	127,2	138,7	150,3	161,9	173,4	185,0	208,1	231,2	289,0	346,8	349,7	349,7	349,7
34	-	-	-	-	-	-	-	-	-	-	-	122,8	135,1	147,4	159,7	172,0	184,3	196,5	221,1	245,7	307,1	368,5	394,7	-	394,7
36	-	-	-	-	-	-	-	-	-	-	-	-	143,1	156,1	169,1	182,1	195,1	208,1	234,1	260,1	325,2	390,2	442,6	-	442,6
40	-	-	-	-	-	-	-	-	-	-	-	-	-	150,8	163,4	175,9	188,5	201,1	226,2	251,3	314,2	377,0	502,7	-	546,3

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 500 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	10,8	13,0	15,1	17,3	19,5	21,6	21,9	21,9	21,9	21,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21,9
10	13,5	16,2	18,9	21,6	24,3	27,0	33,8	34,1	34,1	34,1	34,1	34,1	-	-	-	-	-	-	-	-	-	-	-	-	34,1
12	-	19,5	22,7	25,9	29,2	32,4	40,5	48,6	49,2	49,2	49,2	49,2	49,2	49,2	-	-	-	-	-	-	-	-	-	-	49,2
13	-	-	24,6	28,1	31,6	35,1	43,9	52,7	57,7	57,7	57,7	57,7	57,7	57,7	57,7	57,7	-	-	-	-	-	-	-	-	57,7
14	-	-	26,5	30,3	34,0	37,8	47,3	56,7	66,2	66,9	66,9	66,9	66,9	66,9	66,9	66,9	-	-	-	-	-	-	-	-	66,9
16	-	-	-	32,2	36,2	40,2	50,3	60,3	70,4	80,4	87,4	87,4	87,4	87,4	87,4	87,4	87,4	87,4	-	-	-	-	-	-	87,4
18	-	-	-	-	40,7	45,2	56,5	67,9	79,2	90,5	101,8	110,6	110,6	110,6	110,6	110,6	110,6	110,6	110,6	-	-	-	-	-	110,6
20	-	-	-	-	-	46,5	58,1	69,7	81,4	93,0	104,6	116,2	127,9	136,6	136,6	136,6	136,6	136,6	136,6	136,6	-	-	-	-	136,6
22	-	-	-	-	-	-	63,9	76,7	89,5	102,3	115,1	127,9	140,6	153,4	165,3	165,3	165,3	165,3	165,3	165,3	-	-	-	-	165,3
25	-	-	-	-	-	-	66,8	80,1	93,5	106,8	120,2	133,5	146,9	160,2	173,6	186,9	200,3	213,4	213,4	213,4	-	-	-	-	213,4
28	-	-	-	-	-	-	-	89,7	104,7	119,6	134,6	149,5	164,5	179,4	194,4	209,4	224,3	239,3	267,7	267,7	267,7	-	-	-	267,7
30	-	-	-	-	-	-	-	-	99,0	113,1	127,2	141,4	155,5	169,6	183,8	197,9	212,1	226,2	254,5	282,7	307,3	307,3	-	-	307,3
32	-	-	-	-	-	-	-	-	-	108,6	122,1	135,7	149,3	162,9	176,4	190,0	203,6	217,1	244,3	271,4	339,3	349,7	349,7	349,7	349,7
34	-	-	-	-	-	-	-	-	-	-	129,8	144,2	158,6	173,0	187,5	201,9	216,3	230,7	259,6	288,4	360,5	394,7	394,7	-	394,7
36	-	-	-	-	-	-	-	-	-	-	-	-	143,1	156,1	169,1	182,1	195,1	208,1	234,1	260,1	325,2	390,2	442,6	-	442,6
40	-	-	-	-	-	-	-	-	-	-	-	-	-	150,8	163,4	175,9	188,5	201,1	226,2	251,3	314,2	377,0	502,7	-	546,3

R-KEX-II WITH POST-INSTALLED REBAR

BASIC PERFORMANCE DATA (cont.)

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 500 [N/mm²]

d_s [mm] \ l_0 [mm]	200	220	240	260	280	300	325	350	375	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	21,6	21,9	21,9	21,9	21,9	21,9	21,9	21,9	21,9	21,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21,9
10	27,0	29,7	32,4	34,1	34,1	34,1	34,1	34,1	34,1	34,1	34,1	34,1	-	-	-	-	-	-	-	-	-	-	-	-	34,1
12	32,4	35,7	38,9	42,1	45,4	48,6	49,2	49,2	49,2	49,2	49,2	49,2	49,2	49,2	-	-	-	-	-	-	-	-	-	-	49,2
13	35,1	38,6	42,1	45,7	49,2	52,7	57,1	57,7	57,7	57,7	57,7	57,7	57,7	57,7	57,7	57,7	-	-	-	-	-	-	-	-	57,7
14	-	41,6	45,4	49,2	53,0	56,7	61,5	66,2	66,9	66,9	66,9	66,9	66,9	66,9	66,9	66,9	-	-	-	-	-	-	-	-	66,9
16	-	-	48,3	52,3	56,3	60,3	65,3	70,4	75,4	80,4	87,4	87,4	87,4	87,4	87,4	87,4	87,4	87,4	-	-	-	-	-	-	87,4
18	-	-	-	-	63,3	67,9	73,5	79,2	84,8	90,5	101,8	110,6	110,6	110,6	110,6	110,6	110,6	110,6	110,6	-	-	-	-	-	110,6
20	-	-	-	-	-	69,7	75,6	81,4	87,2	93,0	104,6	116,2	127,9	136,6	136,6	136,6	136,6	136,6	136,6	136,6	-	-	-	-	136,6
22	-	-	-	-	-	-	-	89,5	95,9	102,3	115,1	127,9	140,6	153,4	165,3	165,3	165,3	165,3	165,3	165,3	-	-	-	-	165,3
25	-	-	-	-	-	-	-	-	100,1	106,8	120,2	133,5	146,9	160,2	173,6	186,9	200,3	213,4	213,4	213,4	-	-	-	-	213,4
28	-	-	-	-	-	-	-	-	-	-	134,6	149,5	164,5	179,4	194,4	209,4	224,3	239,3	267,7	267,7	267,7	-	-	-	267,7
30	-	-	-	-	-	-	-	-	-	-	-	141,4	155,5	169,6	183,8	197,9	212,1	226,2	254,5	282,7	307,3	307,3	-	-	307,3
32	-	-	-	-	-	-	-	-	-	-	-	-	-	162,9	176,4	190,0	203,6	217,1	244,3	271,4	339,3	349,7	349,7	349,7	349,7
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	187,5	201,9	216,3	230,7	259,6	288,4	360,5	394,7	394,7	-	394,7
36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	208,1	234,1	260,1	325,2	390,2	442,6	-	442,6
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	226,2	251,3	314,2	377,0	502,7	-	546,3

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 600 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	-	-	8,1	9,2	10,4	11,6	14,5	17,3	20,2	23,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26,2
10	-	-	-	-	13,0	14,5	18,1	21,7	25,3	28,9	32,5	36,1	-	-	-	-	-	-	-	-	-	-	-	-	41,0
12	-	-	-	-	-	-	21,7	26,0	30,3	34,7	39,0	43,4	47,7	52,0	-	-	-	-	-	-	-	-	-	-	59,0
13	-	-	-	-	-	-	23,5	28,2	32,9	37,6	42,3	47,0	51,7	56,4	61,1	65,8	-	-	-	-	-	-	-	-	69,3
14	-	-	-	-	-	-	25,3	30,3	35,4	40,5	45,5	50,6	55,6	60,7	65,8	70,8	-	-	-	-	-	-	-	-	80,3
16	-	-	-	-	-	-	-	34,7	40,5	46,2	52,0	57,8	63,6	69,4	75,1	80,9	86,7	92,5	-	-	-	-	-	-	104,9
18	-	-	-	-	-	-	-	-	45,5	52,0	58,5	65,0	71,5	78,0	84,5	91,0	97,5	104,0	117,1	-	-	-	-	-	132,8
20	-	-	-	-	-	-	-	-	50,6	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	115,6	130,1	144,5	-	-	-	-	163,9
22	-	-	-	-	-	-	-	-	-	63,6	71,5	79,5	87,4	95,4	103,3	111,3	119,2	127,2	143,1	159,0	-	-	-	-	198,3
25	-	-	-	-	-	-	-	-	-	-	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	162,6	180,6	-	-	-	-	256,1
28	-	-	-	-	-	-	-	-	-	-	-	101,2	111,3	121,4	131,5	141,6	151,7	161,9	182,1	202,3	252,9	-	-	-	321,3
30	-	-	-	-	-	-	-	-	-	-	-	-	119,2	130,1	140,9	151,7	162,6	173,4	195,1	216,8	271,0	325,2	-	-	368,8
32	-	-	-	-	-	-	-	-	-	-	-	-	127,2	138,7	150,3	161,9	173,4	185,0	208,1	231,2	289,0	346,8	419,6	419,6	419,6
34	-	-	-	-	-	-	-	-	-	-	-	-	-	147,4	159,7	172,0	184,3	196,5	221,1	245,7	307,1	368,5	473,7	-	473,7
36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	169,1	182,1	195,1	208,1	234,1	260,1	325,2	390,2	520,2	-	531,1
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	188,5	201,1	226,2	251,3	314,2	377,0	502,7	-	655,6

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 600 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	10,8	13,0	15,1	17,3	19,5	21,6	26,2	26,2	26,2	26,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26,2
10	13,5	16,2	18,9	21,6	24,3	27,0	33,8	40,5	41,0	41,0	41,0	41,0	-	-	-	-	-	-	-	-	-	-	-	-	41,0
12	-	19,5	22,7	25,9	29,2	32,4	40,5	48,6	56,7	59,0	59,0	59,0	59,0	59,0	-	-	-	-	-	-	-	-	-	-	59,0
13	-	-	24,6	28,1	31,6	35,1	43,9	52,7	61,5	69,3	69,3	69,3	69,3	69,3	69,3	69,3	-	-	-	-	-	-	-	-	69,3
14	-	-	26,5	30,3	34,0	37,8	47,3	56,7	66,2	75,6	80,3	80,3	80,3	80,3	80,3	80,3	-	-	-	-	-	-	-	-	80,3
16	-	-	-	32,2	36,2	40,2	50,3	60,3	70,4	80,4	90,5	100,5	104,9	104,9	104,9	104,9	104,9	104,9	-	-	-	-	-	-	104,9
18	-	-	-	-	40,7	45,2	56,5	67,9	79,2	90,5	101,8	113,1	124,4	132,8	132,8	132,8	132,8	132,8	132,8	-	-	-	-	-	132,8
20	-	-	-	-	-	-	58,1	69,7	81,4	93,0	104,6	116,2	127,9	139,5	151,1	162,7	163,9	163,9	163,9	163,9	-	-	-	-	163,9
22	-	-	-	-	-	-	63,9	76,7	89,5	102,3	115,1	127,9	140,6	153,4	166,2	179,0	191,8	198,3	198,3	198,3	-	-	-	-	198,3
25	-	-	-	-	-	-	-	80,1	93,5	106,8	120,2	133,5	146,9	160,2	173,6	186,9	200,3	213,6	240,3	256,1	-	-	-	-	256,1
28	-	-	-	-	-	-	-	-	104,7	119,6	134,6	149,5	164,5	179,4	194,4	209,4	224,3	239,3	269,2	299,1	321,3	-	-	-	321,3
30	-	-	-	-	-	-	-	-	-	113,1	127,2	141,4	155,5	169,6	183,8	197,9	212,1	226,2	254,5	282,7	353,4	368,8	-	-	368,8
32	-	-	-	-	-	-	-	-	-	-	-	135,7	149,3	162,9	176,4	190,0	203,6	217,1	244,3	271,4	339,3	407,2	419,6	419,6	419,6
34	-	-	-	-	-	-	-	-	-	-	-	144,2	158,6	173,0	187,5	201,9	216,3	230,7	259,6	288,4	360,5	432,6	473,7	-	473,7
36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	169,1	182,1	195,1	208,1	234,1	260,1	325,2	390,2	520,2	-	531,1
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	188,5	201,1	226,2	251,3	314,2	377,0	502,7	-	655,6

R-KEX-II WITH POST-INSTALLED REBAR

BASIC PERFORMANCE DATA (cont.)

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 600 [N/mm²]																									
d_s [mm] \ l_0 [mm]	200	220	240	260	280	300	325	350	375	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	-	12,7	13,9	15,0	16,2	17,3	18,8	20,2	21,7	23,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26,2
10	-	-	-	18,8	20,2	21,7	23,5	25,3	27,1	28,9	32,5	36,1	-	-	-	-	-	-	-	-	-	-	-	-	41,0
12	-	-	-	-	-	-	28,2	30,3	32,5	34,7	39,0	43,4	47,7	52,0	-	-	-	-	-	-	-	-	-	-	59,0
13	-	-	-	-	-	-	-	32,9	35,2	37,6	42,3	47,0	51,7	56,4	61,1	65,8	-	-	-	-	-	-	-	-	69,3
14	-	-	-	-	-	-	-	-	37,9	40,5	45,5	50,6	55,6	60,7	65,8	70,8	-	-	-	-	-	-	-	-	80,3
16	-	-	-	-	-	-	-	-	-	-	52,0	57,8	63,6	69,4	75,1	80,9	86,7	92,5	-	-	-	-	-	-	104,9
18	-	-	-	-	-	-	-	-	-	-	-	65,0	71,5	78,0	84,5	91,0	97,5	104,0	117,1	-	-	-	-	-	132,8
20	-	-	-	-	-	-	-	-	-	-	-	-	79,5	86,7	93,9	101,2	108,4	115,6	130,1	144,5	-	-	-	-	163,9
22	-	-	-	-	-	-	-	-	-	-	-	-	-	95,4	103,3	111,3	119,2	127,2	143,1	159,0	-	-	-	-	198,3
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	117,4	126,4	135,5	144,5	162,6	180,6	-	-	-	-	256,1
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	151,7	161,9	182,1	202,3	252,9	-	-	-	321,3
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	173,4	195,1	216,8	271,0	325,2	-	-	368,8
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	208,1	231,2	289,0	346,8	419,6	419,6	419,6
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	221,1	245,7	307,1	368,5	473,7	-	473,7
36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	260,1	325,2	390,2	520,2	-	531,1
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	314,2	377,0	502,7	-	655,6

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 600 [N/mm²]																									
d_s [mm] \ l_0 [mm]	200	220	240	260	280	300	325	350	375	400	450	500	550	600	650	700	750	800	900	1000	1250	1500	2000	2500	Steel failure
8	21,6	23,8	25,9	26,2	26,2	26,2	26,2	26,2	26,2	26,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26,2
10	27,0	29,7	32,4	35,1	37,8	40,5	41,0	41,0	41,0	41,0	41,0	41,0	-	-	-	-	-	-	-	-	-	-	-	-	41,0
12	32,4	35,7	38,9	42,1	45,4	48,6	52,7	56,7	59,0	59,0	59,0	59,0	59,0	59,0	-	-	-	-	-	-	-	-	-	-	59,0
13	35,1	38,6	42,1	45,7	49,2	52,7	57,1	61,5	65,9	69,3	69,3	69,3	69,3	69,3	69,3	69,3	-	-	-	-	-	-	-	-	69,3
14	-	41,6	45,4	49,2	53,0	56,7	61,5	66,2	70,9	75,6	80,3	80,3	80,3	80,3	80,3	80,3	-	-	-	-	-	-	-	-	80,3
16	-	-	48,3	52,3	56,3	60,3	65,3	70,4	75,4	80,4	90,5	100,5	104,9	104,9	104,9	104,9	104,9	104,9	-	-	-	-	-	-	104,9
18	-	-	-	-	63,3	67,9	73,5	79,2	84,8	90,5	101,8	113,1	124,4	132,8	132,8	132,8	132,8	132,8	132,8	-	-	-	-	-	132,8
20	-	-	-	-	-	-	75,6	81,4	87,2	93,0	104,6	116,2	127,9	139,5	151,1	162,7	163,9	163,9	163,9	163,9	-	-	-	-	163,9
22	-	-	-	-	-	-	-	89,5	95,9	102,3	115,1	127,9	140,6	153,4	166,2	179,0	191,8	198,3	198,3	198,3	-	-	-	-	198,3
25	-	-	-	-	-	-	-	-	-	-	120,2	133,5	146,9	160,2	173,6	186,9	200,3	213,6	240,3	256,1	-	-	-	-	256,1
28	-	-	-	-	-	-	-	-	-	-	-	149,5	164,5	179,4	194,4	209,4	224,3	239,3	269,2	299,1	321,3	-	-	-	321,3
30	-	-	-	-	-	-	-	-	-	-	-	-	-	169,6	183,8	197,9	212,1	226,2	254,5	282,7	353,4	368,8	-	-	368,8
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	190,0	203,6	217,1	244,3	271,4	339,3	407,2	419,6	419,6	419,6
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	216,3	230,7	259,6	288,4	360,5	432,6	473,7	-	473,7
36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	260,1	325,2	390,2	520,2	-	531,1
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	314,2	377,0	502,7	-	655,6

DESIGN PERFORMANCE DATA

POST INSTALLED REBARS

Size			Ø8	Ø10	Ø12	Ø13	Ø14	Ø16	Ø18	Ø20	Ø22	Ø25	Ø28	Ø30	Ø32	Ø34	Ø36	Ø40
TENSION LOAD																		
Mean ultimate bond resistance C12/15	f_{bd}	[N/mm²]	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
Mean ultimate bond resistance C16/20	f_{bd}	[N/mm²]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Mean ultimate bond resistance C20/25	f_{bd}	[N/mm²]	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.00
Mean ultimate bond resistance C25/30	f_{bd}	[N/mm²]	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.30	2.00
Mean ultimate bond resistance C30/37	f_{bd}	[N/mm²]	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.70	2.70	2.70	2.30	2.00
Mean ultimate bond resistance C35/45	f_{bd}	[N/mm²]	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.00	2.70	2.70	2.70	2.30	2.00
Mean ultimate bond resistance C40/50	f_{bd}	[N/mm²]	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.40	3.00	2.70	2.70	2.70	2.30	2.00
Mean ultimate bond resistance C45/55	f_{bd}	[N/mm²]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.70	3.70	3.40	3.00	2.70	2.70	2.70	2.30	2.00
Mean ultimate bond resistance C50/60	f_{bd}	[N/mm²]	4.30	4.30	4.30	4.30	4.00	4.00	4.00	3.70	3.70	3.40	3.00	2.70	2.70	2.70	2.30	2.00

R-KER-II | R-CFS+KER-II

WITH POST-INSTALLED REBAR

High performance hybrid resin approved for use with post-installed rebar connections

ETA | ETA-17/0594 | CE | SEISMIC C1 | VOC EMISSION TESTING | HYGIENIC CERTIFICATE

FEATURES AND BENEFITS

- Approved for use with post-installed rebars in concrete (EAD 330087-00-0601)
- Opportunity to use it in lower temperatures (to -20°C in winter version) allow you to apply throughout the year
- Very high load capacity
- Suitable for use in dry or wet substrates and water filled holes
- Rapid bonding time enables quick execution of works
- Winter version can be used in warmer temperatures for faster curing
- Approved for 3 types of hole cleaning (including use of dustless drill bit)

APPLICATIONS

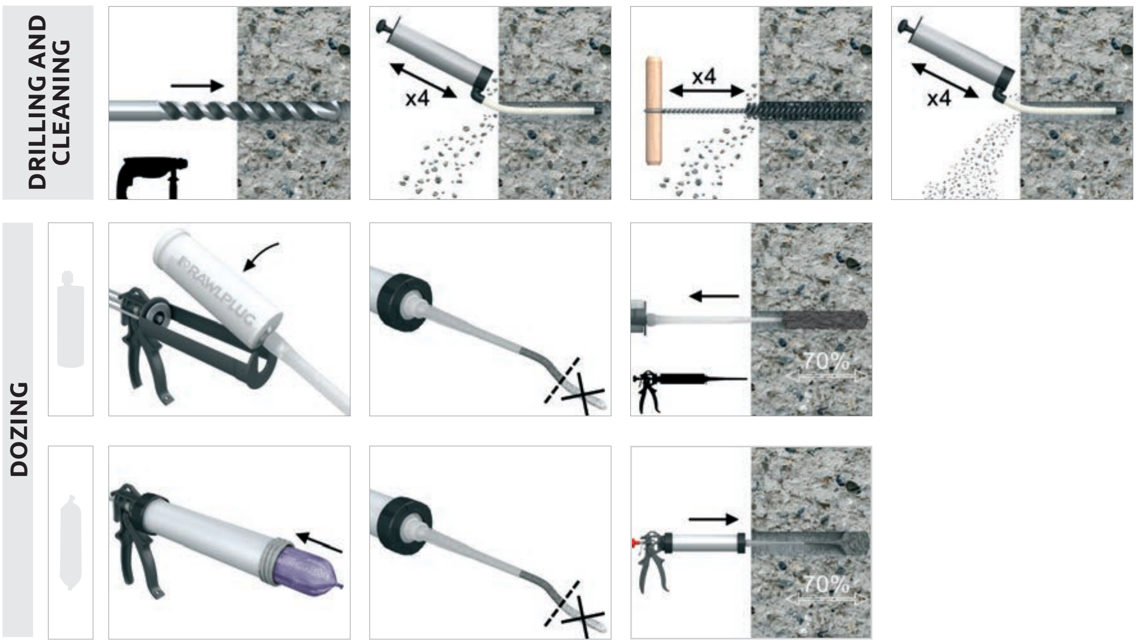
- Post-installed rebar connections
- Rebar
- Rebar missed-outs
- Extending existing buildings and structures.
- Renovation and modrnization of bridges, buildings.
- Platforms
- Safety barriers
- Barriers

BASE MATERIALS

Approved for use in:

- Concrete C12/15-C50/60

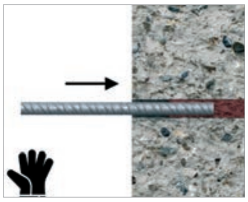
INSTALLATION GUIDE



R-KER-II | R-CFS+KER-II WITH POST-INSTALLED REBAR

INSTALLATION GUIDE (cont.)

ANCHORING



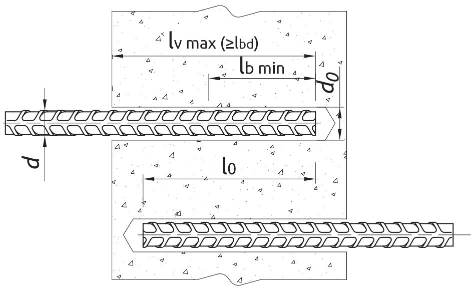
1. Drill hole to the required diameter and depth for rebar size being used.
2. Clean the drill hole thoroughly with brush and hand pump at least four times before installation
3. Insert cartridge into gun and attach nozzle.
4. Dispense to waste until even colour is obtained (min. 10 cm)
5. Insert the mixer nozzle to the bottom of the drill hole and inject resin, slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
6. Immediately insert the rebar, slowly and with slight twisting motion. Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.

PRODUCT INFORMATION

	Product Code	Resin	Description / Resin Type	Volume [ml]
	R-KER-II-300-S	R-KER-II-S	R-KER II Hybrid Resin for High Temperature (Summer) / Slow Cure Styrene Free Hybrid Resin	300
	R-KER-II-400-S			400
	R-CFS+KERII-300-S	R-CFS+KERII-S	R-KER II Hybrid Resin for High Temperature (Summer) / Slow Cure Styrene Free Hybrid Resin	300
	R-CFS+KERII-600-S			600

INSTALLATION DATA

POST INSTALLED REBARS



Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32	Ø40
Rebar diameter	d_s	[mm]	8	10	12	14	16	20	25	28	32	40
Hole diameter in substrate	d_0	[mm]	12	14	16	18	20	25	30	35	40	50
Brush diameter	-	[mm]	14	16	18	20	22	27	32	37	42	52
Min. anchorage length	$l_{b,\,min.}$	[mm]	115	145	170	200	230	285	355	400	455	570
Min. lap length (overlap splice)	$l_{0,\,min.}$	[mm]	200	215	255	300	340	430	540	600	690	860
Max. anchorage length	$l_{v,\,max.}$	[mm]	400	500	600	700	800	1000	1200	1400	1500	1000

Minimum working and curing time

Resin temperature	Concrete temperature	Working time	Curing time*
°C	°C	[min]	[min]
5	-5	1440	40
5	0	180	30
5	5	90	15
10	10	60	8
15	15	60	5
20	20	45	2.5
25	25	45	2
25	30	45	2
25	35	30	1.5
25	40	30	1.5

R-KER-II | R-CFS+KER-II WITH POST-INSTALLED REBAR

MECHANICAL PROPERTIES

POST INSTALLED REBARS

Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32	Ø40
f_yk = 410 (e.g. 34GS acc. to EC2)												
Nominal yield strength - tension	f_{yk}	[N/mm²]	410	410	410	410	410	410	410	410	410	410
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	804.2	1256.6
f_yk = 420 (e.g. G-60 acc. to ASTM 615)												
Nominal yield strength - tension	f_{yk}	[N/mm²]	420	420	420	420	420	420	420	420	420	420
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	804.2	1256.6
f_yk = 460 (e.g. 460 B acc. to BS 4449)												
Nominal yield strength - tension	f_{yk}	[N/mm²]	460	460	460	460	460	460	460	460	460	460
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	804.2	1256.6
f_yk = 500 (e.g. B 500 SP acc. to EC2; 500 B acc. to BS 4449; B 500 B acc. to SS 560)												
Nominal yield strength - tension	f_{yk}	[N/mm²]	500	500	500	500	500	500	500	500	500	500
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	804.2	1256.6
f_yk = 600 (e.g. B 600 B acc. to SS 560)												
Nominal yield strength - tension	f_{yk}	[N/mm²]	600	600	600	600	600	600	600	600	600	600
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	804.2	1256.6

BASIC PERFORMANCE DATA

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 410 [N/mm²]

l_{bd} [mm] / d_s [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	5,8	6,9	8,1	9,2	10,4	11,6	14,5	17,3	17,9	17,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17,9
10	-	8,7	10,1	11,6	13,0	14,5	18,1	21,7	25,3	28,0	28,0	28,0	-	-	-	-	-	-	-	-	-	-	-	-	28,0
12	-	-	12,1	13,9	15,6	17,3	21,7	26,0	30,3	34,7	39,0	40,3	40,3	40,3	-	-	-	-	-	-	-	-	-	-	40,3
14	-	-	-	-	18,2	20,2	25,3	30,3	35,4	40,5	45,5	50,6	54,9	54,9	54,9	54,9	-	-	-	-	-	-	-	-	54,9
16	-	-	-	-	-	23,1	28,9	34,7	40,5	46,2	52,0	57,8	63,6	69,4	71,7	71,7	71,7	71,7	-	-	-	-	-	-	71,7
20	-	-	-	-	-	-	36,1	43,4	50,6	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	112,0	112,0	112,0	112,0	112,0	-	-	112,0
25	-	-	-	-	-	-	-	54,2	63,2	72,3	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	175,0	-	-	175,0
28	-	-	-	-	-	-	-	-	70,8	80,9	91,0	101,2	111,3	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	219,5	-	219,5
32	-	-	-	-	-	-	-	-	-	92,5	104,0	115,6	127,2	138,7	150,3	161,9	173,4	185,0	196,5	208,1	219,7	231,2	286,7	286,7	286,7
40	-	-	-	-	-	-	-	-	-	-	-	125,7	138,2	150,8	163,4	175,9	188,5	201,1	213,6	226,2	238,8	251,3	-	-	448,0

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 410 [N/mm²]

l_{bd} [mm] / d_s [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	10,8	13,0	15,1	17,3	17,9	17,9	17,9	17,9	17,9	17,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17,9
10	13,5	16,2	18,9	21,6	24,3	27,0	28,0	28,0	28,0	28,0	28,0	28,0	-	-	-	-	-	-	-	-	-	-	-	-	28,0
12	-	18,1	21,1	24,1	27,1	30,2	37,7	40,3	40,3	40,3	40,3	40,3	40,3	40,3	-	-	-	-	-	-	-	-	-	-	40,3
14	-	-	24,6	28,1	31,7	35,2	44,0	52,8	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	-	-	-	-	-	-	-	-	54,9
16	-	-	-	29,8	33,5	37,2	46,5	55,8	65,1	71,7	71,7	71,7	71,7	71,7	71,7	71,7	71,7	71,7	-	-	-	-	-	-	71,7
20	-	-	-	-	-	46,5	58,1	69,7	81,4	93,0	104,6	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	-	-	112,0
25	-	-	-	-	-	-	66,8	80,1	93,5	106,8	120,2	133,5	146,9	160,2	173,6	175,0	175,0	175,0	175,0	175,0	175,0	175,0	-	-	175,0
28	-	-	-	-	-	-	-	89,7	104,7	119,6	134,6	149,5	164,5	179,4	194,4	209,4	219,5	219,5	219,5	219,5	219,5	219,5	219,5	-	219,5
32	-	-	-	-	-	-	-	-	105,6	120,6	135,7	150,8	165,9	181,0	196,0	211,1	226,2	241,3	256,4	271,4	286,5	286,7	286,7	286,7	286,7
40	-	-	-	-	-	-	-	-	-	-	130,1	144,5	159,0	173,4	187,9	202,3	216,8	231,2	245,7	260,1	274,6	289,0	-	-	448,0

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 410 [N/mm²]

l_{bd} [mm] / d_s [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	11,6	12,7	13,9	15,0	16,2	17,3	17,9	17,9	17,9	17,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17,9
10	14,5	15,9	17,3	18,8	20,2	21,7	23,5	25,3	27,1	28,0	28,0	28,0	-	-	-	-	-	-	-	-	-	-	-	-	28,0
12	-	19,1	20,8	22,5	24,3	26,0	28,2	30,3	32,5	34,7	39,0	40,3	40,3	40,3	-	-	-	-	-	-	-	-	-	-	40,3
14	-	-	-	26,3	28,3	30,3	32,9	35,4	37,9	40,5	45,5	50,6	54,9	54,9	54,9	54,9	-	-	-	-	-	-	-	-	54,9
16	-	-	-	-	32,4	34,7	37,6	40,5	43,4	46,2	52,0	57,8	63,6	69,4	71,7	71,7	71,7	71,7	-	-	-	-	-	-	71,7
20	-	-	-	-	-	-	-	50,6	54,2	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	112,0	112,0	112,0	112,0	112,0	-	-	112,0
25	-	-	-	-	-	-	-	-	-	-	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	175,0	-	-	175,0
28	-	-	-	-	-	-	-	-	-	-	-	101,2	111,3	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	219,5	-	219,5
32	-	-	-	-	-	-	-	-	-	-	-	-	-	138,7	150,3	161,9	173,4	185,0	196,5	208,1	219,7	231,2	286,7	286,7	286,7
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	188,5	201,1	213,6	226,2	238,8	251,3	-	-	448,0

R-KER-II | R-CFS+KER-II WITH POST-INSTALLED REBAR

BASIC PERFORMANCE DATA (cont.)

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 410 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	17,9	17,9	17,9	17,9	17,9	17,9	17,9	17,9	17,9	17,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17,9
10	27,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	-	-	-	-	-	-	-	-	-	-	-	-	28,0
12	30,2	33,2	36,2	39,2	40,3	40,3	40,3	40,3	40,3	40,3	40,3	40,3	40,3	40,3	-	-	-	-	-	-	-	-	-	-	40,3
14	-	38,7	42,2	45,7	49,3	52,8	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	-	-	-	-	-	-	-	-	54,9
16	-	-	44,6	48,4	52,1	55,8	60,4	65,1	69,7	71,7	71,7	71,7	71,7	71,7	71,7	71,7	71,7	71,7	-	-	-	-	-	-	71,7
20	-	-	-	-	-	69,7	75,6	81,4	87,2	93,0	104,6	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	-	-	112,0
25	-	-	-	-	-	-	-	-	100,1	106,8	120,2	133,5	146,9	160,2	173,6	175,0	175,0	175,0	175,0	175,0	175,0	175,0	-	-	175,0
28	-	-	-	-	-	-	-	-	-	-	134,6	149,5	164,5	179,4	194,4	209,4	219,5	219,5	219,5	219,5	219,5	219,5	219,5	-	219,5
32	-	-	-	-	-	-	-	-	-	-	-	150,8	165,9	181,0	196,0	211,1	226,2	241,3	256,4	271,4	286,5	286,7	286,7	286,7	286,7
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	187,9	202,3	216,8	231,2	245,7	260,1	274,6	289,0	-	-	448,0

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 420 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	5,8	6,9	8,1	9,2	10,4	11,6	14,5	17,3	18,4	18,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18,4
10	-	8,7	10,1	11,6	13,0	14,5	18,1	21,7	25,3	28,7	28,7	28,7	-	-	-	-	-	-	-	-	-	-	-	-	28,7
12	-	-	-	13,9	15,6	17,3	21,7	26,0	30,3	34,7	39,0	41,3	41,3	41,3	-	-	-	-	-	-	-	-	-	-	41,3
14	-	-	-	-	18,2	20,2	25,3	30,3	35,4	40,5	45,5	50,6	55,6	56,2	56,2	56,2	-	-	-	-	-	-	-	-	56,2
16	-	-	-	-	-	23,1	28,9	34,7	40,5	46,2	52,0	57,8	63,6	69,4	73,4	73,4	73,4	73,4	-	-	-	-	-	-	73,4
20	-	-	-	-	-	-	36,1	43,4	50,6	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	114,8	114,8	114,8	114,8	114,8	-	-	114,8
25	-	-	-	-	-	-	-	54,2	63,2	72,3	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	179,3	-	-	179,3
28	-	-	-	-	-	-	-	-	70,8	80,9	91,0	101,2	111,3	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	224,9	-	224,9
32	-	-	-	-	-	-	-	-	-	92,5	104,0	115,6	127,2	138,7	150,3	161,9	173,4	185,0	196,5	208,1	219,7	231,2	289,0	293,7	293,7
40	-	-	-	-	-	-	-	-	-	-	-	-	138,2	150,8	163,4	175,9	188,5	201,1	213,6	226,2	238,8	251,3	-	-	458,9

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 420 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	10,8	13,0	15,1	17,3	18,4	18,4	18,4	18,4	18,4	18,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18,4
10	13,5	16,2	18,9	21,6	24,3	27,0	28,7	28,7	28,7	28,7	28,7	28,7	-	-	-	-	-	-	-	-	-	-	-	-	28,7
12	-	18,1	21,1	24,1	27,1	30,2	37,7	41,3	41,3	41,3	41,3	41,3	41,3	41,3	-	-	-	-	-	-	-	-	-	-	41,3
14	-	-	24,6	28,1	31,7	35,2	44,0	52,8	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	-	-	-	-	-	-	-	-	56,2
16	-	-	-	29,8	33,5	37,2	46,5	55,8	65,1	73,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	-	-	-	-	-	-	73,4
20	-	-	-	-	-	-	46,5	58,1	69,7	81,4	93,0	104,6	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	-	-	114,8
25	-	-	-	-	-	-	-	66,8	80,1	93,5	106,8	120,2	133,5	146,9	160,2	173,6	179,3	179,3	179,3	179,3	179,3	179,3	-	-	179,3
28	-	-	-	-	-	-	-	-	89,7	104,7	119,6	134,6	149,5	164,5	179,4	194,4	209,4	224,3	224,9	224,9	224,9	224,9	224,9	-	224,9
32	-	-	-	-	-	-	-	-	105,6	120,6	135,7	150,8	165,9	181,0	196,0	211,1	226,2	241,3	256,4	271,4	286,5	293,7	293,7	293,7	293,7
40	-	-	-	-	-	-	-	-	-	-	130,1	144,5	159,0	173,4	187,9	202,3	216,8	231,2	245,7	260,1	274,6	289,0	-	-	458,9

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 420 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	11,6	12,7	13,9	15,0	16,2	17,3	18,4	18,4	18,4	18,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18,4
10	14,5	15,9	17,3	18,8	20,2	21,7	23,5	25,3	27,1	28,7	28,7	28,7	-	-	-	-	-	-	-	-	-	-	-	-	28,7
12	-	19,1	20,8	22,5	24,3	26,0	28,2	30,3	32,5	34,7	39,0	41,3	41,3	41,3	-	-	-	-	-	-	-	-	-	-	41,3
14	-	-	-	26,3	28,3	30,3	32,9	35,4	37,9	40,5	45,5	50,6	55,6	56,2	56,2	56,2	-	-	-	-	-	-	-	-	56,2
16	-	-	-	-	-	34,7	37,6	40,5	43,4	46,2	52,0	57,8	63,6	69,4	73,4	73,4	73,4	73,4	-	-	-	-	-	-	73,4
20	-	-	-	-	-	-	-	-	54,2	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	114,8	114,8	114,8	114,8	114,8	-	-	114,8
25	-	-	-	-	-	-	-	-	-	-	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	179,3	-	-	179,3
28	-	-	-	-	-	-	-	-	-	-	-	-	111,3	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	224,9	-	224,9
32	-	-	-	-	-	-	-	-	-	-	-	-	-	138,7	150,3	161,9	173,4	185,0	196,5	208,1	219,7	231,2	289,0	293,7	293,7
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	201,1	213,6	226,2	238,8	251,3	-	-	458,9

R-KER-II | R-CFS+KER-II WITH POST-INSTALLED REBAR

BASIC PERFORMANCE DATA (cont.)

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 420 [N/mm²]

l_{bd} [mm] / d_s [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	18,4	18,4	18,4	18,4	18,4	18,4	18,4	18,4	18,4	18,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18,4
10	27,0	28,7	28,7	28,7	28,7	28,7	28,7	28,7	28,7	28,7	28,7	28,7	-	-	-	-	-	-	-	-	-	-	-	-	28,7
12	30,2	33,2	36,2	39,2	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	-	-	-	-	-	-	-	-	-	-	41,3
14	-	38,7	42,2	45,7	49,3	52,8	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	-	-	-	-	-	-	-	-	56,2
16	-	-	44,6	48,4	52,1	55,8	60,4	65,1	69,7	73,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	-	-	-	-	-	-	73,4
20	-	-	-	-	-	69,7	75,6	81,4	87,2	93,0	104,6	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	-	-	114,8
25	-	-	-	-	-	-	-	-	100,1	106,8	120,2	133,5	146,9	160,2	173,6	179,3	179,3	179,3	179,3	179,3	179,3	179,3	-	-	179,3
28	-	-	-	-	-	-	-	-	-	-	134,6	149,5	164,5	179,4	194,4	209,4	224,3	224,9	224,9	224,9	224,9	224,9	224,9	-	224,9
32	-	-	-	-	-	-	-	-	-	-	-	150,8	165,9	181,0	196,0	211,1	226,2	241,3	256,4	271,4	286,5	293,7	293,7	293,7	293,7
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	202,3	216,8	231,2	245,7	260,1	274,6	289,0	-	-	458,9

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 460 [N/mm²]

l_{bd} [mm] / d_s [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	-	6,9	8,1	9,2	10,4	11,6	14,5	17,3	20,1	20,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20,1
10	-	-	10,1	11,6	13,0	14,5	18,1	21,7	25,3	28,9	31,4	31,4	-	-	-	-	-	-	-	-	-	-	-	-	31,4
12	-	-	-	13,9	15,6	17,3	21,7	26,0	30,3	34,7	39,0	43,4	45,2	45,2	-	-	-	-	-	-	-	-	-	-	45,2
14	-	-	-	-	-	20,2	25,3	30,3	35,4	40,5	45,5	50,6	55,6	60,7	61,6	61,6	-	-	-	-	-	-	-	-	61,6
16	-	-	-	-	-	-	28,9	34,7	40,5	46,2	52,0	57,8	63,6	69,4	75,1	80,4	80,4	80,4	-	-	-	-	-	-	80,4
20	-	-	-	-	-	-	-	43,4	50,6	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	115,6	122,8	125,7	125,7	125,7	-	-	125,7
25	-	-	-	-	-	-	-	-	63,2	72,3	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	180,6	-	-	196,4
28	-	-	-	-	-	-	-	-	-	80,9	91,0	101,2	111,3	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	246,3	-	246,3
32	-	-	-	-	-	-	-	-	-	-	104,0	115,6	127,2	138,7	150,3	161,9	173,4	185,0	196,5	208,1	219,7	231,2	289,0	321,7	321,7
40	-	-	-	-	-	-	-	-	-	-	-	-	-	150,8	163,4	175,9	188,5	201,1	213,6	226,2	238,8	251,3	-	-	502,6

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 460 [N/mm²]

l_{bd} [mm] / d_s [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	10,8	13,0	15,1	17,3	19,5	20,1	20,1	20,1	20,1	20,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20,1
10	13,5	16,2	18,9	21,6	24,3	27,0	31,4	31,4	31,4	31,4	31,4	31,4	-	-	-	-	-	-	-	-	-	-	-	-	31,4
12	-	18,1	21,1	24,1	27,1	30,2	37,7	45,2	45,2	45,2	45,2	45,2	45,2	45,2	-	-	-	-	-	-	-	-	-	-	45,2
14	-	-	24,6	28,1	31,7	35,2	44,0	52,8	61,6	61,6	61,6	61,6	61,6	61,6	61,6	61,6	-	-	-	-	-	-	-	-	61,6
16	-	-	-	29,8	33,5	37,2	46,5	55,8	65,1	74,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	-	-	-	-	-	-	80,4
20	-	-	-	-	-	46,5	58,1	69,7	81,4	93,0	104,6	116,2	125,7	125,7	125,7	125,7	125,7	125,7	125,7	125,7	125,7	125,7	-	-	125,7
25	-	-	-	-	-	-	66,8	80,1	93,5	106,8	120,2	133,5	146,9	160,2	173,6	186,9	196,4	196,4	196,4	196,4	196,4	196,4	-	-	196,4
28	-	-	-	-	-	-	-	89,7	104,7	119,6	134,6	149,5	164,5	179,4	194,4	209,4	224,3	239,3	246,3	246,3	246,3	246,3	246,3	-	246,3
32	-	-	-	-	-	-	-	-	105,6	120,6	135,7	150,8	165,9	181,0	196,0	211,1	226,2	241,3	256,4	271,4	286,5	301,6	321,7	321,7	321,7
40	-	-	-	-	-	-	-	-	-	-	-	144,5	159,0	173,4	187,9	202,3	216,8	231,2	245,7	260,1	274,6	289,0	-	-	502,6

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 460 [N/mm²]

l_{bd} [mm] / d_s [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	11,6	12,7	13,9	15,0	16,2	17,3	18,8	20,1	20,1	20,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20,1
10	14,5	15,9	17,3	18,8	20,2	21,7	23,5	25,3	27,1	28,9	31,4	31,4	-	-	-	-	-	-	-	-	-	-	-	-	31,4
12	-	-	20,8	22,5	24,3	26,0	28,2	30,3	32,5	34,7	39,0	43,4	45,2	45,2	-	-	-	-	-	-	-	-	-	-	45,2
14	-	-	-	-	28,3	30,3	32,9	35,4	37,9	40,5	45,5	50,6	55,6	60,7	61,6	61,6	-	-	-	-	-	-	-	-	61,6
16	-	-	-	-	-	-	37,6	40,5	43,4	46,2	52,0	57,8	63,6	69,4	75,1	80,4	80,4	80,4	-	-	-	-	-	-	80,4
20	-	-	-	-	-	-	-	-	-	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	115,6	122,8	125,7	125,7	125,7	-	-	125,7
25	-	-	-	-	-	-	-	-	-	-	-	90,3	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	180,6	-	-	196,4
28	-	-	-	-	-	-	-	-	-	-	-	-	111,3	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	246,3	-	246,3
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	150,3	161,9	173,4	185,0	196,5	208,1	219,7	231,2	289,0	321,7	321,7
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	213,6	226,2	238,8	251,3	-	-	502,6

R-KER-II | R-CFS+KER-II WITH POST-INSTALLED REBAR

BASIC PERFORMANCE DATA (cont.)

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 460 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	20,1	20,1	20,1	20,1	20,1	20,1	20,1	20,1	20,1	20,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20,1
10	27,0	29,7	31,4	31,4	31,4	31,4	31,4	31,4	31,4	31,4	31,4	31,4	-	-	-	-	-	-	-	-	-	-	-	-	31,4
12	30,2	33,2	36,2	39,2	42,2	45,2	45,2	45,2	45,2	45,2	45,2	45,2	45,2	45,2	-	-	-	-	-	-	-	-	-	-	45,2
14	-	38,7	42,2	45,7	49,3	52,8	57,2	61,6	61,6	61,6	61,6	61,6	61,6	61,6	61,6	61,6	-	-	-	-	-	-	-	-	61,6
16	-	-	44,6	48,4	52,1	55,8	60,4	65,1	69,7	74,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	-	-	-	-	-	-	80,4
20	-	-	-	-	-	69,7	75,6	81,4	87,2	93,0	104,6	116,2	125,7	125,7	125,7	125,7	125,7	125,7	125,7	125,7	125,7	125,7	-	-	125,7
25	-	-	-	-	-	-	-	-	100,1	106,8	120,2	133,5	146,9	160,2	173,6	186,9	196,4	196,4	196,4	196,4	196,4	196,4	-	-	196,4
28	-	-	-	-	-	-	-	-	-	-	134,6	149,5	164,5	179,4	194,4	209,4	224,3	239,3	246,3	246,3	246,3	246,3	246,3	-	246,3
32	-	-	-	-	-	-	-	-	-	-	-	150,8	165,9	181,0	196,0	211,1	226,2	241,3	256,4	271,4	286,5	301,6	321,7	321,7	321,7
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	216,8	231,2	245,7	260,1	274,6	289,0	-	-	502,6

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 500 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	-	6,9	8,1	9,2	10,4	11,6	14,5	17,3	20,2	21,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21,9
10	-	-	-	11,6	13,0	14,5	18,1	21,7	25,3	28,9	32,5	34,1	-	-	-	-	-	-	-	-	-	-	-	-	34,1
12	-	-	-	-	15,6	17,3	21,7	26,0	30,3	34,7	39,0	43,4	47,7	49,2	-	-	-	-	-	-	-	-	-	-	49,2
14	-	-	-	-	-	20,2	25,3	30,3	35,4	40,5	45,5	50,6	55,6	60,7	65,8	66,9	-	-	-	-	-	-	-	-	66,9
16	-	-	-	-	-	-	28,9	34,7	40,5	46,2	52,0	57,8	63,6	69,4	75,1	80,9	86,7	87,4	-	-	-	-	-	-	87,4
20	-	-	-	-	-	-	-	43,4	50,6	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	115,6	122,8	130,1	136,6	136,6	-	-	136,6
25	-	-	-	-	-	-	-	-	-	72,3	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	180,6	-	-	213,4
28	-	-	-	-	-	-	-	-	-	80,9	91,0	101,2	111,3	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	252,9	-	267,7
32	-	-	-	-	-	-	-	-	-	-	-	115,6	127,2	138,7	150,3	161,9	173,4	185,0	196,5	208,1	219,7	231,2	289,0	346,8	349,7
40	-	-	-	-	-	-	-	-	-	-	-	-	-	150,8	163,4	175,9	188,5	201,1	213,6	226,2	238,8	251,3	-	-	546,3

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 500 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	10,8	13,0	15,1	17,3	19,5	21,6	21,9	21,9	21,9	21,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21,9
10	13,5	16,2	18,9	21,6	24,3	27,0	33,8	34,1	34,1	34,1	34,1	34,1	-	-	-	-	-	-	-	-	-	-	-	-	34,1
12	-	18,1	21,1	24,1	27,1	30,2	37,7	45,2	49,2	49,2	49,2	49,2	49,2	49,2	-	-	-	-	-	-	-	-	-	-	49,2
14	-	-	24,6	28,1	31,7	35,2	44,0	52,8	61,6	66,9	66,9	66,9	66,9	66,9	66,9	66,9	-	-	-	-	-	-	-	-	66,9
16	-	-	-	29,8	33,5	37,2	46,5	55,8	65,1	74,4	83,7	87,4	87,4	87,4	87,4	87,4	87,4	87,4	-	-	-	-	-	-	87,4
20	-	-	-	-	-	46,5	58,1	69,7	81,4	93,0	104,6	116,2	127,9	136,6	136,6	136,6	136,6	136,6	136,6	136,6	136,6	136,6	-	-	136,6
25	-	-	-	-	-	-	66,8	80,1	93,5	106,8	120,2	133,5	146,9	160,2	173,6	186,9	200,3	213,4	213,4	213,4	213,4	213,4	-	-	213,4
28	-	-	-	-	-	-	-	89,7	104,7	119,6	134,6	149,5	164,5	179,4	194,4	209,4	224,3	239,3	254,2	267,7	267,7	267,7	267,7	-	267,7
32	-	-	-	-	-	-	-	-	105,6	120,6	135,7	150,8	165,9	181,0	196,0	211,1	226,2	241,3	256,4	271,4	286,5	301,6	349,7	349,7	349,7
40	-	-	-	-	-	-	-	-	-	-	-	-	159,0	173,4	187,9	202,3	216,8	231,2	245,7	260,1	274,6	289,0	-	-	546,3

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 500 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	11,6	12,7	13,9	15,0	16,2	17,3	18,8	20,2	21,7	21,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21,9
10	-	15,9	17,3	18,8	20,2	21,7	23,5	25,3	27,1	28,9	32,5	34,1	-	-	-	-	-	-	-	-	-	-	-	-	34,1
12	-	-	-	22,5	24,3	26,0	28,2	30,3	32,5	34,7	39,0	43,4	47,7	49,2	-	-	-	-	-	-	-	-	-	-	49,2
14	-	-	-	-	-	30,3	32,9	35,4	37,9	40,5	45,5	50,6	55,6	60,7	65,8	66,9	-	-	-	-	-	-	-	-	66,9
16	-	-	-	-	-	-	-	40,5	43,4	46,2	52,0	57,8	63,6	69,4	75,1	80,9	86,7	87,4	-	-	-	-	-	-	87,4
20	-	-	-	-	-	-	-	-	-	-	65,0	72,3	79,5	86,7	93,9	101,2	108,4	115,6	122,8	130,1	136,6	136,6	-	-	136,6
25	-	-	-	-	-	-	-	-	-	-	-	-	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	180,6	-	-	213,4
28	-	-	-	-	-	-	-	-	-	-	-	-	-	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	252,9	-	267,7
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	161,9	173,4	185,0	196,5	208,1	219,7	231,2	289,0	346,8	349,7
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	226,2	238,8	251,3	-	-	546,3

R-KER-II | R-CFS+KER-II WITH POST-INSTALLED REBAR

BASIC PERFORMANCE DATA (cont.)

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 500 [N/mm²]

l_{bd} [mm] / d_s [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	21,6	21,9	21,9	21,9	21,9	21,9	21,9	21,9	21,9	21,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21,9
10	27,0	29,7	32,4	34,1	34,1	34,1	34,1	34,1	34,1	34,1	34,1	34,1	-	-	-	-	-	-	-	-	-	-	-	-	34,1
12	30,2	33,2	36,2	39,2	42,2	45,2	49,0	49,2	49,2	49,2	49,2	49,2	49,2	49,2	-	-	-	-	-	-	-	-	-	-	49,2
14	-	38,7	42,2	45,7	49,3	52,8	57,2	61,6	66,0	66,9	66,9	66,9	66,9	66,9	66,9	66,9	-	-	-	-	-	-	-	-	66,9
16	-	-	44,6	48,4	52,1	55,8	60,4	65,1	69,7	74,4	83,7	87,4	87,4	87,4	87,4	87,4	87,4	87,4	-	-	-	-	-	-	87,4
20	-	-	-	-	-	69,7	75,6	81,4	87,2	93,0	104,6	116,2	127,9	136,6	136,6	136,6	136,6	136,6	136,6	136,6	136,6	136,6	-	-	136,6
25	-	-	-	-	-	-	-	-	100,1	106,8	120,2	133,5	146,9	160,2	173,6	186,9	200,3	213,4	213,4	213,4	213,4	213,4	-	-	213,4
28	-	-	-	-	-	-	-	-	-	-	134,6	149,5	164,5	179,4	194,4	209,4	224,3	239,3	254,2	267,7	267,7	267,7	267,7	-	267,7
32	-	-	-	-	-	-	-	-	-	-	-	-	165,9	181,0	196,0	211,1	226,2	241,3	256,4	271,4	286,5	301,6	349,7	349,7	349,7
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	231,2	245,7	260,1	274,6	289,0	-	-	546,3

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 600 [N/mm²]

l_{bd} [mm] / d_s [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	-	-	8,1	9,2	10,4	11,6	14,5	17,3	20,2	23,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26,2
10	-	-	-	-	13,0	14,5	18,1	21,7	25,3	28,9	32,5	36,1	-	-	-	-	-	-	-	-	-	-	-	-	41,0
12	-	-	-	-	-	-	21,7	26,0	30,3	34,7	39,0	43,4	47,7	52,0	-	-	-	-	-	-	-	-	-	-	59,0
14	-	-	-	-	-	-	25,3	30,3	35,4	40,5	45,5	50,6	55,6	60,7	65,8	70,8	-	-	-	-	-	-	-	-	80,3
16	-	-	-	-	-	-	-	34,7	40,5	46,2	52,0	57,8	63,6	69,4	75,1	80,9	86,7	92,5	-	-	-	-	-	-	104,9
20	-	-	-	-	-	-	-	-	50,6	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	115,6	122,8	130,1	137,3	144,5	-	-	163,9
25	-	-	-	-	-	-	-	-	-	-	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	180,6	-	-	256,1
28	-	-	-	-	-	-	-	-	-	-	-	101,2	111,3	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	252,9	-	321,3
32	-	-	-	-	-	-	-	-	-	-	-	-	127,2	138,7	150,3	161,9	173,4	185,0	196,5	208,1	219,7	231,2	289,0	346,8	419,6
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	188,5	201,1	213,6	226,2	238,8	251,3	-	-	655,6

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 600 [N/mm²]

l_{bd} [mm] / d_s [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	10,8	13,0	15,1	17,3	19,5	21,6	26,2	26,2	26,2	26,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26,2
10	13,5	16,2	18,9	21,6	24,3	27,0	33,8	40,5	41,0	41,0	41,0	41,0	-	-	-	-	-	-	-	-	-	-	-	-	41,0
12	-	18,1	21,1	24,1	27,1	30,2	37,7	45,2	52,8	59,0	59,0	59,0	59,0	59,0	-	-	-	-	-	-	-	-	-	-	59,0
14	-	-	24,6	28,1	31,7	35,2	44,0	52,8	61,6	70,4	79,2	80,3	80,3	80,3	80,3	80,3	-	-	-	-	-	-	-	-	80,3
16	-	-	-	-	33,5	37,2	46,5	55,8	65,1	74,4	83,7	93,0	102,3	104,9	104,9	104,9	104,9	104,9	-	-	-	-	-	-	104,9
20	-	-	-	-	-	-	58,1	69,7	81,4	93,0	104,6	116,2	127,9	139,5	151,1	162,7	163,9	163,9	163,9	163,9	163,9	163,9	-	-	163,9
25	-	-	-	-	-	-	-	80,1	93,5	106,8	120,2	133,5	146,9	160,2	173,6	186,9	200,3	213,6	227,0	240,3	253,7	256,1	-	-	256,1
28	-	-	-	-	-	-	-	-	104,7	119,6	134,6	149,5	164,5	179,4	194,4	209,4	224,3	239,3	254,2	269,2	284,1	299,1	321,3	-	321,3
32	-	-	-	-	-	-	-	-	-	-	135,7	150,8	165,9	181,0	196,0	211,1	226,2	241,3	256,4	271,4	286,5	301,6	377,0	419,6	419,6
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	187,9	202,3	216,8	231,2	245,7	260,1	274,6	289,0	-	-	655,6

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 600 [N/mm²]

l_{bd} [mm] / d_s [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	-	12,7	13,9	15,0	16,2	17,3	18,8	20,2	21,7	23,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26,2
10	-	-	-	18,8	20,2	21,7	23,5	25,3	27,1	28,9	32,5	36,1	-	-	-	-	-	-	-	-	-	-	-	-	41,0
12	-	-	-	-	-	-	28,2	30,3	32,5	34,7	39,0	43,4	47,7	52,0	-	-	-	-	-	-	-	-	-	-	59,0
14	-	-	-	-	-	-	-	-	37,9	40,5	45,5	50,6	55,6	60,7	65,8	70,8	-	-	-	-	-	-	-	-	80,3
16	-	-	-	-	-	-	-	-	-	-	52,0	57,8	63,6	69,4	75,1	80,9	86,7	92,5	-	-	-	-	-	-	104,9
20	-	-	-	-	-	-	-	-	-	-	-	-	79,5	86,7	93,9	101,2	108,4	115,6	122,8	130,1	137,3	144,5	-	-	163,9
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	117,4	126,4	135,5	144,5	153,5	162,6	171,6	180,6	-	-	256,1
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	151,7	161,9	172,0	182,1	192,2	202,3	252,9	-	321,3
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	196,5	208,1	219,7	231,2	289,0	346,8	419,6
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	655,6

R-KER-II | R-CFS+KER-II WITH POST-INSTALLED REBAR

BASIC PERFORMANCE DATA (cont.)

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 600 [N/mm²]																								
d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1250	1500	Steel failure
8	21,6	23,8	25,9	26,2	26,2	26,2	26,2	26,2	26,2	26,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26,2
10	27,0	29,7	32,4	35,1	37,8	40,5	41,0	41,0	41,0	41,0	41,0	41,0	-	-	-	-	-	-	-	-	-	-	-	-	41,0
12	30,2	33,2	36,2	39,2	42,2	45,2	49,0	52,8	56,5	59,0	59,0	59,0	59,0	59,0	-	-	-	-	-	-	-	-	-	-	59,0
14	-	38,7	42,2	45,7	49,3	52,8	57,2	61,6	66,0	70,4	79,2	80,3	80,3	80,3	80,3	80,3	-	-	-	-	-	-	-	-	80,3
16	-	-	-	48,4	52,1	55,8	60,4	65,1	69,7	74,4	83,7	93,0	102,3	104,9	104,9	104,9	104,9	104,9	-	-	-	-	-	-	104,9
20	-	-	-	-	-	-	75,6	81,4	87,2	93,0	104,6	116,2	127,9	139,5	151,1	162,7	163,9	163,9	163,9	163,9	163,9	163,9	-	-	163,9
25	-	-	-	-	-	-	-	-	-	-	120,2	133,5	146,9	160,2	173,6	186,9	200,3	213,6	227,0	240,3	253,7	256,1	-	-	256,1
28	-	-	-	-	-	-	-	-	-	-	-	149,5	164,5	179,4	194,4	209,4	224,3	239,3	254,2	269,2	284,1	299,1	321,3	-	321,3
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	196,0	211,1	226,2	241,3	256,4	271,4	286,5	301,6	377,0	419,6	419,6
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	274,6	289,0	-	-	655,6

DESIGN PERFORMANCE DATA

POST INSTALLED REBARS

Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32	Ø40
TENSION LOAD												
Mean ultimate bond resistance C12/15	f_{bd}	[N/mm²]	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
Mean ultimate bond resistance C16/20	f_{bd}	[N/mm²]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Mean ultimate bond resistance C20/25	f_{bd}	[N/mm²]	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.00
Mean ultimate bond resistance C25/30	f_{bd}	[N/mm²]	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.00
Mean ultimate bond resistance C30/37	f_{bd}	[N/mm²]	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.70	2.00
Mean ultimate bond resistance C35/45	f_{bd}	[N/mm²]	3.40	3.40	3.40	3.40	3.40	3.40	3.00	3.00	3.00	2.00
Mean ultimate bond resistance C40/50	f_{bd}	[N/mm²]	3.70	3.70	3.70	3.70	3.70	3.40	3.00	3.00	3.00	2.30
Mean ultimate bond resistance C45/55	f_{bd}	[N/mm²]	4.00	4.00	4.00	3.70	3.70	3.40	3.40	3.00	3.00	2.30
Mean ultimate bond resistance C50/60	f_{bd}	[N/mm²]	4.30	4.30	4.00	4.00	3.70	3.70	3.40	3.40	3.00	2.30

R-KER | R-CFS+RV200 WITH POST-INSTALLED REBARS

High performance vinylester resin approved for use with post-installed rebar connections

ETA | ETA-12/0319 | CE

FEATURES AND BENEFITS

- Approved for use with post-installed rebars in non-cracked concrete
- Winter version can be used in warmer temperatures for faster curing
- Suitable for use in dry and wet substrates as well as holes and substrates covered with water
- Rapid bonding time enables quick execution of works
- Very high load capacity

APPLICATIONS

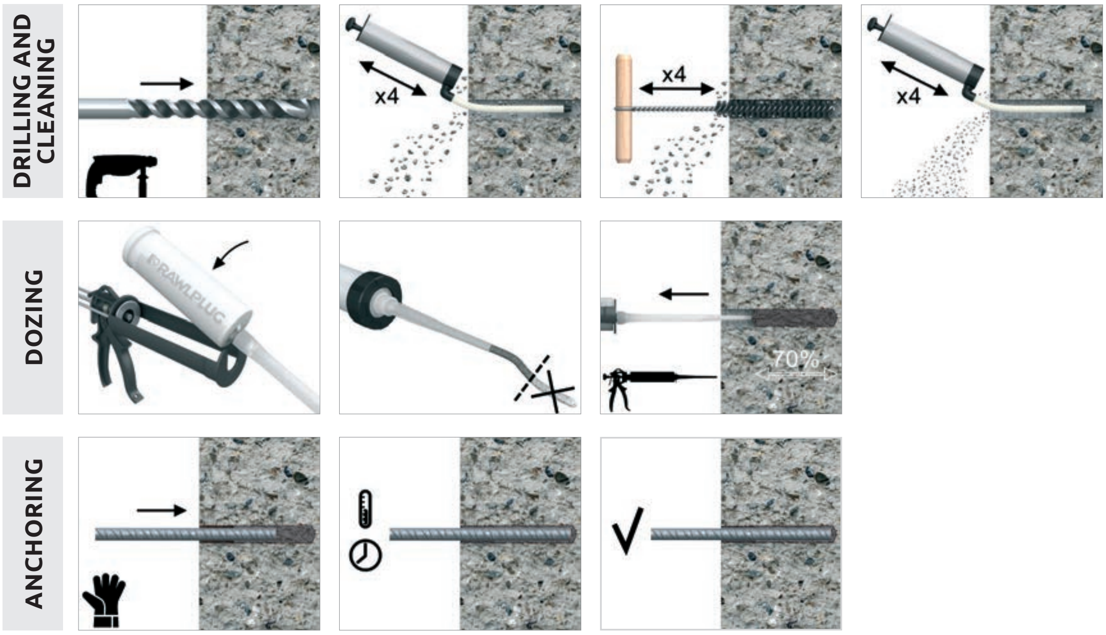
- Post-installed rebar connections
- Rebar
- Temporary works/formworks support systems
- Safety barriers
- Barriers
- Platforms
- Rebar dowelling
- Starter bars
- Rebar missed-outs

BASE MATERIALS

Approved for use in:

- Concrete C12/C15-C50/60

INSTALLATION GUIDE



1. Drill hole to the required diameter and depth for rebar size being used.
2. Clean the drill hole thoroughly with brush and hand pump at least four times before installation
3. Insert cartridge into gun and attach nozzle.
4. Dispense to waste until even colour is obtained.
5. Insert the mixer nozzle to the bottom of the drill hole and inject resin, slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
6. Immediately insert the rebar, slowly and with slight twisting motion.
   Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.

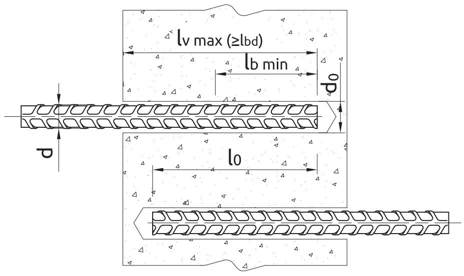
R-KER | R-CFS+RV200 WITH POST-INSTALLED REBARS

PRODUCT INFORMATION

Product Code	Resin	Description / Resin Type	Volume [ml]
R-KER-300	R-KER	Styrene Free Vinylester Resin	300
R-KER-345			345
R-KER-380			380
R-KER-400			400
R-CFS+RV200-4	RV200	Styrene Free Vinylester Resin	300
R-CFS+RV200-600-8			600

INSTALLATION DATA

POST INSTALLED REBARS



Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32
Rebar diameter	d_s	[mm]	8	10	12	14	16	20	25	28	30	32
Hole diameter in substrate	d_0	[mm]	12	14	16	18	20	25	30	35	35	40
Brush diameter	-	[mm]	14	16	20	20	24	28	37	37	37	42
Min. anchorage length	$l_{b,\,min.}$	[mm]	115	145	170	200	230	285	355	400	420	455
Min. lap length (overlap splice)	$l_{0,\,min.}$	[mm]	200	215	255	300	340	430	540	600	640	690
Max. anchorage length	$l_{v,\,max.}$	[mm]	400	500	600	700	800	1000	1000	1000	1000	1000

Minimum working and curing time

Resin temperature	Concrete temperature	Curing time* [min.]	Working time [min.]
°C	°C	R-KER	R-KER
5	-20	-	-
5	-15	-	-
5	-10	-	-
5	-5	6h	60
5	0	3h	40
5	5	2h	20
10	10	80	12
15	15	60	8
20	20	45	5
25	25	30	3
25	30	20	2
25	40	10	0.5
25	45	-	-
25	50	-	-

*For wet concrete the curing time must be doubled

MECHANICAL PROPERTIES

POST INSTALLED REBARS

Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32
f_yk = 410 (e.g. 34GS acc. to EC2)												
Nominal yield strength - tension	f_{yk}	[N/mm²]	410	410	410	410	410	410	410	410	410	410
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	706.9	804.2
f_yk = 420 (e.g. G-60 acc. to ASTM 615)												
Nominal yield strength - tension	f_{yk}	[N/mm²]	420	420	420	420	420	420	420	420	420	420
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	706.9	804.2
f_yk = 460 (e.g. 460 B acc. to BS 4449)												
Nominal yield strength - tension	f_{yk}	[N/mm²]	460	460	460	460	460	460	460	460	460	460
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	706.9	804.2
f_yk = 500 (e.g. B 500 SP acc. to EC2; 500 B acc. to BS 4449; B 500 B acc. to SS 560)												
Nominal yield strength - tension	f_{yk}	[N/mm²]	500	500	500	500	500	500	500	500	500	500
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	706.9	804.2
f_yk = 600 (e.g. B 600 B acc. to SS 560)												
Nominal yield strength - tension	f_{yk}	[N/mm²]	600	600	600	600	600	600	600	600	600	600
Cross sectional area - tension	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	706.9	804.2

R-KER | R-CFS+RV200 WITH POST-INSTALLED REBARS

BASIC PERFORMANCE DATA

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 410 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	230	260	290	320	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	5,8	6,9	8,1	9,2	10,4	11,6	13,3	15,0	16,8	17,9	17,9	17,9	-	-	-	-	-	-	-	-	-	-	-	-	17,9
10	-	8,7	10,1	11,6	13,0	14,5	16,6	18,8	21,0	23,1	25,3	28,0	28,0	28,0	-	-	-	-	-	-	-	-	-	-	28,0
12	-	-	12,1	13,9	15,6	17,3	19,9	22,5	25,1	27,7	30,3	34,7	39,0	40,3	40,3	40,3	-	-	-	-	-	-	-	-	40,3
14	-	-	-	-	18,2	20,2	23,3	26,3	29,3	32,4	35,4	40,5	45,5	50,6	54,9	54,9	54,9	54,9	-	-	-	-	-	-	54,9
16	-	-	-	-	-	23,1	26,6	30,1	33,5	37,0	40,5	46,2	52,0	57,8	63,6	69,4	71,7	71,7	71,7	71,7	-	-	-	-	71,7
20	-	-	-	-	-	-	-	37,6	41,9	46,2	50,6	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	112,0	112,0	112,0	112,0	112,0	112,0
25	-	-	-	-	-	-	-	-	-	57,8	63,2	72,3	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	175,0	175,0
28	-	-	-	-	-	-	-	-	-	-	70,8	80,9	91,0	101,2	111,3	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	219,5
30	-	-	-	-	-	-	-	-	-	-	75,9	86,7	97,5	108,4	119,2	130,1	140,9	151,7	162,6	173,4	184,3	195,1	205,9	216,8	252,0
32	-	-	-	-	-	-	-	-	-	-	-	92,5	104,0	115,6	127,2	138,7	150,3	161,9	173,4	185,0	196,5	208,1	219,7	231,2	286,7

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 410 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	225	250	275	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	10,8	13,0	15,1	17,3	17,9	17,9	17,9	17,9	17,9	17,9	17,9	17,9	-	-	-	-	-	-	-	-	-	-	-	-	17,9
10	13,5	16,2	18,9	21,6	24,3	27,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	-	-	-	-	-	-	-	-	-	-	28,0
12	-	19,5	22,7	25,9	29,2	32,4	36,5	40,3	40,3	40,3	40,3	40,3	40,3	40,3	40,3	40,3	-	-	-	-	-	-	-	-	40,3
14	-	-	26,5	30,3	34,0	37,8	42,6	47,3	52,0	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	-	-	-	-	-	-	54,9
16	-	-	-	32,2	36,2	40,2	45,2	50,3	55,3	60,3	70,4	71,7	71,7	71,7	71,7	71,7	71,7	71,7	71,7	71,7	-	-	-	-	71,7
20	-	-	-	-	-	46,5	52,3	58,1	63,9	69,7	81,4	93,0	104,6	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0
25	-	-	-	-	-	-	-	58,9	64,8	70,7	82,5	94,2	106,0	117,8	129,6	141,4	153,2	164,9	175,0	175,0	175,0	175,0	175,0	175,0	175,0
28	-	-	-	-	-	-	-	-	-	79,2	92,4	105,6	118,8	131,9	145,1	158,3	171,5	184,7	197,9	211,1	219,5	219,5	219,5	219,5	219,5
30	-	-	-	-	-	-	-	-	-	76,3	89,1	101,8	114,5	127,2	140,0	152,7	165,4	178,1	190,9	203,6	216,3	229,0	241,7	252,0	252,0
32	-	-	-	-	-	-	-	-	-	-	95,0	108,6	122,1	135,7	149,3	162,9	176,4	190,0	203,6	217,1	230,7	244,3	257,9	271,4	286,7

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 410 [N/mm²]

d_s [mm] \ l_0 [mm]	200	220	240	260	280	300	325	350	375	400	425	450	475	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	11,6	12,7	13,9	15,0	16,2	17,3	17,9	17,9	17,9	17,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17,9
10	14,5	15,9	17,3	18,8	20,2	21,7	23,5	25,3	27,1	28,0	28,0	28,0	28,0	28,0	-	-	-	-	-	-	-	-	-	-	28,0
12	-	19,1	20,8	22,5	24,3	26,0	28,2	30,3	32,5	34,7	36,9	39,0	40,3	40,3	40,3	40,3	-	-	-	-	-	-	-	-	40,3
14	-	-	-	26,3	28,3	30,3	32,9	35,4	37,9	40,5	43,0	45,5	48,1	50,6	54,9	54,9	54,9	54,9	-	-	-	-	-	-	54,9
16	-	-	-	-	32,4	34,7	37,6	40,5	43,4	46,2	49,1	52,0	54,9	57,8	63,6	69,4	71,7	71,7	71,7	71,7	-	-	-	-	71,7
20	-	-	-	-	-	-	-	50,6	54,2	57,8	61,4	65,0	68,6	72,3	79,5	86,7	93,9	101,2	108,4	112,0	112,0	112,0	112,0	112,0	112,0
25	-	-	-	-	-	-	-	-	-	-	-	81,3	85,8	90,3	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	175,0	175,0
28	-	-	-	-	-	-	-	-	-	-	-	-	-	101,2	111,3	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	219,5
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	119,2	130,1	140,9	151,7	162,6	173,4	184,3	195,1	205,9	216,8	252,0
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	138,7	150,3	161,9	173,4	185,0	196,5	208,1	219,7	231,2	286,7

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 410 [N/mm²]

d_s [mm] \ l_0 [mm]	200	220	240	260	280	300	325	350	375	400	425	450	475	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	17,9	17,9	17,9	17,9	17,9	17,9	17,9	17,9	17,9	17,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17,9
10	27,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	28,0	-	-	-	-	-	-	-	-	-	-	28,0
12	32,4	35,7	38,9	40,3	40,3	40,3	40,3	40,3	40,3	40,3	40,3	40,3	40,3	40,3	40,3	40,3	-	-	-	-	-	-	-	-	40,3
14	-	41,6	45,4	49,2	53,0	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	54,9	-	-	-	-	-	-	54,9
16	-	-	48,3	52,3	56,3	60,3	65,3	70,4	71,7	71,7	71,7	71,7	71,7	71,7	71,7	71,7	71,7	71,7	71,7	71,7	-	-	-	-	71,7
20	-	-	-	-	-	69,7	75,6	81,4	87,2	93,0	98,8	104,6	110,4	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0
25	-	-	-	-	-	-	-	-	88,4	94,2	100,1	106,0	111,9	117,8	129,6	141,4	153,2	164,9	175,0	175,0	175,0	175,0	175,0	175,0	175,0
28	-	-	-	-	-	-	-	-	-	-	112,2	118,8	125,3	131,9	145,1	158,3	171,5	184,7	197,9	211,1	219,5	219,5	219,5	219,5	219,5
30	-	-	-	-	-	-	-	-	-	-	-	114,5	120,9	127,2	140,0	152,7	165,4	178,1	190,9	203,6	216,3	229,0	241,7	252,0	252,0
32	-	-	-	-	-	-	-	-	-	-	-	-	-	135,7	149,3	162,9	176,4	190,0	203,6	217,1	230,7	244,3	257,9	271,4	286,7

R-KER | R-CFS+RV200 WITH POST-INSTALLED REBARS

BASIC PERFORMANCE DATA

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 420 [N/mm²]

l_{bd} [mm] / d_s [mm]	100	120	140	160	180	200	230	260	290	320	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	5,8	6,9	8,1	9,2	10,4	11,6	13,3	15,0	16,8	18,4	18,4	18,4	-	-	-	-	-	-	-	-	-	-	-	-	18,4
10	-	8,7	10,1	11,6	13,0	14,5	16,6	18,8	21,0	23,1	25,3	28,7	28,7	28,7	-	-	-	-	-	-	-	-	-	-	28,7
12	-	-	-	13,9	15,6	17,3	19,9	22,5	25,1	27,7	30,3	34,7	39,0	41,3	41,3	41,3	-	-	-	-	-	-	-	-	41,3
14	-	-	-	-	18,2	20,2	23,3	26,3	29,3	32,4	35,4	40,5	45,5	50,6	55,6	56,2	56,2	56,2	-	-	-	-	-	-	56,2
16	-	-	-	-	-	23,1	26,6	30,1	33,5	37,0	40,5	46,2	52,0	57,8	63,6	69,4	73,4	73,4	73,4	73,4	-	-	-	-	73,4
20	-	-	-	-	-	-	-	37,6	41,9	46,2	50,6	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	114,8	114,8	114,8	114,8	114,8	114,8
25	-	-	-	-	-	-	-	-	-	57,8	63,2	72,3	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	179,3	179,3
28	-	-	-	-	-	-	-	-	-	-	70,8	80,9	91,0	101,2	111,3	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	224,9
30	-	-	-	-	-	-	-	-	-	-	-	86,7	97,5	108,4	119,2	130,1	140,9	151,7	162,6	173,4	184,3	195,1	205,9	216,8	258,2
32	-	-	-	-	-	-	-	-	-	-	-	92,5	104,0	115,6	127,2	138,7	150,3	161,9	173,4	185,0	196,5	208,1	219,7	231,2	293,7

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 420 [N/mm²]

l_{bd} [mm] / d_s [mm]	100	120	140	160	180	200	230	260	290	320	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	10,8	13,0	15,1	17,3	18,4	18,4	18,4	18,4	18,4	18,4	18,4	18,4	-	-	-	-	-	-	-	-	-	-	-	-	18,4
10	13,5	16,2	18,9	21,6	24,3	27,0	28,7	28,7	28,7	28,7	28,7	28,7	28,7	28,7	-	-	-	-	-	-	-	-	-	-	28,7
12	-	19,5	22,7	25,9	29,2	32,4	37,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	-	-	-	-	-	-	-	-	41,3
14	-	-	26,5	30,3	34,0	37,8	43,5	49,2	54,8	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	-	-	-	-	-	-	56,2
16	-	-	-	32,2	36,2	40,2	46,2	52,3	58,3	64,3	70,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	-	-	-	-	73,4
20	-	-	-	-	-	46,5	53,5	60,4	67,4	74,4	81,4	93,0	104,6	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8
25	-	-	-	-	-	-	-	61,3	68,3	75,4	82,5	94,2	106,0	117,8	129,6	141,4	153,2	164,9	176,7	179,3	179,3	179,3	179,3	179,3	179,3
28	-	-	-	-	-	-	-	-	76,5	84,4	92,4	105,6	118,8	131,9	145,1	158,3	171,5	184,7	197,9	211,1	224,3	224,9	224,9	224,9	224,9
30	-	-	-	-	-	-	-	-	-	81,4	89,1	101,8	114,5	127,2	140,0	152,7	165,4	178,1	190,9	203,6	216,3	229,0	241,7	254,5	258,2
32	-	-	-	-	-	-	-	-	-	-	95,0	108,6	122,1	135,7	149,3	162,9	176,4	190,0	203,6	217,1	230,7	244,3	257,9	271,4	293,7

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 420 [N/mm²]

l_0 [mm] / d_s [mm]	200	220	240	260	280	300	325	350	375	400	425	450	475	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	11,6	12,7	13,9	15,0	16,2	17,3	18,4	18,4	18,4	18,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18,4
10	14,5	15,9	17,3	18,8	20,2	21,7	23,5	25,3	27,1	28,7	28,7	28,7	28,7	28,7	-	-	-	-	-	-	-	-	-	-	28,7
12	-	19,1	20,8	22,5	24,3	26,0	28,2	30,3	32,5	34,7	36,9	39,0	41,2	41,3	41,3	41,3	-	-	-	-	-	-	-	-	41,3
14	-	-	-	26,3	28,3	30,3	32,9	35,4	37,9	40,5	43,0	45,5	48,1	50,6	55,6	56,2	56,2	56,2	-	-	-	-	-	-	56,2
16	-	-	-	-	-	34,7	37,6	40,5	43,4	46,2	49,1	52,0	54,9	57,8	63,6	69,4	73,4	73,4	73,4	73,4	-	-	-	-	73,4
20	-	-	-	-	-	-	-	-	54,2	57,8	61,4	65,0	68,6	72,3	79,5	86,7	93,9	101,2	108,4	114,8	114,8	114,8	114,8	114,8	114,8
25	-	-	-	-	-	-	-	-	-	-	-	81,3	85,8	90,3	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	179,3	179,3
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	111,3	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	224,9
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	119,2	130,1	140,9	151,7	162,6	173,4	184,3	195,1	205,9	216,8	258,2
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	138,7	150,3	161,9	173,4	185,0	196,5	208,1	219,7	231,2	293,7

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 420 [N/mm²]

l_0 [mm] / d_s [mm]	200	220	240	260	280	300	325	350	375	400	425	450	475	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	18,4	18,4	18,4	18,4	18,4	18,4	18,4	18,4	18,4	18,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18,4
10	27,0	28,7	28,7	28,7	28,7	28,7	28,7	28,7	28,7	28,7	28,7	28,7	28,7	28,7	-	-	-	-	-	-	-	-	-	-	28,7
12	32,4	35,7	38,9	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	-	-	-	-	-	-	-	-	41,3
14	-	41,6	45,4	49,2	53,0	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	56,2	-	-	-	-	-	-	56,2
16	-	-	48,3	52,3	56,3	60,3	65,3	70,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	73,4	-	-	-	-	73,4
20	-	-	-	-	-	69,7	75,6	81,4	87,2	93,0	98,8	104,6	110,4	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8	114,8
25	-	-	-	-	-	-	-	-	88,4	94,2	100,1	106,0	111,9	117,8	129,6	141,4	153,2	164,9	176,7	179,3	179,3	179,3	179,3	179,3	179,3
28	-	-	-	-	-	-	-	-	-	-	112,2	118,8	125,3	131,9	145,1	158,3	171,5	184,7	197,9	211,1	224,3	224,9	224,9	224,9	224,9
30	-	-	-	-	-	-	-	-	-	-	-	-	120,9	127,2	140,0	152,7	165,4	178,1	190,9	203,6	216,3	229,0	241,7	254,5	258,2
32	-	-	-	-	-	-	-	-	-	-	-	-	-	135,7	149,3	162,9	176,4	190,0	203,6	217,1	230,7	244,3	257,9	271,4	293,7

R-KER | R-CFS+RV200 WITH POST-INSTALLED REBARS

BASIC PERFORMANCE DATA

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 460 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	230	260	290	320	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	-	6,9	8,1	9,2	10,4	11,6	13,3	15,0	16,8	18,5	20,1	20,1	-	-	-	-	-	-	-	-	-	-	-	-	20,1
10	-	-	10,1	11,6	13,0	14,5	16,6	18,8	21,0	23,1	25,3	28,9	31,4	31,4	-	-	-	-	-	-	-	-	-	-	31,4
12	-	-	-	13,9	15,6	17,3	19,9	22,5	25,1	27,7	30,3	34,7	39,0	43,4	45,2	45,2	-	-	-	-	-	-	-	-	45,2
14	-	-	-	-	-	20,2	23,3	26,3	29,3	32,4	35,4	40,5	45,5	50,6	55,6	60,7	61,6	61,6	-	-	-	-	-	-	61,6
16	-	-	-	-	-	-	26,6	30,1	33,5	37,0	40,5	46,2	52,0	57,8	63,6	69,4	75,1	80,4	80,4	80,4	-	-	-	-	80,4
20	-	-	-	-	-	-	-	-	41,9	46,2	50,6	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	115,6	122,8	125,7	125,7	125,7	125,7
25	-	-	-	-	-	-	-	-	-	-	63,2	72,3	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	180,6	196,4
28	-	-	-	-	-	-	-	-	-	-	-	80,9	91,0	101,2	111,3	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	246,3
30	-	-	-	-	-	-	-	-	-	-	-	86,7	97,5	108,4	119,2	130,1	140,9	151,7	162,6	173,4	184,3	195,1	205,9	216,8	282,7
32	-	-	-	-	-	-	-	-	-	-	-	-	104,0	115,6	127,2	138,7	150,3	161,9	173,4	185,0	196,5	208,1	219,7	231,2	321,7

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 460 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	230	260	290	320	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	10,8	13,0	15,1	17,3	19,5	20,1	20,1	20,1	20,1	20,1	20,1	20,1	-	-	-	-	-	-	-	-	-	-	-	-	20,1
10	13,5	16,2	18,9	21,6	24,3	27,0	31,1	31,4	31,4	31,4	31,4	31,4	31,4	31,4	-	-	-	-	-	-	-	-	-	-	31,4
12	-	19,5	22,7	25,9	29,2	32,4	37,3	42,1	45,2	45,2	45,2	45,2	45,2	45,2	45,2	45,2	-	-	-	-	-	-	-	-	45,2
14	-	-	26,5	30,3	34,0	37,8	43,5	49,2	54,8	60,5	61,6	61,6	61,6	61,6	61,6	61,6	61,6	61,6	-	-	-	-	-	-	61,6
16	-	-	-	32,2	36,2	40,2	46,2	52,3	58,3	64,3	70,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	-	-	-	-	80,4
20	-	-	-	-	-	46,5	53,5	60,4	67,4	74,4	81,4	93,0	104,6	116,2	125,7	125,7	125,7	125,7	125,7	125,7	125,7	125,7	125,7	125,7	125,7
25	-	-	-	-	-	-	-	61,3	68,3	75,4	82,5	94,2	106,0	117,8	129,6	141,4	153,2	164,9	176,7	188,5	196,4	196,4	196,4	196,4	196,4
28	-	-	-	-	-	-	-	-	76,5	84,4	92,4	105,6	118,8	131,9	145,1	158,3	171,5	184,7	197,9	211,1	224,3	237,5	246,3	246,3	246,3
30	-	-	-	-	-	-	-	-	-	-	89,1	101,8	114,5	127,2	140,0	152,7	165,4	178,1	190,9	203,6	216,3	229,0	241,7	254,5	282,7
32	-	-	-	-	-	-	-	-	-	-	-	108,6	122,1	135,7	149,3	162,9	176,4	190,0	203,6	217,1	230,7	244,3	257,9	271,4	321,7

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 460 [N/mm²]

d_s [mm] \ l_0 [mm]	200	220	240	260	280	300	325	350	375	400	425	450	475	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	11,6	12,7	13,9	15,0	16,2	17,3	18,8	20,1	20,1	20,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20,1
10	14,5	15,9	17,3	18,8	20,2	21,7	23,5	25,3	27,1	28,9	30,7	31,4	31,4	31,4	-	-	-	-	-	-	-	-	-	-	31,4
12	-	-	20,8	22,5	24,3	26,0	28,2	30,3	32,5	34,7	36,9	39,0	41,2	43,4	45,2	45,2	-	-	-	-	-	-	-	-	45,2
14	-	-	-	-	28,3	30,3	32,9	35,4	37,9	40,5	43,0	45,5	48,1	50,6	55,6	60,7	61,6	61,6	-	-	-	-	-	-	61,6
16	-	-	-	-	-	-	37,6	40,5	43,4	46,2	49,1	52,0	54,9	57,8	63,6	69,4	75,1	80,4	80,4	80,4	-	-	-	-	80,4
20	-	-	-	-	-	-	-	-	-	57,8	61,4	65,0	68,6	72,3	79,5	86,7	93,9	101,2	108,4	115,6	122,8	125,7	125,7	125,7	125,7
25	-	-	-	-	-	-	-	-	-	-	-	-	-	90,3	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	180,6	196,4
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	111,3	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	246,3
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	130,1	140,9	151,7	162,6	173,4	184,3	195,1	205,9	216,8	282,7
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	150,3	161,9	173,4	185,0	196,5	208,1	219,7	231,2	321,7

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk}= 460 [N/mm²]

d_s [mm] \ l_0 [mm]	200	220	240	260	280	300	325	350	375	400	425	450	475	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	20,1	20,1	20,1	20,1	20,1	20,1	20,1	20,1	20,1	20,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20,1
10	27,0	29,7	31,4	31,4	31,4	31,4	31,4	31,4	31,4	31,4	31,4	31,4	31,4	31,4	-	-	-	-	-	-	-	-	-	-	31,4
12	32,4	35,7	38,9	42,1	45,2	45,2	45,2	45,2	45,2	45,2	45,2	45,2	45,2	45,2	45,2	45,2	-	-	-	-	-	-	-	-	45,2
14	-	41,6	45,4	49,2	53,0	56,7	61,5	61,6	61,6	61,6	61,6	61,6	61,6	61,6	61,6	61,6	61,6	61,6	-	-	-	-	-	-	61,6
16	-	-	48,3	52,3	56,3	60,3	65,3	70,4	75,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	80,4	-	-	-	-	80,4
20	-	-	-	-	-	69,7	75,6	81,4	87,2	93,0	98,8	104,6	110,4	116,2	125,7	125,7	125,7	125,7	125,7	125,7	125,7	125,7	125,7	125,7	125,7
25	-	-	-	-	-	-	-	-	88,4	94,2	100,1	106,0	111,9	117,8	129,6	141,4	153,2	164,9	176,7	188,5	196,4	196,4	196,4	196,4	196,4
28	-	-	-	-	-	-	-	-	-	-	112,2	118,8	125,3	131,9	145,1	158,3	171,5	184,7	197,9	211,1	224,3	237,5	246,3	246,3	246,3
30	-	-	-	-	-	-	-	-	-	-	-	-	-	127,2	140,0	152,7	165,4	178,1	190,9	203,6	216,3	229,0	241,7	254,5	282,7
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	149,3	162,9	176,4	190,0	203,6	217,1	230,7	244,3	257,9	271,4	321,7

R-KER | R-CFS+RV200 WITH POST-INSTALLED REBARS

BASIC PERFORMANCE DATA

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 500 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	230	260	290	320	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	-	6,9	8,1	9,2	10,4	11,6	13,3	15,0	16,8	18,5	20,2	21,9	-	-	-	-	-	-	-	-	-	-	-	-	21,9
10	-	-	-	11,6	13,0	14,5	16,6	18,8	21,0	23,1	25,3	28,9	32,5	34,1	-	-	-	-	-	-	-	-	-	-	34,1
12	-	-	-	-	15,6	17,3	19,9	22,5	25,1	27,7	30,3	34,7	39,0	43,4	47,7	49,2	-	-	-	-	-	-	-	-	49,2
14	-	-	-	-	-	20,2	23,3	26,3	29,3	32,4	35,4	40,5	45,5	50,6	55,6	60,7	65,8	66,9	-	-	-	-	-	-	66,9
16	-	-	-	-	-	-	26,6	30,1	33,5	37,0	40,5	46,2	52,0	57,8	63,6	69,4	75,1	80,9	86,7	87,4	-	-	-	-	87,4
20	-	-	-	-	-	-	-	-	41,9	46,2	50,6	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	115,6	122,8	130,1	136,6	136,6	136,6
25	-	-	-	-	-	-	-	-	-	-	-	72,3	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	180,6	213,4
28	-	-	-	-	-	-	-	-	-	-	-	80,9	91,0	101,2	111,3	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	267,7
30	-	-	-	-	-	-	-	-	-	-	-	-	97,5	108,4	119,2	130,1	140,9	151,7	162,6	173,4	184,3	195,1	205,9	216,8	307,3
32	-	-	-	-	-	-	-	-	-	-	-	-	-	115,6	127,2	138,7	150,3	161,9	173,4	185,0	196,5	208,1	219,7	231,2	349,7

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 500 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	230	260	290	320	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	10,8	13,0	15,1	17,3	19,5	21,6	21,9	21,9	21,9	21,9	21,9	21,9	-	-	-	-	-	-	-	-	-	-	-	-	21,9
10	13,5	16,2	18,9	21,6	24,3	27,0	31,1	34,1	34,1	34,1	34,1	34,1	34,1	34,1	-	-	-	-	-	-	-	-	-	-	34,1
12	-	19,5	22,7	25,9	29,2	32,4	37,3	42,1	47,0	49,2	49,2	49,2	49,2	49,2	49,2	49,2	-	-	-	-	-	-	-	-	49,2
14	-	-	26,5	30,3	34,0	37,8	43,5	49,2	54,8	60,5	66,2	66,9	66,9	66,9	66,9	66,9	66,9	66,9	-	-	-	-	-	-	66,9
16	-	-	-	32,2	36,2	40,2	46,2	52,3	58,3	64,3	70,4	80,4	87,4	87,4	87,4	87,4	87,4	87,4	87,4	87,4	-	-	-	-	87,4
20	-	-	-	-	-	46,5	53,5	60,4	67,4	74,4	81,4	93,0	104,6	116,2	127,9	136,6	136,6	136,6	136,6	136,6	136,6	136,6	136,6	136,6	136,6
25	-	-	-	-	-	-	-	-	68,3	75,4	82,5	94,2	106,0	117,8	129,6	141,4	153,2	164,9	176,7	188,5	200,3	212,1	213,4	213,4	213,4
28	-	-	-	-	-	-	-	-	-	84,4	92,4	105,6	118,8	131,9	145,1	158,3	171,5	184,7	197,9	211,1	224,3	237,5	250,7	263,9	267,7
30	-	-	-	-	-	-	-	-	-	-	-	101,8	114,5	127,2	140,0	152,7	165,4	178,1	190,9	203,6	216,3	229,0	241,7	254,5	307,3
32	-	-	-	-	-	-	-	-	-	-	-	108,6	122,1	135,7	149,3	162,9	176,4	190,0	203,6	217,1	230,7	244,3	257,9	271,4	349,7

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 500 [N/mm²]

d_s [mm] \ l_0 [mm]	200	220	240	260	280	300	325	350	375	400	425	450	475	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	11,6	12,7	13,9	15,0	16,2	17,3	18,8	20,2	21,7	21,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21,9
10	-	15,9	17,3	18,8	20,2	21,7	23,5	25,3	27,1	28,9	30,7	32,5	34,1	34,1	-	-	-	-	-	-	-	-	-	-	34,1
12	-	-	-	22,5	24,3	26,0	28,2	30,3	32,5	34,7	36,9	39,0	41,2	43,4	47,7	49,2	-	-	-	-	-	-	-	-	49,2
14	-	-	-	-	-	30,3	32,9	35,4	37,9	40,5	43,0	45,5	48,1	50,6	55,6	60,7	65,8	66,9	-	-	-	-	-	-	66,9
16	-	-	-	-	-	-	-	40,5	43,4	46,2	49,1	52,0	54,9	57,8	63,6	69,4	75,1	80,9	86,7	87,4	-	-	-	-	87,4
20	-	-	-	-	-	-	-	-	-	-	-	65,0	68,6	72,3	79,5	86,7	93,9	101,2	108,4	115,6	122,8	130,1	136,6	136,6	136,6
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	180,6	213,4
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	267,7
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	140,9	151,7	162,6	173,4	184,3	195,1	205,9	216,8	307,3
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	161,9	173,4	185,0	196,5	208,1	219,7	231,2	349,7

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 500 [N/mm²]

d_s [mm] \ l_0 [mm]	200	220	240	260	280	300	325	350	375	400	425	450	475	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	21,6	21,9	21,9	21,9	21,9	21,9	21,9	21,9	21,9	21,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21,9
10	27,0	29,7	32,4	34,1	34,1	34,1	34,1	34,1	34,1	34,1	34,1	34,1	34,1	34,1	-	-	-	-	-	-	-	-	-	-	34,1
12	32,4	35,7	38,9	42,1	45,4	48,6	49,2	49,2	49,2	49,2	49,2	49,2	49,2	49,2	49,2	49,2	-	-	-	-	-	-	-	-	49,2
14	-	41,6	45,4	49,2	53,0	56,7	61,5	66,2	66,9	66,9	66,9	66,9	66,9	66,9	66,9	66,9	66,9	66,9	-	-	-	-	-	-	66,9
16	-	-	48,3	52,3	56,3	60,3	65,3	70,4	75,4	80,4	85,5	87,4	87,4	87,4	87,4	87,4	87,4	87,4	87,4	87,4	-	-	-	-	87,4
20	-	-	-	-	-	69,7	75,6	81,4	87,2	93,0	98,8	104,6	110,4	116,2	127,9	136,6	136,6	136,6	136,6	136,6	136,6	136,6	136,6	136,6	136,6
25	-	-	-	-	-	-	-	-	-	-	100,1	106,0	111,9	117,8	129,6	141,4	153,2	164,9	176,7	188,5	200,3	212,1	213,4	213,4	213,4
28	-	-	-	-	-	-	-	-	-	-	-	-	125,3	131,9	145,1	158,3	171,5	184,7	197,9	211,1	224,3	237,5	250,7	263,9	267,7
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	140,0	152,7	165,4	178,1	190,9	203,6	216,3	229,0	241,7	254,5	307,3
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	162,9	176,4	190,0	203,6	217,1	230,7	244,3	257,9	271,4	349,7

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 600 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	230	260	290	320	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	-	-	8,1	9,2	10,4	11,6	13,3	15,0	16,8	18,5	20,2	23,1	-	-	-	-	-	-	-	-	-	-	-	-	26,2
10	-	-	-	-	13,0	14,5	16,6	18,8	21,0	23,1	25,3	28,9	32,5	36,1	-	-	-	-	-	-	-	-	-	-	41,0
12	-	-	-	-	-	-	19,9	22,5	25,1	27,7	30,3	34,7	39,0	43,4	47,7	52,0	-	-	-	-	-	-	-	-	59,0
14	-	-	-	-	-	-	-	26,3	29,3	32,4	35,4	40,5	45,5	50,6	55,6	60,7	65,8	70,8	-	-	-	-	-	-	80,3
16	-	-	-	-	-	-	-	-	33,5	37,0	40,5	46,2	52,0	57,8	63,6	69,4	75,1	80,9	86,7	92,5	-	-	-	-	104,9
20	-	-	-	-	-	-	-	-	-	-	50,6	57,8	65,0	72,3	79,5	86,7	93,9	101,2	108,4	115,6	122,8	130,1	137,3	144,5	163,9
25	-	-	-	-	-	-	-	-	-	-	-	-	81,3	90,3	99,4	108,4	117,4	126,4	135,5	144,5	153,5	162,6	171,6	180,6	256,1
28	-	-	-	-	-	-	-	-	-	-	-	-	-	101,2	111,3	121,4	131,5	141,6	151,7	161,9	172,0	182,1	192,2	202,3	321,3
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	119,2	130,1	140,9	151,7	162,6	173,4	184,3	195,1	205,9	216,8	368,8
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	127,2	138,7	150,3	161,9	173,4	185,0	196,5	208,1	219,7	231,2	419,6

R-KER | R-CFS+RV200 WITH POST-INSTALLED REBARS

BASIC PERFORMANCE DATA

ANCHORAGES – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 600 [N/mm²]

d_s [mm] \ l_{bd} [mm]	100	120	140	160	180	200	230	260	290	320	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	10,8	13,0	15,1	17,3	19,5	21,6	24,9	26,2	26,2	26,2	26,2	26,2	-	-	-	-	-	-	-	-	-	-	-	-	26,2
10	13,5	16,2	18,9	21,6	24,3	27,0	31,1	35,1	39,2	41,0	41,0	41,0	41,0	41,0	-	-	-	-	-	-	-	-	-	-	41,0
12	-	19,5	22,7	25,9	29,2	32,4	37,3	42,1	47,0	51,9	56,7	59,0	59,0	59,0	59,0	59,0	-	-	-	-	-	-	-	-	59,0
14	-	-	26,5	30,3	34,0	37,8	43,5	49,2	54,8	60,5	66,2	75,6	80,3	80,3	80,3	80,3	80,3	80,3	-	-	-	-	-	-	80,3
16	-	-	-	32,2	36,2	40,2	46,2	52,3	58,3	64,3	70,4	80,4	90,5	100,5	104,9	104,9	104,9	104,9	104,9	104,9	-	-	-	-	104,9
20	-	-	-	-	-	-	53,5	60,4	67,4	74,4	81,4	93,0	104,6	116,2	127,9	139,5	151,1	162,7	163,9	163,9	163,9	163,9	163,9	163,9	163,9
25	-	-	-	-	-	-	-	-	-	-	82,5	94,2	106,0	117,8	129,6	141,4	153,2	164,9	176,7	188,5	200,3	212,1	223,8	235,6	256,1
28	-	-	-	-	-	-	-	-	-	-	-	105,6	118,8	131,9	145,1	158,3	171,5	184,7	197,9	211,1	224,3	237,5	250,7	263,9	321,3
30	-	-	-	-	-	-	-	-	-	-	-	-	114,5	127,2	140,0	152,7	165,4	178,1	190,9	203,6	216,3	229,0	241,7	254,5	368,8
32	-	-	-	-	-	-	-	-	-	-	-	-	-	135,7	149,3	162,9	176,4	190,0	203,6	217,1	230,7	244,3	257,9	271,4	419,6

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C20/25, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 600 [N/mm²]

d_s [mm] \ l_0 [mm]	200	220	240	260	280	300	325	350	375	400	425	450	475	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	-	12,7	13,9	15,0	16,2	17,3	18,8	20,2	21,7	23,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26,2
10	-	-	-	18,8	20,2	21,7	23,5	25,3	27,1	28,9	30,7	32,5	34,3	36,1	-	-	-	-	-	-	-	-	-	-	41,0
12	-	-	-	-	-	-	28,2	30,3	32,5	34,7	36,9	39,0	41,2	43,4	47,7	52,0	-	-	-	-	-	-	-	-	59,0
14	-	-	-	-	-	-	-	-	37,9	40,5	43,0	45,5	48,1	50,6	55,6	60,7	65,8	70,8	-	-	-	-	-	-	80,3
16	-	-	-	-	-	-	-	-	-	-	49,1	52,0	54,9	57,8	63,6	69,4	75,1	80,9	86,7	92,5	-	-	-	-	104,9
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	79,5	86,7	93,9	101,2	108,4	115,6	122,8	130,1	137,3	144,5	163,9
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	117,4	126,4	135,5	144,5	153,5	162,6	171,6	180,6	256,1
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	151,7	161,9	172,0	182,1	192,2	202,3	321,3
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	173,4	184,3	195,1	205,9	216,8	368,8
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	196,5	208,1	219,7	231,2	419,6

OVERLAP SPLICE – DESIGN RESISTANCE – CONCRETE C50/60, NOMINAL YIELD STRENGTH FOR TENSION - f_{yk} = 600 [N/mm²]

d_s [mm] \ l_0 [mm]	200	220	240	260	280	300	325	350	375	400	425	450	475	500	550	600	650	700	750	800	850	900	950	1000	Steel failure
8	21,6	23,8	25,9	26,2	26,2	26,2	26,2	26,2	26,2	26,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26,2
10	27,0	29,7	32,4	35,1	37,8	40,5	41,0	41,0	41,0	41,0	41,0	41,0	41,0	41,0	-	-	-	-	-	-	-	-	-	-	41,0
12	32,4	35,7	38,9	42,1	45,4	48,6	52,7	56,7	59,0	59,0	59,0	59,0	59,0	59,0	59,0	59,0	-	-	-	-	-	-	-	-	59,0
14	-	41,6	45,4	49,2	53,0	56,7	61,5	66,2	70,9	75,6	80,3	80,3	80,3	80,3	80,3	80,3	80,3	80,3	-	-	-	-	-	-	80,3
16	-	-	48,3	52,3	56,3	60,3	65,3	70,4	75,4	80,4	85,5	90,5	95,5	100,5	104,9	104,9	104,9	104,9	104,9	104,9	-	-	-	-	104,9
20	-	-	-	-	-	-	75,6	81,4	87,2	93,0	98,8	104,6	110,4	116,2	127,9	139,5	151,1	162,7	163,9	163,9	163,9	163,9	163,9	163,9	163,9
25	-	-	-	-	-	-	-	-	-	-	-	-	-	117,8	129,6	141,4	153,2	164,9	176,7	188,5	200,3	212,1	223,8	235,6	256,1
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	145,1	158,3	171,5	184,7	197,9	211,1	224,3	237,5	250,7	263,9	321,3
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	178,1	190,9	203,6	216,3	229,0	241,7	254,5	368,8
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	190,0	203,6	217,1	230,7	244,3	257,9	271,4	419,6

DESIGN PERFORMANCE DATA

POST INSTALLED REBARS

Size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32
TENSION LOAD												
Mean ultimate bond resistance C12/15	f_{bd}	[N/mm²]	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
Mean ultimate bond resistance C16/20	f_{bd}	[N/mm²]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Mean ultimate bond resistance C20/25	f_{bd}	[N/mm²]	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30
Mean ultimate bond resistance C25/30	f_{bd}	[N/mm²]	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.30	2.30
Mean ultimate bond resistance C30/37	f_{bd}	[N/mm²]	3.00	3.00	3.00	3.00	3.00	3.00	2.70	2.70	2.30	2.30
Mean ultimate bond resistance C35/45	f_{bd}	[N/mm²]	3.40	3.40	3.40	3.40	3.40	3.40	2.70	2.70	2.70	2.70
Mean ultimate bond resistance C40/50	f_{bd}	[N/mm²]	3.70	3.70	3.70	3.70	3.70	3.40	3.00	2.70	2.70	2.70
Mean ultimate bond resistance C45/50	f_{bd}	[N/mm²]	4.00	4.00	4.00	4.00	4.00	3.40	3.00	3.00	2.70	2.70
Mean ultimate bond resistance C50/60	f_{bd}	[N/mm²]	4.30	4.30	4.30	4.30	4.00	3.70	3.00	3.00	2.70	2.70

R-KEM-II | RM50 WITH THREADED RODS FOR MASONRY

Universal polyester (styrene free) resin - European Approval for 15 substrates

ETA | ETA12/0528 | CE

FEATURES AND BENEFITS

- The most convenient bonded anchor for general purpose use
- Approved for 15 substrates
- Quick, secure and simple installation
- Product with wide spectrum of use in the medium load capacity area
- Ideal for applications where mechanical anchors are not suitable
- Easy dosage thanks to patented self-opening system and use of manual or pneumatic gun
- Option of use standard manual silicone gun
- Suitable for multiple use. Partly used product can be reused after fitting new nozzle

APPLICATIONS

- Gates
- Window elements
- Canopies
- Sanitary appliances
- Railings
- Handrails
- Consoles
- Ladders
- Cable trays

BASE MATERIALS

Approved for use in:

- Hollow Brick
- Solid Brick
- Hollow Sand-lime Brick
- Solid Sand-lime Brick
- Hollow Lightweight Concrete Block
- Aerated Concrete Block

INSTALLATION GUIDE

R-KEM-II | RM50 WITH THREADED RODS FOR MASONRY

INSTALLATION GUIDE (cont.)

1. Drill hole to the required diameter and depth for stud size being used.
2. Solid substrates: Clean the drill hole thoroughly with brush and hand pump at least four times before installation.
3. Hollow substrates: insert mesh sleeve into the hole.
4. Insert cartridge into gun and attach nozzle.
5. Dispense to waste until even colour is obtained.
6. Solid substrates: Insert the mixer nozzle to the bottom of the drill hole and inject resin, slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
7. Hollow substrates: Insert the mixer nozzle to the bottom of the drill hole and inject resin, slowly withdrawing the nozzle as the hole is filled to 100% of its depth.
8. Immediately insert the stud, slowly and with slight twisting motion.
   Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.
9. Attach fixture and tighten the nut to the required torque.

PRODUCT INFORMATION

	Product Code	Resin	Description / Resin Type	Volume [ml]
	R-KEM-II-175	R-KEMII	Styrene Free Polyester Resin	175
	R-KEM-II-300			300
	R-KEM-II-410			410
	R-KEM-II-175-W	R-KEMII-W	Low Temperature (Winter) / Rapid Cure Styrene Free Polyester Resin	175
	R-KEM-II-300-W			300
	R-KEM-II-175-S	R-KEMII-S	High Temperature (Summer) / Slow Cure Styrene Free Polyester Resin	175
	R-KEM-II-300-S			300
	R-KEM-II-175-SET	R-KEMII	Set with 4 studs and plastic sleeves	175
	R-KEM-II-300-SET			300
	R-KEM-II-300-STONE		Stone colour Styrene Free Polyester Resin	
	R-KEM-II-410-STONE			410
	R-KEM-II-300-GREY		Grey colour Styrene Free Polyester Resin	300
	R-KEM-II-410-GREY			410
	R-CFS+RM50-4	RM50	Styrene Free Polyester Resin	300
	R-CFS+RM50S-4	RM50-S	High Temperature (Summer) / Slow Cure Styrene Free Polyester Resin	
	R-CFS+RM50W-4	RM50-W	Low Temperature (Winter) / Rapid Cure Styrene Free Polyester Resin	
	R-CFS+RM50-600-8	RM50	Styrene Free Polyester Resin	600

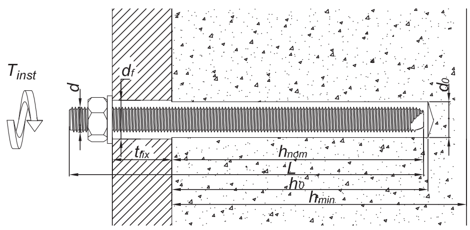
R-STUDS

Size	Product Code			Anchor		Fixture			
	Steel class 5.8	Steel class 8.8	Steel grade A4	Diameter	Length	Hole diameter	Max. thickness Solid substrates	Max. thickness Hollow substrates	
				d	L	d_f	t_{fix} Standard	t_{fix} Standard	t_{fix} Maximum
				[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-STUDS-08110	R-STUDS-08110-88	R-STUDS-08110-A4	8	110	9	20	50	20
	R-STUDS-08160	-	R-STUDS-08160-A4	8	160	9	70	100	70
M10	R-STUDS-10130	R-STUDS-10130-88	R-STUDS-10130-A4	10	130	12	33	33	-
	R-STUDS-10170	-	R-STUDS-10170-A4	10	170	12	73	73	33
	R-STUDS-10190	-	R-STUDS-10190-A4	10	190	12	93	93	53
M12	R-STUDS-12160	R-STUDS-12160-88	R-STUDS-12160-A4	12	160	14	50	60	20
	R-STUDS-12190	-	R-STUDS-12190-A4	12	190	14	80	90	50
	R-STUDS-12220	-	R-STUDS-12220-A4	12	220	14	110	120	80
	R-STUDS-12260	-	R-STUDS-12260-A4	12	260	14	150	160	120
	R-STUDS-12300	-	R-STUDS-12300-A4	12	300	14	190	200	160
M16	R-STUDS-16190	R-STUDS-16190-88	R-STUDS-16190-A4	16	190	18	66	86	-
	R-STUDS-16220	-	R-STUDS-16220-A4	16	220	18	96	116	-
	R-STUDS-16260	-	R-STUDS-16260-A4	16	260	18	136	156	-
	R-STUDS-16300	-	R-STUDS-16300-A4	16	300	18	176	196	-
	R-STUDS-16380	-	R-STUDS-16380-A4	16	380	18	256	276	-

INSTALLATION DATA

AERATED CONCRETE

Size			M8	M10	M12	M16
Thread diameter	d	[mm]	8	10	12	16
Hole diameter in substrate	d_0	[mm]	10	12	14	18
Installation torque	T_{inst}	[Nm]	3	4	6	10
Min. hole depth in substrate	h_0	[mm]	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$	$h_{nom} + 5$
Min. installation depth	h_{nom}	[mm]	80	85	95	105
Min. spacing	s_{min}	[mm]	50	50	50	54
Min. edge distance	c_{min}	[mm]	50	50	50	54



R-KEM-II | RM50 WITH THREADED RODS FOR MASONRY

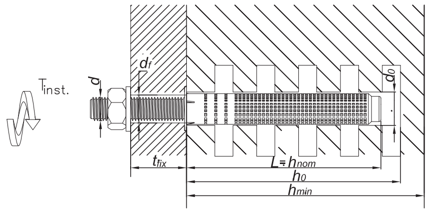
INSTALLATION DATA (cont.)

CERAMIC SOLID SUBSTRATES

Size			M8	M10	M12	M16
Thread diameter	d	[mm]	8	10	12	16
Hole diameter in substrate	d_0	[mm]	10	12	14	18
Installation torque	T_{inst}	[Nm]	5	8	10	15
Min. hole depth in substrate	h_0	[mm]	h_{nom} + 5	h_{nom} + 5	h_{nom} + 5	h_{nom} + 5
Min. installation depth	h_{nom}	[mm]	80	85	95	105
Min. spacing	s_{min}	[mm]	50	50	50	54
Min. edge distance	c_{min}	[mm]	50	50	50	54

HOLLOW SUBSTRATES

Size			M8		M10		M12		M16
Plastic mesh sleeve size	dxl	[mm]	12x50	12x80	16x85	16x130	16x85	16x130	20x85
Thread diameter	d	[mm]	8	8	10	10	12	12	16
Hole diameter in substrate	d_0	[mm]	12	12	16	16	16	16	20
Installation torque	T_{inst}	[Nm]	3	3	4	4	6	6	10
Min. hole depth in substrate	h_0	[mm]	h_{nom} + 5	h_{nom} + 5	h_{nom} + 5	h_{nom} + 5	h_{nom} + 5	h_{nom} + 5	h_{nom} + 5
Min. installation depth	h_{nom}	[mm]	50	80	85	125	85	125	85
Min. spacing	s_{min}	[mm]	100	100	100	100	100	100	120
Min. edge distance	c_{min}	[mm]	100	100	100	100	100	100	120



Minimum working and curing time

Resin temperature	Concrete temperature	Working time [min]			Curing time* [min]		
[°C]	[°C]	R-KEMII-S	R-KEMII	R-KEMII-W	R-KEMII-S	R-KEMII	R-KEMII-W
5	-20	-	-	45	-	-	24 h
5	-15	-	-	30	-	-	18 h
5	-10	-	-	20	-	-	8 h
5	-5	3 h	70	11	24 h	8 h	5 h
5	0	2 h	45	7	18 h	4 h	2 h
5	5	1 h	25	5	12 h	2 h	1 h
10	10	45	15	2	8 h	1.5 h	45
15	15	25	9	1.5	6 h	1 h	30
20	20	15	5	1	4 h	45	15
25	30	7	2	-	1.5 h	30	-
25	35	6	-	-	1 h	-	-
25	40	5	-	-	45	-	-

MECHANICAL PROPERTIES

Size			M8	M10	M12	M16
R-STUDS Metric Threaded Rods - Steel Class 5.8						
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	500	500	500	500
Nominal yield strength - tension	f_{yk}	[N/mm²]	400	400	400	400
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	19	37	65	166
Design bending resistance	M	[Nm]	15	30	52	133
Allowable bending resistance	M_{rec}	[Nm]	11	21	37	95
R-STUDS Metric Threaded Rods - Steel Class 8.8						
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	800	800	800	800
Nominal yield strength - tension	f_{yk}	[N/mm²]	640	640	640	640
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	30	60	105	266
Design bending resistance	M	[Nm]	24	48	84	213
Allowable bending resistance	M_{rec}	[Nm]	17	34	60	152
R-STUDS Metric Threaded Rods - A4						
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	700	700	700	700
Nominal yield strength - tension	f_{yk}	[N/mm²]	350	350	350	350
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	233
Design bending resistance	M	[Nm]	17	34	59	149
Allowable bending resistance	M_{rec}	[Nm]	12	24	42	107

R-KEM-II | RM50 WITH THREADED RODS FOR MASONRY

BASIC PERFORMANCE DATA

R-STUDS LIGHT

Performance data for single anchor without influence of edge distance and spacing

Size		M8		M10		M12		M16
Substrate type	-	Hollow substrates						
Plastic mesh sleeve size	[mm]	12x50	12x80	16x85	16x130	16x85	16x130	20x85
MEAN ULTIMATE LOAD								
TENSION AND SHEAR LOAD $F_{Ru,m}$								
Silicate hollow block min 12MPa (eg KS Ratio Block 8 DF)	[kN]	3.42	3.50	3.73	5.11	4.16	4.48	4.24
Perforated ceramic blocks min 12MPa (eg Proton Hlz 12/0.9 DF)	[kN]	3.21	3.54	3.87	4.03	3.97	4.16	3.69
Perforated ceramic blocks min 15MPa (eg Wienerberger Porotherm)	[kN]	2.04	2.84	3.07	3.68	3.74	3.99	3.51
Perforated ceramic blocks min 10MPa (eg Leiter Thermopor)	[kN]	2.08	2.98	3.19	3.78	3.68	4.03	3.77
Perforated ceramic blocks min 15MPa (eg MEGA MAX)	[kN]	2.86	3.43	3.74	3.59	3.71	3.94	3.80
Perforated ceramic blocks min 6.0MPa (eg LS Tableau Mono Rect)	[kN]	1.24	1.25	2.49	2.74	2.82	2.78	2.14
Perforated ceramic blocks min 6.0MPa (eg LS Tableau Rect)	[kN]	1.73	1.60	2.37	2.51	2.41	2.68	2.10
Perforated ceramic blocks min 6.0MPa (eg LS Monomur)	[kN]	1.30	1.39	1.99	2.06	2.05	2.12	2.05
Perforated ceramic blocks min 6MPa (eg SM BGV Thermo)	[kN]	1.45	1.45	2.22	2.17	2.19	2.24	2.25
Perforated ceramic blocks min 6.0MPa (eg SM BGV Thermo Plus)	[kN]	1.51	1.60	1.39	1.45	1.86	2.07	1.75
Lightweight concrete hollow block min 2.0MPa	[kN]	1.73	2.38	3.52	3.00	3.93	3.75	3.92
Substrate type	-	Hollow substrates						
Plastic mesh sleeve size	[mm]	12x50	12x80	16x85	16x130	16x85	16x130	20x85
MEAN ULTIMATE LOAD								
TENSION AND SHEAR LOAD F_{Rk}								
Silicate hollow block min 12MPa (eg KS Ratio Block 8 DF)	[kN]	2.50	2.50	2.50	3.50	3.00	3.00	3.00
Perforated ceramic blocks min 12MPa (eg Proton Hlz 12/0.9 DF)	[kN]	2.00	2.50	2.50	2.50	2.50	2.50	2.50
Perforated ceramic blocks min 15MPa (eg Wienerberger Porotherm)	[kN]	1.50	2.00	2.00	2.50	2.50	2.50	2.50
Perforated ceramic blocks min 10MPa (eg Leiter Thermopor)	[kN]	1.50	2.00	2.00	2.50	2.50	2.50	2.50
Perforated ceramic blocks min 15MPa (eg MEGA MAX)	[kN]	2.00	2.50	2.50	2.50	2.50	2.50	2.50
Perforated ceramic blocks min 6.0MPa (eg LS Tableau Mono Rect)	[kN]	0.90	0.90	1.50	2.00	2.00	2.00	1.20
Perforated ceramic blocks min 6.0MPa (eg LS Tableau Rect)	[kN]	0.90	1.20	1.50	1.50	1.50	2.00	1.50
Perforated ceramic blocks min 6.0MPa (eg LS Monomur)	[kN]	0.90	0.90	1.20	1.50	1.50	1.50	1.50
Perforated ceramic blocks min 6MPa (eg SM BGV Thermo)	[kN]	0.90	0.90	1.50	1.50	1.50	1.50	1.50
Perforated ceramic blocks min 6.0MPa (eg SM BGV Thermo Plus)	[kN]	0.90	1.20	0.90	0.90	1.20	1.50	1.20
Lightweight concrete hollow block min 2.0MPa	[kN]	1.20	1.50	2.50	2.00	2.50	2.50	2.50
DESIGN LOAD								
TENSION AND SHEAR LOAD F_{Rd}								
Silicate hollow block min 12MPa (eg KS Ratio Block 8 DF)	[kN]	1.00	1.00	1.00	1.40	1.20	1.20	1.20
Perforated ceramic blocks min 12MPa (eg Proton Hlz 12/0.9 DF)	[kN]	0.88	1.00	1.20	1.40	1.40	1.60	1.60
Perforated ceramic blocks min 15MPa (eg Wienerberger Porotherm)	[kN]	0.60	0.80	1.00	1.00	1.40	1.40	1.00
Perforated ceramic blocks min 10MPa (eg Leiter Thermopor)	[kN]	0.60	0.80	0.80	1.00	1.00	1.40	1.20
Perforated ceramic blocks min 15MPa (eg MEGA MAX)	[kN]	0.80	1.00	1.40	1.40	1.60	1.60	1.60
Perforated ceramic blocks min 6.0MPa (eg LS Tableau Mono Rect)	[kN]	0.36	0.36	0.80	0.80	0.80	0.80	0.60
Perforated ceramic blocks min 6.0MPa (eg LS Tableau Rect)	[kN]	0.48	0.48	0.60	0.60	0.80	0.80	0.60
Perforated ceramic blocks min 6.0MPa (eg LS Monomur)	[kN]	0.36	0.36	0.60	0.60	0.60	0.60	0.60
Perforated ceramic blocks min 6MPa (eg SM BGV Thermo)	[kN]	0.36	0.36	0.60	0.60	0.60	0.60	0.60
Perforated ceramic blocks min 6.0MPa (eg SM BGV Thermo Plus)	[kN]	0.48	0.48	0.48	0.48	0.48	0.60	0.48
Lightweight concrete hollow block min 2.0MPa	[kN]	0.48	0.60	1.00	1.00	1.00	1.40	1.40
RECOMMENDED LOAD								
TENSION AND SHEAR LOAD F_{rec}								
Silicate hollow block min 12MPa (eg KS Ratio Block 8 DF)	[kN]	0.71	0.71	0.71	1.00	0.86	0.86	0.86
Perforated ceramic blocks min 12MPa (eg Proton Hlz 12/0.9 DF)	[kN]	0.63	0.71	0.86	1.00	1.00	1.14	1.14
Perforated ceramic blocks min 15MPa (eg Wienerberger Porotherm)	[kN]	0.43	0.57	0.71	0.71	1.00	1.00	0.71
Perforated ceramic blocks min 10MPa (eg Leiter Thermopor)	[kN]	0.43	0.57	0.57	0.71	0.71	1.00	0.86
Perforated ceramic blocks min 15MPa (eg MEGA MAX)	[kN]	0.57	0.71	1.00	1.00	1.14	1.14	1.14
Perforated ceramic blocks min 6.0MPa (eg LS Tableau Mono Rect)	[kN]	0.26	0.26	0.57	0.57	0.57	0.57	0.43
Perforated ceramic blocks min 6.0MPa (eg LS Tableau Rect)	[kN]	0.34	0.34	0.43	0.43	0.57	0.57	0.43
Perforated ceramic blocks min 6.0MPa (eg LS Monomur)	[kN]	0.26	0.26	0.43	0.43	0.43	0.43	0.43
Perforated ceramic blocks min 6MPa (eg SM BGV Thermo)	[kN]	0.26	0.26	0.43	0.43	0.43	0.43	0.43
Perforated ceramic blocks min 6.0MPa (eg SM BGV Thermo Plus)	[kN]	0.34	0.34	0.34	0.34	0.34	0.43	0.34
Lightweight concrete hollow block min 2.0MPa	[kN]	0.34	0.43	0.71	0.71	0.71	1.00	1.00

R-KEM-II | RM50 WITH THREADED RODS FOR MASONRY

BASIC PERFORMANCE DATA

R-STUDS LIGHT

Performance data for single anchor without influence of edge distance and spacing

Size		M8	M10	M12	M16
Substrate type	-	Solid substrates			
Plastic mesh sleeve size	-	-	-	-	-
MEAN ULTIMATE LOAD					
TENSION LOAD $N_{Ru,m}$					
Solid clay brick min 20MPa (eg Mz20/2.0)	[kN]	8.78	10.9	11.3	11.5
Autoclaved aerated concrete block min 6.0MPa (AAC7)	[kN]	2.65	3.24	4.11	4.68
Solid silicate brick min 20MPa (eg KS NF 20/2.0)	[kN]	7.54	8.00	8.30	8.50
SHEAR LOAD $V_{Ru,m}$					
Solid clay brick min 20MPa (eg Mz20/2.0)	[kN]	5.79	8.35	11.6	11.5
Autoclaved aerated concrete block min 6.0MPa (AAC7)	[kN]	2.43	3.41	4.36	4.48
Solid silicate brick min 20MPa (eg KS NF 20/2.0)	[kN]	5.86	8.11	7.91	8.23
CHARACTERISTIC LOAD					
TENSION LOAD N_{Rk}					
Solid clay brick min 20MPa (eg Mz20/2.0)	[kN]	6.00	7.00	7.00	7.00
Autoclaved aerated concrete block min 6.0MPa (AAC7)	[kN]	1.50	2.00	2.50	3.00
Solid silicate brick min 20MPa (eg KS NF 20/2.0)	[kN]	5.00	5.00	5.00	5.00
SHEAR LOAD V_{Rk}					
Solid clay brick min 20MPa (eg Mz20/2.0)	[kN]	3.50	5.00	7.00	7.00
Autoclaved aerated concrete block min 6.0MPa (AAC7)	[kN]	1.50	2.00	2.50	2.50
Solid silicate brick min 20MPa (eg KS NF 20/2.0)	[kN]	3.50	5.00	5.00	5.00
DESIGN LOAD					
TENSION LOAD N_{Rd}					
Solid clay brick min 20MPa (eg Mz20/2.0)	[kN]	2.40	2.80	2.80	2.80
Autoclaved aerated concrete block min 6.0MPa (AAC7)	[kN]	0.75	1.00	1.25	1.50
Solid silicate brick min 20MPa (eg KS NF 20/2.0)	[kN]	2.00	2.00	2.00	2.00
SHEAR LOAD V_{Rd}					
Solid clay brick min 20MPa (eg Mz20/2.0)	[kN]	1.40	2.00	2.80	2.80
Autoclaved aerated concrete block min 6.0MPa (AAC7)	[kN]	0.75	1.00	1.25	1.25
Solid silicate brick min 20MPa (eg KS NF 20/2.0)	[kN]	1.40	2.00	2.00	2.00
RECOMMENDED LOAD					
TENSION LOAD N_{rec}					
Solid clay brick min 20MPa (eg Mz20/2.0)	[kN]	1.71	2.00	2.00	2.00
Autoclaved aerated concrete block min 6.0MPa (AAC7)	[kN]	0.54	0.71	0.89	1.07
Solid silicate brick min 20MPa (eg KS NF 20/2.0)	[kN]	1.43	1.43	1.43	1.43
SHEAR LOAD V_{rec}					
Solid clay brick min 20MPa (eg Mz20/2.0)	[kN]	1.00	1.43	2.00	2.00
Autoclaved aerated concrete block min 6.0MPa (AAC7)	[kN]	0.54	0.71	0.89	0.89
Solid silicate brick min 20MPa (eg KS NF 20/2.0)	[kN]	1.00	1.43	1.43	1.43

R-STUDS

METRIC THREADED RODS
-ZINC PLATED CARBON STEEL 5.8 GRADE

Threaded rod with hexagonal head made of zinc plated carbon steel 5.8 grade for use with bonded anchors.

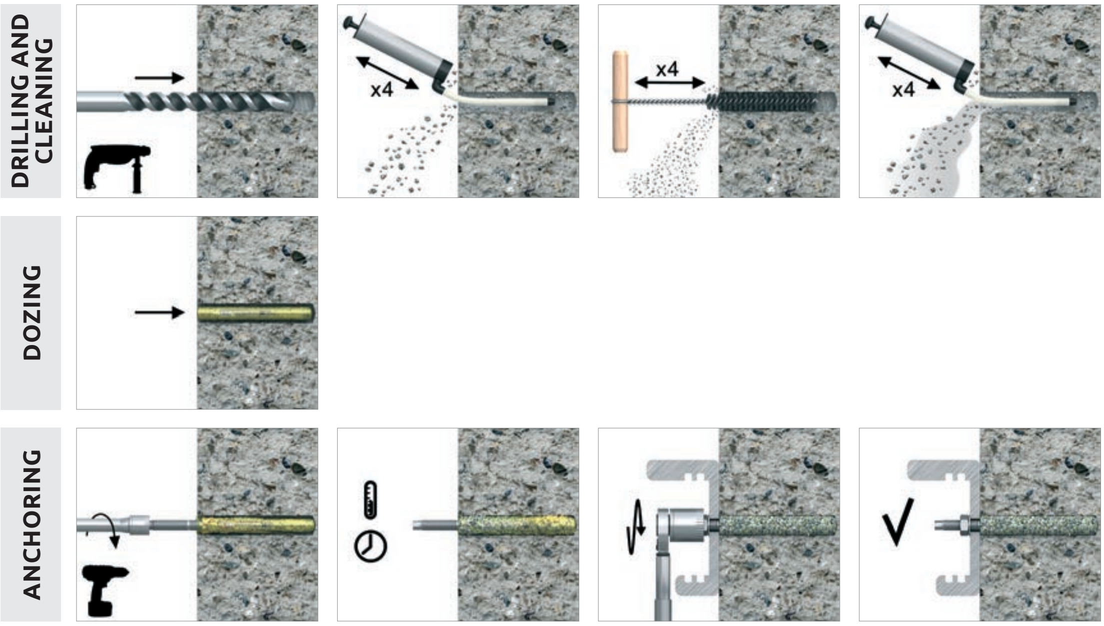
FEATURES AND BENEFITS

- High-performance bonded anchors offer high load-bearing capacities
- Suitable for use with special mesh sleeves in hollow substrates.
- Can be post-installed through fixture in some cases. (Consult technical advisory service)
- Hexagonal head for convenient use with torque wrench
- Possibility of removal when used with internally threaded socket

APPLICATIONS

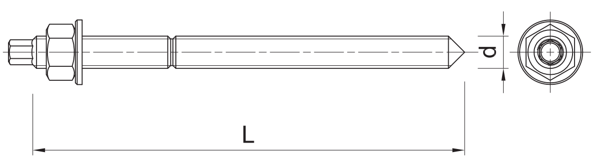
- Balustrading & handrails
- Supports
- Barriers
- Racking systems
- Consoles
- Railings
- Window elements
- Scaffolding
- Heavy machinery
- Facades
- Copy-eco systems
- Cable trays
- Curtain walling
- Formwork support systems
- Lamps

INSTALLATION GUIDE



1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with hand pump and hole brush
3. If required, insert the mesh sleeve into position
4. Fill hole with the required resin to the recommended fill level. (Follow the relevant instructions for the resin product)
5. Insert the threaded stud slowly and with a slight twisting motion, until the required embedment depth is reached
6. Leave undisturbed until curing time of resin has elapsed
7. Attach fixture and tighten the nut to the required installation torque

PRODUCT INFORMATION



R-STUDS

METRIC THREADED RODS
-ZINC PLATED CARBON STEEL 5.8 GRADE

PRODUCT INFORMATION

Size	Product Code	Anchor		Fixture						
		Diameter	Length	Max. thickness t_{fix} for:			Hole diameter	Max. thickness	Max. thickness t_{fix} for:	
		d	L	$h_{nom, min}$	$h_{nom,std}$	$h_{nom, max}$	d_f	t_{fix}	$h_{nom, min}$	$h_{nom, max}$
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-STUDS-08110	8	110	40	20	-	9	20	40	-
	R-STUDS-08160	8	160	90	70	50	9	70	90	-
M10	R-STUDS-10130	10	130	48	28	-	12	33	58	-
	R-STUDS-10170	10	170	88	68	38	12	73	98	-
	R-STUDS-10190	10	190	108	88	58	12	93	118	-
M12	R-STUDS-12160	12	160	65	35	-	14	50	85	-
	R-STUDS-12190	12	190	95	65	30	14	80	115	-
	R-STUDS-12220	12	220	125	95	60	14	110	145	-
	R-STUDS-12260	12	260	165	135	100	14	150	185	-
	R-STUDS-12300	12	300	205	175	140	14	190	225	45
M16	R-STUDS-16190	16	190	71	46	-	18	66	111	-
	R-STUDS-16220	16	220	101	76	11	18	96	141	-
	R-STUDS-16260	16	260	141	116	51	18	136	181	-
	R-STUDS-16300	16	300	181	156	91	18	176	221	-
	R-STUDS-16380	16	380	261	236	171	18	256	301	41
M20	R-STUDS-20260	20	260	117	67	-	22	-	157	-
	R-STUDS-20300	20	300	157	107	37	22	-	197	-
	R-STUDS-20350	20	350	207	157	87	22	-	247	-
M24	R-STUDS-24300	24	300	132	62	-	26	-	176	-
M30	R-STUDS-30380	30	380	181	106	-	32	-	226	-

R-STUDS

METRIC THREADED RODS
-ZINC PLATED CARBON STEEL 5.8 GRADE, FLAT HEAD

Threaded rod with flat head made of carbon steel 5.8 grade for use with bonded anchors.

FEATURES AND BENEFITS

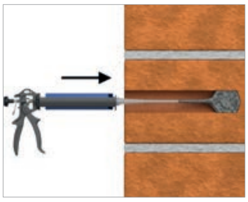
- High-performance bonded anchors offer high load-bearing capacities
- Suitable for use with special mesh sleeves in hollow substrates.
- Flat head for quick manual installation without a setting tool
- Can be post-installed through fixture in some cases. (Consult technical advisory service)
- Possibility of removal when used with internally threaded socket

APPLICATIONS

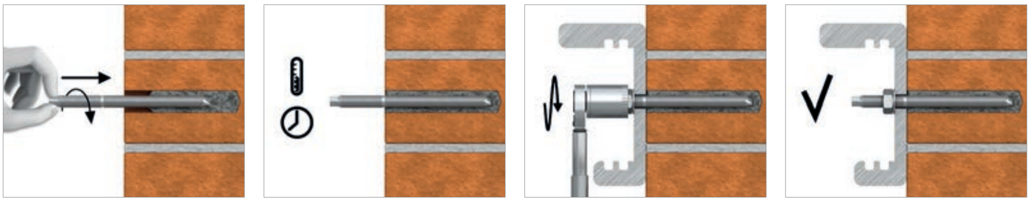
- Fastening with bonded anchors
- Supports
- Barriers
- Racking systems
- Consoles
- Railings
- Window elements
- Scaffolding
- Heavy machinery

INSTALLATION GUIDE

DOZING



ANCHORING



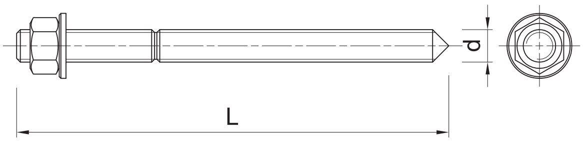
R-STUDS

METRIC THREADED RODS
-ZINC PLATED CARBON STEEL 5.8 GRADE, FLAT HEAD

INSTALLATION GUIDE (cont.)

1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with hand pump and hole brush
3. If required, insert the mesh sleeve into position
4. Fill hole with the required resin to the recommended fill level. (Follow the relevant instructions for the resin product)
5. Insert the threaded stud slowly and with a slight twisting motion, until the required embedment depth is reached
6. Leave undisturbed until curing time of resin has elapsed
7. Attach fixture and tighten the nut to the required installation torque

PRODUCT INFORMATION



Size	Product Code	Anchor		Fixture				
		Diameter	Length	Max. thickness t_{fix} for:			Hole diameter	Max. thickness
		d	L	$h_{nom, min}$	$h_{nom,std}$	$h_{nom, max}$	d_f	t_{fix}
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-STUDS-08110-FL	8	110	40	20	0	9	20
	R-STUDS-08160-FL	8	160	90	70	50	9	70
M10	R-STUDS-10130-FL	10	130	48	28	0	12	33
	R-STUDS-10170-FL	10	170	88	68	38	12	73
M12	R-STUDS-12160-FL	12	160	65	35	0	14	50
	R-STUDS-12190-FL	12	190	95	65	30	14	80
	R-STUDS-12220-FL	12	220	125	95	60	14	110
	R-STUDS-12260-FL	12	260	165	135	100	14	150
M16	R-STUDS-16190-FL	16	190	71	46	0	18	66
	R-STUDS-16220-FL	16	220	101	76	11	18	96
	R-STUDS-16260-FL	16	260	141	116	51	18	136
M20	R-STUDS-20260-FL	20	260	117	67	0	22	-
	R-STUDS-20300-FL	20	300	157	107	37	22	-
	R-STUDS-20350-FL	20	350	207	157	87	22	-
M24	R-STUDS-24300-FL	24	300	132	62	0	26	-
M30	R-STUDS-30380-FL	30	380	181	76	0	32	-

R-STUDS

METRIC THREADED RODS
-ZINC PLATED CARBON STEEL 8.8 GRADE

Threaded rod made of carbon steel 8.8 grade for use with bonded anchors

FEATURES AND BENEFITS

- Threaded rod made of carbon steel class 8.8 is suitable for outdoor use and in damp conditions
- Can be post-installed through fixture in some cases. (Consult technical advisory service)
- Hexagonal head for convenient use with torque wrench

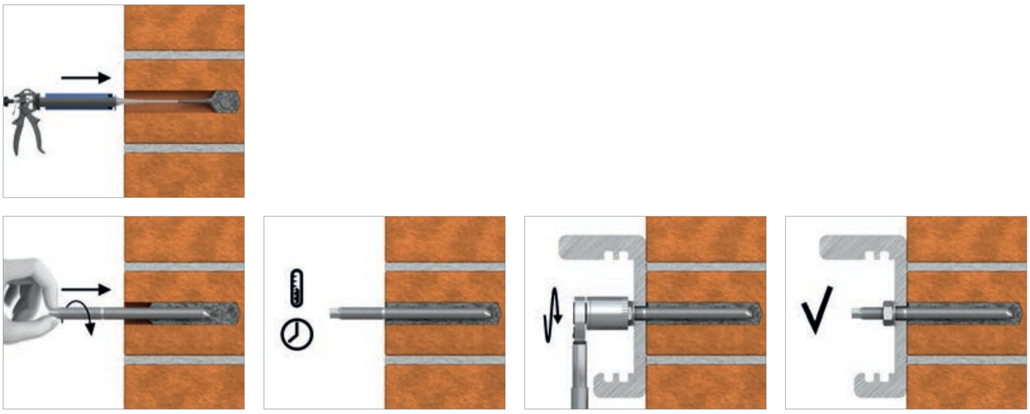
APPLICATIONS

- Fastening with bonded anchors
- Balustrading & handrails
- Barriers
- Cable trays
- Consoles
- Curtain walling
- Formwork support systems
- Heavy machinery
- Lamps
- Safety barriers
- Road Signs
- Railings
- Public seating

INSTALLATION GUIDE

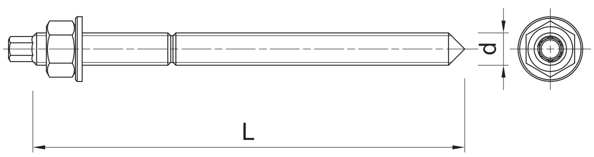
DOZING

ANCHORING



1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with hand pump and hole brush
3. If required, insert the mesh sleeve into position
4. Fill hole with the required resin to the recommended fill level. (Follow the relevant instructions for the resin product)
5. Insert the threaded stud slowly and with a slight twisting motion, until the required embedment depth is reached
6. Leave undisturbed until curing time of resin has elapsed
7. Attach fixture and tighten the nut to the required installation torque

PRODUCT INFORMATION



Size	Product Code	Anchor		Fixture						
		Diameter	Length	Max. thickness t_{fix} for:			Hole diameter	Max. thickness	Max. thickness t_{fix} for:	
		d	L	$h_{nom, min}$	$h_{nom,std}$	$h_{nom, max}$	d_f	t_{fix}	$h_{nom, min}$	$h_{nom, max}$
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-STUDS-08110-88	8	110	40	20	-	9	20	40	-
M10	R-STUDS-10130-88	10	130	48	28	-	12	33	48	-
M12	R-STUDS-12160-88	12	160	65	35	-	14	50	85	-
M16	R-STUDS-16190-88	16	190	71	46	-	18	66	111	-
	R-STUDS-16220-88	16	220	101	76	-	18	96	141	-
M20	R-STUDS-20260-88	20	260	117	67	-	22	-	157	-
M24	R-STUDS-24300-88	24	300	132	62	-	26	-	176	-
M30	R-STUDS-30380-88	30	380	181	76	-	32	-	226	-

R-STUDS

METRIC THREADED RODS
-ZINC PLATED CARBON STEEL 8.8 GRADE, FLAT HEAD

Threaded rod made of carbon steel 8.8 grade for use with bonded anchors

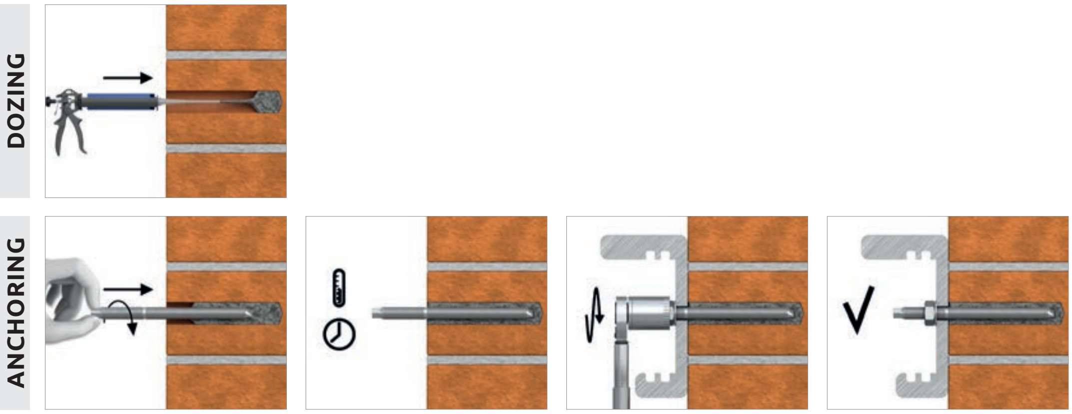
FEATURES AND BENEFITS

- Threaded rod made of carbon steel class 8.8 is suitable for outdoor use and in damp conditions
- Possibility of removal when used with internally threaded socket
- Can be post-installed through fixture in some cases. (Consult technical advisory service)
- No screwdriver needed for installation

APPLICATIONS

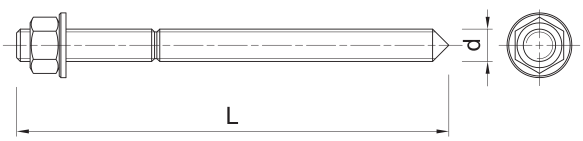
- Fastening with bonded anchors
- Balustrading & handrails
- Barriers
- Cable trays
- Consoles
- Curtain walling
- Formwork support systems
- Heavy machinery
- Lamps
- Safety barriers
- Road Signs
- Railings
- Public seating
- Copy-eco systems

INSTALLATION GUIDE



1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with hand pump and hole brush
3. If required, insert the mesh sleeve into position
4. Fill hole with the required resin to the recommended fill level. (Follow the relevant instructions for the resin product)
5. Insert the threaded stud slowly and with a slight twisting motion, until the required embedment depth is reached
6. Leave undisturbed until curing time of resin has elapsed
7. Attach fixture and tighten the nut to the required installation torque

PRODUCT INFORMATION



Size	Product Code	Anchor		Fixture				
		Diameter	Length	Max. thickness t_{fix} for:			Hole diameter	Max. thickness
		d	L	$h_{nom, min}$	$h_{nom,std}$	$h_{nom, max}$	d_f	t_{fix}
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-STUDS-08110-88-FL	8	110	40	20	0	9	20
M10	R-STUDS-10130-88-FL	10	130	48	28	0	12	33
M12	R-STUDS-12160-88-FL	12	160	65	35	0	14	50
M16	R-STUDS-16190-88-FL	16	190	71	46	0	18	66
	R-STUDS-16220-88-FL	16	220	101	76	11	18	96
M20	R-STUDS-20260-88-FL	20	260	117	67	0	22	-
M24	R-STUDS-24300-88-FL	24	300	132	62	0	26	-
M30	R-STUDS-30380-88-FL	30	380	181	76	0	32	-

R-STUDS

METRIC THREADED RODS - STEEL CLASS 5.8 HOT DIP GALVANIZED

Threaded rod for outdoor applications increased corrosion resistance due to hot dip zinc external protection layer

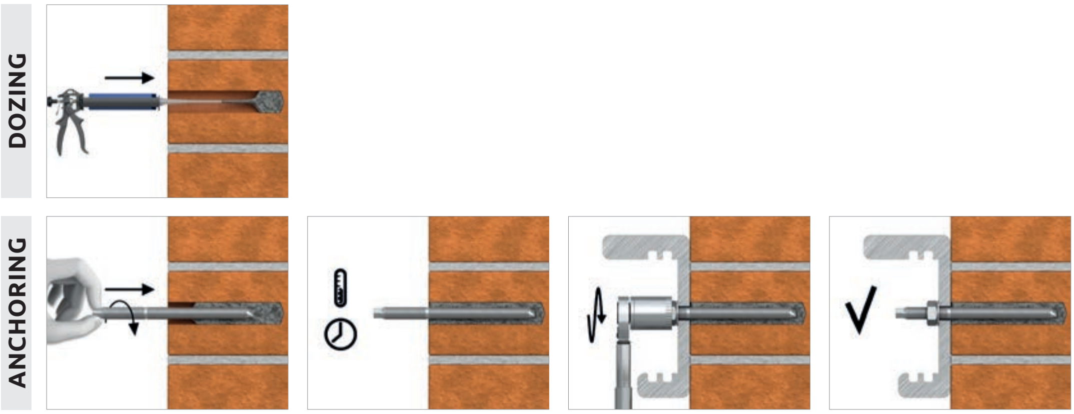
FEATURES AND BENEFITS

- Threaded rod made of hot dip galvanized steel is suitable for outdoor use and in damp conditions
- Can be post-installed through fixture in some cases. (Consult technical advisory service)
- Hexagonal head for convenient use with torque wrench

APPLICATIONS

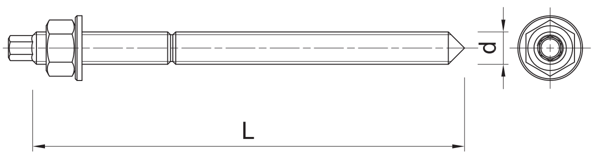
- Fastening with bonded anchors
- Balustrading & handrails
- Barriers
- Cable trays
- Consoles
- Curtain walling
- Formwork support systems
- Heavy machinery
- Lamps
- Safety barriers
- Road Signs
- Railings
- Public seating

INSTALLATION GUIDE



1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with hand pump and hole brush
3. If required, insert the mesh sleeve into position
4. Fill hole with the required resin to the recommended fill level. (Follow the relevant instructions for the resin product)
5. Insert the threaded stud slowly and with a slight twisting motion, until the required embedment depth is reached
6. Leave undisturbed until curing time of resin has elapsed
7. Attach fixture and tighten the nut to the required installation torque

PRODUCT INFORMATION



Size	Product Code	Anchor		Fixture						
		Diameter	Length	Max. thickness t_{fix} for:			Hole diameter	Max. thickness	Max. thickness t_{fix} for:	
		d	L	$h_{nom, min}$	$h_{nom,std}$	$h_{nom, max}$	d_f	t_{fix}	$h_{nom, min}$	$h_{nom, max}$
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-STUDS-08110-HD	8	110	40	20	-	9	20	40	-
M10	R-STUDS-10130-HD	10	130	48	28	-	12	33	48	-
M12	R-STUDS-12160-HD	12	160	65	35	-	14	50	85	-
M16	R-STUDS-16190-HD	16	190	71	46	-	18	66	111	-
M20	R-STUDS-20260-HD	20	260	117	67	-	22	-	157	-
M24	R-STUDS-24300-HD	24	300	132	62	-	26	-	176	-
M30	R-STUDS-30380-HD	30	380	181	76	-	32	-	226	-

R-STUDS

METRIC THREADED RODS - STEEL CLASS 8.8 HOT DIP GALVANIZED

Threaded rod for outdoor applications increased corrosion resistance due to hot dip zinc external protection layer

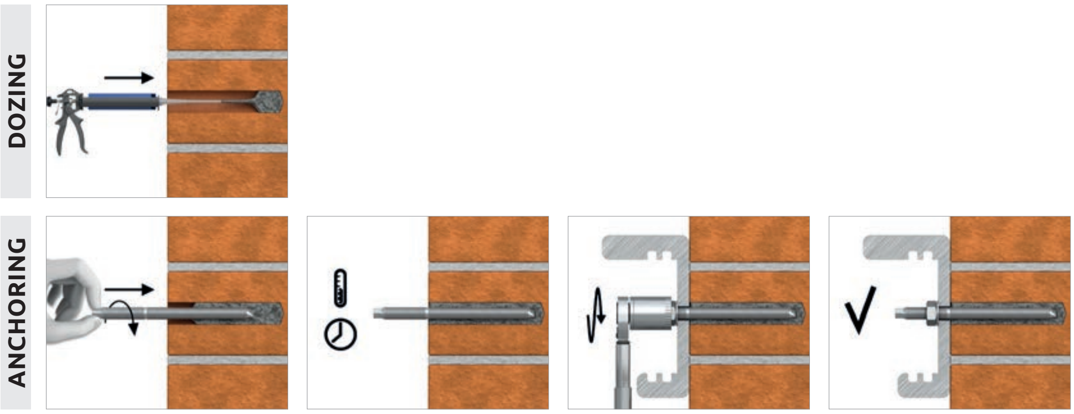
FEATURES AND BENEFITS

- Threaded rod made of hot dip galvanized steel is suitable for outdoor use and in damp conditions
- Can be post-installed through fixture in some cases. (Consult technical advisory service)
- Hexagonal head for convenient use with torque wrench

APPLICATIONS

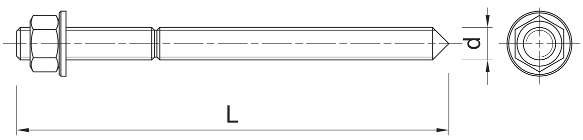
- Fastening with bonded anchors
- Balustrading & handrails
- Barriers
- Cable trays
- Consoles
- Curtain walling
- Formwork support systems
- Heavy machinery
- Lamps
- Safety barriers
- Road Signs
- Railings
- Public seating

INSTALLATION GUIDE



1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with hand pump and hole brush
3. If required, insert the mesh sleeve into position
4. Fill hole with the required resin to the recommended fill level. (Follow the relevant instructions for the resin product)
5. Insert the threaded stud slowly and with a slight twisting motion, until the required embedment depth is reached
6. Leave undisturbed until curing time of resin has elapsed
7. Attach fixture and tighten the nut to the required installation torque

PRODUCT INFORMATION



Size	Product Code	Anchor		Fixture						
		Diameter	Length	Max. thickness t_{fix} for:			Hole diameter	Max. thickness	Max. thickness t_{fix} for:	
		d	L	$h_{nom, min}$	$h_{nom,std}$	$h_{nom, max}$	d_f	t_{fix}	$h_{nom, min}$	$h_{nom, max}$
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-STUDS-08110-88HD	8	110	40	20	-	9	20	40	-
M10	R-STUDS-10130-88HD	10	130	48	28	-	12	33	48	-
M12	R-STUDS-12160-88HD	12	160	65	35	-	14	50	85	-
M16	R-STUDS-16190-88HD	16	190	71	46	-	18	66	111	-
M20	R-STUDS-20260-88HD	20	260	117	67	-	22	-	157	-
M24	R-STUDS-24300-88HD	24	300	132	62	-	26	-	176	-
M30	R-STUDS-30380-88HD	30	380	181	76	-	32	-	226	-

R-STUDS
METRIC THREADED RODS - A4

A4 stainless steel threaded rod for outdoor and damp conditions

FEATURES AND BENEFITS

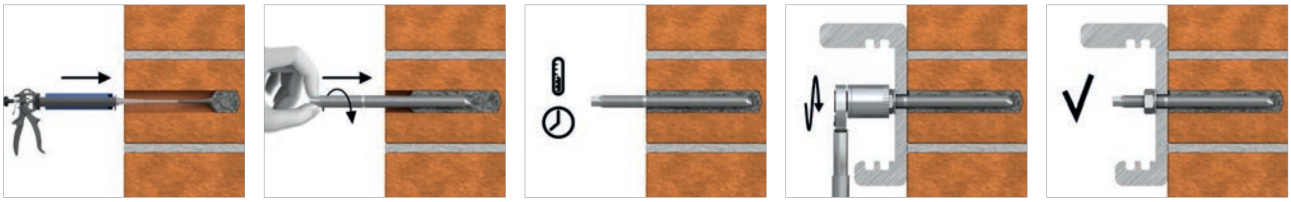
- High-performance bonded anchors offer high load-bearing capacities
- A4 stainless steel offers improved load-bearing capacities (relative to standard carbon steel)
- Can be post-installed through fixture in some cases. (Consult technical advisory service)

APPLICATIONS

- Satelite dishes
- Balustrading & handrails
- Barriers
- Safety barriers
- Starter bars
- Gates, wickets, fences
- Stadium seating
- Fixing electrical boxes, sanitary ware, cable trunking, etc.
- Road Signs

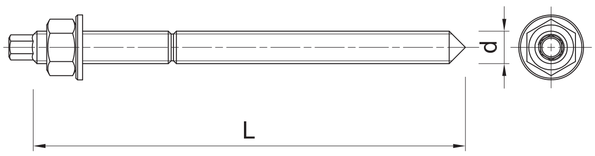
INSTALLATION GUIDE

DOZING AND ANCHORING



1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with hand pump and hole brush
3. If required, insert the mesh sleeve into position
4. Fill hole with the required resin to the recommended fill level. (Follow the relevant instructions for the resin product)
5. Insert the threaded stud slowly and with a slight twisting motion, until the required embedment depth is reached
6. Leave undisturbed until curing time of resin has elapsed
7. Attach fixture and tighten the nut to the required installation torque

PRODUCT INFORMATION



Size	Product Code	Anchor		Fixture						
		Diameter	Length	Max. thickness t_{fix} for:			Hole diameter	Max. thickness	Max. thickness t_{fix} for:	
		d	L	$h_{nom, min}$	$h_{nom,std}$	$h_{nom, max}$	d_f	t_{fix}	$h_{nom, min}$	$h_{nom, max}$
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-STUDS-08110-A4	8	110	40	20	-	9	20	40	-
	R-STUDS-08160-A4	8	160	90	70	50	9	70	90	-
M10	R-STUDS-10130-A4	10	130	48	28	-	12	33	58	-
M10	R-STUDS-10170-A4	10	170	88	68	38	12	73	98	-
	R-STUDS-10190-A4	10	190	108	88	58	12	93	118	-
M12	R-STUDS-12160-A4	12	160	65	35	-	14	50	85	-
	R-STUDS-12190-A4	12	190	95	65	30	14	80	115	-
	R-STUDS-12220-A4	12	220	125	95	60	14	110	145	-
	R-STUDS-12260-A4	12	260	165	135	100	14	150	185	-
	R-STUDS-12300-A4	12	300	205	175	140	14	190	225	45
M16	R-STUDS-16190-A4	16	190	71	46	-	18	66	111	-
	R-STUDS-16220-A4	16	220	101	76	11	18	96	141	-
	R-STUDS-16260-A4	16	260	141	116	51	18	136	181	-
	R-STUDS-16300-A4	16	300	181	156	91	18	176	221	-
	R-STUDS-16380-A4	16	380	261	236	171	18	256	301	41
M20	R-STUDS-20260-A4	20	260	117	67	-	22	-	157	-
	R-STUDS-20300-A4	20	300	157	107	37	22	-	197	-
	R-STUDS-20350-A4	20	350	207	157	87	22	-	247	-
M24	R-STUDS-24300-A4	24	300	132	62	-	26	-	176	-
M30	R-STUDS-30380-A4	30	380	181	76	-	32	-	226	-

R-STUDS

METRIC THREADED RODS - A4, FLAT HEAD

A4 stainless steel threaded rod for outdoor and damp conditions

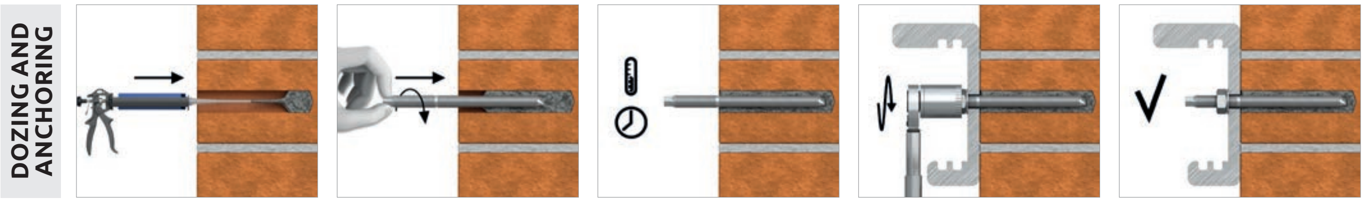
FEATURES AND BENEFITS

- High-performance bonded anchors offer high load-bearing capacities
- A4 stainless steel offers improved load-bearing capacities (relative to standard carbon steel)
- Can be post-installed through fixture in some cases. (Consult technical advisory service)
- Flat head for quick manual installation without a setting tool

APPLICATIONS

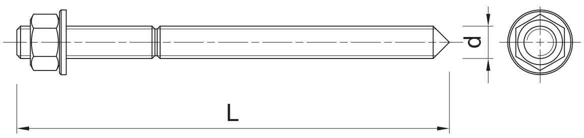
- Satelite dishes
- Balustrading & handrails
- Safety barriers
- Starter bars
- Gates, wickets, fences
- Lamps
- Stadium seating
- Gratings
- Fixing electrical boxes, sanitary ware, cable trunking, etc.

INSTALLATION GUIDE



1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with hand pump and hole brush
3. If required, insert the mesh sleeve into position
4. Fill hole with the required resin to the recommended fill level. (Follow the relevant instructions for the resin product)
5. Insert the threaded stud slowly and with a slight twisting motion, until the required embedment depth is reached
6. Leave undisturbed until curing time of resin has elapsed
7. Attach fixture and tighten the nut to the required installation torque

PRODUCT INFORMATION



Size	Product Code	Anchor		Fixture				
		Diameter	Length	Max. thickness t_{fix} for:			Hole diameter	Max. thickness
		d	L	$h_{nom, min}$	$h_{nom,std}$	$h_{nom, max}$	d_f	t_{fix}
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-STUDS-08110-A4FL	8	110	40	20	0	9	20
	R-STUDS-08160-A4FL	8	160	90	70	50	9	70
M10	R-STUDS-10130-A4FL	10	130	48	28	0	12	33
	R-STUDS-10170-A4FL	10	170	88	68	38	12	73
	R-STUDS-10190-A4FL	10	190	108	88	58	12	93
M12	R-STUDS-12160-A4FL	12	160	65	35	0	14	50
	R-STUDS-12190-A4FL	12	190	95	65	30	14	80
	R-STUDS-12220-A4FL	12	220	125	95	60	14	110
	R-STUDS-12260-A4FL	12	260	165	135	100	14	150
	R-STUDS-12300-A4FL	12	300	205	175	140	14	190
M16	R-STUDS-16190-A4FL	16	190	71	46	0	18	66
	R-STUDS-16220-A4FL	16	220	101	76	11	18	96
	R-STUDS-16260-A4FL	16	260	141	116	51	18	136
	R-STUDS-16300-A4FL	16	300	181	156	91	18	176
	R-STUDS-16380-A4FL	16	380	261	236	171	18	256
M20	R-STUDS-20260-A4FL	20	260	117	67	0	22	-
	R-STUDS-20300-A4FL	20	300	157	107	37	22	-
	R-STUDS-20350-A4FL	20	350	207	157	87	22	-
M24	R-STUDS-24300-A4FL	24	300	132	62	0	26	-
M30	R-STUDS-30380-A4FL	30	380	181	76	0	32	-

R-STUDS

METRIC THREADED RODS - STEEL CLASS 5.8, ZINC FLAKE

Threaded rod with hexagonal head made of zinc plated carbon steel 5.8 grade for use with bonded anchors.

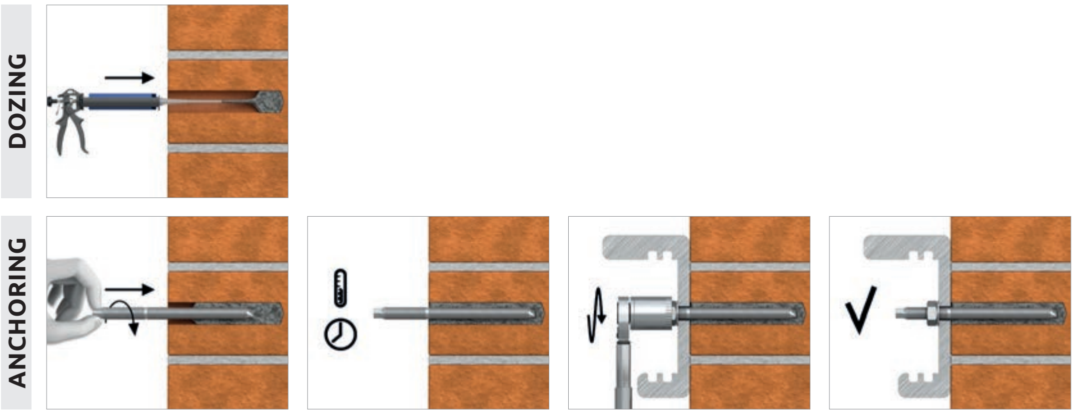
FEATURES AND BENEFITS

- Threaded rod made of hot dip galvanized steel is suitable for outdoor use and in damp conditions
- Can be post-installed through fixture in some cases. (Consult technical advisory service)
- Hexagonal head for convenient use with torque wrench
- Special zinc flake corrosion-resistant coating

APPLICATIONS

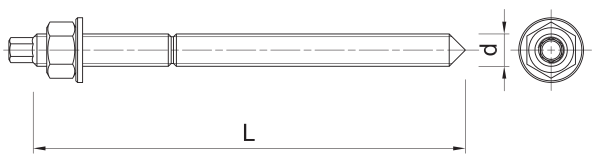
- Fastening with bonded anchors
- Balustrading & handrails
- Barriers
- Cable trays
- Consoles
- Curtain walling
- Formwork support systems
- Heavy machinery
- Lamps
- Safety barriers
- Road Signs
- Railings
- Public seating

INSTALLATION GUIDE



1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with hand pump and hole brush
3. If required, insert the mesh sleeve into position
4. Fill hole with the required resin to the recommended fill level. (Follow the relevant instructions for the resin product)
5. Insert the threaded stud slowly and with a slight twisting motion, until the required embedment depth is reached
6. Leave undisturbed until curing time of resin has elapsed
7. Attach fixture and tighten the nut to the required installation torque

PRODUCT INFORMATION



Size	Product Code	Anchor		Fixture						
		Diameter	Length	Max. thickness t_{fix} for:			Hole diameter	Max. thickness	Max. thickness t_{fix} for:	
		d	L	$h_{nom, min}$	$h_{nom,std}$	$h_{nom, max}$	d_f	t_{fix}	$h_{nom, min}$	$h_{nom, max}$
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-STUDS-08110 -ZF	8	110	40	20	-	9	20	40	-
M10	R-STUDS-10130 -ZF	10	130	48	28	-	12	33	58	-
M12	R-STUDS-12160 -ZF	12	160	65	35	-	14	50	85	-
M16	R-STUDS-16190 -ZF	16	190	71	46	-	18	66	111	-
M20	R-STUDS-20260 -ZF	20	260	117	67	-	22	-	157	-
M24	R-STUDS-24300 -ZF	24	300	132	62	-	26	-	176	-
M30	R-STUDS-30380 -ZF	30	380	181	106	-	32	-	226	-

R-STUDS

METRIC THREADED RODS
- STEEL CLASS 5.8, FLAT HEAD, ZINC FLAKE

Threaded rod with hexagonal head made of zinc plated carbon steel 5.8 grade for use with bonded anchors.

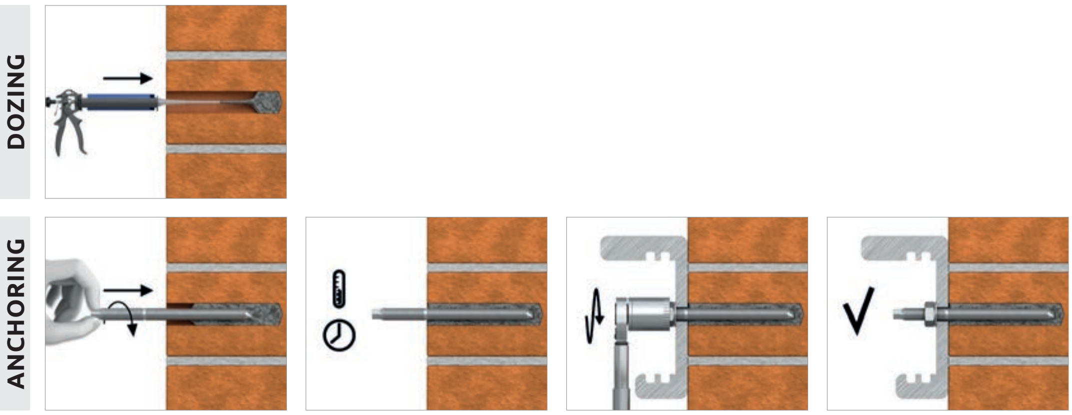
FEATURES AND BENEFITS

- Threaded rod made of hot dip galvanized steel is suitable for outdoor use and in damp conditions
- Can be post-installed through fixture in some cases. (Consult technical advisory service)
- Special zinc flake corrosion-resistant coating

APPLICATIONS

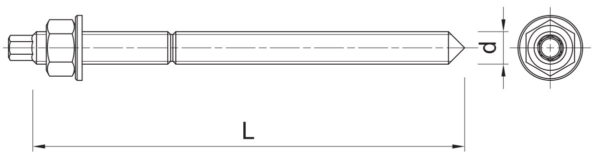
- Fastening with bonded anchors
- Balustrading & handrails
- Barriers
- Cable trays
- Consoles
- Curtain walling
- Formwork support systems
- Heavy machinery
- Lamps
- Safety barriers
- Road Signs
- Railings
- Public seating

INSTALLATION GUIDE



1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole thoroughly with hand pump and hole brush
3. If required, insert the mesh sleeve into position
4. Fill hole with the required resin to the recommended fill level. (Follow the relevant instructions for the resin product)
5. Insert the threaded stud slowly and with a slight twisting motion, until the required embedment depth is reached
6. Leave undisturbed until curing time of resin has elapsed
7. Attach fixture and tighten the nut to the required installation torque

PRODUCT INFORMATION



Size	Product Code	Anchor		Fixture						
		Diameter	Length	Max. thickness t_{fix} for:			Hole diameter	Max. thickness	Max. thickness t_{fix} for:	
		d	L	$h_{nom, min}$	$h_{nom,std}$	$h_{nom, max}$	d_f	t_{fix}	$h_{nom, min}$	$h_{nom, max}$
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-STUDS-08110FL-ZF	8	110	40	20	-	9	20	40	-
M10	R-STUDS-10130FL-ZF	10	130	48	28	-	12	33	58	-
M12	R-STUDS-12160FL-ZF	12	160	65	35	-	14	50	85	-
M16	R-STUDS-16190FL-ZF	16	190	71	46	-	18	66	111	-
M20	R-STUDS-20260FL-ZF	20	260	117	67	-	22	-	157	-
M24	R-STUDS-24300FL-ZF	24	300	132	62	-	26	-	176	-
M30	R-STUDS-30380FL-ZF	30	380	181	106	-	32	-	226	-

R-NOZ MIXER NOZZLE

Static mixer for bonded anchors in cartridges and CFS+ system

R-NOZ

R-NOZ-KER-II

R-NOZ-KEX-II

FEATURES AND BENEFITS

- Covenient extrusion and mixing of resin and hardener
- Available with or without hanger
- Ideal for serial applications: rebar or anchoring
- Specially dedicated nozzle fits for anchoring systems R-KEM II, R-KER, R-CFS+
- Possibility of extenstion- attach SP-CE-ED-1m extension nozzle

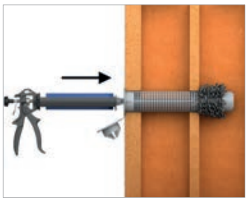
APPLICATIONS

- For use in a wide range of fastening applications in concrete and solid masonry structures

INSTALLATION GUIDE

MOUNTING

ANCHORING



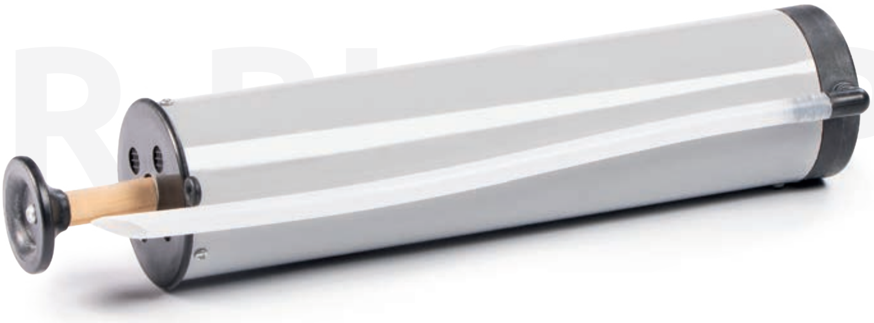
1. Simply screw the mixer nozzle onto the resin cartridge (after removing cap) or CFS+ system
2. Before inserting nozzle to the hole inject resin until even colour is obtained
3. Insert mixing nozzle to the far end the hole and inject resin, slowly withdrawing the nozzle

PRODUCT INFORMATION

Product Code	Length		Diameter
	L		D
	[mm]	-	[mm]
R-NOZ-10	200	10 element Mixer Nozzle	-
R-NOZ-100/100	200	10 element Mixer Nozzle	-
R-NOZ-EXT-200	200	Extension for mixer nozzle R-NOZ	9.5
R-NOZ-EXT-300	300	Extension for mixer nozzle R-NOZ	9.5
R-NOZ-EXT-3000	3000	Extension for mixer nozzle R-NOZ	12
SP-CE-ED-1M	1000	Extension for mixer nozzle R-NOZ	12

R-BLOWPUMP BLOW PUMP

Manual blow pump ideal for cleaning dust from drilled holes



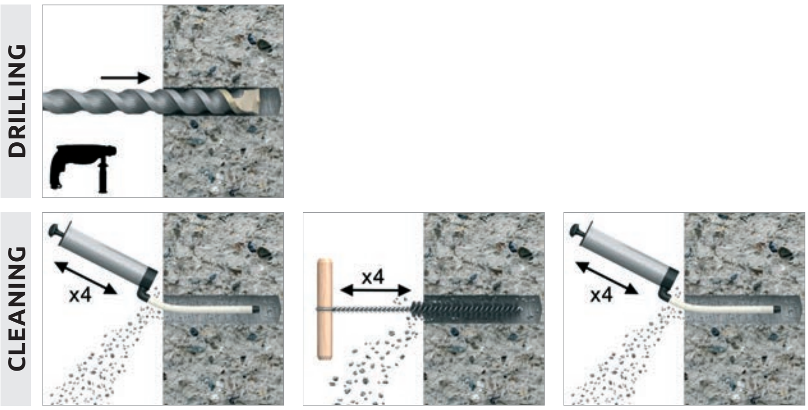
FEATURES AND BENEFITS

- Ideal for cleaning dust from drilled holes prior to applying bonded anchors or installing mechanical anchors
- Hole cleaning is necessary for correct loads
- Manual, easy to use
- Serial application

APPLICATIONS

- Accessory used for cleaning out anchoring holes in concrete and masonry

INSTALLATION GUIDE



1. Before inserting anchor, clear debris from hole
2. Insert pipe to bottom of hole and pump air repeatedly four times
3. Additional use of hole brush is recommended, four times

PRODUCT INFORMATION

Product Code	Description
R-BLOWPUMP	Manual Blow pump

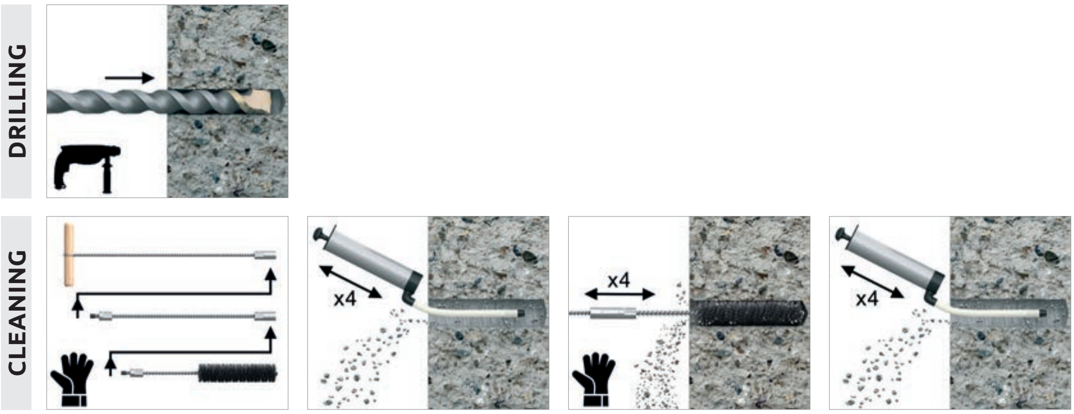
R-BRUSH MANUAL CLEANING SYSTEM

Brush accessory for cleaning out holes prior to anchor installation

FEATURES AND BENEFITS

- Ideal for cleaning dust from drilled holes prior to applying bonded anchors or installing mechanical anchors
- Hole cleaning is necessary for correct loads
- Suitable for variable anchor embedment depths up to 2,5 m.
- Suitable for repetitive and frequent use.

INSTALLATION GUIDE



1. Drill hole to the required diameter and depth for stud size being used.
2. Before inserting anchor, clean inside of hole by commpresed air.
3. Choose extensions and brushes to the selected depth and diameter of the hole, then combine them into one set.
4. Connect the drill set with the SDS tip.
5. Clean the hole twice with a prepared brush set.
6. Clean the hole again with compressed air.

PRODUCT INFORMATION

Product Code	Length	Diameter D	Drill diameter	Stud size	Rebar diameter d_s
	[mm]	[mm]	[mm]	-	[mm]
R-BRUSH-EXT-LH	360	-	-	-	-
R-BRUSH-EXT-LT	360	-	-	-	-
R-BRUSH-12-TC	200	12	10	M8	-
R-BRUSH-14-TC	200	14	12	M10	8
R-BRUSH-16-TC	200	16	14	M12	10
R-BRUSH-18-TC	200	18	16	-	12
R-BRUSH-20-TC	200	20	18	M16	14
R-BRUSH-22-TC	200	22	20	-	16
R-BRUSH-27-TC	200	27	25	M20	20
R-BRUSH-32-TC	200	32	30	M24	25
R-BRUSH-37-TC	200	37	35	M30	28
R-BRUSH-42-TC	200	42	40	-	32
R-BRUSH-52-TC	200	52	50	-	40

R-BRUSH FOR AUTOMATIC CLEANING SYSTEM

System for automatic cleaning deep holes before installing the anchor in a solid substrate

FEATURES AND BENEFITS

- Ideal for cleaning dust from drilled holes prior to applying bonded anchors or installing mechanical anchors
- Hole cleaning is necessary for correct loads
- Suitable for variable anchor embedment depths.
- Suitable for repetitive and frequent use.
- Ideal for serial cleaning of deep holes.

INSTALLATION GUIDE

1. Drill hole to the required diameter and depth for stud size being used.
2. Before inserting anchor, clean inside of hole by commpresed air starting from the drill holle botton. Blow the hole at least twice by compressed air at minimum 6 bar.
3. Choose extensions and brushes to the selected depth and diameter of the hole, then combine them into one set.
4. Connect the drill set with the SDS tip.
5. Clean the hole twice with a prepared brush set.
6. Clean the hole again with compressed air.

PRODUCT INFORMATION

Product Code	Length	Diameter D	Drill diameter	Stud size	Rebar diameter d_s
	[mm]	[mm]	[mm]	-	[mm]
R-BRUSH-EXT-H-SDS	420	-	-	-	-
R-BRUSH-EXT-H-TC	420	-	-	-	-
R-BRUSH-12-TC	200	12	10	M8	-
R-BRUSH-14-TC	200	14	12	M10	8
R-BRUSH-16-TC	200	16	14	M12	10
R-BRUSH-18-TC	200	18	16	-	12
R-BRUSH-20-TC	200	20	18	M16	14
R-BRUSH-22-TC	200	22	20	-	16
R-BRUSH-27-TC	200	27	25	M20	20
R-BRUSH-32-TC	200	32	30	M24	25
R-BRUSH-37-TC	200	37	35	M30	28
R-BRUSH-42-TC	200	42	40	-	32
R-BRUSH-52-TC	200	52	50	-	40

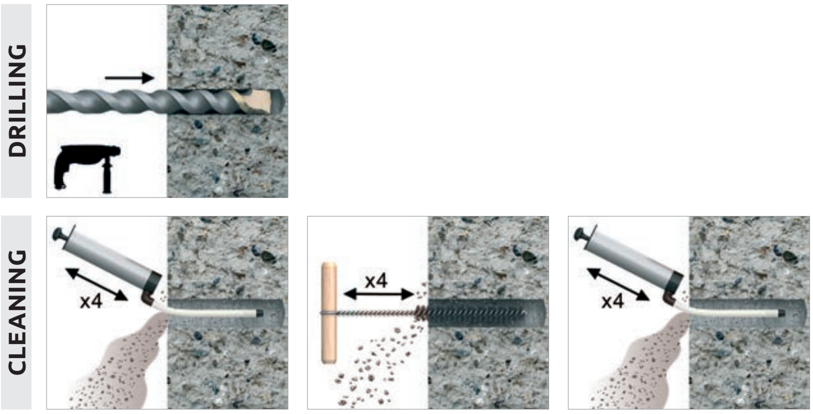
R-BRUSH MANUAL WIRE BRUSHES

Brush accessory for cleaning out holes prior to anchor installation

FEATURES AND BENEFITS

- Ideal for cleaning dust from drilled holes prior to applying bonded anchors or installing mechanical anchors
- Hole cleaning is necessary for correct loads
- Suitable for variable anchor embedment depths
- Suitable for repetitive and frequent use

INSTALLATION GUIDE



1. Drill hole to the required diameter and depth for stud size being used.
2. Before inserting anchor, clean inside of hole by commpresed air.
3. Choose extensions and brushes to the selected depth and diameter of the hole, then combine them into one set.
4. Connect the drill set with the SDS tip.
5. Clean the hole twice with a prepared brush set.
6. Clean the hole again with compressed air.

PRODUCT INFORMATION

Product Code	Drill diameter	Stud size	Diameter D
	[mm]	-	[mm]
R-BRUSH-M10/M	12	M10	14
R-BRUSH-M12/M	14	M12	16
R-BRUSH-M16/M	18	M16	20
R-BRUSH-M20/M	24	M20	26
R-BRUSH-M24/M	28	M24	30
R-BRUSH-M30/M	35	M30	37

R-NOZ-P FOR AUTOMATIC CLEANING SYSTEM

System for automatic cleaning deep holes before installing the anchor in a solid substrate

R-NOZ-P-28-50

R-NOZ-P-16-26

FEATURES AND BENEFITS

- Full control over the degree to which the hole is filled with resin
- Uniform resin injection into the hole
- Absence of air bubbles in the hole.
- Dispensing of the appropriate volume of the resin.

INSTALLATION GUIDE

MOUNTING

DOZING

1. Prepare the resin for the application.
2. Cut the PISTON PLUG with the required hole diameter.
3. Insert the hose with piston plug into the bottom hole.
4. Discard about 10 cm of unmixed resin, then connect the other end of the hose to the resin mixer.
5. Start dispensing the resin: the resin being injected will now be pushing the plug out of the hole (like a piston)

PRODUCT INFORMATION

Product Code	Suitable for	Drill diameter
	[mm]	[mm]
R-NOZ-P-16-26	Piston Plug dosing	16-26
R-NOZ-P-28-50	Piston Plug dosing	28-50
R-NOZ-P-SET	Piston Plug dosing	

R-NOZ-ADAPTER AIR ADAPTER

Air Adapter R-NOZ-ADAPTER


R-NOZ-ADAPTER-14

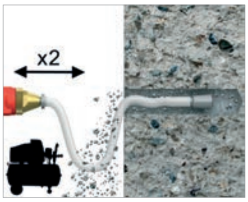

R-NOZ-ADAPTER-28

FEATURES AND BENEFITS

- Enables precise cleaning of holes - especially in deep anchoring.
- Uniform removes dust and dust from the hole.
- Thanks to the use of a compressor speed up work.
- Ideal for serial cleaning of deep holes.

INSTALLATION GUIDE

MOUNTING



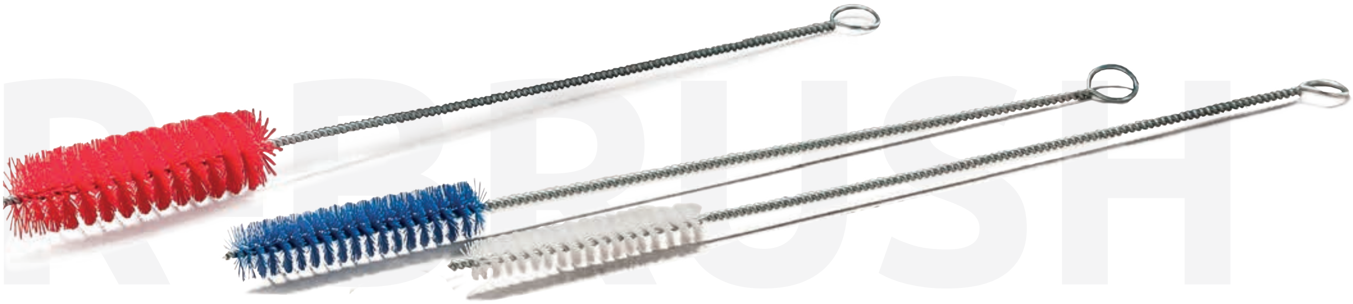
1. Select the right air adapter to the required hole size.
2. Connected adapter to the flexible hose insert in the hole, reaching the bottom.
3. The other end of the flexible hose connect to the compressor and start cleaning the hole with dust.
4. Clean the hole with compressed air starting from the drill hole bottom, blow the hole at least twice by compressed air minimum 6 bar.

PRODUCT INFORMATION

Product Code	Description	Size
		[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

R-BRUSH MANUAL PLASTIC BRUSHES

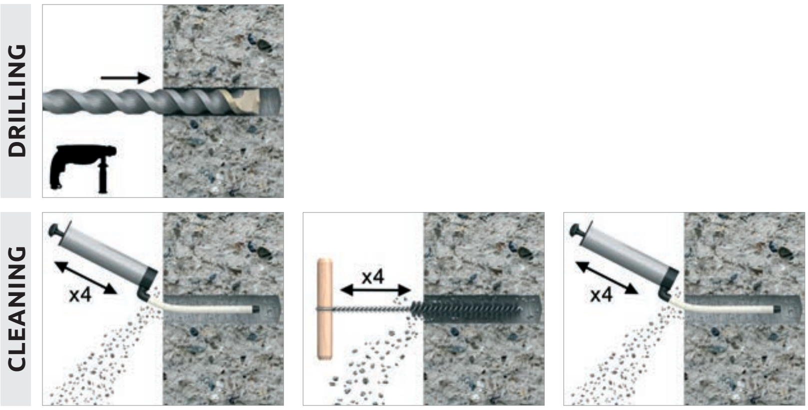
Brush accessory for cleaning out holes prior to anchor installation



FEATURES AND BENEFITS

- Ideal for cleaning dust from drilled holes prior to applying bonded anchors or installing mechanical anchors
- Hole cleaning is necessary for correct loads
- Suitable for variable anchor embedment depths.
- Suitable for repetitive and frequent use.

INSTALLATION GUIDE



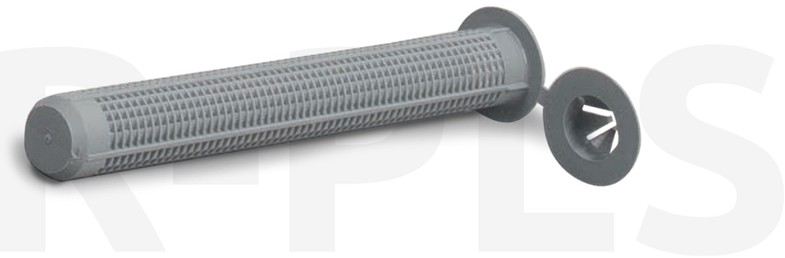
1. Drill hole to the required diameter and depth for stud size being used.
2. Before inserting anchor, clean inside of hole by commpresed air.
3. Choose extensions and brushes to the selected depth and diameter of the hole, then combine them into one set.
4. Connect the drill set with the SDS tip.
5. Clean the hole twice with a prepared brush set.
6. Clean the hole again with compressed air.

PRODUCT INFORMATION

Product Code	Diameter D	Stud size	Length L	Working length	Material	Raw material	Colour
	[mm]	-	[mm]	[mm]	-	-	-
R-BRUSH-M08/10	15	M8-M10	385	105	Steel wire	Nylon	WHITE
R-BRUSH-M10/14	20	M12-M14	385	105	Steel wire	Nylon	BLUE
R-BRUSH-M16/28	30	-	395	105	Steel wire	Nylon	RED

R-PLS PLASTIC MESH SLEEVES

The sleeve for reduced mortar consumption and optimal mechanical interlock



FEATURES AND BENEFITS

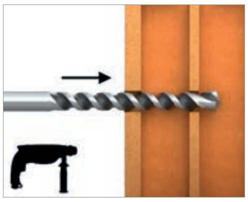
- Ensures that the anchor rod is properly centred.
- Reduces consumption of resin
- User-friendly installation in hollow substrates
- Size must be adjusted to the hole depht and diameter
- Hole cleaning is not necessary

APPLICATIONS

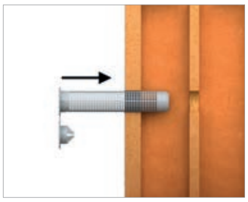
- For use with R-STUDS threaded rods in hollow base materials

INSTALLATION GUIDE

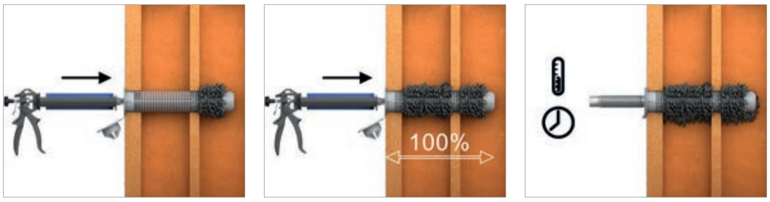
DRILLING



MOUNTING



ANCHORING



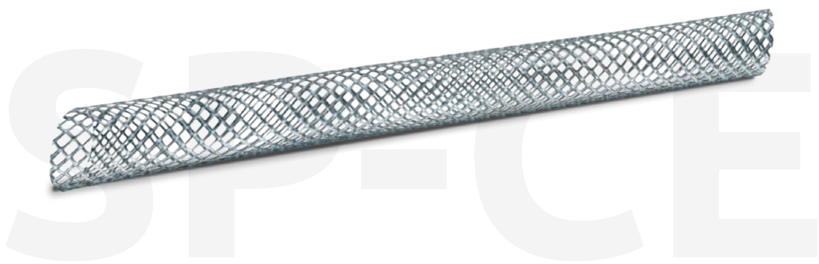
1. Drill the hole and clean it up.
2. Insert the sleeve in the hole.
3. Apply the resin in 100 % of depth of the hole and close the cap.
4. Place the stud in the sleeve and wait until full curing of the resin, as stated on the product label.
5. After full curing of the anchor, install the fixed element with proper torque.

PRODUCT INFORMATION

Size	Product Code	Plastic mesh sleeve size dxl [mm]	Stud size	Raw material	Colour
Ø_12	R-PLS-12050-10	12x50	M8	polypropylene	transparent
Ø_16	R-PLS-16085-10	16x85	M10-M12	polypropylene	transparent
	R-PLS-16130-10	16x130	M10-M12	polypropylene	transparent
Ø_20	R-PLS-20085-10	20x85	M16	polypropylene	transparent

SP-CE WIRE MESH SLEEVES

Metal, zinc-plated mesh sleeve for use with bonded anchors in hollow substrates and concrete



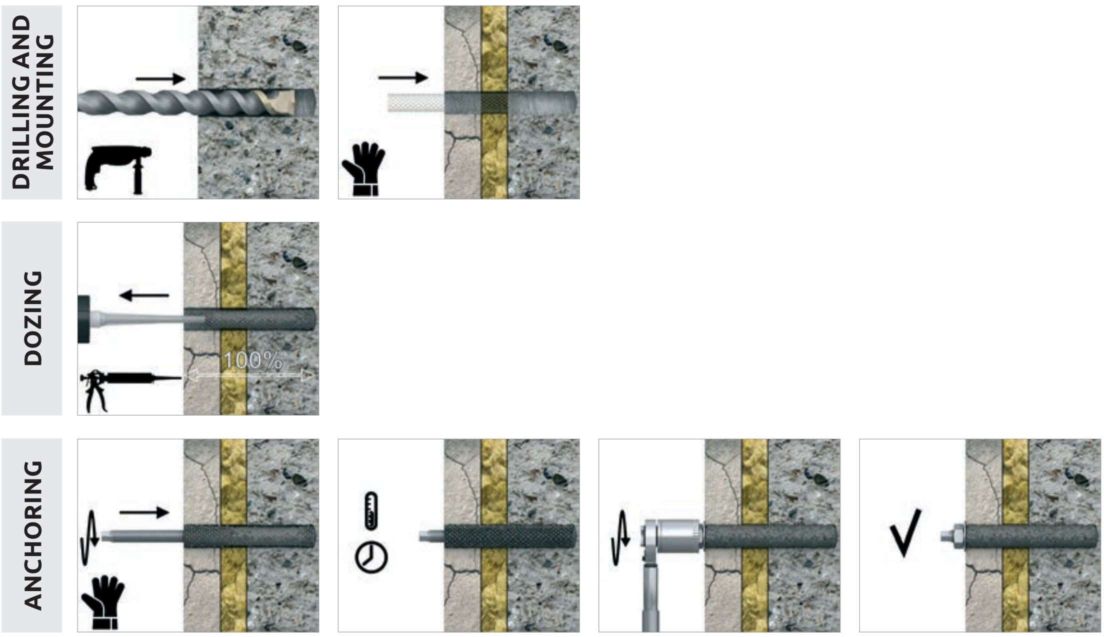
FEATURES AND BENEFITS

- Reduces consumption of resin and holds threaded rod in position
- Optimal mechanical interlock
- Dedicated for deep anchorage
- Necessary for use in copy-eco system - reinforcement of suspension rod in large-panel construction systems

APPLICATIONS

- For use with R-STUDS threaded rods in hollow base materials

INSTALLATION GUIDE



1. Drill the hole and clear it with steps proper for the used substrate.
2. Insert the mesh into pre-drilled hole, inject the resin and apply the stud.
3. Apply the curing time given on the label of bonded anchor.
4. After full curing of the resin complete the installation using torque indicated in proper ETA assesment.

PRODUCT INFORMATION

Size	Product Code	Diameter d [mm]	Length L [mm]	Stud diameter [mm]
Ø 12	SP-CE-R08	12	1000	8
Ø 14	SP-CE-R10	14	1000	10
Ø 16	SP-CE-R12	16	1000	12
Ø 20	SP-CE-R16	20	1000	16
Ø 24	SP-CE-R20	24	1000	20

R-ITS-Z INTERNALLY THREADED SOCKETS

High load-bearing capacity

FEATURES AND BENEFITS

- Allows removal of bolt to leave a re-usable socket in place
- High load-bearing capacity
- Close edge and spacing distances
- Expansion free functioning
- Available in zinc plated and stainless steel versions

APPLICATIONS

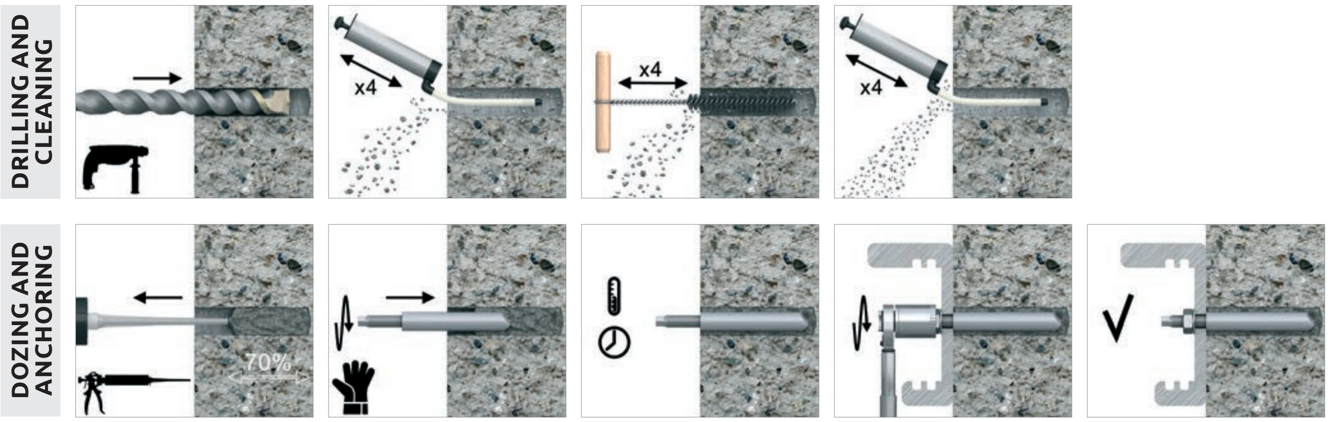
- For fastening bolts
- Safety barriers
- Temporary works/formworks support systems

BASE MATERIALS

Approved for use in:

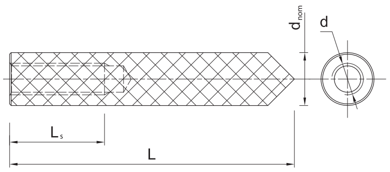
- Non-cracked concrete C20/25-C50/60

INSTALLATION GUIDE



1. After injecting resin, immediately insert the socket anchor, slowly and with a slight twisting motion until flush with surface
2. Remove excess resin, then leave anchorage undisturbed until curing time has elapsed
3. Fill hole with the required resin to the recommended fill level. (Follow the relevant instructions for the resin product)
4. Attach fixture and tighten the nut to the required torque.
5. After injecting resin, immediately insert the socket anchor, slowly and with a slight twisting motion until flush with surface
6. For installation with a drilling machine, insert the setting tool into socket and spin in using rotary hammer action
7. Remove excess resin, then leave anchorage undisturbed until curing time has elapsed

PRODUCT INFORMATION



Size	Product Code	Anchor			Fixture	
		Socket diameter	Length	Internal thread length	Max. thickness t_{fix} for:	Hole diameter
		d	L	l_g	$h_{nom,std}$	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
M6	R-ITS-Z-06075	10	75	24	-	7
M8	R-ITS-Z-08075	12	75	25	-	9
	R-ITS-Z-08090	12	90	25	-	9
M10	R-ITS-Z-10075	16	75	30	-	12
	R-ITS-Z-10100	16	100	30	-	12
M12	R-ITS-Z-12100	16	100	35	-	14
M16	R-ITS-Z-16125	24	125	50	-	18

R-ITS-A4

INTERNALLY THREADED SOCKETS
ZINC PLATED

Internally threaded socket for the attachement of suitable bolt or threaded rod. ETA Approved with pure epoxy resin

FEATURES AND BENEFITS

Allows removal of bolt to leave a re-usable socket in place
- High load-bearing capacity
- Close edge and spacing distances
- Expansion free functioning
- Available in zinc plated and stainless steel versions

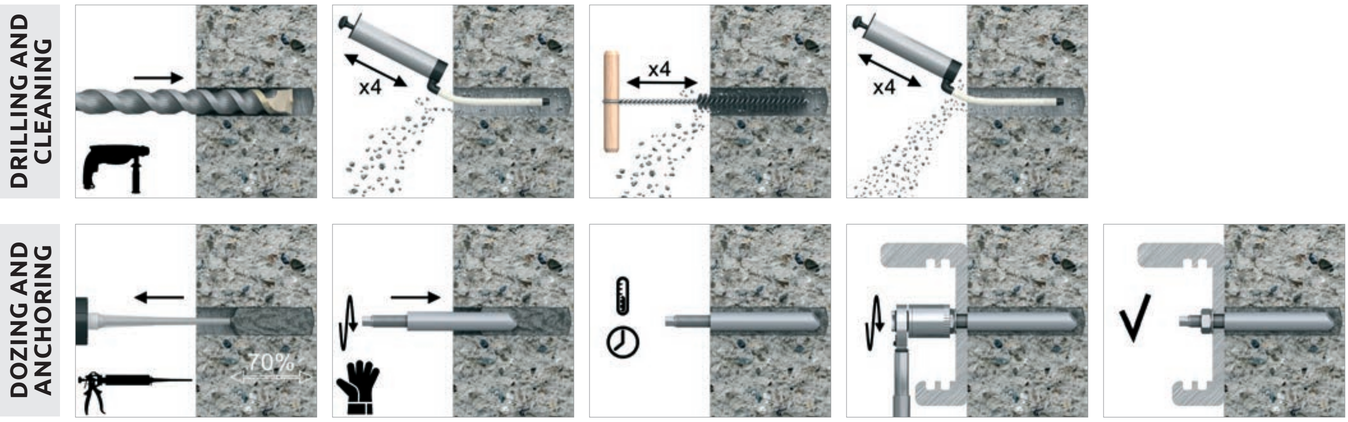
APPLICATIONS

- For fastening bolts
- Safety barriers
- Temporary works/formworks support systems

BASE MATERIALS

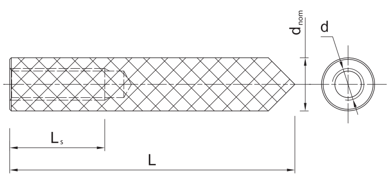
Approved for use in:
- Non-cracked concrete C20/25-C50/60

INSTALLATION GUIDE



1. After injecting resin, immediately insert the socket anchor, slowly and with a slight twisting motion until flush with surface
2. Remove excess resin, then leave anchorage undisturbed until curing time has elapsed
3. Fill hole with the required resin to the recommended fill level. (Follow the relevant instructions for the resin product)
4. Attach fixture and tighten the nut to the required torque.
5. After injecting resin, immediately insert the socket anchor, slowly and with a slight twisting motion until flush with surface
6. For installation with a drilling machine, insert the setting tool into socket and spin in using rotary hammer action
7. Remove excess resin, then leave anchorage undisturbed until curing time has elapsed

PRODUCT INFORMATION



Size	Product Code	Anchor			Fixture		Hole diameter
		Socket diameter	Length	Internal thread length	Max. thickness t_{fix} for:	Hole diameter	
		d [mm]	L [mm]	l_g [mm]	$h_{nom,std}$ [mm]	d_f [mm]	d_1 [mm]
M6	R-ITS-A4-06075	10	75	24	-	7	-
M8	R-ITS-A4-08075	12	75	25	-	9	14
	R-ITS-A4-08090	12	90	25	-	9	-
M10	R-ITS-A4-10075	16	75	30	-	12	-
	R-ITS-A4-10100	16	100	30	-	12	-
M12	R-ITS-A4-12100	16	100	35	-	14	-
M16	R-ITS-A4-16125	24	125	50	-	18	-

R-GUN

DISPENSER GUN
175 - 310 ML

Professional dispensing system for resin anchors in cartridges

FEATURES AND BENEFITS

- Fast and effortless resin injection
- Convenient dispensing tool for a range of situations
- Type of gun used for anchoring strictly depends on the type of cartridge
- Robust design for all jobsite conditions

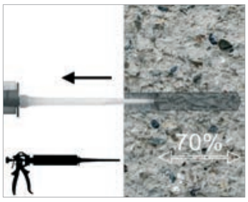
APPLICATIONS

- Dispenser gun suitable for 175ml, 280ml, 300ml, 310ml cartridges
- Manual operation - no need for external power supply
- For use in a wide range of fastening applications in concrete and solid masonry structures

INSTALLATION GUIDE

MOUNTING

DOZING



1. Open the cartridge and attach the proper nozzle.
2. Put the cartridge into the gun thoroughly.
3. Make sure that the nozzle is in correct position and lies in the fence.
4. By pressing the trigger dose the required amount of the product.
5. After finished work empty the gun and clean if necessary.

PRODUCT INFORMATION

Product Code	Description	Suitable for
R-GUN-300-N	300 ml CARTRIDGE GUN	Cartridges 175 ml, 280 ml, 300ml, 310ml R-KEM+, R-KEM-II, R-KER, R-KER-II

R-GUN DISPENSER GUN 345 ML

Professional dispensing system for resin anchors in cartridges

FEATURES AND BENEFITS

- Manual operation - no need for external power supply
- Type of gun used for anchoring strictly depends on the type of cartridge
- Fast and effortless resin injection
- Convenient dispensing tool for a range of situations
- Robust design for all jobsite conditions

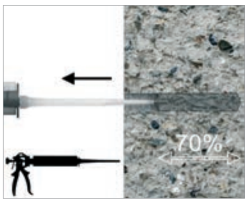
APPLICATIONS

- Gun dedicated for side-by-side cartridge 345 ml
- Manual operation - no need for external power supply
- For use in a wide range of fastening applications in concrete and solid masonry structures

INSTALLATION GUIDE

MOUNTING

DOZING



1. Open the cartridge and attach the proper nozzle.
2. Put the cartridge into the gun thoroughly.
3. Make sure that the nozzle is in correct position and lies in the fence.
4. By pressing the trigger dose the required amount of the product.
5. After finished work empty the gun and clean if necessary.

PRODUCT INFORMATION

Product Code	Description	Suitable for
R-GUN-345-N	345 ml CARTRIDGE GUN	R-KER-345, R-KER-II-345

R-GUN MANUAL EXTRUSION GUN FOR 380-410ML CARTRIDGES

Professional dispensing system for resin anchors in cartridges

FEATURES AND BENEFITS

- Manual operation - no need for external power supply
- Type of gun used for anchoring strictly depends on the type of cartridge
- Fast and effortless resin injection
- Convenient dispensing tool for a range of situations
- Robust design for all jobsite conditions

APPLICATIONS

- Dosing of bonded resins and other mediums from coaxial 380 -410 ml cartridges.
- Manual operation - no need for external power supply
- For use in a wide range of fastening applications in concrete and solid masonry structures

INSTALLATION GUIDE

1. Open the cartridge and attach the proper nozzle.
2. Put the cartridge into the gun thoroughly.
3. Make sure that the nozzle is in correct position and lies in the fence.
4. By pressing the trigger dose the required amount of the product.
5. After finished work empty the gun and clean if necessary.

PRODUCT INFORMATION

Product Code	Description	Suitable for
R-GUN-380-P	380 ml CARTRIDGE GUN	R-KEM-II-380,410, R-KF2-380,400, R-KER-II-400, R-KER-380, R-KER-400

R-GUN PNEUMATIC DISPENSER GUN 380ML

Professional dispensing system for resin anchors in cartridges

FEATURES AND BENEFITS

- Type of gun used for anchoring strictly depends on the type of cartridge
- Fast and effortless resin injection
- Convenient dispensing tool for a range of situations
- Robust design for all jobsite conditions

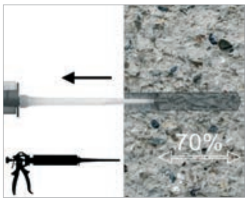
APPLICATIONS

- Dosing of bonded resins and other mediums from coaxial 380 -410 ml cartridges.
- For use in a wide range of fastening applications in concrete and solid masonry structures
- Pneumatic gun ideal for serial application

INSTALLATION GUIDE

MOUNTING

DOZING



1. Open the cartridge and attach the proper nozzle.
2. Put the cartridge into the gun thoroughly.
3. Make sure that the nozzle is in correct position and lies in the fence.
4. By pressing the trigger dose the required amount of the product.
5. After finished work empty the gun and clean if necessary.

PRODUCT INFORMATION

Product Code	Description	Suitable for	Box	Weight	Pneumatic system	Magnitude of force exerted by the applicator Magnitude of force exerted by the applicator
			[pcs]	[kg]	[bar]	[kN]
R-GUN-380-PNEU	380 ml Cartridge Pneumatic Gun	For 380ml coaxial cartridges only	1	1.81	6,8	2,2
R-GUN-KEX-600-PNEU	-	For 385 and 600 ml (3:1 ratio) side by side cartridges eg R-KEX-II-385, R-KEX-II-600	1	1.81	5,2	1,5

R-GUN

DISPENSER GUN
385 ML

Professional dispensing system for resin anchors in cartridges

FEATURES AND BENEFITS

- Manual operation - no need for external power supply
- Type of gun used for anchoring strictly depends on the type of cartridge
- Fast and effortless resin injection
- Convenient dispensing tool for a range of situations
- Robust design for all jobsite conditions
- Gun dedicated for side-by-side cartridges of 385 ml

APPLICATIONS

- Manual operation - no need for external power supply
- Pneumatic gun ideal for serial application
- For use in a wide range of fa-stening applications in concrete and solid masonry structures

BASE MATERIALS

Approved for use in:

- Cracked Concrete
- Non-cracked Concrete
- Solid Brick
- Solid Concrete Block
- Solid Sand-lime Brick
- Hollow Brick
- Hollow Lightweight Concrete Block
- Hollow Sand-lime Brick
- Hollow-core Slab

INSTALLATION GUIDE

1. Open the cartridge and attach the proper nozzle.
2. Put the cartridge into the gun thoroughly.
3. Make sure that the nozzle is in correct position and lies in the fence.
4. By pressing the trigger dose the required amount of the product.
5. After finished work empty the gun and clean if necessary.

PRODUCT INFORMATION

Product Code	Description	Suitable for
R-GUN-385-P	385 ml CARTRIDGE GUN	R-KEX-II

R-GUN

DISPENSER GUN
CFS+

Professional dispensing system for bonded anchors in 300 ml foil packs

FEATURES AND BENEFITS

- Manual operation - no need for external power supply
- Type of gun used for anchoring strictly depends on the type of cartridge
- Fast and effortless resin injection
- Convenient dispensing tool for a range of situations
- Robust design for all jobsite conditions

APPLICATIONS

- Gun dedicated for 300 ml CFS+ system
- For use in a wide range of fastening applications in concrete and solid masonry structures

INSTALLATION GUIDE

MOUNTING

DOZING

1. Drill hole to the required diameter and depth for threaded rods size being used.
2. Clean the hole thoroughly with brush and hand pump at least four times before installation.
3. Insert foil into gun and attach nozzle.
4. Dispense to waste until even colour is obtained.
5. Insert the mixer nozzle to the bottom of the drill hole and inject resin, slowly withdrawing the nozzle as the hole is filled to 70% of its depth.
6. Immediately insert the rebar, slowly and with slight twisting motion. Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.
7. Attach fixture and tighten the nut to the required torque.

PRODUCT INFORMATION

Product Code	Description	Suitable for	Colour
R-CFS+-GUN	300 ml CFS+ GUN	RV200, RM50, RP30	-
R-CFS+GUN-600	600 ml CFS+ GUN	RV200, RM50, RP30	transparent
R-GUN-CFS+300-P	300 ml CFS+ GUN	RV200, RM50, RP30	transparent

R-GUN PNEUMATIC DISPENSER GUN CFS+

Professional dispensing system for resin anchors in foil packs

FEATURES AND BENEFITS

- Type of gun used for anchoring strictly depends on the type of cartridge
- Fast and effortless resin injection
- Convenient dispensing tool for a range of situations
- Robust design for all jobsite conditions

APPLICATIONS

- Pneumatic gun dedicated for 300/600 ml CFS+ system
- Pneumatic gun ideal for serial application
- For use in a wide range of fastening applications in concrete and solid masonry structures

BASE MATERIALS

Approved for use in:

- Cracked Concrete
- Non-cracked Concrete
- Solid Brick
- Solid Concrete Block
- Solid Sand-lime Brick
- Hollow Brick
- Hollow Lightweight Concrete Block
- Hollow Sand-lime Brick
- Hollow-core Slab

INSTALLATION GUIDE

1. Charge the battery and install it in the dispenser handle. Release the squeezing piston with the button and pull it backwards.
2. Open the cartridge and attach the proper nozzle.
3. Put the cartridge into the powered gun thoroughly.
4. By pressing the trigger dose the required amount of the product. Dispense to waste until even colour is obtained (min. 10 cm).
5. Resin dosaging can be performed in a manual or repetitive function. The setting is possible by selecting the manual or repate button
6. After finished work empty the gun and clean if necessary.

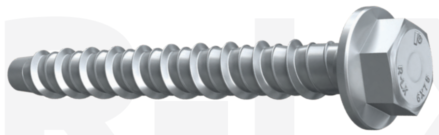
PRODUCT INFORMATION

Product Code	Description	Suitable for
R-CFS+-GUN-PNEU	300/600 ml CARTRIDGE GUN	RV200, RM50, RP30

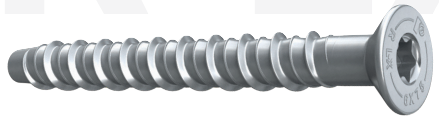
Mechanical Anchors

R-LX CONCRETE SCREW ANCHORS - STRUCTURAL FIXINGS

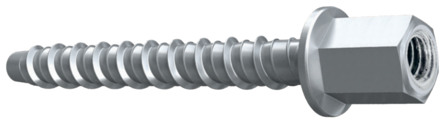
Self-tapping concrete screwbolt



Hexagonal head screw with washer
R-LX-HF

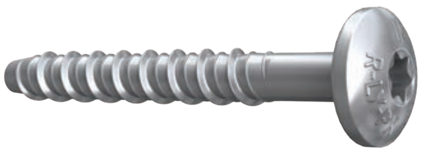


Countersunk head screw
R-LX-CS

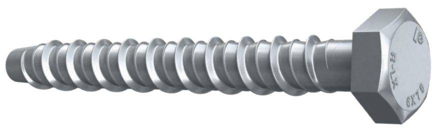


Internally threaded head screw
R-LX-I

Externally threaded head screw
R-LX-E



Panhead XL screw
R-LX-PX-ZP



Hexagonal head screw for temporary installation
R-LX-H*

*not included in the approval

ETA 17/0185

FEATURES AND BENEFITS

- Time-efficient installation through streamlined procedure - simply drill and drive
- Completely removable with possibility of reuse
- Unique design with patented threadform ensures high performance for relatively small hole diameter
- Non-expansion functioning ensures low risk of damage to base material and makes R-LX ideal for installation near edges and adjacent anchors
- Special zinc flake corrosion-resistant coating
- High performance in both uncracked and cracked concrete
- Different head types for any application
- Oversize head for fixtures with elongated holes
- Excellent product for temporary fixing
- Suitable for standard and reduced embedment depth

APPLICATIONS

- Through-fixing
- Temporary anchorages
- Formwork support systems
- Balustrading & handrails
- Fencing & gates manufacturing and installation
- Racking systems
- Public seating
- Scaffolding

BASE MATERIALS

Approved for use in:

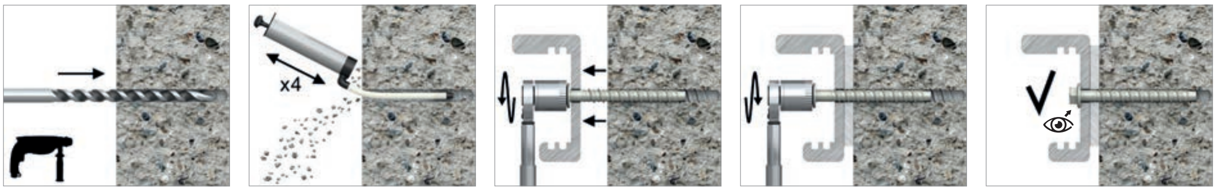
- Cracked concrete C20/25-C50/60
- Non-cracked concrete C20/25-C50/60
- Reinforced concrete
- Unreinforced concrete

Also suitable for use in:

- Natural Stone (after site testing)

R-LX-HF HEXAGONAL HEAD SCREW WITH WASHER

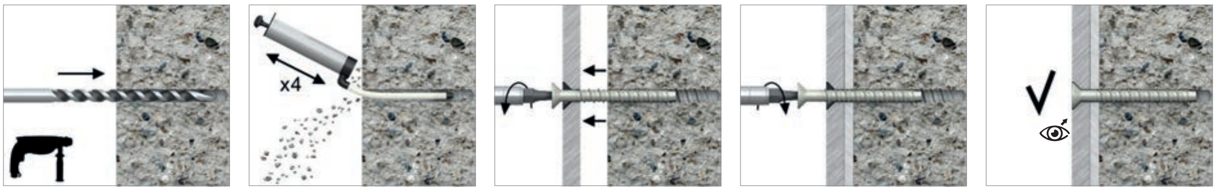
INSTALLATION GUIDE



1. Drill the hole with rotary percussive machine. Drill to a required depth.
2. Blow out dust at least 4 times with a hand pump.
3. Possibility of unscrewing and re-screwing.
4. Tighten to the recommended torque.
5. After installation.

R-LX-CS COUNTERSUNK HEAD SCREW

INSTALLATION GUIDE



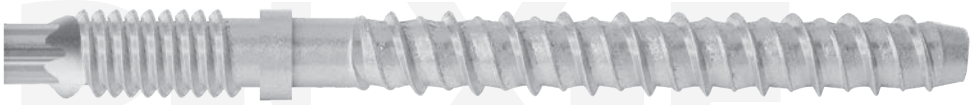
1. Drill the hole with rotary percussive machine. Drill to a required depth.
2. Blow out dust at least 4 times with a hand pump.
3. Possibility of unscrewing and re-screwing.
4. Tighten to the recommended torque.
5. After installation.

R-LX-I INTERNALLY THREADED HEAD SCREW

INSTALLATION GUIDE

1. Drill the hole with rotary percussive machine. Drill to a required depth.
2. Blow out dust at least 4 times with a hand pump.
3. Possibility of unscrewing and re-screwing.
4. Tighten to the recommended torque.
5. After installation.

R-LX-E EXTERNALLY THREADED HEAD SCREW



INSTALLATION GUIDE

1. Drill the hole with rotary percussive machine. Drill to a required depth
2. Blow out dust at least 4 times with a hand pump
3. Possibility of unscrewing and re-screwing
4. Tighten to the recommended torque
5. After installation.

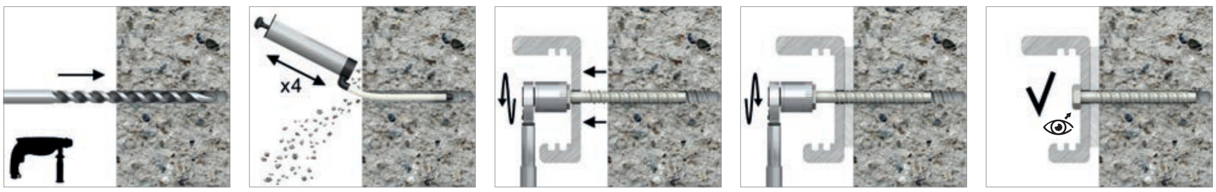
R-LX-PX-ZP PANHEAD XL SCREW

INSTALLATION GUIDE

1. Drill the hole with rotary percussive machine. Drill to a required depth
2. Blow out dust at least 4 times with a hand pump
3. Tighten to the recommended torque
4. After installation.

R-LX-H HEXAGONAL HEAD SCREW FOR TEMPORARY INSTALLATION

INSTALLATION GUIDE

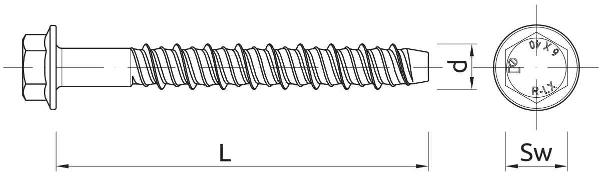


1. Drill the hole with rotary percussive machine. Drill to a required depth.
2. Blow out dust at least 4 times with a hand pump.
3. Possibility of unscrewing and re-screwing.
4. Tighten to the recommended torque.
5. After installation.

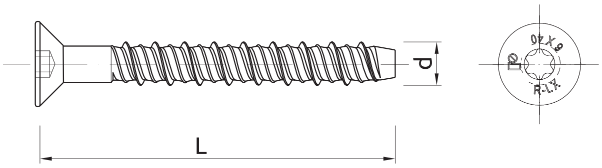
R-LX CONCRETE SCREW ANCHORS - STRUCTURAL FIXINGS

PRODUCT INFORMATION

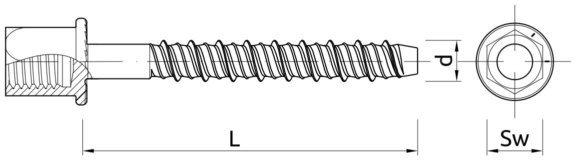
R-LX-HF HEXAGONAL HEAD SCREW WITH WASHER



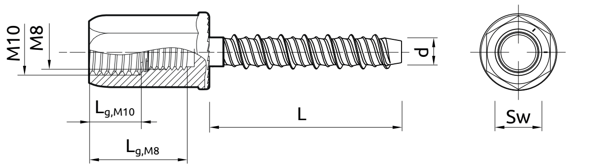
R-LX-CS COUNTERSUNK HEAD SCREW



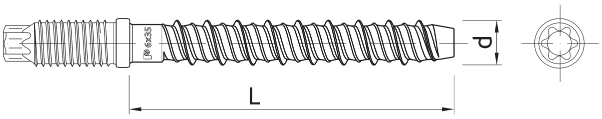
R-LX-I INTERNALLY THREADED HEAD SCREW



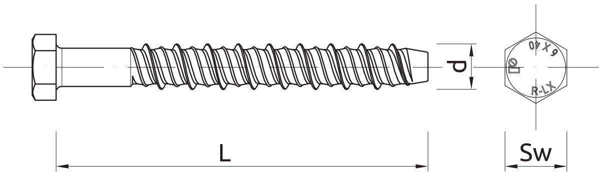
R-LX-I 8/10 INTERNALLY THREADED HEAD SCREW



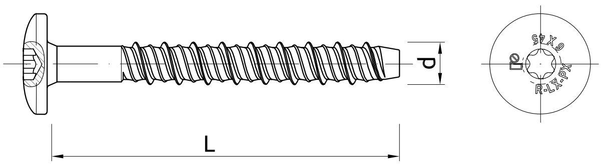
R-LX-E EXTERNALLY THREADED HEAD SCREW



R-LX-H HEXAGONAL HEAD SCREW FOR TEMPORARY INSTALLATION



R-LX-PX-ZP PANHEAD XL SCREW



PRODUCT INFORMATION

	Product Code		Drill	Anchor			Fixture		
				Diameter	Length	Internal thread	Max. thickness t_{fix} for:		Hole diameter
				d	L		$h_{nom,s}$	$h_{nom,r}$	d_f
				[mm]	[mm]		[mm]	[mm]	[mm]
R-LX-HF Hex with Flange									
	R-LX-HF-ZF	**R-LX-HF-ZP**							
5	R-LX-05X050-HF-ZF	R-LX-05X050-HF-ZP	5	6.3	50	-	7	-	7
	R-LX-05X075-HF-ZF	R-LX-05X075-HF-ZP	5	6.3	75	-	32	-	7
	R-LX-06X050-HF-ZF	R-LX-06X050-HF-ZP	6	7.5	50	-	-	7	9
	-	R-LX-06X060-HF-ZP	6	7.5	60	-	5	17	9
	R-LX-06X075-HF-ZF	R-LX-06X075-HF-ZP	6	7.5	75	-	20	32	9
6	-	R-LX-06X090-HF-ZP	6	7.5	90	-	35	47	9
	R-LX-06X100-HF-ZF	R-LX-06X100-HF-ZP	6	7.5	100	-	45	57	9
	R-LX-06X130-HF-ZF	R-LX-06X130-HF-ZP	6	7.5	130	-	75	87	9
	R-LX-06X150-HF-ZF	R-LX-06X150-HF-ZP	6	7.5	150	-	95	107	9
	R-LX-08X060-HF-ZF	R-LX-08X060-HF-ZP	8	10	60	-	-	10	12
	R-LX-08X075-HF-ZF	R-LX-08X075-HF-ZP	8	10	75	-	5	30	12
	R-LX-08X090-HF-ZF	R-LX-08X090-HF-ZP	8	10	90	-	20	40	12
8	R-LX-08X100-HF-ZF	R-LX-08X100-HF-ZP	8	10	100	-	30	50	12
	-	R-LX-08X120-HF-ZP	8	10	120	-	50	70	12
	R-LX-08X130-HF-ZF	R-LX-08X130-HF-ZP	8	10	130	-	60	80	12
	R-LX-08X150-HF-ZF	R-LX-08X150-HF-ZP	8	10	150	-	80	100	12
	-	R-LX-10X060-HF-ZP	10	12.5	60	-	-	5	14
	R-LX-10X065-HF-ZF	R-LX-10X065-HF-ZP	10	12.5	65	-	-	10	14
	R-LX-10X075-HF-ZF	R-LX-10X075-HF-ZP	10	12.5	75	-	-	20	14
	R-LX-10X085-HF-ZF	R-LX-10X085-HF-ZP	10	12.5	85	-	-	30	14
	-	R-LX-10X090-HF-ZP	10	12.5	90	-	5	35	14
10	R-LX-10X100-HF-ZF	R-LX-10X100-HF-ZP	10	12.5	100	-	15	45	14
	-	R-LX-10X110-HF-ZP	10	12.5	110	-	25	55	14
	R-LX-10X120-HF-ZF	R-LX-10X120-HF-ZP	10	12.5	120	-	35	65	14
	-	R-LX-10X130-HF-ZP	10	12.5	130	-	45	75	14
	R-LX-10X140-HF-ZF	R-LX-10X140-HF-ZP	10	12.5	140	-	55	85	14
	-	R-LX-10X150-HF-ZP	10	12,.5	150	-	65	95	14
	R-LX-12X075-HF-ZF	R-LX-12X075-HF-ZP	12	14	75	-	-	10	16
12	R-LX-12X100-HF-ZF	R-LX-12X100-HF-ZP	12	14	100	-	-	35	16
	R-LX-12X130-HF-ZF	R-LX-12X130-HF-ZP	12	14	130	-	30	65	16
	R-LX-12X150-HF-ZF	R-LX-12X150-HF-ZP	12	14	150	-	50	85	16

R-LX CONCRETE SCREW ANCHORS - STRUCTURAL FIXINGS

PRODUCT INFORMATION

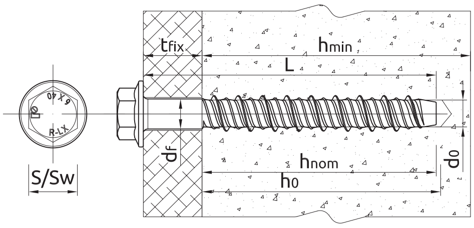
	Product Code		Drill	Anchor			Fixture		
				Diameter	Length	Internal thread	Max. thickness t_{fix} for:		Hole diameter
				d	L		$h_{nom,s}$	$h_{nom,r}$	d_f
				[mm]	[mm]		[mm]	[mm]	[mm]
14	R-LX-14X080-HF-ZF	R-LX-14X080-HF-ZP	14	17	80	-	-	5	18
	R-LX-14X105-HF-ZF	R-LX-14X105-HF-ZP	14	17	105	-	-	30	18
	R-LX-14X115-HF-ZF	R-LX-14X115-HF-ZP	14	17	115	-	-	40	18
	R-LX-14X135-HF-ZF	R-LX-14X135-HF-ZP	14	17	135	-	15	60	18
	-	R-LX-14X160-HF-ZP	14	17	160	-	40	85	18
R-LX-CS Countresunk head screw									
	R-LX-CS-ZF	**R-LX-CS-ZP**							
5	R-LX-05X050-CS-ZF	R-LX-05X050-CS-ZP	5	6.3	50	-	7	-	7
	R-LX-05X075-CS-ZF	R-LX-05X075-CS-ZP	5	6.3	75	-	32	-	7
6	R-LX-06X050-CS-ZF	R-LX-06X050-CS-ZP	6	7.5	50	-	-	7	9
	-	R-LX-06X060-CS-ZP	6	7.5	60	-	5	17	9
	R-LX-06X075-CS-ZF	R-LX-06X075-CS-ZP	6	7.5	75	-	20	32	9
	-	R-LX-06X090-CS-ZP	6	7.5	90	-	35	47	9
	R-LX-06X100-CS-ZF	R-LX-06X100-CS-ZP	6	7.5	100	-	45	57	9
	R-LX-06X130-CS-ZF	R-LX-06X130-CS-ZP	6	7.5	130	-	75	87	9
	R-LX-06X150-CS-ZF	R-LX-06X150-CS-ZP	6	7.5	150	-	95	107	9
8	R-LX-08X060-CS-ZF	R-LX-08X060-CS-ZP	8	10	60	-	-	10	12
	R-LX-08X075-CS-ZF	R-LX-08X075-CS-ZP	8	10	75	-	5	30	12
	R-LX-08X090-CS-ZF	R-LX-08X090-CS-ZP	8	10	90	-	20	40	12
	R-LX-08X100-CS-ZF	R-LX-08X100-CS-ZP	8	10	100	-	30	50	12
	-	R-LX-08X120-CS-ZP	8	10	120	-	50	70	12
	R-LX-08X130-CS-ZF	R-LX-08X130-CS-ZP	8	10	130	-	60	80	12
	R-LX-08X150-CS-ZF	R-LX-08X150-CS-ZP	8	10	150	-	80	100	12
10	-	R-LX-10X060-CS-ZP	10	12.5	60	-	-	5	14
	R-LX-10X065-CS-ZF	R-LX-10X065-CS-ZP	10	12.5	65	-	-	10	14
	R-LX-10X075-CS-ZF	R-LX-10X075-CS-ZP	10	12.5	75	-	-	20	14
	R-LX-10X085-CS-ZF	R-LX-10X085-CS-ZP	10	12.5	85	-	-	30	14
	-	R-LX-10X090-CS-ZP	10	12.5	90	-	5	35	14
	R-LX-10X100-CS-ZF	R-LX-10X100-CS-ZP	10	12.5	100	-	15	45	14
	-	R-LX-10X110-CS-ZP	10	12.5	110	-	25	55	14
	R-LX-10X120-CS-ZF	R-LX-10X120-CS-ZP	10	12.5	120	-	35	65	14
	-	R-LX-10X130-CS-ZP	10	12.5	130	-	45	75	14
	R-LX-10X140-CS-ZF	R-LX-10X140-CS-ZP	10	12.5	140	-	55	85	14
	-	R-LX-10X150-CS-ZP	10	12.5	150	-	65	95	14
	R-LX-10X160-CS-ZF	R-LX-10X160-CS-ZP	10	12.5	160	-	75	105	14
R-LX-I Internally threaded head									
		R-LX-I-ZP							
5		R-LX-05X025-I06-ZP	5	6	35	M8	-	-	
6		R-LX-06X035-I06-ZP	6	7.5	35	M8			
	-	R-LX-06X035-I08/10Z	6	7.5	35	M8	-	-	-
	-	R-LX-06X055-I08/10Z	6	7.5	35	M8	-	-	-
	-	R-LX-06X055-I08-ZP	6	7.5	55	M8	-	-	-
	-	R-LX-06X055-I10-ZP	6	7.5	55	M10	-	-	-
		R-LX-06X035-I06-ZP	6	7.5	35	M8	-	-	-
		R-LX-06X035-I08-ZP	6	7.5	35	M8	-	-	-
		R-LX-06X055-I08-ZP	6	7.5	55	M8	-	-	-
		R-LX-06X035-I10-ZP	6	7.5	35	M10	-	-	-
		R-LX-06X055-I10-ZP	6	7.5	55	M10	-	-	-
		R-LX-06X035-I08/10Z	6	7.5	35	M8	-	-	-
		R-LX-06X055-I08/10Z	7	7.6	55	M9	-	-	-
8	-	R-LX-08X050-I12-ZP	8	10	50	M12	-	-	-
10	-	R-LX-10X055-I16-ZP	10	12.5	55	M16	-	-	-
R-LX-E Externally threaded head									
		R-LX-E-ZP							
6	-	R-LX-06X055-E-ZP	6	7.5	55	-	-	-	-
R-LX-PX-ZP Pan-head XL									
		R-LX-PX-ZP							
6		R-LX-06X035-PX-ZP	6	7.5	35	-	-	-	9
	-	R-LX-06X050-PX-ZP	6	7.5	50	-	15	11	9
R-LX-H Hexagonal head									
		R-LX-H-ZP							
8	*R-LX-08X060-H-ZF	*R-LX-08X060-H-ZP	8	10	60	-	-	10	12
	*R-LX-08X075-H-ZF	*R-LX-08X075-H-ZP	8	10	75	-	5	25	12
	*R-LX-08X090-H-ZF	*R-LX-08X090-H-ZP	8	10	90	-	20	40	12
	*R-LX-08X100-H-ZF	*R-LX-08X100-H-ZP	8	10	100	-	30	50	12
	*R-LX-08X130-H-ZF	*R-LX-08X130-H-ZP	8	10	130	-	60	80	12
	*R-LX-08X150-H-ZF	*R-LX-08X150-H-ZP	8	10	150	-	80	100	12
10	*R-LX-10X065-H-ZF	*R-LX-10X065-H-ZP	10	12.5	65	-	-	10	14
	*R-LX-10X075-H-ZF	*R-LX-10X075-H-ZP	10	12.5	75	-	-	20	14
	*R-LX-10X085-H-ZF	*R-LX-10X085-H-ZP	10	12.5	85	-	-	30	14
	*R-LX-10X100-H-ZF	*R-LX-10X100-H-ZP	10	12.5	100	-	15	45	14
	*R-LX-10X120-H-ZF	*R-LX-10X120-H-ZP	10	12.5	120	-	35	65	14
	*R-LX-10X140-H-ZF	*R-LX-10X140-H-ZP	10	12.5	140	-	55	85	14

*not included in the approval

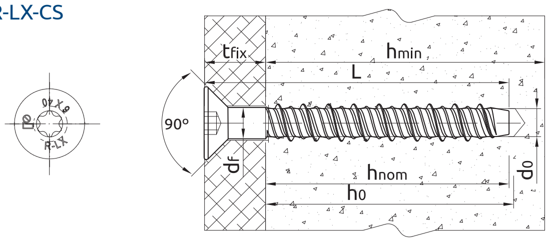
R-LX CONCRETE SCREW ANCHORS - STRUCTURAL FIXINGS

INSTALLATION DATA

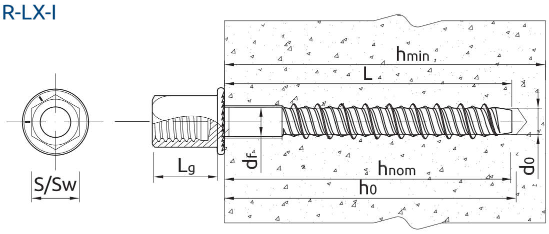
R-LX-HF



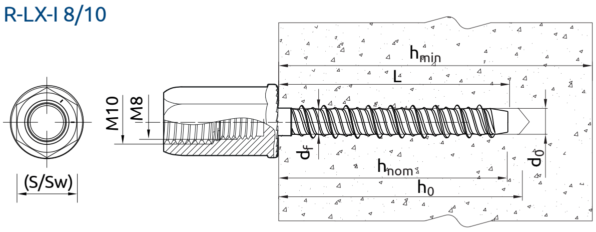
R-LX-CS



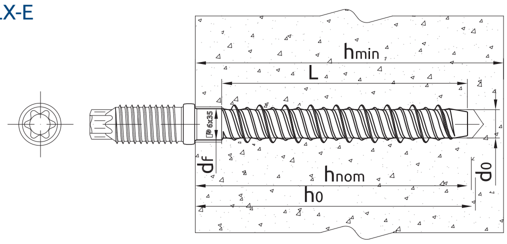
R-LX-I



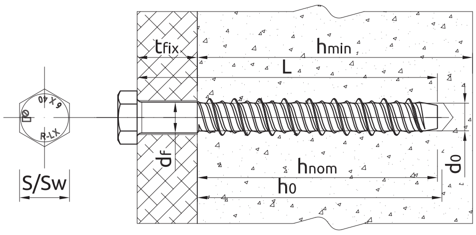
R-LX-I 8/10



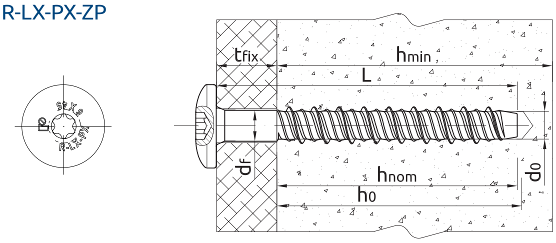
R-LX-E



R-LX-



R-LX-PX-ZP



Size			5	6	8	10	12	14
Thread diameter	d	[mm]	6.3	7.5	10	12.5	14.9	17
Hole diameter in substrate	d_0	[mm]	5	6	8	10	12	14
Wrench size for hex head	Sw	[mm]	8	10	13	15	17	19
Wrench size for internally threaded head	Sw_i	[mm]	10	13	15	21	-	-
Torx driver for externally threaded head			-	E7	-	-	-	-
Torx driver for countersunk and pan head			T25	T30	T45	T50	-	-
Max. installation torque for impact driver	$T_{imp,max}$	[Nm]	200	400	900	950	950	950
STANDARD EMBEDMENT DEPTH								
Min. hole depth in substrate	$h_{0,s}$	[mm]	50	65	80	95	110	130
Real hole depth in substrate	h_0	[mm]	L + 10 - t_{fix}	L + 10 - t_{fix}	L + 10 - t_{fix}	L + 10 - t_{fix}	L + 10 - t_{fix}	L + 10 - t_{fix}
Min. installation depth	$h_{nom,s}$	[mm]	43	55	70	85	100	120
Min. substrate thickness	$h_{min,s}$	[mm]	100	100	110	130	155	190
Min. spacing	$s_{min,s}$	[mm]	40	45	50	60	80	100
Min. edge distance	$c_{min,s}$	[mm]	40	45	50	60	80	100
REDUCED EMBEDMENT DEPTH								
Min. hole depth in substrate	$h_{0,r}$	[mm]	-	50	60	65	70	85
Real hole depth in substrate	h_0	[mm]	-	L + 10 - t_{fix}	L + 10 - t_{fix}	L + 10 - t_{fix}	L + 10 - t_{fix}	L + 10 - t_{fix}
Min. installation depth	$h_{nom,r}$	[mm]	-	43	50	55	60	75
Min. substrate thickness	$h_{min,r}$	[mm]	-	100	100	100	110	110
Min. spacing	$s_{min,r}$	[mm]	-	45	50	60	80	100
Min. edge distance	$c_{min,r}$	[mm]	-	45	50	60	80	100

MECHANICAL PROPERTIES

Size			5	6	8	10	12	14
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	1300	1250	1200	1050	1000	1020
Nominal yield strength - tension	f_{yk}	[N/mm²]	1150	1100	1050	950	900	800
Cross sectional area - tension	A_s	[mm²]	19.6	28.3	50.3	78.5	113.1	153.9
Elastic section modulus	W_{el}	[mm³]	12.2	21.2	50.3	98.1	169.6	269.3
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	19.0	31.8	72.4	123.6	203.3	329.6
Design bending resistance	M	[Nm]	12.7	12.2	48.3	82.4	135.5	219.8

R-LX CONCRETE SCREW ANCHORS - STRUCTURAL FIXINGS

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing - ETAG001

Size		5	6	8	10	12	14
Standard embedment depth h_{nom}	[mm]	43.00	55.00	70.00	85.00	100.00	120.00
Reduced embedment depth h_{nom}	[mm]	-	43.00	50.00	55.00	60.00	75.00
MEAN ULTIMATE LOAD							
TENSION LOAD $N_{Ru.m}$							
NON-CRACKED CONCRETE C20/25							
Standard embedment depth	[kN]	10.10	14.80	26.04	35.37	-	59.96
Reduced embedment depth	[kN]	-	11.09	15.19	17.08	-	27.53
CRACKED CONCRETE C20/25							
Standard embedment depth	[kN]	7.10	11.10	18.33	24.89	-	41.92
Reduced embedment depth	[kN]	-	7.81	10.69	12.02	-	19.37
SHEAR LOAD $V_{Ru.m}$							
NON-CRACKED CONCRETE C20/25							
Standard embedment depth	[kN]	10.10	14.80	26.04	49.46	-	94.19
Reduced embedment depth	[kN]	-	11.09	15.19	17.08	-	27.53
CRACKED CONCRETE C20/25							
Standard embedment depth	[kN]	7.10	11.10	18.33	49.46	-	83.83
Reduced embedment depth	[kN]	-	7.81	10.69	12.02	-	19.37
CHARACTERISTIC LOAD							
TENSION LOAD N_{Rk}							
NON-CRACKED CONCRETE C20/25							
Standard embedment depth	[kN]	7.00	12.00	19.49	26.46	33.46	44.56
Reduced embedment depth	[kN]	-	9.14	10.91	12.78	12.00	20.04
CRACKED CONCRETE C20/25							
Standard embedment depth	[kN]	4.50	7.00	13.00	18.87	23.85	31.77
Reduced embedment depth	[kN]	-	6.52	7.50	8.00	7.00	13.00
SHEAR LOAD V_{Rk}							
NON-CRACKED CONCRETE C20/25							
Standard embedment depth	[kN]	9.14	13.75	19.49	41.20	57.00	78.50
Reduced embedment depth	[kN]	-	9.14	10.91	12.78	13.75	20.04
CRACKED CONCRETE C20/25							
Standard embedment depth	[kN]	6.52	9.80	13.89	37.73	47.70	63.54
Reduced embedment depth	[kN]	-	6.52	7.78	9.11	9.80	14.29
DESIGN LOAD							
TENSION LOAD N_{Rd}							
NON-CRACKED CONCRETE C20/25							
Standard embedment depth	[kN]	3.89	8.00	12.99	17.64	22.31	29.71
Reduced embedment depth	[kN]	-	6.09	7.27	8.52	8.00	13.36
CRACKED CONCRETE C20/25							
Standard embedment depth	[kN]	2.50	4.67	8.67	12.58	15.90	21.18
Reduced embedment depth	[kN]	-	4.34	5.00	5.33	4.67	8.67
SHEAR LOAD V_{Rd}							
NON-CRACKED CONCRETE C20/25							
Standard embedment depth	[kN]	6.09	9.16	12.99	27.47	38.00	52.33
Reduced embedment depth	[kN]	-	6.09	7.27	8.52	9.16	13.36
CRACKED CONCRETE C20/25							
Standard embedment depth	[kN]	4.34	6.53	9.26	25.15	31.8	42.36
Reduced embedment depth	[kN]	-	4.34	5.18	6.07	6.53	9.52
RECOMMENDED LOAD							
TENSION LOAD N_{rec}							
NON-CRACKED CONCRETE C20/25							
Standard embedment depth	[kN]	2.78	5.71	9.28	12.60	15.93	21.22
Reduced embedment depth	[kN]	-	4.35	5.19	6.09	5.71	9.54
CRACKED CONCRETE C20/25							
Standard embedment depth	[kN]	1.79	3.34	6.19	8.98	11.35	15.13
Reduced embedment depth	[kN]	-	3.10	3.57	3.81	3.33	6.19
SHEAR LOAD V_{rec}							
NON-CRACKED CONCRETE C20/25							
Standard embedment depth	[kN]	4.35	6.54	9.28	19.62	27.14	37.38
Reduced embedment depth	[kN]	-	4.35	5.19	6.09	6.55	9.54
CRACKED CONCRETE C20/25							
Standard embedment depth	[kN]	3.10	4.66	6.61	17.96	22.72	30.26
Reduced embedment depth	[kN]	-	3.10	3.70	4.34	4.67	6.80

R-LX CONCRETE SCREW ANCHORS - STRUCTURAL FIXINGS

DESIGN PERFORMANCE DATA

Standard embedment depth

Size			5	6	8	10	12	14
Min. installation depth	h_{nom}	[mm]	43.0	55.0	70.0	85.0	100.0	120.0
Effective embedment depth	h_{ef}	[mm]	32.0	42.0	53.0	65.0	76.0	92.0
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk.s}$	[kN]	25.50	35.40	60.40	82.40	113.0	157.00
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.4	1.50
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25								
Characteristic resistance	$N_{Rk.p}$	[kN]	7.00	12.00	-	-	-	-
PULL-OUT FAILURE; CRACKED CONCRETE C20/25								
Characteristic resistance	$N_{Rk.p}$	[kN]	4.50	7.00	13.00	-	-	-
PULL-OUT FAILURE								
Installation safety factor	γ_2	-	1.20	1.00	1.00	1.00	1.00	1.00
Increasing factors for $N_{Rd.p}$ - C30/37	Ψ_c	-	1.08	1.08	1.08	1.08	1.08	1.08
Increasing factors for $N_{Rd.p}$ - C40/50	Ψ_c	-	1.15	1.15	1.15	1.15	1.15	1.15
Increasing factors for $N_{Rd.p}$ - C50/60	Ψ_c	-	1.19	1.19	1.19	1.19	1.19	1.19
CONCRETE CONE FAILURE								
Installation safety factor	γ_2	-	1.20	1.00	1.00	1.00	1.00	1.00
Factor for cracked concrete	k	-	7.20	7.20	7.20	7.20	7.20	7.20
Factor for cracked concrete	$k_{cr.N}$	-	7.70	7.70	7.70	7.70	7.70	7.70
Factor for non-cracked concrete	k	-	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr.N}$	-	11.00	11.00	11.00	11.00	11.00	11.00
Spacing	$s_{cr.N}$	[mm]	90.00	126.00	160.00	196.00	228.00	276.00
Edge distance	$c_{cr.N}$	[mm]	45.00	63.00	80.00	98.00	114.00	138.00
CONCRETE SPLITTING FAILURE								
Installation safety factor	γ_2	-	1.20	1.00	1.00	1.00	1.00	1.00
Spacing	$s_{cr.sp}$	[mm]	90.00	126.00	160.00	222.00	228.00	312.00
Edge distance	$c_{cr.sp}$	[mm]	45.00	63.00	80.00	111.00	114.00	156.00
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk.s}$	[kN]	12.70	17.70	30.20	41.20	57.00	78.50
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk.s}$	[Nm]	19.00	31.80	72.40	123.60	203.30	329.60
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50
CONCRETE PRY-OUT FAILURE								
Factor	k	-	1.00	1.00	1.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE								
Effective length of anchor	ℓ_f	[mm]	32.00	42.00	53.00	65.00	100.00	92.00
Anchor diameter	d_{nom}	[mm]	6.00	6.00	8.00	10.00	12.00	14.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00

(-) failure is not decisive

R-LX CONCRETE SCREW ANCHORS - STRUCTURAL FIXINGS

DESIGN PERFORMANCE DATA

Characteristic Resistance under fire exposure in concrete C20/25 to C50/60 - standard embedment depth

Size			5	6	8	10	12	14
TENSION LOAD								
Edge distance	c_{cr}	[mm]	64.00	84.00	106.00	130.00	152.00	184.00
Spacing	s_{cr}	[mm]	128.00	168.00	212.00	260.00	304.00	368.00
R (for EI) = 30 min								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	0.20	0.28	0.75	1.57	2.26	3.08
PULL-OUT FAILURE								
Characteristic resistance	$N_{Rk,p}$	[kN]	1.13	1.75	3.25	4.75	6.5	8.50
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.20	0.28	0.75	1.57	2.26	3.08
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.15	0.25	0.90	2.36	4.07	6.47
R (for EI) = 60 min								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	0.18	0.25	0.65	1.18	1.70	2.31
PULL-OUT FAILURE								
Characteristic resistance	$N_{Rk,p}$	[kN]	1.13	1.75	3.25	4.75	6.50	8.50
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.18	0.25	0.65	1.18	1.70	2.31
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.13	0.23	0.78	1.77	3.05	4.85
R (for EI) = 90 min								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	0.14	0.20	0.50	1.02	1.47	2.00
PULL-OUT FAILURE								
Characteristic resistance	$N_{Rk,p}$	[kN]	1.13	1.75	3.25	4.75	6.05	8.50
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.14	0.20	0.50	1.02	1.47	2.00
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.10	0.18	0.60	1.53	2.65	4.20
R (for EI) = 120 min								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	0.10	0.14	0.40	0.79	1.13	1.54
PULL-OUT FAILURE								
Characteristic resistance	$N_{Rk,p}$	[kN]	0.90	1.40	2.60	3.80	5.20	6.80
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.10	0.14	0.40	0.79	1.13	1.54
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.07	0.13	0.48	1.18	2.04	3.23

Allowable values for resistance in case of Seismic performance category C1 - standard embedment depth

Size			5	6	8	10	12	14
Effective embedment depth	h_{ef}	[mm]	-	-	53.0	65.0	-	92.0
TENSION LOAD, STEEL FAILURE								
Characteristic resistance	$N_{Rk,s,seisC1}$	[kN]	-	-	60.00	82.00	-	157.00
Partial safety factor	$\gamma_{Ms,seisC1}$	-	-	-	1.40	1.40	-	1.50
TENSION LOAD, PULL-OUT FAILURE								
Characteristic resistance	$NR_{k,p,seisC1}$	[kN]	-	-	5.00	13.00	-	19.00
Partial safety factor	$\gamma_{Mp,seisC1}$	-	-	-	1.50	1.50	-	1.50
SHEAR LOAD, STEEL FAILURE								
Characteristic resistance	$V_{Rk,s,seisC1}$	[kN]	-	-	15.10	27.40	-	52.30
Partial safety factor	$\gamma_{Ms,seisC1}$	-	-	-	1.50	1.50	-	1.50

R-LX CONCRETE SCREW ANCHORS - STRUCTURAL FIXINGS

DESIGN PERFORMANCE DATA

Allowable values for resistance in case of Seismic performance category C2 - standard embedment depth

Size			5	6	8	10	12	14
Effective embedment depth	h_{ef}	[mm]	-	-	53.0	65.0	-	92.0
TENSION LOAD, STEEL FAILURE								
Characteristic resistance	$N_{Rk,s,seisC2}$	[kN]	-	-	60.00	82.00	-	157.00
Partial safety factor	$\gamma_{Ms,seisC2}$	-	-	-	1.40	1.40	-	1.50
TENSION LOAD, PULL-OUT FAILURE								
Characteristic resistance	$N_{Rk,p,seisC2}$	[kN]	-	-	1.50	4.90	-	14.80
Partial safety factor	$\gamma_{Mp,seisC2}$	-	-	-	1.50	1.50	-	1.50
SHEAR LOAD, STEEL FAILURE								
Characteristic resistance	$V_{Rk,s,seisC2}$	[kN]	-	-	9.90	20.60	-	35.10
Partial safety factor	$\gamma_{Ms,seisC2}$	-	-	-	1,.50	1.50	-	1.50

DESIGN PERFORMANCE DATA

Reduced embedment depth

Size			5	6	8	10	12	14
Min. installation depth	h_{nom}	[mm]	-	43.00	50.00	55.00	60.00	75.00
Effective embedment depth	h_{ef}	[mm]	-	32.00	36.00	40.00	42.00	54.00
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	-	35.40	60.40	82.40	113.00	157.00
Partial safety factor	γ_{Ms}	-	-	1.40	1.40	1.40	1.40	1.50
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25								
Characteristic resistance	$N_{Rk,p}$	[kN]	-	-	-	-	12	-
PULL-OUT FAILURE; CRACKED CONCRETE C20/25								
Characteristic resistance	$N_{Rk,p}$	[kN]	-	-	7.50	8.00	7.00	13.00
PULL-OUT FAILURE								
Installation safety factor	γ_2	-	-	1.00	1.00	1.00	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	-	1.08	1.08	1.08	1.08	1.08
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	-	1.15	1.15	1.15	1.15	1.15
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	-	1.19	1.19	1.19	1.19	1.19
CONCRETE CONE FAILURE								
Installation safety factor	γ_2	-	-	1.00	1.00	1.00	1.00	1.00
Factor for cracked concrete	k	-	-	7.20	7.20	7.20	7.20	7.20
Factor for cracked concrete	$k_{cr,N}$	-	-	7.70	7.70	7.70	7.70	7.70
Factor for non-cracked concrete	k	-	-	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	-	11.00	11.00	11.00	11.00	11.00
Spacing	$s_{cr,N}$	[mm]	-	126.00	160.00	196.00	126.00	276.00
Edge distance	$c_{cr,N}$	[mm]	-	63.00	80.00	98.00	63.00	138.00
CONCRETE SPLITTING FAILURE								
Installation safety factor	γ_2	-	-	1.00	1.00	1.00	1.00	1.00
Spacing	$s_{cr,sp}$	[mm]	-	90.00	112.00	136.00	126.00	188.00
Edge distance	$c_{cr,sp}$	[mm]	-	45.00	56.00	68.00	63.00	94.00
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	-	17.70	30.20	41.20	57.00	78.50
Ductility factor	k_7	-	-	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	-	31.80	72.40	123.60	203.30	329.60
Partial safety factor	γ_{Ms}	-	-	1.50	1.50	1.50	1.50	1.50
CONCRETE PRY-OUT FAILURE								
Factor	k	-	-	1.00	1.00	1.00	1.00	1.00
Installation safety factor	γ_2	-	-	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE								
Effective length of anchor	ℓ_f	[mm]	-	32.00	36.00	40.00	60.00	54.00
Anchor diameter	d_{nom}	[mm]	-	6.00	8.00	10.00	12.00	14.00
Installation safety factor	γ_2	-	-	1.00	1.00	1.00	1.00	1.00

R-LX CONCRETE SCREW ANCHORS - STRUCTURAL FIXINGS

DESIGN PERFORMANCE DATA

Characteristic Resistance under fire exposure in concrete C20/25 to C50/60 - reduced embedment depth

Size			5	6	8	10	12	14
TENSION LOAD								
Edge distance	c_{cr}	[mm]	-	64.00	72.00	80.00	84.00	108.00
Spacing	s_{cr}	[mm]	-	128.00	144.00	160.00	168.00	216.00
R (for EI) = 30 min								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	-	0.28	0.75	1.57	2.26	3.08
PULL-OUT FAILURE								
Characteristic resistance	$N_{Rk,p}$	[kN]	-	1.38	1.88	2.00	1.75	3.25
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	-	0.28	0.75	1.57	2.06	3.08
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	-	0.25	0.90	2.36	4.07	6.47
R (for EI) = 60 min								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	-	0.25	0.65	1.18	1.70	2.31
PULL-OUT FAILURE								
Characteristic resistance	$N_{Rk,p}$	[kN]	-	1.38	1.88	2.00	1.75	3.25
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	-	0.25	0.65	1.18	1.70	2.31
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	-	0.23	0.78	1.77	3.05	4.85
R (for EI) = 90 min								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	-	0.20	0.50	1.02	1.47	2.00
PULL-OUT FAILURE								
Characteristic resistance	$N_{Rk,p}$	[kN]	-	1.38	1.88	2.00	1.75	3.25
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	-	0.20	0.50	1.02	1.47	2.00
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	-	0.18	0.60	1.53	2.65	4.20
R (for EI) = 120 min								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	-	0.14	0.40	0.79	1.13	1.54
PULL-OUT FAILURE								
Characteristic resistance	$N_{Rk,p}$	[kN]	-	1.10	1.50	1.60	1.40	2.60
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	-	0.14	0.40	0.79	1.13	1.54
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	-	1.10	1.50	1.60	2.04	2.60

R-HPTIIA4 STAINLESS STEEL THROUGHBOLT

Stainless steel throughbolt anchor for cracked and non-cracked concrete

ETA 17/0185

FEATURES AND BENEFITS

- Stainless steel anchor for the highest corrosion resistance
- High performance in cracked and non-cracked concrete confirmed by ETA Option 1
- Highest quality ensures maximum load capability
- For applications requiring fire resistance up to 120 minutes
- Suitable for reduced embedment to avoid contact with reinforcement
- Embedment depth markings help to ensure precise installation of the anchor
- Design of R-HPTII allows drilling and installing directly through the fixture and helps to reduce installation time
- Suitable for installation in corrosive environments category C1, C2, C3,C4 and C5

APPLICATIONS

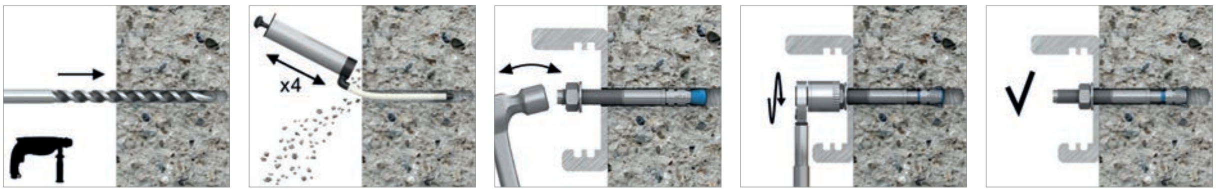
- Cladding restraints
- Barriers
- Structural steel
- Curtain walling
- Handrails
- Heavy Plant
- Balustrading
- Passenger lifts
- Facades
- Fencing & gates manufacturing and installation
- Masonry support
- Platforms
- Public seating
- Racking systems

BASE MATERIALS

Approved for use in:
- Cracked concrete C20/25-C50/60
- Non-cracked concrete C20/25-C50/60
- Reinforced concrete
- Unreinforced concrete

Also suitable for use in:
- Natural Stone (after site testing)

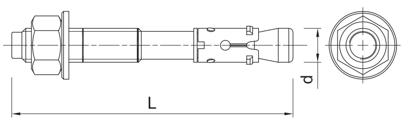
INSTALLATION GUIDE



1. Drill a hole of required diameter and depth.
2. Clear the hole of drilling dust and debris (using blow pump and brush or equivalent method).
3. Lightly tap the throughbolt through the fixture into hole with a hammer, until fixing depth is reached.
4. Tighten to the recommended torque.
5. After installation.

PRODUCT INFORMATION

Size	Product Code: Regular washer DIN 125A	Product Code: Large washer DIN 9021	Anchor: Diameter d [mm]	Anchor: Length L [mm]	Fixture: Max. thickness t_{fix} for: $h_{nom,red}$ [mm]	Fixture: Max. thickness t_{fix} for: $h_{nom,std}$ [mm]	Fixture: Hole diameter d_f [mm]
M8	R-HPTIIA4-08060/10	R-HPTIIA4D08060/10	8	60	10	-	9
	R-HPTIIA4-08075/10	R-HPTIIA4D08075/10	8	75	25	10	9
	R-HPTIIA4-08085/20	R-HPTIIA4D08085/20	8	85	35	20	9
	R-HPTIIA4-08095/30	R-HPTIIA4D08095/30	8	95	45	30	9
	R-HPTIIA4-08105/40	R-HPTIIA4D08105/40	8	105	55	40	9
	R-HPTIIA4-08115/50	R-HPTIIA4D08115/50	8	115	65	50	9
M10	R-HPTIIA4-10065/5	R-HPTIIA4D10065/5	10	65	5	-	11
	R-HPTIIA4-10080/20	R-HPTIIA4D10080/20	10	80	20	-	11
	R-HPTIIA4-10095/15	R-HPTIIA4D10095/15	10	95	35	15	11
	R-HPTIIA4-10115/35	R-HPTIIA4D10115/35	10	115	55	35	11
	R-HPTIIA4-10130/50	R-HPTIIA4D10130/50	10	130	70	50	11
	R-HPTIIA4-10140/60	R-HPTIIA4D10140/60	10	140	80	60	11
M12	R-HPTIIA4-12080/5	R-HPTIIA4D12080/5	12	80	5	-	13
	R-HPTIIA4-12100/5	R-HPTIIA4D12100/5	12	100	25	5	13
	R-HPTIIA4-12115/20	R-HPTIIA4D12115/20	12	115	40	20	13
	R-HPTIIA4-12125/30	R-HPTIIA4D12125/30	12	125	50	30	13
	R-HPTIIA4-12150/55	R-HPTIIA4D12150/55	12	150	75	55	13
	R-HPTIIA4-12180/85	R-HPTIIA4D12180/85	12	180	105	85	13



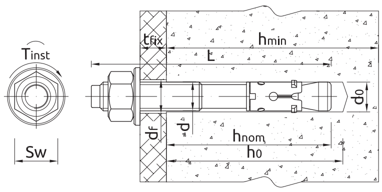
R-HPTIIA4 STAINLESS STEEL THROUGHBOLT

PRODUCT INFORMATION

Size	Product Code		Anchor		Fixture		
			Diameter	Length	Max. thickness t_{fix} for:		Hole diameter
	Regular washer DIN 125A	Large washer DIN 9021	d	L	$h_{nom,red}$	$h_{nom,std}$	d_f
			[mm]	[mm]	[mm]	[mm]	[mm]
M16	R-HPTIIA4-16125/5	R-HPTIIA4D16125/5	16	125	25	5	18
	R-HPTIIA4-16140/20	R-HPTIIA4D16140/20	16	140	40	20	18
	R-HPTIIA4-16150/30	R-HPTIIA4D16150/30	16	150	50	30	18
	R-HPTIIA4-16180/60	R-HPTIIA4D16180/60	16	180	80	60	18

INSTALLATION DATA

Size			M8	M10	M12	M16
Thread diameter	d	[mm]	8	10	12	16
Hole diameter in substrate	d_0	[mm]	8	10	12	16
Installation torque	T_{inst}	[Nm]	15	30	50	100
Wrench size	Sw	[mm]	13	17	19	24
External diameter of washer DIN 125A	-	[mm]	16	20	24	30
External diameter of washer DIN 9021	-	[mm]	24	30	37	50
STANDARD EMBEDMENT DEPTH						
Min. hole depth in substrate	$h_{0,s}$	[mm]	65	80	90	110
Min. installation depth	$h_{nom,s}$	[mm]	55	69	80	100
Min. substrate thickness	$h_{min,s}$	[mm]	100	120	140	170
Min. spacing (Non-cracked concrete)	$s_{min,s}$	[mm]	55	70	90	135
Min. spacing (Cracked concrete)	$s_{min,s}$	[mm]	55	70	90	135
Min. edge distance (Non-cracked concrete)	$c_{min,s}$	[mm]	40	50	55	80
Min. edge distance (Cracked concrete)	$c_{min,s}$	[mm]	40	45	55	70
REDUCED EMBEDMENT DEPTH						
Min. hole depth in substrate	$h_{0,r}$	[mm]	50	60	70	90
Min. installation depth	$h_{nom,r}$	[mm]	40	49	60	80
Min. substrate thickness	$h_{min,r}$	[mm]	100	100	100	130
Min. spacing (Non-cracked concrete)	$s_{min,r}$	[mm]	50	70	120	150
Min. spacing (Cracked concrete)	$s_{min,r}$	[mm]	50	70	120	150
Min. edge distance (Non-cracked concrete)	$c_{min,r}$	[mm]	50	60	70	90
Min. edge distance (Cracked concrete)	$c_{min,r}$	[mm]	40	50	70	85



MECHANICAL PROPERTIES

Size			M8	M10	M12	M16
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	600	600	550	550
Nominal yield strength - tension	f_{yk}	[N/mm²]	450	450	413	413
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157
Elastic section modulus	W_{el}	[mm³]	50.27	98.17	169.65	402.12
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	22	45	72	180
Design bending resistance	M	[Nm]	18	36	57	144

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M8	M10	M12	M16
CRACKED AND NON-CRACKED					
Standard embedment depth h_{nom}	[mm]	55.00	69.00	80.00	100.00
Reduced embedment depth h_{nom}	[mm]	40.00	49.00	60.00	80.00
MEAN ULTIMATE LOAD					
TENSION LOAD $N_{Ru,m}$					
NON-CRACKED CONCRETE					
Standard embedment depth	[kN]	15.40	22.80	29.20	55.80
Reduced embedment depth	[kN]	10.40	16.00	22.10	37.90
CRACKED CONCRETE					
Standard embedment depth	[kN]	9.70	11.50	18.60	30.40
Reduced embedment depth	[kN]	5.60	9.80	13.40	22.20
SHEAR LOAD $V_{Ru,m}$					
NON-CRACKED CONCRETE					
Standard embedment depth	[kN]	14.00	22.20	29.60	54.50
Reduced embedment depth	[kN]	11.80	19.20	29.60	54.50
CRACKED CONCRETE					
Standard embedment depth	[kN]	14.00	21.20	29.60	54.50
Reduced embedment depth	[kN]	8.50	13.60	15.40	54.50

R-HPTIIA4 STAINLESS STEEL THROUGHBOLT

BASIC PERFORMANCE DATA

Size		M8	M10	M12	M16
CHARACTERISTIC LOAD					
TENSION LOAD N_{Rk}					
NON-CRACKED CONCRETE					
Standard embedment depth	[kN]	9.00	16.00	25.00	39.50
Reduced embedment depth	[kN]	7.50	12.00	16.80	26.40
CRACKED CONCRETE					
Standard embedment depth	[kN]	6.00	9.00	12.00	25.00
Reduced embedment depth	[kN]	3.00	7.50	9.00	16.00
SHEAR LOAD V_{Rk}					
NON-CRACKED CONCRETE					
Standard embedment depth	[kN]	11.70	18.50	24.60	45.40
Reduced embedment depth	[kN]	9.14	14.70	16.79	45.40
CRACKED CONCRETE					
Standard embedment depth	[kN]	11.60	16.31	24.60	45.40
Reduced embedment depth	[kN]	6.52	10.52	11.97	37.70
DESIGN LOAD					
TENSION LOAD N_{Rd}					
NON-CRACKED CONCRETE					
Standard embedment depth	[kN]	5.00	10.70	16.70	26.30
Reduced embedment depth	[kN]	4.17	6.67	11.20	17.60
CRACKED CONCRETE					
Standard embedment depth	[kN]	3.33	6.00	8.00	16.70
Reduced embedment depth	[kN]	1.67	4.17	6.00	10.70
SHEAR LOAD V_{Rd}					
NON-CRACKED CONCRETE					
Standard embedment depth	[kN]	9.40	14.80	19.70	36.30
Reduced embedment depth	[kN]	6.09	9.84	11.20	35.30
CRACKED CONCRETE					
Standard embedment depth	[kN]	7.73	10.88	19.68	36.30
Reduced embedment depth	[kN]	4.34	7.01	7.98	25.15
RECOMMENDED LOAD					
TENSION LOAD N_{rec}					
NON-CRACKED CONCRETE					
Standard embedment depth	[kN]	3.57	7.62	11.90	18.80
Reduced embedment depth	[kN]	2.98	4.76	8.00	12.60
CRACKED CONCRETE					
Standard embedment depth	[kN]	2.38	4.29	5.71	11.90
Reduced embedment depth	[kN]	1.19	2.98	4.29	7.62
SHEAR LOAD V_{rec}					
NON-CRACKED CONCRETE					
Standard embedment depth	[kN]	6.69	10.60	14.10	25.90
Reduced embedment depth	[kN]	4.35	7.03	8.00	25.20
CRACKED CONCRETE					
Standard embedment depth	[kN]	5.52	7.77	14.06	25.90
Reduced embedment depth	[kN]	3.10	5.01	5.70	18.00

DESIGN PERFORMANCE DATA

Standard embedment depth

Size			M8	M10	M12	M16
Effective embedment depth	h_{ef}	[mm]	47.00	59.00	68.00	85.00
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s}$	[kN]	21.20	33.60	44.80	82.60
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25						
Characteristic resistance	$N_{Rk,p}$	[kN]	9.00	16.00	25.00	-
PULL-OUT FAILURE; CRACKED CONCRETE C20/25						
Characteristic resistance	$N_{Rk,p}$	[kN]	6.00	9.00	12.00	25.00
PULL-OUT FAILURE						
Installation safety factor	γ_2	-	1.20	1.00	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.16	1.26	1.23	1.18
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.33	1.52	1.45	1.37
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.50	1.78	1.67	1.55
CONCRETE CONE FAILURE						
Factor for cracked concrete	k	-	7.20	7.20	7.20	7.20
Factor for cracked concrete	$k_{cr,N}$	-	7.70	7.70	7.70	7.70
Factor for non-cracked concrete	k	-	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00
Installation safety factor	γ_2	-	1.20	1.00	1.00	1.00
Spacing	$s_{cr,N}$	[mm]	141.00	177.00	204.00	255.00
Edge distance	$c_{cr,N}$	[mm]	71.00	89.00	102.00	128.00
CONCRETE SPLITTING FAILURE						
Spacing	$s_{cr,sp}$	[mm]	240.00	300.00	340.00	430.00
Edge distance	$c_{cr,sp}$	[mm]	120.00	150.00	170.00	215.00
Installation safety factor	γ_2	-	1.20	1.00	1.00	1.00

R-HPTIIA4 STAINLESS STEEL THROUGHBOLT

DESIGN PERFORMANCE DATA (cont.)

Size			M8	M10	M12	M16
SHEAR LOAD						
STEEL FAILURE						
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	11.70	18.50	24.60	45.40
Ductility factor	k_7	-	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	22.00	45.00	72.00	180.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25
CONCRETE PRY-OUT FAILURE						
Factor	k	-	1.00	1.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE						
Effective length of anchor	ℓ_f	[mm]	47.00	59.00	68.00	85.00
Anchor diameter	d_{nom}	[mm]	8.00	10.00	12.00	16.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00

(-) failure is not decisive

DESIGN PERFORMANCE DATA

Resistance to tension and shear loads under fire exposure - Standard embedment depth

Size			M8	M10	M12	M16
R (for EI) = 30 min						
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s}$	[kN]	0.70	1.50	2.50	4.70
PULL-OUT FAILURE						
Characteristic resistance	$N_{Rk,p}$	[kN]	1.50	2.30	3.00	6.30
CONCRETE CONE FAILURE						
Characteristic resistance	$N_{Rk,c}$	[kN]	2.70	4.80	6.90	12.00
SHEAR LOAD						
STEEL FAILURE						
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.70	1.50	2.50	4.70
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.70	1.90	3.90	10.00
R (for EI) = 60 min						
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s}$	[kN]	0.60	1.20	2.10	3.90
PULL-OUT FAILURE						
Characteristic resistance	$N_{Rk,p}$	[kN]	1.50	2.30	3.00	6.30
CONCRETE CONE FAILURE						
Characteristic resistance	$N_{Rk,c}$	[kN]	2.70	4.80	6.90	12.00
SHEAR LOAD						
STEEL FAILURE						
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.60	1.20	2.10	3.90
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.60	1.50	3.30	8.30
R (for EI) = 90 min						
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s}$	[kN]	0.40	0.90	1.70	3.10
PULL-OUT FAILURE						
Characteristic resistance	$N_{Rk,p}$	[kN]	1.50	2.30	3.00	6.30
CONCRETE CONE FAILURE						
Characteristic resistance	$N_{Rk,c}$	[kN]	2.70	4.80	6.90	12.00
SHEAR LOAD						
STEEL FAILURE						
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.40	0.90	1.70	3.10
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.40	1.20	2.60	6.70
R (for EI) = 120 min						
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s}$	[kN]	0.40	0.80	1.30	2.50
PULL-OUT FAILURE						
Characteristic resistance	$N_{Rk,p}$	[kN]	1.20	1.80	2.40	5.00
CONCRETE CONE FAILURE						
Characteristic resistance	$N_{Rk,c}$	[kN]	2.20	3.90	5.50	9.60
SHEAR LOAD						
STEEL FAILURE						
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.40	0.80	1.30	2.50
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.40	1.00	2.10	5.30

Allowable values for resistance in case of Seismic performance category C1 - Standard embedment depth

Size			M8	M10	M12	M16
Effective embedment depth	h_{ef}	[mm]	47.00	59.00	68.00	85.00
TENSION LOAD, STEEL FAILURE						
Characteristic resistance	$N_{Rk,s}$	[kN]	21.20	33.60	44.80	82.60
Partial safety factor	$\gamma_{MsN,seisC1}$	-	1.50			
TENSION LOAD, PULL-OUT FAILURE						
Characteristic resistance	$N_{Rk,p}$	[kN]	6.00	9.00	12.00	25.00
Partial safety factor	$\gamma_{Mp,seisC1}$	-	1.80	1.50		
SHEAR LOAD, STEEL FAILURE						
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	6.70	12.50	18.40	39.00
Partial safety factor	$\gamma_{MsV,seisC1}$	-	1.25			

R-HPTIIA4 STAINLESS STEEL THROUGHBOLT

DESIGN PERFORMANCE DATA

Reduced embedment depth

Size			M8	M10	M12	M16
Effective embedment depth	h_{ef}	[mm]	32.00	39.00	48.00	65.00
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s}$	[kN]	21.20	33.60	44.80	82.60
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25						
Characteristic resistance	$N_{Rk,p}$	[kN]	7.50	12.00	-	-
PULL-OUT FAILURE; CRACKED CONCRETE C20/25						
Characteristic resistance	$N_{Rk,p}$	[kN]	3.00	7.50	9.00	16.00
PULL-OUT FAILURE						
Installation safety factor	γ_2	-	1.20	1.20	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.07	1.07	1.16	1.18
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.13	1.13	1.32	1.37
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.20	1.20	1.49	1.55
CONCRETE CONE FAILURE						
Factor for cracked concrete	k	-	7.20	7.20	7.20	7.20
Factor for cracked concrete	$k_{cr,N}$	-	7.70	7.70	7.70	7.70
Factor for non-cracked concrete	k	-	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00
Installation safety factor	γ_2	-	1.20	1.20	1.00	1.00
Spacing	$s_{cr,N}$	[mm]	96.00	117.00	144.00	195.00
Edge distance	$c_{cr,N}$	[mm]	48.00	59.00	72.00	98.00
CONCRETE SPLITTING FAILURE						
Spacing	$s_{cr,sp}$	[mm]	160.00	200.00	250.00	320.00
Edge distance	$c_{cr,sp}$	[mm]	80.00	100.00	125.00	160.00
Installation safety factor	γ_2	-	1.20	1.20	1.00	1.00
SHEAR LOAD						
STEEL FAILURE						
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	11.70	18.50	24.60	45.40
Ductility factor	k_7	-	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	22.00	42.00	72.00	180.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25
CONCRETE PRY-OUT FAILURE						
Factor	k	-	1.00	1.00	1.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE						
Effective length of anchor	ℓ_f	[mm]	32.00	39.00	48.00	65.00
Anchor diameter	d_{nom}	[mm]	8.00	10.00	12.00	16.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00

(-) failure is not decisive

DESIGN PERFORMANCE DATA

Resistance to tension and shear loads under fire exposure - Reduced embedment depth

Size			M8	M10	M12	M16
R (for EI) = 30 min						
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s}$	[kN]	0.70	1.50	2.50	4.70
PULL-OUT FAILURE						
Characteristic resistance	$N_{Rk,p}$	[kN]	0.80	1.90	2.30	4.00
CONCRETE CONE FAILURE						
Characteristic resistance	$N_{Rk,c}$	[kN]	1.00	1.70	2.90	6.10
SHEAR LOAD						
STEEL FAILURE						
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.70	1.50	2.50	4.70
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.70	1.90	3.90	10.00
R (for EI) = 60 min						
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s}$	[kN]	0.60	1.20	2.10	3.90
PULL-OUT FAILURE						
Characteristic resistance	$N_{Rk,p}$	[kN]	0.80	1.90	2.30	4.00
CONCRETE CONE FAILURE						
Characteristic resistance	$N_{Rk,c}$	[kN]	1.00	1.70	2.90	6.10

R-HPTIIA4 STAINLESS STEEL THROUGHBOLT

DESIGN PERFORMANCE DATA

Size			M8	M10	M12	M16
SHEAR LOAD						
STEEL FAILURE						
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.60	1.20	2.10	3.90
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.60	1.50	3.30	8.30
R (for EI) = 90 min						
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s}$	[kN]	0.40	0.90	1.70	3.10
PULL-OUT FAILURE						
Characteristic resistance	$N_{Rk,p}$	[kN]	0.80	1.90	2.30	4.00
CONCRETE CONE FAILURE						
Characteristic resistance	$N_{Rk,c}$	[kN]	1.00	1.70	2.90	6.10
SHEAR LOAD						
STEEL FAILURE						
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.40	0.90	1.70	3.10
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.40	1.20	2.60	6.70
R (for EI) = 120 min						
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s}$	[kN]	0.40	0.80	1.30	2.50
PULL-OUT FAILURE						
Characteristic resistance	$N_{Rk,p}$	[kN]	0.60	1.50	1.80	3.20
CONCRETE CONE FAILURE						
Characteristic resistance	$N_{Rk,c}$	[kN]	0.80	1.40	2.30	4.90
SHEAR LOAD						
STEEL FAILURE						
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.40	0.80	1.30	2.50
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.40	1.00	2.10	5.30

DESIGN PERFORMANCE DATA

Allowable values for resistance in case of Seismic performance category C1 - Reduced embedment depth

Size			M8	M10	M12	M16
Effective embedment depth	h_{ef}	[mm]	32.00	39.00	48.00	65.00
TENSION LOAD, STEEL FAILURE						
Characteristic resistance	$N_{Rk,s}$	[kN]	21.20	33.60	44.80	82.60
Partial safety factor	$\gamma_{MsN,seisC1}$	-	1.50			
TENSION LOAD, PULL-OUT FAILURE						
Characteristic resistance	$N_{Rk,p}$	[kN]	3.00	7.50	9.00	16.00
Partial safety factor	$\gamma_{Mp,seisC1}$	-	1.80	1.80	1.50	1.50
SHEAR LOAD, STEEL FAILURE						
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	X	X	18.40	39.00
Partial safety factor	$\gamma_{MsV,seisC1}$	-	1.25			

R-HPTII-ZF ZINC FLAKE THROUGHBOLT

Zinc Flake Throughbolt anchor for cracked and non-cracked concrete

ETA 17/0184

FEATURES AND BENEFITS

- New generation of throughbolt with unique corrosion-resistant coating
- High performance in cracked and non-cracked concrete confirmed by ETA Option 1
- Highest quality ensures maximum load capability
- For applications requiring fire resistance up to 120 minutes
- Suitable for reduced embedment to avoid contact with reinforcement
- Embedment depth markings help to ensure precise installation of the anchor
- Design of R-HPTII allows drilling and installing directly through the fixture and helps to reduce installation time
- Fire resistant

APPLICATIONS

- Cladding restraints
- Consoles
- Barriers
- Structural steel
- Curtain walling
- Handrails
- Heavy Plant
- Balustrading
- Passenger lifts
- Facades
- Racking systems
- Platforms
- Fencing & gates manufacturing and installation

BASE MATERIALS

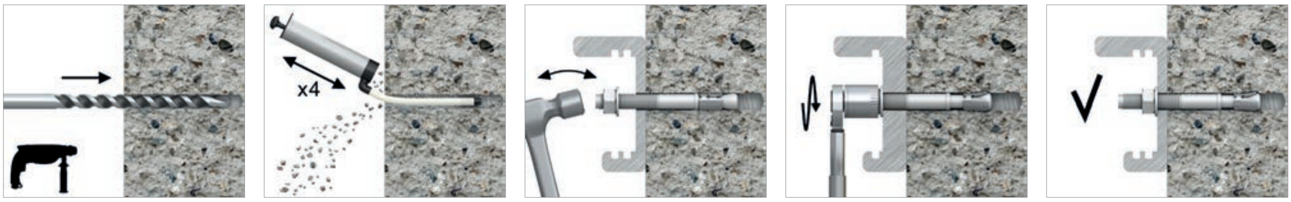
Approved for use in:

- Cracked concrete C20/25-C50/60
- Non-cracked concrete C20/25-C50/60
- Reinforced concrete
- Unreinforced concrete

Also suitable for use in:

- Natural Stone (after site testing)

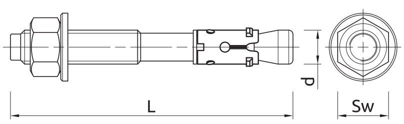
INSTALLATION GUIDE



1. Drill a hole of required diameter and depth
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Lightly tap the throughbolt through the fixture into hole with a hammer, until fixing depth is reached
4. Tighten to the recommended torque

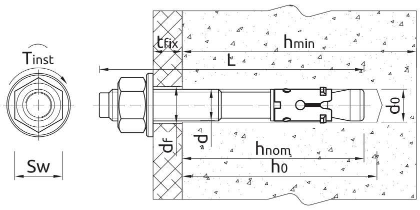
PRODUCT INFORMATION

Size	Product Code		Anchor		Fixture		
			Diameter	Length	Max. thickness t_{fix} for:		Hole diameter
	Regular washer DIN 125A	Large washer DIN 9021	d	L	$h_{nom,red}$	$h_{nom,std}$	d_f
			[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-HPTIIZF-08065/15	R-HPTIIZFD08065/15	8	65	15	-	9
	R-HPTIIZF-08080/15	R-HPTIIZFD08080/15	8	80	30	15	9
	R-HPTIIZF-08100/35	R-HPTIIZFD08100/35	8	100	50	35	9
	R-HPTIIZF-08115/50	R-HPTIIZFD08115/50	8	115	65	50	9
M10	R-HPTIIZF-10065/5	R-HPTIIZFD10065/5	10	65	5	-	11
	R-HPTIIZF-10080/20	R-HPTIIZFD10080/20	10	80	20	-	11
	R-HPTIIZF-10095/15	R-HPTIIZFD10095/15	10	95	35	15	11
	R-HPTIIZF-10115/35	R-HPTIIZFD10115/35	10	115	55	35	11
	R-HPTIIZF-10130/50	R-HPTIIZFD10130/50	10	130	70	50	11
M12	R-HPTIIZF-12080/5	R-HPTIIZFD12080/5	12	80	5	-	13
	R-HPTIIZF-12100/5	R-HPTIIZD12100/5	12	100	25	5	13
	R-HPTIIZF-12120/25	R-HPTIIZFD12120/25	12	120	45	25	13
	R-HPTIIZF-12135/40	R-HPTIIZFD12135/40	12	135	60	40	13
	R-HPTIIZF-12150/55	R-HPTIIZFD12150/55	12	150	75	55	13
M16	R-HPTIIZF-16105/10	R-HPTIIZFD16105/10	16	105	10	-	18
	R-HPTIIZF-16140/20	R-HPTIIZFD16140/20	16	140	40	20	18
	R-HPTIIZF-16180/60	R-HPTIIZFD16140/20	16	180	80	60	18
	R-HPTIIZF16220/100	-	16	220	120	100	18
M20	R-HPTIIZF-20125/5	R-HPTIIZFD20125/5	20	125	5	-	22
	R-HPTIIZF-20160/20	R-HPTIIZFD20160/20	20	160	40	20	22
	R-HPTIIZF-20200/60	-	20	200	80	60	22



R-HPTII-ZF ZINC FLAKE THROUGHBOLT

INSTALLATION DATA



Size			M8	M10	M12	M16	M20
Thread diameter	d	[mm]	8	10	12	16	20
Hole diameter in substrate	d_0	[mm]	8	10	12	16	20
Installation torque	T_{inst}	[Nm]	10	20	40	100	180
Wrench size	Sw	[mm]	13	17	19	24	30
External diameter of washer DIN 125A	-	[mm]	16	20	24	30	37
External diameter of washer DIN 9021	-	[mm]	24	30	37	50	60
STANDARD EMBEDMENT DEPTH							
Min. hole depth in substrate	$h_{0,s}$	[mm]	65	79	90	110	129
Min. installation depth	$h_{nom,s}$	[mm]	55	69	80	100	119
Min. substrate thickness	$h_{min,s}$	[mm]	100	120	140	170	200
Min. spacing (Non-cracked concrete)	$s_{min,s}$	[mm]	50	70	90	160	180
Min. spacing (Cracked concrete)	$s_{min,s}$	[mm]	50	70	90	160	180
Min. edge distance (Non-cracked concrete)	$c_{min,s}$	[mm]	40	50	65	85	100
Min. edge distance (Cracked concrete)	$c_{min,s}$	[mm]	40	45	65	90	100
REDUCED EMBEDMENT DEPTH							
Min. hole depth in substrate	$h_{0,r}$	[mm]	50	59	70	90	110
Min. installation depth	$h_{nom,r}$	[mm]	40	49	60	80	100
Min. substrate thickness	$h_{min,r}$	[mm]	100	100	100	130	160
Min. spacing (Non-cracked concrete)	$s_{min,r}$	[mm]	55	75	150	190	300
Min. spacing (Cracked concrete)	$s_{min,r}$	[mm]	55	75	150	190	300
Min. edge distance (Non-cracked concrete)	$c_{min,r}$	[mm]	45	60	70	100	160
Min. edge distance (Cracked concrete)	$c_{min,r}$	[mm]	40	50	80	110	120

MECHANICAL PROPERTIES

Size			M8	M10	M12	M16	M20
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	620	620	620	620	620
Nominal ultimate tensile strength - shear	f_{uk}	[N/mm²]	520	520	520	520	520
Nominal yield strength - tension	f_{yk}	[N/mm²]	531	531	531	531	531
Nominal yield strength - shear	f_{yk}	[N/mm²]	416	416	416	416	416
Cross sectional area - tension	A_s	[mm²]	25.5	40.7	60.1	106.6	162.9
Cross sectional area - shear	A_s	[mm²]	38.9	61.7	89.6	165.2	259.1
Elastic section modulus	W_{el}	[mm³]	34.3	68.3	119.6	299.5	588.3
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	19	38	67	167	328
Design bending resistance	M	[Nm]	15	31	53	134	263

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M8	M10	M12	M16	M20
CRACKED AND NON-CRACKED						
Standard embedment depth h_{nom}	[mm]	55.00	69.00	80.00	100.00	119.00
Reduced embedment depth h_{nom}	[mm]	40.00	49.00	60.00	80.00	100.00
MEAN ULTIMATE LOAD						
TENSION LOAD $N_{Ru,m}$						
NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	12.40	20.60	27.70	45.50	64.80
Reduced embedment depth	[kN]	9.60	13.60	17.60	34.50	47.10
CRACKED CONCRETE						
Standard embedment depth	[kN]	7.50	12.50	19.90	27.30	41.90
Reduced embedment depth	[kN]	4.80	8.60	12.80	26.80	32.70
SHEAR LOAD $V_{Ru,m}$						
NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	12.20	19.20	28.00	51.50	80.90
Reduced embedment depth	[kN]	12.20	19.20	28.00	51.50	80.90
CRACKED CONCRETE						
Standard embedment depth	[kN]	12.20	19.20	28.00	51.50	80.90
Reduced embedment depth	[kN]	12.20	19.20	28.00	51.50	80.90
CHARACTERISTIC LOAD						
TENSION LOAD N_{Rk}						
NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	9.00	12.00	20.00	35.00	49.74
Reduced embedment depth	[kN]	7.50	9.00	12.00	26.46	36.13
CRACKED CONCRETE						
Standard embedment depth	[kN]	5.00	9.00	12.00	20.00	30.00
Reduced embedment depth	[kN]	3.00	6.00	9.00	16.00	25.76
SHEAR LOAD V_{Rk}						
NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	9.10	15.70	23.70	47.10	60.60
Reduced embedment depth	[kN]	9.10	12.30	16.79	47.10	60.60
CRACKED CONCRETE						
Standard embedment depth	[kN]	9.10	15.70	23.70	47.10	60.60
Reduced embedment depth	[kN]	6.52	8.77	11.97	37.73	51.52

R-HPTII-ZF ZINC FLAKE THROUGHBOLT

BASIC PERFORMANCE DATA

Size		M8	M10	M12	M16	M20
DESIGN LOAD						
TENSION LOAD N_{Rd}						
NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	5.00	8.00	13.30	23.33	33.16
Reduced embedment depth	[kN]	4.17	5.00	8.00	17.64	24.09
CRACKED CONCRETE						
Standard embedment depth	[kN]	2.78	6.00	8.00	13.33	20.00
Reduced embedment depth	[kN]	1.67	3.33	6.00	10.67	17.17
SHEAR LOAD V_{Rd}						
NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	7.28	12.56	18.96	37.68	48.48
Reduced embedment depth	[kN]	6.09	8.20	11.20	35.29	48.18
CRACKED CONCRETE						
Standard embedment depth	[kN]	7.28	10.88	18.96	37.62	47.28
Reduced embedment depth	[kN]	4.34	5.85	7.98	25.15	34.35
RECOMMENDED LOAD						
TENSION LOAD N_{rec}						
NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	3.57	5.71	9.52	16.67	23.69
Reduced embedment depth	[kN]	2.98	3.57	5.71	12.60	17.21
CRACKED CONCRETE						
Standard embedment depth	[kN]	1.98	4.29	5.71	9.52	14.29
Reduced embedment depth	[kN]	1.19	2.38	4.29	7.62	12.27
SHEAR LOAD V_{rec}						
NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	5.20	8.97	13.54	26.91	34.63
Reduced embedment depth	[kN]	4.35	5.86	8.00	25.20	34.41
CRACKED CONCRETE						
Standard embedment depth	[kN]	5.20	7.77	13.54	26.87	33.77
Reduced embedment depth	[kN]	3.10	4.18	5.70	17.97	24.53

DESIGN PERFORMANCE DATA

Standard embedment depth

Size			M8	M10	M12	M16	M20
Effective embedment depth	h_{ef}	[mm]	47.00	59.00	68.00	85.00	99.00
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	11.00	17.50	25.80	45.80	70.00
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	9.00	12.00	20.00	35.00	-
PULL-OUT FAILURE; CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	5.00	9.00	12.00	20.00	30.00
PULL-OUT FAILURE							
Installation safety factor	γ_2	-	1.20	1.00	1.00	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.12	1.22	1.00	1.14	1.07
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.22	1.44	1.00	1.28	1.14
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.33	1.67	1.00	1.43	1.21
CONCRETE CONE FAILURE							
Factor for cracked concrete	k	-	7.20	7.20	7.20	7.20	7.20
Factor for cracked concrete	$k_{cr,N}$	-	7.70	7.70	7.70	7.70	7.70
Factor for non-cracked concrete	k	-	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00
Installation safety factor	γ_2	-	1.20	1.00	1.00	1.00	1.00
Spacing	$s_{cr,N}$	[mm]	141.00	177.00	204.00	255.00	297.00
Edge distance	$c_{cr,N}$	[mm]	71.00	89.00	102.00	128.00	149.00
CONCRETE SPLITTING FAILURE							
Spacing	$s_{cr,sp}$	[mm]	220.00	300.00	340.00	430.00	530.00
Edge distance	$c_{cr,sp}$	[mm]	110.00	150.00	170.00	215.00	265.00
Installation safety factor	γ_2	-	1.20	1.00	1.00	1.00	1.00

(-) failure is not decisive

R-HPTII-ZF ZINC FLAKE THROUGHBOLT

DESIGN PERFORMANCE DATA

Size			M8	M10	M12	M16	M20
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	9.10	15.70	23.70	47.10	60.60
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	22.00	45.00	79.00	200.00	389.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25
CONCRETE PRY-OUT FAILURE							
Factor	k	-	1.00	1.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE							
Effective length of anchor	ℓ_f	[mm]	47.00	59.00	68.00	85.00	99.00
Anchor diameter	d_{nom}	[mm]	8.00	10.00	12.00	16.00	20.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00

DESIGN PERFORMANCE DATA

Resistance to tension and shear loads under fire exposure - Standard embedment depth

Size			M8	M10	M12	M16	M20
TENSION LOAD							
Spacing	s_{cr}	[mm]	188.00	236.00	272.00	340.00	369.00
Edge distance	c_{cr}	[mm]	94.00	118.00	136.00	170.00	198.00
R (for EI) = 30 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.40	0.90	1.70	3.10	4.90
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	1.30	2.30	3.00	5.00	-
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.40	0.90	1.70	3.10	4.90
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.40	1.10	2.60	6.70	13.00
R (for EI) = 60 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.30	0.80	1.30	2.40	3.70
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	1.30	2.30	3.00	5.00	-
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.30	0.80	1.30	2.40	3.70
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.30	1.00	2.00	5.00	9.70
R (for EI) = 90 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.30	0.60	1.10	2.00	3.20
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	1.30	2.30	3.00	5.00	-
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.30	0.60	1.10	2.00	3.20
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.30	0.70	1.70	4.30	8.40
R (for EI) = 120 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.20	0.50	0.80	1.60	2.50
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	1.00	1.80	2.40	4.00	-
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.20	0.50	0.80	1.60	2.50
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.20	0.60	1.30	3.30	6.50

R-HPTII-ZF ZINC FLAKE THROUGHBOLT

DESIGN PERFORMANCE DATA (cont.)

Allowable values for resistance in case of Seismic performance category C1 - Standard embedment depth

Size			M8	M10	M12	M16	M20
Effective embedment depth	h_{ef}	[mm]	47.00	59.00	68.00	85.00	99.00
TENSION LOAD, STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	11.00	17.50	25.80	45.80	70.00
Partial safety factor	$\gamma_{MsN,seisC1}$	-			1.40		
TENSION LOAD, PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	5.00	9.00	12.00	20.00	30.00
Partial safety factor	$\gamma_{Mp,seisC1}$	-	1.80		1.50		
SHEAR LOAD, STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.20	9.40	23.80	33.30	55.10
Partial safety factor	$\gamma_{MsV,seisC1}$	-			1.25		

Allowable values for resistance in case of Seismic performance category C2

Size			M10	M12	M16
Effective embedment depth	h_{ef}	[mm]	59.00	68.00	85.00
TENSION LOAD, STEEL FAILURE					
Characteristic resistance	$N_{Rk,s}$	[kN]	17.50	25.80	45.80
Partial safety factor	$\gamma_{MsN,seisC2}$	-		1.40	
TENSION LOAD, PULL-OUT FAILURE					
Characteristic resistance	$N_{Rk,p}$	[kN]	3.40	7.00	10.90
Partial safety factor	$\gamma_{Mp,seisC2}$	-		1.50	
SHEAR LOAD, STEEL FAILURE					
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	9.20	11.10	28.20
Partial safety factor	$\gamma_{MsV,seisC2}$	-		1.25	

DESIGN PERFORMANCE DATA

Reduced embedment depth

Size			M8	M10	M12	M16	M20
Effective embedment depth	h_{ef}	[mm]	32.00	39.00	48.00	65.00	80.00
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	11.00	17.50	25.80	45.80	70.00
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	7.50	9.00	12.00	-	-
PULL-OUT FAILURE; CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	3.00	6.00	9.00	16.00	-
PULL-OUT FAILURE							
Installation safety factor	γ_2	-	1.20	1.20	1.00	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.20	1.16	1.22	1.11	1.12
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.40	1.33	1.44	1.22	1.26
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.60	1.50	1.67	1.33	1.39
CONCRETE CONE FAILURE							
Factor for cracked concrete	k	-	7.20	7.20	7.20	7.20	7.20
Factor for cracked concrete	$k_{cr,N}$	-	7.70	7.70	7.70	7.70	7.70
Factor for non-cracked concrete	k	-	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00
Installation safety factor	γ_2	-	1.20	1.20	1.00	1.00	1.00
Spacing	$s_{cr,N}$	[mm]	96.00	117.00	144.00	195.00	240.00
Edge distance	$c_{cr,N}$	[mm]	48.00	59.00	72.00	98.00	120.00
CONCRETE SPLITTING FAILURE							
Spacing	$s_{cr,sp}$	[mm]	170.00	200.00	250.00	320.00	410.00
Edge distance	$c_{cr,sp}$	[mm]	85.00	100.00	125.00	160.00	205.00
Installation safety factor	γ_2	-	1.20	1.20	1.00	1.00	1.00
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	9.10	15.70	23.70	47.10	60.60
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	22.00	45.00	79.00	200.00	389.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25
CONCRETE PRY-OUT FAILURE							
Factor	k	-	1.00	1.00	1.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE							
Effective length of anchor	ℓ_f	[mm]	32.00	39.00	48.00	65.00	80.00
Anchor diameter	d_{nom}	[mm]	8.00	10.00	12.00	16.00	20.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00

(-) failure is not decisive

R-HPTII-ZF ZINC FLAKE THROUGHBOLT

DESIGN PERFORMANCE DATA (cont.)

Resistance to tension and shear loads under fire exposure - Reduced embedment depth

Size			M8	M10	M12	M16	M20
TENSION LOAD							
Spacing	s_{cr}	[mm]	128.00	156.00	192.00	260.00	320.00
Edge distance	c_{cr}	[mm]	64.00	78.00	96.00	130.00	160.00
R (for EI) = 30 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.40	0.90	1.70	3.10	4.90
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	0.80	1.50	2.30	4.00	-
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.40	0.90	1.70	3.10	4.90
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.40	1.10	2.60	6.70	13.00
R (for EI) = 60 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.30	0.80	1.30	2.40	3.70
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	0.80	1.50	2.30	4.00	-
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.30	0.80	1.30	2.40	3.70
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.30	1.00	2.00	5.00	9.70
R (for EI) = 90 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.30	0.60	1.10	2.00	3.20
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	0.80	1.50	2.30	4.00	-
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.30	0.60	1.10	2.00	3.20
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.30	0.70	1.70	4.30	8.40
R (for EI) = 120 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.20	0.50	0.80	1.60	2.50
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	0.60	1.20	1.80	3.20	-
SHEAR LOAD							
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.20	0.50	0.80	1.60	2.50
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	0.20	0.60	1.30	3.30	6.50

R-XPTII-A4 STAINLESS STEEL THROUGHBOLT

Stainless steel throughbolt for non-cracked concrete

ETA 17/0782

FEATURES AND BENEFITS

- Stainless steel anchor for the highest corrosion resistance
- High performance in non-cracked concrete confirmed by ETA Option 7
- Highest quality ensures maximum load capability
- Suitable for reduced embedment to avoid contact with reinforcement
- Embedment depth markings help to ensure precise installation of the anchor
- Simple through-installation (drilling and installation through fixed material)

APPLICATIONS

- Cladding restraint
- Curtain wall
- Balustrading
- Barriers
- Handrails
- Racking
- Structural steel
- Bollards

BASE MATERIALS

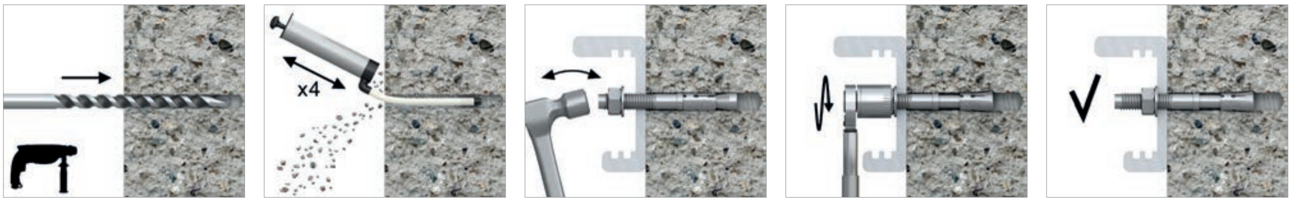
Approved for use in:

- Non-cracked concrete C20/25-C50/60
- Unreinforced concrete
- Reinforced concrete

Also suitable for use in:

- Natural Stone (after site testing)

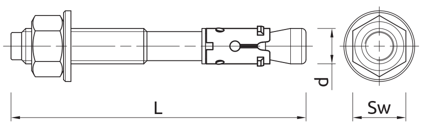
INSTALLATION GUIDE



1. Drill a hole of required diameter and depth
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Lightly tap the throughbolt through the fixture into hole with a hammer, until fixing depth is reached
4. Insert bolt through fixture and tighten to the recommended torque

PRODUCT INFORMATION

Size	Product Code	Anchor		Fixture		
		Diameter	Length	Max. thickness t_{fix} for:		Hole diameter
		d	L	$h_{nom,red}$	$h_{nom,std}$	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
M6*	R-XPTIIA4-06050/10	6	50	10	-	7
	R-XPTIIA4-06085/25	6	85	45	25	7
M8	R-XPTIIA4-08060/10	8	60	10	-	9
	R-XPTIIA4-08075/10	8	75	25	10	9
	R-XPTIIA4-08085/20	8	85	35	20	9
	R-XPTIIA4-08095/30	8	95	45	30	9
	R-XPTIIA4-08105/40	8	105	55	40	9
	R-XPTIIA4-08115/50	8	115	65	50	9
M10	R-XPTIIA4-10065/5	10	65	5	-	11
	R-XPTIIA4-10080/20	10	80	20	-	11
	R-XPTIIA4-10095/15	10	95	35	15	11
	R-XPTIIA4-10115/35	10	115	55	35	11
	R-XPTIIA4-10130/50	10	130	70	50	11
	R-XPTIIA4-10140/60	10	140	80	60	11
M12	R-XPTIIA4-12080/5	12	80	5	-	13
	R-XPTIIA4-12100/5	12	100	25	5	13
	R-XPTIIA4-12115/20	12	115	40	20	13
	R-XPTIIA4-12125/30	12	125	50	30	13
	R-XPTIIA4-12150/55	12	150	75	55	13
	R-XPTIIA4-12180/85	12	180	105	85	13
M16	R-XPTIIA4-16125/5	16	125	25	5	18
	R-XPTIIA4-16140/20	16	140	40	20	18
	R-XPTIIA4-16150/30	16	150	50	30	18
	R-XPTIIA4-16180/60	16	180	80	60	18
M20*	R-XPTIIA4-20125/5	20	125	5	-	22
	R-XPTIIA4-20160/20	20	160	40	20	22
	R-XPTIIA4-20200/60	20	200	80	60	22
	R-XPTIIA4-20300/16	20	300	180	160	22
M24*	R-XPTIIA4-24260/10	24	260	115	100	26

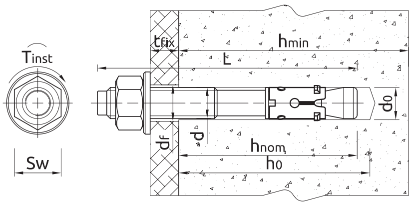


* Not covered by ETA

R-XPTII-A4 STAINLESS STEEL THROUGHBOLT

INSTALLATION DATA

Size			M6	M8	M10	M12	M16	M20	M24
Thread diameter	d	[mm]	6	8	10	12	16	20	24
Hole diameter in substrate	d_0	[mm]	6	8	10	12	16	20	24
Installation torque	T_{inst}	[Nm]	5	15	30	50	100	180	320
Wrench size	Sw	[mm]	10	13	17	19	24	30	36
STANDARD EMBEDMENT DEPTH									
Min. hole depth in substrate	$h_{0,s}$	[mm]	55	65	79	90	110	140	155
Min. installation depth	$h_{nom,s}$	[mm]	50	55	69	80	100	120	135
Min. substrate thickness	$h_{min,s}$	[mm]	100	100	120	140	170	210	230
Min. spacing (Non-cracked concrete)	$s_{min,s}$	[mm]	45	65	90	110	170	170	180
Min. edge distance (Non-cracked concrete)	$c_{min,s}$	[mm]	50	50	60	85	90	160	200
REDUCED EMBEDMENT DEPTH									
Min. hole depth in substrate	$h_{0,r}$	[mm]	40	50	59	70	90	120	140
Min. installation depth	$h_{nom,r}$	[mm]	30	40	49	60	80	100	120
Min. substrate thickness	$h_{min,r}$	[mm]	100	100	100	100	130	210	230
Min. spacing (Non-cracked concrete)	$s_{min,r}$	[mm]	40	65	115	150	190	160	190
Min. edge distance (Non-cracked concrete)	$c_{min,r}$	[mm]	45	50	80	100	120	125	160



MECHANICAL PROPERTIES

Size			M6	M8	M10	M12	M16	M20	M24
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	800	600	600	550	550	500	500
Nominal yield strength - tension	f_{yk}	[N/mm²]	600	480	480	440	440	210	210
Cross sectional area - tension	A_s	[mm²]	14.25	25.5	40.7	60.1	106.6	162.9	234.52
Elastic section modulus	W_{el}	[mm³]	13.15	31.2	62.3	109	276.4	539.9	940.9
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12.62	22	45	72	180	323.9	564.54
Design bending resistance	M	[Nm]	9.49	17.6	36	57.6	144	136.11	237.2

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M6	M8	M10	M12	M16	M20	M24
CRACKED AND NON-CRACKED								
Standard embedment depth h_{nom}	[mm]		55.00	69.00	80.00	100.00		
Reduced embedment depth h_{nom}	[mm]		40.00	49.00	60.00	80.00		
MEAN ULTIMATE LOAD								
TENSION LOAD $N_{Ru,m}$								
Standard embedment depth	[kN]	9.80	15.40	22.80	30.39	55.80	24.00	30.00
Reduced embedment depth	[kN]	1.90	10.40	16.00	22.10	37.90	14.40	19.20
SHEAR LOAD $V_{Ru,m}$								
Standard embedment depth	[kN]	9.80	14.00	22.20	29.60	54.50	48.00	60.00
Reduced embedment depth	[kN]	1.90	14.00	22.20	29.60	54.50	28.80	38.40
CHARACTERISTIC LOAD								
TENSION LOAD N_{Rk}								
Standard embedment depth	[kN]	7.50	9.00	16.00	25.00	39.57	20.00	25.00
Reduced embedment depth	[kN]	1.50	7.50	12.00	16.79	26.46	12.00	16.00
SHEAR LOAD V_{Rk}								
Standard embedment depth	[kN]	7.50	11.70	18.50	24.60	45.40	40.00	50.00
Reduced embedment depth	[kN]	1.50	9.14	12.30	16.79	45.40	24.00	32.00
DESIGN LOAD								
TENSION LOAD N_{Rd}								
Standard embedment depth	[kN]	2.97	5.00	10.67	16.67	26.38	7.94	9.92
Reduced embedment depth	[kN]	0.59	4.17	6.67	11.20	17.64	4.76	6.35
SHEAR LOAD V_{Rd}								
Standard embedment depth	[kN]	6.00	9.36	14.80	19.68	36.32	32.00	40.00
Reduced embedment depth	[kN]	1.20	6.09	8.20	11.20	35.29	19.20	25.60
RECOMMENDED LOAD								
TENSION LOAD N_{rec}								
Standard embedment depth	[kN]	2.12	3.57	7.62	11.90	18.85	5.67	7.09
Reduced embedment depth	[kN]	0.42	2.98	4.76	8.00	12.60	3.40	4.54
SHEAR LOAD V_{rec}								
Standard embedment depth	[kN]	4.28	6.69	10.57	14.06	25.94	22.85	28.57
Reduced embedment depth	[kN]	0.85	4.35	5.86	8.00	25.20	13.71	18.28

R-XPTII-A4 STAINLESS STEEL THROUGHBOLT

DESIGN PERFORMANCE DATA

Standard embedment depth

Size			M6	M8	M10	M12	M16	M20	M24
Effective embedment depth	h_{ef}	[mm]	42.00	47.00	59.00	68.00	85.00	105.00	112.00
TENSION LOAD									
STEEL FAILURE									
Characteristic resistance	$N_{Rk,s}$	[kN]	11.83	21.20	36.60	44.80	82.60	114.03	164.16
Partial safety factor	γ_{Ms}	-	1.60	1.50	1.50	1.50	1.50	2.86	2.86
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
Characteristic resistance	$N_{Rk,p}$	[kN]	7.50	9.00	16.00	25.00	-	20.00	25.00
PULL-OUT FAILURE									
Installation safety factor	γ_2	-	1.68	1.20	1.00	1.00	1.00	1.68	1.68
Increasing factors for $N_{Rd,p}$ - C30/37	ψ_c	-	1.22	1.22	1.22	1.22	1.22	1.22	1.22
Increasing factors for $N_{Rd,p}$ - C40/50	ψ_c	-	1.41	1.41	1.41	1.41	1.41	1.41	1.41
Increasing factors for $N_{Rd,p}$ - C50/60	ψ_c	-	1.55	1.55	1.55	1.55	1.55	1.55	1.55
CONCRETE CONE FAILURE									
Factor for non-cracked concrete	k	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Installation safety factor	γ_2	-	1.68	1.20	1.00	1.00	1.00	1.68	1.68
Spacing	$s_{cr,N}$	[mm]	126.00	141.00	177.00	204.00	255.00	315.00	336.00
Edge distance	$c_{cr,N}$	[mm]	63.00	71.00	89.00	102.00	128.00	168.00	168.00
CONCRETE SPLITTING FAILURE									
Spacing	$s_{cr,sp}$	[mm]	210.00	240.00	300.00	340.00	430.00	560.00	580.00
Edge distance	$c_{cr,sp}$	[mm]	105.00	120.00	150.00	170.00	215.00	280.00	290.00
Installation safety factor	γ_2	-	1.68	1.20	1.00	1.00	1.00	1.68	1.68
SHEAR LOAD									
STEEL FAILURE									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	8.04	11.70	18.50	24.60	45.40	61.25	88.25
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	12.62	22.00	45.00	72.00	180.00	323.94	564.54
Partial safety factor	γ_{Ms}	-	1.33	1.25	1.25	1.25	1.25	2.38	2.38
CONCRETE PRY-OUT FAILURE									
Factor	k	-	1.00	1.00	1.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Effective length of anchor	ℓ_f	[mm]	42.00	47.00	59.00	68.00	85.00	105.00	112.00
Anchor diameter	d_{nom}	[mm]	6.00	8.00	10.00	12.00	16.00	20.00	24.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

(-) failure is not decisive

DESIGN PERFORMANCE DATA

Reduced embedment depth

Size			M6	M8	M10	M12	M16	M20	M24
Effective embedment depth	h_{ef}	[mm]	22.00	32.00	39.00	48.00	65.00	85.00	97.00
TENSION LOAD									
STEEL FAILURE									
Characteristic resistance	$N_{Rk,s}$	[kN]	11.83	21.20	33.60	44.80	82.60	114.03	164.10
Partial safety factor	γ_{Ms}	-	1.60	1.50	1.50	1.50	1.50	2.86	2.86
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
Characteristic resistance	$N_{Rk,p}$	[kN]	1.50	7.50	12.00	-	-	12.00	16.00
PULL-OUT FAILURE									
Installation safety factor	γ_2	-	1.68	1.20	1.20	1.00	1.00	1.68	1.68
Increasing factors for $N_{Rd,p}$ - C30/37	ψ_c	-	1.22	1.17	1.22	1.22	1.22	1.22	1.22
Increasing factors for $N_{Rd,p}$ - C40/50	ψ_c	-	1.41	1.32	1.41	1.41	1.41	1.41	1.41
Increasing factors for $N_{Rd,p}$ - C50/60	ψ_c	-	1.55	1.42	1.55	1.55	1.55	1.55	1.55
CONCRETE CONE FAILURE									
Factor for non-cracked concrete	k	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Installation safety factor	γ_2	-	1.68	1.20	1.20	1.00	1.00	1.68	1.68
Spacing	$s_{cr,N}$	[mm]	66.00	96.00	117.00	144.00	195.00	255.00	291.00
Edge distance	$c_{cr,N}$	[mm]	33.00	48.00	59.00	72.00	98.00	128.00	146.00
CONCRETE SPLITTING FAILURE									
Spacing	$s_{cr,sp}$	[mm]	100.00	160.00	200.00	250.00	320.00	430.00	500.00
Edge distance	$c_{cr,sp}$	[mm]	55.00	80.00	100.00	125.00	160.00	215.00	250.00
Installation safety factor	γ_2	-	1.68	1.20	1.20	1.00	1.00	1.68	1.68
SHEAR LOAD									
STEEL FAILURE									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	8.04	11.70	18.50	24.60	45.40	61.25	88.25
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	12.62	22.00	45.00	72.00	180.00	323.94	564.54
Partial safety factor	γ_{Ms}	-	1.33	1.25	1.25	1.25	1.25	2.38	2.38
CONCRETE PRY-OUT FAILURE									
Factor	k	-	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Effective length of anchor	ℓ_f	[mm]	22.00	32.00	39.00	48.00	65.00	85.00	97.00
Anchor diameter	d_{nom}	[mm]	6.00	8.00	10.00	12.00	16.00	20.00	24.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

(-) failure is not decisive

R-XPT-HD HOT DIP GALVANIZED THROUGHBOLT

Hot Dip Galvanized throughbolt for non-cracked concrete

FEATURES AND BENEFITS

- Increased corrosion resistance due to hot dip zinc external protection layer
- R-XPT is suitable for reduced embedment to avoid contact with reinforcement
- Embedment depth markings help to ensure precise installation of the anchor
- Design of R-XPTII allows drilling and installing directly through the fixture and helps to reduce installation time
- High quality with cost effectiveness
- Cold formed body ensures consistent dimensional accuracy

APPLICATIONS

- Cladding restraint
- Curtain wall
- Balustrading
- Barriers
- Handrails
- Racking
- Structural steel
- Bollards

BASE MATERIALS

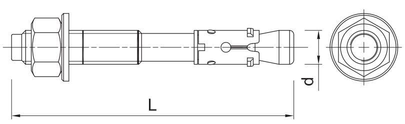
Approved for use in:
- Non-cracked concrete C20/25-C50/60
- Unreinforced concrete
- Reinforced concrete
- Concrete
- Also suitable for use in:
- Natural Stone (after site testing)

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Lightly tap the throughbolt through the fixture into hole with a hammer, until fixing depth is reached
4. Tighten to the recommended torque

PRODUCT INFORMATION

Size	Product Code	Anchor		Fixture		
		Diameter	Length	Max. thickness t_{fix} for:		Hole diameter
		d	L	$h_{nom,red}$	$h_{nom,std}$	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
M6	R-XPT-HD-06050/10	6	50	10	-	7
	R-XPT-HD-06085/25	6	85	45	25	7
	R-XPT-HD-06100/40	6	100	60	40	7
M8	R-XPT-HD-08050/5	8	50	5	-	9
	R-XPT-HD-08060/10	8	60	10	-	9
	R-XPT-HD-08065/15	8	65	15	-	9
	R-XPT-HD-08075/10	8	75	25	10	9
	R-XPT-HD-08080/15	8	80	30	15	9
	R-XPT-HD-08095/30	8	95	45	30	9
	R-XPT-HD-08115/50	8	115	65	50	9
	R-XPT-HD-08140/75	8	140	90	75	9
M10	R-XPT-HD-10065/5	10	65	5	-	11
	R-XPT-HD-10080/10	10	80	20	10	11
	R-XPT-HD-10095/25	10	95	35	25	11
	R-XPT-HD-10115/45	10	115	55	45	11
	R-XPT-HD-10130/60	10	130	70	60	11
	R-XPT-HD-10140/70	10	140	80	70	11
M12	R-XPT-HD-12080/5	12	80	5	-	13
	R-XPT-HD-12100/5	12	100	25	5	13
	R-XPT-HD-12120/25	12	120	45	25	13
	R-XPT-HD-12125/30	12	125	50	30	13
	R-XPT-HD-12135/40	12	135	60	40	13
	R-XPT-HD-12150/55	12	150	75	55	13
	R-XPT-HD-12180/85	12	180	105	85	13
	R-XPT-HD-12220/125	12	220	145	125	13



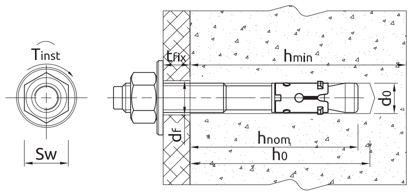
R-XPT-HD HOT DIP GALVANIZED THROUGHBOLT

PRODUCT INFORMATION (cont.)

Size	Product Code	Anchor		Fixture		
		Diameter	Length	Max. thickness t_{fix} for:		Hole diameter
		d	L	$h_{nom,red}$	$h_{nom,std}$	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
M16	R-XPT-HD-16100/5	16	100	5	-	18
	R-XPT-HD-16105/10	16	105	10	-	18
	R-XPT-HD-16125/5	16	125	25	5	18
	R-XPT-HD-16140/20	16	140	40	20	18
	R-XPT-HD-16150/30	16	150	50	30	18
	R-XPT-HD-16180/60	16	180	80	60	18
	R-XPT-HD-16220/100	16	220	120	100	18
M20	R-XPT-HD-20125/5	20	125	5	-	22
	R-XPT-HD-20160/20	20	160	40	20	22
	R-XPT-HD-20200/60	20	200	80	60	22
M24	R-XPT-HD-24260/100	24	260	115	100	26

INSTALLATION DATA

Size			M6	M8	M10	M12	M16	M20	M24
Thread diameter	d	[mm]	6	8	10	12	16	20	24
Hole diameter in substrate	d_0	[mm]	6	8	10	12	16	20	24
Installation torque	T_{inst}	[Nm]	5	15	30	50	100	200	300
Wrench size	Sw	[mm]	10	13	17	19	24	30	36
STANDARD EMBEDMENT DEPTH									
Min. hole depth in substrate	$h_{0,s}$	[mm]	55	60	65	85	105	125	140
Min. installation depth	$h_{nom,s}$	[mm]	50	55	59	80	100	119	135
Min. substrate thickness	$h_{min,s}$	[mm]	84	100	100	136	170	198	224
Min. spacing	$s_{min,s}$	[mm]	45	50	55	75	90	140	180
Min. edge distance	$c_{min,s}$	[mm]	50	40	50	65	80	100	200
REDUCED EMBEDMENT DEPTH									
Min. hole depth in substrate	$h_{0,r}$	[mm]	35	45	55	65	85	105	125
Min. installation depth	$h_{nom,r}$	[mm]	30	40	49	60	80	99	120
Min. substrate thickness	$h_{min,r}$	[mm]	80	100	100	100	130	158	194
Min. spacing	$s_{min,r}$	[mm]	40	45	55	100	100	125	160
Min. edge distance	$c_{min,r}$	[mm]	45	40	65	100	100	125	160



MECHANICAL PROPERTIES

Size			M6	M8	M10	M12	M16	M20	M24
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	620	620	620	620	620	620	620
Nominal ultimate tensile strength - shear	f_{uk}	[N/mm²]	520	520	520	520	520	520	520
Nominal yield strength - tension	f_{yk}	[N/mm²]	531	531	531	531	531	531	531
Nominal yield strength - shear	f_{yk}	[N/mm²]	416	416	416	416	416	416	416
Cross sectional area - tension	A_s	[mm²]	15.2	25.5	40.7	60.1	106.6	162.9	311
Cross sectional area - shear	A_s	[mm²]	20.1	36.6	58	84.3	157	245	353
Elastic section modulus	W_{el}	[mm³]	12.7	31.2	62.3	109.2	277.5	540.9	935.5
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	7.1	17	35	61	155	302	651
Design bending resistance	M	[Nm]	5.7	14	28	49	124	241	521

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M6	M8	M10	M12	M16	M20	M24
CRACKED AND NON-CRACKED								
Standard embedment depth h_{nom}	[mm]							
Reduced embedment depth h_{nom}	[mm]							
MEAN ULTIMATE LOAD								
TENSION LOAD $N_{Ru,m}$								
Standard embedment depth	[kN]	8.68	16.15	20.03	29.95	47.87	58.40	71.73
Reduced embedment depth	[kN]	4.20	9.61	12.91	20.95	34.75	46.60	61.57
SHEAR LOAD $V_{Ru,m}$								
Standard embedment depth	[kN]	6.66	12.15	19.24	27.95	51.54	80.85	152.33
Reduced embedment depth	[kN]	6.66	12.15	16.00	27.95	51.54	80.85	152.33
CHARACTERISTIC LOAD								
TENSION LOAD N_{Rk}								
Standard embedment depth	[kN]	6.85	9.72	12.61	20.17	27.59	35.02	41.89
Reduced embedment depth	[kN]	2.98	6.05	8.87	12.87	19.36	28.05	35.56
SHEAR LOAD V_{Rk}								
Standard embedment depth	[kN]	5.50	9.72	12.61	23.30	43.00	67.40	83.78
Reduced embedment depth	[kN]	2.98	6.05	8.87	12.87	38.72	56.10	70.72

R-XPT-HD HOT DIP GALVANIZED THROUGHBOLT

BASIC PERFORMANCE DATA (cont.)

Size		M6	M8	M10	M12	M16	M20	M24
DESIGN LOAD								
TENSION LOAD N_{Rd}								
Standard embedment depth	[kN]	2.72	3.86	5.00	8.00	10.95	13.90	16.62
Reduced embedment depth	[kN]	1.18	2.40	3.52	5.11	7.68	11.13	14.03
SHEAR LOAD V_{Rd}								
Standard embedment depth	[kN]	2.72	3.86	5.00	16.01	21.90	27.79	33.25
Reduced embedment depth	[kN]	1.18	2.40	3.52	5.11	15.37	22.26	28.06
RECOMMENDED LOAD								
TENSION LOAD N_{rec}								
Standard embedment depth	[kN]	1.94	2.76	3.57	5.72	7.82	9.93	11.87
Reduced embedment depth	[kN]	0.84	1.71	2.51	3.65	5.49	7.95	10.02
SHEAR LOAD V_{rec}								
Standard embedment depth	[kN]	1.94	2.76	3.57	11.43	15.64	19.86	23.75
Reduced embedment depth	[kN]	0.84	1.71	2.51	3.65	10.98	15.80	20.05

DESIGN PERFORMANCE DATA

Standard embedment depth

Size			M6	M8	M10	M12	M16	M20	M24
Effective embedment depth	h_{ef}	[mm]	42.00	47.00	49.00	68.00	85.00	99.00	112.00
TENSION LOAD									
STEEL FAILURE									
Characteristic resistance	$N_{Rk,s}$	[kN]	9.58	15.80	25.20	37.30	66.10	101.00	180.39
Design resistance γ_{Ms}= 1.4	$N_{Rd,s}$	[kN]	6.84	11.29	18.00	26.64	47.21	72.14	128.85
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
Characteristic resistance	$N_{Rk,p}$	[kN]	6.85	9.72	12.61	20.17	27.59	35.02	41.89
Design resistance γ_{Mp}= 2.52	$N_{Rd,p}$	[kN]	2.72	3.86	5.00	8.00	10.95	13.90	16.62
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Spacing	$s_{cr,N}$	[mm]	126.00	141.00	147.00	204.00	255.00	297.00	336.00
Edge distance	$c_{cr,N}$	[mm]	63.00	71.00	74.00	102.00	128.00	149.00	168.00
SHEAR LOAD									
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25									
Edge distance	c_1	[mm]	50.00	40.00	50.00	65.00	80.00	100.00	200.00
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	6.39	5.03	7.07	10.96	15.77	22.56	58.63
Design resistance γ_{Mc}= 1.8	$V_{Rd,c}$	[kN]	3.55	2.79	3.93	6.09	8.76	12.53	32.57
CONCRETE PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
Factor	k	-	1.00	1.00	1.00	2.00	2.00	2.00	2.00
Characteristic resistance	$V_{Rk,cp}$	[kN]	6.85	9.72	12.61	40.34	55.18	70.04	83.78
Design resistance γ_{Mc}= 2.52	$V_{Rd,cp}$	[kN]	2.72	3.86	5.00	16.01	21.90	27.79	33.25
STEEL FAILURE									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.50	10.10	16.00	23.30	43.00	67.40	126.94
Design resistance γ_{Ms}= 1.25	$V_{Rd,s}$	[kN]	4.40	8.08	12.80	18.64	34.40	53.92	101.55

DESIGN PERFORMANCE DATA

Reduced embedment depth

Size			M6	M8	M10	M12	M16	M20	M24
Effective embedment depth	h_{ef}	[mm]	22.00	32.00	39.00	48.00	65.00	79.00	97.00
TENSION LOAD									
STEEL FAILURE									
Characteristic resistance	$N_{Rk,s}$	[kN]	9.58	15.80	25.20	37.30	66.10	101.00	180.39
Design resistance γ_{Ms}= 1.4	$N_{Rd,s}$	[kN]	6.84	11.29	18.00	26.64	47.21	72.14	128.85
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
Characteristic resistance	$N_{Rk,p}$	[kN]	2.98	6.05	8.87	12.87	19.36	28.05	35.36
Design resistance γ_{Mp}= 2.52	$N_{Rd,p}$	[kN]	1.18	2.40	3.52	5.11	7.68	11.13	14.03
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Spacing	$s_{cr,N}$	[mm]	66.00	96.00	117.00	144.00	195.00	237.00	291.00
Edge distance	$c_{cr,N}$	[mm]	33.00	48.00	59.00	72.00	98.00	119.00	146.00
SHEAR LOAD									
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25									
Edge distance	c_1	[mm]	45.00	40.00	65.00	100.00	100.00	125.00	160.00
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	5.05	4.70	9.67	18.36	20.04	28.81	42.54
Design resistance γ_{Mc}= 1.8	$V_{Rd,c}$	[kN]	2.80	2.61	5.37	10.20	11.13	16.00	23.63
CONCRETE PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
Factor	k	-	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Characteristic resistance	$V_{Rk,cp}$	[kN]	2.98	6.05	8.87	12.87	38.72	56.10	42.54
Design resistance γ_{Mc}= 2.52	$V_{Rd,cp}$	[kN]	1.18	2.40	3.52	5.11	15.37	22.26	28.06
STEEL FAILURE									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.50	10.10	16.00	23.30	43.00	67.40	126.94
Design resistance γ_{Ms}= 1.25	$V_{Rd,s}$	[kN]	4.40	8.08	12.80	18.64	34.40	53.92	101.55

R-XPT THROUGHBOLT

Throughbolt for non-cracked concrete

ETA 17/0183

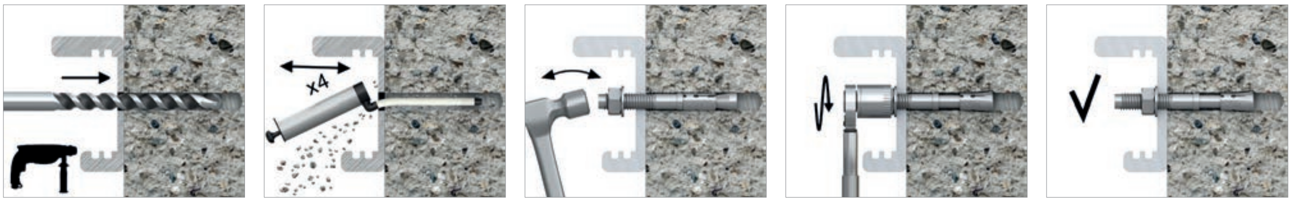
FEATURES AND BENEFITS
- High performance in non-cracked concrete confirmed by ETA Option 7
- High quality with cost effectiveness
- Suitable for reduced embedment to avoid contact with reinforcement
- Embedment depth markings help to ensure precise installation of the anchor
- Design allows drilling and installing directly through the fixture and helps to reduce installation effort
- Cold formed body ensures consistent dimensional accuracy
- Simple through-installation (drilling and installation through fixed material)
- Optimized expander design with six grip features allows for a high load-bearing capacity

APPLICATIONS
- Cladding restraint
- Curtain wall
- Balustrading
- Barriers
- Handrails
- Racking
- Structural steel
- Bollards

BASE MATERIALS
Approved for use in:
- Non-cracked concrete C20/25-C50/60
- Unreinforced concrete

Also suitable for use in:
- Also suitable for use in:
- Natural Stone (after site testing)

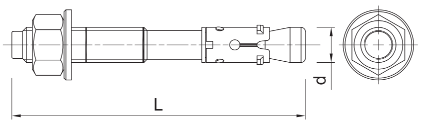
INSTALLATION GUIDE



1. Drill a hole of required diameter and depth
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Lightly tap the throughbolt through the fixture into hole with a hammer, until fixing depth is reached
4. Tighten to the recommended torque

PRODUCT INFORMATION

Size	Product Code	Anchor		Fixture		
		Diameter	Length	Max. thickness t_{fix} for:		Hole diameter
		d	L	$h_{nom,red}$	$h_{nom,std}$	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
M6*	R-XPT-06050/10	6	50	10	-	7
	R-XPT-06065/5	6	65	25	5	7
	R-XPT-06085/25	6	85	45	25	7
	R-XPT-06100/40	6	100	60	40	7
M8	R-XPT-08050/5	8	50	5	-	9
	R-XPT-08060/10	8	60	10	-	9
	R-XPT-08065/15	8	65	15	-	9
	R-XPT-08075/10	8	75	25	10	9
	R-XPT-08080/15	8	80	30	15	9
	R-XPT-08085/20	8	85	35	20	9
	R-XPT-08095/30	8	95	45	30	9
	R-XPT-08115/50	8	115	65	50	9
	R-XPT-08140/75	8	140	90	75	9
	R-XPT-08150/85	8	150	100	85	9
M10	R-XPT-10065/5	10	65	5	-	11
	R-XPT-10080/10	10	80	20	10	11
	R-XPT-10095/25	10	95	35	25	11
	R-XPT-10115/45	10	115	55	45	11
	R-XPT-10130/60	10	130	70	60	11
	R-XPT-10140/70	10	140	80	70	11
	R-XPT-10150/80	10	150	90	80	11
	R-XPT-10180/110	10	180	120	110	11



R-XPT THROUGHBOLT

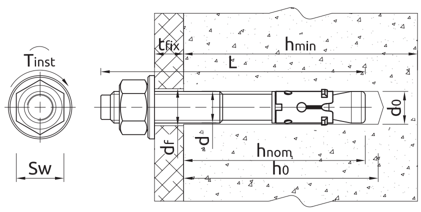
PRODUCT INFORMATION CD

Size	Product Code	Anchor		Fixture		
		Diameter	Length	Max. thickness t_{fix} for:		Hole diameter
		d	L	$h_{nom,red}$	$h_{nom,std}$	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
M12	R-XPT-12080/5	12	80	5	-	13
	R-XPT-12100/5	12	100	25	5	13
	R-XPT-12120/25	12	120	45	25	13
	R-XPT-12125/30	12	125	50	30	13
	R-XPT-12135/40	12	135	60	40	13
	R-XPT-12140/45	12	140	65	45	13
	R-XPT-12150/55	12	150	75	55	13
	R-XPT-12160/65	12	160	85	65	13
	R-XPT-12180/85	12	180	105	85	13
	R-XPT-12200/105	12	200	125	105	13
	R-XPT-12220/125	12	220	145	125	13
	R-XPT-12250/155	12	250	175	155	13
	R-XPT-12280/185	12	280	205	185	13
M16	R-XPT-16100/5	16	100	5	-	18
	R-XPT-16105/10	16	105	10	-	18
	R-XPT-16125/5	16	125	25	5	18
	R-XPT-16140/20	16	140	40	20	18
	R-XPT-16150/30	16	150	50	30	18
	R-XPT-16160/40	16	160	60	40	18
	R-XPT-16180/60	16	180	80	60	18
	R-XPT-16200/80	16	200	100	80	18
	R-XPT-16220/100	16	220	120	100	18
	R-XPT-16250/130	16	250	150	130	18
	R-XPT-16280/160	16	280	180	160	18
	R-XPT-16300/180	16	300	200	180	18
M20	R-XPT-20125/5	20	125	5	-	22
	R-XPT-20160/20	20	160	40	20	22
	R-XPT-20200/60	20	200	80	60	22
	R-XPT-20250/110	20	250	130	110	22
	R-XPT-20300/160	20	300	180	160	22
M24*	R-XPT-24180/20	24	180	35	20	26
	R-XPT-24260/100	24	260	115	100	26
	R-XPT-24300/140	24	300	155	140	26

* Not covered by ETA

INSTALLATION DATA

Size			M6	M8	M10	M12	M16	M20	M24
Thread diameter	d	[mm]	6	8	10	12	16	20	24
Hole diameter in substrate	d_0	[mm]	6	8	10	12	16	20	24
Installation torque	T_{inst}	[Nm]	5	15	30	50	100	200	300
Wrench size	Sw	[mm]	10	13	17	19	24	30	36
STANDARD EMBEDMENT DEPTH									
Min. hole depth in substrate	$h_{0,s}$	[mm]	55	55	59	80	100	119	140
Min. installation depth	$h_{nom,s}$	[mm]	50	55	59	80	100	119	135
Min. substrate thickness	$h_{min,s}$	[mm]	84	100	100	136	170	198	224
Min. spacing	$s_{min,s}$	[mm]	45	50	55	75	90	140	180
Min. edge distance	$c_{min,s}$	[mm]	50	40	50	65	80	100	200
REDUCED EMBEDMENT DEPTH									
Min. hole depth in substrate	$h_{0,r}$	[mm]	35	40	49	60	80	100	125
Min. installation depth	$h_{nom,r}$	[mm]	30	40	49	60	80	100	120
Min. substrate thickness	$h_{min,r}$	[mm]	80	100	100	100	130	158	194
Min. spacing	$s_{min,r}$	[mm]	40	45	55	100	100	125	160
Min. edge distance	$c_{min,r}$	[mm]	45	40	65	100	100	125	160



MECHANICAL PROPERTIES

Size			M6	M8	M10	M12	M16	M20	M24
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	620	620	620	620	620	620	620
Nominal yield strength - tension	f_{yk}	[N/mm²]	531	531	531	531	531	531	531
Cross sectional area - tension	A_s	[mm²]	14.25	25.5	40.7	60.1	106.6	162.9	234.52
Elastic section modulus	W_{el}	[mm³]	13.15	31.2	62.3	109	276.4	539.9	940.9
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	7	17	35	61	154	301	525
Design bending resistance	M	[Nm]	5.6	13.6	28	48.8	123.2	240.8	420

R-XPT THROUGHBOLT

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M6	M8	M10	M12	M16	M20	M24
CRACKED AND NON-CRACKED								
Standard embedment depth h_{nom}	[mm]							
Reduced embedment depth h_{nom}	[mm]							
MEAN ULTIMATE LOAD								
TENSION LOAD $N_{Ru,m}$								
Standard embedment depth	[kN]	8.70	18.10	19.80	28.00	49.70	65.30	67.60
Reduced embedment depth	[kN]	5.70	10.90	11.40	21.50	43.00	45.50	62.70
SHEAR LOAD $V_{Ru,m}$								
Standard embedment depth	[kN]	6.00	12.20	19.20	28.00	51.50	80.90	118.60
Reduced embedment depth	[kN]	6.00	12.20	19.06	28.00	51.50	94.70	118.60
CHARACTERISTIC LOAD								
TENSION LOAD N_{Rk}								
Standard embedment depth	[kN]	8.67	12.00	12.00	25.00	39.57	40.00	38.14
Reduced embedment depth	[kN]	4.27	9.00	9.00	16.00	26.46	35.00	31.92
SHEAR LOAD V_{Rk}								
Standard embedment depth	[kN]	5.50	10.10	16.00	23.30	43.00	67.40	97.10
Reduced embedment depth	[kN]	5.50	9.14	9.14	16.79	43.00	67.40	97.10
DESIGN LOAD								
TENSION LOAD N_{Rd}								
Standard embedment depth	[kN]	3.44	6.67	6.67	13.89	21.99	22.22	15.13
Reduced embedment depth	[kN]	1.69	5.00	5.00	8.89	14.70	19.44	12.67
SHEAR LOAD V_{Rd}								
Standard embedment depth	[kN]	4.40	8.08	11.55	18.64	34.40	53.92	77.68
Reduced embedment depth	[kN]	4.40	6.09	6.09	11.20	34.40	42.28	77.68
RECOMMENDED LOAD								
TENSION LOAD N_{rec}								
Standard embedment depth	[kN]	2.46	4.76	4.76	9.92	15.70	15.87	10.81
Reduced embedment depth	[kN]	1.21	3.57	3.60	6.35	10.50	13.89	9.05
SHEAR LOAD V_{rec}								
Standard embedment depth	[kN]	3.14	5.77	8.25	13.31	24.57	38.51	55.49
Reduced embedment depth	[kN]	3.14	4.35	4.35	8.00	24.57	33.77	55.49

DESIGN PERFORMANCE DATA

Standard embedment depth

Size			M6	M8	M10	M12	M16	M20	M24
Effective embedment depth	h_{ef}	[mm]	42.00	47.00	49.00	68.00	85.00	99.00	112.00
TENSION LOAD									
STEEL FAILURE									
Characteristic resistance	$N_{Rk,s}$	[kN]	8.84	15.80	25.20	37.30	66.10	101.00	145.40
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
Characteristic resistance	$N_{Rk,p}$	[kN]	8.67	12.00	12.00	25.00	40.00	40.00	38.14
PULL-OUT FAILURE									
Installation safety factor	γ_2	-	1.68	1.20	1.20	1.20	1.20	1.20	1.68
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.00	1.10	1.37	1.16	1.17	1.30	1.00
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.00	1.21	1.74	1.33	1.34	1.59	1.00
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.00	1.32	2.10	1.49	1.50	1.89	1.00
CONCRETE CONE FAILURE									
Factor for non-cracked concrete	k	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Installation safety factor	γ_2	-	1.68	1.20	1.20	1.20	1.20	1.20	1.68
Spacing	$s_{cr,N}$	[mm]	126.00	141.00	147.00	204.00	255.00	297.00	336.00
Edge distance	$c_{cr,N}$	[mm]	63.00	71.00	74.00	102.00	128.00	149.00	168.00
CONCRETE SPLITTING FAILURE									
Spacing	$s_{cr,sp}$	[mm]	210.00	240.00	260.00	370.00	430.00	530.00	580.00
Edge distance	$c_{cr,sp}$	[mm]	105.00	120.00	130.00	185.00	215.00	265.00	290.00
Installation safety factor	γ_2	-	1.68	1.20	1.20	1.20	1.20	1.20	1.68
SHEAR LOAD									
STEEL FAILURE									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.50	10.10	16.00	23.30	43.00	67.40	97.10
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	7.34	17.00	35.00	61.00	154.00	301.00	525.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
CONCRETE PRY-OUT FAILURE									
Factor	k	-	1.00	1.00	1.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Effective length of anchor	ℓ_f	[mm]	42.00	47.00	49.00	68.00	85.00	99.00	112.00
Anchor diameter	d_{nom}	[mm]	6.00	8.00	10.00	12.00	16.00	20.00	24.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

* Not covered by ETA

R-XPT THROUGHBOLT

DESIGN PERFORMANCE DATA

Reduced embedment depth

Size			M6	M8	M10	M12	M16	M20	M24
Effective embedment depth	h_{ef}	[mm]	22.00	32.00	39.00	48.00	65.00	79.00	97.00
TENSION LOAD									
STEEL FAILURE									
Characteristic resistance	$N_{Rk,s}$	[kN]	8.84	15.80	25.20	37.30	66.10	101.00	145.40
Partial safety factor	γ_{Ms}	-	1.40	1.40	1.40	1.40	1.40	1.40	1.40
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
Characteristic resistance	$N_{Rk,p}$	[kN]	4.27	9.00	9.00	16.00	30.00	35.00	31.92
PULL-OUT FAILURE									
Installation safety factor	γ_2	-	1.68	1.20	1.20	1.20	1.20	1.20	1.68
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.00	1.25	1.36	1.20	1.12	1.18	1.00
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.00	1.50	1.72	1.40	1.23	1.36	1.00
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.00	1.76	2.08	1.60	1.34	1.54	1.00
CONCRETE CONE FAILURE									
Factor for non-cracked concrete	k	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Installation safety factor	γ_2	-	1.68	1.20	1.20	1.20	1.20	1.20	1.68
Spacing	$s_{cr,N}$	[mm]	66.00	96.00	117.00	144.00	195.00	237.00	291.00
Edge distance	$c_{cr,N}$	[mm]	33.00	48.00	59.00	72.00	98.00	119.00	156.00
CONCRETE SPLITTING FAILURE									
Spacing	$s_{cr,sp}$	[mm]	110.00	160.00	200.00	250.00	360.00	410.00	500.00
Edge distance	$c_{cr,sp}$	[mm]	55.00	80.00	100.00	125.00	180.00	205.00	250.00
Installation safety factor	γ_2	-	1.68	1.20	1.20	1.20	1.20	1.20	1.68
SHEAR LOAD									
STEEL FAILURE									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.50	10.10	16.00	23.30	43.00	67.40	97.10
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	7.34	17.00	35.00	61.00	154.00	301.00	525.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
CONCRETE PRY-OUT FAILURE									
Factor	k	-	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Effective length of anchor	ℓ_f	[mm]	22.00	32.00	39.00	48.00	65.00	79.00	97.00
Anchor diameter	d_{nom}	[mm]	6.00	8.00	10.00	12.00	16.00	20.00	24.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

R-RB Rawlbolt®

FOR USE IN CRACKED AND NON-CRACKED CONCRETE

World's most popular all-purpose expanding shield anchor - loose bolt version

Loose bolt
R-RBL Rawlbolt®

Bolt projecting
R-RBP Rawlbolt®

ETA-11/0479

FEATURES AND BENEFITS

- RAWLBOLT® - first ever mechanical anchor in the world, forerunner of all of the later mechanical anchors
- For use in cracked and non-cracked concrete (ETA option 1), hollow-core slabs, flooring blocks and ceramics
- Product recommended for applications requiring fire resistance
- Three-pieces expanding sleeve of maximum expansion provides optimal load and safety of use in any substrate
- Wide range of diameters (M6 to M20)

APPLICATIONS

- Roller shutter doors
- Fire doors
- Structural steelwork
- Security grills
- Heavy machinery
- Pipework/ductwork supports

BASE MATERIALS

Approved for use in:
- Cracked concrete C20/25-C50/60
- Non-cracked concrete C20/25-C50/60
- Unreinforced concrete
- Reinforced concrete

Also suitable for use in:
- Solid clay brick ≥ 20MPa
- Hollow Lightweight Concrete Block LAC 5 ≥ 5MPa
- Hollow Sand-lime Brick ≥ 15MPa
- Concrete hollow floor block (eg. Teriva)
- Hollow-core Slab C20/25
- Hollow-core Slab C30/37-C50/60
- Natural Stone (after site testing)

INSTALLATION GUIDE

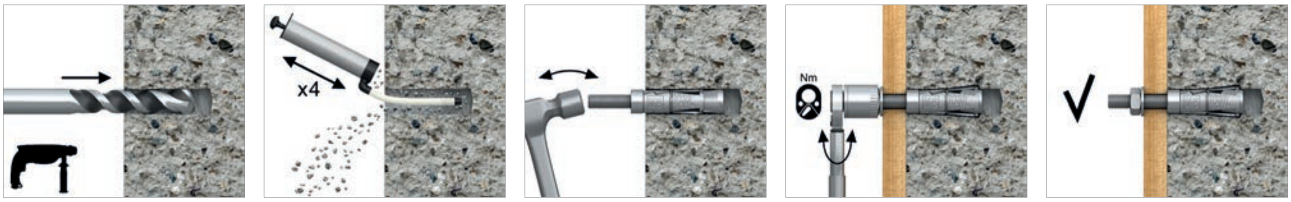
R-RBL Rawlbolt®

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth. Note: When fixing into brickwork, mortar joints should be avoided
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Remove pre-assembled bolt and washer. Insert shield into hole and tap home with hammer until flush with surface
4. Insert bolt with washer through fixture into the shield
5. Tighten to the recommended torque

R-RBP Rawlbolt®

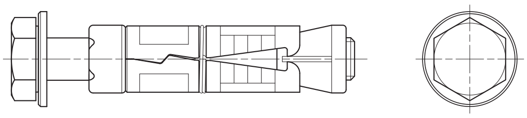
INSTALLATION GUIDE



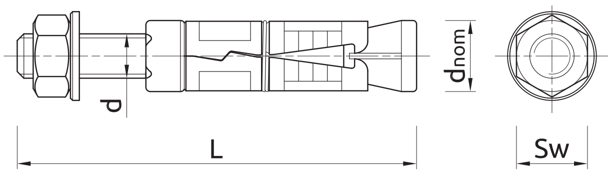
1. Drill a hole of required diameter and depth. Note: When fixing into brickwork, mortar joints should be avoided
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Remove pre-assembled bolt and washer. Insert shield into hole and tap home with hammer until flush with surface
4. Insert bolt with washer through fixture into the shield
5. Tighten to the recommended torque

PRODUCT INFORMATION

R-RBL Rawlbolt®



R-RBP Rawlbolt®



Size	Product Code	Anchor			Fixture	
		Diameter	External diameter	Length	Max. thickness	Hole diameter
		d	d_{nom}	L	t_{fix}	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
R-RBL Rawlbolt®						
M6	R-RBL-M06/10W	6	12	55	10	6.5
	R-RBL-M06/25W	6	12	70	25	6.5
	R-RBL-M06/40W	6	12	85	40	6.5
M8	R-RBL-M08/10W	8	14	65	10	9
	R-RBL-M08/25W	8	14	80	25	9
	R-RBL-M08/40W	8	14	95	40	9
M10	R-RBL-M10/10W	10	16	75	10	11
	R-RBL-M10/25W	10	16	90	25	11
	R-RBL-M10/50W	10	16	115	50	11
	R-RBL-M10/75W	10	16	140	75	11
M12	R-RBL-M12/10W	12	20	90	10	13
	R-RBL-M12/25W	12	20	105	25	13
	R-RBL-M12/40W	12	20	120	40	13
	R-RBL-M12/60W	12	20	140	60	13
M16	R-RBL-M16/15W	16	25	135	15	17
	R-RBL-M16/30W	16	25	150	30	17
	R-RBL-M16/60W	16	25	180	60	17
M20	R-RBL-M20/60W	20	32	195	60	22
	R-RBL-M20/100W	20	32	235	110	22
M24*	R-RBL-M24/100W	24	38	255	100	26
	R-RBL-M24/150W	24	38	300	150	26

R-RB Rawlbolt®

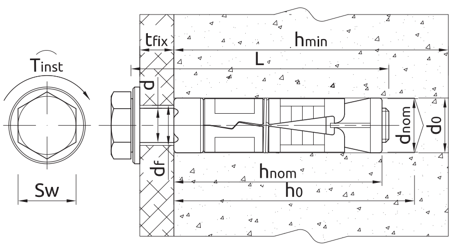
FOR USE IN CRACKED AND NON-CRACKED CONCRETE

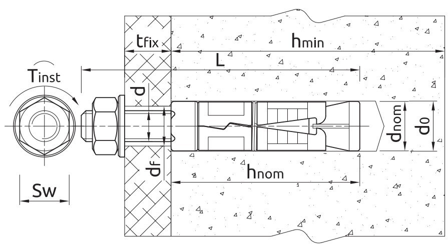
PRODUCT INFORMATION (cont.)

Size	Product Code	Anchor			Fixture	
		Diameter	External diameter	Length	Max. thickness	Hole diameter
		d	d_{nom}	L	t_{fix}	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
R-RBP Rawlbolt®						
M6	R-RBP-M06/10W	6	12	65	10	6,5
	R-RBP-M06/25W	6	12	80	25	6,5
	R-RBP-M06/60W	6	12	115	60	6,5
M8	R-RBP-M08/10W	8	14	75	10	9
	R-RBP-M08/25W	8	14	90	25	9
	R-RBP-M08/60W	8	14	125	60	9
M10	R-RBP-M10/15W	10	16	90	15	11
	R-RBP-M10/30W	10	16	105	30	11
	R-RBP-M10/60W	10	16	135	60	11
M12	R-RBP-M12/15W	12	20	110	15	13
	R-RBP-M12/30W	12	20	125	30	13
	R-RBP-M12/75W	12	20	170	75	13
M16	R-RBP-M16/15W	16	25	150	15	17
	R-RBP-M16/35W	16	25	170	35	17
	R-RBP-M16/75W	16	25	210	75	17
M20	R-RBP-M20/15W	20	32	170	15	22
	R-RBP-M20/30W	20	32	185	30	22
	R-RBP-M20/100W	20	32	255	100	22
M24*	R-RBP-M24/75W	24	38	255	75	26
	R-RBP-M24/150W	24	38	300	150	26

* Not covered by ETA

INSTALLATION DATA





INSTALLATION DATA

Size			M6	M8	M10	M12	M16	M20	M24
Thread diameter	d	[mm]	6	8	10	12	16	20	24
Hole diameter in substrate	d_0	[mm]	12	14	16	20	25	32	38
Installation torque	T_{inst}	[Nm]	6.5	15	27	50	120	230	400
Wrench size	Sw	[mm]	10	13	17	19	24	30	36
Min. hole depth in substrate	h_0	[mm]	50	55	65	85	125	140	160
Min. installation depth	h_{nom}	[mm]	45	50	60	80	120	135	155
Min. substrate thickness	h_{min}	[mm]	100	100	100	100	142.5	172.5	240
Min. spacing	s_{min}	[mm]	35	40	50	60	95	115	210
Min. edge distance	c_{min}	[mm]	53	60	75	90	143	173	188

MECHANICAL PROPERTIES

Size			M6	M8	M10	M12	M16	M20	M24
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	500	500	500	500	500	500	500
Nominal yield strength - tension	f_{yk}	[N/mm²]	400	400	400	400	400	400	400
Cross sectional area - tension	A_s	[mm²]	20.1	36.6	58	84.3	157	245	353
Elastic section modulus	W_{el}	[mm³]	21.21	50.27	98.17	169.65	402.12	785.4	1357.17
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12.72	30.16	58.9	101.79	241.27	471.24	814.3
Design bending resistance	M	[Nm]	10.18	24.13	47.12	81.43	193.02	376.99	651.44

R-RB Rawlbolt®

FOR USE IN CRACKED AND NON-CRACKED CONCRETE

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M6	M8	M10	M12	M16	M20	M24
MEAN ULTIMATE LOAD								
TENSION LOAD $N_{Ru,m}$								
Non-cracked concrete	[kN]	6.36	8.35	15.24	18.48	48.77	56.55	94.30
Cracked concrete	[kN]	4.06	5.31	7.12	12.01	18.24	34.16	-
SHEAR LOAD $V_{Ru,m}$								
Non-cracked concrete	[kN]	6.04	10.98	17.40	25.30	47.10	73.50	105.90
Cracked concrete	[kN]	6.04	10.98	17.40	25.30	47.10	73.50	-
CHARACTERISTIC LOAD								
TENSION LOAD N_{Rk}								
Non-cracked concrete	[kN]	6.00	7.50	12.00	16.00	40.00	50.00	70.00
Cracked concrete	[kN]	4.00	5.00	6.00	12.00	16.00	30.00	-
SHEAR LOAD V_{Rk}								
Non-cracked concrete	[kN]	5.03	9.15	14.50	21.08	39.25	61.25	88.30
Cracked concrete	[kN]	5.03	9.11	12.73	21.08	39.25	61.25	-
DESIGN LOAD								
TENSION LOAD N_{Rd}								
Non-cracked concrete	[kN]	3.33	4.17	6.67	8.89	22.22	27.78	38.90
Cracked concrete	[kN]	2.22	2.78	3.33	6.67	8.89	16.67	-
SHEAR LOAD V_{Rd}								
Non-cracked concrete	[kN]	4.02	7.32	11.60	16.86	31.40	49.00	70.60
Cracked concrete	[kN]	4.02	7.32	10.61	16.86	31.40	49.00	-
RECOMMENDED LOAD								
TENSION LOAD N_{rec}								
NON-CRACKED CONCRETE	[kN]	2.38	2.98	4.76	6.35	15.87	19.84	27.80
CRACKED CONCRETE	[kN]	1.59	1.99	2.38	4.76	6.35	11.91	-
SHEAR LOAD V_{rec}								
NON-CRACKED CONCRETE	[kN]	2.87	5.23	8.29	12.05	22.43	35.00	50.40
CRACKED CONCRETE	[kN]	2.87	5.23	7.58	12.05	22.43	35.00	-

DESIGN PERFORMANCE DATA

Size			M6	M8	M10	M12	M16	M20	M24
Effective embedment depth	h_{ef}	[mm]	35.00	40.00	50.00	60.00	95.00	115.00	125.00
TENSION LOAD									
STEEL FAILURE									
Characteristic resistance	$N_{Rk,s}$	[kN]	10.05	18.30	29.00	42.15	78.50	122.50	176.50
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50	1.50	1.50
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
Characteristic resistance	$N_{Rk,p}$	[kN]	6.00	7.50	12.00	16.00	40.00	50.00	70.00
PULL-OUT FAILURE; CRACKED CONCRETE C20/25									
Characteristic resistance	$N_{Rk,p}$	[kN]	4.00	5.00	6.00	12.00	16.00	30.00	-
PULL-OUT FAILURE									
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.40
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.22	1.22	1.22	1.22	1.22	1.22	1.00
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.41	1.41	1.41	1.41	1.41	1.41	1.00
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.55	1.55	1.55	1.55	1.55	1.55	1.00
CONCRETE CONE FAILURE									
Factor for cracked concrete	k	-	7.20	7.20	7.20	7.20	7.20	7.20	-
Factor for cracked concrete	$k_{cr,N}$	-	7.70	7.70	7.70	7.70	7.70	7.70	-
Factor for non-cracked concrete	k	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10
Factor for non-cracked concrete	$k_{ucr,N}$	-	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.40
Spacing	$s_{cr,N}$	[mm]	105.00	120.00	150.00	180.00	285.00	345.00	375.00
Edge distance	$c_{cr,N}$	[mm]	52.50	60.00	75.00	90.00	143.00	173.00	188.00
CONCRETE SPLITTING FAILURE									
Spacing	$s_{cr,sp}$	[mm]	105.00	120.00	150.00	180.00	285.00	345.00	375.00
Edge distance	$c_{cr,sp}$	[mm]	53.00	60.00	75.00	90.00	143.00	173.00	188.00
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20	1.40
SHEAR LOAD									
STEEL FAILURE									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.03	9.15	14.50	21.08	39.25	61.25	88.30
Ductility factor	k_7	-	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	7.63	18.74	37.39	65.52	166.52	324.62	583.40
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25	1.25
CONCRETE PRY-OUT FAILURE									
Factor	k	-	1.00	1.00	1.00	2.00	2.00	2.00	2.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONCRETE EDGE FAILURE									
Effective length of anchor	ℓ_f	[mm]	35.00	40.00	50.00	60.00	95.00	115.00	125.00
Anchor diameter	d_{nom}	[mm]	6.00	8.00	10.00	12.00	16.00	20.00	24.00
Installation safety factor	γ_2	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00

R-RB Rawlbolt®

FOR USE IN CRACKED AND NON-CRACKED CONCRETE

DESIGN PERFORMANCE DATA

Resistance to tension and shear loads under fire exposure

Size			M6	M8	M10	M12	M16	M20
TENSION LOAD								
Edge distance	c_{cr}	[mm]	70.00	80.00	100.00	120.00	190.00	230.00
Spacing	s_{cr}	[mm]	140.00	160.00	200.00	240.00	380.00	460.00
R (for EI) = 30 min								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	0.20	0.40	0.90	1.70	3.10	4.90
PULL-OUT FAILURE								
Characteristic resistance	$N_{Rk,p}$	[kN]	1.00	1.30	1.50	3.00	4.00	7.50
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.20	0.40	0.90	1.70	3.10	4.90
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.20	0.40	1.10	2.60	6.70	13.00
R (for EI) = 60 min								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	0.20	0.30	0.80	1.30	2.40	3.70
PULL-OUT FAILURE								
Characteristic resistance	$N_{Rk,p}$	[kN]	1.00	1.30	1.50	3.00	4.00	7.50
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.20	0.30	0.80	1.30	2.40	3.70
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.10	0.30	1.00	2.00	5.00	9.70
R (for EI) = 90 min								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	0.10	0.30	0.60	1.10	2.00	3.20
PULL-OUT FAILURE								
Characteristic resistance	$N_{Rk,p}$	[kN]	1.00	1.30	1.50	3.00	4.00	7.50
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.10	0.30	0.60	1.10	2.00	3.20
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.10	0.30	0.70	1.70	4.30	8.40
R (for EI) = 120 min								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	0.10	0.20	0.50	0.80	1.60	2.50
PULL-OUT FAILURE								
Characteristic resistance	$N_{Rk,p}$	[kN]	0.80	1.00	1.20	2.40	3.20	6.00
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.10	0.20	0.50	0.80	1.60	2.50
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.10	0.20	0.60	1.30	3.30	6.50

R-SPL-II

High performance mechanical anchor

Loose Bolt
R-SPL-II-L SafetyPlus II

Bolt Projecting
R-SPL-II-P SafetyPlus II

Countersunk
R-SPL-II-C SafetyPlus II

ETA ETA-14/0345 CE

FEATURES AND BENEFITS

- Mechanical anchor for highest tension and shear loads
- Seismic category C2 for structural applications. Seismic category C1 for non-structural use in areas with low seismic risk.
- For usage with required fire resistance
- ETA Option 1 for cracked and non-cracked concrete.
- Antirotation brush to prevent rotation during installation.
- Anchor's construction allows easy through-installation (drilling and installation through fixed material)
- Three types of tips (nut, flat or tapered bolt) allow simple fitment for installed element
- 8.8 grade steel material of anchor provides high durability

APPLICATIONS

- Structural steel
- Masonry support
- Cladding restraints
- Road Signs
- Heavy machinery
- Racking systems
- Industrial doors
- Safety barriers

BASE MATERIALS

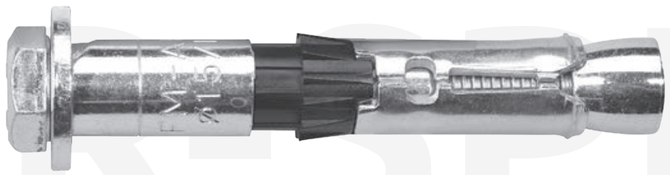
Approved for use in:
- Cracked concrete C20/25-C50/60
- Non-cracked concrete C20/25-C50/60
- Unreinforced concrete
- Reinforced concrete

Also suitable for use in:
- Natural Stone (after site testing)

INSTALLATION GUIDE

R-SPL-II-L SafetyPlus II

LOOSE BOLT



INSTALLATION GUIDE

1. Drill a hole of required diameter and depth
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Insert anchor through fixture into hole and tap until required installation depth is achieved
4. Tighten to the recommended torque

R-SPL-II-P SafetyPlus II

BOLT PROJECTING

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Insert anchor through fixture into hole and tap until required installation depth is achieved
4. Tighten to the recommended torque

R-SPL-II-C SafetyPlus II

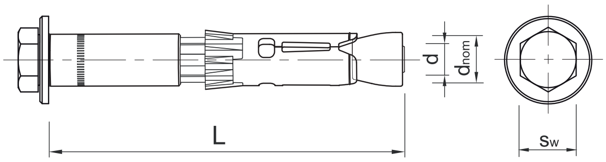
COUNTERSUNK

INSTALLATION GUIDE

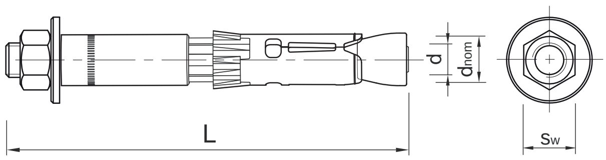
1. Drill a hole of required diameter and depth
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Insert anchor through fixture into hole and tap until required installation depth is achieved
4. Tighten to the recommended torque

PRODUCT INFORMATION

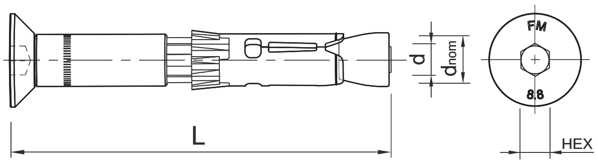
R-SPL-II-L SafetyPlus II LOOSE BOLT



R-SPL-II-P SafetyPlus II BOLT PROJECTING



R-SPL-II-C SafetyPlus II COUNTERSUNK

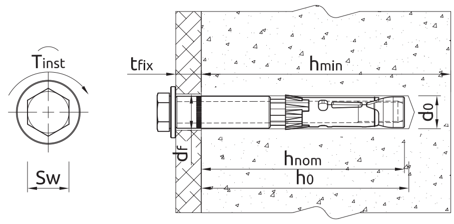


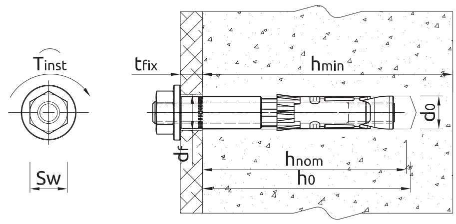
R-SPL-II

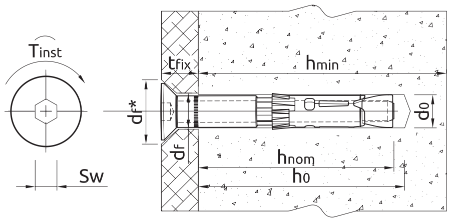
PRODUCT INFORMATION

Size	Product Code	Anchor			Fixture	
		Thread size	External diameter	Length	Max. thickness	Hole diameter
		d	d_{nom}	L	t_{fix}	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
R-SPL-II-L						
M6	R-SPL-II-06080/20L	6	10	80	20	12
	R-SPL-II-06110/50L	6	10	110	50	12
M8	R-SPL-II-08080/10L	8	12	80	10	14
	R-SPL-II-08090/20L	8	12	90	20	14
	R-SPL-II-08120/50L	8	12	120	50	14
M10	R-SPL-II-10090/10L	10	15	90	10	17
	R-SPL-II-10100/20L	10	15	100	20	17
	R-SPL-II-10130/50L	10	15	130	50	17
	R-SPL-II-10180100L	10	15	180	100	17
M12	R-SPL-II-12110/10L	12	18	110	10	20
	R-SPL-II-12125/25L	12	18	125	25	20
	R-SPL-II-12150/50L	12	18	150	50	20
	R-SPL-II-12200100L	12	18	200	100	20
M16	R-SPL-II-16125/10L	16	24	125	10	26
	R-SPL-II-16140/25L	16	24	140	25	26
	R-SPL-II-16165/50L	16	24	165	50	26
	R-SPL-II-16215100L	16	24	215	100	26
R-SPL-II-P						
M6	R-SPL-II-06110/50P	6	10	110	50	12
M8	R-SPL-II-08090/20P	8	12	90	20	14
M10	R-SPL-II-10100/20P	10	15	100	20	17
M12	R-SPL-II-12125/25P	12	18	125	25	20
	R-SPL-II-12150/50P	12	18	150	50	20
M16	R-SPL-II-16125/10P	16	24	125	10	26
R-SPL-II-C						
M6	R-SPL-II-06080/25C	6	10	80	25	12
M8	R-SPL-II-08080/16C	8	12	80	16	14
	R-SPL-II-08090/26C	8	12	90	26	14
M10	R-SPL-II-10090/17C	10	15	90	17	17
	R-SPL-II-10100/27C	10	15	100	27	17
M12	R-SPL-II-12125/33C	12	18	125	33	20

INSTALLATION DATA







Size			M6	M8	M10	M12	M16
Thread diameter	d	[mm]	6	8	10	12	16
Hole diameter in substrate	d_0	[mm]	10	12	15	18	24
Installation torque	T_{inst}	[Nm]	10	20	45	80	150
Min. hole depth in substrate	h_0	[mm]	75	85	95	115	130
Min. installation depth	h_{nom}	[mm]	60	70	80	100	115
Min. substrate thickness	h_{min}	[mm]	100	120	140	180	200
Min. spacing	s_{min}	[mm]	50	60	70	80	100
Min. edge distance	c_{min}	[mm]	50	60	70	80	100
Wrench size	Sw	[mm]	10	13	17	19	24
Hex key wrenches for countersunk	HEX	[mm]	5	6	8	10	-

R-SPL-II

MECHANICAL PROPERTIES

Size			M6	M8	M10	M12	M16
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	800	800	800	800	830
Nominal yield strength - tension	f_{yk}	[N/mm²]	640	640	640	640	660
Cross sectional area - tension	A_s	[mm²]	20.1	36.6	58	84.3	157
Elastic section modulus	W_{el}	[mm³]	21.2	50.3	98.2	169.7	402.1
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12	30	60	105	266
Design bending resistance	M	[Nm]	9.6	24	48	84	214

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M6	M8	M10	M12	M16
CRACKED AND NON-CRACKED						
Effective embedment depth h_{nom}	[mm]	60.00	70.00	80.00	100.00	115.00
CHARACTERISTIC LOAD						
TENSION LOAD N_{Rk}						
NON-CRACKED CONCRETE	[kN]	16.00	22.90	27.70	41.70	49.70
CRACKED CONCRETE	[kN]	9.00	12.00	16.00	25.00	35.50
SHEAR LOAD V_{Rk}						
NON-CRACKED CONCRETE	[kN]	14.00	22.90	42.00	50.00	97.00
CRACKED CONCRETE	[kN]	12.30	16.30	39.50	50.00	70.90
DESIGN LOAD						
TENSION LOAD N_{Rd}						
NON-CRACKED CONCRETE	[kN]	10.70	15.30	18.50	27.80	33.20
CRACKED CONCRETE	[kN]	6.00	8.00	10.70	16.70	23.60
SHEAR LOAD V_{Rd}						
NON-CRACKED CONCRETE	[kN]	11.20	15.30	33.60	40.00	66.30
CRACKED CONCRETE	[kN]	8.23	10.88	26.30	39.60	47.30
RECOMMENDED LOAD						
TENSION LOAD N_{rec}						
NON-CRACKED CONCRETE	[kN]	7.62	10.90	13.20	19.90	23.70
CRACKED CONCRETE	[kN]	4.29	5.71	7.62	11.90	16.90
SHEAR LOAD V_{rec}						
NON-CRACKED CONCRETE	[kN]	8.00	10.90	24.00	28.60	47.40
CRACKED CONCRETE	[kN]	5.88	7.77	18.80	28.30	33.80

DESIGN PERFORMANCE DATA

Size			M6	M8	M10	M12	M16
Effective embedment depth	h_{ef}	[mm]	49.00	59.00	67.00	88.00	99.00
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	16.00	29.00	46.00	67.00	126.00
Design resistance γ_{Ms} = 1.5	$N_{Rd,s}$	[kN]	10.70	19.30	30.70	44.70	84.00
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	17.30	22.90	27.70	41.70	49.70
Design resistance $\gamma_{Mc} = \gamma_{Mp}$ = 1.5	$N_{Rd,p}$	[kN]	11.60	15.30	18.50	27.80	33.20
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	9.00	12.00	16.00	25.00	35.50
Design resistance $\gamma_{Mc} = \gamma_{Mp}$ = 1.5	$N_{Rd,p}$	[kN]	6.00	8.00	10.70	16.70	23.60
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.22	1.22	1.22	1.22	1.22
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.41	1.41	1.41	1.41	1.41
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.55	1.55	1.55	1.55	1.55
Spacing	$s_{cr,N}$	[mm]	147.00	177.00	201.00	264.00	297.00
Edge distance	c_{cr}	[mm]	74.00	89.00	101.00	132.00	149.00
SHEAR LOAD							
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25							
Edge distance	c_1	[mm]	50.00	60.00	70.00	80.00	100.00
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	7.07	9.59	12.50	16.20	23.30
Design resistance γ_{Mc} = 1.5	$V_{Rd,c}$	[kN]	4.71	6.39	8.32	10.80	15.50
CONCRETE EDGE FAILURE; CRACKED CONCRETE C20/25							
Edge distance	c_1	[mm]	50.00	60.00	70.00	80.00	100.00
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	5.00	6.79	8.84	11.50	16.50
Design resistance γ_{Mc} = 1.5	$V_{Rd,c}$	[kN]	3.33	4.53	5.89	7.65	11.00
CONCRETE PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25							
Factor	k	-	1.00	1.00	2.00	2.00	2.00
Characteristic resistance	$V_{Rk,cp}$	[kN]	17.30	22.90	55.40	83.40	99.50
Design resistance γ_{Mc} = 1.5	$V_{Rd,cp}$	[kN]	11.60	15.30	36.90	55.60	66.30
CONCRETE PRY-OUT FAILURE; CRACKED CONCRETE C20/25							
Factor	k	-	1.00	1.00	2.00	2.00	2.00
Characteristic resistance	$V_{Rk,cp}$	[kN]	12.30	16.30	39.50	59.40	70.90
Design resistance γ_{Mc} = 1.5	$V_{Rd,cp}$	[kN]	8.23	10.90	26.30	39.60	47.30
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	14.00	26.00	42.00	50.00	97.00
Design resistance γ_{Ms} = 1.25	$V_{Rd,s}$	[kN]	11.20	20.80	33.60	40.00	77.60

R-SPL-II

DESIGN PERFORMANCE DATA

Characteristic Resistance under fire exposure in concrete C20/25 to C50/60

Size			M6	M8	M10	M12	M16
R (for EI) = 30 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.20	0.37	0.87	1.69	3.14
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	2.25	3.00	4.00	6.25	8.88
CONCRETE CONE FAILURE							
Characteristic resistance	$N_{Rk,c}$	[kN]	3.03	4.81	6.61	13.08	17.55
SHEAR LOAD							
CONCRETE PRY-OUT FAILURE							
Factor	k	-	1.00	1.00	2.00	2.00	2.00
Characteristic resistance	$V_{Rk,cp}$	[kN]	2.25	3.00	8.00	12.50	17.76
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.20	0.37	0.87	1.69	3.14
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.15	0.37	1.12	2.62	6.66
R (for EI) = 60 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.18	0.33	0.75	1.26	2.36
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	2.25	3.00	4.00	6.25	8.88
CONCRETE CONE FAILURE							
Characteristic resistance	$N_{Rk,c}$	[kN]	3.03	4.81	6.61	13.08	17.55
SHEAR LOAD							
CONCRETE PRY-OUT FAILURE							
Factor	k	-	1.00	1.00	2.00	2.00	2.00
Characteristic resistance	$V_{Rk,cp}$	[kN]	2.25	3.00	8.00	12.50	17.76
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.18	0.33	0.75	1.26	2.36
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.14	0.34	0.97	1.96	5.00
R (for EI) = 90 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.14	0.26	0.58	1.10	2.04
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	2.25	3.00	4.00	6.25	8.88
CONCRETE CONE FAILURE							
Characteristic resistance	$N_{Rk,c}$	[kN]	3.03	4.81	6.61	13.08	17.55
SHEAR LOAD							
CONCRETE PRY-OUT FAILURE							
Factor	k	-	1.00	1.00	2.00	2.00	2.00
Characteristic resistance	$V_{Rk,cp}$	[kN]	2.25	3.00	8.00	12.50	17.76
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.14	0.26	0.58	1.10	2.06
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.11	0.26	0.75	1.70	4.33
R (for EI) = 120 min							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	0.10	0.18	0.46	0.84	1.57
PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	1.80	2.40	3.20	5.00	7.10
CONCRETE CONE FAILURE							
Characteristic resistance	$N_{Rk,c}$	[kN]	2.42	3.85	5.29	10.46	14.04
SHEAR LOAD							
CONCRETE PRY-OUT FAILURE							
Factor	k	-	1.00	1.00	2.00	2.00	2.00
Characteristic resistance	$V_{Rk,cp}$	[kN]	1.80	2.40	6.40	10.00	14.20
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.10	0.18	0.46	0.84	1.57
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.08	0.19	0.60	1.31	3.33

R-SPL-II

DESIGN PERFORMANCE DATA

Allowable values for resistance in case of Seismic performance category C1

Size			M6	M8	M10	M12	M16
Effective embedment depth	h_{ef}	[mm]	49.00	59.00	67.00	88.00	99.00
TENSION LOAD, STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	16.00	29.00	46.00	67.00	126.00
Partial safety factor	$\gamma_{MsN,seisC1}$	-			1.50		
TENSION LOAD, PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	6.80	12.00	16.00	25.00	35.50
Partial safety factor	$\gamma_{Mp,seisC1}$	-			1.50		
SHEAR LOAD, STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	9.80	13.00	20.00		48.50
Partial safety factor	$\gamma_{MsV,seisC1}$	-			1.25		

Allowable values for resistance in case of Seismic performance category C2

Size			M6	M8	M10	M12	M16
Effective embedment depth	h_{ef}	[mm]	49.00	59.00	67.00	88.00	99.00
TENSION LOAD, STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	-	29.00	46.00	67.00	126.00
Partial safety factor	$\gamma_{MsN,seisC2}$	-			1.50		
TENSION LOAD, PULL-OUT FAILURE							
Characteristic resistance	$N_{Rk,p}$	[kN]	-	3.90	7.80	15.20	28.80
Partial safety factor	$\gamma_{Mp,seisC2}$	-			1.50		
SHEAR LOAD, STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	-	10.20	17.00		43.00
Partial safety factor	$\gamma_{MsV,seisC2}$	-			1.25		

R-SPL SafetyPlus

High performance mechanical anchor - loose bolt option

Loose Bolt
R-SPL SafetyPlus

Bolt Projecting
R-SPL-BP SafetyPlus

Countersunk
R-SPL-C SafetyPlus

ETA | ETA-11/0126 | CE

FEATURES AND BENEFITS

- High performance in non-cracked concrete confirmed by ETA Option 7
- Design of SafetyPlus allows for easy through fixing
- Integral controlled collapse and anti-rotation feature ensures fixture is firmly secured
- Unique zig-zag feature provides balanced expansion, ensuring secure setting and maximised load-bearing capacity
- Case-hardened nut with optimum taper angle for enhanced expansion
- Fire resistant

APPLICATIONS

- Structural steel
- Masonry support
- Cladding restraint
- Road Signs
- Heavy machinery
- Racking systems
- Industrial doors
- Safety barriers

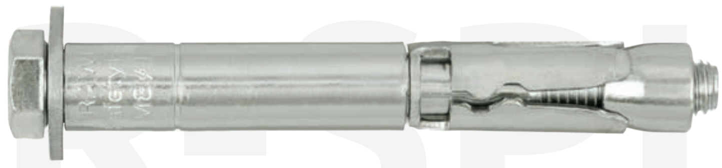
BASE MATERIALS

Approved for use in:
- Non-cracked concrete C20/25-C50/60
- Unreinforced concrete
- Reinforced concrete

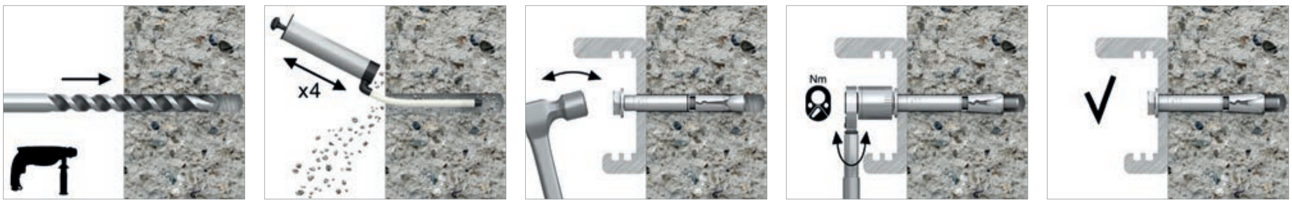
Also suitable for use in:
- Natural Stone
- (after site testing

INSTALLATION GUIDE

R-SPL SafetyPlus LOOSE BOLT

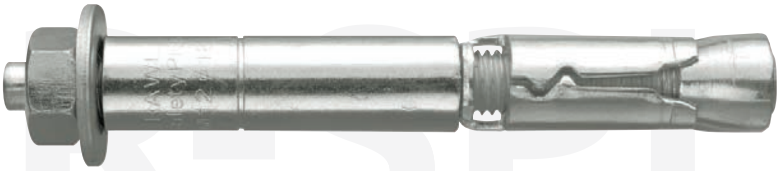


INSTALLATION GUIDE

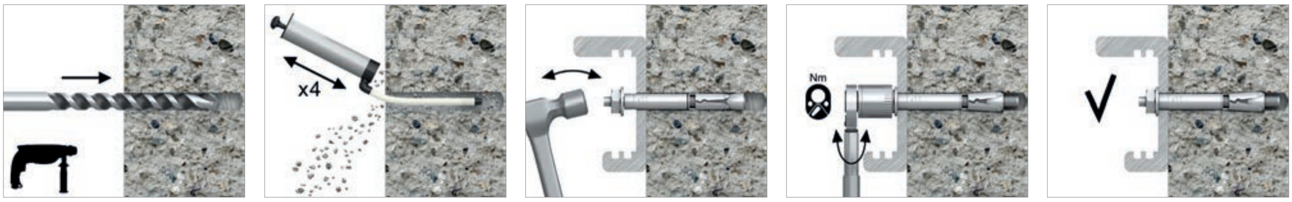


1. Drill a hole of required diameter and depth
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Insert anchor through fixture into hole and tap until required installation depth is achieved
4. Tighten to the recommended torque

R-SPL-BP SafetyPlus BOLT PROJECTING

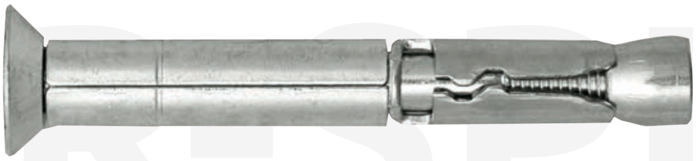


INSTALLATION GUIDE



1. Drill a hole of required diameter and depth
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Insert anchor through fixture into hole and tap until required installation depth is achieved
4. Tighten to the recommended torque

R-SPL-C SafetyPlus COUNTERSUNK

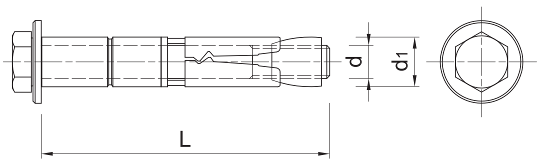


INSTALLATION GUIDE

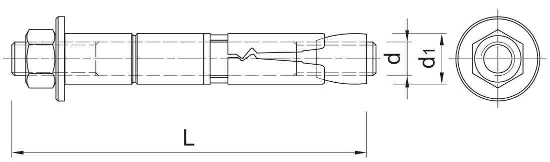
1. Drill a hole of required diameter and depth
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Insert anchor through fixture into hole and tap until required installation depth is achieved
4. Tighten to the recommended torque

PRODUCT INFORMATION

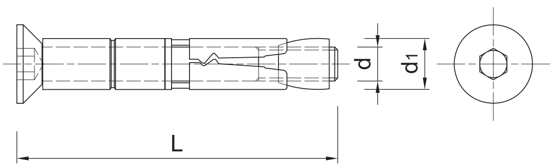
R-SPL SafetyPlus LOOSE BOLT



R-SPL-BP SafetyPlus BOLT PROJECTING



R-SPL-C SafetyPlus COUNTERSUNK

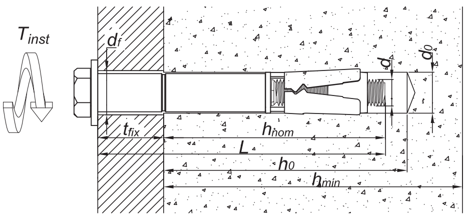


R-SPL SafetyPlus

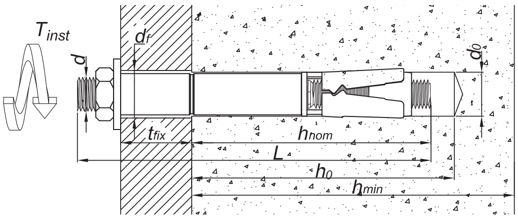
PRODUCT INFORMATION

Size	Product Code	Anchor			Fixture	
		Thread size	External diameter	Length	Max. thickness	Hole diameter
		d	d_{nom}	L	t_{fix}	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
R-SPL						
M8	R-SPL-08090/15	8	12	90	15	14
	R-SPL-08110/40	8	12	110	40	14
M10	R-SPL-10105/20	10	15	105	20	17
	R-SPL-10120/40	10	15	120	40	17
	R-SPL-10140/60	10	15	140	60	17
M12	R-SPL-12120/25	12	18	120	25	20
	R-SPL-12150/50	12	18	150	50	20
M16	R-SPL-16145/25	16	24	145	25	26
	R-SPL-16170/50	16	24	170	50	26
M20	R-SPL-20175/30	20	28	175	30	30
R-SPL-BP						
M10	R-SPL-BP-10110/20	10	15	110	20	17
M12	R-SPL-BP-12135/25	12	18	135	25	20
	R-SPL-BP-12160/50	12	18	160	50	20
M16	R-SPL-BP-16160/25	16	24	160	25	26
	R-SPL-BP-16185/50	16	24	185	50	26
M20	R-SPL-BP-20190/30	20	28	190	30	30
M8	R-SPL-C-08090/20	8	12	90	20	14
M10	R-SPL-C-10105/25	10	15	105	25	17
M12	R-SPL-C-12125/30	12	18	125	30	20
M16	R-SPL-C-16145/30	16	24	145	30	26

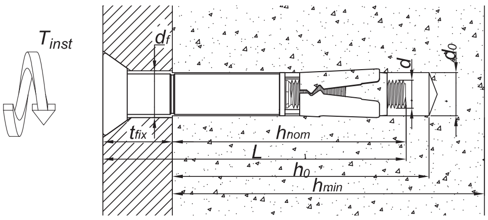
INSTALLATION DATA



R-SPL



R-SPL-BP



R-SPL-C

Size			M8	M10	M12	M16	M20
Thread diameter	d	[mm]	8	10	12	16	20
Hole diameter in substrate	d_0	[mm]	12	15	18	24	28
Min. hole depth in substrate	h_0	[mm]	85	95	105	130	160
Installation torque	T_{inst}	[Nm]	25	50	80	180	275
Min. installation depth	h_{nom}	[mm]	70	80	90	110	130
Min. substrate thickness	h_{min}	[mm]	100	105	120	150	188
Min. spacing	s_{min}	[mm]	60	70	80	100	125
Min. edge distance	c_{min}	[mm]	90	105	120	150	186
Wrench size	Sw	[mm]	13	17	19	24	30
Hex key wrenches for countersunk	Hex	[mm]	6	8	10	12	

MECHANICAL PROPERTIES

Size			M8	M10	M12	M16	M20
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	800	800	800	800	800
Nominal yield strength - tension	f_{yk}	[N/mm²]	640	640	640	640	640
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245
Elastic section modulus	W_{el}	[mm³]	50.3	98.2	169.7	402.1	758.9
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	45.04	87.97	152.01	365.97	728.54
Design bending resistance	M	[Nm]	36.03	70.38	121.61	292.78	592.83

R-SPL SafetyPlus

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M8	M10	M12	M16	M20
Effective embedment depth h_{nom}	[mm]	70.00	80.00	90.00	110.00	130.00
MEAN ULTIMATE LOAD						
TENSION LOAD $N_{Ru,m}$	[kN]	15.70	19.70	28.20	60.10	66.80
SHEAR LOAD $V_{Ru,m}$	[kN]	25.08	35.04	57.61	98.15	88.42
CHARACTERISTIC LOAD						
TENSION LOAD N_{Rk}	[kN]	9.00	12.00	16.00	35.00	40.00
SHEAR LOAD V_{Rk}	[kN]	18.00	24.00	32.00	70.00	73.68
DESIGN LOAD						
TENSION LOAD N_{Rd}	[kN]	4.29	5.71	7.62	16.67	19.05
SHEAR LOAD V_{Rd}	[kN]	8.57	11.43	15.24	33.33	38.10
RECOMMENDED LOAD						
TENSION LOAD N_{rec}	[kN]	3.06	4.08	5.44	11.90	13.61
SHEAR LOAD V_{rec}	[kN]	6.12	8.16	10.89	23.81	27.21

DESIGN PERFORMANCE DATA

Data based on ETA-11/0126 Option 7

Size			M8	M10	M12	M16	M20
Effective embedment depth	h_{ef}	[mm]	60.00	70.00	80.00	100.00	125.00
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	29.30	46.40	57.40	125.60	196.00
Design resistance γ_{Ms}= 1.5	$V_{Rd,s}$	[kN]	19.53	30.93	38.27	83.73	130.67
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	9.00	12.00	16.00	35.00	40.00
Design resistance γ_{Mp}= 2.1	$N_{Rd,p}$	[kN]	4.29	5.71	7.62	16.67	19.05
Spacing	$s_{cr,N}$	[mm]	180.00	210.00	240.00	300.00	375.00
Edge distance	$c_{cr,N}$	-	90.00	105.00	120.00	150.00	188.00
SHEAR LOAD							
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25							
Edge distance	c_1	[mm]	90.00	105.00	120.00	150.00	186.00
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	16.50	21.48	26.96	39.32	55.68
Design resistance γ_{Mc}= 2.1	$V_{Rd,c}$	[kN]	7.86	10.23	12.84	18.72	26.51
CONCRETE PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25							
Factor	k	-	2.00	2.00	2.00	2.00	2.00
Characteristic resistance	$V_{Rk,cp}$	[kN]	18.00	24.00	32.00	70.00	80.00
Design resistance γ_{Mc}= 2.1	$V_{Rd,cp}$	[kN]	8.57	11.43	15.24	33.33	38.10
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	19.20	30.00	43.20	77.60	73.68
Design resistance γ_{Ms}= 1.25	$V_{Rd,s}$	[kN]	15.36	24.00	34.56	62.08	58.94

R-DCA-A4 STAINLESS STEEL WEDGE ANCHOR

Internally threaded stainless steel wedge anchor for simple hammer-set installation

ETA ETA-13/0584 CE FIRE

FEATURES AND BENEFITS

- High performance in cracked and non-cracked concrete confirmed by ETA
- Product is covered with European Technical Assessment for multi-point non-structural fixings
- Product recommended for applications requiring fire resistance
- Stainless steel material for high resistance to corrosion
- Easy to install by hammer action and manual setting tool
- Slotted sleeve and internal wedge component together facilitate easy setting and expansion
- Product was tested for construction fixing

APPLICATIONS

- Pipelines systems
- Ventilation systems
- Sprinkler systems
- Cable conduits and wires
- Gratings

BASE MATERIALS

Approved for use in:

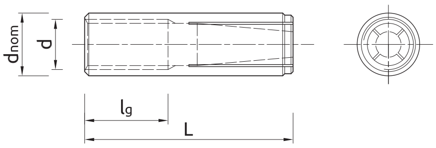
- Cracked concrete C20/25-C50/60
- Non-cracked concrete C20/25-C50/60
- Unreinforced concrete
- Reinforced concrete

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth
2. Clear the hole of drilling dust and debris (using blow pump and brush or equivalent method)
3. Insert wedge anchor, slotted end first
4. Use the setting tool to drive the internal wedge into the anchor
5. Insert bolt or stud through fixture and tighten to the recommended torque

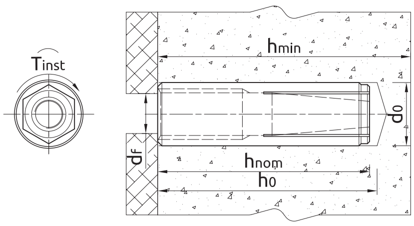
PRODUCT INFORMATION

Size	Product Code	Anchor				Fixture
		Diameter	External diameter	Length	Internal thread length	Hole diameter
		d	d_{nom}	L	l_g	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
M6	R-DCA-06-25-A4	6	8	25	11	7
M8	R-DCA-08-30-A4	8	10	30	14	9
M10	R-DCA-10-40-A4	10	12	40	19	12
M12	R-DCA-12-50-A4	12	15	50	25	14
M16	R-DCA-16-65-A4	16	20	65	28	18



INSTALLATION DATA

Size			M6	M8	M10	M12	M16
Thread diameter	d	[mm]	6	8	10	12	16
Hole diameter in substrate	d_0	[mm]	8	10	12	15	20
Installation torque	T_{inst}	[Nm]	4.5	11	22	38	98
Min. hole depth in substrate	h_0	[mm]	27	32	42	52	67
Min. installation depth	h_{nom}	[mm]	25	30	40	50	65
Min. substrate thickness	h_{min}	[mm]	80	80	80	100	130
Min. spacing	s_{min}	[mm]	200	200	200	200	260
Min. edge distance	c_{min}	[mm]	150	150	150	150	195



R-DCA-A4 STAINLESS STEEL WEDGE ANCHOR

MECHANICAL PROPERTIES

Size			M6	M8	M10	M12	M16
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	500	500	500	500	500
Nominal yield strength - tension	f_{yk}	[N/mm²]	210	210	210	210	210
Cross sectional area - tension	A_s	[mm²]	20.1	36.6	58	84.3	157
Elastic section modulus	W_{el}	[mm³]	21.21	50.27	98.17	169.65	402.12

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M6	M8	M10	M12	M16
Effective embedment depth h_{ef}	[mm]	25.00	30.00	40.00	50.00	65.00
MEAN ULTIMATE LOAD						
TENSION AND SHEAR LOAD $F_{Ru,m}$	[kN]	-	-	-	-	-
CHARACTERISTIC LOAD						
TENSION AND SHEAR LOAD F_{Rk}	[kN]	1.00	2.01	3.20	4.59	8.27
DESIGN LOAD						
TENSION AND SHEAR LOAD F_{Rd}	[kN]	0.55	1.11	1.77	2.55	4.59
RECOMMENDED LOAD						
TENSION AND SHEAR LOAD F_{rec}	[kN]	0.39	0.79	1.26	1.82	3.28

DESIGN PERFORMANCE DATA

Size			M6	M8	M10	M12	M16
Effective embedment depth	h_{ef}	[mm]	25.00	30.00	40.00	50.00	65.00
TENSION AND SHEAR LOAD							
Characteristic resistance	F_{Rk}	[kN]	1.00	2.01	3.20	4.59	8.27
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20
Spacing	s_{cr}	[mm]	200.00	200.00	200.00	200.00	260.00
Edge distance	c_{cr}	[mm]	150.00	150.00	150.00	150.00	195.00
SHEAR LOAD							
STEEL FAILURE; STEEL GRADE A4-70							
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	11.00	26.00	52.00	92.00	233.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25

DESIGN PERFORMANCE DATA

Characteristic Resistance under fire exposure in concrete C20/25 to C50/60

Size			M8	M10	M12	M16
TENSION AND SHEAR LOAD						
Spacing	s_{cr}	[mm]	120.00	160.00	200.00	260.00
Edge distance	c_{cr}	[mm]	60.00	80.00	100.00	130.00
R (for EI) = 30 min						
TENSION AND SHEAR LOAD						
Characteristic resistance	F_{Rk}	[kN]	0.50	0.80	1.10	2.10
R (for EI) = 60 min						
TENSION AND SHEAR LOAD						
Characteristic resistance	F_{Rk}	[kN]	0.50	0.80	1.10	2.10
R (for EI) = 90 min						
TENSION AND SHEAR LOAD						
Characteristic resistance	F_{Rk}	[kN]	0.50	0.80	1.10	2.10
R (for EI) = 120 min						
TENSION AND SHEAR LOAD						
Characteristic resistance	F_{Rk}	[kN]	0.40	0.60	0.90	1.60

R-DCA WEDGE ANCHOR

Internally threaded wedge anchor for simple hammer-set installation

ETA-13/0584

FEATURES AND BENEFITS

- High performance in cracked and non-cracked concrete confirmed by ETA
- Product is covered with European Technical Assessment for multi--point non-structural fixings
- Product recommended for applications requiring fire resistance
- Internally threaded to be used with threaded stud or bolt
- Easy to install by hammer action and manual setting tool
- Slotted sleeve and internal wedge component together facilitate easy setting and expansion
- Product was tested for construction fixing

APPLICATIONS

- Pipelines systems
- Ventilation systems
- Sprinkler systems
- Cable conduits and wires
- Gratings

BASE MATERIALS

Approved for use in:

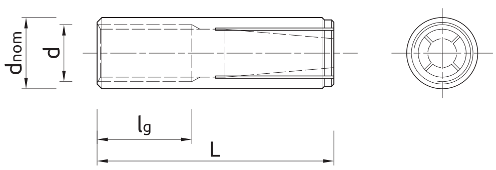
- Cracked concrete C20/25-C50/60
- Non-cracked concrete C20/25-C50/60
- Unreinforced concrete
- Reinforced concrete

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Insert wedge anchor, slotted end first
4. Use the setting tool to drive the internal wedge into the anchor
5. Insert bolt or stud through fixture and tighten to the recommended torque

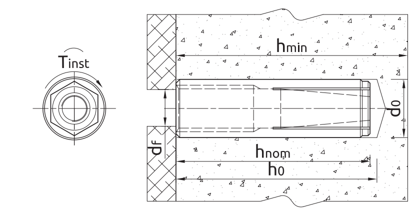
PRODUCT INFORMATION

Size	Product Code	Anchor				Fixture
		Diameter	External diameter	Length	Internal thread length	Hole diameter
		d	d_{nom}	L	l_g	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
M6	R-DCA-06-25	6	8	25	11	7
M8	R-DCA-08-30	8	10	30	14	9
M10	R-DCA-10-40	10	12	40	19	12
M12	R-DCA-12-50	12	15	50	25	14
M16	R-DCA-16-65	16	20	65	28	18
M20	R-DCA-20-80	20	25	80	38	22



INSTALLATION DATA

Size			M6	M8	M10	M12	M16	M20
Thread diameter	d	[mm]	6	8	10	12	16	20
Hole diameter in substrate	d_0	[mm]	8	10	12	15	20	25
Max. installation torque	T_{inst}	[Nm]	4.5	11	22	38	98	130
Min. hole depth in substrate	h_0	[mm]	27	32	42	52	67	82
Min. installation depth	h_{nom}	[mm]	25	30	40	50	65	80
Min. substrate thickness	h_{min}	[mm]	80	80	80	100	130	160
Min. spacing	s_{min}	[mm]	200	200	200	200	260	320
Min. edge distance	c_{min}	[mm]	150	150	150	150	195	240



R-DCA WEDGE ANCHOR

MECHANICAL PROPERTIES

Size			M6	M8	M10	M12	M16	M20
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	450	450	450	450	450	450
Nominal yield strength - tension	f_{yk}	[N/mm²]	360	360	360	360	360	360
Cross sectional area - tension	A_s	[mm²]	20.1	36.6	58	84.3	157	245
Elastic section modulus	W_{el}	[mm³]	21.21	50.3	98.2	169.7	402.1	785.4

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M6	M8	M10	M12	M16	M20
Effective embedment depth h_{ef}	[mm]	25.00	30.00	40.00	50.00	65.00	80.00
MEAN ULTIMATE LOAD							
TENSION AND SHEAR LOAD $F_{Ru,m}$	[kN]	-	-	-	-	-	-
CHARACTERISTIC LOAD							
TENSION AND SHEAR LOAD F_{Rk}	[kN]	1.52	3.01	4.57	6.43	13.31	17.38
DESIGN LOAD							
TENSION AND SHEAR LOAD F_{Rd}	[kN]	0.84	1.67	2.54	3.57	7.39	9.65
RECOMMENDED LOAD							
TENSION AND SHEAR LOAD F_{rec}	[kN]	0.60	1.19	1.81	2.55	5.28	6.89

DESIGN PERFORMANCE DATA

Size			M6	M8	M10	M12	M16	M20
Effective embedment depth	h_{ef}	[mm]	25.00	30.00	40.00	50.00	65.00	80.00
TENSION AND SHEAR LOAD								
Characteristic resistance	F_{Rk}	[kN]	1.52	3.01	4.57	6.43	13.31	17.38
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20	1.20
Spacing	s_{cr}	[mm]	200.00	200.00	200.00	200.00	260.00	320.00
Edge distance	c_{cr}	[mm]	150.00	150.00	150.00	150.00	195.00	240.00
SHEAR LOAD								
STEEL FAILURE; [ENGLISH]: STAL KLASY 4.8								
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	6.00	15.00	30.00	52.00	133.00	260.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL CLASS 5.8								
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	8.00	19.00	37.00	66.00	167.00	325.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; [ENGLISH]: STAL KLASY 6.8								
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	9.00	23.00	45.00	79.00	200.00	390.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL CLASS 8.8								
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	12.00	30.00	60.00	105.00	267.00	520.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25	1.25

DESIGN PERFORMANCE DATA

Characteristic Resistance under fire exposure in concrete C20/25 to C50/60

Size			M8	M10	M12	M16	M20
TENSION AND SHEAR LOAD							
Spacing	s_{cr}	[mm]	120.00	160.00	200.00	260.00	320.00
Edge distance	c_{cr}	[mm]	60.00	80.00	100.00	130.00	160.00
R (for EI) = 30 min							
TENSION AND SHEAR LOAD							
Characteristic resistance	F_{Rk}	[kN]	0.40	0.90	1.60	3.10	4.30
R (for EI) = 60 min							
TENSION AND SHEAR LOAD							
Characteristic resistance	F_{Rk}	[kN]	0.30	0.80	1.30	2.40	3.70
R (for EI) = 90 min							
TENSION AND SHEAR LOAD							
Characteristic resistance	F_{Rk}	[kN]	0.30	0.60	1.10	2.00	3.20
R (for EI) = 120 min							
TENSION AND SHEAR LOAD							
Characteristic resistance	F_{Rk}	[kN]	0.20	0.50	0.80	1.60	2.50

R-DCL LIPPED WEDGE ANCHOR

High performance mechanical anchor

ETA-13/0584

FEATURES AND BENEFITS

- High performance in cracked and non-cracked concrete confirmed by ETA
- Product is covered with European Technical Assessment for multi-point non-structural fixings
- Product recommended for applications requiring fire resistance
- Internally threaded to be used with threaded stud or bolt
- Easy to install by hammer action and manual setting tool
- Slotted sleeve and internal wedge component together facilitate easy setting and expansion

APPLICATIONS

- Pipelines systems
- Ventilation systems
- Sprinkler systems
- Cable conduits and wires
- Gratings

BASE MATERIALS

Approved for use in:

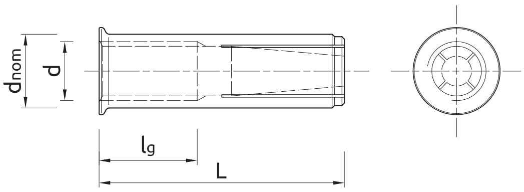
- Cracked concrete C20/25-C50/60
- Non-cracked concrete C20/25-C50/60
- Unreinforced concrete
- Reinforced concrete

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Insert wedge anchor, slotted end first
4. Use the setting tool to drive the internal wedge into the anchor
5. Insert bolt or stud through fixture and tighten to the recommended torque

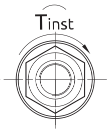
PRODUCT INFORMATION

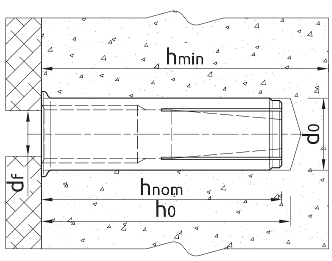
Size	Product Code	Anchor				Fixture
		Diameter	External diameter	Length	Internal thread length	Hole diameter
		d	d_{nom}	L	l_g	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
M6	R-DCL-06	6	8	25	11	7
M8	R-DCL-08-25	8	10	25	14	9
	R-DCL-08	8	10	30	14	9
M10	R-DCL-10-25	10	12	25	14	12
	R-DCL-10	10	12	40	19	12
M12	R-DCL-12-25	12	15	25	14	14
	R-DCL-12	12	15	50	25	14
M16	R-DCL-16	16	20	65	28	18



INSTALLATION DATA

Size			M6	M8	M10	M12	M16
Thread diameter	d	[mm]	6	8	10	12	16
Hole diameter in substrate	d_0	[mm]	8	10	12	15	20
Max. installation torque	T_{inst}	[Nm]	4.5	11	22	38	98
Min. hole depth in substrate	h_0	[mm]	27	32	42	52	67
Min. installation depth	h_{nom}	[mm]	25	30	40	50	65
Min. substrate thickness	h_{min}	[mm]	80	80	80	100	130
Min. spacing	s_{min}	[mm]	200	200	200	200	260
Min. edge distance	c_{min}	[mm]	150	150	150	150	195





R-DCL LIPPED WEDGE ANCHOR

MECHANICAL PROPERTIES

Size			M6	M8	M10	M12	M16
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	450	450	450	450	450
Nominal yield strength - tension	f_{yk}	[N/mm²]	360	360	360	360	360
Cross sectional area - tension	A_s	[mm²]	20.1	36.6	58	84.3	157
Elastic section modulus	W_{el}	[mm³]	21.21	50.3	98.2	169.7	402.1

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size		M6	M8	M10	M12	M16
Effective embedment depth h_{ef}	[mm]	25.00	30.00	40.00	50.00	65.00
MEAN ULTIMATE LOAD						
TENSION AND SHEAR LOAD $F_{Ru,m}$	[kN]	-	-	-	-	-
CHARACTERISTIC LOAD						
TENSION AND SHEAR LOAD F_{Rk}	[kN]	1.52	3.01	4.57	6.43	13.31
DESIGN LOAD						
TENSION AND SHEAR LOAD F_{Rd}	[kN]	0.84	1.67	2.54	3.57	7.39
RECOMMENDED LOAD						
TENSION AND SHEAR LOAD F_{rec}	[kN]	0.60	1.19	1.81	2.55	5.28

DESIGN PERFORMANCE DATA

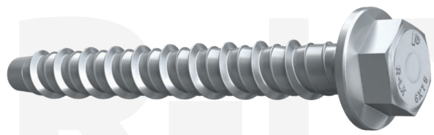
Size			M6	M8	M10	M12	M16
Effective embedment depth	h_{ef}	[mm]	25.00	30.00	40.00	50.00	65.00
TENSION AND SHEAR LOAD							
Characteristic resistance	F_{Rk}	[kN]	1.52	3.01	4.57	6.43	13.31
Installation safety factor	γ_2	-	1.20	1.20	1.20	1.20	1.20
Spacing	s_{cr}	[mm]	200.00	200.00	200.00	200.00	260.00
Edge distance	c_{cr}	[mm]	150.00	150.00	150.00	150.00	195.00
SHEAR LOAD							
STEEL FAILURE; [ENGLISH]: STAL KLASY 4.8							
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	6.00	15.00	30.00	52.00	133.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL CLASS 5.8							
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	8.00	19.00	37.00	66.00	167.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; [ENGLISH]: STAL KLASY 6.8							
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	9.00	23.00	45.00	79.00	200.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25
STEEL FAILURE; STEEL CLASS 8.8							
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	12.00	30.00	60.00	105.00	267.00
Partial safety factor	γ_{Ms}	-	1.25	1.25	1.25	1.25	1.25

Characteristic Resistance under fire exposure in concrete C20/25 to C50/60

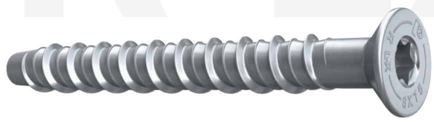
Size			M8	M10	M12	M16
TENSION AND SHEAR LOAD						
Spacing	s_{cr}	[mm]	120.00	160.00	200.00	260.00
Edge distance	c_{cr}	[mm]	60.00	80.00	100.00	130.00
R (for EI) = 30 min						
TENSION AND SHEAR LOAD						
Characteristic resistance	F_{Rk}	[kN]	0.40	0.90	1.60	3.10
R (for EI) = 60 min						
TENSION AND SHEAR LOAD						
Characteristic resistance	F_{Rk}	[kN]	0.30	0.80	1.30	2.40
R (for EI) = 90 min						
TENSION AND SHEAR LOAD						
Characteristic resistance	F_{Rk}	[kN]	0.30	0.60	1.10	2.00
R (for EI) = 120 min						
TENSION AND SHEAR LOAD						
Characteristic resistance	F_{Rk}	[kN]	0.20	0.50	0.80	1.60

R-LX CONCRETE SCREW ANCHORS MULTI-POINT NON-STRUCTURAL FIXINGS

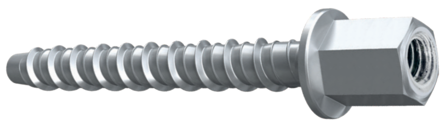
Self-tapping concrete screwbolt



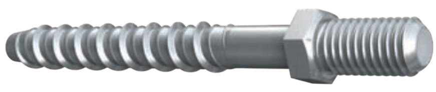
Hexagonal head screw with washer
R-LX-HF



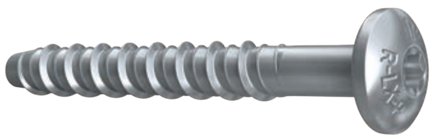
Countersunk head screw
R-LX-CS



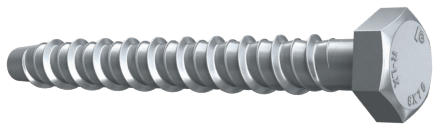
Internally threaded head screw
R-LX-I



Externally threaded head screw
R-LX-E



Panhead screw
R-LX-P



Hexagonal head screw for temporary installation
R-LX-H*

*not included in the approval

ETA | ETA 17/0783 | CE | ZP ZINC-PLATED | ZF ZINC FLAKE COATING | C1 - C4

FEATURES AND BENEFITS
- Time-efficient installation through streamlined procedure - simply drill and drive
- Completely removable with possibility of reuse
- Unique design with patented threadform ensures high performance for relatively small hole diameter
- Non-expansion functioning ensures low risk of damage to base material and makes R-LX ideal for installation near edges and adjacent anchors
- Special zinc flake corrosion-resistant coating
- High performance in both uncracked and cracked concrete
- Different head types for any application
- Oversize head for fixtures with elongated holes
- Excellent product for temporary fixing
- Suitable for standard and reduced embedment depth

APPLICATIONS
- Through-fixing
- Temporary anchorages
- Formwork support systems
- Balustrading & handrails
- Fencing & gates manufacturing and installation
- Racking systems
- Public seating
- Scaffolding

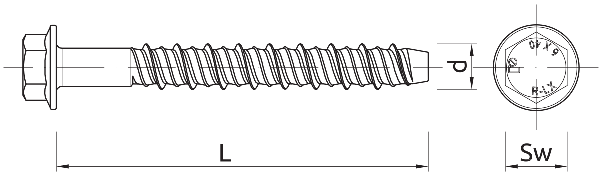
BASE MATERIALS
Approved for use in:
- Cracked concrete C20/25-C50/60
- Non-cracked concrete C20/25-C50/60
- Reinforced concrete
- Unreinforced concrete
- Hollow Core Slab (only R-LX-06)

Also suitable for use in:
- Natural Stone (after site testing)

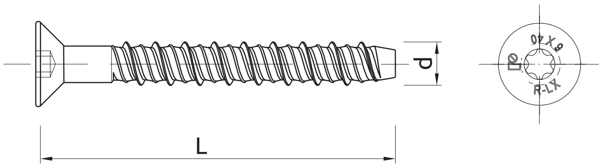
R-LX CONCRETE SCREW ANCHORS MULTI-POINT NON-STRUCTURAL FIXINGS

PRODUCT INFORMATION

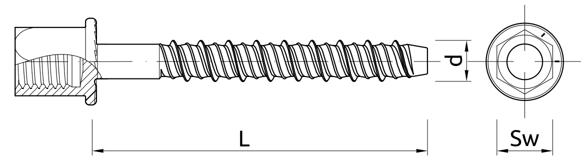
R-LX-HF HEXAGONAL HEAD SCREW WITH WASHER



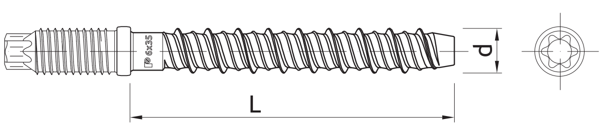
R-LX-CS COUNTERSUNK HEAD SCREW



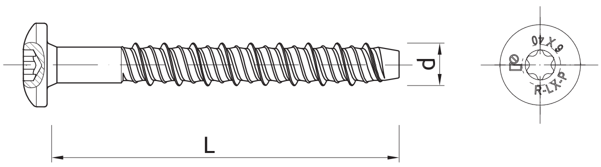
R-LX-I INTERNALLY THREADED HEAD SCREW



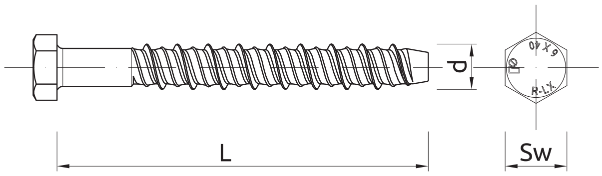
R-LX-E EXTERNALLY THREADED HEAD SCREW



R-LX-P PANHEAD SCREW



R-LX-H HEXAGONAL HEAD SCREW FOR TEMPORARY INSTALLATION



	Product Code		Drill	Anchor			Fixture		
				Diameter	Length	Internal thread	Max. thickness t_{fix} for:		Hole diameter
				d	L		$h_{nom,s}$	$h_{nom,r}$	d_f
				[mm]	[mm]		[mm]	[mm]	[mm]
R-LX-HF Hex with Flange									
	R-LX-HF-ZF	**R-LX-HF-ZP**							
5	R-LX-05X050-HF-ZF	R-LX-05X050-HF-ZP	5	6.3	50	-	7	-	7
	R-LX-05X075-HF-ZF	R-LX-05X075-HF-ZP	5	6.3	75	-	32	-	7
6	R-LX-06X050-HF-ZF	R-LX-06X050-HF-ZP	6	7.5	50	-	-	7	9
	-	R-LX-06X060-HF-ZP	6	7.5	60	-	5	17	9
	R-LX-06X075-HF-ZF	R-LX-06X075-HF-ZP	6	7.5	75	-	20	32	9
	-	R-LX-06X090-HF-ZP	6	7.5	90	-	35	47	9
	R-LX-06X100-HF-ZF	R-LX-06X100-HF-ZP	6	7.5	100	-	45	57	9
	R-LX-06X130-HF-ZF	R-LX-06X130-HF-ZP	6	7.5	130	-	75	87	9
	R-LX-06X150-HF-ZF	R-LX-06X150-HF-ZP	6	7.5	150	-	95	107	9
8	R-LX-08X060-HF-ZF	R-LX-08X060-HF-ZP	8	10	60	-	-	10	12
	R-LX-08X075-HF-ZF	R-LX-08X075-HF-ZP	8	10	75	-	5	30	12
	R-LX-08X090-HF-ZF	R-LX-08X090-HF-ZP	8	10	90	-	20	40	12
	R-LX-08X100-HF-ZF	R-LX-08X100-HF-ZP	8	10	100	-	30	50	12
	-	R-LX-08X120-HF-ZP	8	10	120	-	50	70	12
	R-LX-08X130-HF-ZF	R-LX-08X130-HF-ZP	8	10	130	-	60	80	12
	R-LX-08X150-HF-ZF	R-LX-08X150-HF-ZP	8	10	150	-	80	100	12
10	-	R-LX-10X060-HF-ZP	10	12.5	60	-	-	5	14
	R-LX-10X065-HF-ZF	R-LX-10X065-HF-ZP	10	12.5	65	-	-	10	14
	R-LX-10X075-HF-ZF	R-LX-10X075-HF-ZP	10	12.5	75	-	-	20	14
	R-LX-10X085-HF-ZF	R-LX-10X085-HF-ZP	10	12.5	85	-	-	30	14
	-	R-LX-10X090-HF-ZP	10	12.5	90	-	5	35	14
	R-LX-10X100-HF-ZF	R-LX-10X100-HF-ZP	10	12.5	100	-	15	45	14
	-	R-LX-10X110-HF-ZP	10	12.5	110	-	25	55	14
	R-LX-10X120-HF-ZF	R-LX-10X120-HF-ZP	10	12.5	120	-	35	65	14
	-	R-LX-10X130-HF-ZP	10	12.5	130	-	45	75	14
	R-LX-10X140-HF-ZF	R-LX-10X140-HF-ZP	10	12.5	140	-	55	85	14
	-	R-LX-10X150-HF-ZP	10	12,.5	150	-	65	95	14
12	R-LX-12X075-HF-ZF	R-LX-12X075-HF-ZP	12	14	75	-	-	10	16
	R-LX-12X100-HF-ZF	R-LX-12X100-HF-ZP	12	14	100	-	-	35	16
	R-LX-12X130-HF-ZF	R-LX-12X130-HF-ZP	12	14	130	-	30	65	16
	R-LX-12X150-HF-ZF	R-LX-12X150-HF-ZP	12	14	150	-	50	85	16
14	R-LX-14X080-HF-ZF	R-LX-14X080-HF-ZP	14	17	80	-	-	5	18
	R-LX-14X105-HF-ZF	R-LX-14X105-HF-ZP	14	17	105	-	-	30	18
	R-LX-14X115-HF-ZF	R-LX-14X115-HF-ZP	14	17	115	-	-	40	18
	R-LX-14X135-HF-ZF	R-LX-14X135-HF-ZP	14	17	135	-	15	60	18
	-	R-LX-14X160-HF-ZP	14	17	160	-	40	85	18

R-LX CONCRETE SCREW ANCHORS
MULTI-POINT NON-STRUCTURAL FIXINGS

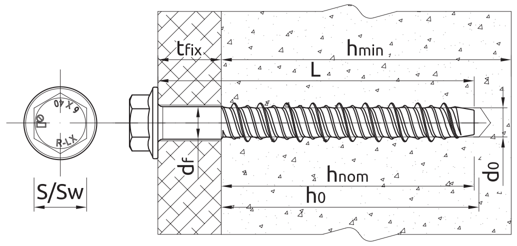
PRODUCT INFORMATION (cont.)

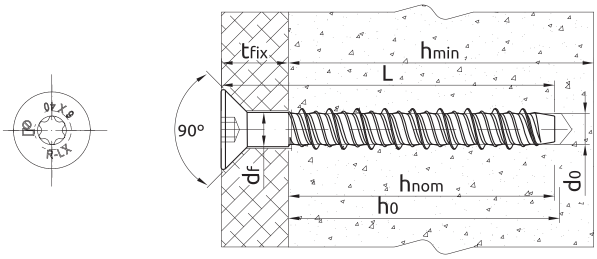
	Product Code		Drill	Anchor			Fixture		
				Diameter	Length	Internal thread	Max. thickness t_{fix} for:		Hole diameter
				d	L		$h_{nom,s}$	$h_{nom,r}$	d_f
				[mm]	[mm]		[mm]	[mm]	[mm]
R-LX-CS Countresunk head screw									
	R-LX-CS-ZF	**R-LX-CS-ZP**							
5	R-LX-05X050-CS-ZF	R-LX-05X050-CS-ZP	5	6.3	50	-	7	-	7
	R-LX-05X075-CS-ZF	R-LX-05X075-CS-ZP	5	6.3	75	-	32	-	7
6	R-LX-06X050-CS-ZF	R-LX-06X050-CS-ZP	6	7.5	50	-	-	7	9
	-	R-LX-06X060-CS-ZP	6	7.5	60	-	5	17	9
	R-LX-06X075-CS-ZF	R-LX-06X075-CS-ZP	6	7.5	75	-	20	32	9
	-	R-LX-06X090-CS-ZP	6	7.5	90	-	35	47	9
	R-LX-06X100-CS-ZF	R-LX-06X100-CS-ZP	6	7.5	100	-	45	57	9
	R-LX-06X130-CS-ZF	R-LX-06X130-CS-ZP	6	7.5	130	-	75	87	9
	R-LX-06X150-CS-ZF	R-LX-06X150-CS-ZP	6	7.5	150	-	95	107	9
8	R-LX-08X060-CS-ZF	R-LX-08X060-CS-ZP	8	10	60	-	-	10	12
	R-LX-08X075-CS-ZF	R-LX-08X075-CS-ZP	8	10	75	-	5	30	12
	R-LX-08X090-CS-ZF	R-LX-08X090-CS-ZP	8	10	90	-	20	40	12
	R-LX-08X100-CS-ZF	R-LX-08X100-CS-ZP	8	10	100	-	30	50	12
	-	R-LX-08X120-CS-ZP	8	10	120	-	50	70	12
	R-LX-08X130-CS-ZF	R-LX-08X130-CS-ZP	8	10	130	-	60	80	12
	R-LX-08X150-CS-ZF	R-LX-08X150-CS-ZP	8	10	150	-	80	100	12
10	-	R-LX-10X060-CS-ZP	10	12.5	60	-	-	5	14
	R-LX-10X065-CS-ZF	R-LX-10X065-CS-ZP	10	12.5	65	-	-	10	14
	R-LX-10X075-CS-ZF	R-LX-10X075-CS-ZP	10	12.5	75	-	-	20	14
	R-LX-10X085-CS-ZF	R-LX-10X085-CS-ZP	10	12.5	85	-	-	30	14
	-	R-LX-10X090-CS-ZP	10	12.5	90	-	5	35	14
	R-LX-10X100-CS-ZF	R-LX-10X100-CS-ZP	10	12.5	100	-	15	45	14
	-	R-LX-10X110-CS-ZP	10	12.5	110	-	25	55	14
	R-LX-10X120-CS-ZF	R-LX-10X120-CS-ZP	10	12.5	120	-	35	65	14
	-	R-LX-10X130-CS-ZP	10	12.5	130	-	45	75	14
	R-LX-10X140-CS-ZF	R-LX-10X140-CS-ZP	10	12.5	140	-	55	85	14
	-	R-LX-10X150-CS-ZP	10	12.5	150	-	65	95	14
	R-LX-10X160-CS-ZF	R-LX-10X160-CS-ZP	10	12.5	160	-	75	105	14
R-LX-I Internally threaded head									
		R-LX-I-ZP							
6	-	R-LX-06X055-I08-ZP	6	7.5	55	M8	-	-	-
	-	R-LX-06X055-I10-ZP	6	7.5	55	M10	-	-	-
8	-	R-LX-08X050-I12-ZP	8	10	50	M12	-	-	-
10	-	R-LX-10X055-I16-ZP	10	12.5	55	M16	-	-	-
R-LX-E Externally threaded head									
		R-LX-E-ZP							
6	-	R-LX-06X055-E-ZP	6	7.5	55	-	-	-	-
R-LX-P-ZP Pan-head									
		R-LX-P-ZP							
6		R-LX-06X040-P-ZP	6	7.5	35	-	-	-	9
		R-LX-H-ZP							
8	*R-LX-08X060-H-ZF	*R-LX-08X060-H-ZP	8	10	60	-	-	10	12
	*R-LX-08X075-H-ZF	*R-LX-08X075-H-ZP	8	10	75	-	5	25	12
	*R-LX-08X090-H-ZF	*R-LX-08X090-H-ZP	8	10	90	-	20	40	12
	*R-LX-08X100-H-ZF	*R-LX-08X100-H-ZP	8	10	100	-	30	50	12
	*R-LX-08X130-H-ZF	*R-LX-08X130-H-ZP	8	10	130	-	60	80	12
	*R-LX-08X150-H-ZF	*R-LX-08X150-H-ZP	8	10	150	-	80	100	12
10	*R-LX-10X065-H-ZF	*R-LX-10X065-H-ZP	10	12.5	65	-	-	10	14
	*R-LX-10X075-H-ZF	*R-LX-10X075-H-ZP	10	12.5	75	-	-	20	14
	*R-LX-10X085-H-ZF	*R-LX-10X085-H-ZP	10	12.5	85	-	-	30	14
	*R-LX-10X100-H-ZF	*R-LX-10X100-H-ZP	10	12.5	100	-	15	45	14
	*R-LX-10X120-H-ZF	*R-LX-10X120-H-ZP	10	12.5	120	-	35	65	14
	*R-LX-10X140-H-ZF	*R-LX-10X140-H-ZP	10	12.5	140	-	55	85	14

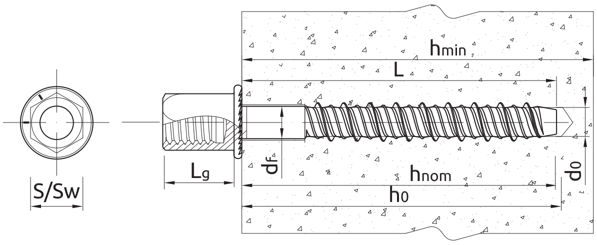
*not included in the approval

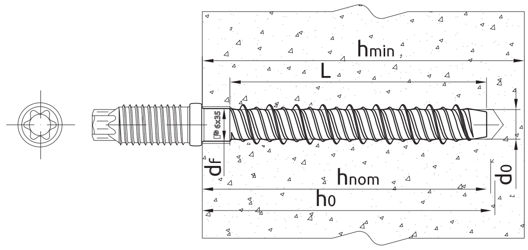
R-LX CONCRETE SCREW ANCHORS MULTI-POINT NON-STRUCTURAL FIXINGS

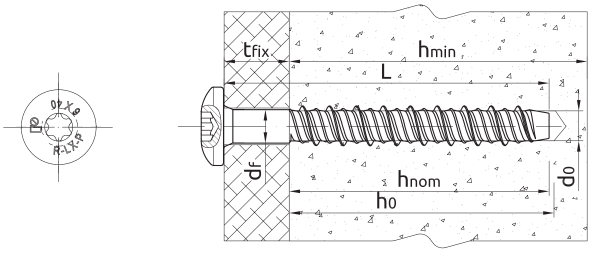
INSTALLATION DATA

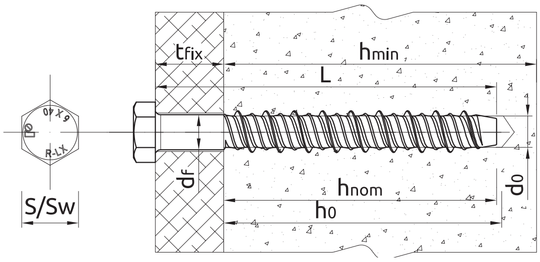










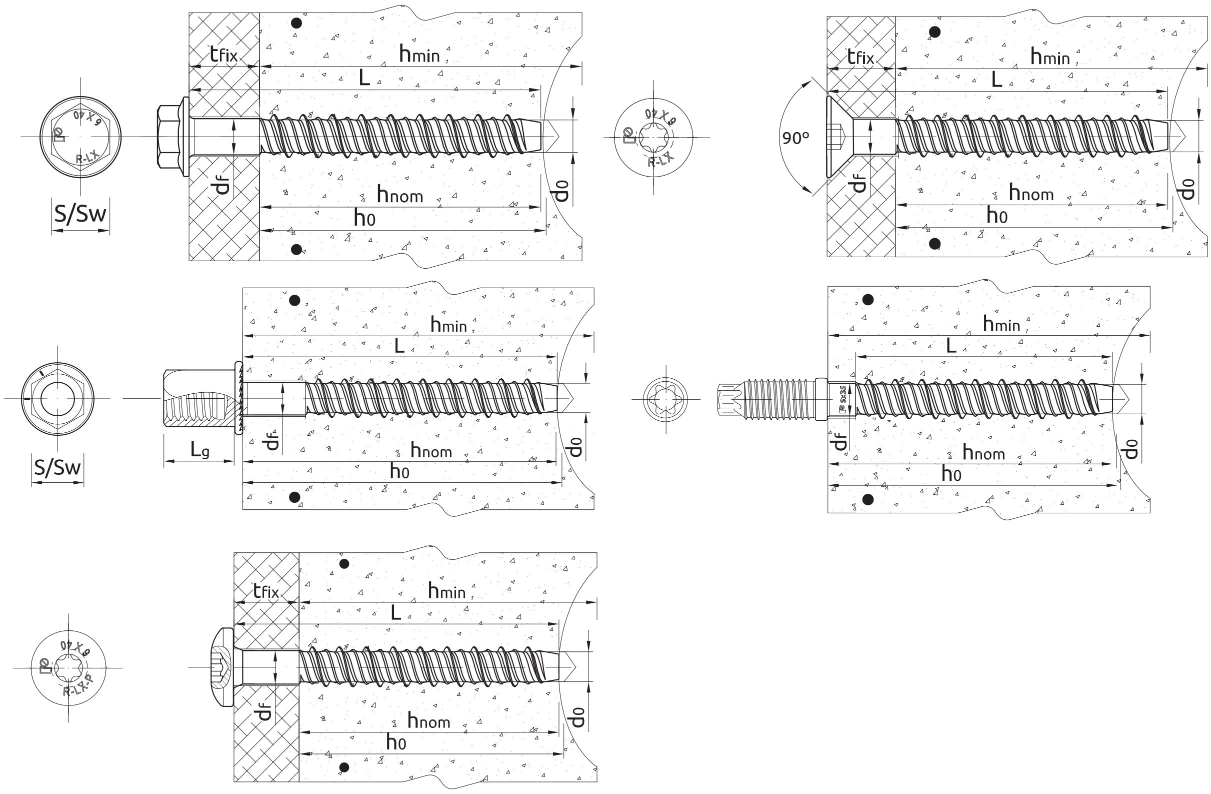


Normal concrete

Size			5	6	8	10	14
Thread diameter	d	[mm]	6,3	7,5	10	12,5	17
Hole diameter in substrate	d_0	[mm]	5	6	8	10	14
Wrench size for hex head	Sw	[mm]	8	10	13	15	19
Wrench size for internally threaded head	Sw_i	[mm]	10	13	15	21	-
Torx driver for externally threaded head			-	E7	-	-	-
Torx driver for countersunk and pan head			T25	T30	T45	T50	-
Max. installation torque for impact driver	$T_{imp,max}$	[Nm]	200	400	900	950	950
STANDARD EMBEDMENT DEPTH							
Min. hole depth in substrate	$h_{0,s}$	[mm]	50	65	80	95	130
Real hole depth in substrate	h_0	[mm]	$L + 10 - t_{fix}$	$L + 10 - t_{fix}$	$L + 10 - t_{fix}$	$L + 10 - t_{fix}$	$L + 10 - t_{fix}$
Min. installation depth	$h_{nom,s}$	[mm]	40	55	70	85	120
Min. substrate thickness	$h_{min,s}$	[mm]	80	84	110	130	190
Min. spacing	$s_{min,s}$	[mm]	40	45	50	60	100
Min. edge distance	$c_{min,s}$	[mm]	40	45	50	60	100
REDUCED EMBEDMENT DEPTH							
Min. hole depth in substrate	$h_{0,r}$	[mm]	35	50	60	65	85
Real hole depth in substrate	h_0	[mm]	$L + 10 - t_{fix}$	$L + 10 - t_{fix}$	$L + 10 - t_{fix}$	$L + 10 - t_{fix}$	$L + 10 - t_{fix}$
Min. installation depth	$h_{nom,r}$	[mm]	25	39	50	55	75
Min. substrate thickness	$h_{min,r}$	[mm]	80	80	80	80	110
Min. spacing	$s_{min,r}$	[mm]	40	45	50	60	100
Min. edge distance	$c_{min,r}$	[mm]	40	45	50	60	100
MINIMUM EMBEDMENT DEPTH							
Min. hole depth in substrate	$h_{0,m}$	[mm]	-	45	-	-	-
Real hole depth in substrate	h_0	[mm]	-	$L + 10 - t_{fix}$	-	-	-
Min. installation depth	$h_{nom,m}$	[mm]	-	35	-	-	-
Min. substrate thickness	$h_{min,m}$	[mm]	-	80	-	-	-
Min. spacing	$s_{min,m}$	[mm]	-	45	-	-	-
Min. edge distance	$c_{min,m}$	[mm]	-	45	-	-	-

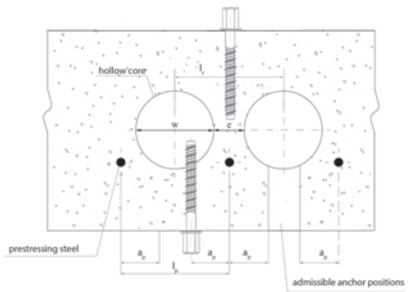
R-LX CONCRETE SCREW ANCHORS MULTI-POINT NON-STRUCTURAL FIXINGS

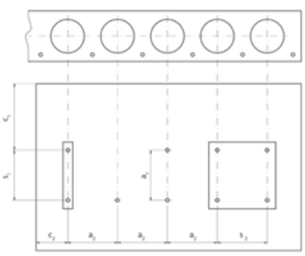
INSTALLATION DATA HOLLOW CONCRETE SLAB



Hollow concrete slab

Size			6
Thread diameter	d	[mm]	7.5
Hole diameter in substrate	d_0	[mm]	6
Wrench size for hex head	Sw	[mm]	10
Wrench size for internally threaded head	Sw_i	[mm]	13
Torx driver for externally threaded head			E7
Torx driver for countersunk and pan head			T30
Max. installation torque for impact driver	$T_{imp,max}$	[Nm]	400
MINIMUM EMBEDMENT DEPTH			
Min. hole depth in substrate	$h_{0,m}$	[mm]	45
Real hole depth in substrate	h_0	[mm]	$L + 10 - t_{fix}$
Min. installation depth	$h_{nom,m}$	[mm]	35
Min. spacing	$s_{min,m}$	[mm]	100
Min. edge distance	$c_{min,m}$	[mm]	50





c1, c2, - edge distance
s1, s2, - anchor spacing
a1, a2, - distance beteen anchor groups

Core width / Web thickness; w / e	≤ 4.2
Core distance	$l_c \geq 100$ mm
Prestressing steel	$l_p \geq 100$ mm
Distance between anchor position an prestressing steel	$a_p \geq 50$ mm

R-LX CONCRETE SCREW ANCHORS MULTI-POINT NON-STRUCTURAL FIXINGS

MECHANICAL PROPERTIES

Size			5	6	8	10	14
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	1300	1250	1200	1050	1020
Nominal yield strength - tension	f_{yk}	[N/mm²]	1150	1100	1050	950	800
Cross sectional area - tension	A_s	[mm²]	19.6	28.3	50.3	78.5	153.9
Elastic section modulus	W_{el}	[mm³]	12.2	21.2	50.3	98.1	269.3
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	19.0	31.8	72.4	123.6	329.6
Design bending resistance	M	[Nm]	12.7	12.2	48.3	82.4	219.8

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing

Size		5	6	8	10	14
CRACKED AND NON-CRACKED CONCRETE						
Standard embedment depth h_{nom}	[mm]	40.00	55.00	70.00	85.00	120.00
Reduced embedment depth h_{nom}	[mm]	25.00	39.00	50.00	55.00	75.00
Minimum embedment depth h_{nom}	[mm]	-	35.00	-	-	-
HOLLOW CORE SLAB						
Minimum embedment depth h_{nom}	[mm]	-	35.00	-	-	-
CHARACTERISTIC LOAD						
TENSION AND SHEAR LOAD F_{Rk}						
CRACKED AND NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	5.00	9.00	12.00	20.00	30.00
Reduced embedment depth	[kN]	3.00	6.00	7.50	9.00	12.00
Minimum embedment depth	[kN]	-	3,00	-	-	-
HOLLOW CORE SLAB*						
Minimum embedment depth	[kN]	-	6.00	-	-	-
DESIGN LOAD						
TENSION AND SHEAR LOAD F_{Rd}						
CRACKED AND NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	2.78	6.00	8.00	13.33	20.00
Reduced embedment depth	[kN]	1.67	4.00	5.00	6.00	8.00
Minimum embedment depth	[kN]	-	2.00	-	-	-
HOLLOW CORE SLAB						
Minimum embedment depth	[kN]	-	4.00	-	-	-
RECOMMENDED LOAD						
TENSION AND SHEAR LOAD F_{rec}						
CRACKED AND NON-CRACKED CONCRETE						
Standard embedment depth	[kN]	1.98	4.29	5.71	9.52	14.29
Reduced embedment depth	[kN]	1.19	2.86	3.57	4.29	5.71
Minimum embedment depth	[kN]	-	1.42	-	-	-
HOLLOW CORE SLAB						
Minimum embedment depth	[kN]	-	2.85	-	-	-

Hollow concrete slabs C40/50 to C50/60

DESIGN PERFORMANCE DATA

Standard embedment depth - normal concrete

Size			5	6	8	10	14
Min. installation depth	h_{nom}	[mm]	40.0	55.0	70.0	85.0	120.0
Effective embedment depth	h_{ef}	[mm]	30.0	42.0	53.0	65.0	92.0
TENSION AND SHEAR LOAD							
Characteristic resistance	F_{Rk}	[kN]	5.00	9.00	12.00	20.00	30.00
Installation safety factor	γ_2	-	1.20	1.00	1.00	1.00	1.00
Increasing factors for NRd,p - C30/37	Ψ_c	-	1.08	1.08	1.08	1.08	1.08
Increasing factors for NRd,p - C40/50	Ψ_c	-	1.15	1.15	1.15	1.15	1.15
Increasing factors for NRd,p - C50/60	Ψ_c	-	1.19	1.19	1.19	1.19	1.19
Spacing	$s_{cr,N}$	[mm]	90.00	126.00	160.00	196.00	276.00
Edge distance	$c_{cr,N}$	[mm]	45.00	63.00	80.00	98.00	138.00
SHEAR LOAD							
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	19.00	31.80	72.40	123.60	329.60
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50

R-LX CONCRETE SCREW ANCHORS MULTI-POINT NON-STRUCTURAL FIXINGS

DESIGN PERFORMANCE DATA

Characteristic Resistance under fire exposure in concrete C20/25 to C50/60 - standard embedment depth

Size			5	6	8	10	14
Spacing	s_{cr}	[mm]	120.0	168.0	212.0	260.0	368.0
Edge distance	c_{cr}	[mm]	60.0	84.0	106.0	130.0	184.0
R (for EI) = 30 min							
TENSION AND SHEAR LOAD							
Characteristic resistance	F_{Rk}	[kN]	0.20	0.28	0.75	1.57	3.08
R (for EI) = 60 min							
TENSION AND SHEAR LOAD							
Characteristic resistance	F_{Rk}	[kN]	0.18	0.25	0.65	1.18	2.31
R (for EI) = 90 min							
TENSION AND SHEAR LOAD							
Characteristic resistance	F_{Rk}	[kN]	0.14	0.20	0.50	1.02	2.00
R (for EI) = 120 min							
TENSION AND SHEAR LOAD							
Characteristic resistance	F_{Rk}	[kN]	0.10	0.14	0.40	0.79	1.54

Reduced embedment depth - normal concrete

Size			5	6	8	10	14
Min. installation depth	h_{nom}	[mm]	25.0	39.0	50.0	55.0	75.0
Effective embedment depth	h_{ef}	[mm]	17.5	30.0	37.0	40.0	55.0
TENSION AND SHEAR LOAD							
Characteristic resistance	$N_{Rk.s}$	[kN]	3.00	6.00	7.50	9.00	12.00
Installation safety factor	γ_2	-	1.20	1.00	1.00	1.00	1.00
Increasing factors for $N_{Rd.p}$ - C30/37	Ψ_c	-	1.08	1.08	1.08	1.08	1.08
Increasing factors for $N_{Rd.p}$ - C40/50	Ψ_c	-	1.15	1.15	1.15	1.15	1.15
Increasing factors for $N_{Rd.p}$ - C50/60	Ψ_c	-	1.19	1.19	1.19	1.19	1.19
Spacing	$s_{cr.N}$	[mm]	70.00	90.00	120.00	120.00	180.00
Edge distance	$c_{cr.N}$	[mm]	35.00	45.00	60.00	60.00	90.00
SHEAR LOAD							
Characteristic resistance without lever arm	$M_{Rk.s}$	[kN]	19.00	31.80	72.40	123.60	329.60
Partial safety factor	γ_{Ms}	-	1.50	1.50	1.50	1.50	1.50

Characteristic Resistance under fire exposure in concrete C20/25 to C50/60 - reduced embedment depth

Size			5	6	8	10	14
Spacing	s_{cr}	[mm]	-	120.0	148.0	160.0	220.0
Edge distance	c_{cr}	[mm]	-	60.0	74.0	80.0	110.0
R (for EI) = 30 min							
TENSION AND SHEAR LOAD							
Characteristic resistance	F_{Rk}	[kN]	-	0.28	0.75	1.57	3.08
R (for EI) = 60 min							
TENSION AND SHEAR LOAD							
Characteristic resistance	F_{Rk}	[kN]	-	0.25	0.65	1.18	2.31
R (for EI) = 90 min							
TENSION AND SHEAR LOAD							
Characteristic resistance	F_{Rk}	[kN]	-	0.20	0.50	1.02	2.00
R (for EI) = 120 min							
TENSION AND SHEAR LOAD							
Characteristic resistance	F_{Rk}	[kN]	-	0.14	0.40	0.79	1.54

DESIGN PERFORMANCE DATA

Minimum embedment depth - normal concrete

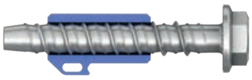
Size			5
Min. installation depth	h_{nom}	[mm]	35.0
Effective embedment depth	h_{ef}	[mm]	24.7
TENSION AND SHEAR LOAD			
Characteristic resistance	F_{Rk}	[kN]	3.00
Installation safety factor	γ_2	-	1.00
Increasing factors for NRd,p - C30/37	Ψ_c	-	1.00
Increasing factors for NRd,p - C40/50	Ψ_c	-	1.00
Increasing factors for NRd,p - C50/60	Ψ_c	-	1.00
Spacing	$s_{cr,N}$	[mm]	100.00
Edge distance	$c_{cr,N}$	[mm]	50.00
SHEAR LOAD			
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	31.80
Partial safety factor	γ_{Ms}	-	1.50

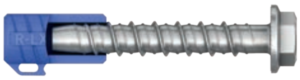
Minimum embedment depth - hollow concrete slab

Size			5
Min. installation depth	h_{nom}	[mm]	35.0
Effective embedment depth	h_{ef}	[mm]	24.7
Min. bottom flange thickness	$\geq d_b$	[mm]	35.0
TENSION AND SHEAR LOAD			
HOLLOW CONCRETE SLAB C30/37			
Characteristic resistance	F_{Rk}	[kN]	5.00
HOLLOW CONCRETE SLAB C40/50			
Characteristic resistance	F_{Rk}	[kN]	6.00
HOLLOW CONCRETE SLAB C50/60			
Characteristic resistance	F_{Rk}	[kN]	6.00
Installation safety factor	γ_2	-	1.00
Spacing	$s_{cr,N}$	[mm]	100.00
Edge distance	$c_{cr,N}$	[mm]	50.00
SHEAR LOAD			
Characteristic resistance with lever arm	$M_{Rk,s}$	[Nm]	31.80
Partial safety factor	γ_{Ms}	-	1.50

R-S1-LX-TEST TESTING GAUGE

Concrete screw re-usability testing gauge





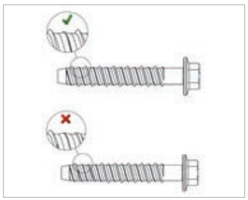
FEATURES AND BENEFITS

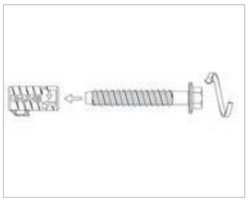
- Testing Gauge allows to determine whether the product R-LX is suitable for re-use.

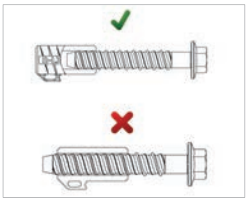
APPLICATIONS

- Concrete screw re-usability testing gauge

INSTALLATION GUIDE







1. Visual assessment. The anchor thread shall not be damaged.
2. Drive the screw counterclockwise into the no-go gauge with at least one revolution during the test. You can re-use the anchor if its tip is not visible on the other end of the no-go gauge.
3. Screws which failed the test 1 or the test 2 are not recommended to use

PRODUCT INFORMATION

Product Code	Description
R-S1-LX-TEST-08/2	Wear Gauge for R-LX-08
R-S1-LX-TEST-10/2	Wear Gauge for R-LX-10
R-S1-LX-TEST-14/2	Wear Gauge for R-LX-14

R-RB Rawlbolt®

FOR USE IN HOLLOW CORE SLAB AND CERAMIC SUBSTRATES

World's most popular all-purpose expanding shield anchor - bolt projecting version

Loose bolt
R-RBL Rawlbolt®

Bolt projecting
R-RBP Rawlbolt®

Bolt projecting with plastic ferrule
R-RBP-PF Rawlbolt®

Loose bolt with plastic ferrule
R-RBL-PF Rawlbolt®

Eye bolt
R-RBE Rawlbolt®

Shield
R-RB Rawlbolt®

ETA CE

FEATURES AND BENEFITS
- The only original Rawlbolt with single-piece cold-formed eyebolt for maximum durability
- Three-pieces expanding sleeve of maximum expansion provides optimal load and safety of use in any substrate
- Eye Rawlbolts are not suitable for all arrest systems nor shock loading
- Closed, forged hook for maximum safety

APPLICATIONS
- Supporting guy ropes, stays and cables
- Supporting ladder restraints

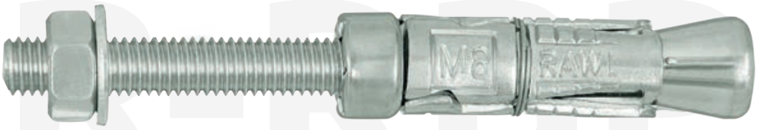
BASE MATERIALS
Approved for use in:
- Cracked concrete C20/25-C50/60
- Non-cracked concrete C20/25-C50/60
- Unreinforced concrete
- Reinforced concrete
- Solid clay brick ≥ 20MPa
- Hollow Lightweight Concrete Block LAC 5 ≥ 5MPa
- Hollow Sand-lime Brick ≥ 15MPa
- Concrete hollow floor block (eg. Teriva)
- Hollow-core Slab C20/25
- Hollow-core Slab C30/37-C50/60

R-RBL Rawlbolt® LOOSE BOLT

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth.
2. Clear the hole of drilling dust and debris (using blow pump and brush or equivalent method).
3. Lightly tap the throughbolt through the fixture into hole with a hammer, until fixing depth is reached.
4. Tighten to the recommended torque.
5. After installation.

R-RBP Rawlbolt® BOLT PROJECTING



INSTALLATION GUIDE

1. Drill a hole of required diameter and depth
2. Remove nut and washer and insert anchor into hole. Tap home with hammer until flush with surface
3. Position fixture over the projecting bolt
4. Add washer and nut and tighten to recommended torque

R-RBP-PF Rawlbolt® BOLT PROJECTING WITH PLASTIC FERRULE

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth
2. Remove nut and washer and insert anchor into hole. Tap home with hammer until flush with surface
3. Position fixture over the projecting bolt
4. Add washer and nut and tighten to recommended torque

R-RBL-PF Rawlbolt® LOOSE BOLT WITH PLASTIC FERRULE

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth
2. Remove pre-assembled bolt and washer. Insert shield into hole and tap home with hammer until flush with surface
3. Insert bolt with washer through fixture into the shield

Tighten to the recommended torque .

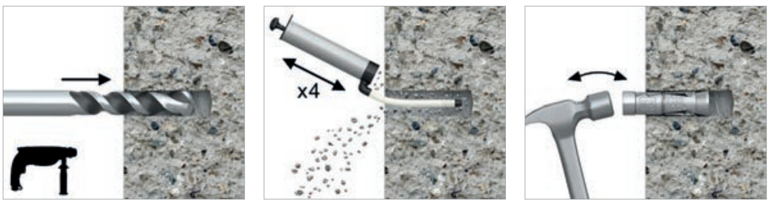
R-RBL-E Rawlbolt® EYE BOLT

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth. Note: When fixing into brickwork, mortar joints should be avoided
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Insert the anchor (tap home until flush with surface) and position eye accordingly
4. Tighten to recommended torque, using the hex nut (not the eye)

R-RB Rawlbolt® SHIELD

INSTALLATION GUIDE



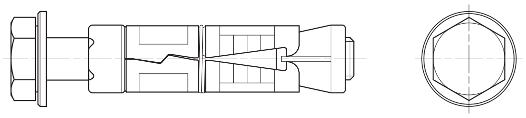
1. Drill a hole of required diameter and depth. Note: When fixing into brickwork, mortar joints should be avoided
2. Remove debris and thoroughly clean hole with brush and pum
3. Tap home with hammer until flush with surface

R-RB Rawlbolt®

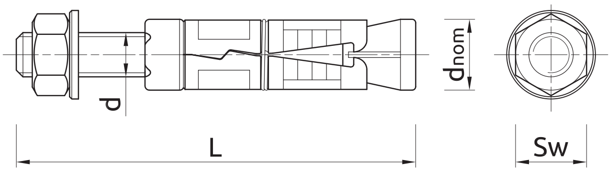
FOR USE IN HOLLOW CORE SLAB AND CERAMIC SUBSTRATES

PRODUCT INFORMATION

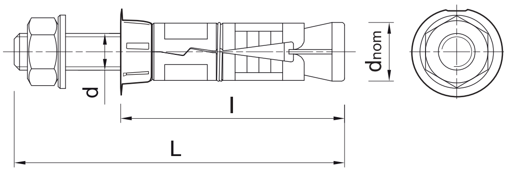
R-RBL Rawlbolt® LOOSE BOLT



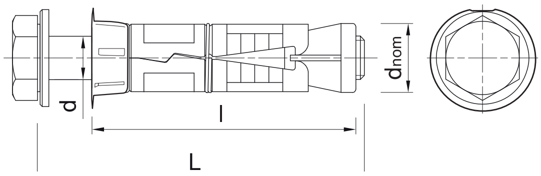
R-RBP Rawlbolt® BOLT PROJECTING



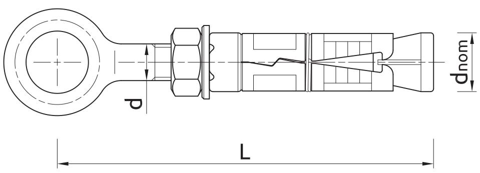
R-RBP-PF Rawlbolt® BOLT PROJECTING WITH PLASTIC FERRULE



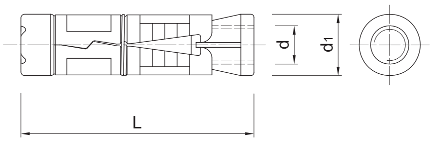
R-RBL-PF Rawlbolt® LOOSE BOLT WITH PLASTIC FERRULE



R-RBL-E Rawlbolt® EYE BOLT



R-RB Rawlbolt® SHIELD



Size	Product Code	Anchor			Fixture	
		Diameter	External diameter	Length	Max. thickness	Hole diameter
		d	d_{nom}	L	t_{fix}	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
R-RBL						
M6	R-RBL-M06/10W	6	12	55	10	6.5
	R-RBL-M06/25W	6	12	70	25	6.5
	R-RBL-M06/40W	6	12	85	40	6.5
M8	R-RBL-M08/10W	8	14	65	10	9
	R-RBL-M08/25W	8	14	80	25	9
	R-RBL-M08/40W	8	14	95	40	9
M10	R-RBL-M10/10W	10	16	75	10	11
	R-RBL-M10/25W	10	16	90	25	11
	R-RBL-M10/50W	10	16	115	50	11
	R-RBL-M10/75W	10	16	140	75	11
M12	R-RBL-M12/10W	12	20	90	10	13
	R-RBL-M12/25W	12	20	105	25	13
	R-RBL-M12/40W	12	20	120	40	13
	R-RBL-M12/60W	12	20	140	60	13
M16	R-RBL-M16/15W	16	25	135	15	17
	R-RBL-M16/30W	16	25	150	30	17
	R-RBL-M16/60W	16	25	180	60	17
M20	R-RBL-M20/60W	20	32	195	60	22
	R-RBL-M20/100W	20	32	235	110	22
R-RBP						
M6	R-RBP-M06/10W	6	12	65	10	6,5
	R-RBP-M06/25W	6	12	80	25	6,5
	R-RBP-M06/60W	6	12	115	60	6,5
M8	R-RBP-M08/10W	8	14	75	10	9
	R-RBP-M08/25W	8	14	90	25	9
	R-RBP-M08/60W	8	14	125	60	9
M10	R-RBP-M10/15W	10	16	90	15	11
	R-RBP-M10/30W	10	16	105	30	11
	R-RBP-M10/60W	10	16	135	60	11
M12	R-RBP-M12/15W	12	20	110	15	13
	R-RBP-M12/30W	12	20	125	30	13
	R-RBP-M12/75W	12	20	170	75	13
M16	R-RBP-M16/15W	16	25	150	15	17
	R-RBP-M16/35W	16	25	170	35	17
	R-RBP-M16/75W	16	25	210	75	17
M20	R-RBP-M20/15W	20	32	170	15	22
	R-RBP-M20/30W	20	32	185	30	22
	R-RBP-M20/100W	20	32	255	100	22

R-RB Rawlbolt®

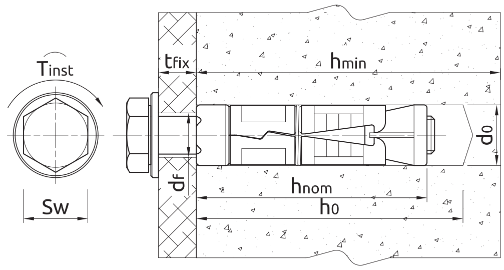
FOR USE IN HOLLOW CORE SLAB AND CERAMIC SUBSTRATES

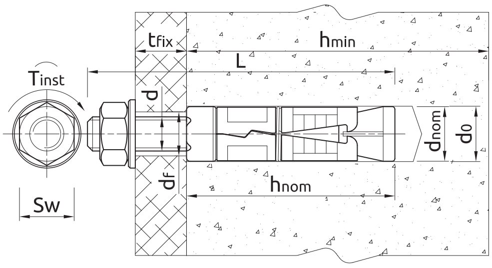
PRODUCT INFORMATION (cont.)

Size	Product Code	Anchor			Fixture	
		Diameter	External diameter	Length	Max. thickness	Hole diameter
		d	d_{nom}	L	t_{fix}	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
R-RBP-PF						
M6	R-RBP-PF-M06/10W	6	12	65	10	6,5
	R-RBP-PF-M06/25W	6	12	80	25	6,5
	R-RBP-PF-M06/60W	6	12	115	60	6,5
M8	R-RBP-PF-M08/10W	8	14	75	10	9
	R-RBP-PF-M08/25W	8	14	90	25	9
	R-RBP-PF-M08/60W	8	14	125	60	9
M10	R-RBP-PF-M10/15W	10	16	90	15	11
	R-RBP-PF-M10/30W	10	16	105	30	11
	R-RBP-PF-M10/60W	10	16	135	60	11
M12	R-RBP-PF-M12/15W	12	20	110	15	13
	R-RBP-PF-M12/30W	12	20	125	30	13
	R-RBP-PF-M12/75W	12	20	170	75	13
M16	R-RBP-PF-M16/15W	16	25	150	15	17
	R-RBP-PF-M16/35W	16	25	170	35	17
	R-RBP-PF-M16/75W	16	25	210	75	17
R-RBL-PF						
M6	R-RBL-PF-M06/10W	6	12	55	10	6.5
	R-RBL-PF-M06/25W	6	12	70	25	6.5
	R-RBL-PF-M06/40W	6	12	85	40	6.5
M8	R-RBL-PF-M08/10W	8	14	65	10	9
	R-RBL-PF-M08/25W	8	14	80	25	9
	R-RBL-PF-M08/40W	8	14	95	40	9
M10	R-RBL-PF-M10/10W	10	16	75	10	11
	R-RBL-PF-M10/25W	10	16	90	25	11
	R-RBL-PF-M10/50W	10	16	115	50	11
	R-RBL-PF-M10/75W	10	16	140	75	11
M12	R-RBL-PF-M12/10W	12	20	90	10	13
	R-RBL-PF-M12/25W	12	20	105	25	13
	R-RBL-PF-M12/40W	12	20	120	40	13
	R-RBL-PF-M12/60W	12	20	140	60	13
M16	R-RBL-PF-M16/15W	16	25	135	15	17
	R-RBL-PF-M16/30W	16	25	150	30	17
	R-RBL-PF-M16/60W	16	25	180	60	17
R-RBL-E						
M6	R-RBL-06EW	6	12	73	-	-
M8	R-RBL-08EW	8	14	87	-	-
M10	R-RBL-10EW	10	16	108	-	-
M12	R-RBL-12EW	12	20	130	-	-
R-RB						
M6	R-RB-M06W	6	12	45	6.5	-
M8	R-RB-M08W	8	14	50	9	-
M10	R-RB-M10W	10	16	60	11	-
M12	R-RB-M12W	12	20	75	13	-
M16	R-RB-M16W	16	25	115	17	-
M20	R-RB-M20W	20	32	130	22	-
M24	R-RB-M24W	24	38	150	26	-

INSTALLATION DATA

Installation in sollid substrates



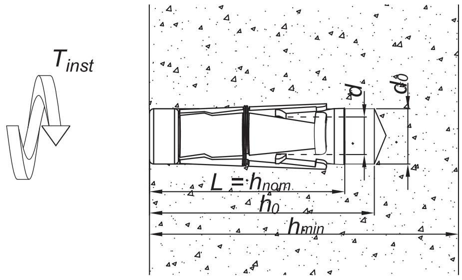


R-RB Rawlbolt®

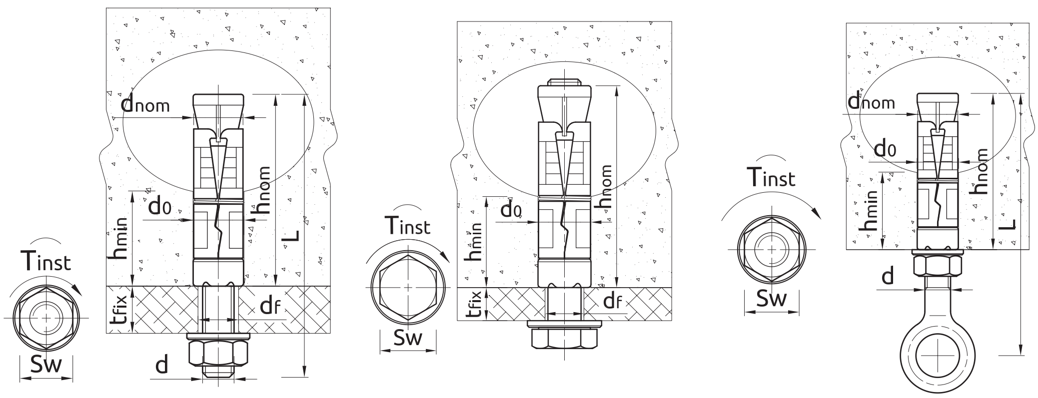
FOR USE IN HOLLOW CORE SLAB AND CERAMIC SUBSTRATES

INSTALLATION DATA (cont.)

Installation in sollid substrates



Installation in hollow core slab



Size			M6	M8	M10	M12	M16	M20
Thread diameter	d	[mm]	6	8	10	12	16	20
Hole diameter in substrate	d_0	[mm]	12	14	16	20	25	32
Wrench size	Sw	[mm]	10	13	17	19	24	30
CONCRETE								
Installation torque	T_{inst}	[Nm]	6.5	15	27	50	120	230
Min. hole depth in substrate	h_0	[mm]	50	55	65	85	125	140
Min. installation depth	h_{nom}	[mm]	45	50	60	80	120	135
Min. substrate thickness	h_{min}	[mm]	100	100	100	100	142	172
Min. spacing	s_{min}	[mm]	35	40	50	60	95	115
Min. edge distance	c_{min}	[mm]	53	60	75	90	143	173
CERAMIC AND HOLLOW SUBSTRATES								
Installation torque	T_{inst}	[Nm]	3	5	8	10	15	20
Min. hole depth in substrate	h_0	[mm]	-	-	-	-	-	-
Min. installation depth	h_{nom}	[mm]	45	50	60	80	120	135
Min. substrate thickness	h_{min}	[mm]	23	23	35	40	50	50
Min. spacing	s_{min}	[mm]	100	100	100	100	100	115
Min. edge distance	c_{min}	[mm]	100	100	100	100	143	173

MECHANICAL PROPERTIES

Size			M6	M8	M10	M12	M16	M20
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	500	500	500	500	500	500
Nominal yield strength - tension	f_{yk}	[N/mm²]	400	400	400	400	400	400
Cross sectional area - tension	A_s	[mm²]	20.1	36.6	58	84.3	157	245
Elastic section modulus	W_{el}	[mm³]	21.21	50.27	98.17	169.65	402.12	785.4
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12.72	30.16	58.9	101.79	241.27	471.24
Design bending resistance	M	[Nm]	10.18	24.13	47.12	81.43	193.02	376.99

Mechanical properties for R-RBL-E

Size			M6	M8	M10	M12
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	300	300	300	300
Nominal yield strength - tension	f_{yk}	[N/mm²]	180	180	180	180
Cross sectional area - tension	A_s	[mm²]	20.1	36.6	58	84.3
Elastic section modulus	W_{el}	[mm³]	21.21	50.27	98.17	169.65
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12.72	30.16	58.9	101.79
Design bending resistance	M	[Nm]	10.18	24.13	47.12	81.43

R-RB Rawlbolt® FOR USE IN HOLLOW CORE SLAB AND CERAMIC SUBSTRATES

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Size			M6	M8	M10	M12
CHARACTERISTIC LOAD						
TENSION AND SHEAR LOAD F_{Rk}						
Cracked concrete C20/25		[kN]	4.00	5.00	6.00	12.00
Non-cracked concrete C20/25		[kN]	6.00	7.50	12.00	16.00
Hollow core slab min. C20/25						
Wall thickness	Material class					
23	C30/37	[kN]	4.36	5.44	-	-
	C35/45	[kN]	4.82	6.02	-	-
	C45/55	[kN]	5.35	6.67	-	-
	C50/60	[kN]	5.81	7.25	-	-
35	C30/37	[kN]	6.61	11.42	16.07	-
	C35/45	[kN]	6.61	12.64	17.78	-
	C45/55	[kN]	6.61	13.13	19.00	-
	C50/60	[kN]	6.61	13.13	19.00	-
40	C30/37	[kN]	6.61	13.13	19.00	23.87
	C35/45	[kN]	6.61	13.13	19.00	23.87
	C45/55	[kN]	6.61	13.13	19.00	23.87
	C50/60	[kN]	6.61	13.13	19.00	23.87
50	C20/25	[kN]	6.61	8.93	8.93	8.93
Beam-and-block floor (eg.Terriva 4.0/2), min. 25mm wall thickness		[kN]	1.21	2.02	-	-
Lightweight concrete LAC class 5		[kN]	5.98	5.99	5.99	5.99
Solid clay brick class 20		[kN]	6.25	6.37	6.37	6.37
Silicate hollow block class 15		[kN]	1.90	-	-	-
DESIGN LOAD						
TENSION AND SHEAR LOAD F_{Rd}						
Cracked concrete C20/25		[kN]	2.22	2.78	3.33	6.67
Non-cracked concrete C20/25		[kN]	3.33	4.17	6.67	8.89
Hollow core slab min. C20/25						
Wall thickness	Material class					
23	C30/37	[kN]	1.73	2.16	-	-
	C35/45	[kN]	1.91	2.39	-	-
	C45/55	[kN]	2.12	2.65	-	-
	C50/60	[kN]	2.31	2.88	-	-
35	C30/37	[kN]	2.62	4.53	6.38	-
	C35/45	[kN]	2.90	5.02	7.06	-
	C45/55	[kN]	3.22	5.56	7.82	-
	C50/60	[kN]	3.50	6.04	8.50	-
40	C30/37	[kN]	2.90	6.72	7.62	10.10
	C35/45	[kN]	3.21	7.44	8.42	11.18
	C45/55	[kN]	3.55	8.25	9.34	12.39
	C50/60	[kN]	3.86	8.96	10.15	13.47
50	C20/25	[kN]	3.35	3.54	3.54	3.54
Beam-and-block floor (eg.Terriva 4.0/2), min. 25mm wall thickness		[kN]	0.48	0.80	-	-
Lightweight concrete LAC class 5		[kN]	1.95	1.96	1.96	1.96
Solid clay brick class 20		[kN]	2.16	2.20	2.20	2.20
Silicate hollow block class 15		[kN]	0.75	-	-	-
RECOMMENDED LOAD						
TENSION AND SHEAR LOAD F_{rec}						
Cracked concrete C20/25		[kN]	1.59	1.99	2.38	4.76
Non-cracked concrete C20/25		[kN]	2.38	2.98	4.76	6.35
Hollow core slab min. C20/25						
Wall thickness	Material class					
23	C30/37	[kN]	1.24	1.54	-	-
	C35/45	[kN]	1.37	1.71	-	-
	C45/55	[kN]	1.52	1.89	-	-
	C50/60	[kN]	1.65	2.05	-	-
35	C30/37	[kN]	1.87	3.24	4.55	-
	C35/45	[kN]	2.07	3.58	5.04	-
	C45/55	[kN]	2.30	3.97	5.59	-
	C50/60	[kN]	2.50	4.32	6.07	-
40	C30/37	[kN]	2.07	4.80	5.44	7.22
	C35/45	[kN]	2.29	5.31	6.02	7.99
	C45/55	[kN]	2.54	5.89	6.67	8.85
	C50/60	[kN]	2.76	6.40	7.25	9.62
50	C20/25	[kN]	2.40	2.53	2.53	2.53
Beam-and-block floor (eg.Terriva 4.0/2), min. 25mm wall thickness		[kN]	0.34	0.57	-	-
Lightweight concrete LAC class 5		[kN]	1.40	1.40	1.40	1.40
Solid clay brick class 20		[kN]	1.54	1.57	1.57	1.57
Silicate hollow block class 15		[kN]	0.54	-	-	-

Lightweight Fixings

FF1 NYLON FRAME FIXING

Universal frame fixing for many applications

Nylon frame fixing
FF1-L

Nylon frame fixing with collar hex head
FF1-K

ETA ETA-12/0398 CE

FEATURES AND BENEFITS

- The stainless steel screw for best anti-corrosion protection and external applications
- The countersunk plug for flush fixing of soft material (eg. timber)
- Specially-formulated nylon allows best performance installation for use in all base material categories according to ETAG 020 (A, B, C, D)
- Internal plug geometry designed to fit the screw head
- Plug design ensures multi-axis expansion

APPLICATIONS

- Door and window frames
- Garage doors
- Gates
- Industrial doors
- Facade (substructures made of wood and metal)
- Wall cabinets
- Satelite dishes
- Shelves
- Handrails
- Cable trays

BASE MATERIALS

Approved for use in:

- Concrete ≥ C12/15
- Solid Brick
- Solid Sand-lime Brick
- Hollow Brick
- Hollow Sand-lime Brick
- Hollow Lightweight Concrete Block
- Aerated Concrete Block

FF1 NYLON FRAME FIXING COUNTERSUNK

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth
2. With a hammer, lightly tap the plug through the fixture into hole until fixing depth is reached
3. Tighten the FF1 screw

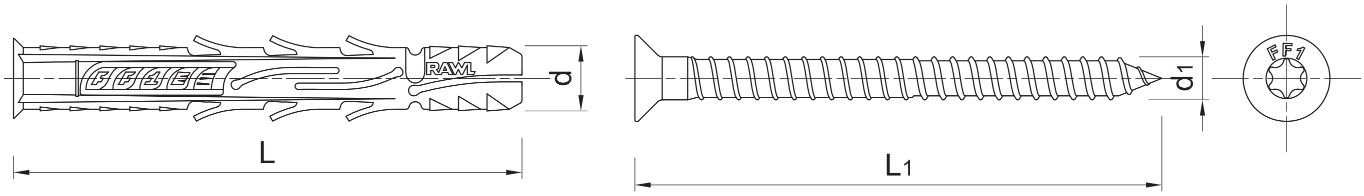
FF1 NYLON FRAME FIXING

INSTALLATION GUIDE

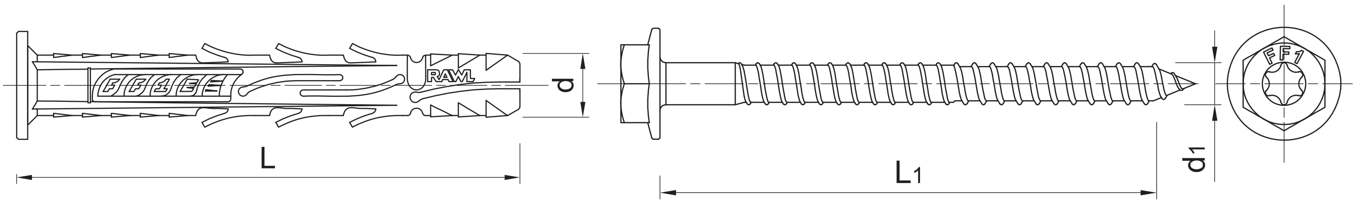
1. Drill a hole of required diameter and depth
2. With a hammer, lightly tap the plug through the fixture into hole until fixing depth is reached
3. Tighten the FF1 screw

PRODUCT INFORMATION

COUNTERSUNK VERSION



HEX HEAD VERSION WITH COLLARED PLUG



PRODUCT INFORMATION

Size	Product Code	Plug [mm]		Screw [mm]		Fixture [mm]		
		Diameter	Length	Diameter	Length	Max. thickness		Hole diameter
		d	L	d_1	L_1	t_{fix} 50	t_{fix} 70	d_f
FF1-N-L Frame Fixing Countersunk - Stainless Steel Screw								
Ø8	R-FF1-N-08L080-A4	7.8	80	5.8	87	30	10	8
	R-FF1-N-08L100-A4	7.8	100	5.8	107	50	30	8
	R-FF1-N-08L120-A4	7.8	120	5.8	127	70	50	8
Ø10	R-FF1-N-10L080-A4	9.8	80	7	87	30	10	10
	R-FF1-N-10L100-A4	9.8	100	7	107	50	30	10
	R-FF1-N-10L120-A4	9.8	120	7	127	70	50	10
	R-FF1-N-10L140-A4	9.8	140	7	147	90	70	10
	R-FF1-N-10L160-A4	9.8	160	7	167	110	90	10
	R-FF1-N-10L200-A4	9.8	200	7	207	150	130	10
	R-FF1-N-10L240-A4	9.8	240	7	247	190	170	10
	R-FF1-N-10L300-A4	9.8	300	7	307	250	230	10

FF1 NYLON FRAME FIXING

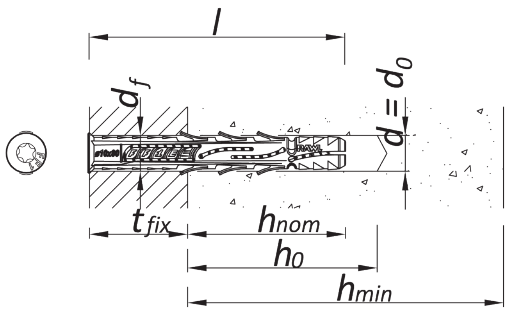
PRODUCT INFORMATION (cont.)

Size	Product Code	Plug [mm]		Screw [mm]		Fixture [mm]		
		Diameter	Length	Diameter	Length	Max. thickness		Hole diameter
		d	L	d_1	L_1	t_{fix} 50	t_{fix} 70	d_f
FF1-N-L Frame Fixing Countersunk - Zinc Flake Screw								
Ø8	R-FF1-N-08L080/ZF	7.8	80	5.8	87	30	10	8
	R-FF1-N-08L100/ZF	7.8	100	5.8	107	50	30	8
	R-FF1-N-08L120/ZF	7.8	120	5.8	127	70	50	8
Ø10	R-FF1-N-10L080/DT	9.8	80	7	87	30	10	10
	R-FF1-N-10L100/DT	9.8	100	7	107	50	30	10
	R-FF1-N-10L120/DT	9.8	120	7	127	70	50	10
	R-FF1-N-10L140/DT	9.8	140	7	147	90	70	10
	R-FF1-N-10L160/DT	9.8	160	7	167	110	90	10
	R-FF1-N-10L200/DT	9.8	200	7	207	150	130	10
	R-FF1-N-10L240/DT	9.8	240	7	247	190	170	10
	R-FF1-N-10L300/DT	9.8	300	7	307	250	230	10
FF1-N-L Frame Fixing Countersunk - Zinc Plated Screw								
Ø8	R-FF1-N-08L080	7.8	80	5.8	87	30	10	8
	R-FF1-N-08L100	7.8	100	5.8	107	50	30	8
	R-FF1-N-08L120	7.8	120	5.8	127	70	50	8
Ø10	R-FF1-N-10L080	9.8	80	7	87	30	10	10
	R-FF1-N-10L100	9.8	100	7	107	50	30	10
	R-FF1-N-10L120	9.8	120	7	127	70	50	10
	R-FF1-N-10L140	9.8	140	7	147	90	70	10
	R-FF1-N-10L160	9.8	160	7	167	110	90	10
	R-FF1-N-10L200	9.8	200	7	207	150	130	10
	R-FF1-N-10L240	9.8	240	7	247	190	170	10
	R-FF1-N-10L300	9.8	300	7	307	250	230	10
FF1-N-K Frame Fixing with Collar - Stainless Steel Screw								
Ø10	R-FF1-N-10K080-A4	9.8	80	7	89	30	10	10
	R-FF1-N-10K100-A4	9.8	100	7	109	50	30	10
	R-FF1-N-10K120-A4	9.8	120	7	129	70	50	10
	R-FF1-N-10K140-A4	9.8	140	7	149	90	70	10
	R-FF1-N-10K160-A4	9.8	160	7	169	110	90	10
	R-FF1-N-10K200-A4	9.8	200	7	209	150	130	10
	R-FF1-N-10K240-A4	9.8	240	7	249	190	170	10
	R-FF1-N-10K300-A4	9.8	300	7	309	250	230	10
FF1-N-K Frame Fixing with Collar - Zinc Flake Screw								
Ø10	R-FF1-N-10K080/DT	9.8	80	7	89	30	10	10
	R-FF1-N-10K100/DT	9.8	100	7	109	50	30	10
	R-FF1-N-10K120/DT	9.8	120	7	129	70	50	10
	R-FF1-N-10K140/DT	9.8	140	7	149	90	70	10
	R-FF1-N-10K160/DT	9.8	160	7	169	110	90	10
	R-FF1-N-10K200/DT	9.8	200	7	209	150	130	10
	R-FF1-N-10K240/DT	9.8	240	7	249	190	170	10
	R-FF1-N-10K300/DT	9.8	300	7	309	250	230	10
FF1-N-K Frame Fixing with Collar - Zinc Plated Screw								
Ø10	R-FF1-N-10K080	9.8	80	7	89	30	10	10
	R-FF1-N-10K100	9.8	100	7	109	50	30	10
	R-FF1-N-10K120	9.8	120	7	129	70	50	10
	R-FF1-N-10K140	9.8	140	7	149	90	70	10
	R-FF1-N-10K160	9.8	160	7	169	110	90	10
	R-FF1-N-10K200	9.8	200	7	209	150	130	10
	R-FF1-N-10K240	9.8	240	7	249	190	170	10
	R-FF1-N-10K300	9.8	300	7	309	250	230	10

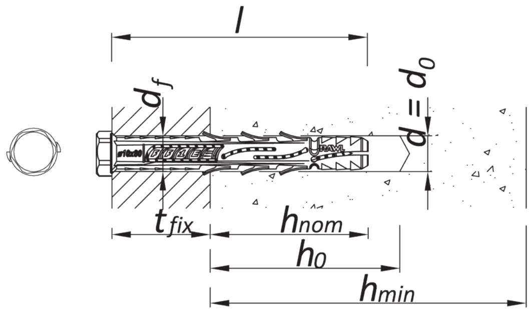
FF1 NYLON FRAME FIXING

INSTALLATION DATA

FF1-L



FF1-K



Size			Ø8	Ø8	Ø10	Ø10
Effective embedment depth	h_{ef}		50	70	50	70
Fixing diameter	d	[mm]	7.8	7.8	9.8	9.8
Hole diameter in substrate	d_0	[mm]	8	8	10	10
Min. hole depth in substrate	h_0	[mm]	60	80	60	80
Min. installation depth	h_{nom}	[mm]	50	70	50	70
Min. substrate thickness	h_{min}	[mm]	100	100	100	100
Min. spacing	s_{min}	[mm]	60	100	90	95
Min. edge distance	c_{min}	[mm]	60	100	80	80
Screw drive	-	[-]	T30	T30	T40	T40

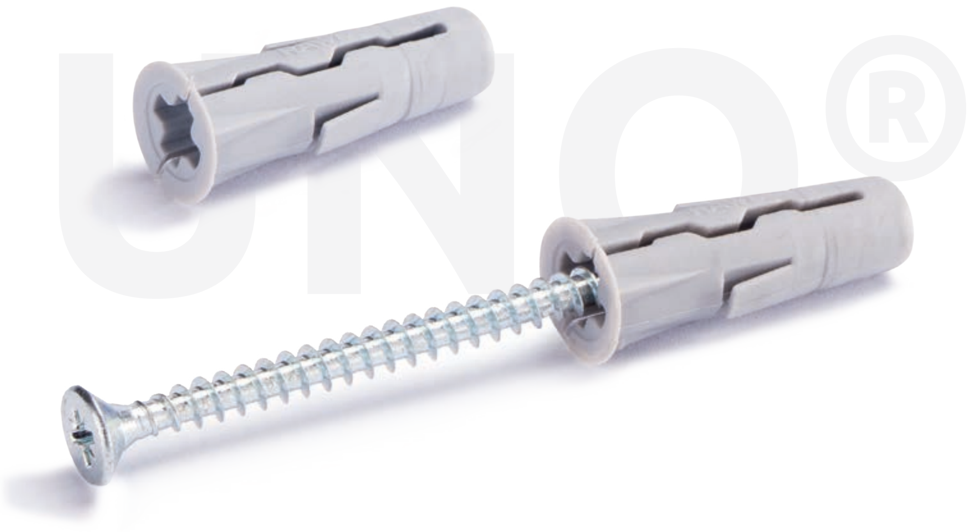
BASIC PERFORMANCE DATA

Performance data for single fixing without influence of edge distance and spacing

Substrate		Concrete C12/15	Concrete min. C16/20	Solid clay brick min 20MPa (eg Mz20/2.0)	Solid silicate brick min 20MPa (eg KS NF 20/2.0)	Perforated ceramic blocks min 15MPa (eg MEGA MAX)	Perforated ceramic blocks min 15MPa (eg Wienerberger Porotherm)	Sand-lime hollow block min. 20MPa	Lightweight concrete hollow block min 2.0MPa	Hollow brick min. 12MPa	Hollow brick min. 15MPa	Autoclaved aerated concrete AAC 2	Autoclaved aerated concrete AAC 6	Solid brick min. 50MPa	Sand-lime brick min. 30MPa	Hollow clay block min. 7.5MPa
CHARACTERISTIC LOAD F_{Rk}																
Ø8, Embedment depth 50 mm	[kN]	1.50	2.00	1.50	1.50	0.75	0.40	0.50	0.90	0.60	1.20	-	-	-	-	-
Ø8, Embedment depth 70 mm	[kN]	-	-	-	-	-	-	-	-		-	0.40	0.90	-	-	-
Ø10, Embedment depth 50 mm	[kN]	1.20	2.00	-	-	-	-	-	-	-		-	-	-	-	-
Ø10, Embedment depth 70 mm	[kN]	2.50	4.00	-	-	1.50	1.50	3.50	0.90	0.90	0.75	0.40	0.90	5.00	-	0.75
DESIGN LOAD F_{Rd}																
Ø8, Embedment depth 50 mm	[kN]	0.83	1.11	0.60	0.60	0.30	0.16	0.20	0.36	0.24	0.48	-	-	-	-	-
Ø8, Embedment depth 70 mm	[kN]	-	-	-	-	-	-	-	-	-	-	0.20	0.45	-	-	-
Ø10, Embedment depth 50 mm	[kN]	0.67	1.11	-	-	-	-	-	-	-	-		-	-	0.60	-
Ø10, Embedment depth 70 mm	[kN]	1.39	2.22	-	-	0.60	0.60	1.40	0.36	0.36	0.30	0.20	0.45	2.00	-	0.30
RECOMMENDED LOAD F_{rec}																
Ø8, Embedment depth 50 mm	[kN]	0.60	0.79	0.43	0.43	0.21	0.11	0.14	0.26	0.17	0.34	-	-	-	-	-
Ø8, Embedment depth 70 mm	[kN]	-	-	-	-	-	-	-	-	-	-	0.14	0.32	-	-	-
Ø10, Embedment depth 50 mm	[kN]	0.48	0.79	-	-	-	-	-	-	-	-	-	-	-	0.43	-
Ø10, Embedment depth 70 mm	[kN]	0.99	1.59	-	-	0.43	0.43	1.00	0.26	0.26	0.21	0.14	0.32	1.43	-	0.21

UNO® UNIVERSAL PLUG

Truly universal plug which fixes into any base material, solid or hollow



Universal plug
UNO-K

Universal plug with screw
UNO®

Ø5 Ø6 Ø7 Ø8 Ø10

AT-15-8093/2016

FEATURES AND BENEFITS

- Unique geometry guarantees maximum expansion and grip
- Instant grip resulting from split plug design
- Anti-rotation features prevent spinning in the hole
- Lip prevents plug slipping into over-sized holes
- Reccomended for uncertain substrates, irregular or worn-out holes
- Short length enables effective installation in thin walls ("partition walls")

APPLICATIONS

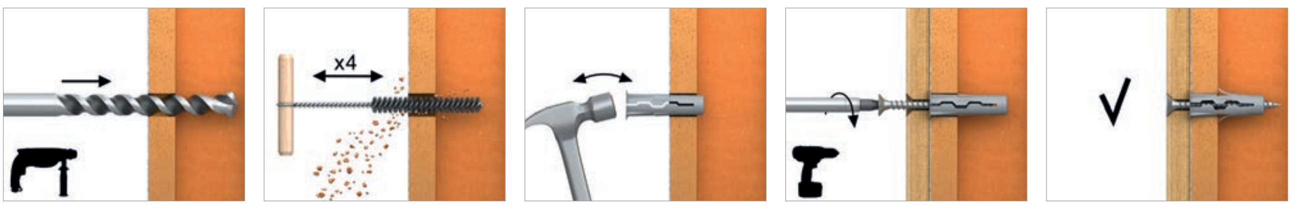
- Suspended ceilings
- Electrical fittings
- Cable trays
- Boilers
- Radiators
- Lighting
- Bathroom fittings

BASE MATERIALS

Suitable for use in:

- Concrete
- Hollow-core Slab
- High-Density Natural Stone
- Solid Brick
- Solid Sand-lime Brick
- Hollow Brick
- Vertically-perforated clay block
- Lightweight Concrete Block
- Hollow Lightweight Concrete Block
- Aerated Concrete Block
- Plasterboard

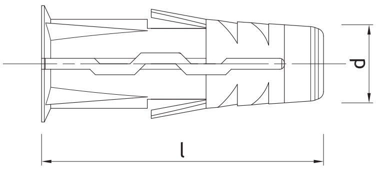
INSTALLATION GUIDE



1. Drill a hole of required diameter.
2. Insert UNO plug into hole and tap home.
3. Insert screw of required diameter into plug through fixture and tighten.

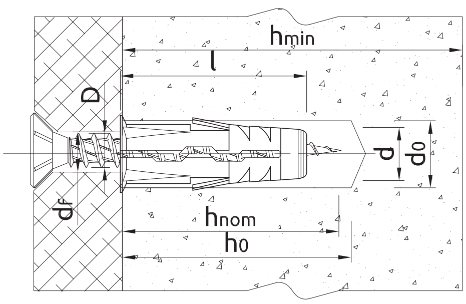
UNO® UNIVERSAL PLUG

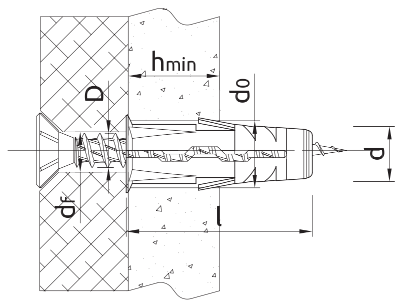
PRODUCT INFORMATION



Size	Product Code	Plug		Screw		Fixture	
		Diameter	Length	Diameter	Length	Max. thickness	Hole diameter
		d	L	D	L	t_{fix}	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
Universal plug							
Ø5	UNO-K-05	5	24	-	-	-	4.0 - 5.0
Ø6	UNO-K-06	6	28	-	-	-	4.0 - 6.0
Ø7	UNO-K-07	7	30	-	-	-	5.0 - 7.0
Ø8	UNO-K-08	8	32	-	-	-	5.0 - 7.0
Ø10	UNO-K-10	10	36	-	-	-	6.0 - 9.0
Universal plug with screw							
Ø5	UNO-05+330	5	24	3.5	30	6	6
Ø6	UNO-06+430	6	28	4.0	30	1	5
	UNO-06+435	6	28	4.0	35	5	5
	UNO-06+445	6	28	4.0	45	15	6
Ø8	UNO-08+435	8	32	4.5	35	2	5
	UNO-08+450	8	32	4.5	50	15	6
	UNO-08+560	8	32	5.0	60	25	7
Ø10	UNO-10+540	10	36	5.0	40	2	6
	UNO-10+650	10	36	6.0	50	15	7
	UNO-10+660	10	36	6.0	60	25	8

INSTALLATION DATA





Size			Ø5	Ø6	Ø7	Ø8	Ø10
Thread diameter	d	[mm]	5	6	7	8	10
Hole diameter in substrate	d_0	[mm]	5	6	7	8	10
Min. hole depth in substrate	h_0	[mm]	34	38	40	42	46
Min. installation depth	h_{nom}	[mm]	24	28	30	32	36
Min. substrate thickness	h_{min}	[mm]	50	55	60	65	70
Min. spacing	s_{min}	[mm]	24	28	30	32	36
Min. edge distance	c_{min}	[mm]	24	28	30	32	36

UNO® UNIVERSAL PLUG

BASIC PERFORMANCE DATA

Performance data for single fixing without influence of edge distance and spacing

Substrate		Concrete C20/25	Solid brick	Sand-lime solid brick	Perforated ceramic brick	Sand-lime hollow brick	Plasterboard min. 12.5 mm
CHARACTERISTIC LOAD F_{Rk}							
Ø5, Embedment depth 24mm	[kN]	0.60	1.50	1.50	0.60	1.50	0.17
Ø6, Embedment depth 28mm	[kN]	1.20	2.50	1.50	0.75	1.50	0.21
Ø7, Embedment depth 30mm	[kN]	1.20	3.00	3.00	0.90	3.50	0.24
Ø8, Embedment depth 32mm	[kN]	1.20	3.00	2.50	0.90	1.50	0.37
Ø10, Embedment depth 36mm	[kN]	2.50	4.00	0.90	0.90	1.20	0.34
DESIGN LOAD F_{Rd}							
Ø5, Embedment depth 24mm	[kN]	0.33	0.60	0.60	0.24	0.60	0.08
Ø6, Embedment depth 28mm	[kN]	0.66	1.00	0.60	0.30	0.60	0.10
Ø7, Embedment depth 30mm	[kN]	0.66	1.20	1.20	0.36	1.40	0.12
Ø8, Embedment depth 32mm	[kN]	0.66	1.20	1.00	0.36	0.60	0.18
Ø10, Embedment depth 36mm	[kN]	1.38	1.60	0.36	0.36	0.48	0.17
RECOMMENDED LOAD F_{rec}							
Ø5, Embedment depth 24mm	[kN]	0.24	0.43	0.43	0.17	0.43	0.06
Ø6, Embedment depth 28mm	[kN]	0.47	0.71	0.43	0.21	0.43	0.07
Ø7, Embedment depth 30mm	[kN]	0.47	0.86	0.86	0.26	1.00	0.09
Ø8, Embedment depth 32mm	[kN]	0.47	0.86	0.71	0.26	0.43	0.13
Ø10, Embedment depth 36mm	[kN]	0.99	1.14	0.26	0.26	0.29	0.12

4ALL UNIVERSAL NYLON PLUG

High performance nylon plug for all types of substrates

Universal nylon plug
4ALL

Universal nylon plug with screw
4ALL

AT-15-8093/2016

FEATURES AND BENEFITS

- Unique internal design provides positive grip for screws.
- Rib detail at plug head provides added grip.
- Expanding section designed to collapse in hollow materials and provide positive grip behind surfaces.
- Unique 4 way expansion allowing application in any substrate material and type.
- Solid head design provides strength whilst plug is installed.
- Anti-rotational lugs promote grip in wide range of substrates including soft masonry materials.

APPLICATIONS

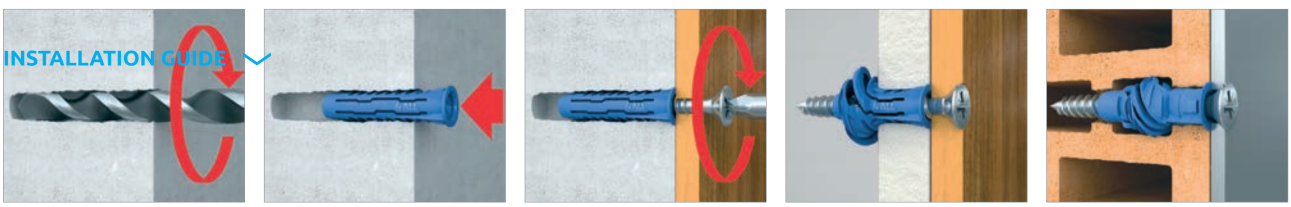
- Lighting
- Wall cabinets
- Wardrobes
- Letterboxes
- TV brackets
- Bathroom fittings
- Electrical fittings
- Shelves

BASE MATERIALS

Suitable for use in:

- Concrete
- Hollow-core Slab
- High-Density Natural Stone
- Solid Brick
- Hollow Brick
- Vertically-perforated clay block
- Lightweight Concrete Block
- Hollow Lightweight Concrete Block
- Aerated Concrete Block
- Plasterboard

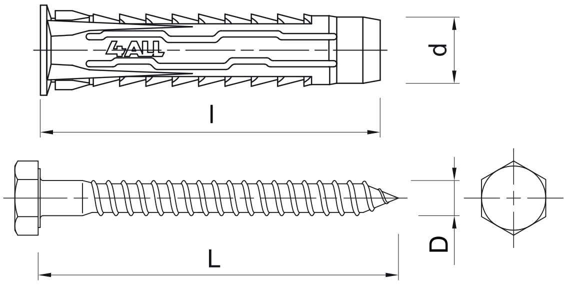
INSTALLATION GUIDE

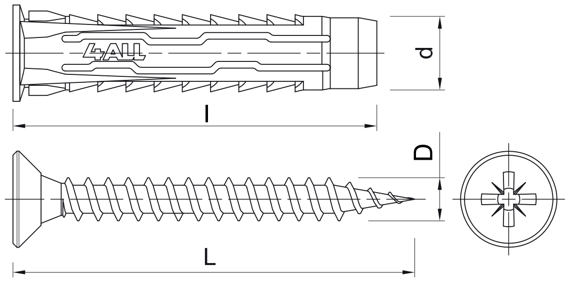


1. Drill a hole of required diameter.
2. Insert 4ALL plug into hole and tap home.
3. Insert screw of required diameter into plug through fixture and tighten.

4ALL UNIVERSAL NYLON PLUG

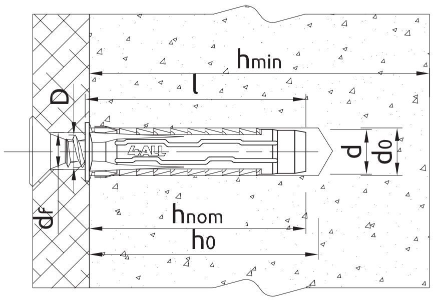
PRODUCT INFORMATION

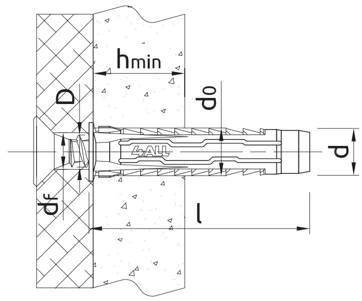




Size	Product Code	Plug		Screw		Fixture	
		Diameter	Length	Diameter	Length	Max. thickness	Hole diameter
		d	l	D	L	t_{fix}	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
Universal nylon plug 4ALL							
Ø5	4ALL-05	5	25	3,0 - 4,0	min. 25	4,0 - 5,0	-
Ø6	4ALL-06	6	30	4,0 - 5,0	min. 30	5,0 - 6,0	-
	4ALL-06050	6	50	4,0 - 5,0	min. 60	5,0 - 6,0	-
Ø8	4ALL-08	8	40	4,5 - 6,0	min. 40	6,0 - 8,0	-
	4ALL-08065	8	65	4,5 - 6,0	min. 70	6,0 - 8,0	-
Ø10	4ALL-10	10	50	6,0 - 8,0	min. 50	7,0 - 9,0	-
Ø12	4ALL-12	12	60	8,0 - 10,0	min. 60	9,0 - 11,0	-
Ø14	4ALL-14	14	70	10,0	min. 70	11,0	-
Universal nylon plug with screw 4ALL							
Ø5	4ALL-05+3530	5	25	3.5	30	10	4
Ø6	4ALL-06+4540	6	30	4.5	40	10	5
Ø8	4ALL-08+5060	8	40	5	60	20	6
Ø10	4ALL-10+6060	10	50	6	60	10	7
Ø12	4ALL-12/80	12	60	8	80	20	9
Ø12	4ALL-12/100	12	60	8	100	40	9
Ø14	4ALL-14/100	14	70	10	100	30	11
Ø6	4ALL-06050+4560	6	50	4.5	60	10	5
Ø8	4ALL-08065+5080	8	65	5	80	15	6

INSTALLATION DATA





Size			Ø5	Ø6	Ø8	Ø10	Ø12	Ø14
Fixing diameter	d	[mm]	5	6	8	10	12	14
Hole diameter in substrate	d_0	[mm]	5	6	8	10	12	14
Min. hole depth in substrate	h_0	[mm]	34	38	42	46	70	80
Min. installation depth	h_{nom}	[mm]	24	28	32	36	60	70
Min. substrate thickness	h_{min}	[mm]	50	55	65	70	100	100
Min. spacing	s_{min}	[mm]	24	28	32	36	60	70
Min. edge distance	c_{min}	[mm]	24	28	32	36	60	70

4ALL UNIVERSAL NYLON PLUG

BASIC PERFORMANCE DATA

Performance data for single fixing without influence of edge distance and spacing

Substrate		Concrete C20/25 - C50/60	Solid clay brick min 20MPa (eg Mz20/2.0)	Sand-lime solid brick	Perforated brick 15MPa	Sand-lime hollow block min. 20MPa	Aerated concrete 600 Mark V	Plasterboard min. 12.5 mm	Plasterboard min. 2x12.5 mm
CHARACTERISTIC LOAD F_{Rk}									
Ø5, Embedment depth 25mm	[kN]	0.10	-	0.20	0.15	0.50	0.20	0.11	-
Ø6, Embedment depth 30mm	[kN]	0.20	0.15	0.60	0.30	0.60	0.30	0.12	-
Ø8, Embedment depth 40mm	[kN]	0.50	0.75	0.90	0.50	0.75	0.50	0.15	-
Ø10, Embedment depth 50mm	[kN]	0.50	0.90	1.20	0.50	0.75	0.60	0.26	-
Ø12, Embedment depth 60mm	[kN]	4.50	4.00	7.00	2.50	4.50	3.50	-	0.66
Ø14, Embedment depth 70mm	[kN]	5.50	6.00	10.50	1.50	5.00	5.50	-	0.74
DESIGN LOAD F_{Rd}									
Ø5, Embedment depth 25mm	[kN]	0.06	-	0.08	0.06	0.20	0.10	0.06	-
Ø6, Embedment depth 30mm	[kN]	0.11	0.06	0.24	0.12	0.24	0.15	0.06	-
Ø8, Embedment depth 40mm	[kN]	0.28	0.30	0.36	0.20	0.30	0.25	0.08	-
Ø10, Embedment depth 50mm	[kN]	0.28	0.36	0.48	0.20	0.30	0.30	0.13	-
Ø12, Embedment depth 60mm	[kN]	2.50	1.60	2.80	1.00	1.80	1.75	-	0.33
Ø14, Embedment depth 70mm	[kN]	3.06	2.40	4.20	0.60	2.00	2.75	-	0.37
RECOMMENDED LOAD F_{rec}									
Ø5, Embedment depth 25mm	[kN]	0.04	-	0.06	0.04	0.14	0.07	0.04	-
Ø6, Embedment depth 30mm	[kN]	0.08	0.04	0.17	0.09	0.17	0.11	0.04	-
Ø8, Embedment depth 40mm	[kN]	0.20	0.21	0.26	0.14	0.21	0.18	0.05	-
Ø10, Embedment depth 50mm	[kN]	0.20	0.26	0.34	0.14	0.21	0.21	0.09	-
Ø12, Embedment depth 60mm	[kN]	1.79	1.14	2.00	0.71	1.29	1.25	-	0.24
Ø14, Embedment depth 70mm	[kN]	2.18	1.71	3.00	0.43	1.43	1.96	-	0.26

BASIC PERFORMANCE DATA

Performance data for single fixing without influence of edge distance and spacing

Substrate		Concrete C20/25 - C50/60	Solid clay brick min 20MPa (eg Mz20/2.0)	Sand-lime solid brick	Perforated brick 15MPa	Sand-lime hollow block min. 20MPa	Aerated concrete 600 Mark V	Plasterboard min. 12.5 mm	Plasterboard min. 2x12.5 mm
CHARACTERISTIC LOAD F_{Rk}									
Ø5, Embedment depth 25mm	[kN]	0.10	-	0.20	0.15	0.50	0.20	0.11	-
Ø6, Embedment depth 30mm	[kN]	0.20	0.15	0.60	0.30	0.60	0.30	0.12	-
Ø8, Embedment depth 40mm	[kN]	0.50	0.75	0.90	0.50	0.75	0.50	0.15	-
Ø10, Embedment depth 50mm	[kN]	0.50	0.90	1.20	0.50	0.75	0.60	0.26	-
Ø12, Embedment depth 60mm	[kN]	4.50	4.00	7.00	2.50	4.50	3.50	-	0.66
Ø14, Embedment depth 70mm	[kN]	5.50	6.00	10.50	1.50	5.00	5.50	-	0.74
DESIGN LOAD F_{Rd}									
Ø5, Embedment depth 25mm	[kN]	0.06	-	0.08	0.06	0.20	0.10	0.06	-
Ø6, Embedment depth 30mm	[kN]	0.11	0.06	0.24	0.12	0.24	0.15	0.06	-
Ø8, Embedment depth 40mm	[kN]	0.28	0.30	0.36	0.20	0.30	0.25	0.08	-
Ø10, Embedment depth 50mm	[kN]	0.28	0.36	0.48	0.20	0.30	0.30	0.13	-
Ø12, Embedment depth 60mm	[kN]	2.50	1.60	2.80	1.00	1.80	1.75	-	0.33
Ø14, Embedment depth 70mm	[kN]	3.06	2.40	4.20	0.60	2.00	2.75	-	0.37
RECOMMENDED LOAD F_{rec}									
Ø5, Embedment depth 25mm	[kN]	0.04	-	0.06	0.04	0.14	0.07	0.04	-
Ø6, Embedment depth 30mm	[kN]	0.08	0.04	0.17	0.09	0.17	0.11	0.04	-
Ø8, Embedment depth 40mm	[kN]	0.20	0.21	0.26	0.14	0.21	0.18	0.05	-
Ø10, Embedment depth 50mm	[kN]	0.20	0.26	0.34	0.14	0.21	0.21	0.09	-
Ø12, Embedment depth 60mm	[kN]	1.79	1.14	2.00	0.71	1.29	1.25	-	0.24
Ø14, Embedment depth 70mm	[kN]	2.18	1.71	3.00	0.43	1.43	1.96	-	0.26

GS CEILING WEDGE ANCHOR

Ceiling wire hanger for lightweight ceilings and suspended ceilings to solid building materials

ETA-11/0268

FEATURES AND BENEFITS

- During installation, when the nail is flush with the head, it signifies the complete expansion of the anchor
- The two hit zone ensure correct installation (especially in narrow drill holes) and high safety in use.
- Approved for installation in cracked and non-cracket concrete.
- Fire resistance class A1
- Reliable setting thanks to the simple visual check
- Impact expansion by hammer, no setting tool is needed

APPLICATIONS

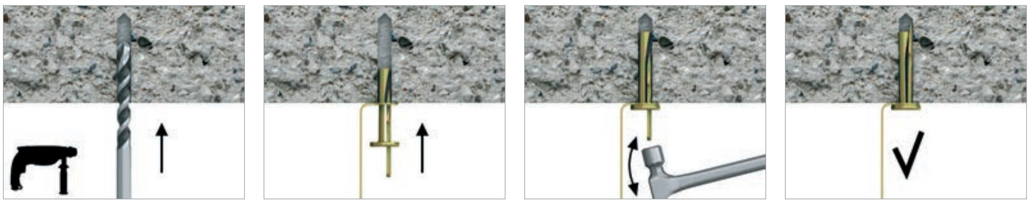
- Installation of lightweight ceilings and suspended ceilings
- Installation of coffered ceilings
- Installation of conduit and pipe clamps and other MEP applications
- Ventilation systems
- Metal roof profiles
- Punched straps

BASE MATERIALS

Approved for use in:

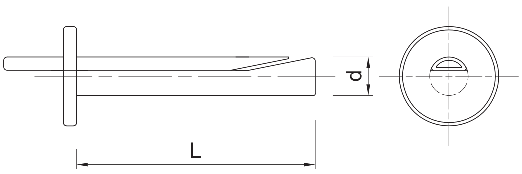
- Cracked concrete C20/25-C50/60
- Non-cracked concrete C20/25-C50/60

INSTALLATION GUIDE



1. Drill a hole of required diameter and depth
2. Insert anchor through fixture into hole until fixing depth is reached.
3. Hammer-in the nail until flush with head.
4. Do not hit the expansion wedge at the stage.

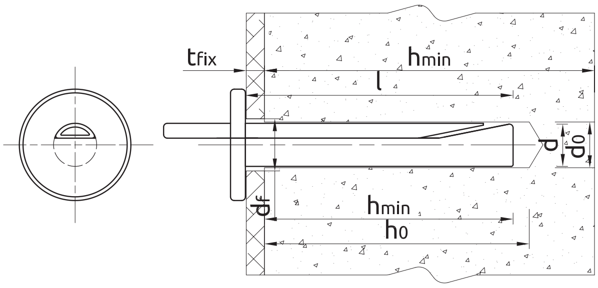
PRODUCT INFORMATION



Size	Product Code	Anchor		Fixture	
		Diameter	Length	Max. thickness	Hole diameter
		d	l	t_{fix}	d_f
		[mm]	[mm]	[mm]	[mm]
Ø6	R-GS-06040	5.8	36	4.5	7
	R-GS-06065	5.8	65	35	7

GS CEILING WEDGE ANCHOR

INSTALLATION DATA



Size			Ø6
Fixing diameter	d	[mm]	5.8
Hole diameter in substrate	d_0	[mm]	6
Min. hole depth in substrate	h_0	[mm]	40
Min. installation depth	h_{nom}	[mm]	32
Min. substrate thickness	h_{min}	[mm]	100
Min. spacing	s_{min}	[mm]	200
Min. edge distance	c_{min}	[mm]	150

BASIC PERFORMANCE DATA

Performance data for single fixing without influence of edge distance and spacing

Substrate		Cracked concrete	Non-cracked concrete
CHARACTERISTIC LOAD F_{Rk}			
Ø06, Effective embedment depth 32 mm	[kN]	3.00	3.00
DESIGN LOAD F_{Rd}			
Ø06, Effective embedment depth 32 mm	[kN]	2.00	2.00
RECOMMENDED LOAD F_{rec}			
Ø06, Effective embedment depth 32 mm	[kN]	1.43	1.43

FX-N NYLON HAMMER-IN FIXINGS

The nylon hammer fixing with cylinder head for fast, simple, cost-effective installations

Nylon hammer-in fixing with cylinder head
FX-N-C

Nylon hammer-in fixing with mushroom head
FX-N-K

Nylon hammer-in fixing with countersunk head
FX-N-L

ETA-12/0457

FEATURES AND BENEFITS

- Rapid hammer-set installation reduces the time required and allows for cost-effective, high-volume installation.
- Cylinder head prevents plug slipping into over-sized holes and allows fix thin elements
- Combination of PH recess and the helical thread makes removal of the nail possible, facilitating disassembly when necessary.
- The extensive range of product lengths, diameters and head types ensures availability of the correct fixing for every scenario.
- Designed for push-through installation.

APPLICATIONS

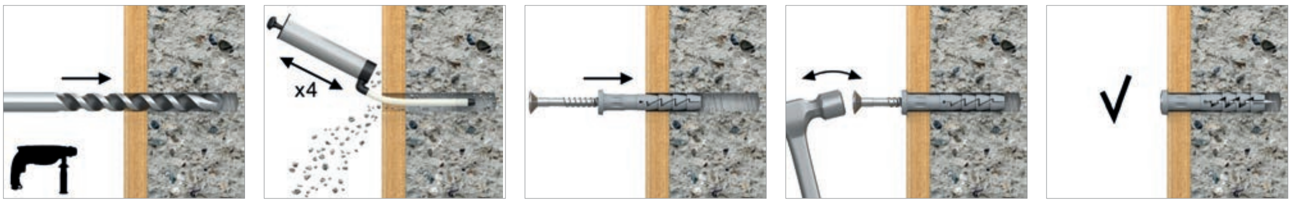
- Timber or metal battens
- Drywall structures
- Skirting / Dado railing
- Cable clamps
- Pipe clamps

BASE MATERIALS

Approved for use in:
- Concrete
- Solid Brick
- Solid Sand-lime Brick
- Hollow Sand-lime Brick
- Lightweight Concrete Block
- Hollow Lightweight Concrete Block
- Aerated Concrete Block

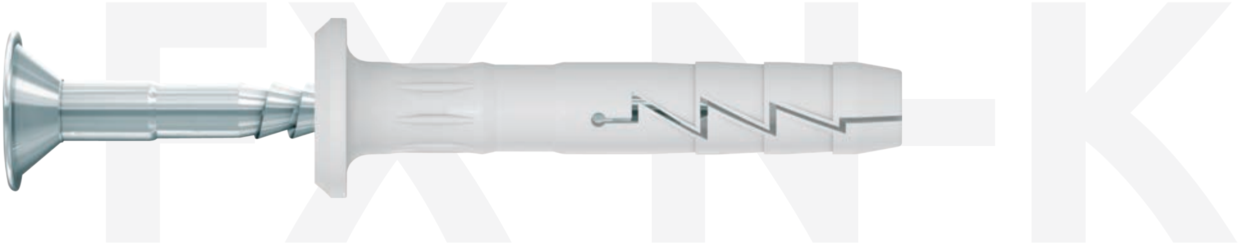
FX-N-C NYLON HAMMER-IN FIXING WITH CYLINDER HEAD

INSTALLATION GUIDE

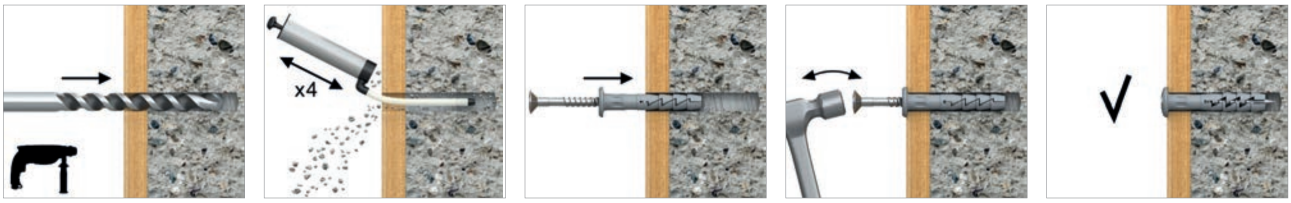


1. Drill a hole of required diameter.
2. Insert FX plug into hole through fixture.
3. Hammer the nail into the plastic sleeve until fixing is secure and flush with the fixture.

FX-N-K
NYLON HAMMER-IN FIXING
WITH MUSHROOM HEAD



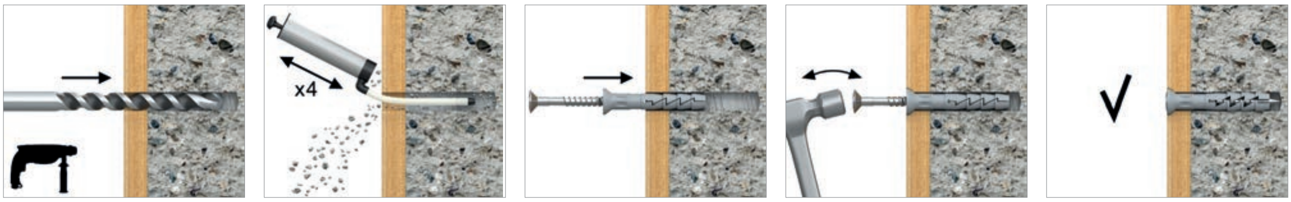
INSTALLATION GUIDE



1. Drill a hole of required diameter.
2. Insert FX plug into hole through fixture.
3. Hammer the nail into the plastic sleeve until fixing is secure and flush with the fixture.

FX-N-L
NYLON HAMMER-IN FIXING
WITH COUNTERSUNK HEAD

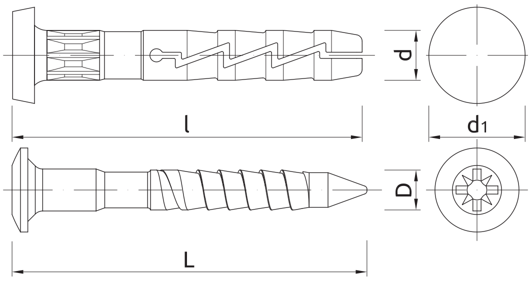
INSTALLATION GUIDE



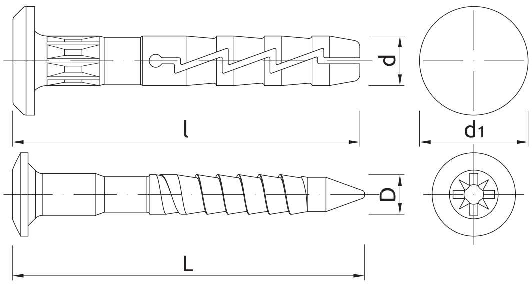
1. Drill a hole of required diameter.
2. Insert FX plug into hole through fixture.
3. Hammer the nail into the plastic sleeve until fixing is secure and flush with the fixture.

PRODUCT INFORMATION

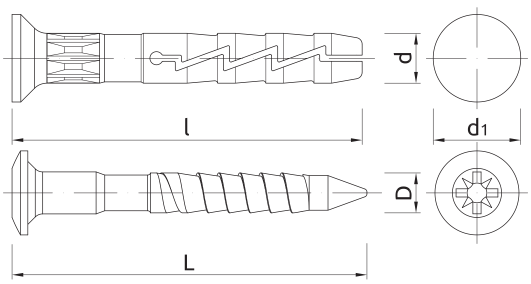
FX-N-C



FX-N-K



FX-N-L



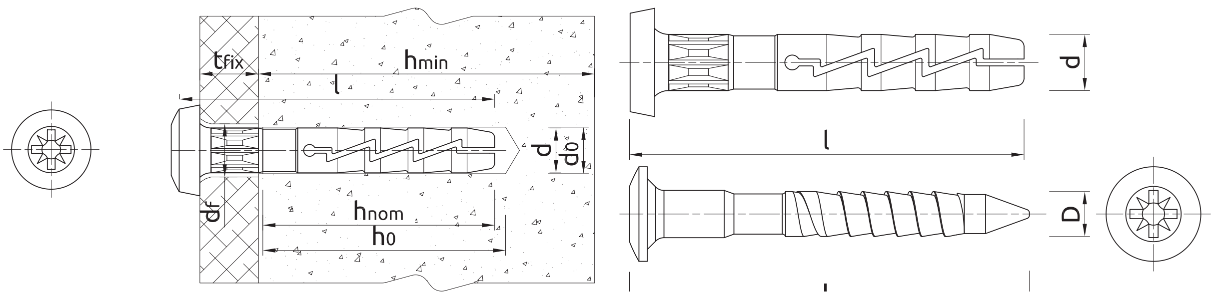
FX-N NYLON HAMMER-IN FIXINGS

PRODUCT INFORMATION (cont.)

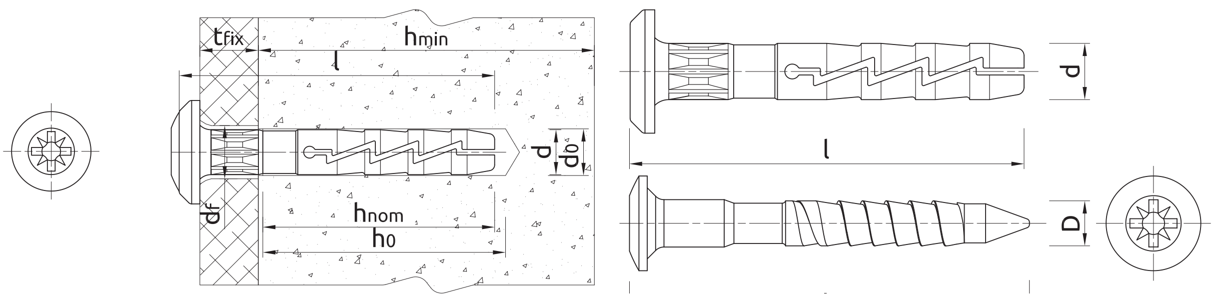
Size	Product Code	Plug		Nail		Fixture		Diameter
		Diameter	Length	Diameter	Length	Max. thickness	Hole diameter	
		d	l	D	L	t_{fix}	d_f	d_1
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
Nylon hammer-in fixing with cylinder head FX-N-C								
Ø5	R-FX-N-05C030	4.9	30	3.3	33	5	6	9
	R-FX-N-05C035	4.9	35	3.3	38	10	6	9
	R-FX-N-05C050	4.9	50	3.3	54	25	6	9
Ø6	R-FX-N-06C035	5.9	35	3.8	39	6	7	11
	R-FX-N-06C040	5.9	40	3.8	44	11	7	11
	R-FX-N-06C045	5.9	45	3.8	49	16	7	11
	R-FX-N-06C060	5.9	60	3.8	64	31	7	11
	R-FX-N-06C080	5.9	80	3.8	84	51	7	11
Ø8	R-FX-N-08C045	7.9	45	4.8	51	5	9	13.2
	R-FX-N-08C060	7.9	60	4.8	66	20	9	13.2
	R-FX-N-08C080	7.9	80	4.8	86	40	9	13.2
	R-FX-N-08C100	7.9	100	4.8	106	60	9	13.2
	R-FX-N-08C120	7.9	120	4.8	126	80	9	13.2
	R-FX-N-08C140	7.9	140	4.8	146	100	9	13.2
	R-FX-N-08C160	7.9	160	4.8	166	120	9	13.2
Nylon hammer-in fixing with mushroom head FX-N-K								
Ø6	R-FX-N-06K040	5.9	40	3.8	44	11	7	12.5
	R-FX-N-06K045	5.9	45	3.8	49	16	7	12.5
	R-FX-N-06K060	5.9	60	3.8	64	31	7	12.5
	R-FX-N-06K080	5.9	80	3.8	84	51	7	12.5
Nylon hammer-in fixing with countersunk head FX-N-L								
Ø5	R-FX-N-05L025	4.9	25	3.3	28	1	6	8.5
	R-FX-N-05L030	4.9	30	3.3	33	5	6	8.5
	R-FX-N-05L035	4.9	35	3.3	38	10	6	8.5
	R-FX-N-05L040	4.9	40	3.3	43	15	6	8.5
	R-FX-N-05L050	4.9	50	3.3	54	25	6	8.5
Ø6	R-FX-N-06L035	5.9	35	3.8	39	6	7	10
	R-FX-N-06L040	5.9	40	3.8	44	11	7	10
	R-FX-N-06L045	5.9	45	3.8	49	16	7	10
	R-FX-N-06L050	5.9	50	3.8	54	21	7	10
	R-FX-N-06L055	5.9	55	3.8	59	26	7	10
	R-FX-N-06L060	5.9	60	3.8	64	31	7	10
	R-FX-N-06L080	5.9	80	3.8	84	51	7	10

INSTALLATION DATA

FX-N-C



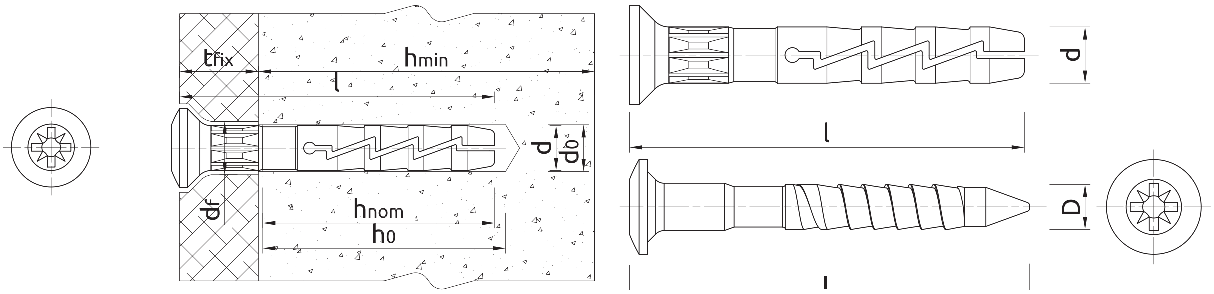
FX-N-K



FX-N NYLON HAMMER-IN FIXINGS

INSTALLATION DATA (cont.)

FX-N-L



Size			Ø5	Ø6	Ø8
Fixing diameter	d	[mm]	5	6	8
Hole diameter in substrate	d_0	[mm]	5	6	8
Min. hole depth in substrate	h_0	[mm]	30	35	45
Min. installation depth	h_{nom}	[mm]	25	29	40
Min. substrate thickness	h_{min}	[mm]	100	100	100
Min. spacing	s_{min}	[mm]	100	100	100
Min. edge distance	c_{min}	[mm]	100	100	100

BASIC PERFORMANCE DATA

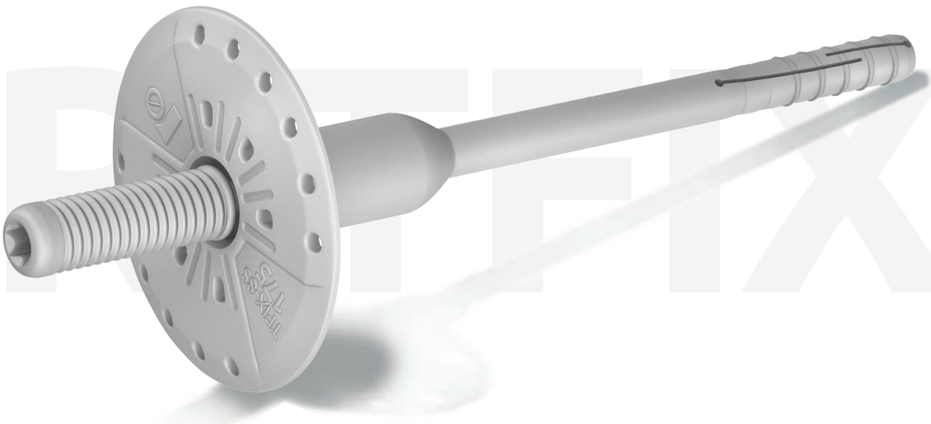
Performance data for single fixing without influence of edge distance and spacing

Substrate		Concrete C12/15	Concrete C20/25 - C50/60	Solid brick	Sand-lime solid brick	Sand-lime hollow brick	Lightweight concrete hollow block	Lightweight concrete block	Autoclaved aerated concrete
POLYAMIDE PLUG									
CHARACTERISTIC LOAD F_{Rk}									
Ø5, Embedment depth 25mm	[kN]	0.20	0.30	0.20	0.20	0.30	0.20	0.20	-
Ø6, Embedment depth 29mm	[kN]	0.20	0.30	0.20	0.40	0.30	0.30	0.30	0.10
Ø8, Embedment depth 40mm	[kN]	0.30	0.50	0.50	0.40	-	0.30	0.50	0.10
DESIGN LOAD F_{Rd}									
Ø5, Embedment depth 25mm	[kN]	0.15	0.15	0.10	0.10	0.15	0.10	0.10	-
Ø6, Embedment depth 29mm	[kN]	0.15	0.15	0.10	0.20	0.15	0.15	0.15	0.05
Ø8, Embedment depth 40mm	[kN]	0.25	0.25	0.25	0.20	-	0.15	0.25	0.05
RECOMMENDED LOAD F_{rec}									
Ø5, Embedment depth 25mm	[kN]	0.11	0.11	0.07	0.07	0.11	0.07	0.07	-
Ø6, Embedment depth 29mm	[kN]	0.11	0.11	0.07	0.14	0.11	0.11	0.11	0.04
Ø8, Embedment depth 40mm	[kN]	0.18	0.18	0.18	0.14	-	0.11	0.18	0.04

Facade Fixings

R-TFIX-8S UNIVERSAL FACADE FIXINGS

Versatile screw-in facade fixing with high performance in all base materials recommended for ETICS



ETA ETA-17/0161 CE

FEATURES AND BENEFITS

- The shortest embedment depth at the maximum strength parameters
- Quick and easy installation in all substrates (categories A,B,C,D,E)
- Unique sleeve compression zone for precision installations.
- The long plastic overmoulding on the R-TFIX-8S screw minimises thermal bridging (value 0,001-0,002W/K), contributing to energy-saving benefits
- Plate stiffness (value 0.6 kN/mm) ensures smooth elevation surface and stable insulation system.
- Unique design allows for high load-bearing capacities. This reduces the quantity of fixings required per square metre of insulation
- Pre-assembled screw saves time and labour.

APPLICATIONS

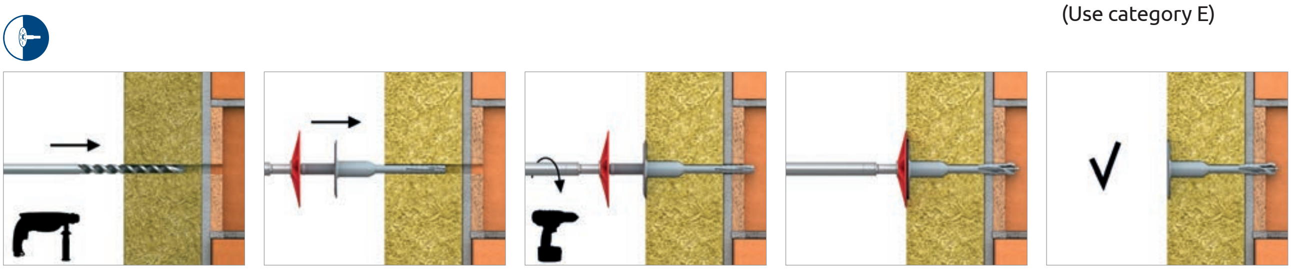
- External Thermal Insulation Composite Systems (ETICS)
- Polystyrene (EPS) boards
- Mineral wool (MW) boards
- Polyurethane (PU) boards
- Cork boards
- Light wood wool building boards

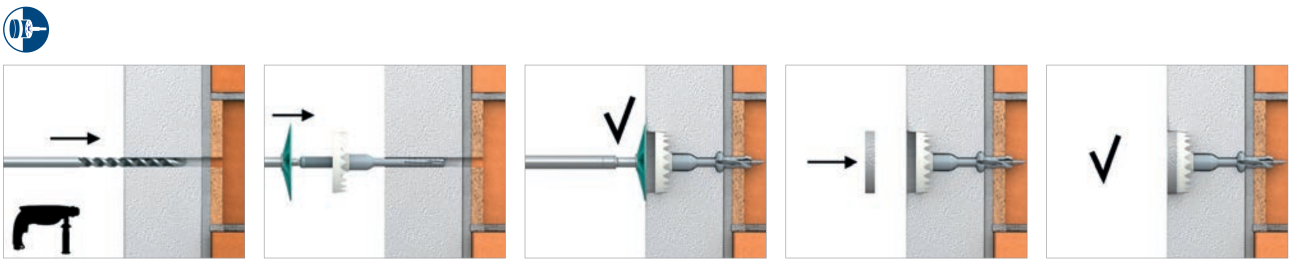
BASE MATERIALS

Approved for use in:

- Concrete C12/15-C50/60 (Use category A)
- External wall panel of concrete C 16/20 - C50/60 (Use category A)
- Solid Brick (Use category B)
- Solid Sand-lime Brick (Use category B)
- Vertically-perforated clay block (Use category C)
- Reinforced components of lightweight aggregate concrete (Use category D)
- Aerated Concrete Block (Use category E)

INSTALLATION GUIDE

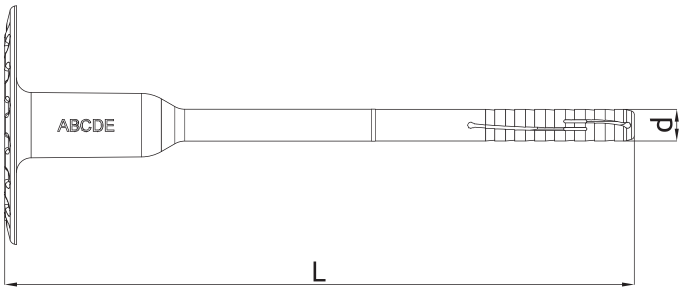


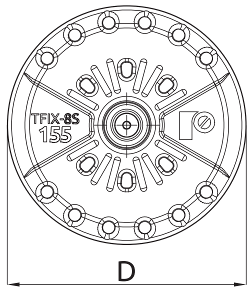


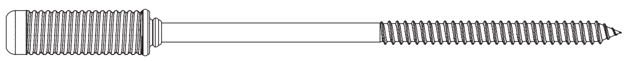
1. Drill a hole of required diameter and depth
2. Drilling depth of min 35mm in A,B,C,D materials and 75mm in Aerated Concrete Block.
3. Clean drilled hole 3 times.
4. Insert driver bit into recess in head moulding of R-TFIX-8S screw.
5. Insert the fixing into the drilled hole.
6. After inserting the fixing in the hole, the plate should be pressed against the thermal insulation surface.
7. Embedment depth of min 25mm in A,B,C,D materials and 65mm in Aerated Concrete Block.
8. Apply steady axial pressure, ensuring the disc of the setting tool is kept perpendicular to the fixing axis.
9. Steadily drive in the screw with high revs until fixing is secure (when disc touches insulation surface).

R-TFIX-8S UNIVERSAL FACADE FIXINGS

PRODUCT INFORMATION







Size	Product Code	Fixing			Fixture	
		Diameter	Plate diameter	Length	Recommended thickness	
		d	D	L	t_{fix} A, B, C, D	t_{fix} E
		[mm]	[mm]	[mm]	[mm]	[mm]
Ø08	R-TFIX-8S-115	8	60	115	80	40
	R-TFIX-8S-135	8	60	135	100	60
	R-TFIX-8S-155	8	60	155	120	80
	R-TFIX-8S-175	8	60	175	140	100
	R-TFIX-8S-195	8	60	195	160	120
	R-TFIX-8S-215	8	60	215	180	140
	R-TFIX-8S-235	8	60	235	200	160
	R-TFIX-8S-255	8	60	255	220	180
	R-TFIX-8S-275	8	60	275	240	200
	R-TFIX-8S-295	8	60	295	260	220
	R-TFIX-8S-335	8	60	335	300	260
	R-TFIX-8S-355	8	60	355	320	280
	R-TFIX-8S-375	8	60	375	340	300
	R-TFIX-8S-395	8	60	395	360	320
	R-TFIX-8S-415	8	60	415	380	340
	R-TFIX-8S-435	8	60	435	400	360
	R-TFIX-8S-455	8	60	455	420	380

INSTALLATION DATA

Size			A, B, C, D	A - external panel	E
Fixing diameter	d	[mm]	8	8	8
Hole diameter in substrate	d_0	[mm]	8	8	8
Min. installation depth	h_{nom}	[mm]	25	25	65
Min. hole depth in substrate	h_0	[mm]	35	35	75
Min. hole depth in substrate - countersunk mounting	h_0	[mm]	45	45	85
Min. substrate thickness	h_{min}	[mm]	100	40	100
Min. spacing	s_{min}	[mm]	100	100	100
Min. edge distance	c_{min}	[mm]	100	100	100

R-TFIX-8S UNIVERSAL FACADE FIXINGS

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing - ETAG 001

Substrate		Concrete C12/15	Concrete min. C16/20	External wall panel of concrete	Solid clay brick min 20MPa (eg Mz20/2.0)	Sand-lime brick min. 30MPa	Hollow brick 15MPa	Prefabricated reinforced components of lightweight aggregate concrete 4MPa	Autoclaved aerated concrete AAC 4MPa
Effective embedment depth h_{ef}	[mm]	25	25	25	25	25	25	25	65
CHARACTERISTIC LOAD N_{Rk}									
R-TFIX-8S	[kN]	1.20	1.50	1.50	1.50	1.50	0.90	0.90	1.20
DESIGN LOAD N_{Rd}									
R-TFIX-8S	[kN]	0.60	0.75	0.75	0.75	0.75	0.45	0.45	0.60
RECOMMENDED LOAD N_{rec}									
R-TFIX-8S	[kN]	0.43	0.54	0.54	0.54	0.54	0.32	0.32	0.43

Fixing type		R-TFIX-8S
Plate resistance	[kN]	2.04
Plate stiffness	[kN/mm]	0.6
Point thermal transmittance	[W/K]	0,001 - 0,002

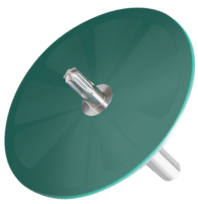
ASSOCIATED PRODUCTS

RT-SDSA
Drill bits Aggressor SDS plus

RT-SDSB
Drill bits Brickdrill SDS plus

RT-SDSR
Drill bits Rebardrill SDS plus

R-TFIX-TOOL-RED
Setting tool



R-TFIX-TOOL-GREEN
Setting tool

R-TFIX-8SX UNIVERSAL FACADE FIXINGS

Versatile screw-in facade fixing with high performance in all base materials recommended for ETICS

ETA-17/0161

FEATURES AND BENEFITS

- Quick and easy installation in all substrates (categories A,B,C,D,E)
- Unique sleeve compression zone for precision installations.
- Installation with post-installed insulation cap R-TFIX-CAP reduces heat transmission and results in a homogenous insulation surface
- Plate stiffness (value 0.6 kN/mm) ensures smooth elevation surface and stable insulation system.
- Unique design allows for high load-bearing capacities. This reduces the quantity of fixings required per square metre of insulation
- The shortest embedment depth at the maximum strength parameters
- Countersunk installation possible with use of R-TFIX-TOOL-CS or additional R-KWX-063 plate with post-installed R-TFIX-CAP63 insulation cap and system bit R-TFIX-TOOL-BLACK
- Installation flush with the surface possible with use of R-TFIX-TOOL-BLACK system bit and post-installed R-TFIX-CAP15 insulation cap
- Pre-assembled screw saves time and labour

APPLICATIONS

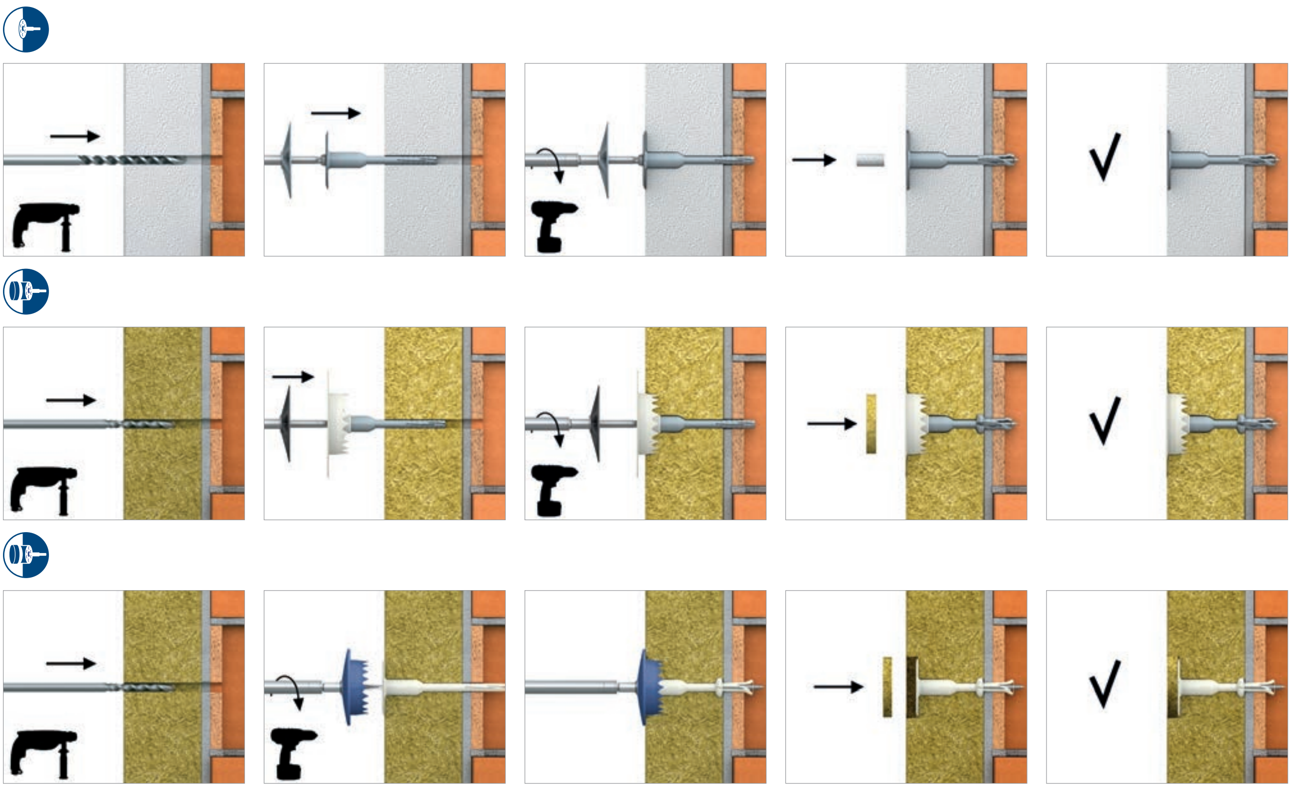
- External Thermal Insulation Composite Systems (ETICS)
- Polystyrene (EPS) boards
- Mineral wool (MW) boards
- Polyurethane (PU) boards
- Cork boards
- Light wood wool building boards

BASE MATERIALS

Approved for use in:

- Concrete C12/15-C50/60 (Use category A)
- External wall panel of concrete C 16/20 – C50/60 (Use category A)
- Solid Brick (Use category B)
- Solid Sand-lime Brick (Use category B)
- Vertically-perforated clay block (Use category C)
- Reinforced components of lightweight aggregate concrete (Use category D)
- Aerated Concrete Block (Use category E)

INSTALLATION GUIDE

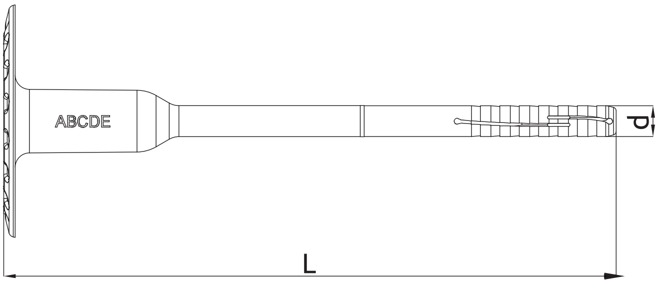


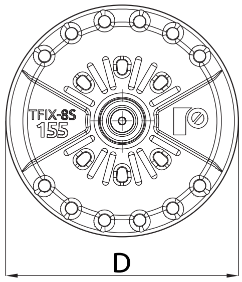
R-TFIX-8SX UNIVERSAL FACADE FIXINGS

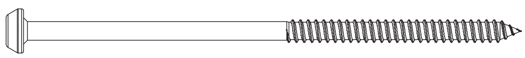
INSTALLATION GUIDE (cont.)

1. Drill a hole of required diameter and depth
2. Drilling depth of min 35mm in A,B,C,D materials and 75mm in Aerated Concrete Block.
3. Clean drilled hole 3 times.
4. Insert driver bit into recess in head moulding of R-TFIX-8S screw.
5. Insert the fixing into the drilled hole.
6. After inserting the fixing in the hole, the plate should be pressed against the thermal insulation surface.
7. Embedment depth of min 25mm in A,B,C,D materials and 65mm in Aerated Concrete Block.
8. Apply steady axial pressure, ensuring the disc of the setting tool is kept perpendicular to the fixing axis.
9. Steadily drive in the screw with high revs until fixing is secure (when disc touches insulation surface).

PRODUCT INFORMATION







Size	Product Code	Fixing			Fixture	
		Diameter	Plate diameter	Length	Recommended thickness	
		d	D	L	t_{fix} A, B, C, D	t_{fix} E
		[mm]	[mm]	[mm]	[mm]	[mm]
Ø08	R-TFIX-8SX-115	8	60	115	80	40
	R-TFIX-8SX-135	8	60	135	100	60
	R-TFIX-8SX-155	8	60	155	120	80
	R-TFIX-8SX-175	8	60	175	140	100
	R-TFIX-8SX-195	8	60	195	160	120
	R-TFIX-8SX-215	8	60	215	180	140
	R-TFIX-8SX-235	8	60	235	200	160
	R-TFIX-8SX-255	8	60	255	220	180
	R-TFIX-8SX-275	8	60	275	240	200
	R-TFIX-8SX-295	8	60	295	260	220
	R-TFIX-8SX-335	8	60	335	300	260
	R-TFIX-8SX-355	8	60	355	320	280
	R-TFIX-8SX-375	8	60	375	340	300
	R-TFIX-8SX-395	8	60	395	360	320
	R-TFIX-8SX-415	8	60	415	380	340
	R-TFIX-8SX-435	8	60	435	400	360
	R-TFIX-8SX-455	8	60	455	420	380

INSTALLATION DATA

Size			A, B, C, D	A - external panel	E
Fixing diameter	d	[mm]	8	8	8
Hole diameter in substrate	d_0	[mm]	8	8	8
Min. installation depth	h_{nom}	[mm]	25	25	65
Min. hole depth in substrate	h_0	[mm]	35	35	75
Min. hole depth in substrate - countersunk mounting	h_0	[mm]	45	45	85
Min. substrate thickness	h_{min}	[mm]	100	40	100
Min. spacing	s_{min}	[mm]	100	100	100
Min. edge distance	c_{min}	[mm]	100	100	100

R-TFIX-8SX UNIVERSAL FACADE FIXINGS

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing

Substrate		Concrete C12/15	Concrete min. C16/20	External wall panel of concrete	Solid clay brick min 20MPa (eg Mz20/2.0)	Sand-lime brick min. 30MPa	Hollow brick 15MPa	Prefabricated reinforced components of lightweight aggregate concrete 4MPa	Autoclaved aerated concrete AAC 4MPa
Effective embedment depth h_{ef}	[mm]	25	25	25	25	25	25	25	65
CHARACTERISTIC LOAD N_{Rk}									
R-TFIX-8SX	[kN]	1.20	1.50	1.50	1.50	1.50	0.90	0.90	1.20
DESIGN LOAD N_{Rd}									
R-TFIX-8SX	[kN]	0.60	0.75	0.75	0.75	0.75	0.45	0.45	0.60
RECOMMENDED LOAD N_{rec}									
R-TFIX-8SX	[kN]	0.43	0.54	0.54	0.54	0.54	0.32	0.32	0.43

Fixing type		R-TFIX-8SX
Plate resistance	[kN]	2.04
Plate stiffness	[kN/mm]	0.6
Point thermal transmittance	[W/K]	0,001 - 0,002

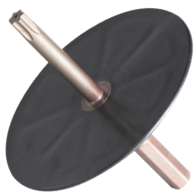
ASSOCIATED PRODUCTS

RT-SDSA
Drill bits Aggressor SDS plus

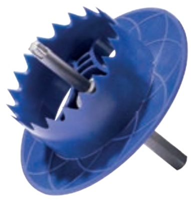
RT-SDSB
Drill bits Brickdrill SDS plus

RT-SDSR
Drill bits Rebardrill SDS plus

TFIX-8ST-TOOL
Setting tool



R-TFIX-TOOL-BLACK
Setting tool



R-TFIX-TOOL-CS
Setting tool

R-TFIX-8M FACADE FIXING WITH METAL NAIL

Versatile hammer-in facade fixing with steel nail recommended for ETICS.

ETA-17/0592

FEATURES AND BENEFITS

- Quick and easy installation in all substrates (categories A,B,C,D,E)
- Unique sleeve compression zone for precision installations.
- Reduced point thermal transmittance to 0.001W/K thanks to high steel nail overmould, which decreases facade heat losses
- Highest loads with anchoring zone reduced in length to 25 mm
- Excellent plate stiffness (value 1.0 kN/mm) ensures smooth elevation surface and stable insulation system.
- Increased head diameter enabling centric hammer driving for improvedinstallation comfort
- Pre-assembled components of the fixing allow you to save time

APPLICATIONS

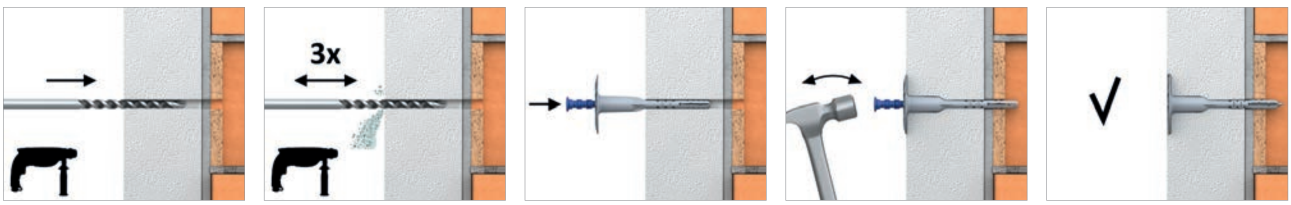
- External Thermal Insulation Composite Systems (ETICS)
- Polystyrene (EPS) boards
- Mineral wool (MW) boards
- Polyurethane (PU) boards
- Cork boards
- Light wood wool building boards

BASE MATERIALS

Approved for use in:

- Concrete C12/15-C50/60 (Use category A)
- Concrete C16/20 (Use category A)
- Concrete C20/25-C50/60 (Use category A)
- External wall panel of concrete C 16/20 – C50/60 (Use category A)
- Solid Brick (Use category B)
- Solid Sand-lime Brick (Use category B)
- Hollow Sand-lime Brick |(Use category C)
- Vertically-perforated clay block (Use category C)

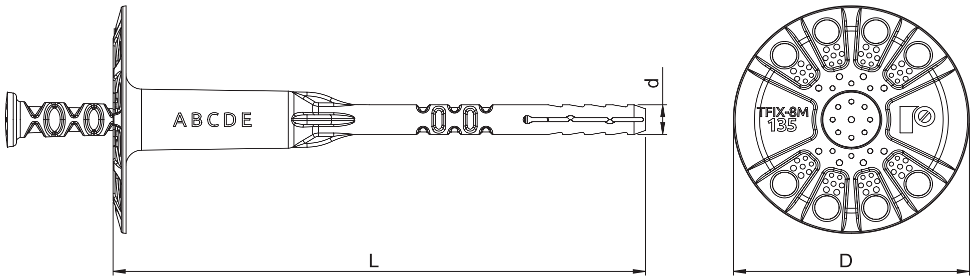
INSTALLATION GUIDE



1. Drill a hole of required diameter and depth
2. Drilling depth of min 35mm in A,B,C,D materials and 75mm in Aerated Concrete Block.
3. Clean drilled hole 3 times.
4. Bottom side of the plate must be flush with the ETICS.
5. Embedment depth of min 25mm in A,B,C,D materials and 65mm in Aerated Concrete Block.
6. Hammer the nail into the plastic sleeve until fixing is secure and flush with insulation material.
7. In soft insulation panels the fixing should be combined with insulation retaining plates KWL-90, KWL-110, KWL-140.

R-TFIX-8M FACADE FIXING WITH METAL NAIL

PRODUCT INFORMATION



Size	Product Code	Fixing			Fixture	
		Diameter	Plate diameter	Length	Recommended thickness	
		d	D	L	t_{fix} A, B, C, D	t_{fix} E
		[mm]	[mm]	[mm]	[mm]	[mm]
Ø08	R-TFIX-8M-135	8	60	135	100	60
	R-TFIX-8M-155	8	60	155	120	80
	R-TFIX-8M-175	8	60	175	140	100
	R-TFIX-8M-195	8	60	195	160	120
	R-TFIX-8M-215	8	60	215	180	140
	R-TFIX-8M-235	8	60	235	200	160
	R-TFIX-8M-255	8	60	255	220	180
	R-TFIX-8M-275	8	60	275	240	200
	R-TFIX-8SX-295	8	60	295	260	220

INSTALLATION DATA

Size			A, B, C, D	A - external panel	E
Fixing diameter	d	[mm]	8	8	8
Hole diameter in substrate	d_0	[mm]	8	8	8
Min. installation depth	h_{nom}	[mm]	25	25	65
Min. hole depth in substrate	h_0	[mm]	35	35	75
Min. substrate thickness	h_{min}	[mm]	100	40	100
Min. spacing	s_{min}	[mm]	100	100	100
Min. edge distance	c_{min}	[mm]	100	100	100

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing

Substrate		Concrete C12/15	Concrete min. C16/20	External wall panel of concrete	Solid clay brick min 20MPa (eg Mz20/2.0)	Sand-lime brick min. 30MPa	Sand-lime hollow block min. 20MPa	Hollow brick min. 15MPa	Prefabricated reinforced components of lightweight aggregate concrete 4MPa	Aerated concrete AAC5
Effective embedment depth h_{ef}	[mm]	25	25	25	25	25	25	25	25	25
CHARACTERISTIC LOAD N_{Rk}										
R-TFIX-8M	[kN]	1.10	1.20	1.10	1.20	1.20	1.10	0.50	0.50	1.00
DESIGN LOAD N_{Rd}										
R-TFIX-8M	[kN]	0.55	0.60	0.55	0.60	0.60	0.55	0.25	0.25	0.50
RECOMMENDED LOAD N_{rec}										
R-TFIX-8M	[kN]	0.39	0.43	0.39	0.43	0.43	0.39	0.18	0.18	0.36

Fixing type		R-TFIX-8M
Plate resistance	[kN]	1.53
Plate stiffness	[kN/mm]	1
Point thermal transmittance	[W/K]	0.001

ASSOCIATED PRODUCTS

RT-SDSA
Drill bits Aggressor SDS plus

RT-SDSB
Drill bits Brickdrill SDS plus

RT-SDSR
Drill bits Rebardrill SDS plus

TFIX-8ST UNIVERSAL FACADE FIXING

The first thermal insulation combination screw fixing that can be countersunk together with the integrated insulation cap

ETA-11/0144

FEATURES AND BENEFITS

- Accurate countersunk setting automatically sets the fixing flush with the insulation layer
- Integrated insulation cap (with unique surface reinforcement) equalizes thermal conductivity over the fixing point, whilst also leveling out drying times of render.
- Unique sleeve compression zone for precision installations.
- Simple countersunk installation in all substrates (A,B,C,D,E).
- The long plastic overmoulding on the TFIX-8ST screw minimises thermal bridging (value 0.001-0,002W/K), contributing to energy-saving benefits
- The shortest embedment depth at the maximum strength parameters
- Unique design allows for high load-bearing capacities. This reduces the quantity of fixings required per square metre of insulation
- Plate stiffness (value 0.6 kN/mm) ensures smooth elevation surface and stable insulation system.
- Pre-assembled elements of the fixing saves time and labour

APPLICATIONS

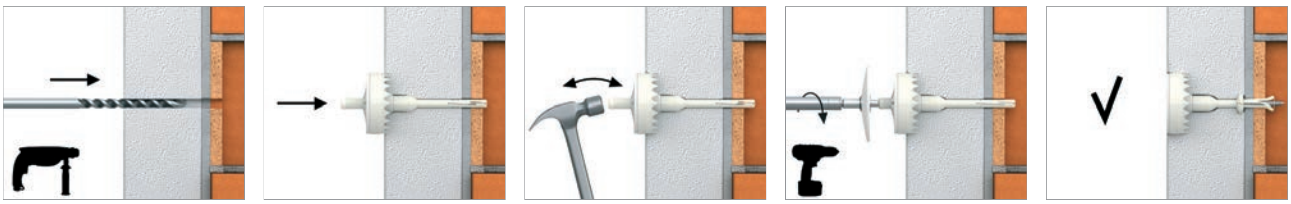
- External Thermal Insulation Composite Systems (ETICS)
- Polystyrene (EPS) boards
- Mineral wool
- Polyurethane (PU) boards

BASE MATERIALS

Approved for use in:

- Concrete C12/15-C50/60 (Use category A)
- Solid Brick (Use category B)
- Solid Sand-lime Brick (Use category B)
- Hollow Brick (Use category C)
- Hollow Sand-lime Brick (Use category C)
- Vertically-perforated clay block (Use category C)
- Lightweight Concrete Block (Use category C)
- Hollow Lightweight Concrete Block (Use category C)
- Reinforced components of lightweight aggregate concrete (Use category D)
- Aerated Concrete Block (Use category E)

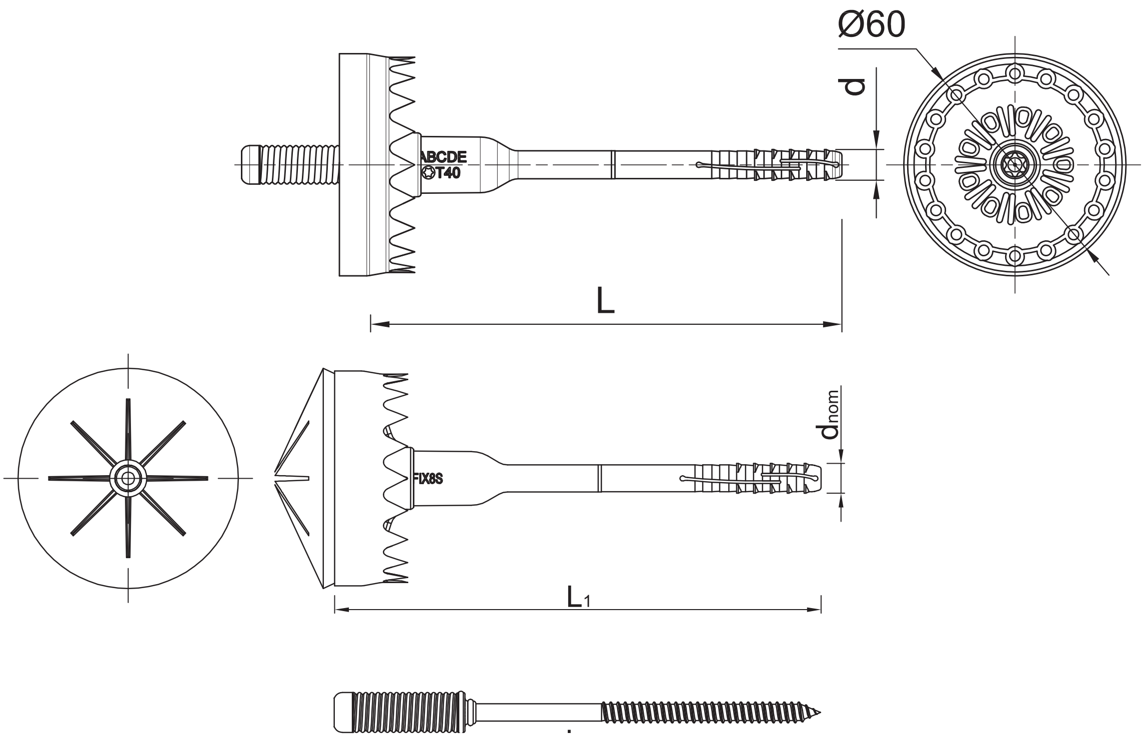
INSTALLATION GUIDE



1. Drill a hole of required diameter and depth
2. Drilling depth of min 35mm in A,B,C,D materials and 75mm in Aerated Concrete Block
3. Lightly tap the plastic sleeve through the insulation material into hole with a hammer, until fixing depth is reached
4. Embedment depth of min 25mm in A,B,C,D materials and 65mm in Aerated Concrete Block
5. When using the KWX-63 the teeth should be embedded in the insulation material after hammering.

TFIX-8ST UNIVERSAL FACADE FIXING

PRODUCT INFORMATION



Size	Product Code	Fixing			Fixture	
		Diameter	Plate diameter	Length	Recommended thickness	
		d	D	L	t_{fix} A, B, C, D	t_{fix} E
		[mm]	[mm]	[mm]	[mm]	[mm]
Ø08	TFIX-8ST-115	8	115	60	80	40
	TFIX-8ST-135	8	135	60	100	60
	TFIX-8ST-155	8	155	60	120	80
	TFIX-8ST-175	8	175	60	140	100
	TFIX-8ST-195	8	195	60	160	120
	TFIX-8ST-215	8	215	60	180	140
	TFIX-8ST-235	8	235	60	200	160
	TFIX-8ST-255	8	255	60	220	180
	TFIX-8ST-275	8	275	60	240	200
	TFIX-8ST-295	8	295	60	260	220
	TFIX-8ST-335	8	335	60	300	260
	TFIX-8ST-355	8	355	60	320	280
	TFIX-8ST-375	8	375	60	340	300
	TFIX-8ST-395	8	395	60	360	320
	TFIX-8ST-415	8	415	60	380	340
	TFIX-8ST-435	8	435	60	400	360
	TFIX-8ST-455	8	455	60	420	380

INSTALLATION DATA

Size			A, B, C, D	E
Fixing diameter	d	[mm]	8	8
Hole diameter in substrate	d_0	[mm]	8	8
Min. installation depth	h_{nom}	[mm]	25	65
Min. hole depth in substrate	h_0	[mm]	40	80
Min. substrate thickness	h_{min}	[mm]	100	100
Min. spacing	s_{min}	[mm]	100	100
Min. edge distance	c_{min}	[mm]	100	100

TFIX-8ST UNIVERSAL FACADE FIXING

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing

Substrate		Concrete C12/15	Concrete C16/20	Concrete C50/60	Solid brick Mz	Vertically perforated clay brick HLz	Sand-lime solid brick KS	Sand-lime perforated brick KSL	Lightweight concrete solid brick V	Lightweight concrete hollow block HBL 4MPa	Lightweight concrete hollow block HBL 6MPa	Prefabricated reinforced components of lightweight aggregate concrete 4MPa	Prefabricated reinforced components of lightweight aggregate concrete 6MPa	Autoclaved aerated concrete AAC 4MPa	Autoclaved aerated concrete AAC 6MPa
Effective embedment depth h_{ef}	[mm]	25	25	25	25	25	25	25	25	25	25	25	25	65	65
CHARACTERISTIC LOAD N_{Rk}															
TFIX-8ST	[kN]	1.20	1.50	1.20	1.20	0.75	0.90	0.90	0.50	0.40	0.60	0.40	0.60	0.90	1.20
DESIGN LOAD N_{Rd}															
TFIX-8ST	[kN]	0.60	0.75	0.60	0.60	0.38	0.45	0.45	0.25	0.20	0.30	0.20	0.30	0.45	0.60
RECOMMENDED LOAD N_{rec}															
TFIX-8ST	[kN]	0.43	0.54	0.43	0.43	0.27	0.32	0.32	0.18	0.14	0.21	0.14	0.21	0.32	0.43

Fixing type		TFIX-8ST
Plate resistance	[kN]	2.04
Plate stiffness	[kN/mm]	0.6
Point thermal transmittance	[W/K]	0.002

ASSOCIATED PRODUCTS

RT-SDSA
Drill bits Aggressor SDS plus

RT-SDSB
Drill bits Brickdrill SDS plus

RT-SDSR
Drill bits Rebardrill SDS plus

TFIX-8ST-TOOL
Setting tool

TFIX-8P FACADE FIXING WITH PLASTIC PIN

Versatile hammer-in facade fixing with plastic nail recommended for ETICS

ETA ETA-13/0845 CE

FEATURES AND BENEFITS

- Installation in all base materials (categories A,B,C,D,E)
- The plastic nail reduces heat transmission (value 0.0W/K)
- Pre-assembled expansion nail saves time and labour.
- Unique nylon pin design reinforced with glass fibre allows fast and trouble-free installation with correct expansion of the plug.
- Expansion zone designed for low embedment depths, reducing the amount of drilling required.
- Can be used in combination with additional KWL plate - 90, 110 or 140mm diameter.

APPLICATIONS

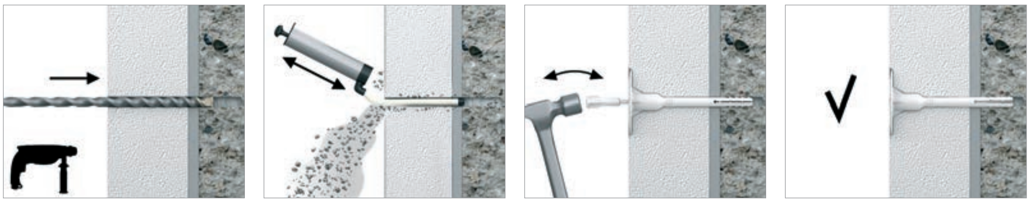
- External Thermal Insulation Composite Systems (ETICS)
- Polystyrene (EPS) boards
- Polyurethane (PU) boards
- Mineral wool
- Lightweight wood wool building boards
- Cork boards

BASE MATERIALS

Approved for use in:

- Concrete C12/15-C50/60 (Use category A)
- Solid Brick (Use category B)
- Solid Sand-lime Brick (Use category B)
- Hollow Brick (Use category C)
- Hollow Sand-lime Brick (Use category C)
- Vertically-perforated clay block (Use category C)
- Lightweight Concrete Block (Use category C)
- Hollow Lightweight Concrete Block (Use category C)
- Reinforced components of lightweight aggregate concrete (Use category D)
- Aerated Concrete Block (Use category E)

INSTALLATION GUIDE

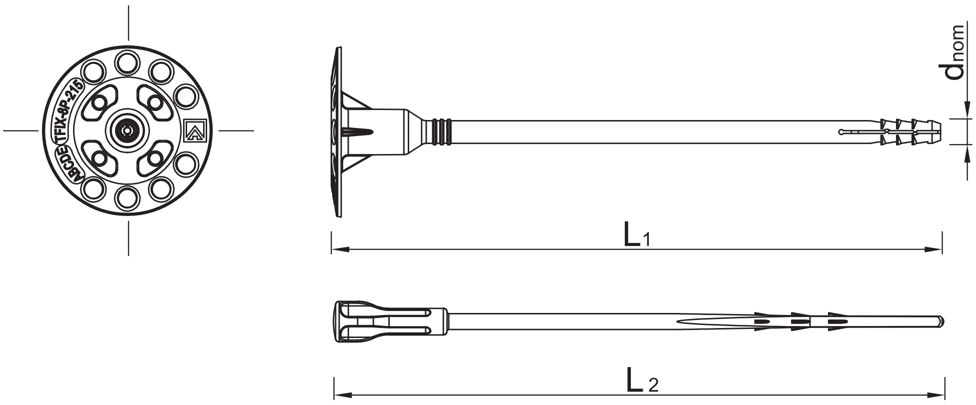


1. Drill a hole of required diameter and depth
2. Clean the hole
3. Bottom side of the plate must be flush with the ETICS.
4. Lightly tap the plastic nail into the plastic sleeve until fixing is secure and flush with insulation material.
5. Embedment depth of min 25 in masonry, perforated materials and lightweight concrete blocks and 65mm in aerated concrete.
6. In soft insulation panels the fixing should be combined with insulation retaining plates KWL-90, KWL-110, KWL-140.

TFIX-8P

FACADE FIXING WITH PLASTIC PIN

PRODUCT INFORMATION



Size	Product Code	Fixing			Fixture	
		Diameter	Plate diameter	Length	Recommended thickness	
		d	D	L	t_{fix} A, B, C, D	t_{fix} E
		[mm]	[mm]	[mm]	[mm]	[mm]
Ø08	TFIX-8P-115	8	60	115	80	40
	TFIX-8P-135	8	60	135	100	60
	TFIX-8P-155	8	60	155	120	80
	TFIX-8P-175	8	60	175	140	100
	TFIX-8P-195	8	60	195	160	120
	TFIX-8P-215	8	60	215	180	140

INSTALLATION DATA

Size			A, B, C, D	E
Fixing diameter	d	[mm]	8	8
Hole diameter in substrate	d_0	[mm]	8	8
Min. installation depth	h_{nom}	[mm]	25	65
Min. hole depth in substrate	h_0	[mm]	40	80
Min. substrate thickness	h_{min}	[mm]	100	100
Min. spacing	s_{min}	[mm]	100	100
Min. edge distance	c_{min}	[mm]	100	100

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing

Substrate		Concrete C16/20	Concrete C12/15	Solid brick	Sand-lime solid brick	Perforated ceramic brick	Sand-lime hollow brick	Lightweight concrete solid block	Lightweight concrete hollow block	Lightweight concrete	Autoclaved aerated concrete AAC 6MPa
Effective embedment depth h_{ef}	[mm]	25	25	25	25	25	25	25	25	25	65
CHARACTERISTIC LOAD N_{Rk}											
TFIX-8ST	[kN]	0.50	0.40	0.50	0.50	0.30	0.30	0.30	0.30	0.30	0.50
DESIGN LOAD N_{Rd}											
TFIX-8ST	[kN]	0.25	0.20	0.25	0.25	0.15	0.15	0.15	0.15	0.15	0.15
RECOMMENDED LOAD N_{rec}											
TFIX-8ST	[kN]	0.18	0.14	0.18	0.18	0.11	0.11	0.11	0.11	0.11	0.11

Fixing type		TFIX-8P
Plate resistance	[kN]	1.38
Plate stiffness	[kN/mm]	0.3
Point thermal transmittance	[W/K]	0

ASSOCIATED PRODUCTS

RT-SDSA

Drill bits Aggressor SDS plus

RT-SDSB

Drill bits Brickdrill SDS plus

RT-SDSR

Drill bits Rebardrill SDS plus

MBA/MBA-SS FACADE FIXING

Fire-resistant metal insulation fixing

KOT-2018/0721

FEATURES AND BENEFITS

- Metal facade fixing, recommended for use when fire resistance (F120) is a requirement
- Fast and simple hammer-set installation reduces working times.
- Extensive dimensional range allows anchorage of insulation boards up to 250mm thick
- Accessory spreader plate, MKC (85mm diameter) also available for installation of soft insulation materials such as mineral wool.

APPLICATIONS

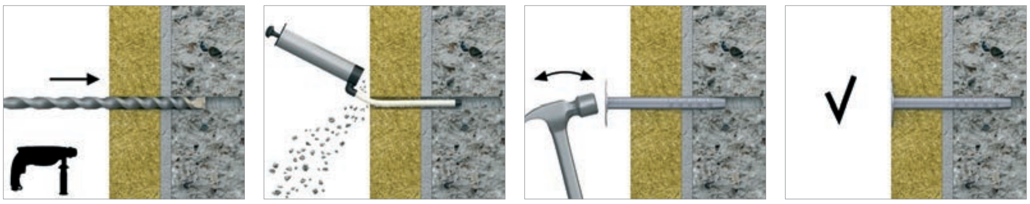
- Mineral wool
- Glass wool
- Lightweight wood wool building boards
- Lightweight recycled panels
- Polystyrene (EPS) boards
- Polyurethane (PU) boards

BASE MATERIALS

Approved for use in:

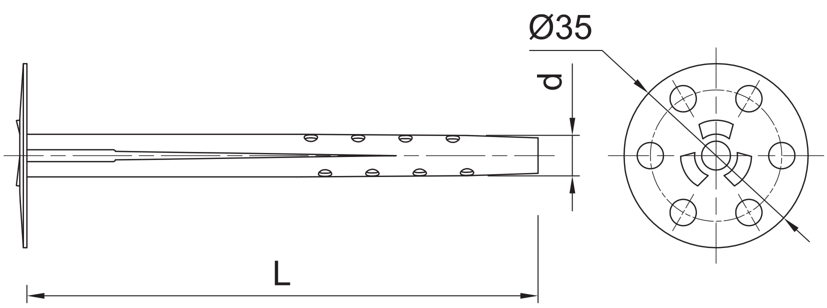
- Concrete C12/15-C50/60 (Use category A)
- Solid Brick (Use category B)
- Solid Sand-lime Brick (Use category B)
- Aerated Concrete Block (Use category E)

INSTALLATION GUIDE



1. Drill a hole of required diameter and depth
2. With a hammer, lightly tap MBA fixing (with MKC washer where applicable) through the insulation material into hole, until fixing depth is reached.

PRODUCT INFORMATION



Size	Product Code	Fixing [mm]			Fixture [mm]
		Diameter	Plate diameter	Length	Max. thickness
		d	D	L	t_{fix}
Ø08	MBA-08090 / MBA-SS-08090	8	35	90	40
	MBA-08110 / MBA-SS-08110	8	35	110	60
	MBA-08140 / MBA-SS-08140	8	35	140	90
	MBA-08170 / MBA-SS-08170	8	35	170	120
	MBA-08200 / MBA-SS-08200	8	35	200	150
	MBA-08250 / MBA-SS-08250	8	35	250	200
	MBA-08300 / MBA-SS-08300	8	35	300	250

MBA/MBA-SS FACADE FIXING

INSTALLATION DATA

Size			A, B	E
Fixing diameter	d	[mm]	8	8
Hole diameter in substrate	d_0	[mm]	8	-
Min. installation depth	h_{nom}	[mm]	35	50
Min. hole depth in substrate	h_0	[mm]	30	-
Min. substrate thickness	h_{min}	[mm]	80	80
Min. spacing	s_{min}	[mm]	75	75
Min. edge distance	c_{min}	[mm]	75	75

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing

Substrate		Concrete	Solid brick	Sand-lime solid brick	Autoclaved aerated concrete
Effective embedment depth h_{ef}	[mm]	30	30	30	30
CHARACTERISTIC LOAD N_{Rk}					
MBA-SS	[kN]	0.90	0.60	0.75	0.82
DESIGN LOAD N_{Rd}					
MBA-SS	[kN]	0.36	0.24	0.30	0.41
RECOMMENDED LOAD N_{rec}					
MBA-SS	[kN]	0.26	0.17	0.21	0.29

ASSOCIATED PRODUCTS

RT-SDSA

Drill bits Aggressor SDS plus

RT-SDSB

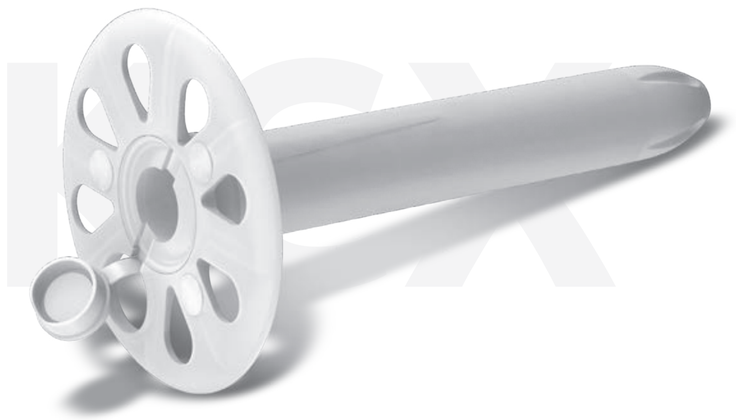
Drill bits Brickdrill SDS plus

RT-SDSR

Drill bits Rebardrill SDS plus

KCX TUBED INSULATION WASHER

Insulation washer with integral cap suitable for attachment of insulation layers to wooden and sheet metal substrates



AT-15-9280/2014

FEATURES AND BENEFITS

- Recommended for the attachment of ETICS to wooden substrates using UC screws, or to sheet metal using WB screws (allows setting without pre-drilling, thus saving a stage of installation)
- Special design of integral fastener cap allows reduction of thermal bridges to 0,001W/K.
- Design with long tube allows to use short length of the screw for best cost effective solution to fix large insulation thickness.
- Consistent and reliable holding force
- Quick, simple and clean installation.
- Can be used in combination with additional KWL plate - 90, 110 or 140mm diameter.

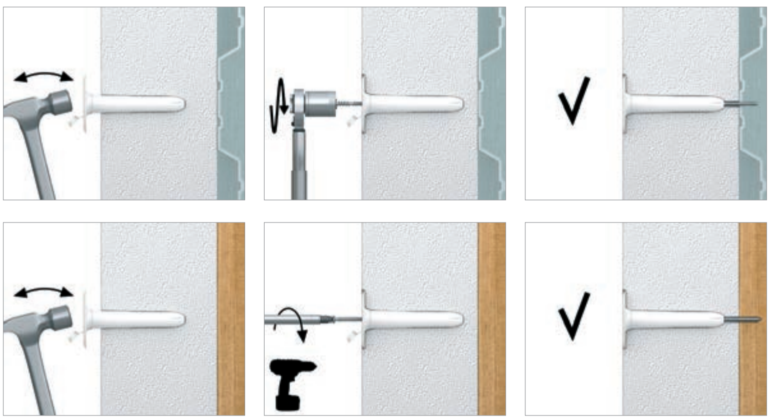
APPLICATIONS

- External Thermal Insulation Composite Systems (ETICS)

BASE MATERIALS

Approved for use in:
- Metal Sheet & Profiles
- Wood
- Timber
- Chipboard
- Concrete

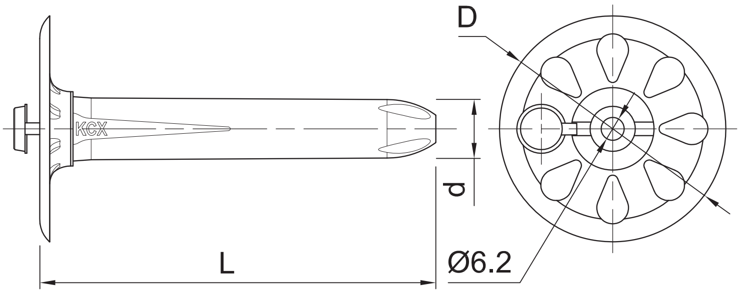
INSTALLATION GUIDE



1. 1. Lightly insert KCX washer into surface of insulation material.
2. 2. Drive the required screw through the washer and insulation material into the substrate, until fixing depth is reached.
3. 3. In wooden substrates the washer is recommended for use with the UC chipboard screw.
4. 4. In sheet metal the washer is recommended for use with either the WB or WX self-drilling screw.

KCX TUBED INSULATION WASHER

PRODUCT INFORMATION



Size	Product Code	Screw	Screw [mm] Diameter d [mm]	Screw [mm] Length L [mm]	Fixture [mm] Max. thickness t_{fix} [mm]	Diameter D [mm]	Length L [mm]
KCX with screw to wood							
Ø5	KCX-055	R-UC-5050	5	50	70	60	55
		R-UC-5060	5	60	80	60	55
		R-UC-5070	5	70	90	60	55
		R-UC-5080	5	80	100	60	55
		R-UC-5090	5	90	110	60	55
Ø6	KCX-105	R-UC-6050	6	50	120	60	105
		R-UC-6060	6	60	130	60	105
		R-UC-6070	6	70	140	60	105
		R-UC-6080	6	80	150	60	105
		R-UC-6090	6	90	160	60	105
		R-UC-6100	6	100	170	60	105
	KCX-165	R-UC-6050	6	50	180	60	165
		R-UC-6060	6	60	190	60	165
		R-UC-6070	6	70	200	60	165
		R-UC-6080	6	80	210	60	165
		R-UC-6090	6	90	220	60	165
		R-UC-6100	6	100	230	60	165
		R-UC-6110	6	110	240	60	165
		R-UC-6120	6	120	250	60	165
		R-UC-6140	6	140	270	60	165
		R-UC-6160	6	160	290	60	165
KCX with selfdrilling screw to metal sheet							
Ø4.8	KCX-055	R-WX-48050	4.8	50	70	60	55
		R-WX-48060	4.8	60	80	60	55
		R-WX-48070	4.8	70	90	60	55
		R-WX-48080	4.8	80	100	60	55
		R-WX-48100	4.8	100	110	60	55
	KCX-105	R-WX-48050	4.8	50	120	60	105
		R-WX-48060	4.8	60	130	60	105
		R-WX-48070	4.8	70	140	60	105
		R-WX-48080	4.8	80	150	60	105
		R-WX-48100	4.8	100	170	60	105
	KCX-165	R-WX-48050	4.8	50	180	60	165
		R-WX-48060	4.8	60	190	60	165
		R-WX-48070	4.8	70	200	60	165
		R-WX-48080	4.8	80	210	60	165
		R-WX-48100	4.8	100	230	60	165
		R-WX-48120	4.8	120	250	60	165
		R-WX-48140	4.8	140	270	60	165
		R-WX-48160	4.8	160	290	60	165
		R-WX-48180	4.8	180	310	60	165
		R-WX-48200	4.8	200	330	60	165
		R-WX-48240	4.8	240	370	60	165
		R-WX-48300	4.8	300	430	60	165
KCX with screw to concrete							
Ø6.1	KCX-055	R-WBT-61075	6.1	75	90	60	55
		R-WBT-61100	6.1	100	110	60	55
	KCX-105	R-WBT-61075	6.1	75	140	60	105
		R-WBT-61100	6.1	100	160	60	105
		R-WBT-61120	6.1	120	180	60	105
	KCX-165	R-WBT-61075	6.1	75	200	60	165
		R-WBT-61100	6.1	100	230	60	165
		R-WBT-61120	6.1	120	250	60	165
		R-WBT-61140	6.1	140	270	60	165
		R-WBT-61160	6.1	160	290	60	165
		R-WBT-61180	6.1	180	310	60	165
		R-WBT-61200	6.1	200	330	60	165
		R-WBT-61220	6.1	220	430	60	165
		R-WBT-61240	6.1	240	450	60	165
		R-WBT-61260	6.1	260	470	60	165
		R-WBT-61300	6.1	300	510	60	165

KCX TUBED INSULATION WASHER

INSTALLATION DATA

Size			Timber		Steel	Concrete
Fixing diameter	d	[mm]	5	6	4.8	6.1
Min. installation depth	h_{nom}	[mm]	20	25	-	40
Min. substrate thickness	h_{min}	[mm]	20	25	0.75	70
Min. spacing	s_{min}	[mm]	100	100	120	120
Min. edge distance	c_{min}	[mm]	100	100	30	50

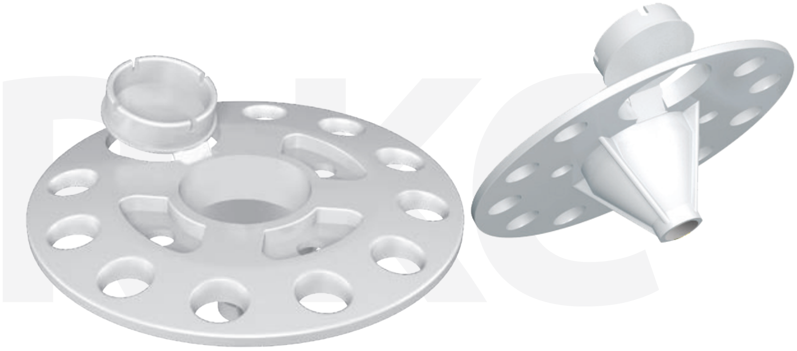
BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing

Substrate		Timber			OSB	Steel				Timber	Concrete
Effective embedment depth h_{ef}	[mm]	20	24	19	18	0.5	0.63	0.75	0.88	30	30
CHARACTERISTIC LOAD N_{Rk}											
KCX + UC 5	[kN]	1.78	-	-	-	-	-	-	-	-	-
KCX + UC 6	[kN]	-	1.78	-	-	-	-	-	-	-	-
KCX + WO 4.8	[kN]	-	-	1.78	1.78	0.96	1.04	1.54	-	-	-
KCX + WX 4.8	[kN]	-	-	-	-	-	-	1.30	1.78	-	-
KCX + WBT 6.1	[kN]	-	-	-	-	-	-	-	-	1.78	1.78
DESIGN LOAD N_{Rd}											
KCX + UC 5	[kN]	0.89	-	-	-	-	-	-	-	-	-
KCX + UC 6	[kN]	-	0.89	-	-	-	-	-	-	-	-
KCX + WO 4.8	[kN]	-	-	0.89	0.89	0.48	0.52	0.77	-	-	-
KCX + WX 4.8	[kN]	-	-	-	-	-	-	0.65	0.89	-	-
KCX + WBT 6.1	[kN]	-	-	-	-	-	-	-	-	0.89	0.89

R-KC INSULATION WASHERS

Insulation washer with integral cap suitable for attachment of insulation layers to wooden and sheet metal substrates



KOT-2017-0345

FEATURES AND BENEFITS

- Recommended for the attachment of ETICS to wooden substrates using UC screws, or to sheet metal using WB screws.
- Special design of integral fastener cap allows reduction of thermal bridges.
- Consistent and reliable holding force
- Quick, simple and clean installation.
- Can be used in combination with additional KWL plate - 90, 110 or 140mm diameter.

APPLICATIONS

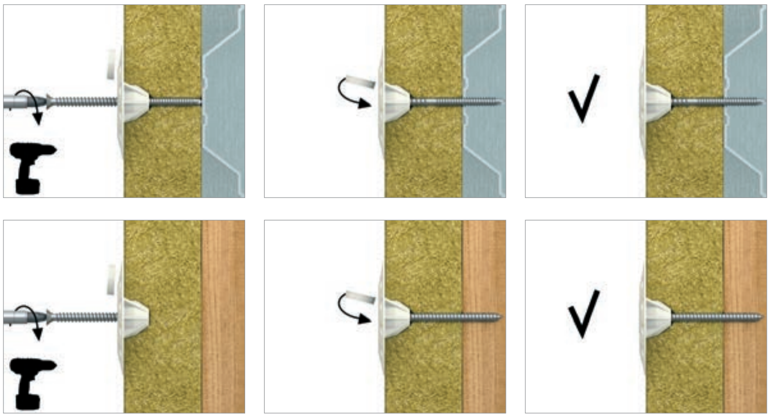
- External Thermal Insulation Composite Systems (ETICS)
- Polystyrene (EPS) boards
- Mineral wool (MW) boards
- Polyurethane (PU) boards

BASE MATERIALS

Approved for use in:

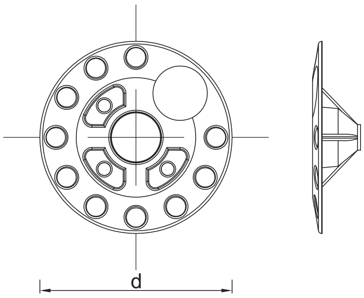
- Metal Sheet & Profiles
- Wood

INSTALLATION GUIDE



1. Lightly insert KC washer into surface of insulation material.
2. Drive the required screw through the washer and insulation material into the substrate, until fixing depth is reached.
3. In wooden substrates the washer is recommended for use with the UC chipboard screw.
4. In sheet metal the washer is recommended for use with either the WB or WX self-drilling screw.

PRODUCT INFORMATION



R-KC INSULATION WASHERS

PRODUCT INFORMATION (cont.)

Size	Product Code	Fixing [mm]			Fixture [mm]
		Diameter	Plate diameter	Length	Max. thickness
		d	D	L	t_{fix}
KC with screw to wood					
Ø5	KC + UC-5050	5	50	60	30
	KC + UC-5060	5	60	60	40
	KC + UC-5070	5	70	60	50
	KC + UC-5080	5	80	60	60
	KC + UC-5090	5	90	60	70
	KC + UC-50100	5	100	60	80
Ø6	KC + UC-60100	6	100	60	75
	KC + UC-60120	6	120	60	95
	KC + UC-60140	6	140	60	115
	KC + UC-60160	6	160	60	135
	KC + UC-60200	6	200	60	175
KC with selfdrilling screw to steel sheet					
Ø5	KC + WB-48100	4.8	100	60	90
	KC + WB-48120	4.8	120	60	110
	KC + WB-48140	4.8	140	60	130
	KC + WB-48160	4.8	160	60	150
	KC + WB-48170	4.8	170	60	160
	KC + WB-48180	4.8	180	60	170
	KC + WB-48200	4.8	200	60	190
	KC + WB-48220	4.8	220	60	210

INSTALLATION DATA

Size			Timber		Steel
Fixing diameter	d	[mm]	5	6	4.8
Hole diameter in substrate	d_0	[mm]	-	-	-
Min. installation depth	h_{nom}	[mm]	20	25	0.75
Min. hole depth in substrate	h_0	[mm]	-	-	-
Min. substrate thickness	h_{min}	[mm]	20	25	0.75
Min. spacing	s_{min}	[mm]	100	100	100
Min. edge distance	c_{min}	[mm]	100	100	100

BASIC PERFORMANCE DATA

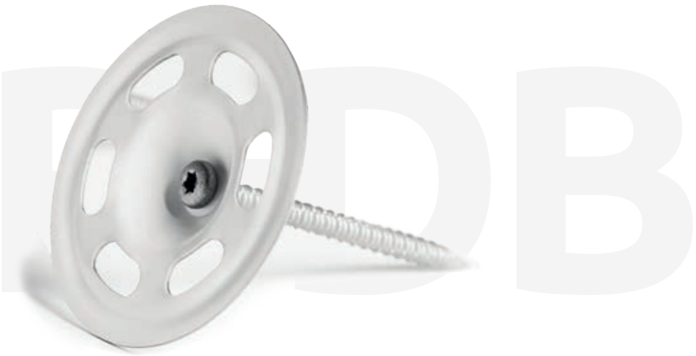
Performance data for single anchor without influence of edge distance and spacing

Substrate		Timber	Timber	Steel
Effective embedment depth h_{ef}	[mm]	20	25	0.75
CHARACTERISTIC LOAD N_{Rk}				
KC + UC ø5		0.78	-	-
KC + UC ø6		-	0.98	-
KC + WB		-	-	0.86
DESIGN LOAD N_{Rd}				
KC + UC ø5		0.73	-	-
KC + UC ø6		-	0.91	-
KC + WB		-	-	0.81
RECOMMENDED LOAD N_{Rec}				
KC + UC ø5		0.17	-	-
KC + UC ø6		-	0.22	-
KC + WB		-	-	0.31

Fixing type		KC
Plate stiffness	[kN/mm]	0.4

R-DB CEILING SCREW-IN SOLUTION WITH WASHER

Screw-in system for fastening ceiling and acoustic insulation boards



FEATURES AND BENEFITS

- Easy removable solution helps to replace the insulation board if necessary
- Screw for concrete substrates, TX25 head. Shape and type of the thread specially design to allow connecting to concrete and wood.
- Special zinc flake corrosion-resistant coating for anti-corrosion protection.
- The drill point is designed to provide a fast and hassle-free installation in the steel. Sharp point of the drill prevents movement of the surface of the fixture.
- Wide retaining plate improve pull-through insulation loads for the fixing point
- Flange ensures flush fit to insulation surface.

APPLICATIONS

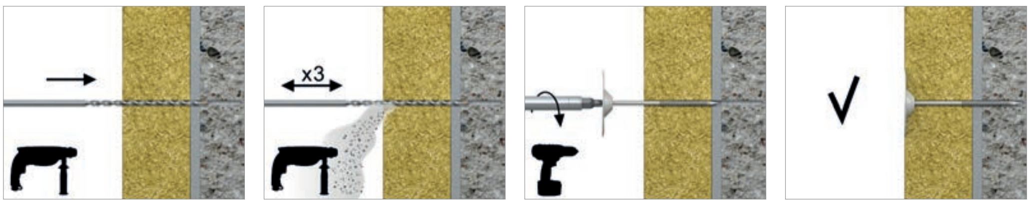
- Thermal and acoustic insulation
- Ceiling and acoustic insulation boards
- Mineral wool (MW) boards

BASE MATERIALS

Approved for use in:

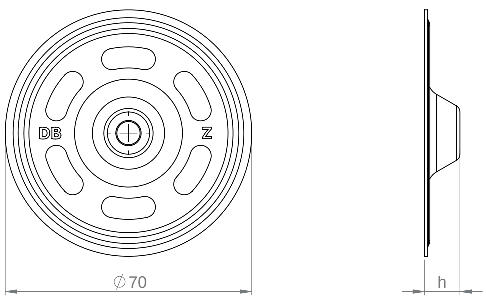
- Concrete C20/25-C50/60

INSTALLATION GUIDE



1. Drill a 5mm diameter hole perpendicular to the surface of the substrate
2. Clean drilled hole 3 times.
3. Use a standard bit for installation
4. The upper part of the plate must be flush with surface
5. Properly set insulation fixing

PRODUCT INFORMATION



R-DB CEILING SCREW-IN SOLUTION WITH WASHER

PRODUCT INFORMATION (cont.)

Size	Product Code	Screw [mm]	
		Diameter	Plate diameter
		d	D
Ø6.1	R-WBT-61050	6.1	50
	R-WBT-61075	6.1	75
	R-WBT-61090	6.1	90
	R-WBT-61100	6.1	100
	R-WBT-61120	6.1	120
	R-WBT-61140	6.1	140
	R-WBT-61160	6.1	160
	R-WBT-61180	6.1	180
	R-WBT-61200	6.1	200
	R-WBT-61220	6.1	220
	R-WBT-61240	6.1	240
	R-WBT-61300	6.1	300

Size	Product Code	Fixing Plate diameter	Hole depth	Embedment depth	Hole diameter	Thickness	Depth
		D	h_0	L	d	t	h
		[mm]					
Ø70	R-DB-Z	70	30	25	6.5	0.8	10
	R-DB-Z-FL	70	30	25	6.5	0.8	5

INSTALLATION DATA

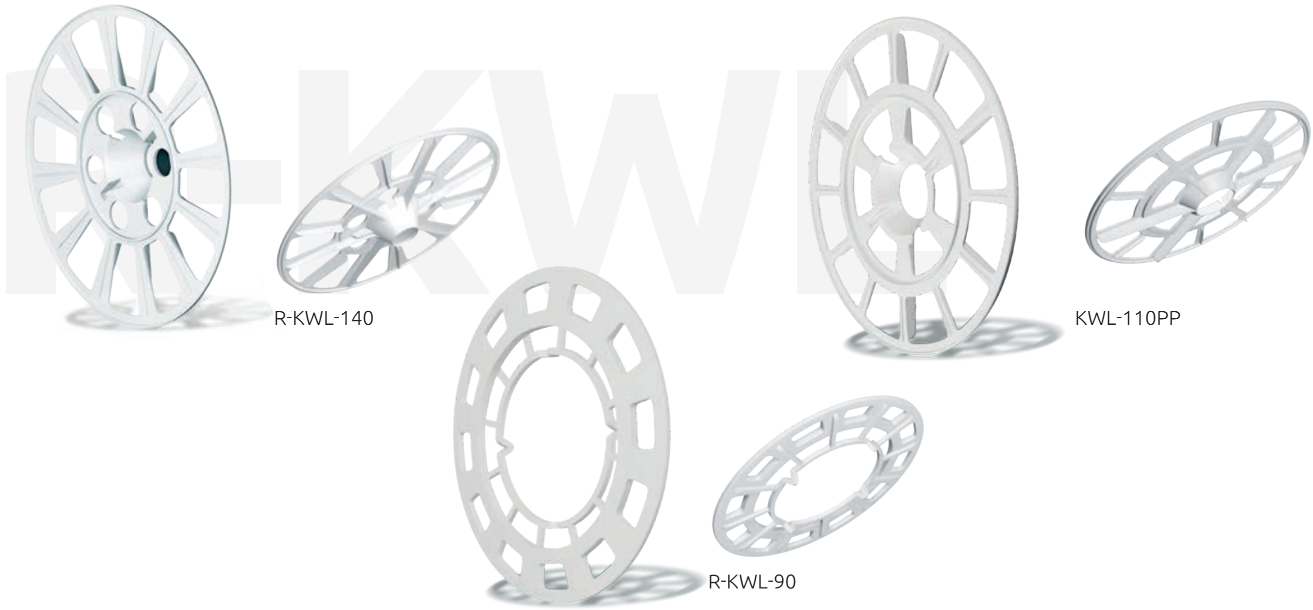
Size			70
Hole diameter in substrate	d_0	[mm]	5
Min. installation depth	h_{nom}	[mm]	25
Min. hole depth in substrate	h_0	[mm]	30
Min. substrate thickness	h_{min}	[mm]	80
Min. spacing	s_{min}	[mm]	100
Min. edge distance	c_{min}	[mm]	100

BASIC PERFORMANCE DATA

Propery	Value
Design load N_{Rd} [kN]	0.50

R-KWL INSULATION RETAINING PLATE

Insulation retaining plate for use in combination with facade fixings from TFIXand KI ranges



ETA 17/0161

FEATURES AND BENEFITS

- Quick and easy application possible with all ETICS fixings.
- Nylon versions ideal for enhanced plate stiffness.
- Polypropylene standard versions are recommended for cost-effective applications.
- A versatile solution for many insulation scenarios.

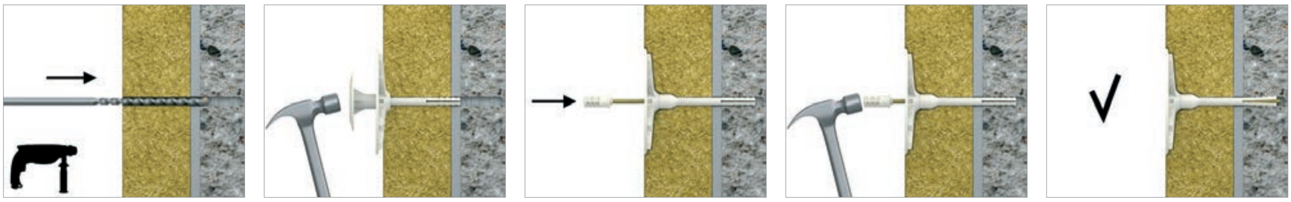
APPLICATIONS

- External Thermal Insulation Composite Systems (ETICS)
- Polystyrene (EPS) boards
- Mineral wool
- Polyurethane (PU) boards

BASE MATERIALS

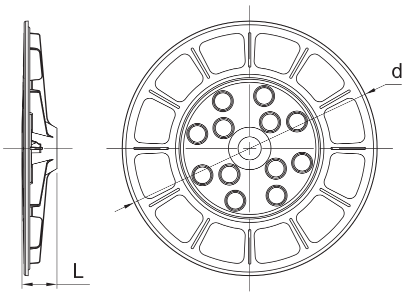
Approved for use in:
- Polystyrene (EPS) Boards
- Mineral wool (MW) boards

INSTALLATION GUIDE



1. Insert chosen TFIX or KI fixing through hole in centre of KWL flange.
2. Follow installation procedure for relevant TFIX or KI fixing.

PRODUCT INFORMATION



Size	Product Code	Screw [mm]	
		Plate diameter	Length
		D	L
Ø90	R-KWL-090	90	15
Ø110	R-KWL-110	110	15
Ø140	R-KWL-140	140	15

R-KWX INSULATION RETAINING PLATE WITH PERFORATOR

Joining retaining plate with perforator for countersunk installation in mineral wool insulation boards

ETA 17/0161

FEATURES AND BENEFITS

- Usage always with screw-in insulation fixing eg. R-TFIX-8SX / KWX
- Wide retaining plate improve pull-through insulation loads for the fixing point
- Allows countersunk installation into all mineral wool-insulation boards with minimal lateral tensile strength and phenolic board
- Accurate countersunk setting automatically sets the fixing flush with the insulation layer
- Permanent contact pressure
- No additional installation tool required
- Quick and easy installation
- Compatible with TFIX-8S-MW insulation cap

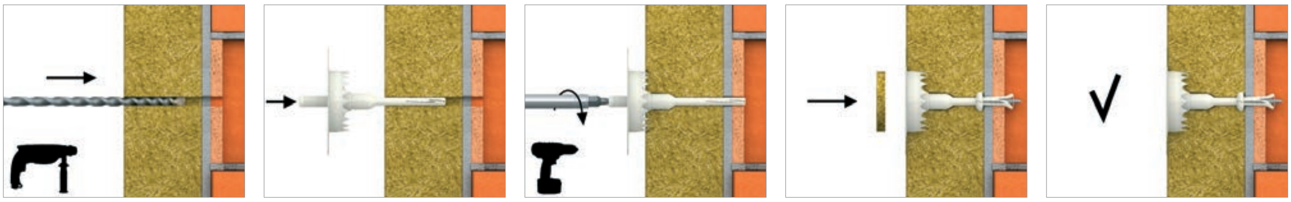
APPLICATIONS

- External Thermal Insulation Composite Systems (ETICS)

BASE MATERIALS

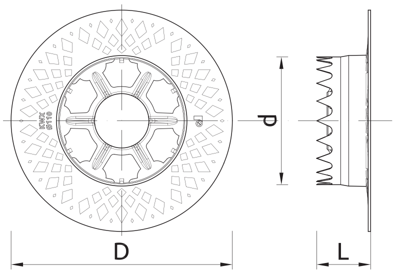
Approved for use in:
- Polystyrene (EPS) Boards
- Mineral wool (MW) boards

INSTALLATION GUIDE



1. Drill a hole of required diameter and depth
2. Drilling depth of min 35mm in A,B,C,D materials and 75mm in Aerated Concrete Block.
3. Clean drilled hole 3 times.
4. Insert R-TFIX-TOOL-BLACK into recess in head moulding of R-TFIX-8SX screw.
5. Insert the fixing into the drilled hole.
6. When using the KWX-63 the teeth should be embedded in the insulation material after hammering.
7. Embedment depth of min 25mm in A,B,C,D materials and 65mm in Aerated Concrete Block.
8. Apply steady axial pressure, ensuring the disc of the setting tool is kept perpendicular to the fixing axis.
9. Steadily drive in the screw with high revs until fixing is secure (when disc touches insulation surface).

PRODUCT INFORMATION



Size	Product Code	Fixing Plate diameter D	Drill diameter Ø	Fixing Length L
110	R-KWX-110	110	63.5	13.7
63,5	R-KWX-63	63.5	63.5	16.5

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We are proud to present innovative fixing from the ***Bonded Anchors and Mechanical Anchors*** group designed for the heavy loads demanded by industrial construction. Among our products you will find unique solutions to enable you to achieve maximal amounts with any kind of substrate. Knowledge backed-up with experience guarantees the effectiveness of our fixings and the success of your investment.

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Our wide range of expansion plugs made of synthetic materials and metal, for low and medium loads, have been used for years for both industrial and residential construction. Incredibly durable FF1 from frame fixings group, universal in use 4ALL and UNO Plug, no. 1 on the UK market, are leading products of RAWLPLUG®'s offer in the field of ***Lightweight Fixings***, designed with every substrate in mind.

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As a leading producer of façade insulation fixings we would like to present to you our wide array of products used in energy saving constructions. The Reliability and simplicity of our solutions combined with their ease of installation make them the most popular and desired by professionals. We invite you to familiarize yourselves with our offer for ***Façade Insulations Fixings***.

Excellent resistance for high loads
Thanks to our close cooperation with roof covering product producers, and our insight into the needs of investment contractors, our ***Roofing Insulations Fixings*** are one of the most popular among European roof fixing system producers. We invite cooperation from engineers, architects, and roof works contractors. And encourage you to try out our calculation software "ROOFIX" today.

Safety Certificate
Stepping towards the needs of customers, and increasing the general level of safety in closed spaces, we have created a protection system event of which in the combustion prevents fire and smoke from spreading. We invite you to acquaint with our offer for ***Passive Fire Protection Systems***, which hold the European Conformity Assessment.

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Thanks to our constant monitoring of the production of assortments from our ***Foams, Sealants and Adhesives*** range we guarantee the constant and repeatable quality of our products. Their wide range of application possibilities and high efficiency has enabled us to rank among the top 5 of companies in the construction chemistry industry for years.

Maximal weather resistance
Rawlplug® ***Fasteners*** guarantee reliability of connections and maximal weather resistance. Our products, thanks to the use of appropriate materials and adoption of modern anticorrosion coating, pass even the hardest tests, matching the expectations of the most demanding clients. In our rich offer of screws characterized by extraordinary ease of installation, one may find perfect kind of connection for any kind of material and substrate.

Save time and minimize costs
In our offer of ***Direct Fastening Systems*** you may find, among others, highly effective pneumatically and gas powered nailers with accessories, compressors and an innovative and ergonomic rebar tier. We invite you to familiarize yourselves with the capabilities of Rawlplug® tools, which can significantly increase the comfort and effectiveness of work at any construction site.

Maximal effect of optimal offer
In order to ease the application and proper use and installation of our products, we supplement the our assortment of fixings with a precisely composed offer of ***Power Tool Accessories***. They include, among others, European-made drills of the highest quality, as confirmed with a Sichersafe certificate. We invite you to familiarize yourselves with our offer of accessories for professional installation techniques of the Rawlplug® brand.

Ergonomics for construction and at home
We offer high-quality ***Stapling, Tacking and Gluing*** tools that are recommended for both professionals and home DIY. Rawlplug's stapling tools are especially intended for construction, finishing works and repairs while our hot-melt adhesive system includes a new line of glue guns and glues for a wide range of applications - all of which are exceptionally easy to use and provide maximum efficiency and a high degree of flexibility for routine work

Unique and exclusive exposition
Rawlplug ***POS Essential Offer*** it is a unique and complete solution designed for product exposition in building wholesale and retail stores. The POS system is based on easily configurable rack components enhanced with expansive information elements and additional decorations, as well as a combination of individual packages in form of innovative Rawlplug Bag and cutting-edge cardboard boxes.

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